SGW-60432
Revision 0

Borehole Summary Report for the Characterization Boreholes in the 200-DV-1 Operable Unit, FY 2015 and FY 2016

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

P.O. Box 1600
Richland, Washington 99352

Approved for Public Release;
Further Dissemination Unlimited

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CH2M HILL Plateau Remediation Company

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Terms

2GHA	Mt Sopris 2GHA Logging System
bgs	below ground surface
Becker Hammer	AP1000 Becker Hammer
BGO	Bismuth germinate detector
Cascade	Cascade Drilling, L.P.
CCU	Cold Creek unit
CCUc	Cold Creek unit calcic
CCUz	Cold Creek unit silt-dominated
DOE	United States Department of Energy
dpm	disintegrations per minute
DPT	direct-push technology
Ecology	Washington State Department of Ecology
ERT	electrical resistivity tomography
ft	feet or foot
Freestone	Freestone Environmental Services, Inc.
H1	Hanford formation gravel-dominated unit
H2	Hanford formation sand-dominated unit
HEIS	Hanford Environmental Information System
HRLS	High Rate Logging System
ID	identification
IDW	investigation-derived waste
in.	inch
IH	industrial hygienist
Layne	Layne Christensen Company
N/A	not applicable
NMLS	Neutron Moisture Logging System
NR	not recorded
OD	outer diameter
PNLS	Passive Neutron Logging System
PVC	polyvinyl chloride

ppmv	parts per million by volume
Rev.	revision
Rtf	Ringold Formation member of Taylor Flat
Rwie	Ringold Formation member of Wooded Island-unit E
SAP	sampling and analysis plan
SGLS	Spectral Gamma Logging System
SN3	Stoller Newport News Nuclear, Inc.
TD	total depth
OU	Operable Unit
VOC	volatile organic compound
WAC	*Washington Administrative Code*
WMA	waste management area

Metric Conversion Chart

Into Metric Units			Out of Metric Units		
If you know	*Multiply by*	*To get*	*If you know*	*Multiply by*	*To get*
Length			**Length**		
inches	25.40	millimeters	millimeters	0.0394	inches
inches	2.54	centimeters	centimeters	0.394	inches
feet	0.305	meters	meters	3.281	feet
yards	0.914	meters	meters	1.094	yards
miles (statute)	1.609	kilometers	kilometers	0.621	miles
Area			**Area**		
sq. inches	6.452	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.0929	sq. meters	sq. meters	10.764	sq. feet
sq. yards	0.836	sq. meters	sq. meters	1.196	sq. yards
sq. miles	2.591	sq. kilometers	sq. kilometers	0.386	sq. miles
acres	0.405	hectares	hectares	2.471	acres
Mass (weight)			**Mass (weight)**		
ounces (avoir)	28.349	grams	grams	0.0353	ounces
pounds	0.454	kilograms	kilograms	2.205	pounds
tons (short)	0.907	ton (metric)	ton (metric)	1.102	tons (short)
Volume			**Volume**		
teaspoons	5	milliliters	milliliters	0.034	ounces
tablespoons	15	milliliters	liters	2.113	pints
ounces	29.573	milliliters	liters	1.057	quarts
cups	0.24	liters	liters	0.264	gallons
pints	0.473	liters	cubic meters	35.315	cubic feet
quarts	0.946	liters	cubic meters	1.308	cubic yards
gallons	3.785	liters			
cubic feet	0.0283	cubic meters			
cubic yards	0.764	cubic meters			
Radioactivity			**Radioactivity**		
picocurie	37	millibecquerel	millibecquerel	0.027	picocurie

1 Introduction

This report presents field-generated records and summarizes field activities performed during the direct-push drilling, continuous core sampling, and decommissioning of twenty-two boreholes in the 200-DV-1 Operable Unit (OU) of the Hanford Site. The report also presents information for six boreholes that did not reach total depth and had to be replaced. This report focuses on the advancement of boreholes in accordance with SGW-58552, *Description of Work for the Characterization of 200-DV-1 Operable Unit, FY2015*, Rev. 2 and DOE/RL-2011-104, Rev. 0, *Characterization Sampling and Analysis Plan for the 200-DV-1 Operable Unit* (hereafter referred to as the Rev. 0 sampling and analysis plan [SAP]). The purpose of advancing the boreholes was to characterize contaminant concentrations and their vertical distribution in the vadose zone at 200-DV-1 OU waste sites.

The forty-three 200-DV-1 OU waste sites are located in three areas on the Central Plateau at the Hanford Site. The 200-DV-1 OU waste sites are primarily the cribs and trenches adjacent to, and associated with, the 241-B/BX/BY, 241-T/TX/TY, and 241-S/SX Tank Farms, referred to as the B Complex, the T Complex, and the S Complex, respectively. The 200-DV-1 OU was created in 2010 to support remedy selection for waste sites with deep vadose zone contamination. In general, deep vadose zone contamination poses a potential threat to groundwater and is not easily remediated using typical surface remedies.

The 200-DV-1 OU contaminants of potential concern are identified in Table 1-2 of the Rev. 0 SAP as revised by Tri-Party Agreement (Ecology et al., (1989), the *Hanford Federal Facility Agreement and Consent Order*) change order TPA-CN-688.

Cascade Drilling, L.P. (Cascade), Layne Christensen Company (Layne), and Stillwater, LLC (Stillwater), under the direction of CH2M Hill Plateau Remediation Company (CHPRC), conducted drilling and decommissioning activities associated with the 200-DV-1 OU boreholes between July 8, 2015, and September 29, 2016. Freestone Environmental Services, Inc. (Freestone), provided well-site geology and well decommissioning documentation services. Stoller Newport News Nuclear, Inc. (SN3) provided geophysical logging services.

1.1 Purpose and Scope

The purpose of this report is to compile field data and summarize observations made during direct-push advancement, continuous core sampling, and decommissioning activities for the 200-DV-1 OU boreholes. This report includes field notes and completed field forms, borehole decommissioning information, radiological data, geologic observations, civil survey results, and records of investigation-derived waste (IDW) management and disposition.

The primary controlling documents for the direct-push drilling, continuous core sampling, and decommissioning activities were SGW-58552, SGW-58569, *Supplemental Sampling Instruction for the Field Investigation of B Complex area in 200-DV-1 Operable Unit*, and the Rev. 0 SAP.

Drilling and sampling of the twenty-two final and the six incomplete boreholes support the planned characterization activities detailed in the Rev. 0 SAP. Figure 1-1, Figure 1-2, and Figure 1-3 depict the borehole location and associated waste sites. Unsuccessful drilling attempts are represented on the location maps by the borehole ID in parentheses and a color code associated with the failed drilling technology. Borehole identification, location, and drilling summary information are presented in Table 1-1.

The Well Summary Sheets, borehole geologic logs, and Well Survey Data Reports for each borehole are in Appendices A, B, and C, respectively. Sample details including Hanford Environmental Information System (HEIS) numbers, sample interval depths, dates, temperature data, and % recovery are summarized in Appendix D. Other supporting information including variances are presented in Appendix E. Geophyscial logging combination plots, core borehole geologic logs and core photos are in Appendices F, G and H, respectively.

Table 1-1. Borehole Identification, Location, Waste Site Association, and Drilling Summary Information

Borehole ID	Associated 200-DV-1 Operable Unit Waste Site	Purpose	Ecology ID	Northing[a] (meters)[c]	Easting[a] (meters)[c]	Elevation of Brass Survey Marker[b] (meters)[c]	Total Drilled Depth (ft bgs)	Field Activity Dates: Initiate Drilling	Field Activity Dates: Conclude Field Work
C8711	BY Cribs	Unsuccessful drilling attempt - replaced by C9550	N/A	Unable to Locate Marker			27.6	Jul. 8, 2015	Jul. 23, 2015
C8707	BY Cribs	Unsuccessful drilling attempt - replaced by C9549	N/A	137697.00	573661.64	189.57	29.7	Jul. 13, 2015	Jul. 23, 2015
C9548	BY Cribs	Unsuccessful drilling attempt - replaced by C9549	N/A	137696.87	573662.29	189.59	90.6	Jul. 14, 2015	Feb. 4, 2016
C9550	BY Cribs	Sediment Sample, Geophysical, and electrode installation for ERT, replacement for C8711	BJB 773	137719.05	573549.49	190.18	200.7	Oct. 1, 2015	Apr. 20, 2016
C9549	BY Cribs	Sediment Sample, Geophysical, and electrode installation for ERT, replacement for C9548 and C8707	BJB 771	137697.13	573663.52	189.61	200.7	Oct. 5, 2015	May 2, 2016
C8709	BY Cribs: 216-B-45/46	Unsuccessful drilling attempt - replaced by C9552	N/A	Unable to Locate Marker			16.3	Oct. 9, 2015	Oct. 13, 2015
C9551	BY Cribs: 216-B-45/46	Unsuccessful drilling attempt - replaced by C9552	N/A	Unable to Locate Marker			12.9	Oct. 14, 2015	Oct. 14, 2015
C9552	BY Cribs: 216-B-45/46	Sediment Sample and Geophysical	BJB 772	137679.33	573616.00	192.06	202.2	Oct. 20, 2015	April 27, 2016

Table 1-1. Borehole Identification, Location, Waste Site Association, and Drilling Summary Information

Borehole ID	Associated 200-DV-1 Operable Unit Waste Site	Purpose	Ecology ID	Northing[a]	Easting[a]	Elevation of Brass Survey Marker[b]	Total Drilled Depth (ft bgs)	Field Activity Dates	
				(meters)[c]				Initiate Drilling	Conclude Field Work
C8706	BY Cribs: 216-B-46 Crib	Sediment Sample, Geophysical, and electrode installation for ERT	BJB 774	137698.47	573636.73	189.72	202.3	Oct. 21, 2015	May 3, 2016
C9491	216-B-37 Trench	Sediment Sample and Geophysical	N/A	137319.46	573466.26	202.94	227.7	Oct. 26, 2015	May 4, 2016
C9487	216-B-7 A&B	Sediment Sample and Geophysical	N/A	137396.10	573802.32	198.74	235.5	Oct. 29, 2015	May 9, 2016
C9490	216-B-9 Crib	216-B-9 Crib & Tile Field	N/A	136810.33	573856.96	208.16	252.6	Nov. 2, 2015	Sep. 6, 2016
C9489	216-B-9 Crib & Tile Field	Sediment Sample and Geophysical	N/A	136849.94	573842.2	207.92	253.1	Nov. 4, 2015	Sep. 7, 2016
C9492	216-T-5 Trench	Sediment Sample and Geophysical	N/A	136732.60	566675.38	206.83	102.0	Nov. 10, 2015	Sep. 8, 2016
C9494	216-T-5 Trench	Geophysical	N/A	136718.92	566673.43	206.80	100.6	Nov. 12, 2015	Sep. 12, 2016
C9495	216-T-14 Trench	Geophysical	N/A	136809.11	566948.09	212.89	106.0	Nov. 16, 2015	Sep. 20, 2016
C9496	216-T-15 Trench	Geophysical	N/A	136868.82	566975.07	213.01	106.1	Nov. 16, 2015	Sep. 21, 2016
C9510	216-T-25 Trench	Sediment Sample and Geophysical	N/A	136228.59	566569.52	206.39	122.4	Nov. 18, 2015	Sep. 29, 2016
C9511	216-T-23 Trench	Sediment Sample and Geophysical	N/A	136172.25	566583.67	206.21	117.2	Nov. 19, 2015	Sep. 28, 2016

Table 1-1. Borehole Identification, Location, Waste Site Association, and Drilling Summary Information

Borehole ID	Associated 200-DV-1 Operable Unit Waste Site	Purpose	Ecology ID	Northing[a]	Easting[a]	Elevation of Brass Survey Marker[b]	Total Drilled Depth (ft bgs)	Field Activity Dates	
				(meters)[c]				Initiate Drilling	Conclude Field Work
C9505	216-T-15 Trench	Sediment Sample and Geophysical	N/A	136801.24	566975.41	213.21	106.4	Nov. 20, 2015	Sep. 21, 2016
C9512	216-S-9 Crib	Sediment Sample and Geophysical	N/A	134419.87	567186.30	207.61	142.5	Nov. 24, 2015	Sep. 22, 2016
C9502	216-T-6 (Crib #2)	Unsuccessful drilling attempt - replaced by C9554	N/A	136670.61	567176.95	216.66	15.0	Dec. 2, 2015	Dec. 3, 2015
C9488	216-B-8 Crib & Tile Field	Sediment Sample and Geophysical	N/A	137469.69	573784.63	195.35	226.0	March 8, 2016	May 10, 2016
C9554	216-T-6 (Crib #2)	Geophysical, replaced C9502	N/A	136670.78	567178.25	216.65	107.5	Mar. 9, 2016	Sep. 15, 2016
C9499	216-T-6 (Crib #1)	Sediment Sample, Geophysical, and Physical Properties	N/A	136657.88	567202.86	216.33	107.0	Mar. 15, 2016	Sep. 14, 2016
C9506	216-T-18 Crib	Sediment Sample and Geophysical	N/A	136471.97	566948.95	205.14	101.8	Mar. 17, 2016	Sep. 13, 2016
C9507	216-T-19 Crib & Tile Field	Sediment Sample, Geophysical, and Physical Properties	N/A	136032.03	566847.78	202.64	243.4	Apr. 5, 2016	Sep. 27, 2016
C9514	216-S-21 Crib	Sediment Sample and Geophysical	N/A	134412.24	566615.64	202.51	127.6	Apr. 7, 2016	Sep. 26, 2016

Table 1-1. Borehole Identification, Location, Waste Site Association, and Drilling Summary Information

Borehole ID	Associated 200-DV-1 Operable Unit Waste Site	Purpose	Ecology ID	Northing[a]	Easting[a]	Elevation of Brass Survey Marker[b]	Total Drilled Depth (ft bgs)	Field Activity Dates	
				(meters)[c]				Initiate Drilling	Conclude Field Work

Notes:
a. Northing and easting coordinates are based on Washington State Plane Coordinates NAD83, North American Datum of 1983.
b Vertical Elevation values are based on NAVD88, North American Vertical Datum of 1988 and are rounded to 0.01 m.
c. Original units reported in Well Survey Data Report.
Ecology = Washington State Department of Ecology.
ERT = electrical resistivity tomography.
ft bgs = feet below ground surface.
ID = identification.
N/A = not applicable.

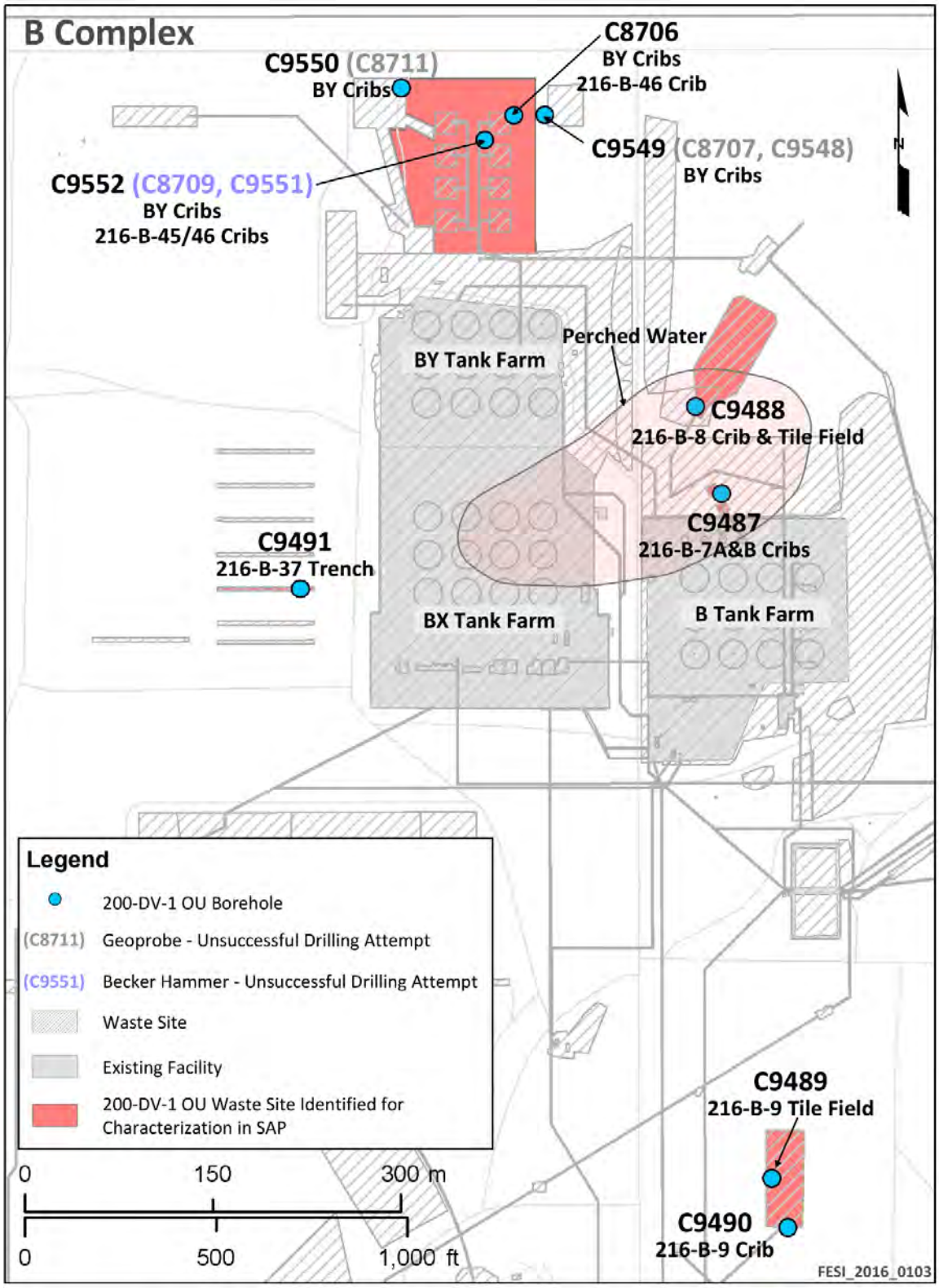

Figure 1-1. Borehole Locations in B Complex.

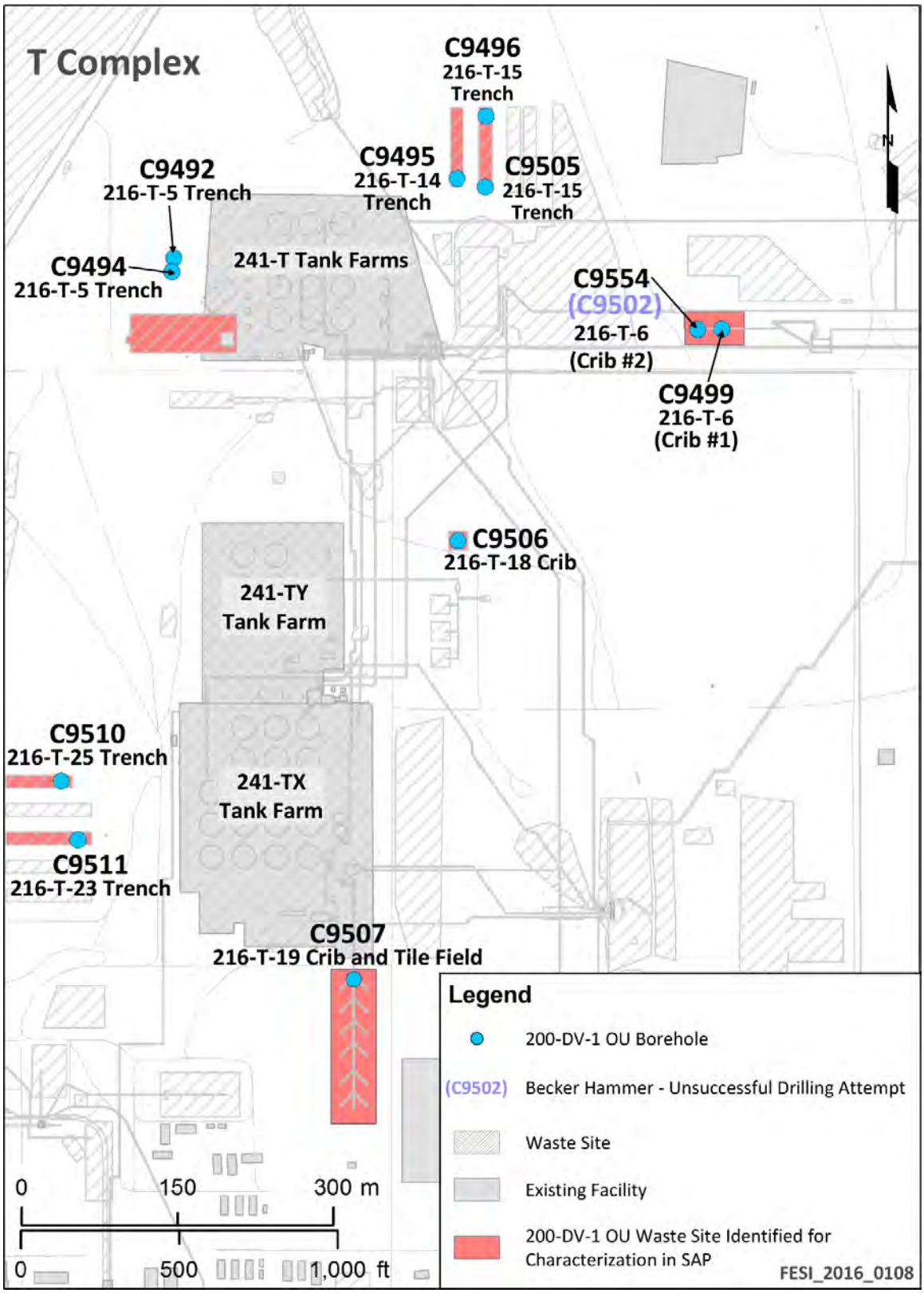

Figure 1-2. Borehole Locations in T Complex.

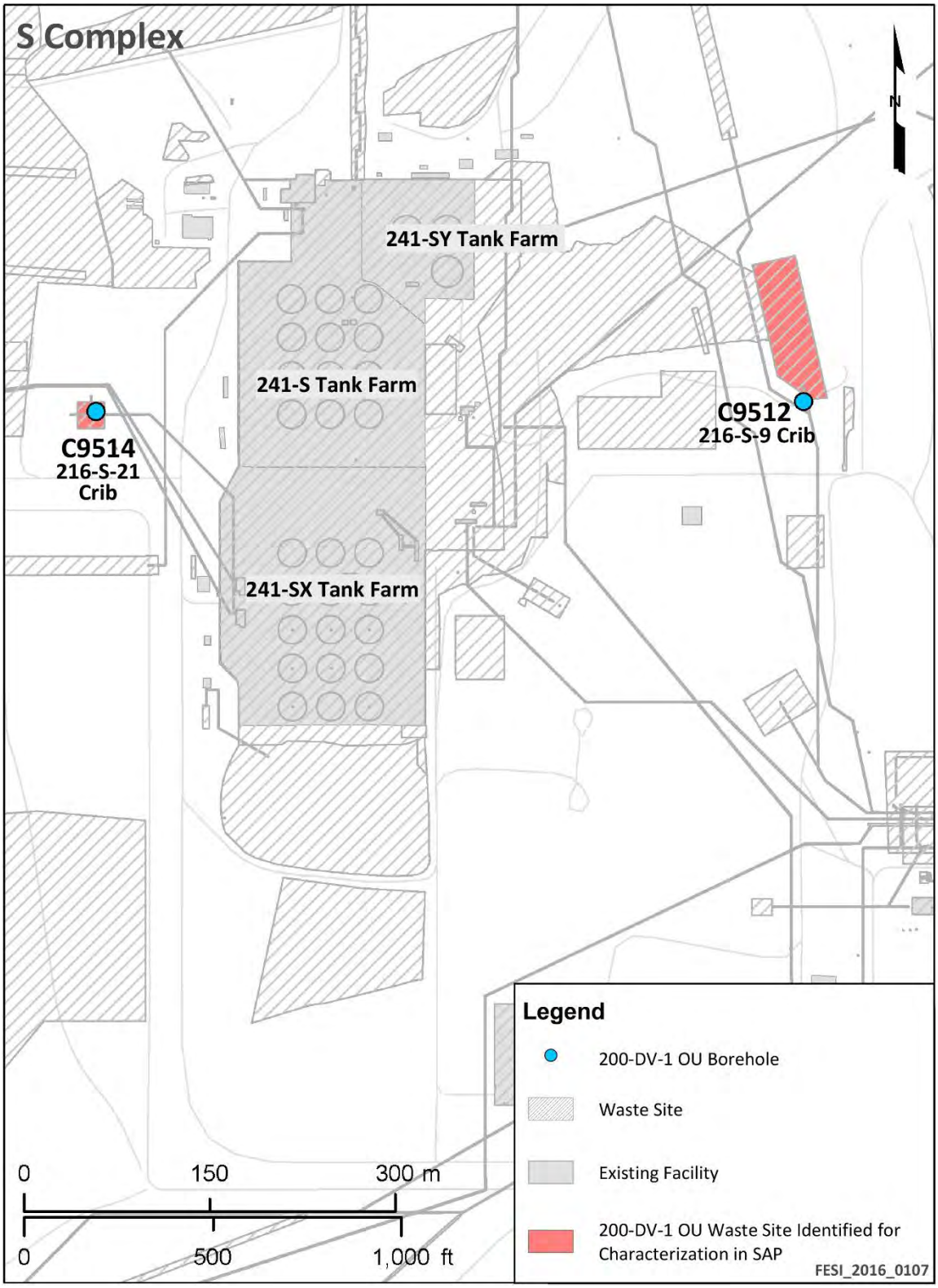

Figure 1-3. Borehole Locations in S Complex.

2 General Description of Field Activities

This chapter summarizes the drilling, sampling, and decommissioning details common to all of the 200-DV-1 OU boreholes. Borehole-specific details are included in Chapter 3. The boreholes were drilled and decommissioned to Washington State standards as detailed in the WAC 173-160, *Minimum Standards for Construction and Maintenance of Wells.* Well decommissioning activities were recorded in accordance with CHPRC procedures GRP-EE-02-14.1, *Drilling, Remediating, and Decommissioning Resource Protection Wells and Geotechnical Soil Borings.* Due to the drilling and sampling methods, soil cuttings were not available for photographs, sieve analysis or detailed geologic logging at the drill site. To the extent possible, soil cuttings were logged in the field in accordance with CHPRC procedure GRP-EE-01-7.0, *Geologic Logging.* Detailed descriptions and photographs of soil within the continuous core samples were completed at an offsite location following drilling and are included in Appendix G and H.

2.1 Drilling

The 200-DV-1 OU characterization boreholes were drilled in areas with the potential for elevated levels of radiological contamination. Two types of drilling technologies, direct-push and sonic, were used to reduce the potential for worker exposure to contaminated soil cuttings and reduce IDW.

The Rev. 0 SAP (DOE/RL-2011-104) was written to support the use of direct-push technology to advance the boreholes and collect the required soil samples. The first attempts to sample boreholes occurred from July 8, 2015 through July 23, 2015, and were performed by Cascade using a Geoprobe® 8040DT drilling rig (Figure 2-1). Attempts were made to collect 3 inch (in.) inner diameter and 1 7/8 in. inner diameter continuous cores; however, the recovered cores were incomplete and produced insufficient sample volume to perform the analyses prescribed in the Rev. 0 SAP. In addition, the capabilities of the rig were inadequate to push through the sandy gravels of the Hanford formation. Subsequently, this Geoprobe® 8040DT was unable to achieve the required target depths and its use was discontinued.

Tri-Party Agreement (Ecology et al., 1989) change notice TPA-CN-668 incorporates the Becker Hammer and sonic drilling continuous coring method into the Rev. 0 SAP field sampling plan. Direct-push activities, performed by Layne, resumed October 1, 2015, using a Becker Hammer AP1000 drill rig (Figure 2-2) and threaded, 8 5/8 in. outer diameter (OD) temporary casing. The Becker Hammer drill rig was used to advance the direct-push portion of the borehole through zones which may contain radiological contamination greater than 10,000 pCi/g. A 600C sonic drill rig and threaded 6 in. OD temporary casing was then used by Cascade to collect 3 1/2 in. inner diameter continuous cores to target Rev. 0 SAP depths. Drilling and decommissioning activities concluded September 29, 2016. Drilling and decommissioning activities performed by Cascade and Stillwater, concluded September 29, 2016.

Geoprobe® is a registered trademark of Kejr, Inc, Salina, Kansas.

Figure 2-1. Geoprobe® 8040DT drill rig.

Figure 2-2. Layne AP1000 Becker Hammer drill rig.

Becker Hammer direct-push drilling uses a hydraulic hammer and double-walled casing to advance the borehole. At selected intervals above the zone of elevated radiological contamination, samples were collected using a split-spoon sampler. Typically, the drilling cuttings are retrieved using compressed air without a means to contain potentially contaminated sediment. This conventional method to retrieve cuttings was unsuitable for use in the zone of elevated radiological contamination. Instead, a custom-designed drill tip and casing shoe was developed for this project (Figure 2-3). The solid drill tip on the inner casing seats within the 8 5/8 in. OD casing shoe to create a solid end which can penetrate the vadose zone without producing soil cuttings.

The Cascade 600C sonic drill rig used resonant energy, coupled with the weight of the drill pipe and downward thrust of the drill head, to allow for penetration of the formation. The resonant energy transmitted along the length of the drill pipe substantially reduces the amount of friction between the drill pipe and the borehole wall, PNNL-11321, *Phase III ResonantSonic® Report*. Concurrent with the resonant energy, the drill head can be rotated to assist penetration and to place the cutting surfaces of the drill bit adjacent to the formation. The soil cuttings entered the drill string through an open-face drill bit and were contained in an inner core tube. Borehole integrity was maintained by the threaded drill casing that remained in the subsurface, while the coring string was removed and sections of the drill pipe were added. Figure 2-4 depicts the sonic rig used to drill deeper portions of the 200-DV-1 OU boreholes.

Figure 2-3. Adaptation of Becker Hammer Casing for Direct-Push Drilling in Radiologically Contaminated Soils.

Figure 2-4. Cascade 600C Sonic drill rig.

2.2 Sample Collection

Samples for laboratory analysis were collected during direct-push drilling using split-spoon samplers. Split-spoon samples were collected by driving a decontaminated 4 in. OD split-spoon sampler 2.5 feet (ft) through the sampling interval or until refusal. Split-spoon sampling depths and associated HEIS numbers are included for each individual borehole in Appendix D.

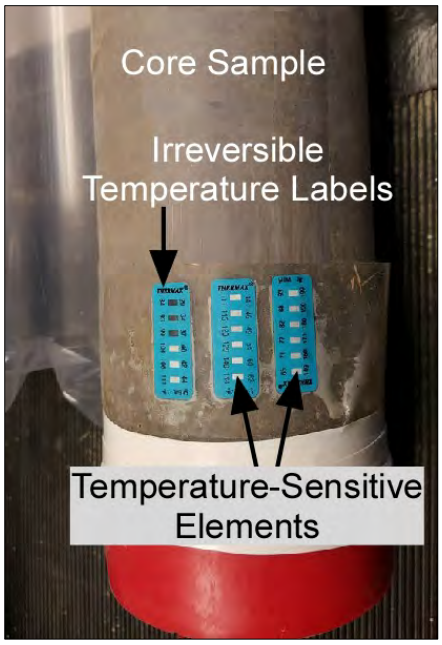

Figure 2-5. Temperature-sensitive labels.

Using LEXAN™ liners, continuous core samples were collected by driving a decontaminated 3 1/2 in. OD liner through the sampling interval or until refusal. LEXAN™ liner sample depths and associated HEIS numbers are included for each individual borehole in Appendix D.

Thermal measurements were collected and recorded from the drill shoe and the LEXAN™ liners, because sediment retrieval methods may inadvertently increase core barrel temperature and affect sample quality. Temperatures were measured using an infrared digital thermometer, once the sample was retrieved. Irreversible temperature labels (Figure 2-5) were used on selected samples at the direction of the project scientist. The temperature labels, placed on the LEXAN™ liners before drilling, consisted of a series of temperature-sensitive elements that ranged from 84ºF to 199°F. Each temperature-sensitive element permanently changes color from white to black as its temperature range is exceeded, indicating the maximum temperature attained during core sample collection. All temperature measurements were recorded, and are summarized in Chapter 3 and listed in Appendix D.

2.3 Geophysical Logging

Each borehole was logged using SN3's Spectral Gamma Logging System (SGLS) and Neutron Moisture Logging System (NMLS) to identify natural and man-made gamma-emitting radionuclides and moisture levels in each borehole. Geophysical borehole logging was performed through the temporary casing to produce a geophysical log of the full length of the borehole. SN3 prepared a Log Data Report for each borehole. The report numbers for the Log Data Reports are presented in Table 3-2, Table 3-11, and Table 3-18. The combination plot from each geophysical logging report displaying the soil moisture and radionuclides found in each borehole is presented in Appendix F.

2.4 Borehole Decommissioning

Well summary sheets included in Appendix A provide visual representations of each decommissioning profile. The four boreholes at the 216-BY Cribs were selected for installation of vertical arrays of electrodes that will be used to enhance the ability of electrical resistivity tomography (ERT) to image the subsurface and distribution of conductive contaminants in that area. The arrays were designed and

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constructed by Pacific Northwest National Laboratory by attaching electrodes every 10 ft to the outside of a 1 in. OD polyvinyl chloride (PVC) pipe.

The section of borehole that was advanced using sonic drilling was decommissioned by Cascade. The section of borehole associated with direct-push drilling then was decommissioned by Stillwater. Annular seal materials include 3/8 in. diameter bentonite pellets, medium granular bentonite crumbles or chips, and type I/II cement grout. High-strength concrete mix was used to seal the top 3 to 12 in. of annular space. Borehole-specific decommissioning details are listed in Table 3-1, Table 3-10, and Table 3-17, and discussed in Chapter 3.

The surface completion consists of a cement marker at the location of the decommissioned borehole or a flush-mount, water-tight vault. Both the cement marker and vault completion contains a brass survey marker that is die-stamped with the borehole identification (ID) and date of decommissioning.

Boreholes in which ERT electrode arrays were installed, were tagged with unique Ecology ID affixed to the protective casing of each surface vault. These identification numbers are listed in Table 1-1.

2.5 Health and Safety Screening

A radiological control technician performed continuous radiological surveys of any soil cuttings generated during the sonic portion of drilling, LEXAN™ liners, temporary drive casing, core barrel and drill rods, and driller's control station using standard field screening instruments. Radiological activity levels greater than background were recorded and are discussed in Chapter 3. Field-related activities associated with the Becker Hammer portion of drilling were performed in accordance with the requirements of RWP-GW-052, REV. 9. Field-related activities associated with the sonic portion of drilling were performed under RWP-GW-059 REV. 6.

Air quality monitoring for volatile organic compounds (VOCs) and ammonia was performed during drilling and sampling activities by an industrial hygienist professional (IH). The drillers' breathing zone near the wellhead, and the fresh soil generated during the sonic portion of drilling were surveyed for VOCs using a photo-ionization detector. Field measurements of contaminant concentrations above background levels are discussed in Chapter 3.

3 Borehole-Specific Summary of Field Activities

This chapter summarizes the borehole drilling and sampling, geophysical logging, electrode installation, and decommissioning activities specific to each borehole. All measurements are reported in the original units in which they were measured in the field.

3.1 Boreholes Located in the B Complex

This chapter includes boreholes located in the B Complex. Decommissioning information for each borehole is summarized in Table 3-1. Geophysical logging information for each borehole is summarized in Table 3-2. The combination plot from each geophysical logging report displaying the soil moisture and radionuclides found in each borehole is presented in Appendix F.

Table 3-1. Decommissioning Information for B Complex Boreholes

Borehole ID	Total Depth Drilled (ft bgs)	PVC Inside Diameter	Surface Seal[a] (ft bgs)	Bentonite Backfill (ft bgs)
C9487	235.5	N/A	0.0 – 1.5	1.5 – 235.5
C9488	226.0	N/A	0.0 – 2.0	1.95 – 226.0
C9489	253.1	N/A	0.0 – 2.0	2.0 – 253.1
C9490	252.6	N/A	0.0 – 2.1	2.1 – 252.6
C9491	227.7	N/A	0.0 – 2.6	2.6 – 227.7
C9550	200.7	1 inch	0.0 – 43.3	43.3 – 200.7[b]
C8711 Replaced by C9550	27.6	N/A	0.0 – 1.9	1.9 – 27.6
C9549	200.7	1 inch	0.0 – 1.5	1.5 – 200.7[b]
C9548 Replaced by C9549	90.6	N/A	0.0 – 2.0	2.0 – 90.6
C8707 Replaced by C9549	29.7	N/A	0.0 – 1.0	1.0 – 235.5
C9552	202.2	1 inch	0.0 – 1.5	1.5 – 202.2[b]
C9551 Replaced by C9552	12.9	N/A	0.0 – 2.0	2.0 – 12.9
C8709 Replaced by C9552	16.3	N/A	0.0 – 2.0	2.0 – 16.3
C8706	202.3	1 inch	0.0 – 2.5	2.5 – 202.3[b]

Table 3-1. Decommissioning Information for B Complex Boreholes

Borehole ID	Total Depth Drilled (ft bgs)	PVC Inside Diameter	Surface Seal[a] (ft bgs)	Bentonite Backfill (ft bgs)

Notes:
a. type I/II cement grout
b. Cement and bentonite intervals were added during installation of electrodes. See Chapter 3 for additional detail.
ft bgs = feet below ground surface
ID = identification
N/A = not applicable
PVC = polyvinyl chloride

Table 3-2. Geophysical Logging Information for B Complex Boreholes

Borehole ID	Total Depth Drilled (ft bgs)	Report Number	Logging System	Man-made Contamination Present
C9487	235.5	HGLP-LDR-903, Rev.0	SGLS, NMLS	Cs-137, Pa-234m (U-238), U-235
C9488	226.0	HGLP-LDR-906, Rev. 0	SGLS, HRLS, NMLS	Cs-137, Pa-234m (U-238), U-235
C9489	253.1	HGLP-LDR-961, Rev. 0	SGLS, NMLS	Cs-137
C9490	252.6	HGLP-LDR-959, Rev. 0	SGLS, NMLS	Cs-137
C9491	227.7	HGLP-LDR-901, Rev. 0	SGLS, HRLS, NMLS	Cs-137
C9550	200.7	HGLP-LDR-885, Rev. 2	SGLS, NMLS	Cs-137, Pa-234m (U-238), U-235
C8711[a]	27.6	HGLP-LDR-844, Rev. 0	SGLS, NMLS	Cs-137
C9549	200.7	HGLP-LDR-887, Rev. 3	SGLS, HRLS, NMLS	Cs-137
C9548	90.6	HGLP-LDR-851, Rev. 0	BGO, NMLS, PNLS, 2GHA	Cs-137
C8707	29.7	N/A[b]		
C9552	202.2	HGLP-LDR-890, Rev. 1	SGLS, NMLS	Cs-137, Co-60
C9551	12.9	N/A[c]		
C8709	16.3	N/A[c]		
C8706	202.3	HGLP-LDR-897, Rev. 0	SGLS, HRLS, NMLS, PNLS	Cs-137, Co-60, Pa-234m (U-238), U-235

Table 3-2. Geophysical Logging Information for B Complex Boreholes

Borehole ID	Total Depth Drilled (ft bgs)	Report Number	Logging System	Man-made Contamination Present

Notes:
a. This borehole met refusal and was replaced by C9550. The project decided to perform geophysical logging because one sediment sample was collected.
b. This borehole met refusal and was replaced by C9549. No geophysical logging was performed.
c. This borehole met refusal and was replaced by C9552. No geophysical logging was performed.
2GHA = Mt Sopris 2GHA Logging System
ft bgs = feet below ground surface
BGO = Bismuth germinate detector
HRLS = High Rate Logging System
ID = identification
N/A = not applicable, borehole was not logged
NMLS = Neutron Moisture Logging System
PNLS = Passive Neutron Logging System
Rev. = revision
SGLS = Spectral Gamma Logging System

3.1.1 Borehole C9487

Borehole C9487, located at the 216-B-7A&B Cribs, was drilled from ground surface to 33.4 ft bgs on October 29, 2015, by Layne using the Becker Hammer direct-push drill rig. Three split-spoon soil samples were collected. Refusal was encountered at 33.4 ft bgs. Due to uncertainty associated with the levels of radiological contamination below this depth, the borehole was re-drilled in the same location by Stillwater, on March 8, 2016 and March 9, 2016, using a cable tool drill rig and 10 3/4 in. OD temporary casing to 34.1 ft bgs. Layne resumed drilling the borehole with the direct-push Becker Hammer rig and 8 5/8 in. OD casing, telescoped within the 10 3/4 in. OD casing, on March 10, 2016, to 54.7 ft bgs. Radiological contamination up to 60,000 disintegrations per minute (dpm) was detected on the inner drill string as it was removed from the borehole on March 11, 2016.

The remainder of the borehole was drilled to a total depth (TD) of 235.5 ft from March 16, 2016 to March 30, 2016 by Cascade using the sonic drilling rig. During sonic drilling, eighty-two core samples were collected in LEXAN™ liners. On March 16, 2016 and March 17, 2016, radiological contamination up to 100,000 dpm of direct beta/gamma was detected on the LEXAN™ liners from 55.0 to 59.7 ft bgs. A perched water aquifer was encountered on March 29, 2016 and extended from 227.2 to 235.0 ft bgs.

The IH detected a maximum of 2.5 parts per million by volume (ppmv) VOC on March 29, 2016, which may have originated from the drill rig exhaust.

The maximum temperature of the drill shoe was recorded as 105.2°Fahrenheit (°F) and the maximum temperature of the LEXAN™ liners was recorded as 132°F at 202.1 ft bgs. Irreversible temperature labels were used on selected samples at this borehole and the maximum temperature recorded using this method was 111°F at 57.0 ft bgs.

Following the initial placement of 8 5/8 in. OD temporary casing from ground surface to 34.4 ft bgs, the borehole was logged on November 3, 2015, using SGLS to 32.0 ft bgs, and NMLS to 32.3 ft bgs. Following the second placement of the temporary 8 5/8 in. OD casing from 34.1 to 54.7 ft bgs, the borehole was logged on March 14, 2016, using SGLS and NMLS, from 31.0 to 54.0 ft bgs. The 10 3/4 in.

OD casing was not logged. The 6 in. OD temporary casing was logged on March 30, 2016 to April 1, 2016, using SGLS from 53.0 to 234.0 ft bgs, and NMLS from 53.0 ft to 234.3 ft bgs.

Borehole decommissioning was performed from April 11, 2016 to May 9, 2016. The borehole was filled from depth to surface with 234.0 ft of bentonite chips and 1.5 ft of cement grout. All 6 in., 8 5/8 in., and 10 3/4 in. OD temporary casing was removed during decommissioning activities.

All radiological contamination measurements are summarized in Table 3-3. Sample date, depth interval, recovery, sample temperatures, and HEIS numbers are summarized in Appendix D.

Table 3-3. Radiological Contamination at Borehole C9487

Date	Depth (ft bgs)	Media	Radiological Condition
3/11/2016	34.7 – 44.7	Inner drill string	Direct, 10,000 dpm, beta/gamma
3/11/2016	44.7 – 54.7	Inner drill string	Direct, 60,000 dpm, beta/gamma
3/16/2016	55.0 – 57.0	LEXAN™ liner	Direct, 100,000 dpm, beta/gamma
3/17/2016	57.2 – 59.7	LEXAN™ liner	Direct, 8,000 dpm, beta/gamma

Notes:
dpm = disintegrations per minute.
ft bgs = feet below ground surface.

3.1.2 Borehole C9488

Borehole C9488, located at the southern end of 216-B-8 Crib and Tile Field, was drilled from ground surface to 43.6 ft bgs from March 8, 2016 to March 22, 2016, by Layne using a Becker Hammer direct-push drill rig. Four split-spoon soil samples were collected. Radiological contamination up to 40,000 dpm was detected on the drill shoe as it was removed from the borehole on March 22, 2016.

The remainder of the borehole was drilled to a TD of 226.0 ft from April 14, 2016 to April 26, 2016 by Cascade using a sonic drilling rig. During sonic drilling, forty-nine core samples were collected in LEXAN™ liners. On April 14, 2016, radiological contamination up to 120,000 dpm of direct beta/gamma was detected on the LEXAN™ liners from 43.5 to 44.5 ft bgs. A perched water aquifer was encountered on April 26, 2016 and extended from 212.0 to 223.1 ft bgs.

The IH detected a maximum of 4.0 ppmv VOC from the sample collected at 112.3 ft bgs on April 19, 2016. No contamination was detected in the breathing zone.

The maximum temperature of the drill shoe was recorded as 115.6°F at 112.4 and 182.1 ft bgs, and the maximum temperature of the LEXAN™ liners was recorded as 160°F at 182.1 ft bgs.

Following the placement of the 8 5/8 in. OD temporary casing, the borehole was logged on March 24, 2016 and March 28, 2016, using SGLS to 42.0 ft bgs, NMLS to 43.0 ft bgs, and High Rate Logging System (HRLS) from 27.0 to 32.0 ft bgs. Following placement of the 6 in. OD temporary casing, the borehole was logged on April 26, 2016 and April 27, 2016, using SGLS from 41.0 to 225.0 ft bgs, and NMLS from 41.0 to 226.0 ft bgs.

Borehole decommissioning was performed from April 28, 2016 to May 10, 2016. The borehole was filled from depth to surface with 224.05 ft of bentonite chips and 1.95 ft of high-strength concrete. All 6 in. and 8 5/8 in. OD temporary casing was removed during decommissioning.

All radiological contamination measurements are summarized in Table 3-4. Sample date, depth interval, recovery, sample temperatures, and HEIS numbers are summarized in Appendix D.

Table 3-4. Radiological Contamination at Borehole C9488

Date	Depth (ft bgs)	Media	Radiological Condition
3/22/2016	43.6	Drill shoe	Direct, 40,000 dpm, beta/gamma
4/14/2016	43.5 – 44.5	LEXAN™ liner	Direct, 120,000 dpm, beta/gamma
4/14/2016	44.7 – 47.2	LEXAN™ liner	Direct, 50,000 dpm, beta/gamma
4/14/2016	47.1 – 49.6	LEXAN™ liner	Direct, 10,000 dpm, beta/gamma
4/14/2016	49.6 – 52.1	LEXAN™ liner	Direct, 5,000 dpm, beta/gamma

Notes:
dpm = disintegrations per minute.
ft bgs = feet below ground surface.

3.1.3 Borehole C9489

Borehole C9489, located on the western boundary of 216-B-9 Tile Field, was from ground surface to 34.2 ft bgs on November 4, 2015, by Layne using a Becker Hammer direct-push drill. Three split-spoon soil samples were collected. Radiological contamination up to 20,000 dpm was detected on the inner drill string as it was removed from the borehole on November 4, 2015.

The remainder of the borehole was drilled to a TD of 253.1 ft from August 15, 2016 to April 24, 2016, by Cascade using the sonic drilling rig. During sonic drilling, forty-six core samples were collected in LEXAN™ liners. On August 15, 2016 and August 16, 2016, radiological contamination up to 10,000 dpm of direct beta/gamma was detected on the LEXAN™ liners from 34.2 to 47.0 ft bgs.

The IH detected a maximum of 4.0 ppmv VOC on August 15, 2016, from the sample collected at 34.5 ft bgs. No contamination was detected in the breathing zone.

The maximum temperature of the drill shoe was recorded as 122.8°F at 122.5 ft bgs, and the maximum temperature of the LEXAN™ liners was recorded as 112°F at 122.5 ft bgs.

Following the placement of 8 5/8 in. OD temporary casing, the borehole was logged on November 5, 2015, using SGLS and NMLS, to 33.0 ft bgs. Following placement of the 6 in. OD temporary casing, the borehole was logged on August 25, 2016, and August 26, 2016, using SGLS and NMLS, from 32.0 to 251.0 ft bgs.

Borehole decommissioning was performed from August 29, 2016 to September 7, 2016. The borehole was filled from depth to surface with 251.1 ft of bentonite chips and 2.0 ft of high-strength concrete. All 6 in.-, and 8 5/8 in. OD temporary casing was removed during decommissioning activities.

All radiological contamination measurements are summarized in Table 3-5. Sample date, depth interval, recovery, sample temperatures, and HEIS numbers are summarized in Appendix D.

Table 3-5. Radiological Contamination at Borehole C9489

Date	Depth (ft bgs)	Media	Radiological Condition
11/4/2015	11.6 – 21.6	Inner drill string	Direct, 20,000 dpm, beta/gamma
11/4/2015	21.6 – 31.6	Inner drill string	Direct, 8,000 dpm, beta/gamma
8/15/2016	34.2 – 36.7	LEXAN™ liner	Direct, 10,000 dpm, beta/gamma
8/16/2016	37.6 – 40.1	LEXAN™ liner	Direct, 10,000 dpm, beta/gamma
8/16/2016	39.6 – 42.1	LEXAN™ liner	Direct, 10,000 dpm, beta/gamma
8/16/2016	42.1 – 44.6	LEXAN™ liner	Direct, 8,000 dpm, beta/gamma
8/16/2016	44.5 – 47.0	LEXAN™ liner	Direct, 8,000 dpm, beta/gamma

Notes:
dpm = disintegrations per minute
ft bgs = feet below ground surface

3.1.4 Borehole C9490

Borehole C9490, located on the southern boundary of 216-B-9 Crib and Tile Field, was drilled from ground surface to 34.2 ft bgs on November 2, 2015 and November 3, 2015, by Layne using the Becker Hammer direct-push drilling rig. Three split-spoon soil samples were collected. Radiological contamination up to 75,000 dpm was detected on the inner drill string as it was removed from the borehole on November 3, 2015.

The remainder of the borehole was drilled to a TD of 252.6 ft from August 3, 2016 to August 15, 2016, by Cascade using the sonic rig. During sonic drilling, fifty-two core samples were collected in LEXAN™ liners. From August 3, 2016 to August 8, 2016, radiological contamination up to 60,000 dpm of direct beta/gamma was detected on the LEXAN™ liners from 34.5 to 72.2 ft bgs.

The IH detected a maximum of 3.0 ppmv VOC from the sample collected at 242.6 ft bgs on August 15, 2016. No contamination was detected in the breathing zone.

The maximum temperature of the drill shoe was recorded as 126.6°F at 252.0 ft bgs and the maximum temperature of the LEXAN™ liners was recorded as 116°F at 252.0 ft bgs.

Following the placement of 8 5/8 in. OD temporary casing from ground surface to 33.0 ft bgs, the borehole was logged on November 4, 2015, using SGLS and NMLS. Following placement of the 6 in. OD temporary casing, the borehole was logged from August 15, 2016 to August 18, 2016, using SGLS from 32.0 to 252.0 ft bgs, and NMLS from 32.0 to 253.0 ft bgs.

Borehole decommissioning was performed from August 25, 2016 to September 6, 2016. The borehole was filled from depth to surface with 250.5 ft of bentonite chips and 2.1 ft of cement grout. All 6 in., and 8 5/8 in. OD temporary casing was removed during decommissioning activities.

All radiological contamination measurements are summarized in Table 3-6. Sample date, depth interval, recovery, sample temperatures, and HEIS numbers are summarized in Appendix D.

Table 3-6. Radiological Contamination at Borehole C9490

Date	Depth (ft bgs)	Media	Radiological Condition
11/3/2015	21.6 – 31.6	Inner drill string	Direct, 75,000 dpm, beta/gamma
8/3/2016	34.5 – 37.0	LEXAN™ liner	Direct, 15,000 dpm, beta/gamma
8/3/2016	37.0 – 39.5	LEXAN™ liner	Direct, 30,000 dpm, beta/gamma
8/3/2016	39.6 – 42.1	LEXAN™ liner	Direct, 45,000 dpm, beta/gamma
8/4/2016	42.0 – 44.5	LEXAN™ liner	Direct, 60,000 dpm, beta/gamma
8/4/2016	44.5 – 47.0	LEXAN™ liner	Direct, 50,000 dpm, beta/gamma
8/4/2016	47.0 – 49.5	LEXAN™ liner	Direct, 20,000 dpm, beta/gamma
8/4/2016	49.5 – 52.0	LEXAN™ liner	Direct, 60,000 dpm, beta/gamma
8/4/2016	52.0 – 54.5	LEXAN™ liner	Direct, 40,000 dpm, beta/gamma
8/4/2016	54.5 – 57.0	LEXAN™ liner	Direct, 35,000 dpm, beta/gamma
8/4/2016	57.0 – 59.5	LEXAN™ liner	Direct, 20,000 dpm, beta/gamma
8/8/2016	59.5 – 62.0	LEXAN™ liner	Direct, 15,000 dpm, beta/gamma
8/8/2016	62.5 – 65.0	LEXAN™ liner	Direct, 20,000 dpm, beta/gamma
8/8/2016	64.6 – 67.1	LEXAN™ liner	Direct, 10,000 dpm, beta/gamma
8/8/2016	67.3 – 69.8	LEXAN™ liner	Direct, 10,000 dpm, beta/gamma
8/8/2016	69.7 – 72.2	LEXAN™ liner	Direct, 10,000 dpm, beta/gamma

Notes:
dpm = disintegrations per minute
ft bgs = feet below ground surface

3.1.5 Borehole C9491

Borehole C9491, located at the 216-B-37 Trench, was drilled from ground surface to 51.5 ft bgs on October 26, 2015 and October 27, 2015, by Layne using the Becker Hammer direct-push drill rig. Three split-spoon soil samples were collected. Radiological contamination up to 20,000 dpm was detected on the drill shoe as it was removed from the borehole on October 27, 2015.

The remainder of the borehole was drilled to a TD of 227.7 ft from March 8, 2016 to March 15, 2016, by Cascade using the sonic drilling rig. During sonic drilling, thirty-eight core samples were collected in LEXAN™ liners. On March 8, 2016, radiological contamination up to 50,000 dpm of direct beta/gamma was detected on the LEXAN™ liners from 51.5 to 55.2 ft bgs.

The maximum temperature of the drill shoe was recorded as 97.8°F at 202.7 ft bgs and the maximum temperature of the LEXAN™ liners was recorded as 162°F at 112.7 ft bgs.

Following the placement of 8 5/8 in. OD temporary casing from ground surface to 51.5 ft bgs, the borehole was logged on October 30, 2015 using SGLS to 50.0 ft bgs, and on November 2, 2015, using NMLS to 50.0 ft bgs. The borehole was also logged using HRLS from 12.0 to 37.0 ft bgs on November 2, 2015. The 6 in. OD temporary casing was logged on March 17, 2016 using SGLS and NMLS, from 49.0 to 226.0 ft bgs.

Borehole decommissioning was performed from March 30, 2016 to May 4, 2016. The borehole was filled from depth to surface with 225.1 ft of bentonite chips and 2.6 ft of high-strength concrete. All 6 in. and 8 5/8 in. OD temporary casing was removed during decommissioning.

All radiological contamination measurements are summarized in Table 3-7. Sample date, depth interval, recovery, sample temperatures, and HEIS numbers are summarized in Appendix D.

Table 3-7. Radiological Contamination at Borehole C9491

Date	Depth (ft bgs)	Media	Radiological Condition
10/27/2015	51.2	Drill shoe	Direct, 20,000 dpm, beta/gamma
3/8/2016	51.5 – 52.5	LEXAN™ liner	Direct, 50,000 dpm, beta/gamma
3/8/2016	52.7 – 55.2	LEXAN™ liner	Direct, 10,000 dpm, beta/gamma

Notes:
dpm = disintegrations per minute
ft bgs = feet below ground surface

3.1.6 Borehole C9550 (Replacement for C8711)

Borehole C8711, located approximately 102 ft northwest of the 216-B-50 Crib, was drilled from ground surface to 27.6 ft bgs from July 8, 2016 to July 22, 2015, by Cascade using a Geoprobe® 8040DT drilling rig. Refusal was encountered at 27.6 ft bgs. Two, 3 in. inner diameter core samples were successfully collected. While attempting to advance the casing, a 6 in. OD stainless steel shoe (Figure 3-1) and 5.0 ft of casing was lost down the borehole. To retrieve the joint of casing, drillers used a 11 in. OD auger to over-drill the borehole to 24.8 ft bgs. The casing was successfully retrieved on July 22, 2015, but the shoe was irretrievable and remains in the borehole at approximately 27.6 ft bgs. Before decommissioning, the 4 1/2 in. OD temporary casing was geophysically logged on July 15, 2015, using SGLS to 27.0 ft bgs, and NMLS from 2.7 to 27.5 ft bgs. C8711 was decommissioned with 22.9 ft of bentonite chips and 1.9 ft of cement grout on July 22, 2015 and September 23, 2015.

Borehole C9550, located 3 ft south of C8711, was drilled from ground surface to 43.5 ft bgs on October 1, 2015 and October 2, 2015, by Layne using a Becker Hammer direct-push drill rig. One split-spoon soil sample was collected.

The remainder of the borehole was drilled to a TD of 200.7 ft from December 17, 2015 to January 19, 2016 by Cascade using the sonic drilling rig. During sonic drilling, thirty-two core samples were collected in LEXAN™ liners.

The maximum temperature of the drill shoe was recorded as 130°F at 183.0 ft bgs, and the maximum temperature of the LEXAN™ liners was recorded as 148°F at 183.0 ft bgs. Irreversible temperature labels were used on selected samples at this borehole and the maximum temperature recorded using this method was 129°F at 78.1 and 183.0 ft bgs.

Figure 3-1. 6 inch stainless steel shoe.

Following the placement of 8 5/8 in. OD temporary casing from ground surface to 43.5 ft bgs, the borehole was logged on October 5, 2015 using SGLS to 43.0 ft bgs, and NMLS to 42.8 ft bgs. Following placement of the 6 in. OD temporary casing was logged on January 21, 2016, using NMLS from 41.0 to 200.0 ft bgs, and on January 30, 2016, using SGLS from 42.0 to 200.0 ft bgs.

Borehole decommissioning was performed from February 1, 2016 to April 20, 2016. The borehole was filled from depth to surface with 150.2 ft of cement grout, 7.2 ft of bentonite chips, 42.8 ft of cement grout and 0.5 ft of high-strength concrete. This borehole was selected for the installation of a vertical array of electrodes and before decommissioning began, the array was constructed and the deepest electrode was set at 198.6 ft bgs. The surface completion is flush-mount with a water-tight vault. All 6 in. and 8 5/8 in. OD temporary casing was removed during decommissioning.

Sample date, depth interval, recovery, sample temperatures, and HEIS numbers are summarized in Appendix D.

3.1.7 Borehole C9549 (Replacement for C8707 and C9548)

Borehole C8707, located approximately 102 ft east of the 216-B-46 Crib, was drilled from ground surface to 29.7 ft bgs on July 13, 2015, by Cascade using the Geoprobe® 8040DT drilling rig and 3 1/2 in. OD temporary casing. Two, 1 7/8 in. inner diameter core samples were successfully collected. Refusal was encountered at 29.7 ft bgs. Radiological contamination up to 1,400,000 dpm of direct beta/gamma was detected in the soil from 12 to 13 ft bgs. C8707 was decommissioned with 28.7 ft of bentonite chips and 1 ft of cement grout on July 21, 2015 and July 23, 2015. All 3 1/2 in. OD temporary casing was removed during decommissioning. This borehole was not geophysically logged. A variance to WAC 173-160-451(2)(d) was requested to allow the direct-push borehole to extend greater than thirty feet in depth. A copy of the variance is presented in Appendix E.

Borehole C9548, located two feet east of C8707, was drilled from ground surface to 90.6 ft bgs on July 14, 2015 and July 15, 2015, by Cascade using the Geoprobe® 8040DT rig and 3 1/2 in. OD temporary casing. Refusal was encountered at 90.6 ft bgs. Three, 1 7/8 in. inner diameter core samples were successfully collected using this method. Radiological contamination up to 250,000 dpm of direct beta/gamma was detected in the soil, drill tip, and on the LEXAN™ liners from 44 to 54.4 ft bgs. C9548 was decommissioned with 88.6 ft of bentonite chips and 2.0 ft of cement grout from February 4, 2016 to February 10, 2016. All 3 1/2 in. OD temporary casing was removed during decommissioning. Following the placement of 3 1/2 in. OD temporary casing, the borehole was logged on July 16, 2015, using a bismuth germinate detector (BGO) to 90.1 ft bgs. The borehole was also logged on July 20, 2015, using NMLS to 90.5 ft bgs, Passive Neutron Logging System (PNLS) from 5.0 to 32.0 ft bgs, and Mt Sopris 2GHA logging System (2GHA) from 5.0 to 20.0 ft bgs. A variance to WAC 173-160-451(2)(d) was

requested to allow the direct-push borehole to extend greater than thirty feet in depth. A copy of the variance is presented in Appendix E.

Borehole C9549, located two feet east of C9548, was drilled from ground surface to 45.4 ft bgs on October 5, 2015 through October 7, 2015, by Layne using the Becker Hammer direct-push drill rig. One split-spoon soil sample was collected. Layne added approximately ten gallons of water to the borehole at an estimated depth of 40 ft on October 6, 2015. Radiological contamination up to 45,000 dpm was detected on the inner drill string as it was removed from the borehole on October 7, 2015.

The IH detected a maximum of 6.0 ppmv VOC from the borehole at 36.8 ft bgs on October 7, 2015. No contamination was detected in the breathing zone.

The remainder of the borehole was drilled to a TD of 200.7 ft from January 20, 2016 to January 28, 2016, by Cascade using the sonic drilling rig. During sonic drilling, thirty-two core samples were collected in LEXAN™ liners. On January 20, 2016, radiological contamination up to 14,000 dpm of direct beta/gamma was detected on the LEXAN™ liners from 45.6 to 55.7 ft bgs.

The maximum temperature of the drill shoe was recorded as 136.2°F at 95.6 ft bgs and the maximum temperature of the LEXAN™ liners was recorded as 114°F at 90.6 ft bgs. Irreversible temperature labels were used on selected samples at this borehole and the maximum temperature recorded using this method was 129°F at 198.2 ft bgs.

Following the placement of temporary 8 5/8 in. OD temporary casing from ground surface to 90.6 ft bgs, the borehole was logged on October 14, 2015, using SGLS to 43.0 ft bgs and on October 15, 2015, using NMLS to 43.0 ft bgs. The borehole was also logged using HRLS from 10.0 to 15.0 ft bgs on October 19, 2015. The 6 in. OD temporary casing was logged on February 1, 2016, using SGLS from 42.0 to 199.0 ft bgs and on February 1, 2016 and February 2, 2016, using NMLS from 42.0 to 200.0 ft bgs.

Borehole decommissioning was performed from February 3, 2016 to May 2, 2016. The borehole was filled from depth to surface with 148.8 ft of cement grout, 6.1 ft of bentonite chips, 44.3 ft of cement grout and 1.5 ft of high-strength concrete. This borehole was selected for the installation of a vertical array of electrodes and before decommissioning began, the array was constructed and the deepest electrode was set at 198.2 ft bgs.

The surface completion is flush-mount with a water-tight vault. All 6 in. OD temporary casing was removed during decommissioning. While back-pulling the 8 5/8 in. OD temporary casing, a joint sheared at the threads and 19.2 ft of casing with the shoe were grouted in place (Figure 3-2). The casing is located from approximately 26.2 to 45.4 ft bgs. A variance was requested and granted by the Ecology on April 29, 2016. A copy of the variance is presented in Appendix E.

Figure 3-2. Becker Hammer shoe.

All radiological contamination measurements are summarized in Table 3-8. Sample date, depth interval, recovery, sample temperatures, and HEIS numbers are summarized in Appendix D.

Table 3-8. Radiological Contamination at Borehole C9549

Borehole	Date	Depth (ft bgs)	Media	Radiological Condition
C8707	7/13/2015	12.0	LEXAN™ liner	Direct, 80,000 dpm, beta/gamma
C8707	7/13/2015	13.0	Soil	Direct, 1,400,000 dpm, beta/gamma
C9548	7/14/2015	44.0	Drill tip	Direct, 250,000 dpm, beta/gamma Removable, 12,000 dpm beta/gamma
C9548	7/14/2015	45.0 – 47.4	Soil	Direct, 40,000 dpm, beta/gamma
C9548	7/14/2015	47.5 – 49.5	LEXAN™ liner	Direct, 10,000 dpm, beta/gamma
C9548	7/14/2015	49.5 – 52.4	LEXAN™ liner	Direct, 8,000 dpm, beta/gamma
C9548	7/14/2015	52.4 – 54.4	LEXAN™ liner	Direct, 7,000 dpm, beta/gamma
C9549	10/6/2015	25.2 – 36.8	Inner drill string	Direct, 45,000 dpm, beta/gamma Removable, 8,000 dpm, beta/gamma
C9549	10/6/2015	36.8 – 45.4	Inner drill string	Direct, 15,000 dpm, beta/gamma Removable, 1,000 dpm, beta/gamma
C9549	1/20/2016	45.6 – 50.6	LEXAN™ liner	Direct, 14,000 dpm, beta/gamma
C9549	1/20/2016	50.7 – 55.7	LEXAN™ liner	Direct, 3,000 dpm, beta/gamma

Notes:
dpm = disintegrations per minute
ft bgs = feet below ground surface

3.1.8 Borehole C9552 (Replacement for C8709 and C9551)

Borehole C8709, located west of the 216-B-45 and 216-B-46 Cribs, was drilled from ground surface to 16.3 ft bgs on October 9, 2015 to October 13, 2015 by Layne using the Becker Hammer direct-push drill rig. Three split-spoon soil samples were collected. Refusal was encountered at 16.3 ft bgs. Radiological contamination up to 2,000 dpm of removable beta/gamma was detected on the inner drill string as it was removed from the borehole on October 13, 2015. C8709 was decommissioned with 14.3 ft of bentonite chips and 2 ft of grout on October 13, 2015. All 8 5/8 in. OD temporary casing was removed during decommissioning. While back-pulling the casing, a joint sheared at the threads and the casing shoe was grouted in place. The shoe is located from approximately 15.1 to 16.3 ft bgs. This borehole was not geophysically logged. A variance to WAC 173-160-451(2)(d) was requested to allow the direct-push borehole to extend greater than thirty feet in depth. A copy of the variance is presented in Appendix E.

Borehole C9551, located two feet east of C8707, was drilled from ground surface to 12.9 ft bgs on October 14, 2015 by Layne using the Becker Hammer direct-push drill rig. Refusal was encountered at 12.9 ft bgs. C9551 was decommissioned with 10.9 ft of bentonite chips and 2.0 ft of cement grout on October 14, 2015. All 8 5/8 in. OD temporary casing was removed during decommissioning. Radiological contamination up to 3,000 dpm of removable beta/gamma was detected on the drill shoe. This borehole was not geophysically logged.

Borehole C9552, located ten feet east of C8709 and five feet east of C9551, was drilled from ground surface to 45.3 ft bgs on October 20, 2015 and October 21, 2015, by Layne using the Becker Hammer direct-push drill rig.

The IH detected a maximum of 2.5 ppmv VOC from the borehole at 46.3 ft bgs on October 21, 2015. No contamination was detected in the breathing zone. The IH also detected up to 8 ppmv of ammonia throughout the borehole.

The remainder of the borehole was drilled to a TD of 202.2 ft from February 8, 2016 to February 17, 2016, by Cascade using the sonic drilling rig. During sonic drilling, sixty-nine core samples were collected in LEXAN™ liners.

The maximum temperature of the drill shoe was recorded as 109.6°F at 112.2 ft bgs, and the maximum temperature of the LEXAN™ liners was recorded as 117°F at 122.5 ft bgs. Irreversible temperature labels were used on selected samples at this borehole and the maximum temperature recorded using this method was 129°F at 122.5 ft bgs.

Following the placement of 8 5/8 in. OD temporary casing from ground surface to 45.3 ft bgs, the borehole was logged on October 27, 2015, using SGLS and NMLS to 43.0 ft bgs. The 6 in. OD temporary casing was logged on February 18, 2016 and February 19, 2016, using SGLS from 42.0 to 201.0 ft bgs and on February 19, 2016, using NMLS from 42.0 to 201.0 ft bgs.

Borehole decommissioning was performed from February 29, 2016 through April 27, 2016. The borehole was filled from depth to surface with 149.9 ft of cement grout, 5.7 ft of bentonite chips, 45.2 ft of cement grout and 1.5 ft of high-strength concrete. This borehole was selected for the installation of a vertical array of electrodes and before decommissioning began, the array was constructed and the deepest electrode was set at 199.0 ft bgs.

The surface completion is flush-mount with a water-tight vault. All temporary 6 in. OD temporary casing was removed during decommissioning. While back-pulling the 8 5/8 in. OD temporary casing, a joint sheared at the threads and 9.2 ft of casing with the shoe were grouted in place. The casing is located from approximately 37.6 to 46.8 ft bgs. A variance was requested and granted by the Ecology on April 29, 2016. A copy of the variance is presented in Appendix E.

Sample date, depth interval, recovery, sample temperatures, and HEIS numbers are summarized in Appendix D.

3.1.9 Borehole C8706

Borehole C8706, located on the northeast corner of the 216-B-46 Crib, was drilled from ground surface to 45.3 ft bgs from October 21, 2015 through October 23, 2015 by Layne using the Becker Hammer direct-push drill rig. Three split-spoon soil samples were collected. Radiological contamination up to 50,000 dpm of direct beta/gamma was detected on the drill shoe as it was removed from the borehole on October 23, 2015.

The remainder of the borehole was drilled to a TD of 202.3 ft from February 17, 2016 through February 29, 2016, by Cascade using the sonic drilling rig. During sonic drilling, thirty-three core samples were in LEXAN™ liners. On February 17, 2016, radiological contamination, up to 10,000 dpm of direct, and 5,000 dpm of removable beta/gamma was detected on the LEXAN™ liners from 45.5 to 47.0 ft bgs.

The IH detected a maximum of 1.6 ppmv VOC on October 22, 2015, at the borehole. No contamination was detected in the breathing zone. The IH also detected a maximum of 1 ppmv ammonia on February 24, 2016 and February 25, 2016.

The maximum temperature of the drill shoe was recorded as 114.8°F at 192.3 ft bgs, and the maximum temperature of the LEXAN™ liners was recorded as 127°F at 152.1 ft bgs.

Following the placement of the 8 5/8 in. OD temporary casing from ground surface to 45.3 ft bgs, the borehole was logged October 28, 2015 through October 29, 2015, using SGLS and NMLS, to 44.0 ft bgs, and HRLS from 9.0 to 29.0 ft bgs. The 6 in. OD temporary casing was logged February 26 2016, through March 1, 2016, using SGLS and NMLS, from 43.0 ft to 202.0 ft bgs.

Borehole decommissioning was performed March 3, 2016 through May 3, 2016. The borehole was filled from depth to surface with 155.7 ft of cement grout, 0.9 ft of bentonite chips, 43.2 ft of cement grout and 2.5 ft of high-strength concrete. This borehole was selected for the installation of a vertical array of electrodes and before decommissioning began, the array was constructed and the deepest electrode was set at 199.0 ft bgs. The surface completion is flush-mount with a water-tight vault. All 8 5/8 in. and 6 in. OD temporary casing was removed from the borehole during decommissioning.

All radiological contamination measurements are summarized in Table 3-9. Sample date, depth interval, recovery, sample temperatures, and HEIS numbers are summarized in Appendix D.

Table 3-9. Radiological Contamination at Borehole C8706

Date	Depth (ft bgs)	Media	Radiological Condition
10/23/2015	43.7 – 45.3	Drill shoe	Direct, 50,000 dpm, beta/gamma
2/17/2016	45.5 – 47.0	LEXAN™ liner	Direct, 10,000 dpm, beta/gamma Removable, 5,000 dpm, beta/gamma

Notes:
dpm = disintegrations per minute.
ft bgs = feet below ground surface.

3.2 Boreholes Located in the T Complex

This section includes boreholes located in the T Complex. Decommissioning information and geophysical logging for each borehole is summarized in Table 3-10, and Table 3-11, respectively. The combination plot from each geophysical logging report displaying the soil moisture and radionuclides found in each borehole is presented in Appendix F.

Table 3-10. Decommissioning Information for T Complex Boreholes

Borehole ID	Total Depth Drilled (ft bgs)	Surface Seal[a] (ft bgs)	Bentonite Backfill (ft bgs)
C9492	102.0	0.0 – 1.8	1.8 – 102.0
C9494	100.6	0.0 – 2.1	2.1 – 100.6
C9554	107.5	0.0 – 2.1	2.1 – 107.5
C9502 Replaced by C9554	15.0	0.0 – 2.5	2.5 – 15.0
C9499	107.0	0.0 – 2.0	2.0 – 107.0
C9495	106.0	0.0 – 2.0	2.0 – 106.0
C9496	106.1	0.0 – 2.1	2.1 – 106.1
C9505	106.4	0.0 – 2.0	2.0 – 106.4
C9506	101.8	0.0 – 2.0	2.0 – 101.8
C9507	243.4	0.0 – 2.0	2.0 – 243.4
C9511	117.2	0.0 – 2.0	2.0 – 117.2
C9510	122.4	0.0 – 2.1	2.1 – 122.4

Notes:
a. type I/II cement grout.
ft bgs = feet below ground surface.
ID = identification.

Table 3-11. Geophysical Logging Information for T Complex Boreholes

Borehole ID	Total Depth Drilled (ft bgs)	Report Number	Logging System	Man-made Contamination Present
C9492	102.0	HGLP-LDR-921, Rev. 0	SGLS, HRLS, NMLS	Cs-137, Co-60
C9494	100.6	HGLP-LDR-919, Rev. 0	SGLS, NMLS	Cs-137, Co-60
C9554	107.5	HGLP-LDR-932, Rev. 0	SGLS, NMLS	Cs-137, Co-60
C9502	15.0	N/A[a]		
C9499	107.0	HGLP-LDR-934, Rev. 0	SGLS, NMLS, PNLS	Cs-137, Co-60
C9495	106.0	HGLP-LDR-920, Rev. 0	SGLS, HRLS, NMLS	Cs-137, Co-60
C9496	106.1	HGLP-LDR-924, Rev. 0	SGLS, NMLS	Cs-137, Co-60
C9505	106.4	HGLP-LDR-927, Rev. 1	SGLS, HRLS, NMLS	Cs-137, Co-60
C9506	101.8	HGLP-LDR-937, Rev. 0	SGLS, NMLS	Cs-137, Co-60
C9507	243.4	HGLP-LDR-929, Rev. 0	SGLS, HRLS, NMLS	Cs-137, Co-60
C9511	117.2	HGLP-LDR-938, Rev. 0	SGLS, HRLS, NMLS	Cs-137, Co-60
C9510	122.4	HGLP-LDR-940, Rev. 0	SGLS, HRLS, NMLS	Cs-137, Co-60

Notes:
a. This borehole met refusal and was replaced by C9554. No geophysical logging was performed.
ft bgs = feet below ground surface.
HRLS = High Rate Logging System.
ID = identification.
N/A = not applicable, borehole was not logged.
NMLS = Neutron Moisture Logging System.
PNLS = Passive Neutron Logging System.
Rev. = revision
SGLS = Spectral Gamma Logging System.

3.2.1 Borehole C9492

Borehole C9492, located on the northern end of the 216-T-5 Trench, was drilled from ground surface to 40.5 ft bgs on November 10, 2015 and November 11, 2015 by Layne using the Becker Hammer direct-push drill rig. Three split-spoon soil samples were collected.

The remainder of the borehole was drilled to a TD of 102.0 ft on June 1, 2016 and June 2, 2016, by Cascade using the sonic drilling rig. During sonic drilling, eleven core samples were collected in LEXAN™ liners. During drilling, 2.5 gallons of water was added to the borehole.

The IH detected a maximum of 1.4 ppmv VOC on June 1, 2016, at 72.0 ft bgs. No VOCs were detected in the breathing zone.

The maximum temperature of the drill shoe was recorded as 116°F at 72.0 and 97.5 ft bgs, and the maximum temperature of the LEXAN™ liners was recorded as 134°F at 67.0 ft bgs.

Following placement of the 8 5/8 in. OD temporary casing from ground surface to 40.5 ft bgs, the borehole was logged on November 12, 2015, using SGLS and NMLS to 40.0 ft bgs, and logged on November 16, 2015, using HRLS from 11.0 to 17.0 ft bgs. The 6 in. OD temporary casing was logged on June 6, 2016 and June 7, 2016, using SGLS and NMLS, from 39.0 ft to 101.0 ft bgs.

Borehole decommissioning was performed June 16, 2016 through September 8, 2016. The borehole was filled from depth to surface with 100.2 ft of bentonite chips and 1.8 ft of high-strength concrete. All 6 in. and 8 5/8 in. OD temporary casing was removed during decommissioning.

Sample date, depth interval, recovery, sample temperatures, and HEIS numbers are summarized in Appendix D.

3.2.2 Borehole C9494

Borehole C9494, located at the southern end of the 216-T-5 Trench, was drilled from ground surface to 40.4 ft bgs on November 12, 2015 by Layne using the Becker Hammer direct-push drill rig. The remainder of the borehole was drilled to a TD of 100.6 ft on May 25, 2016 by Cascade, using the sonic drilling rig. Soil samples were not collected at this location.

Following placement of the 8 5/8 in. OD temporary casing from ground surface to 40.4 ft bgs, the borehole was logged November 16, 2015 through November 18, 2015, using SGLS and NMLS, to 40.0 ft bgs. The 6 in. OD temporary casing was logged May 31, 2016 through June 2, 2016, using SGLS from 39.0 to 100.0 ft bgs, and NMLS from 39.0 ft to 100.3 ft bgs.

Borehole decommissioning was performed June 6, 2016 through September 12, 2016. The borehole was filled from depth to surface with 98.5 ft of bentonite chips and 2.1 ft of high-strength concrete. All 6 in. and 8 5/8 in. OD temporary casing was removed during decommissioning.

3.2.3 Borehole C9554 (Replacement for C9502)

Borehole C9502, located on the northern boundary of the 216-T-6 Crib #2, was drilled from ground surface to 15.0 ft bgs on December 2, 2015 by Layne using the Becker Hammer direct-push drill rig. Refusal was encountered at 15.0 ft bgs. C9502 was decommissioned with 12.5 ft of bentonite chips and 2.5 ft of high-strength concrete on December 3, 2015. This borehole was not geophysically logged.

Borehole C9554, located approximately five feet east of C9502, was drilled from ground surface to 43.4 ft bgs on March 11, 2016 to March 14, 2016, by Layne using the Becker Hammer direct-push drill rig. The remainder of the borehole was drilled to a TD of 107.5 ft on June 22, 2016, by Cascade using the sonic drilling rig. During drilling, 1 gallon of water was added to the borehole. Soil samples were collected at this location.

Following placement of the temporary 8 5/8 in. OD temporary casing from ground surface to 43.4 ft bgs, the borehole was logged on March 14, 2016, using SGLS and NMLS, to 43.0 ft bgs. The 6 in. OD temporary casing was logged June 22, 2016 through June 23, 2016, using SGLS from 42.0 to 106.0 ft bgs, and NMLS, from 42.0 ft to 104.0 ft bgs.

Borehole decommissioning was performed from June 30, 2016 to September 15, 2016. The borehole was filled from depth to surface with 105.4 ft of bentonite chips and 2.1 ft of high-strength concrete. All temporary 6 in. and 8 5/8 in. OD temporary casing was removed during decommissioning.

3.2.4 Borehole C9499

Borehole C9499, located on the southern boundary of the 216-T-6 Crib #1, was drilled ground surface to 43.4 ft bgs on March 14, 2016 to March 17, 2016 by Layne using the Becker Hammer direct-push drill rig. Three split-spoon soil samples were collected.

The remainder of the borehole was drilled to a TD of 107.0 ft from June 23, 2016 to June 27, 2016, by Cascade using the sonic drilling rig. During sonic drilling, fifteen core samples were collected in LEXAN™ liners.

The maximum temperature of the drill shoe was recorded as 123.4°F at 47.0 ft bgs, and the maximum temperature of the LEXAN™ liners was recorded as 89°F at 102.0 ft bgs.

Following placement of the 8 5/8 in. OD temporary casing from ground surface to 43.4 ft bgs, the borehole was logged on March 21, 2016, using SGLS to 42.0 ft bgs, and NMLS to 42.5 ft bgs. The 6 in. OD temporary casing was logged June 27, 2016 through June 29, 2016, using SGLS and NMLS from 41.0 ft to 106.0 ft bgs and PNLS from ground surface to 106.0 ft bgs.

Borehole decommissioning was performed from June 29, 2016 to September 14, 2016. The borehole was filled from depth to surface with 105.0 ft of bentonite chips and 2.0 ft of high-strength concrete. All 6 in. and 8 5/8 in. OD temporary casing was removed during decommissioning.

Sample date, depth interval, recovery, sample temperatures, and HEIS numbers are summarized in Appendix D.

3.2.5 Borehole C9495

Borehole C9495, located on the southern end of the 216-T-14 Trench, was drilled from ground surface to 35.75 ft bgs on November 16, 2015, by Layne using the Becker Hammer direct-push drill rig. The remainder of the borehole was drilled to a TD of 106.0 ft from May 26, 2016 to May 31, 2016, by Cascade using the sonic drilling rig. On May 26, 2016, radiological contamination up to 400,000 dpm of direct beta/gamma was detected on the sediment removed from the borehole from a depth of 35.8 to 37.0 ft. Soil samples were not collected at this location.

Following placement of the 8 5/8 in. OD temporary casing from ground surface to 35.8 ft bgs, the borehole was logged on November 18, 2015, using SGLS to 35.0 ft bgs, NMLS to 35.5 ft bgs, and HRLS from 11.0 to 35.0 ft bgs. The 6 in. OD temporary casing was logged June 2, 2016 through June 6, 2016, using SGLS and NMLS from 34.0 to 105.0 ft bgs, and HRLS from 33.0 to 38.0 ft bgs.

Borehole decommissioning was performed from June 7, 2016 to September 20, 2016. The borehole was filled from depth to surface with 104.0 ft of bentonite chips and 2.0 ft of high-strength concrete. All 6 in. and 8 5/8 in. OD temporary casing was removed during decommissioning.

All radiological contamination measurements are summarized in Table 3-12. Sample date, depth interval, recovery, sample temperatures, and HEIS numbers are summarized in Appendix D.

Table 3-12. Radiological Contamination at Borehole C9495

Date	Depth (ft bgs)	Media	Radiological Condition
3/26/2016	35.8 – 37.0	Sediment	Direct, 400,000 dpm, beta/gamma

Notes:
dpm = disintegrations per minute
ft bgs = feet below ground surface

3.2.6 Borehole C9496

Borehole C9496, located on the north end of the 216-T-15 Trench, was drilled from ground surface to 35.7 ft bgs on November 16, 2015, by Layne using the Becker Hammer direct-push drill rig. The remainder of the borehole was drilled to a TD of 106.1 ft on June 13, 2016 and June 14, 2016 by Cascade, using the sonic drilling rig. During drilling, 5 gallons of water was added to the borehole from 77 to 106.1 ft bgs. Soil samples were not at this location.

Following placement of the 8 5/8 in. OD temporary casing from ground surface to 35.7 ft bgs, the borehole was logged on November 18, 2015, using SGLS to 35.0 ft bgs, and NMLS to 35.5 ft bgs. The 6 in. OD temporary casing was logged on June 14, 2016 and June 15, 2016, using SGLS from 34.0 to 105.0 ft bgs, and NMLS from 34.0 ft to 105.5 ft bgs.

Borehole decommissioning was performed from June 20, 2016 to September 21, 2016. The borehole was filled from depth to surface with 104.0 ft of bentonite chips and 2.1 ft of high-strength concrete. All 6 in. and 8 5/8 in. OD temporary casing was removed during decommissioning.

3.2.7 Borehole C9505

Borehole C9505, located on the southern end of the 216-T-15 Trench, was drilled from ground surface to 43.5 ft bgs on November 20, 2015 to November 23, 2015, by Layne using the Becker Hammer direct-push drill rig. Two split-spoon soil samples were collected. Radiological contamination up to 50,000 dpm of direct beta/gamma was detected on the inner drill string's drill shoe as it was removed from the borehole on November 23, 2015.

The remainder of the borehole was drilled to a TD of 106.4 ft from June 7, 2016 to June 13, 2016, by Cascade using the sonic drilling rig. During sonic drilling, fifteen core samples were collected in LEXAN™ liners. During drilling, 1.5 gallons of water was added to the borehole. On June 7, 2016, radiological contamination, up to 20,000 dpm of direct, and 1,000 dpm of removable beta/gamma was detected on the LEXAN™ liners from 43.6 to 47.0 ft bgs.

The IH detected a maximum of 2.0 ppmv VOC on June 7, 2016, which may have originated from the drill rig exhaust. The IH detected a maximum of 1 ppmv of ammonia near the borehole on June 9, 2016.

The maximum temperature of the drill shoe was recorded as 118.6°F at 105.5 ft bgs and the maximum temperature of the LEXAN™ liners was recorded as 101°F at 47.0 ft bgs.

Following placement of the 8 5/8 in. OD temporary casing from ground surface to 43.5 ft bgs, the borehole was logged November 30, 2015 through December 2, 2015, using NMLS to 43.3 ft bgs, SGLS to 43.0, and HRLS from 10.0 to 36.0 ft bgs. The 6 in. OD temporary casing was logged on

June 13, 2016 and June 14, 2016, using SGLS from 42.0 to 105.0 ft bgs, and NMLS from 42.0 ft to 105.5 ft bgs.

Borehole decommissioning was performed from June 20, 2016 to September 21, 2016. The borehole was filled from depth to surface with 104.4 ft of bentonite chips and 2.0 ft of high-strength concrete. All 6 in. and 8 5/8 in. OD temporary casing was removed during decommissioning.

All radiological contamination measurements are summarized in Table 3-13. Sample date, depth interval, recovery, sample temperatures, and HEIS numbers are summarized in Appendix D.

Table 3-13. Radiological Contamination at Borehole C9505

Date	Depth (ft bgs)	Media	Radiological Condition
11/23/2015	41.9 – 43.5	Drill shoe	Direct, 50,000 dpm, beta/gamma
6/7/2016	43.6 – 47.0	LEXAN™ liner	Direct, 20,000 dpm, beta/gamma Removable, 1,000 dpm, beta/gamma

Notes:
dpm = disintegrations per minute
ft bgs = below ground surface

3.2.8 Borehole C9506

Borehole C9506, located at the 216-T-18 Crib, was drilled from ground surface to 33.5 ft bgs on March 17, 2016 to March 21, 2016, by Layne using the Becker Hammer direct-push drill rig. Three split-spoon soil samples were collected.

The remainder of the borehole was drilled to a TD of 101.8 ft on June 28, 2016 and June 29, 2016, by Cascade using the sonic drilling rig. During sonic drilling, fourteen core samples were collected in LEXAN™ liners. During drilling, three gallons of water was added to the borehole.

The maximum temperature of the drill shoe was recorded as 115.6°F and the maximum temperature of the LEXAN™ liners was recorded as 92°F at 47.1 ft bgs.

Following placement of the 8 5/8 in. OD temporary casing from ground surface to 33.5 ft bgs, the borehole was logged on March 21, 2016, using NMLS to 32.8 ft bgs and on March 23, 2016, using SGLS to 32.0 ft bgs. The 6 in. OD temporary casing was logged on June 29, 2016 and June 30, 2016, using SGLS from 31.0 to 101.0 ft bgs, and NMLS from 31.0 to 100.5 ft bgs.

Borehole decommissioning was performed from July 14, 2016 to September 13, 2016. The borehole was filled from depth to surface with 6.8 ft of bentonite pellets, 93.0 ft of bentonite chips, and 2.0 ft of high-strength concrete. All 6 in. and 8 5/8 in. OD temporary casing was removed during decommissioning.

Sample date, depth interval, recovery, sample temperatures, and HEIS numbers are summarized in Appendix D.

3.2.9 Borehole C9507

Borehole C9507, located on the northern end of the 216-T-19 Crib and Tile Field, was drilled on April 5, 2016 and April 6, 2016, by Cascade using the sonic drilling rig and 10 1/2 in. OD temporary

casing to 20.3 ft bgs and a 4 1/2 in. OD core barrel to 25.3 ft bgs. During sonic drilling, two core samples were collected in LEXAN™ liners. On April 6, 2016, up to 3,000,000 dpm direct, and 145,000 dpm removable beta/gamma was detected on the LEXAN™ liners from 20.3 to 25.3 ft bgs.

Drilling continued to a depth of 48.1 ft from April 8, 2016 to April 11, 2016 by Layne using the Becker Hammer direct-push drill rig and 8 5/8 in. OD temporary casing. Radiological contamination was detected up to 1,000,000 dpm of direct, and 35,000 dpm of removable beta/gamma on the inner drill string, from 40 to 48.1 ft bgs, as it was removed from the borehole.

The borehole was drilled to a depth of 162.7 ft from May 3, 2016 to May 24, 2016, by Cascade using the sonic drilling rig and 6 in. OD temporary casing. During sonic drilling, thirty-two core samples were collected in LEXAN™ liners. From June 14, 2016 to June 16, 2016, the borehole was advanced using 4 7/8 in. OD temporary casing to 240.5 ft bgs, and 3 1/2 in. OD core barrel to TD at 243.4 ft. Two soil samples were collected using the 3 1/2 in. OD core barrel. During drilling, 58 gallons of water was added between 140.1 and 230 ft bgs. On May 3, 2016, radiological contamination up to 1,000,000 dpm of direct beta/gamma was detected the sediment from 52.5 to 57.3 ft bgs. Radiological contamination up to 16,000 dpm of direct beta/gamma was detected on the LEXAN™ liners from 57.3 to 59.8 ft bgs. The water table was encountered at approximately 234.6 ft bgs on June 16, 2016.

The IH detected a maximum of 0.5 ppmv VOC on May 18, 2016, at 132.4 ft bgs. No contamination was detected in the breathing zone.

The maximum temperature of the drill shoe was recorded as 168.8°F at 162.7 ft bgs, and the maximum temperature of the LEXAN™ liners was recorded as 150°F at 122.4 ft bgs. Irreversible temperature labels were used on selected samples at this borehole and the maximum temperature recorded using this method was 149°F at 97.1 ft bgs.

Following placement of the 10 1/2 in. OD temporary casing, the borehole was logged on April 7, 2016, using SGLS and NMLS, to 18.0 ft bgs. Following placement of the 8 5/8 in. OD temporary casing, the borehole was logged on April 13, 2016, using SGLS and NMLS, from 17.0 to 46.0 ft bgs, and HRLS from 24.0 to 45.0 ft bgs. The 6 in. OD temporary casing was logged on May 26, 2016, using SGLS from 44.9 to 233.0 ft bgs, and NMLS from 45.0 to 155.3 ft bgs. The 4 7/8 in. OD temporary casing was logged on June 16, 2016, using NMLS from 154.0 to 234.8 ft bgs, and on June 20, 2016, the casing was logged using SGLS from 154.0 to 233.0 ft bgs.

Borehole decommissioning was performed from June 21, 2016 to September 27, 2016. The borehole was filled from depth to surface with 241.4 ft of bentonite chips and 2.0 ft of high-strength concrete. All 4 7/8 in., 6 in., 8 5/8 in., and 10 1/2 in. OD temporary casing was removed during decommissioning.

All radiological contamination measurements are summarized in Table 3-14. Sample date, depth interval, recovery, sample temperatures, and HEIS numbers are summarized in Appendix D.

Table 3-14. Radiological Contamination at Borehole C9507

Date	Depth (ft bgs)	Media	Radiological Condition
4/6/2016	20.3 – 25.3	LEXAN™ liner	Direct, 3,000,000 dpm beta/gamma Removable, 145,000 dpm beta/gamma
4/11/2016	30.0 – 40.0	Inner drill string	Direct, 100,000 dpm beta/gamma
4/11/2016	40.0 – 48.1	Inner drill string and drill shoe	Direct, 1,000,000 dpm beta/gamma Removable, 35,000 dpm beta/gamma
5/16/2016	57.3 – 59.8	LEXAN™ liner	Direct, 16,000 dpm beta/gamma

Notes:
dpm = disintegrations per minute.
ft bgs = feet below ground surface.

3.2.10 Borehole C9511

Borehole C9511, located on the eastern side of the 216-T-23 Trench, was drilled from ground surface to 43.9 ft bgs on November 19, 2015 and November 20, 2015, by Layne using the Becker Hammer direct-push drill rig. Two split-spoon soil samples were collected. Radiological contamination up to 3,200,000 dpm of direct beta/gamma was detected on a third split-spoon sample collected from 12.2 to 14.6 ft bgs, on November 19, 2015. Due to radiological contamination, the split-spoon was not collected. On November 20, 2015, radiological contamination up to 40,000 dpm of direct beta/gamma was detected on the inner drill string and up to 20,000 dpm of direct beta/gamma on the drill shoe as it was removed from the borehole.

The remainder of the borehole was drilled to a TD of 117.2 ft from July 5, 2016 to July 7, 2016, by Cascade using a sonic drilling rig. During sonic drilling, seventeen core samples were collected in LEXAN™ liners. On July 5, 2016, radiological contamination up to 170,000 dpm of direct beta/gamma was detected on the LEXAN™ liners from a 44.1 to 46.6 ft bgs.

The maximum temperature of the drill shoe was recorded as 116.8°F at 107.7 ft bgs, and the maximum temperature of the LEXAN™ liners was recorded as 105°F at 77.1 ft bgs.

Following placement of the 8 5/8 in. OD temporary casing, the borehole was logged November 23, 2015 and November 24, 2015, using NMLS to 43.5 ft bgs, SGLS to 43.0 ft bgs, and HRLS from 10.0 to 42.0 ft bgs. The 6 in. OD temporary casing was logged on July 7, 2016 to July 11, 2016, using SGLS and NMLS, from 42.0 ft to 116.0 ft bgs.

Borehole decommissioning was performed from July 14, 2016 to September 28, 2016. The borehole was filled from depth to surface with 76.4 ft of bentonite pellets, 44.0 ft of bentonite chips, and 2.0 ft of high-strength concrete. All 6 in. OD temporary casing was removed during decommissioning. While back-pulling the 8 5/8 in. OD temporary casing, a 9.2 ft joint of casing with the shoe, sheared at the threads and remains in the borehole from 31.7 to 40.9 ft bgs. A variance was requested and granted by the Ecology on September 30, 2016. A copy of the variance is presented in Appendix E.

All radiological contamination measurements are summarized in Table 3-15. Sample date, depth interval, recovery, sample temperatures, and HEIS numbers are summarized in Appendix D.

Table 3-15. Radiological Contamination at Borehole C9511

Date	Depth (ft bgs)	Media	Radiological Condition
11/20/2015	0.0 – 9.7	Inner drill string	Direct, 40,000 dpm, beta/gamma
11/19/2015	12.2 – 14.6	Split-spoon	Direct, 3,200,000 dpm, beta/gamma
11/20/2015	34.7 – 42.3	Inner drill string	Removable, 5,000 dpm, beta/gamma
11/20/2015	42.3 – 43.9	Drill shoe	Direct, 20,000 dpm, beta/gamma Removable, 1,000 dpm, beta/gamma
7/5/2016	44.1 – 46.6	LEXAN™ liner	Direct, 170,000 dpm, beta/gamma

Notes:
dpm = disintegrations per minute.
ft bgs = feet below ground surface.

3.2.11 Borehole C9510

Borehole C9510, located on the eastern side of 216-T-25 Trench, was drilled from ground surface to 39.0 ft bgs on November 18, 2015, by Layne using the Becker Hammer direct-push drill rig. Two split-spoon soil samples were successfully collected. On November 18, 2015, the second split-spoon sample had radiological contamination up to 20,000 dpm of direct beta/gamma on the outside of the split-spoon and 150,000 dpm of direct beta/gamma was detected on the sediment. As the inner drill string was removed from the borehole, up to 30,000 dpm of direct beta/gamma was detected on the drill string and 1,000,000 dpm of beta/gamma was detected on the drill shoe.

The remainder of the borehole was drilled to a TD of 122.4 ft on July 12, 2016 and July 13, 2016, by Cascade using the sonic drilling rig. During sonic drilling, twenty-two core samples were collected in LEXAN™ liners. On July 12, 2016, radiological contamination up to 150,000 dpm of direct beta/gamma was detected on the sediment from 39.0 to 47.5 ft bgs.

The IH detected a maximum of 2.5 ppmv VOC on July 13, 2016, which may have originated from the drill rig exhaust.

The maximum temperature of the drill shoe was recorded as 134.2°F and the maximum temperature of the LEXAN™ liners was recorded as 144°F at 117.3 ft bgs. Irreversible temperature labels were used on selected samples at this borehole and the maximum temperature recorded using this method was 160°F at 122 ft bgs.

Following placement of the 8 5/8 in. OD temporary casing from ground surface to 39.0 ft bgs, the borehole was logged on November 19, 2015, using SGLS to 121.0 ft bgs and HRLS from 10.0 to 38.0 ft bgs. On November 23, 2015, the borehole was logged using NMLS, to 38.5 ft bgs. The 6 in. OD temporary casing was logged on July 13, 2016, using NMLS from 37.0 to 122.3 ft bgs, and on July 14, 2016, using SGLS from 37.0 to 121.0 ft bgs.

Borehole decommissioning was performed from July 18, 2016 to September 29, 2016. The borehole was filled from depth to surface with 78.9 ft of bentonite pellets, 104.4 ft of bentonite chips, and 2.0 ft of high-strength cement. All 6 in. and 8 5/8 in. OD temporary casing was removed during decommissioning.

All radiological contamination measurements are summarized in Table 3-16. Sample date, depth interval, recovery, sample temperatures, and HEIS numbers are summarized in Appendix D.

Table 3-16. Radiological Contamination at Borehole C9510

Date	Depth (ft bgs)	Media	Radiological Condition
11/18/2015	0.0 – 7.4	Inner drill string	Direct, 30,000 dpm beta/gamma
11/18/2015	7.0 – 9.2	Split-spoon	Direct, 20,000 dpm, beta/gamma Direct, 150,000 dpm, beta/gamma on sediment
11/18/2015	7.0 – 9.2	Sediment	Direct, 150,000 dpm, beta/gamma
11/18/2015	37.8 – 39.0	Drill shoe	Direct, 1,000,000 dpm, beta/gamma
7/15/2016	39.0 – 47.5	Sediment	Direct, 150,000 dpm, beta/gamma

Notes:
dpm = disintegrations per minute
ft bgs = feet below ground surface

3.3 Boreholes Located in the S Complex

This section includes S Complex boreholes. Decommissioning information and geophysical logging for each borehole is summarized in Table 3-17, and Table 3-18, respectively. The combination plot from each geophysical logging report displaying the soil moisture and radionuclides found in each borehole is presented in Appendix F.

Table 3-17. Decommissioning Information for S Complex Boreholes

Well ID	Total Depth Drilled (ft bgs)	Surface Seal[a] (ft bgs)	Bentonite Backfill (ft bgs)
C9512	142.5	0.0 – 2.0	2.0 – 142.5
C9514	127.6	0.0 – 2.0	2.0 – 127.6

Notes:
a. type I/II cement grout.
ft bgs = feet below ground surface.
ID = identification.

Table 3-18. Geophysical Logging Information for S Complex Boreholes

Well ID	Total Depth Drilled (ft bgs)	Report Number	Logging System	Man-made Contamination Present
C9512	142.5	HGLP-LDR-952, Rev. 0	SGLS, NMLS	Cs-137, Co-60
C9514	127.6	HGLP-LDR-949, Rev. 0	SGLS, HRLS, NMLS	Cs-137, Co-60

Notes:
ft bgs = feet below ground surface.
HRLS = High Rate Logging System.
ID = identification.
N/A = not applicable, borehole was not logged.
NMLS = Neutron Moisture Logging System.
SGLS = Spectral Gamma Logging System.

3.3.1 Borehole C9512

Borehole C9512, located at the 216-S-9 Crib, was drilled from ground surface to 32.7 ft bgs on November 23, 2015, to December 1, 2015, by Layne using a Becker Hammer direct-push drill rig. Three split-spoon soil samples were successfully collected. On November 24, 2015, a fourth split-spoon sample was attempted from 28.1 to 30.4 ft bgs. Radiological contamination up to 5,000 dpm of direct beta/gamma was detected on the outside of the split-spoon. Due to the radiological contamination, the split-spoon was not collected. Radiological contamination up to 25,000 dpm of direct beta/gamma, was detected on the drill shoe of the inner drill string as it was removed from the borehole on November 24, 2015. All 8 5/8 in. OD temporary casing was removed and the borehole was re-drilled by Layne on April 12, 2016 and April 13, 2016, to 36.4 ft bgs.

The remainder of the borehole was drilled to a TD of 142.5 ft from July 25, 2016 to June 27, 2016, by Cascade using the sonic drilling rig. During sonic drilling, forty-two core samples were collected in LEXAN™ liners.

The IH detected a maximum of 9.0 ppmv VOC on December 1, 2015, which may have originated from the drill rig exhaust.

The maximum temperature of the drill shoe was recorded as 283°F at 52.2 ft bgs, and the maximum temperature of the LEXAN™ liners was recorded as 145°F at 49.7 ft bgs. Irreversible temperature labels were used on selected samples at this borehole and the maximum temperature recorded may have exceeded 199°F at 122.0 ft bgs.

Following the initial placement of the 8 5/8 in. OD temporary casing, the borehole was logged on November 3, 2015, using SGLS and NMLS, to 32.0 ft bgs. Following the second placement of the 8 5/8 in. OD temporary casing, the borehole was logged on April 20, 2016, using SGLS and NMLS, from 30.0 to 35.0 ft bgs. The temporary 6 in. OD temporary casing was logged on July 28, 2016, using SGLS and NMLS, from 34.0 to 141.0 ft bgs.

Borehole decommissioning was performed from August 1, 2016 to September 22, 2016. The borehole was filled from depth to surface with 42.3 ft of bentonite pellets, 98.2 ft of bentonite chips, and 2.0 ft of high-strength concrete. All 6 in. and 8 5/8 in. OD temporary casing was removed during decommissioning.

All radiological contamination measurements are summarized in Table 3-19. Sample date, depth interval, recovery, sample temperatures, and HEIS numbers are summarized in Appendix D.

Table 3-19. Radiological Contamination at Borehole C9512

Date	Depth (ft bgs)	Media	Radiological Condition
11/24/2015	28.1 – 30.4	Split-spoon	Direct, 5,000 dpm, beta/gamma
11/24/2015	6.0 – 8.3	Drill shoe	Direct, 25,000 dpm, beta/gamma
11/24/2015	28.1 – 30.4	Split-spoon	Direct, 5,000 dpm, beta/gamma

Notes:
dpm = disintegrations per minute.
ft bgs = feet below ground surface.

3.3.2 Borehole C9514

Borehole C9514, located at the 216-S-21 Crib, was drilled from ground surface to 44.0 ft bgs on April 7, 2016, by Layne using the Becker Hammer direct-push drill rig. Three split-spoon soil samples were collected.

The remainder of the borehole was drilled to a TD of 127.6 ft from July 19, 2016 to July 21, 2016, by Cascade using the sonic drilling rig. During sonic drilling, nineteen core samples were collected in LEXAN™ liners. On July 19, 2016, radiological contamination up to 3,000 dpm of direct beta/gamma was detected on the LEXAN™ liners from 44.1 to 46.6 ft bgs.

The IH detected a maximum of 2.5 ppmv VOC on July 20, 2016, at 97.2 ft bgs. No contamination was detected in the breathing zone.

The maximum temperature of the drill shoe was recorded as 118.6°F at 72.1 ft bgs, and the maximum temperature of the LEXAN™ liners was recorded as 125°F at 87.5 ft bgs.

Following placement of the 8 5/8 in. OD temporary casing, the borehole was logged on April 11, 2016, using SGLS to 43.0 ft bgs, NMLS to 43.3 ft bgs, and HRLS from 22.0 to 29.0 ft bgs. The temporary 6 in. OD temporary casing was logged on July 25, 2016, using SGLS from 42.0 to 126.0 ft bgs, and NMLS from 42.0 to 127.3 ft bgs.

Borehole decommissioning was performed from July 28, 2016 to September 26, 2016. The borehole was filled from depth to surface with 83.4 ft of bentonite pellets, 42.2 ft of bentonite chips, and 2.0 ft of high-strength concrete. All 6 in. and 8 5/8 in. OD temporary casing was removed during decommissioning.

All radiological contamination is summarized in Table 3-20. Sample date, depth interval, recovery, sample temperatures, and HEIS numbers are summarized in Appendix D.

Table 3-20. Radiological Contamination at Borehole C9514

Date	Depth (ft bgs)	Media	Radiological Condition
7/19/2016	44.1 – 46.6	LEXAN™ liner	Direct, 3,000 dpm, beta/gamma

Notes:
dpm = disintegrations per minute
ft bgs = feet below ground surface

4 Geologic Observations

This Chapter summarizes the general geology in the area of the 200-DV-1 OU boreholes and present the stratigraphy encountered during the drilling of each well. No sieve analysis was performed on the samples. Due to the drilling method, limited visual observations of sediments were available during the Becker Hammer direct-push portion of drilling. Limited visual observations were made through the LEXAN™ liners. Exact geologic unit contacts, grain size distribution, lithology, and mineralogy were difficult to describe and estimate in the field. In addition, all reported observations are estimated. Stratigraphic unit contacts included in this document are based on soil cuttings examination in the field, when possible, and drilling observations (e.g. drill rate). Final stratigraphic unit contact depths will be determined during the remedial investigation and will incorporate the field observations, borehole geophysical logging information, and regional stratigraphic interpretations. The basis for the field stratigraphic unit contacts is included in the individual borehole summaries below.

4.1 Geology of the B Complex

The major stratigraphic units encountered during drilling in the B Complex included the gravel dominated Hanford formation unit 1 (H1), sand dominated Hanford formation unit 2 (H2), and the fine-grained silt of the silt-dominated Cold Creek unit (CCUz). The CCUz is a fine-grained eolian/overbank silt (silt facies). Unit H2 overlies the CCUz and is a sand-dominated flood sequence that is composed mostly of horizontal to tabular cross-bedded sand to gravelly sand. The H1 unit is a gravel-dominated flood sequence composed of mostly poorly-sorted, basaltic, sandy gravel to silty sandy gravel.

The following discussion focuses on the geologic conditions encountered at each individual borehole. The drilling borehole logs are presented in Appendix B. The borehole geologic logs developed from the borehole intervals collected in LEXAN™ liner cores are present in Appendix G. Photos of cores are displayed in Appendix H.

4.1.1 Borehole Geology for C9487

Sediments extracted from C9487 include the H1, H2 and CCUz. From ground surface to 3 ft bgs sediment was crushed gravel backfill. At 3 ft bgs, H1 silty sandy gravel is present and consists of approximately 30 % gravel, 40 % sand, and 3 % silt. The silty sandy gravel extends to 17 ft bgs. A 10 ft interval of sandy gravel was present to a depth of 27 ft bgs. The sandy gravel is comprised of approximately 40 to 60 % gravel, 35 to 55 % sand, and 10 % silt. The gravel fraction is poorly sorted with clasts between coarse pebble and small cobble (16 to 126 mm in diameter) that are rounded to sub-rounded. The sand is poorly to moderately sorted with grain size varying between very fine and very coarse. The silt is loosely compacted silt and clay that grades into a silty sandy gravel at 27 ft bgs. The silty sandy gravel is comprised of approximately 30 % gravel, containing coarse pebbles to small cobbles (16 to 126 mm in diameter) that are rounded to sub-rounded. The well sorted, medium to fine grained, sand makes up approximately 50 % of the sediment. The silty sandy gravel grades to sandy gravel at 31 ft bgs and continues to 34.1 ft bgs. The sandy gravel is comprised of approximately 60 % gravel, 30 % sand and trace silt. The gravels are sub-rounded, fine to very coarse pebbles (4 to 64 mm in diameter), with an average clast size of very coarse pebble (32 to 64 mm in diameter). The sand portion is medium to coarse grained and moderately sorted.

From 34.1 until 54.7 ft bgs a direct push drilling method was used with no sediment recovery. Below 54.7 ft bgs LEXAN™ liners were obtained from the borehole. Sediments encountered from 54.7 to 216.5 ft bgs consist of H2 sand with a gravelly sand interval from 187.2 to 197.2 ft bgs. The H2 unit is comprised of approximately 9 % gravel, 90 to 100 % sand, and 9 % silt. The gravels within the H2 unit are sub-rounded very fine pebbles. The sand portion is comprised of very fine to very coarse grains

that average medium to coarse. The gravelly sand interval is approximately 11 to 15 % gravel, 82 to 86 % sand and 3 % silt. The gravel is comprised of very fine to medium pebbles (2 to 16 mm in diameter) that are sub-rounded. The sand grains are fine to very coarse with an average grain size of coarse to very coarse.

The CCUz was encountered from 216.5 to TD of 235 ft and contains the perching interval of silty sand from 227.2 to 232 ft bgs. The CCUz encountered at this depth is dominantly silt with clay with approximately 5 % very fine sand. The silty sand perching interval contains approximately 90 % sand and 10 % silt with very fine to fine sand grains. The perched aquifer was encountered at 227.2 ft bgs on March 29, 2016. Drilling continued until TD at 235 ft.

4.1.2 Borehole Geology for C9488

The sediments extracted from C9488 include the H1, H2 and the CCUz. Gravelly sand is present from ground surface to 10 ft bgs where the sediments grade to sandy gravel. The sandy gravel is comprised of approximately 60 % coarse to very coarse pebbles (16 to 64 mm in diameter), 35 % sand, and 5 % silt. The sandy gravel continues to 12.5 ft bgs surface.

From 12.5 until 43.5 ft bgs a direct push drilling method was used with no sediment recovery. Below 43.5 ft bgs LEXAN™ liners were obtained from the borehole. Sediments encountered from 43.5 to 164.7 ft bgs consist of H2 sand. The sand is comprised of approximately 9 % gravel, 70 to 100 % sand and up to 30 % silt. The gravel fraction contains very fine to very coarse (2 to 64 mm in diameter) sub-rounded pebbles. The sand portion is very fine to very coarse grained with an medium average grain size. The sand grades to sandy gravel which is present from 164.7 to 206.3 ft bgs. The sandy gravel is comprised of approximately 30 % gravel, 65 to 70 % sand and up to 5 % silt. The gravel is composed of sub-rounded, very fine to very coarse (2 to 64 mm in diameter) pebbles. The sand is very fine to very coarse with a coarse average grain size.

At 206.3 ft bgs the silt content increases to approximately 100 % with trace sand and is interpreted to be the top of the CCUz. The CCUz extends to the TD of 226.0 ft and contains the perching interval of sand from 212.3 to 223.1 ft bgs. The CCUz encountered at this location is dominantly silt and clay with trace amounts of very fine sand. The sand perching interval contains approximately 100 % very fine to fine sand and trace silt. Drilling continued until TD at 226.0 ft.

4.1.3 Borehole Geology for C9489

The sediments extracted from C9489 consist of the H1, H2 and CCUz. The direct-push drilling method was used with no sediment recovered from ground surface to 3 ft bgs. Gravelly sand of the H1 is present from 3 to 7 ft bgs and is comprised of approximately 20 % gravel, and 80 % sand. The gravelly sand grades to sandy gravel at 7 ft bgs and extends to 12.6 ft bgs. The sandy gravel is approximately 30 % gravel, 64 % sand and 5 % silt.

From 12.6 until 34.2 ft bgs a direct push drilling method was used with no sediment recovery. Below 34.2 ft bgs LEXAN™ liners were obtained from the borehole. Sediments encountered from 34.2 to 37.6 ft bgs is a sandy gravel comprised of approximately 30 % gravel, 65 % sand, and 5 % silt. The gravel contains very fine to coarse (2 to 32 mm in diameter), sub-angular pebbles. The sand portion is sub-angular and ranges from very fine to very coarse with an average grain size of medium to coarse. From 37.6 to 227.6 ft bgs is H2 sand with a silt interval from 104.8 to 105.3 ft bgs. The H2 unit at this location is comprised of up to approximately 5 % gravel, 90 to 95 % sand, and 5 to 8 % silt. The gravel is composed of sub-angular, very fine to medium (2 to 16 mm in diameter) pebbles. The sand contains very fine to very coarse sub-angular grains that average medium in size. The silt layer from 104.8 to 105.3 ft bgs contains approximately 85 % silt and 15 % very fine sand. From

227.6 to 242.7 ft bgs is a gravelly sand interval. The gravelly sand is approximately 15 % gravel, 85 % sand, and trace silt. The gravel is very fine to coarse (2 to 32 mm in diameter), sub-rounded pebbles. The sand is comprised of very fine to coarse, sub-angular grains. The gravelly sand grades to sandy gravel at 242.7 ft bgs and continues to 246.4 ft bgs. The sandy gravel is approximately 50 to 75 %, very fine to medium (2 to 16 mm in diameter), sub-rounded pebbles and 25 to 50 % very fine to medium sub-angular sand.

At 246.4 ft bgs until 253.1 ft bgs a sandy silt and gravelly sandy silt interval is interpreted as the transition between the H2 and the CCUz. The sandy silt extends to 246.4 ft bgs and is comprised of approximately 40 % very fine sand, and 60 % silt. The gravelly sandy silt is present until the TD of 253.1 ft. The gravel is comprised of very fine to medium (2 to 16 mm in diameter), sub-rounded pebbles and very fine to fine grained sand.

4.1.4 Borehole Geology for C9490

The sediments extracted from C9490 consist of the H1, H2, and CCUz units. The direct-push drilling method was used with no sediment recovered from ground surface to 2.5 ft bgs. H1 sandy gravel is present from 2.5 to 7 ft bgs and is comprised of approximately 30 % gravel and 70 % sand. The sandy gravel grades to silty sandy gravel as the silt content increases at 7 ft bgs and continues to 12.6 ft bgs. The silty sandy gravel is approximately 40 % gravel, 30 % sand and 30 % silt.

From 12.6 until 34.2 ft bgs a direct push drilling method was used with no sediment recovery. Below 34.2 ft bgs LEXAN™ liners were obtained from the borehole. Sediments encountered from 34.2 to 227.0 ft bgs is the H2 sand with a slightly silty sand interval from 59.5 to 79.9 ft bgs. The H2 unit is comprised of approximately 95 % sand and 5 % silt. The sand portion is comprised of very fine to very coarse grains that average medium in size. The slightly silty sand interval contains approximately 85 % very fine to medium grained sand, and 15 % silt. From 227.0 to 250.4 ft bgs the gravel percentage in the sediment increases. Gravelly sand is present from 227.0 to 237.5 ft bgs with approximately 20 % gravel, 75 % sand, and 5 % silt. From 237.5 to 250.4 ft bgs is a sandy gravel interval that contains approximately 45 to 75 % gravel, increasing with depth, 25 to 50 % sand, and 5 % silt. The gravels in both intervals consist of very fine to coarse (2 to 33 mm in diameter), sub-angular to sub-rounded, pebbles. The sand is very fine to very coarse, sub-angular grains with an average medium grain size.

From 250.4 until TD of 252.6 ft, a sandy silt interval is present and interpreted as the transition between the H2 and CCUz units. The sandy silt contains approximately 55 % silt and 45 % very fine to fine sand.

4.1.5 Borehole Geology for C9491

The sediments extracted from C9491 consist of the H1 and H2 units. The direct-push drilling method was used with no sediment recovered from ground surface to 3 ft bgs. H1 silty sand gravel is present from 3 to 12.7 ft bgs and is comprised of approximately 55 to 60 % gravel, 28 to 30 % sand, and 12 to 15 % silt.

From 12.7 until 51.5 ft bgs a direct push drilling method was used with no sediment recovery. Below 51.5 ft bgs LEXAN™ liners were obtained from the borehole. Sediments encountered from 51.5 to TD is H2 sand with a gravelly sand interval from 177.7 to 192.8 ft bgs, a slightly silty sand interval from 212.7 to 222.7 ft bgs, and a sandy gravel interval from 222.7 to 227.7 ft bgs. The H2 sand is comprised of up to 5 % gravel, approximately 92 to 100 % sand, and up to 5 % silt. The gravel portion contains sub-rounded very fine to fine (2 to 8 mm in diameter) pebbles. The sand fraction is sub-angular, very fine to very coarse sand, with an average medium to coarse grain size. The gravelly sand interval from 177.2 to 192.8 ft bgs is comprised of approximately 15 % sub-rounded, very fine to fine (2 to 8 mm in diameter) pebbles, 93 % sand that has a coarse average grain size, and 2 % silt. The slightly silty sand interval from 212.7 to 222.7 ft bgs contains approximately 85 % very fine to fine sand, and 15 % silt.

From 222.6 to 227.7 is the sandy gravel interval that is comprised of approximately 50 % gravel and 50 % sand. The gravel is sub-rounded very fine to very coarse (2 to 64 mm in diameter) pebbles and the sand is very fine to very coarse with an average coarse grain size. Drilling continued until TD at 227.7 ft.

4.1.6 Borehole Geology for C9550 (Replacement for C8711)

The sediments extracted from C8711 consist of the H1 unit. From surface to 20 ft bgs is silty sandy gravel comprised of approximately 40 % gravel, 45 % sand and 15 % silt. The gravel fraction is comprised of very fine to fine (2 to 8 mm in diameter), sub-angular, pebbles. The sand portion contains very fine to medium grained sand. From 20 to TD of 27.6 ft, sandy gravel is present. The sandy gravel is comprised of an estimated 40 % gravel, 50 % sand, and 10 % silt. The gravels are very fine to very coarse (2 to 64 mm in diameter), sub-angular, pebbles. The medium to very coarse sand is comprised of sub-angular grains. Drilling continued until refusal at 27.6 ft bgs.

Borehole C9550 is a replacement for C8711 and was successfully drilled to the targeted depth. The sediments extracted from C9550 consist of the H1, H2 and CCUz units. From surface to 8.2 ft bgs there was no sediment recovery. Sediments encountered from 8.2 to 10.7 ft bgs indicated a silty sandy gravel comprised of approximately 60 % gravel, 25 % sand, and 15 % silt and is interpreted to be the H1 unit.

Below 43.7 ft bgs LEXAN™ liners were obtained from the borehole. Sediments encountered from 43.7 until 123.1 ft bgs consist of H2 sand, grading to sandy gravel at 178.2 ft bgs, which is observed until 193.2 ft bgs. The sands to 123.1 ft bgs consist of approximately 97 to 100 % sand with up to 3 % silt. The sand grains are very fine to very coarse, with an average size of medium to coarse. The sandy gravel consists of an estimated 30 to 70 % gravel, 25 to 68 % sand, and up to 5 % silt. The gravel fraction increases with depth and was observed as sub-rounded, very fine to very coarse (2 to 64 mm in diameter) pebbles. The sand fraction is comprised of very fine to very coarse grains with an average grain size of medium. The fine fraction ranged from approximately 5 to 15 %, increasing with depth.

Sandy silt was observed from 193.2 to 195.2 ft bgs and is interpreted to be the contact between H1 and the CCUz. The sandy silt is comprised of approximately 20 % very fine grained sand, and 80 % silt. From 195.2 to 200.0 ft bgs, the sediments consist of sandy gravel comprised of approximately 70 % sub-rounded, very fine to fine pebbles (2 to 8 mm in diameter), 20 % very fine to coarse grained sand, and 5 % silt. Drilling continued until TD at 200 ft.

4.1.7 Borehole Geology for C9549 (Replacement for C8707 and C9548)

The sediments extracted from C8707 consist of the H1 and H2 units. From surface to 15 ft bgs H1 silty sandy gravel is present and is comprised of approximately 40 % gravel, 45 % sand, and 15 % silt. The gravel contains fine (4 to 8 mm in diameter) sub-angular pebbles and the sand consists of fine to medium grains. The H1 to H2 contact is interpreted to be at 15 ft bgs where the silty sandy gravel grades to sand extending to the TD. The H2 sand is comprised of up to 8 % gravel, approximately 90 to 98 % sand, and 2 % silt. The gravel portion consists of very fine to very coarse (2 to 64 mm in diameter), sub-angular, pebbles The sand is predominantly very coarse grained throughout the interval. Drilling continued until refusal at 29.7 ft bgs.

Borehole C9548 is a replacement borehole for C8707 but did not successfully reach the TD. The sediments extracted at C9548 consist of the H1 and H2 units. From surface to 15 ft bgs, H1 silty sandy gravel is present and is comprised of an estimated 40 % gravel, 45 % sand, and 15 % silt. The gravel contains fine (4 to 8 mm in diameter) sub-angular pebbles, and the sand consists of fine to medium grains. The H1 to H2 contact is interpreted to be at 15 ft bgs where the silty sandy gravel grades to sand, extending to 45 ft bgs. The H1 sand is comprised of up to 8 % gravel, approximately 90 to 98 %, predominantly very coarse sand, and 2 % silt. The gravel portion contains very fine to very coarse

(2 to 64 mm in diameter) pebbles with very fine (2 to 4 mm in diameter) pebbles being the predominate clast size. A silty sandy interval is present from 45 to 47.5 ft bgs that grades to gravelly sand extending to 52.4 ft bgs. The gravelly sand is comprised of approximately 20 % gravel, and 80 % sand. From 52.4 to 69.4 ft bgs very coarse sand is present with occasional very fine (2 to 4 mm in diameter) pebbles. The sand grades into slightly silty sand at 69.4 and continues until the TD. The slightly silty sand is composed of approximately 85 % sand, and 15 % silt. The sand is very fine to coarse grained. Drilling continued until refusal at 90.6 ft bgs.

Borehole C9549 is a replacement borehole for C8707 and C9548 that was successfully drilled to the TD. The sediments extracted from C9549 consist of the H1 and H2 units. From surface to 7.2 ft bgs there was no sediment recovery. H1 sediments encountered from 7.2 to 9.7 ft bgs, indicated a silty sandy gravel comprised of approximately 40 % gravel, 47 % sand, and 13 % silt.

At 45.4 ft bgs, LEXAN™ liners were obtained from the borehole. Sediments encountered from 45.4 to 65.6 ft bgs, consist of H1 sandy gravel. The sandy gravel contains an estimated 40 % gravel, 60 % sand, and trace silt. The gravel fraction contains sub-rounded, very fine to coarse (2 to 32 mm in diameter) pebbles. The sand portion is comprised of very fine to very coarse grains with an average medium grain size.

The H1 to H2 contact is interpreted to be at 65.6 ft bgs where the sandy gravel grades to sand that extends to 150.8 ft bgs. In the H2 an interval of slightly silty sand is present from 85.6 to 90.6 ft bgs and a gravelly sand interval from 140.6 to 145.6 ft bgs. The H2 sand is comprised of up to 5 % gravel, approximately 95 to 100 % sand, and up to 5 % silt. The gravel in the H2 sand consists of very fine (2 to 4 mm in diameter), sub-angular, pebbles. The sand is very fine to very coarse with an average medium to coarse grain size. The slightly silty sand interval from 85.6 to 90.6 ft bgs is comprised of trace gravels, an estimated 85 % very fine to fine sand, and 15 % silt. The gravelly sand interval from 140.6 to 145.6 ft bgs is comprised of approximately 25 % very fine to medium (2 to 16 mm in diameter) pebbles, and 75 % coarse to very coarse sand. Sediments encountered from 145.6 to 150.8 ft, consist of sand containing an estimated 5 % gravel. The sand is fine to very coarse grained and the gravel is comprised of very fine to medium (2 to 16 mm in diameter) pebbles. The sand grades to a sandy gravel at 150.8 extending to 155.7 ft bgs. The sandy gravel is comprised of approximately 50 % very fine to coarse (2 to 32 mm in diameter) pebbles, and 50 % fine to coarse sand. From 155.7 to 160.6 ft bgs gravelly sand is present. The gravelly sand consists of approximately 25 % very fine to medium (2 to 16 mm in diameter) pebbles, and 75 % fine to coarse grained sand. The gravelly sand grades to sand at 160 ft bgs and extends to 190.8 ft bgs. The very fine to medium sand contains an estimated 5 % very fine (2 to 4 mm in diameter) pebbles. From 190.8 to the TD, sandy gravel is present. The sandy gravel is comprised of approximately 60 % very fine to very coarse (2 to 64 mm in diameter) pebbles, 30 % very fine to coarse sand, and 10 % silt. Drilling continued until TD at 200.7 ft.

4.1.8 Borehole Geology for C9552 (Replacement for C9551 and C8709)

The sediments extracted from C8709 consist of the H1 unit until TD. The direct-push drilling method was used with no sediment recovered from ground surface to 2 ft bgs. Silt was encountered from 2 to 4 ft bgs and contained approximately 2 % gravel, and 20 % sand. Gravelly sandy silt was present from 4 to 6 ft bgs and was comprised of approximately 10 to 25 % gravel, 20 to 30 % sand, and 45 to 70 % silt. The gravel portion contained well rounded coarse (16 to 32 mm in diameter) pebbles. After 6 ft bgs no sediment was recovered. Drilling continued until refusal at 16.3 ft bgs.

Borehole C9551 is a replacement borehole for C8709 but did not successfully reach the TD. There was no sediment recovery at this borehole and drilling continued until refusal at 12.9 ft bgs.

Borehole C9552 is a replacement borehole for C9551 and C8709 that successfully reached the TD. The direct-push drilling method was used with no sediment recovered from ground surface to 45.3 ft bgs. Below 45.3 ft bgs LEXAN™ liners were obtained from the borehole. The sediments extracted from C9552 consist of the H2 unit until TD. Sediments encountered from 45.3 ft to 47.0 ft bgs, consist of sand. The sand is fine to very coarse grained with approximately 5 % gravels that are sub-rounded, very fine (2 to 4 mm in diameter) pebbles. Gravel content increased and sand percentage decreased from 47.0 to 62.2 where sandy gravel was observed. The sandy gravel contains an estimated 45 to 65 % gravel, 30 to 55 % sand, and up to 5 % silt. The gravel observed consists of sub-rounded, very fine pebbles to small cobbles (2 to 126 mm in diameter). The sand grains are fine to very coarse with an average grain size of medium. Gravelly sand was observed from 62.2 to 67.1 ft bgs, where gravel content begins to decrease. The gravelly sands are approximately 75 % fine to coarse grained sand with an estimated 25 % gravels that are sub-rounded, very fine (2 to 4 mm in diameter) pebbles. Sand was observed with increasing silt content from 67.1 to 117.2 ft bgs, where slightly silty sand was observed until 127.5 ft bgs. The sands to 117.2 ft bgs consist of approximately 93 to 100 % sand, 5 % gravel, and up to 7 % silt. The sand grains are very fine to coarse, with an average size of fine to medium. The gravel fraction is comprised of very fine (2 to 4 mm in diameter) sub-rounded pebbles. The slightly silty sand that was observed from 117.2 until 127.5 ft bgs contains an estimated 85 %, very fine to very coarse sand with an average grain size of medium, and 15 % silt. Silt content decreases and sand is observed until 142.2 ft bgs. The sand consists of very fine to very coarse grains with an average grain size of medium to coarse, with approximately 5 % silt. From 142.2 to 202.2 sandy gravels and gravelly sands are present. The sandy gravel to 157.2 ft bgs contains approximately 60 % sand, 35 % gravel, and 5 % silt. The sand fraction consists of very fine to coarse grains with a medium average grain size. The gravels are sub-rounded, very fine to very coarse (2 to 64 mm in diameter) pebbles. The gravelly sand from 157.2 to 187.2 ft bgs contains approximately 75 to 85 % sand, 10 to 20 % gravel, and 5 % silt. The sand fraction consists of very fine to coarse grains with an average grain size of medium to coarse. The gravel portion consists of sub-rounded, very fine to very coarse (2 to 64 mm in diameter) pebbles. The sandy gravel from 187.2 to 202.2 ft bgs contains an estimated 50 % gravel, 45 % sand, and 5 % silt. Gravel fraction consists of sub-rounded, fine to very coarse (4 to 64 mm in diameter) pebbles. The sand grains are very fine to very coarse with an average coarse grain size. Drilling continued until TD at 202.2 ft.

4.1.9 Borehole Geology for C8706

The sediments extracted from C8706 consist of the H1 and H2 units. Crushed pad gravel appears from ground surface to 2 ft bgs. Silty sandy gravel is encountered from 2 to 8.4 ft bgs and is comprised of approximately 50 to 75 % gravel, 14 to 38 % sand, and 12 % silt. The very fine to coarse (2 to 32 mm in diameter) pebbles are sub-angular and approximately 70 % basalt. The sand portion is very fine to medium grained.

The direct-push drilling method was used with no sediment recovered from 8.4 to 45.3 ft bgs. Below 45.3 ft bgs, LEXAN™ liners were obtained from the borehole. Sediments encountered from 45.3 to 62.2 ft bgs is interpreted to be the H1 formation which contains an interval of gravelly sand to 52.2 ft bgs and sandy gravel extending to 62.2 ft bgs. The gravelly sand interval contains approximately 25 % gravel, and 75 % sand. The sandy gravel interval contains an estimated 40 % gravel, 55 % sand, and 5 % silt. The gravel portion of the H2 unit is comprised of very fine to very coarse (2 to 64 mm in diameter) pebbles, and the sand is very fine to very coarse with an average medium grain size.

The contact between the H1 and H2 units is interpreted to be at 62.2 ft bgs. Sand was observed from 62.2 to 182.3 ft bgs with a gravelly sand interval at 137.2 to 147.1 ft bgs. The H2 sand is comprised of approximately 5 % very fine to fine (2 to 8 mm in diameter) pebbles and 95 % very fine to very coarse sand, that has an average grain size of medium to coarse. The gravelly sand interval contains an estimated

20 % gravel, 77 % sand, and 3 % silt. The gravel portion of the gravelly sand is comprised of very fine to fine (2 to 8 mm in diameter) pebbles, and the sand portion is very fine to coarse grained. Alternating intervals of gravelly sand and sandy gravel are encountered from 182.3 until the TD. Gravelly sand is present from 182.3 to 187.3 ft, and again at 192.3 to 197.3 ft bgs. The gravelly sand intervals are comprised of approximately 25 % gravel, 72 % sand, and 3 % silt. The gravel is observed as very fine to fine (2 to 8 mm in diameter), sub-rounded pebbles, and the sand is very fine to very coarse grained with a coarse average grain size. The sandy gravel intervals are encountered at 187.3 to 192.3, and 197.3 to 202.3 ft bgs. The sandy gravel intervals are comprised of approximately 35 to 57 % gravel, 40 to 62 % sand, and 3 % silt. The gravel portion contains very fine pebbles to small cobbles (2 to 126 mm in diameter) that are sub-rounded. The sand is very fine to very coarse grained with an average coarse grain size. Drilling continued until TD at 202.3 ft.

4.2 Geology of the T Complex

The major stratigraphic units encountered during drilling in the T Complex include sand and gravel of the Hanford formation and/or surficial deposits, silt and sand of the CCUz and CCUc, sand and gravel of the Ringold Formation member of Taylor Flat (Rtf), and sand and gravel of the Ringold Formation member of Wooded Island – Unit E (Rwie).

The Ringold Formation was deposited on the Columbia River Basalt Group and is up to 600 ft thick in the Cold Creek syncline. The Ringold Formation consists mainly of fluvial gravels and sands. The Rwie is described as a pebble-to-cobble gravel with a fine- to coarse-grained sand matrix. The Rwie is overlain by sediments of the Rtf. The Rtf is a mixture of fluvial-sand and overbank facies associations consisting of bedded, unconsolidated to consolidated and poorly to well-sorted sandy silt, sand, and silty sand. The CCU lies unconformably on the tilted and truncated Ringold Formation surface. The CCUc consists of calcium carbonate-cemented silt, silty sand and sandy silt with some gravel in places. The CCUz overlies the CCUc and consists of slightly to well-consolidated, moderately to well-sorted silt and sandy silt. The CCUz may contain calcium carbonate but lacks the cementation found in the underlying calcic paleosols. The Hanford formation overlays the CCU and is a sand and gravel dominated flood sequence composed of medium sands and poorly-sorted, basaltic, sandy gravels and silty sandy gravels.

The following discussion focuses on the geologic conditions encountered at each individual borehole. The drilling borehole logs are presented in Appendix B. The borehole logs developed from the borehole intervals collected in LEXAN™ liner cores are present in Appendix G. Photos of cores are displayed in Appendix H.

4.2.1 Borehole Geology for C9492

The sediments extracted from C9492 include the Hanford formation and CCUz units. The direct-push drilling method was used with no sediment recovered from ground surface to 3 ft bgs. Gravelly sand was present from 3 to 5 ft bgs and consists of approximately 20 % gravel, 75 % sand, and 5 % silt. The gravel is sub-rounded very coarse (32 to 64 mm in diameter) pebbles, and the sand is very fine to very coarse grained. As silt content increases and gravel decreases, gravelly silty sand is present to 9.1 ft bgs. The gravelly silty sand is comprised of an estimated 10 % very fine (2 to 4 mm in diameter) pebbles, 60 % very fine to medium sand, and 30 % silt. From 9.1 to 11.0 ft bgs slightly silty sandy gravel is present and is comprised of approximately 20 % gravel, 65 % sand, and 15 % silt.

From 11.0 until 40.5 ft bgs a direct push drilling method was used with no sediment recovery. Below 40.5 ft bgs LEXAN™ liners were obtained from the borehole. Sediments encountered from 40.5 to 42.7 ft bgs are classified as a sandy gravel containing approximately 45 % gravel, 55 % sand, and 5 % silt. The gravel portion is comprised of sub-angular, very fine pebbles to small cobbles (2 to 126 mm in

diameter). The sand is very fine to very coarse grained with an average of medium to coarse grains. From 42.7 to 52.4 there was no sediment recovery. Gravelly sand is present from 52.4 to 67 ft bgs and contains an estimated 15 to 25 % gravel, 75 to 85 % sand, and up to 5 % silt. The gravel fraction is very fine to very coarse (2 to 64 mm in diameter), sub-angular to sub-rounded, pebbles. The sand consists of a very fine to medium grain. As the gravel percentage in the sediment continues to decreases the gravelly sand grades to sand at 67 ft and the sand extends to 78 ft bgs. The very fine to very coarse grained sand contains an estimated 9 % very fine to very coarse (2 to 64 mm in diameter) pebbles, and trace silt.

From 78 to 87.6 ft bgs a slightly silty sand is present and is interpreted to be a transition zone between the Hanford formation and the CCUz. The slightly silty sand contains approximately 5 % very fine to fine (2 to 8 mm in diameter) pebbles, 80 % very fine to very coarse sand, and 15 % silt. The CCUz is encountered from 87.6 to 102 ft bgs and is comprised of an estimated 85 to 90 % silt, and 10 to 15 % sand. Drilling continues until TD at 102.0 ft.

4.2.2 Borehole Geology for C9494

The sediments extracted from C9494 include the Hanford formation, CCUz and CCUc units. The direct-push drilling method was used with no sediment recovered from ground surface to 40.7 ft bgs. Gravelly sand of the Hanford formation was encountered from 40.7 ft to 67 ft bgs. The gravelly sand is comprised of approximately 15 to 30 gravel, and 70 to 85 % sand. The gravel consists angular to sub-angular, very fine pebbles to small cobbles (2 to 126 mm in diameter) composed of approximately 90 % mafic-rich minerals. The sand fraction is composed of 80 % mafic-rich minerals, ranging from medium to very coarse grained with coarse and very coarse grains being predominate. From 67 to 77 ft bgs, the lithology transitions from gravelly sand to sand. The sand contains approximately 5 % gravel, and trace silt. The Hanford formation sand is very fine to coarse and contains an estimated 80 % mafic-rich minerals. The very fine (2 to 4 mm in diameter) pebbles in the sand are sub-angular to sub-rounded and approximately 90 % mafic.

From 77 to 87 ft bgs a silty sand is present and is interpreted to be a transition zone between the Hanford formation and the CCUz. The slightly silty sand contains an estimated 65 % sand, and 35 % silt. The sand fraction is well sorted, composed of 90 % silica-rich minerals, ranging in size from very fine to fine. The silt has medium plasticity. The CCUz is encountered from 87 to 95 ft bgs and is comprised of a medium plasticity silt with a trace amount of very fine sand. From 95 to 100.6 ft bgs a sandy silt with caliche nodules, 45 mm in diameter, is present and is interpreted to be the transition from the CCUz to the CCUc. The sandy silt is comprised of an estimated 30 % sand, and 70 % silt with low plasticity. The sand fraction is approximately 90 % felsic and ranges from fine to very fine in size. Drilling continued until TD at 100.6 ft.

4.2.3 Borehole Geology for C9554 (Replacement for C9502)

Borehole C9502 was drilled until refusal at 15 ft bgs and did not yield any sediment recovery. Borehole C9554 is a replacement borehole for C9502 that successfully reached the targeted depth. The sediments extracted from C9554 are interpreted to be part of the Hanford formation. No sediment was recovered from ground surface to 43.7 ft bgs. Gravelly sand is present from 43.7 to 67 ft bgs and is comprised of approximately 15 % gravel, 85 % sand, and trace silt. The gravel fraction contains 85 % mafic-rich sub-angular clasts that range in size from very fine to medium (2 to 16 mm in diameter) pebbles. The sand is coarse to very coarse grained and is 80 % mafic. The gravelly sand transitions to sand at 67 ft bgs and the sand extends to 107.5 ft bgs. The sand contains an estimated 50 % mafic, 50 % felsic-rich minerals, and ranges in size from fine to coarse with an average medium grain size. Drilling continued until TD at 107.5 ft.

4.2.4 Borehole Geology for C9499

The sediments extracted from C9499 are interpreted to be part of the Hanford formation. The direct-push drilling method was used with no sediment recovered from ground surface to 3 ft bgs. From 3 to 5 ft bgs sandy gravel is present that consists of approximately 70 % gravel, 25 % sand, and 5 % silt. The sub-rounded gravels range in size from very fine pebble to small cobble (2 to 126 mm in diameter). The sand is sub-angular and ranges from very fine to very coarse in size. From 5.5 to 8.6 ft bgs there was no sediment recovery. Gravelly sand is present from 8.6 to 15.5 ft and consists of an estimated 25 % gravel, 75 % sand, and trace silt. The gravel ranges in size from very fine to very coarse (2 to 64 mm in diameter) pebbles, and the sand is very fine to coarse with a medium average grain size.

From 15.5 until 43.0 ft bgs a direct push drilling method was used with no sediment recovery. Below 43.0 ft bgs LEXAN™ liners were obtained from the borehole. Sand was encountered from 43.0 to TD with a gravelly sand interval from 82.4 to 97.0 ft bgs. The Hanford formation sand consists of up to 5 % gravel, approximately 90 to 95 % sand, and up to 5 % silt. The gravel fraction ranges from very fine to fine (2 to 8 mm in diameter), sub-angular to sub-rounded, pebbles. The sand is ranges from very fine to very coarse, with a medium average grain size. The gravelly sand interval contains approximately 10 % gravel, 85 % sand, and 5 % silt. The gravel is comprised of sub-angular to sub-rounded very fine to fine (2 to 8 mm in diameter) pebbles. The sand is very fine to coarse with a medium average grain size. Drilling continued to the TD of 107.0 ft.

4.2.5 Borehole Geology for C9495

The sediments extracted from C9495 include the Hanford formation and CCUz. The direct-push drilling method was used with no sediment recovered from ground surface to 57.0 ft bgs. Sand of the Hanford formation is encountered from 57 to 77 ft bgs. The sand consists of up to 5 % gravel, approximately 95 to 100 % sand, and trace silt. The sand fraction is well sorted, composed of 60 % silica-rich minerals, ranging from very fine to medium in size. The gravel fraction consists of 90 % mafic clasts that range in size from very fine to medium (2 to 16 mm in diameter) sub-rounded pebbles. Gravelly sand is present from 77 to 100 ft bgs and is comprised of an estimated 15 % gravel, 85 % sand, and trace silt. The gravel fraction is 90 % mafic and ranges from very fine to medium (2 to 16 mm in diameter), sub-rounded pebbles. The sand contains 60 % felsic-rich minerals, and varies from very fine to very coarse grained with a coarse average grain size.

The Hanford formation contact with the CCUz is interpreted to be at 100 ft bgs where the gravelly sand transitions to silt and extends to 106.0 ft bgs. The CCUz silt is a visually observed 100 % silt with medium plasticity. Drilling continued to the TD of 106.0 ft.

4.2.6 Borehole Geology for C9496

The sediments extracted from C9496 include the Hanford formation and CCUz. The direct-push drilling method was used with no sediment recovered from ground surface to 35.7 ft bgs. Sand of the Hanford formation is encountered from 35.7 to 67 ft bgs. The sand consists of approximately 5 % gravel, and 95 % sand. The gravel fraction consists of 95 % mafic-rich minerals, and ranges in size from very fine to coarse (2 to 32 mm in diameter), sub-angular pebbles. The sand is 70 % mafic-rich minerals and the grains are very fine to very coarse with an average grain size of medium to coarse. Gravelly sand is encountered from 67 to 87 ft bgs. The gravelly sand is comprised of approximately 25 % gravel, 70 % sand, and 5 % silt. The gravel is 90 % mafic with very fine to fine (2 to 8 mm in diameter) sub-angular pebbles. The sand is sub-angular, very fine to very coarse, 50 % mafic, with a medium average grain size. The sandy gravelly grades to slightly silty gravelly sand at 87 ft and continues until 97 ft bgs. The slightly silty gravelly sand is comprised of an estimated 25 % gravel, 60 % sand, and 15 % silt. The gravel is 95 %

mafic, very fine (2 to 4 mm in diameter), sub-angular pebbles. The sand size ranges from very fine to medium and is composed of 70 % silica-rich minerals.

The Hanford formation to CCUz transition zone is interpreted to be at 97 ft bgs where the slightly silty gravelly sand grades to silty sand. The silty sand is composed of approximately 5 % gravel, 55 % sand, and 40 % silt. The gravel is comprised of sub-rounded pebbles that are 95 % mafic. The sand is very fine to medium grained and is comprised of 70 % silica-rich minerals. Drilling continued to the TD of 106.1 ft.

4.2.7 Borehole Geology for C9505

The sediments extracted from C9505 include the Hanford formation and CCUz. The direct-push drilling method was used with no sediment recovered from ground surface to 8.3 ft . Sandy gravel of the Hanford formation was encountered from 8.3 to 12.9 ft bgs. The sandy gravel is comprised of approximately 70 % gravel, 25 % sand, and 5 % silt. The gravel fraction consists of 80 % mafic-rich minerals, and the sub-angular clasts range in size from very fine pebbles to small cobbles (2 to 126 mm in diameter). The sand fraction is very fine to coarse, sub-angular grains. No sediment was recovered from 12.9 until 43.6 ft bgs. Below 43.6 ft bgs LEXAN™ liners were obtained from the borehole. Sand was encountered from 43.6 until 67.2 ft bgs. The sand is comprised of up to 5 % gravel, approximately 93 to 100 % sand, and up to 5 % silt. The gravel consists of sub-rounded, very fine to coarse (2 to 32 mm in diameter) pebbles. The sand is very fine to coarse grained with a medium average grain size. The sand grades to sandy gravel at 67.2 ft bgs and extends to 82.3 ft bgs. The sandy gravel is comprised of an estimated 40 to 75 % gravel, 25 to 60 % sand, and trace silt. The sub-rounded gravel ranges in size from very fine to coarse (2 to 32 mm in diameter) pebbles. The sub-angular sand is fine to very coarse grained with a medium average grain size. Sand with trace gravels and silt is present from 87.3 to 98.3 ft bgs. The sand is sub-angular to sub-rounded and ranges in size from very fine to very coarse with a coarse average grain size.

The Hanford formation to CCUz transition zone is interpreted to be at 98.3 ft bgs where the sand grades to silty sand and extends to 106.4 ft bgs. The silty sand is composed of approximately 70 % very fine sand, and 30 % silt. Drilling continued to the TD of 106.4 ft.

4.2.8 Borehole Geology for C9506

The sediments extracted from C9506 include the Hanford formation and CCUz. The direct-push drilling method was used with no sediment recovered from ground surface to 4.0 ft bgs. Sand of the Hanford formation was encountered from 4.0 to 12.5 ft bgs. The very fine to coarse sand has a medium average grain size and contains approximately 5 % silt. From 12.5 until 33.5 ft bgs a direct push drilling method was used with no sediment recovery. Below 33.5 ft bgs LEXAN™ liners were obtained from the borehole. Sandy gravel was encountered from 33.5 to 42.0 ft bgs. The sandy gravel is an estimated 30 to 35 % gravel, and 60 to 65 % sand. The gravel is sub-angular and ranges from very fine to medium (2 to 16 mm in diameter) pebbles. The sub-angular sand is very fine to very coarse in size with a coarse average grain size. The sandy gravel grades to gravelly sand at 42.1 ft bgs, and extends to 57.2 ft bgs. The gravelly sand is composed of an estimated 15 % gravel, 80 % sand, and 5 % silt. The sub-angular gravel is comprised of very fine to fine (2 to 8 mm in diameter) pebbles. The sand is sub-angular and ranges in size from very fine to very coarse grained with a medium average grain size. As the gravel content in the sediment continues to decrease the gravelly sand grades to sand at 57.2 ft bgs and the sand extends to 87.2 ft bgs. The very fine to coarse, sub-angular, grained sand contains approximately 5 % silt and has a medium average grain size.

The Hanford formation to CCUz transition zone is interpreted to be at 87.2 ft bgs where the sand grades to silty sand and extends to 101.8 ft bgs. The silty sand is composed of approximately 70 % very fine to medium grained sand, and 30 % silt. Drilling continued to the TD of 101.8 ft.

4.2.9 Borehole Geology for C9507

The sediments extracted from C9507 include the Hanford formation, CCUz, CCUc, Rtf, and Rwie units. Sandy gravel of the Hanford formation extends from ground surface to 25.3 ft bgs. The sandy gravel is composed of approximately 60 % gravel, and 40 % sand. The sub-rounded gravel ranges in size from very fine pebbles to large cobbles (2 to 256 mm in diameter). The very fine to coarse grained sand has a medium average grain size. From 25.3 until 48.1 ft bgs a direct drilling method was used with no sediment recovery. From 48.1 until 57.3 there was no sediment identification due to radiological contamination controls. Below 57.3 until 157.0 ft bgs LEXAN™ liners were obtained from the borehole. Sand was encountered from 57.3 until 94.1 ft bgs. The sand is comprised of trace gravels, approximately 95 to 100 % sand, and up to 5 % silt. The sand is very fine to coarse grained with a medium average grain size. The trace gravels begin at 77.5 ft bgs and are sub-angular to sub-rounded, fine to medium (4 to 16 mm in diameter) pebbles.

The Hanford formation to CCUz transition zone is interpreted to be at 94.1 ft bgs where the sand grades to slightly silty sand and extends to 95.1 ft bgs. The slightly silty sand is an estimated 80 % very fine to medium sand, and 20 % silt. The slightly silty sand grades to silt at 95.1 and extends to 107.3 ft bgs.

The CCUz to CCUc contact is interpreted to be at 102.4 ft bgs where caliche nodules are observed in the silt unit. Caliche nodules are present in the sediment until 114.8 ft bgs. The silt contains approximately 10 to 15 % very fine to fine grained sand. Sandy silt is present from 107.3 to 112.3 ft bgs and is composed of an estimated 80 % very fine to medium grained sand, and 20 % silt. Slightly silty sand is observed from 112.3 until 117.4 ft bgs and is composed of approximately 89 % very fine to medium grained sand, and 11 % silt.

The CCUc contact with the Rtf unit is interpreted to be at 117.4 ft bgs where the slightly silty sand grades to sandy gravel. The sandy gravel is comprised of approximately 75 % gravel and 25 % sand extending to 122.5 ft bgs. The gravel fraction contains sub-angular to sub-rounded, very fine pebbles to small cobbles (2 to 126 mm in diameter). The sand is very fine to very coarse grained with a coarse average grain size. Silty sandy gravel was encountered from 122.5 to 142.6 ft bgs and contains approximately 65 % gravel, 20 % sand, and 15 % silt. The sub-angular to sub-rounded gravel ranges in size from very fine pebbles to small cobbles (2 to 126 mm in diameter). The sub-angular sand is very fine to very coarse with a coarse average grain size. As the silt content decreases with depth sandy gravel is encountered from 142.6 until 177.0 ft bgs. The sandy gravel is comprised of an estimated 40 % gravel, 60 % sand, and trace silt until 162.7 ft bgs.

The Rtf contact with the Rwie is interpreted to be at 162.7 ft bgs where the gravel content increases to approximately 65 %. The sandy gravel after 162.7 ft bgs contains a visually observed 65 % gravel, 25 % sand, and 10 % silt. The sandy gravel ranges in size from very fine pebbles to small cobbles (2 to 126 mm in diameter) and fine to coarse grained sand. The sandy gravel grades to silty sandy gravel at 177.0 when the silt content in the sediment increases. The silty sand gravel contains approximately 50 to 65 % gravel, 20 to 38 % sand, and 11 to 15 % silt, and extends to 243.4 ft bgs with an interval of very fine to medium sand at 197 to 200 ft bgs. The gravel fraction of the silty sand gravel contains an estimated 70 % felsic-rich minerals that are poorly sorted, sub-rounded, and range in size from very fine pebbles to small cobbles (2 to 126 mm in diameter). The sand fraction contains 60 % mafic-rich minerals and is fine to coarse grained. The water table was encountered at 234.6 ft bgs on June 16, 2016. Drilling continued until TD at 243.4 ft.

4.2.10 Borehole Geology for C9511

The sediments extracted from C9511 include the Hanford formation and the CCUz. The direct-push drilling method was used with no sediment recovered from ground surface to 4.5 ft bgs. Gravelly sand of the Hanford formation was encountered from 4.5 to 7.6 bgs and consist of approximately 10 % gravel, 88 % sand, and 2 % silt. The gravel is sub-rounded and ranges in size from very fine to very coarse (2 to 64 mm in diameter) pebble. The sand is very fine to very coarse with a very fine average grain size. Slightly silty sand was encountered from 7.6 to 10.0 ft bgs and consisted of approximately 5 % gravel, 80 % sand, and 15 % silt. The gravel is sub-rounded and ranges in size from very fine to medium (2 to 16 mm in diameter) pebble. The sand ranges in size from very fine to fine grained. From 10.0 until 43.9 ft bgs a direct push drilling method was used with no sediment recovery. Beneath 43.9 ft bgs LEXAN™ liners were obtained from the borehole. Very fine to coarse grained sand was encountered from 43.9 to 54.6 ft bgs and contains an estimated 5 %, sub-angular, very fine (2 to 4 mm in diameter) pebbles, and trace silt. As the gravel content increases with depth the sand grades to gravelly sand from 54.6 to 63.1 ft bgs, where the gravelly sand grades to sandy gravel and extends to 106.5 ft bgs. The gravelly sand from 54.6 to 63.1 ft bgs contains approximately 25 % gravel, 70 % sand, and 5 % silt. The gravel fraction is sub-angular to sub-rounded, very fine to coarse (2 to 32 mm in diameter) pebbles. The sand fraction is fine to very coarse, sub-angular grains with a medium average grain size. The sandy gravel from 63.1 to 106.5 ft bgs contains approximately 50 to 75 % gravel, 25 to 45 % sand, and up to 5 % silt. The gravel fraction is comprised of sub-angular to sub-rounded, very fine pebbles to small cobbles (2 to 126 mm in diameter). The sand is fine to very coarse, sub-angular grains with an average medium grain size.

The Hanford formation to CCUz transition zone is interpreted to be at 106.5 ft bgs where the sandy gravel grades into a silty sand and extends to 117.2 ft bgs. The silty sand is comprised of approximately 65 % very fine to fine grained sand, and 35 % silt. Drilling continued until TD at 117.2 ft.

4.2.11 Borehole Geology for C9510

The sediments extracted from C9510 include the Hanford formation and CCUz. The direct-push drilling method was used with no sediment recovered from ground surface to 4 ft bgs. Gravelly silty sand of the Hanford formation was encountered from 4 to 6.2 ft bgs and is comprised of approximately 30 % gravel, 60 % sand, and 10 % silt. Slightly silty gravelly sand was encountered from 6.2 to 9.2 ft bgs and is comprised of an estimated 20 % gravel, 60 % sand, and 20 % silt. The gravel contained in each interval is well-rounded, very fine to medium (2 to 16 mm in diameter) pebbles. The sand fraction is very fine grained. From 9.2 until 39.0 ft bgs a direct-push drilling method was used with no sediment recovery. From 39.0 until 47.5 ft bgs, no sediment was identified due to radiological contamination controls. Beneath 47.5 ft bgs, LEXAN™ liners were obtained from the borehole. Very fine to very coarse sand was encountered from 47.5 to 57.4 ft bgs and contained approximately 5 % silt. The sand is sub-angular with an average grain size of medium to coarse. The sand grades to sandy gravel at 57.4 and extends to 102.5 ft bgs. The sandy gravel contains an estimated 40 to 75 % gravel, 25 to 55 % sand, and up to 5 % silt. The gravel fraction is sub-angular to sub-rounded and ranges in size from very fine pebbles to small cobbles (2 to 126 mm in diameter). The sub-angular sand is very fine to very coarse grained with a medium average grain size. No sediment was recovered from 102.5 to 112.3 ft bgs.

The Hanford formation to CCUz transition zone is interpreted to be at 112.3 ft bgs where silty sand is first observed. The silty sand is comprised of approximately 65 % very fine to fine grained sand, and 35 % silt. Drilling in the silty sand continued until TD at 122.4 ft.

4.3 Geology of the S Complex

The major stratigraphic units encountered during drilling in the S Complex include sand and gravel of the Hanford formation and/or surficial deposits, and the silt and sand of the CCUz. The CCUz consists of interstratified, uncemented fine sand, silt, and/or clay. The Pleistocene-age deposits of the Hanford formation overlie the CCUz and represents the dominant vadose zone materials in this area. The Hanford formation is composed of medium sands and poorly-sorted, basaltic, sandy gravels and silty sandy gravels.

The following discussion focuses on the geologic conditions encountered at each individual borehole. The drilling borehole logs are presented in Appendix B. The borehole logs developed from the borehole intervals collected in LEXAN™ liner cores are present in Appendix G. Photos of cores are displayed in Appendix H.

4.3.1 Borehole Geology for C9512

The sediments extracted from C9512 include the Hanford formation and CCUz The direct-push drilling method was used with no sediment recovered from ground surface to 3.2 ft bgs. Slightly silty sand of the Hanford formation was encountered from 3.2 to 15.3 ft bgs and contained trace gravel, approximately 80 % sand, and 20 % silt. The sand was very fine to medium grained. From 15.3 until 36.4 ft bgs a direct push drilling method was used with no sediment recovery. Beneath 36.4 ft bgs LEXAN™ liners were obtained from the borehole. From 36.4 to 76.9 ft bgs, alternating intervals of gravelly sand and sandy gravel are encountered in the Hanford formation. Gravelly sand was encountered from 36.4 to 42.2 ft bgs. The gravel fraction consisted of sub-angular, very fine to very coarse (2 to 64 mm in diameter) pebbles. The sand was sub-angular, very fine to very coarse grained with a medium average grain size. A sandy gravel interval occurred from 42.2 to 47.2 ft bgs that was comprised of approximately 5 % gravel, 90 % sand, and 5 % silt. The gravels decreased in size to very fine to fine (2 to 8 mm in diameter) pebbles. From 47.2 to 57.4 ft bgs is sandy gravel that is an estimated 70 % gravel, 25 % sand, and 5 % silt. The gravel is sub-angular to sub-rounded and ranges from very fine to very coarse (2 to 64 mm in diameter) pebbles. Very fine to very coarse sand is present from 57.4 to 76.9 ft bgs and contains approximately 5 % very fine to fine (2 to 8 mm in diameter) pebbles, and 5 % silt. At 62.2 ft bgs, the sand drops out any trace of gravels and grades to slightly silty sand at 76.9 ft bgs and extends to 132.0 ft bgs. The slightly silty sand is comprised of approximately 85 %, very fine to medium grained sand, and 5 % silt.

The Hanford formation to CCUz transition zone is interpreted to be at 132.0 ft bgs where the slightly silty sand grades to sandy silt. The sandy silt is comprised of approximately 40 % very fine to fine grained sand, and 60 % silt. Drilling in the sandy silt continued until TD at 142.5 ft.

4.3.2 Borehole Geology for C9514

Sediments extracted from C9514 include the Hanford formation and CCUz. The direct-push drilling method was used with no sediment recovered from ground surface to 4.1 ft bgs. Slightly silty sand of the Hanford formation is encountered from 4.1 to 6.6 ft bgs, and is comprised of an estimated 85 % very fine to coarse grained sand, and 15 % silt. From 9.5 to 13.1 ft bgs, there was no sediment recovery. Gravelly sand was present from 13.1 to 15.6 ft bgs and consisted of approximately 20 % gravel, 75 % sand, and 5 % silt. The sub-angular gravel ranges in size from very fine to coarse (2 to 32 mm in diameter) pebbles. The sand is very fine to coarse grained with a coarse average grain size. From 15.6 until 44.0 ft bgs, a direct-push method of drilling was used with no sediment recovery. Beneath 44.0 ft bgs, LEXAN™ liners were obtained from the borehole. Sand was encountered from 44.0 to 102.0 ft bgs. The sand consists of approximately 92 to 95 %, very fine to coarse grained sand, with 5 to 8 % silt. The sand grades to gravelly sand at 102.0 ft bgs and extends to 117.4 ft bgs. The gravelly sand is comprised of an estimated 25 %

gravel, 70 % sand, and 5 % silt. The gravel fraction is sub-angular to sub-rounded and ranges in size from very fine to very coarse (2 to 64 mm in diameter) pebbles. The sand is very fine to very coarse, sub-angular grains with a medium average grain size.

The Hanford formation to CCUz transition zone is interpreted to be at 117.4 ft bgs where the gravelly sand grades to silty sand. The silty sand extends to 127.6 ft bgs and is comprised of approximately 70 % very fine to medium grained sand, and 30 % silt. Drilling continued until TD at 127.6 ft.

5 Waste Management

Waste from individual boreholes was managed according to DOE/RL-2012-20, *Waste Control Plan for the 200-DV-1 Operable Unit* and DOE/RL-2011-41, *Hanford Site Strategy for Management of Investigation Derived Waste*. Waste generated during drilling activities included soil cuttings, decontamination water, personal protective equipment, and miscellaneous solid waste.

All vadose and saturated zone soil cuttings were released into tip dumpsters, dewatered, and placed in designated waste roll-off boxes. Dewatered fluid was treated as purge water. Water-absorbing crystals were spread over the dewatered soil cuttings to capture free liquids that could not be dewatered, allowing the waste container to be designated as solid waste. Miscellaneous solid waste associated with soil cuttings, including nitrile gloves, plastic bags used to collect soil cuttings, and other waste associated with sampling activities, were contained in clear plastic bags and placed in the designated roll-off box. All waste was managed as IDW and surveyed by the IH professional and RCTs in accordance with the site-specific Health and Safety Plan, and transferred for disposal to the Environmental Restoration Disposal Facility.

Purgewater, and decontamination fluids generated during borehole drilling, sample screening, and analysis was managed as purgewater consistent with guidance provided in DOE/RL-2009-39, *Investigation-Derived Waste Purgewater Management Action Memorandum*, and DOE/RL-2009-80, *Investigation Derived Waste Purgewater Management Work Plan.*

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6 Civil Survey

Vertical and horizontal surveys were performed following borehole decommissioning in accordance with CHPRC procedure SGRP-PRO-SMP-52857 (GRP-EE-01-1.6), *Survey Requirements and Techniques*. Vertical survey data were recorded using NAVD88, *North American Vertical Datum of 1988* and the horizontal coordinates were recorded using the Washington State Plane (South Zone) NAD83, *North American Datum of 1983*, with the 1991 adjustment for horizontal coordinates. Surveyed coordinates and elevation for all but three borehole locations are presented in Table 1-1 and Well Survey Data Reports are included in Appendix C. Boreholes C8709, C8711, and C9551 could not be located in the field following decommission and were not surveyed.

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7 Borehole Acceptance

Borehole acceptance is the final step in the decommissioning process and represents confirmation of meeting requirements of the work scope. Borehole acceptance also serves as the contractual completion of the finished product.

Representatives from CHPRC and Stillwater, participated in the acceptance inspection for all but three of the 200-DV-1 OU boreholes on September 28, 2015 and September 29, 2015. Final acceptance was documented by completion of a checklist and signatures from representatives of the drilling contractor and CHPRC. A Quality Assurance Work Site Assessment will be prepared to document well acceptance. Boreholes C8709, C8711, and C9551 could not be located in the field following decommissioning.

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8 References

CH2M Hill Plateau Remediation Company Soil and Groundwater Remediation Project Procedures:

SGRP-PRO-EN-50025 (GRP-EE-01-7.0), *Geologic Logging*

SGRP-PRO-EN-50030 (GRP-EE-02-14.1), *Drilling, Remediating, and Decommissioning Resource Protection Wells and Geotechnical Soil Borings*

SGRP-PRO-SMP-52857 (GRP-EE-01-1.6), *Survey Requirements and Techniques*

Other References:

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC 9601, et seq., Pub. L. 107-377, December 31, 2002. Available at: http://epw.senate.gov/cercla.pdf.

DOE/RL-2012-20, 2012, *Waste Control Plan for the 200-DV-l Operable Unit*, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=1506301062.

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NAVD88, 1988, *North American Vertical Datum of 1988*, National Geodetic Survey, Federal Geodetic Control Committee, Silver Springs, Maryland.

PNNL-11321, 1996, Phase *III ResonantSonic® Report*, Pacific Northwest National Laboratory, Richland, Washington. Available at: http://www.osti.gov/scitech/servlets/purl/390551-YXtThE/webviewable/.

Resource Conservation and Recovery Act of 1976, 42 USC 6901, et seq. Available at: http://www.epa.gov/rcraonline/.

SGW-58552, 2015, *Description of Work for the Characterization of 200-DV-1 Operable Unit, FY2015*, REV. 2, CH2M Hill Plateau Remediation Company, Richland, Washington.

SGW-58569, 2015, *Supplemental Sampling Instruction for the Field investigation of B-Complex Area in 200-DV-l Operable Unit*, DRAFT, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

TPA-CN-668, 2015, *Tri-Party Agreement Change Notice Form TPA-CN-668, DOE/RL-2011-104, Characterization Sampling and Analysis Plan for the 200-DV-1 Operable Unit*. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0081112H.

WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells," *Washington Administrative Code*, as amended, Washington State Department of Ecology, Olympia, Washington.

Appendix A

Well Summary Sheets for the Characterization Boreholes in 200-DV-1 Operable Unit

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WELL SUMMARY SHEET

Start Date: 10-29-15
Finish Date: 05-09-16

Well ID: C9487	Well Name: N/A
Location: ~15m North of B Tank Farm	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 4/26/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Type I/II Portland Cement Grout: 0.0 - 1.5 ft bgs

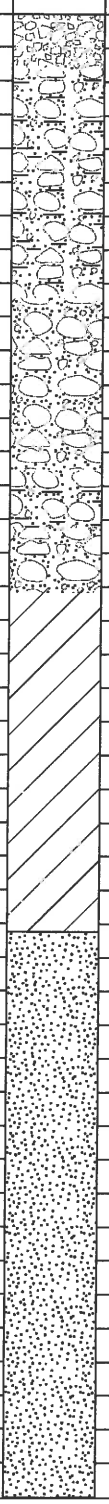
Bentonite chips: 1.5 - 235.5 ft bgs

Depths are in ft below ground surface.
Borehole drilled with 10 3/4-in O.D. casing from 0.0 - 34.1
Borehole drilled with 8 5/8-in O.D. casing from 34.1 - 54.7 ft bgs
Borehole drilled with 6-in O.D. casing from 54.7 - 235.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 0, 10, 20, 30, 40, 50, 60, 70, 80



Lithologic Description (ft bgs)

- 0 - 3.0 gravel backfill
- 3.0 - 17.0 silty sandy Gravel (msG)
- 17.0 - 27.0 sandy Gravel (sG)
- 27.0 - 31.0 silty sandy Gravel (msG)
- 31.0 - 34.1 sandy Gravel (sG)
- 34.1 - 54.7 No Samples Collected
- @ 54.7 bgs. drilling method becomes sonic
- 54.7 - 187.2 Sand (S)

WELL SUMMARY SHEET

Start Date: 10-29-15
Finish Date: 05-09-16

Well ID: C9487	Well Name: N/A
Location: ~15m North of B Tank Farm	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 4/26/16	Reviewed By: Kelly Whitley — Date: 12/1/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description

Bentonite chips: 1.5 - 235.5 ft bgs

Depths are in ft below ground surface.
Borehole drilled with 10 3/4-in O.D. casing from 0.0 - 34.1
Borehole drilled with 8 5/8-in O.D. casing from 34.1 - 54.7 ft bgs
Borehole drilled with 6-in O.D. casing from 54.7 - 235.5 ft bgs

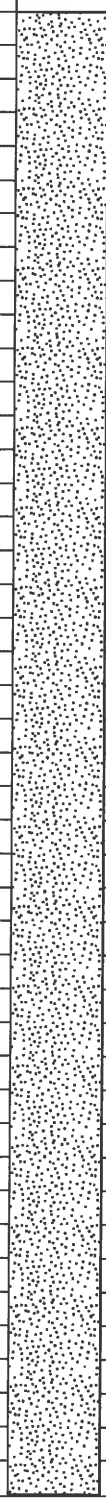
All temporary drill casing was removed from the ground.

Diagram

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 90, 100, 110, 120, 130, 140, 150, 160, 170

Graphic Log



Lithologic Description (ft bgs)

54.7 - 187.2 Sand (S)

WELL SUMMARY SHEET

Start Date: 10/29/15
Finish Date: 05-09-16

Well ID: C9487	Well Name: N/A
Location: ~15m North of B Tank Farm	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 4/26/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

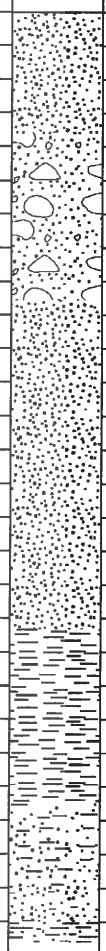
CONSTRUCTION DATA

Description	Diagram
Bentonite chips: 1.5 - 235.5 ft bgs	

Depths are in ft below ground surface.
Borehole drilled with 10 3/4-in O.D. casing from 0.0 - 34.1
Borehole drilled with 8 5/8-in O.D. casing from 34.1 - 54.7 ft bgs
Borehole drilled with 6-in O.D. casing from 54.7 - 235.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
180		54.7 - 187.2 Sand (S)
		187.2 - 197.2 gravelly Sand (gS)
190		
		197.2 - 216.5 Sand (S)
200		
210		
		216.5 - 227.2 Silt (M)
220		
		227.2 Estimated depth of saturated zone
		227.2 - 232.0 silty Sand (mS)
230		
		232.0 - 234.0 slightly silty Sand ((m)S)
		234.0 - 235.0 sandy Silt (sM)
		Total Depth: 235.5 (3-30-16)
240		
250		
260		

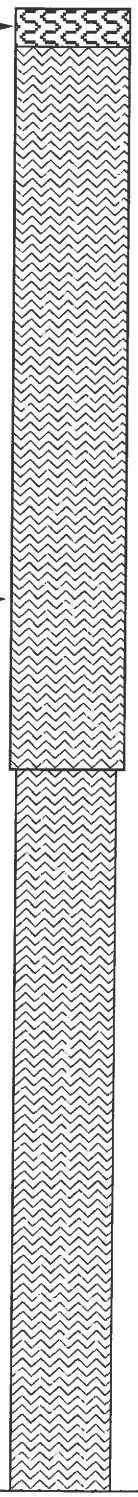
WELL SUMMARY SHEET

Start Date: 03-08-16
Finish Date: 05-10-16

Well ID: C9488	Well Name: N/A
Location: Southern End of 216-B-8 Crib	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10-11-16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
High Strength Concrete Mix: 0.00 - 1.95 ft bgs	
3/8-in Bentonite Chips: 1.95 - 226.00 ft bgs	



Depths are in ft below ground surface.

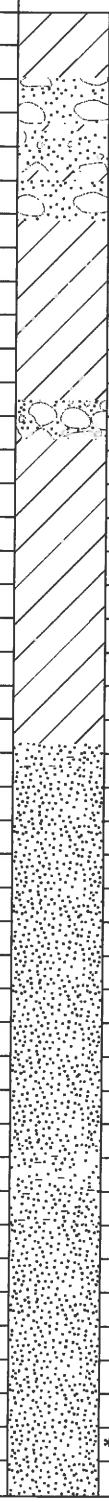
Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 43.6 ft bgs

Borehole drilled with 6-in O.D. casing from 43.5 - 225.6 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 0, 10, 20, 30, 40, 50, 60, 70, 80



Graphic Log

Lithologic Description (ft bgs)

- 0 - 4.0 Unable to Determine*
- 4.0 - 6.5 gravelly Sand (gS)
- 6.5 - 7.0 Unable to Determine*
- 7.0 - 9.5 gravelly Sand (gS)
- 9.5 - 10.0 Unable to Determine*
- 10.0 - 12.5 gravelly Sand (gS)
- 10.0 - 23.0 Unable to Determine*
- 23.0 - 25.5 sandy Gravel (sG)
- 23.5 - 43.5 Unable to Determine*
- @ 43.6 bgs. drilling method becomes sonic
- 43.5 - 44.5 slightly silty Sand ((m)S)
- 44.5 - 67.5 Sand (S)
- 67.5 - 72.0 slightly silty Sand ((m)S)
- 72.0 - 162.3 Sand (S)

* = Drilling method did not produce cuttings at this depth.

WELL SUMMARY SHEET

Start Date: 03-08-16
Finish Date: 05-10-16

Well ID: C9488	Well Name: N/A
Location: Southern End of 216-B-8 Crib	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10-11-16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
3/8-in Bentonite Chips: 1.95 - 226.00 ft bgs	

Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 43.6 ft bgs

Borehole drilled with 6-in O.D. casing from 43.6 - 225.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
90		72.0 - 162.3 Sand (S)
100		
110		
120		
130		
140		
150		
160		162.3 - 164.7 silty Sand (mS)
		164.7 - 206.3 sandy Gravel (sG)
170		

WELL SUMMARY SHEET

Start Date: 03-08-16
Finish Date: 05-10-16
Page 3 of 3

Well ID: C9488	Well Name: N/A
Location: Southern End of 216-B-8 Crib	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10-11-16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
3/8-in Bentonite Chips: 1.95 - 226.0 ft bgs	

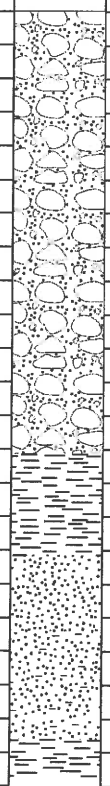
Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 43.6 ft bgs

Borehole drilled with 6-in O.D. casing from 43.6 - 225.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
180		164.7 - 206.3 sandy Gravel (sG)
190		
200		
210		206.3 - 212.3 Silt (M)
		212.0 Estimated depth of saturated zone
		212.3 - 223.1 Sand (S)
220		
		223.1 - 226.0 Silt (M)
230		Total Depth: 226.0 ft bgs (4-26-2016)
240		
250		
260		

A-6003-643 (REV 1)

WELL SUMMARY SHEET

Start Date: 11-04-15
Finish Date: 09-07-16

Well ID: C9489	Well Name: N/A
Location: Western Boundary of 216-B-9	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10-11-16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description

High Strength Concrete Mix: 0.0 - 2.0 ft bgs

3/8-in Bentonite Chips: 2.0 - 253.1 ft bgs

Depths are in ft below ground surface.
Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 34.2 ft bgs
Borehole drilled with 6-in O.D. casing from 34.2 - 250.5 ft bgs

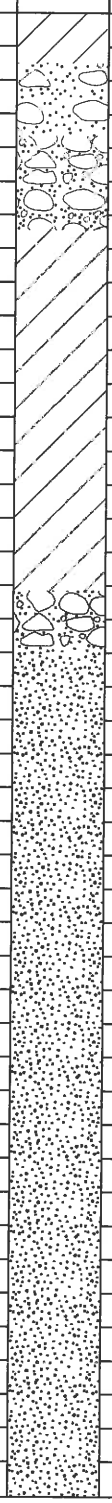
All temporary drill casing was removed from the ground.

Diagram

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 0, 10, 20, 30, 40, 50, 60, 70, 80

Graphic Log



Lithologic Description (ft bgs)

0 - 3.0 Unable to Determine*

3.0 - 7.0 Gravelly Sand (gS)

7.0 - 12.6 Sandy Gravel (sG)

12.6 - 34.2 Unable to Determine*

@ 34.2 bgs. drilling method becomes sonic

34.2 - 37.6 Sandy Gravel (sG)

37.6 - 104.8 Sand (S)

* = Drilling method did not produce cuttings at this depth.

WELL SUMMARY SHEET

Start Date: 11-04-15
Finish Date: 09-07-16

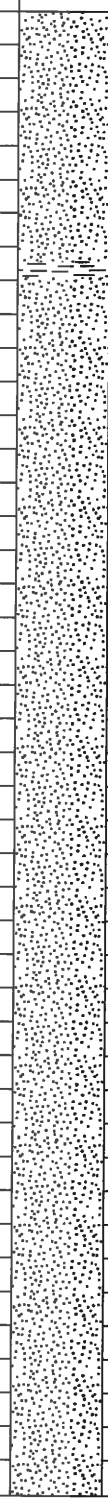
Well ID: C9489	Well Name: N/A
Location: Western Boundary of 216-B-9	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10-11-16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
3/8-in Bentonite Chips: 2.0 - 253.1 ft bgs	
Depths are in ft below ground surface. Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 34.2 ft bgs Borehole drilled with 6-in O.D. casing from 34.2 - 250.5 ft bgs All temporary drill casing was removed from the ground.	

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
90		37.6 - 104.8 Sand (S)
100		
		104.8 - 105.3 Silt (M)
		105.3 - 227.6 Sand (S)
110		
120		
130		
140		
150		
160		
170		



WELL SUMMARY SHEET

Start Date: 11-04-15
Finish Date: 09-07-16

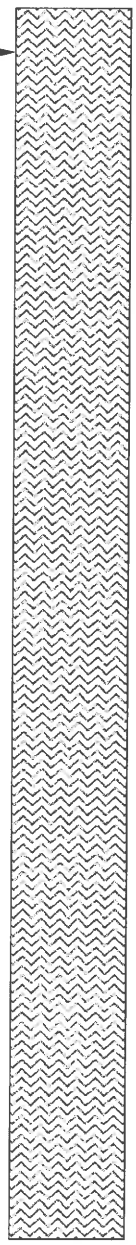
Well ID: C9489	Well Name: N/A
Location: Western Boundary of 216-B-9	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10-11-16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description

3/8-in Bentonite Chips:
2.0 - 253.1 ft bgs

Diagram



Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 34.2 ft bgs

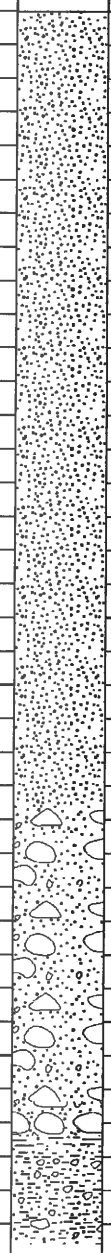
Borehole drilled with 6-in O.D. casing from 34.2 - 250.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 180, 190, 200, 210, 220, 230, 240, 250, 260

Graphic Log



Lithologic Description (ft bgs)

105.3 - 227.6 Sand (S)

227.6 - 242.7 Gravelly Sand (gS)

242.7 - 246.4 Sandy Gravel (sG)

246.4 - 247.0 Sandy Silt (sM)

247.0 - 253.1 Gravelly Sandy Silt (gsM)

Total Depth: 253.1 ft bgs (8-24-2016)

WELL SUMMARY SHEET

Start Date: 11-02-15
Finish Date: 09-06-16

Well ID: C9490	Well Name: N/A
Location: Southern Boundary of 216-B-9	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10-11-16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description

High Strength Concrete Mix: 0.0 - 2.1 ft bgs

3/8-in Bentonite Chips: 2.1 - 252.6 ft bgs

Depths are in ft below ground surface.
Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 34.2 ft bgs
Borehole drilled with 6-in O.D. casing from 34.2 - 252.0 ft bgs

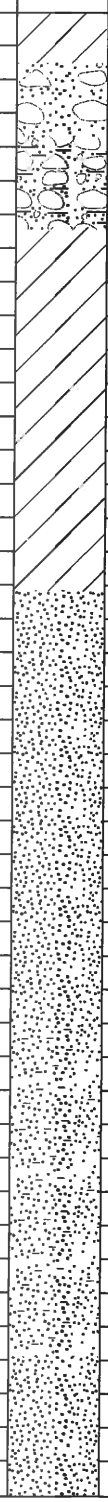
All temporary drill casing was removed from the ground.

Diagram

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 0, 10, 20, 30, 40, 50, 60, 70, 80

Graphic Log



Lithologic Description (ft bgs)

0 - 2.5 Unable to Determine*

2.5 - 7.0 Sandy Gravel (sG)

7.0 - 12.6 Silty Sandy Gravel (msG)

12.6 - 34.2 Unable to Determine*

@ 34.2 bgs Begin Sonic Drilling

34.2 - 59.5 Sand (S)

59.5 - 79.9 Slightly Silty Sand ((m)S)

79.9 - 227.0 Sand (S)

* = Drilling method did not produce cuttings at this depth.

WELL SUMMARY SHEET

Start Date: 11-02-15
Finish Date: 09-06-16

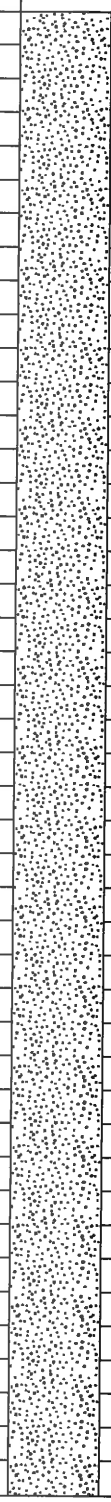
Well ID: C9490	Well Name: N/A
Location: Southern Boundary of 216-B-9	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10-11-16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
3/8-in Bentonite Chips: 2.1 - 252.6 ft bgs	

Depths are in ft below ground surface.
Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 34.2 ft bgs
Borehole drilled with 6-in O.D. casing from 34.2 - 252.0 ft bgs
All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
90		79.9 - 227.0 Sand (S)
100		
110		
120		
130		
140		
150		
160		
170		

WELL SUMMARY SHEET

Start Date: 11-02-15
Finish Date: 09-06-16

Well ID: C9490	Well Name: N/A
Location: Southern Boundary of 216-B-9	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10-11-16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
3/8-in Bentonite Chips: 2.1 - 252.6 ft bgs	

Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 34.2 ft bgs

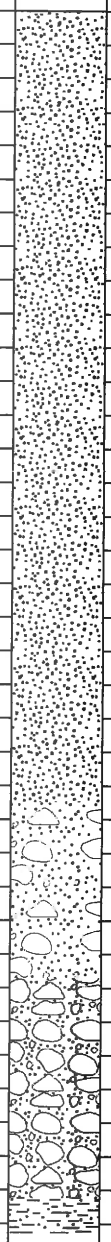
Borehole drilled with 6-in O.D. casing from 34.2 - 252.0 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 180, 190, 200, 210, 220, 230, 240, 250, 260

Graphic Log



Lithologic Description (ft bgs)

- 79.9 - 227.0 Sand (S)
- 227.0 - 237.5 Gravelly Sand (gS)
- 237.5 - 250.4 Sandy Gravel (sG)
- 250.4 - 252.6 Sandy Silt (sM)
- Total Depth: 252.6 ft bgs (8-15-2016)

WELL SUMMARY SHEET

Start Date: 10-26-15
Finish Date: 5-4-16

Well ID: C9491 | Well Name: N/A

Location: 60m West of BX Tank Farm | Project: 9 (+12 Optional) Direct Push Borings in 200-DV-1-OU

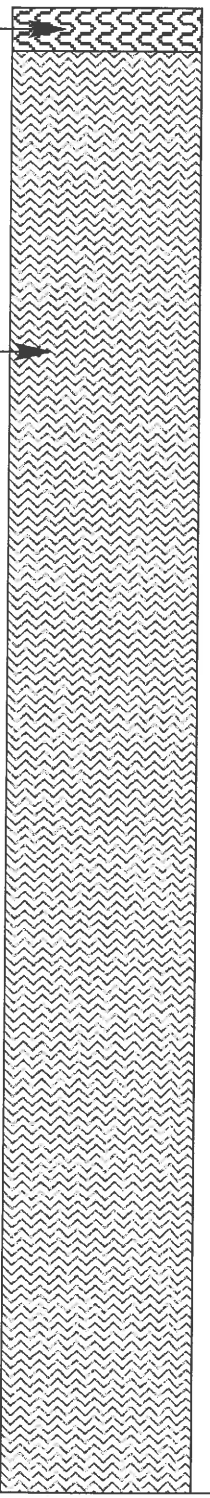
Prepared By: Tracy Mallgren | Date: 10/11/16 | Reviewed By: Kelly Whitley | Date: 12/7/16

Signature: | Signature: Kelly Whitley

CONSTRUCTION DATA

High Strength Concrete:
0 - 2.6 ft bgs

Medium Bentonite Chips:
2.6 - 227.7 ft bgs



Depths are in ft below ground surface.

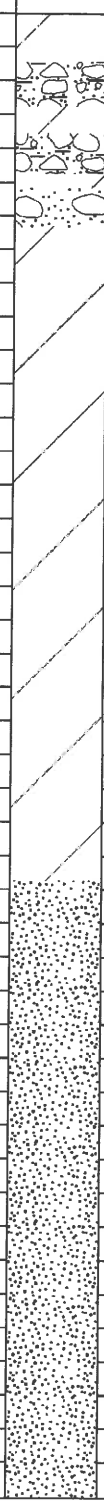
Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 51.5 ft bgs

Borehole drilled with 6-in O.D. casing from 51.5 - 227.7 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 0, 10, 20, 30, 40, 50, 60, 70, 80



Lithologic Description (ft bgs)

Becker Hammer Drilling
0.0 - 3.0 Unable to Determine*
3.0 - 5.5 silty sandy Gravel (msG)
5.5 - 7.1 Unable to Determine*
7.1 - 9.6 silty sandy Gravel (msG)
9.6 - 10.2 Unable to Determine*
10.2 - 12.7 silty sandy Gravel (msG)

12.7 - 51.5 Unable to Determine*

@ 51.5 bgs, Begin Sonic Drilling
51.5 - 177.7 Sand (S)

* = Drilling method did not produce cuttings at this depth.

WELL SUMMARY SHEET

Start Date: 10-26-15
Finish Date: 5-4-16

Well ID: C9491	Well Name: N/A
Location: 60m West of BX Tank Farm	Project: 9 (+12 Optional) Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/11/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description

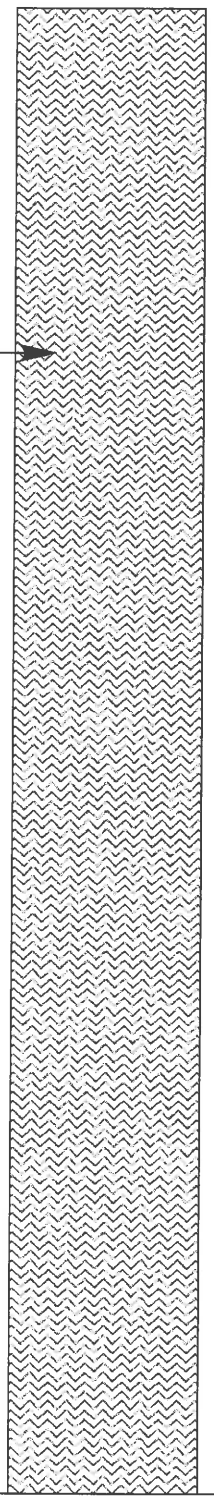
Medium Bentonite Chips:
2.6 - 227.7 ft bgs

Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 51.5 ft bgs
Borehole drilled with 6-in O.D. casing from 51.5 - 227.7 ft bgs

All temporary drill casing was removed from the ground.

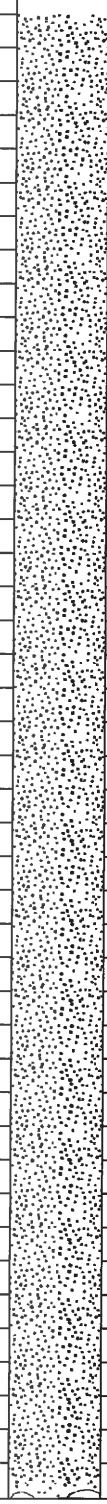
Diagram



GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 90, 100, 110, 120, 130, 140, 150, 160, 170

Graphic Log



Lithologic Description (ft bgs)

51.5 - 177.7 Sand (S)

177.7 - 192.8 gravelly Sand (gS)

WELL SUMMARY SHEET

Start Date: 10-26-15
Finish Date: 5-4-16

Well ID: C9491	Well Name: N/A
Location: 60m West of BX Tank Farm	Project: 9 (+12 Optional) Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren	Date: 10/11/16
Reviewed By: Kelly Whitley	Date: 12/7/16
Signature:	Signature:

CONSTRUCTION DATA

Description

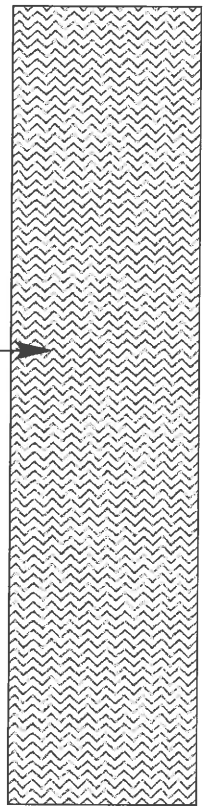
Medium Bentonite Chips:
2.6 - 227.7 ft bgs

Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 51.5 ft bgs
Borehole drilled with 6-in O.D. casing from 51.5 - 227.7 ft bgs

All temporary drill casing was removed from the ground.

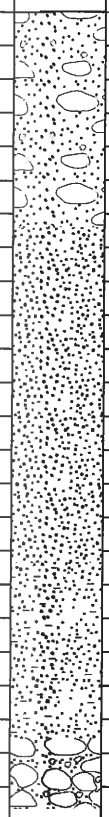
Diagram



GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 180, 190, 200, 210, 220, 230, 240, 250, 260

Graphic Log



Lithologic Description (ft bgs)

177.7 - 192.8 gravelly Sand (gS)

192.8 - 212.7 Sand (S)

212.7 - 222.7 slightly silty Sand ((m)S)

222.7 - 227.7 sandy Gravel (sG)

Total Depth: 227.7 (3/15/16)

WELL SUMMARY SHEET

Start Date: 7/08/2015
Finish Date: 7/23/2015

Well ID: C8711	Well Name: N/A
Location: 31 m NW of 216-B-50	Project: 9 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren Date: 7/27/15	Reviewed By: Kelly Whitley Date: 12/1/15
Signature:	Signature: Kelly Whitley

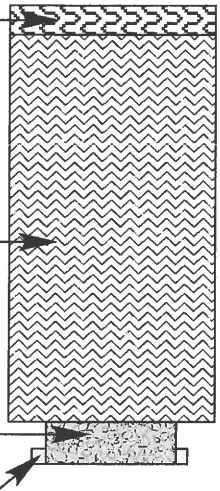
CONSTRUCTION DATA

Sakrete Concrete Mix: 0 - 1.9 ft bgs

3/8 in Cetco Medium Bentonite Chips: 1.9 - 24.8 ft bgs

Native Formation: 24.8 - 27.6 ft bgs

6-in OD stainless steel shoe was left in the ground at approximately 27.6 ft bgs



Depths are in ft below ground surface.

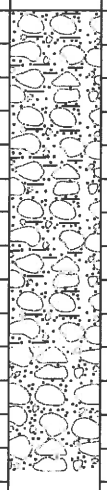
Borehole drilled with 4 1/2-in O.D. casing from 0.0 - 27.6 ft bgs

Borehole was re-drilled with 11-in auger to a depth of 24.8 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 0, 10, 20, 30, 40, 50, 60, 70, 80



Lithologic Description (ft bgs)

0.0 - 20.0 Silty Sandy Gravel (msG)

20.0 - 27.6 Sandy Gravel (sG)

Total Depth: 27.6 ft bgs (7/09/2015)

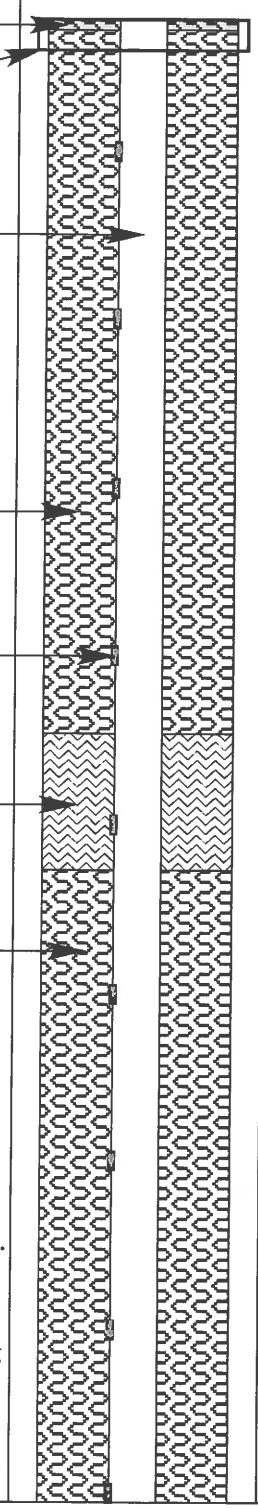
WELL SUMMARY SHEET

Start Date: 10-01-15
Finish Date: 4-20-16

Well ID: C9550	Well Name: N/A
Location: 31 m NW of 216-B-50	Project: 9 (+12 Optional) Direct Push Borings in 200-DV-1 OU
Prepared By: Tracy Mallgren — Date: 4/27/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature:

CONSTRUCTION DATA

Description	Diagram
High Strength Concrete: 0 - 0.5 ft bgs	
Vault	
1-in O.D. Schedule 80, PVC: 0.0 - 198.6 ft bgs	
Type I/II Portland Cement Grout: 0.5 - 43.3 ft bgs	
Resistivity Electrode Array: Individual sensors installed every 10 ft beginning at 198.6 ft bgs.	
30-50 mesh Granular Bentonite: 43.3 - 50.5 ft bgs	
Type I/II Portland Cement Grout: 50.5 - 200.7 ft bgs	



Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 43.5 bgs

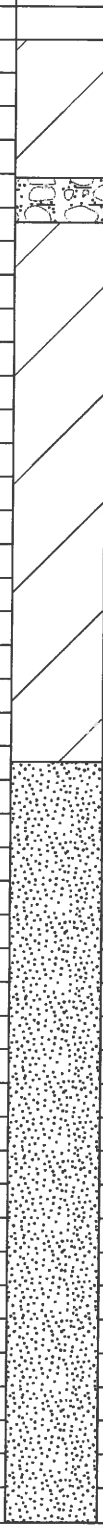
Borehole drilled with 6-in O.D. casing from 43.5 - 200.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 0, 10, 20, 30, 40, 50, 60, 70, 80

Graphic Log



Lithologic Description (ft bgs)

Becker Hammer Drilling

0 - 8.2 Unable to Determine*

8.2 - 10.7 Silty Sandy Gravel (msG)

10.7 - 43.5 Unable to Determine*

@ 43.5 ft bgs, Begin Sonic Drilling

43.5 - 123.1 Sand (S)

* = Drilling method did not produce cuttings at this depth.

WELL SUMMARY SHEET

Start Date: 10-01-15
Finish Date: 4-20-16

Well ID: C9550	Well Name: N/A
Location: 31 m NW of 216-B-50	Project: 9 (+12 Optional) Direct Push Borings in 200-DV-1 OU
Prepared By: Tracy Mallgren	Date: 4/27/16
Reviewed By: Kelly Whitley	Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Type I/II Portland Cement Grout: 50.5 - 200.7 ft bgs

1-in O.D. Schedule 80, PVC: 0.0 - 198.6 ft bgs

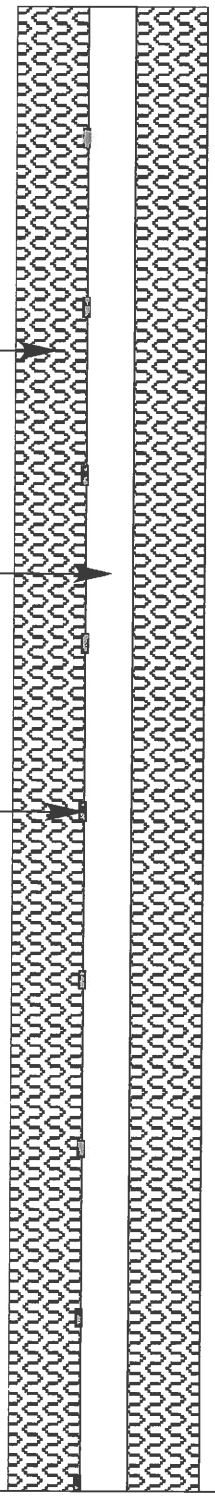
Resistivity Electrode Array: Individual sensors installed every 10 ft beginning at 198.6 ft bgs.

Depths are in ft below ground surface.

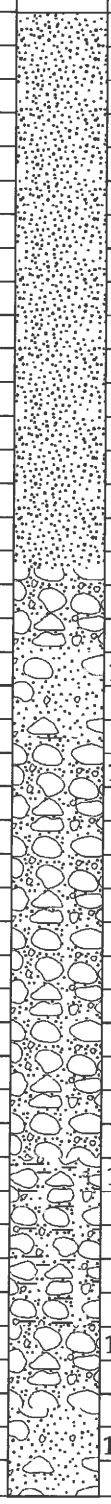
Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 43.5 bgs

Borehole drilled with 6-in O.D. casing from 43.5 - 200.5 ft bgs

All temporary drill casing was removed from the ground.



GEOLOGIC/HYDROLOGIC DATA



Lithologic Description (ft bgs)
43.5 - 123.1 Sand (S)
123.1 - 128.1 sandy Gravel (sG)
128.1 - 133.1 gravelly Sand (gS)
133.1 - 158.0 sandy Gravel (sG)
158.0 - 168.0 silty sandy Gravel (msG)
168.0 - 173.0 sandy Gravel (sG)
173.0 - 178.2 gravelly Sand (gS)

WELL SUMMARY SHEET

Start Date: 10-01-15
Finish Date: 4-20-16

Well ID: C9550	Well Name: N/A
Location: 31 m NW of 216-B-50	Project: 9 (+12 Optional) Direct Push Borings in 200-DV-1 OU
Prepared By: Tracy Mallgren — Date: 4/27/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

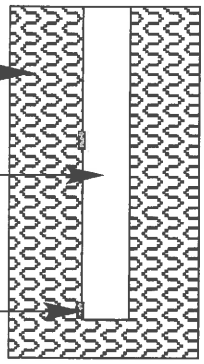
Description

Type I/II Portland Cement Grout: 50.5 - 200.7 ft bgs

1-in O.D. Schedule 80, PVC: 0.0 - 198.6 ft bgs

Resistivity Electrode Array: Individual sensors installed every 10 ft beginning at 198.6 ft bgs.

Diagram



GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 180, 190, 200, 210, 220, 230, 240, 250, 260

Graphic Log

Lithologic Description (ft bgs)

178.2 - 183.1 sandy Gravel (sG)

183.1 - 193.2 silty sandy Gravel (msG)

193.2 - 195.2 sandy Silt (sM)

195.2 - 200.7 sandy Gravel (sG)

Total Depth: 200.7 (1-19-16)

Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 43.5 bgs

Borehole drilled with 6-in O.D. casing from 43.5 - 200.5 ft bgs

All temporary drill casing was removed from the ground.

WELL SUMMARY SHEET

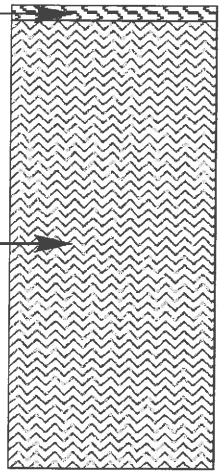
Start Date: 7/13/2015
Finish Date: 7/23/2015

Well ID: C8707	Well Name: N/A
Location: 31 m E of 216-B-46	Project: 9 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 7/27/15	Reviewed By: Kelly Whitley — Date: 12/1/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Sakrete Concrete Mix: 0.0 - 1.0 ft bgs

Medium Bentonite Chips: 1.0 - 29.7 ft bgs

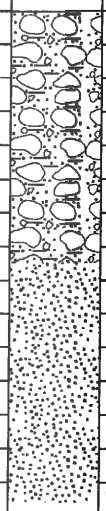


Depths are in ft below ground surface.

Borehole drilled with 3 1/2-in O.D. casing from 0.0 - 29.7 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA



Depth in Feet	Lithologic Description (ft bgs)
0	0 - 15 Silty Sandy Gravel (msG)
15	15 - 29.7 Sand (S)
30	Total Depth: 29.7 ft bgs (7/13/2015)

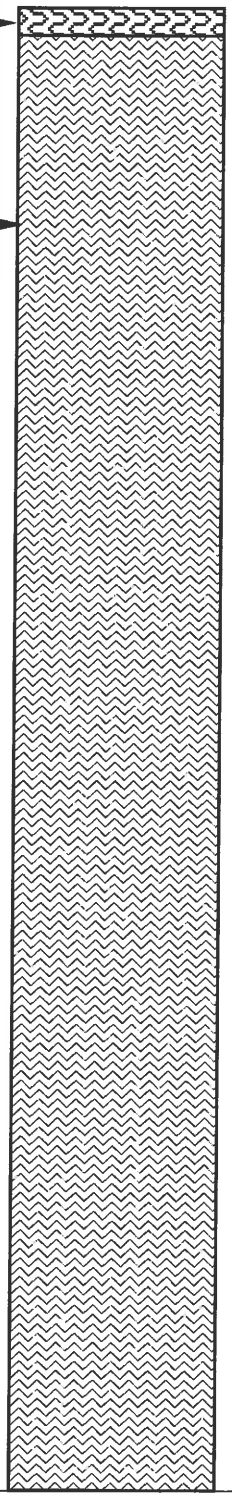
WELL SUMMARY SHEET

Start Date: 7/14/2015
Finish Date: 2/10/2016

Well ID: C9548	Well Name: N/A
Location: 31 m East of 216-B-46	Project: 9 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/11/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
High Strength Concrete: 0 - 2.0 ft bgs	
3/8-in Bentonite Chips: 2.0 - 90.6 ft bgs	



Depths are in ft below ground surface.

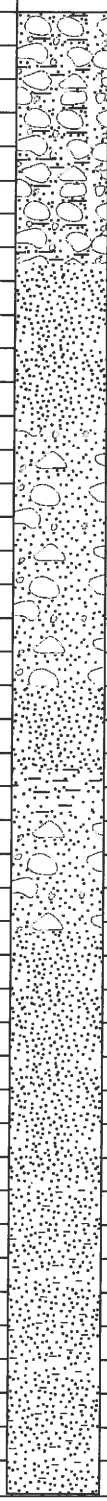
Borehole drilled with 3 1/2-in O.D. casing from 0.0 - 90.6 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 0, 10, 20, 30, 40, 50, 60, 70, 80

Graphic Log



Lithologic Description (ft bgs)
0 - 15 Silty Sandy Gravel (msG)
15.0 - 25.0 Sand (S)
25.0 - 40.0 Gravelly Sand (gS)
40.0 - 45.0 Sand (S)
45.0 - 47.5 Silty Sand (mS)
47.5 - 52.4 Gravelly Sand (gS)
52.4 - 69.4 Sand (S)
69.4 - 90.6 Slightly Silty Sand ((m)S)

WELL SUMMARY SHEET

Start Date: 7/14/2015
Finish Date: 2/10/2016

Well ID: C9548	Well Name: N/A
Location: 31 m East of 216-B-46	Project: 9 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren Date: 10/11/16	Reviewed By: Kelly Whitley Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
3/8-in Bentonite Chips: 2.0 - 90.6 ft bgs	

Depths are in ft below ground surface.

Borehole drilled with 3 1/2-in O.D. casing from 0.0 - 90.6 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
90		69.4 - 90.6 Slightly Silty Sand ((m)S)
		Total Depth: 90.6 ft bgs (7/15/2015)
100		
110		
120		
130		
140		
150		
160		
170		

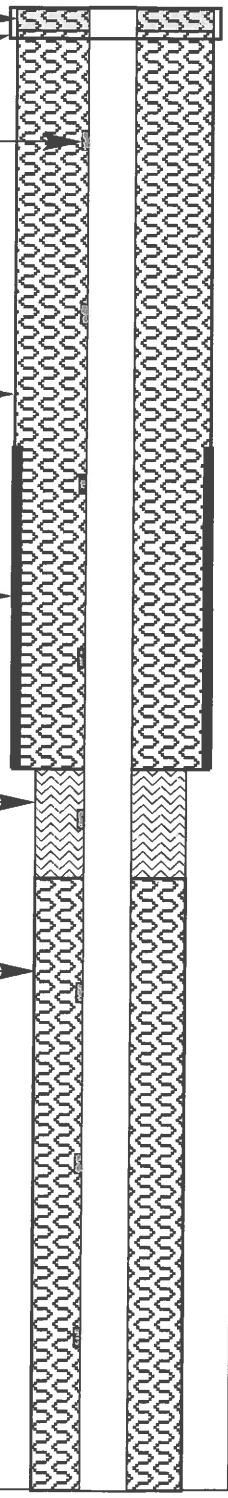
WELL SUMMARY SHEET

Start Date: 10-05-15
Finish Date: 05-02-16

Well ID: C9549	Well Name: N/A
Location: ~31m E of 216-B-46	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10-24-16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
High Strength Concrete: 0 - 1.5 ft bgs	
Vault	
Resistivity Electrode Array: Individual sensors installed every 10 ft beginning at 198.2 ft bgs.	
Type I/II Portland Cement Grout: 1.5 - 45.8 ft bgs	
19.2 ft of 8 5/8-in O.D. casing and shoe remains in the borehole. Estimated depth: 26.2 - 45.4 ft bgs	
30-50 mesh Granular Bentonite: 45.8 - 51.9 ft bgs	
Type I/II Portland Cement Grout: 51.9 - 200.7 ft bgs	



Depths are in ft below ground surface.

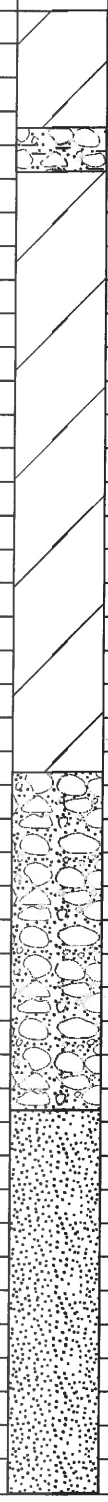
Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 45.38 ft bgs
Borehole drilled with 6-in O.D. casing from 45.38 - 200.7 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 0, 10, 20, 30, 40, 50, 60, 70, 80

Graphic Log



Lithologic Description (ft bgs)

0 - 7.2 Unable to Determine*

7.2 - 9.7 silty sandy Gravel (msG)

9.7 - 45.6 Unable to Determine*

@ 45.6 ft bgs. Begin Sonic Drilling

45.6 - 65.6 sandy Gravel (sG)

65.6 - 85.7 Sand (S)

* = Drilling method did not produce cuttings at this depth.

WELL SUMMARY SHEET

Start Date: 10-05-15
Finish Date: 05-02-16

Well ID: C9549	Well Name: N/A
Location: ~31m E of 216-B-46	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10-24-16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Type I/II Portland Cement Grout: 51.9 - 200.7 ft bgs

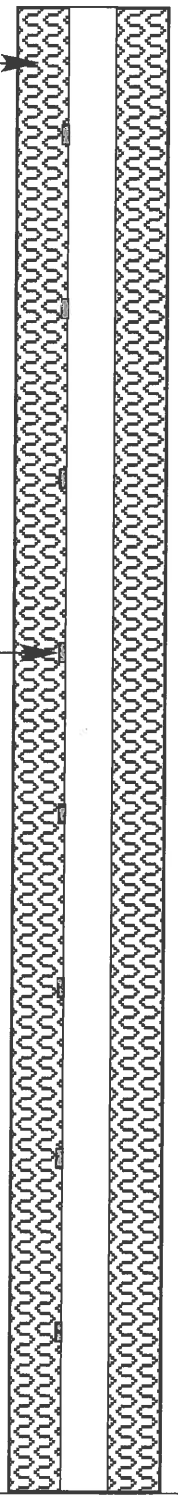
Resistivity Electrode Array: Individual sensors installed every 10 ft beginning at 198.2 ft bgs.

Depths are in ft below ground surface.

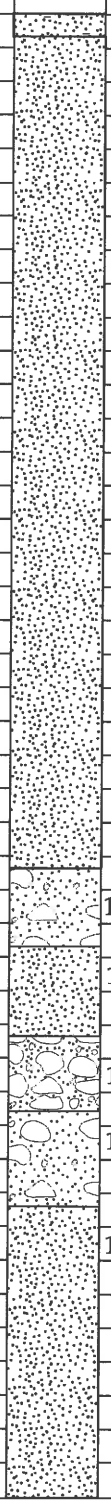
Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 45.38 ft bgs

Borehole drilled with 6-in O.D. casing from 45.38 - 200.7 ft bgs

All temporary drill casing was removed from the ground.



GEOLOGIC/HYDROLOGIC DATA



Depth in Feet	Lithologic Description (ft bgs)
90	85.7 - 90.6 slightly silty Sand ((m)S)
	90.6 - 140.7 Sand (S)
100	
110	
120	
130	
140	140.7 - 145.6 gravelly Sand (gS)
	145.6 - 150.8 Sand (S)
150	150.8 - 155.7 sandy Gravel (sG)
	155.7 - 160.6 gravelly Sand (gS)
160	160.6 - 190.8 Sand (S)
170	

WELL SUMMARY SHEET

Start Date: 10-05-15
Finish Date: 05-02-16

Well ID: C9549	Well Name: N/A
Location: ~31m E of 216-B-46	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10-24-16	Reviewed By: Kelly Whitley — Date: 12-7-16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description

Type I/II Portland Cement Grout: 51.9 - 200.7 ft bgs

Resistivity Electrode Array: Individual sensors installed every 10 ft beginning at 198.2 ft bgs.

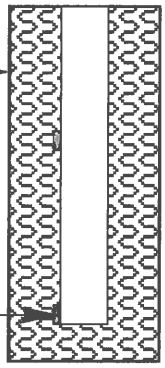
Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 45.38 ft bgs

Borehole drilled with 6-in O.D. casing from 45.38 - 200.7 ft bgs

All temporary drill casing was removed from the ground.

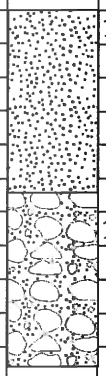
Diagram



GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 180, 190, 200, 210, 220, 230, 240, 250, 260

Graphic Log



Lithologic Description (ft bgs)

160.6 - 190.8 Sand (S)

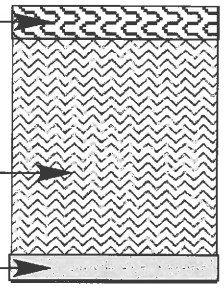
190.8 - 200.7 sandy Gravel (sG)

WELL SUMMARY SHEET

Start Date: 10/09/2015
Finish Date: 10/13/2015

Well ID: C8709	Well Name: N/A
Location: Southwest Corner of 216-B-46	Project: 9 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/19/15	Reviewed By: Kelly Whitley — Date: 10/7/16
Signature:	Signature:

CONSTRUCTION DATA

Description	Diagram
Quikcrete Concrete Mix: 0 - 2.0 ft bgs	
3/8 in Cetco Medium Bentonite Chips: 2.0 - 16.3 ft bgs	
Casing shoe: 15.1-16.3 fg bgs	

Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 16.3 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
0		0 - 2.2 No soil recovered
		2.2 - 4.7 Sandy Silt (sM)
		4.7 - 8.7 Gravelly Sandy Silt (gsM)
10		8.7 - 16.3 No soiled recovered
		Total Depth: 16.3 ft bgs (10/13/2015)
20		
30		
40		
50		
60		
70		
80		

A-6003-643 (REV 1)

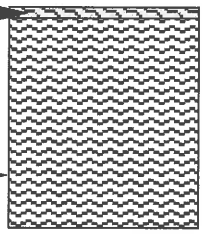
WELL SUMMARY SHEET

Start Date: 10-14-15
Finish Date: 10-14-15

Page 1 of 1

Well ID: C9551	Well Name: N/A
Location: SW corner of 216-B-46	Project: 9 (+12 Optional) Direct Push Borings in 200-DV-1 OU
Prepared By: Tracy Mallgren — Date: 10/11/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
High Strength Concrete: 0 - 2.0 ft bgs	
Medium Bentonite Chips: 2.0 - 12.9 ft bgs	

Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 12.9 bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
0		Becker Hammer Drilling
		0 - 12.9 Unable to Determine*
10		Total Depth: 12.9 (10-14-15)
20		
30		
40		
50		
60		
70		
80		

* = Drilling method did not produce cuttings at this depth.

A-6003-643 (REV 1)

WELL SUMMARY SHEET

Start Date: 10-20-15
Finish Date: 4-27-16

Well ID: C9552	Well Name: N/A
Location: SW corner of 216-B-46	Project: 9 (+12 Optional) Direct Push Borings in 200-DV-1 OU
Prepared By: Tracy Mallgren — Date: 4-26-16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description

Vault

High Strength Concrete
0.0 - 1.5 ft bgs

1-in O.D. Schedule 80, PVC:
0.0 - 199.0 ft bgs

Resistivity Electrode Array:
Individual sensors installed every
10 ft beginning at 199.0 ft bgs.

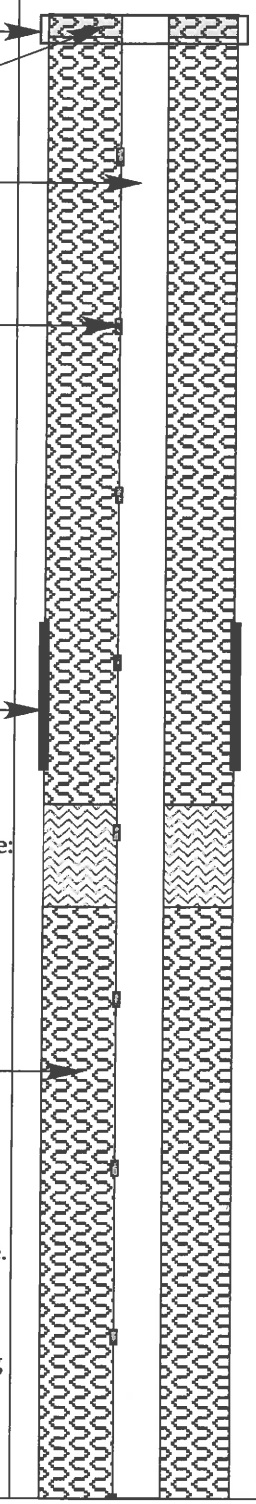
9.2 ft of 8 5/8-in O.D. casing
remains in the borehole.
Estimated depth: 36.1 - 45.3 ft bgs

30-50 mesh Granular Bentonite:
46.7 - 52.4 ft bgs

Type I/II Portland Cement Grout:
52.4 - 200.2 ft bgs

Depths are in ft below ground surface.
Borehole drilled with 8 5/8-in O.D.
casing from 0.0 - 45.3 bgs
Borehole drilled with 6-in O.D. casing
from 45.3 - 202.2 ft bgs

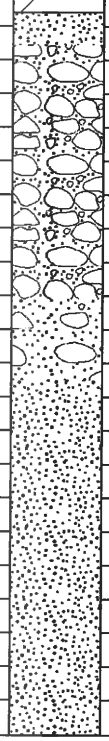
Diagram



GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 0, 10, 20, 30, 40, 50, 60, 70, 80

Graphic Log



Lithologic Description (ft bgs)

Becker Hammer Drilling
0 - 45.5 Unable to Determine*

@ 45.5 bgs, Begin Sonic Drilling
45.5 - 47.0 Sand (S)

47.0 - 62.2 sandy Gravel (sG)

62.2 - 67.1 gravelly Sand (gS)

67.1 - 117.2 Sand (S)

* = Drilling method did not produce cuttings at this depth.

WELL SUMMARY SHEET

Start Date: 10-20-15
Finish Date: 4-27-16

Well ID: C9552	Well Name: N/A
Location: SW corner of 216-B-46	Project: 9 (+12 Optional) Direct Push Borings in 200-DV-1 OU
Prepared By: Tracy Mallgren — Date: 4-26-16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Type I/II Portland Cement Grout: 52.4 - 200.2 ft bgs

1-in O.D. Schedule 80, PVC: 0.0 - 199.0 ft bgs

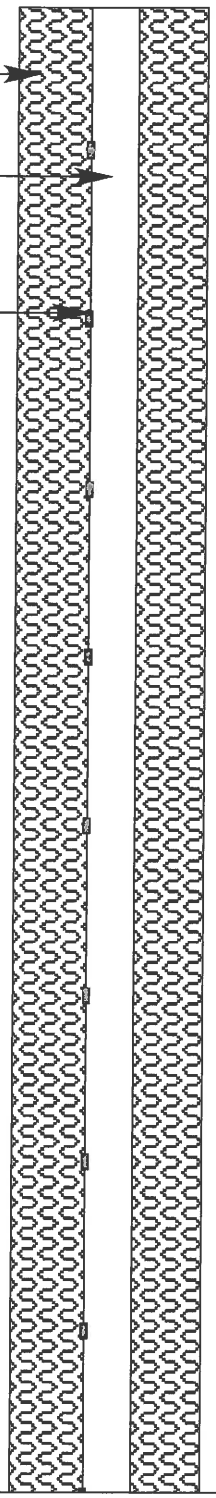
Resistivity Electrode Array: Individual sensors installed every 10 ft beginning at 199.0 ft bgs.

9.2 ft of 8 5/8-in O.D. casing remains in the borehole. Estimated depth: 36.1-45.3 ft bgs

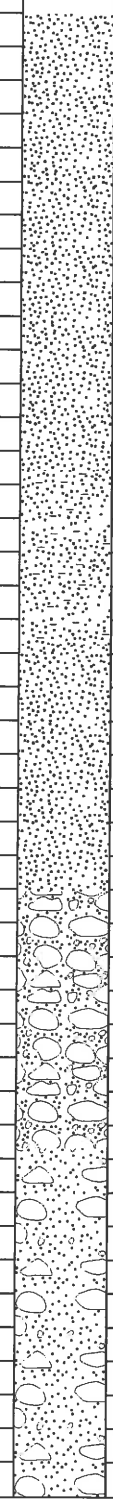
Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 45.3 bgs

Borehole drilled with 6-in O.D. casing from 45.3 - 202.2 ft bgs



GEOLOGIC/HYDROLOGIC DATA



Depth in Feet	Lithologic Description (ft bgs)
90	67.1 - 117.2 Sand (S)
100	
110	
120	117.2 - 127.5 slightly silty Sand ((m)S)
130	127.5 - 142.2 Sand (S)
140	142.2 - 157.2 sandy Gravel (sG)
150	
160	157.2 - 187.2 gravelly Sand (gS)
170	

WELL SUMMARY SHEET

Start Date: 10-20-15
Finish Date: 4-27-16

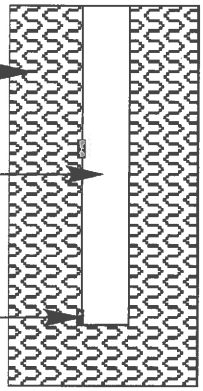
Well ID: C9552	Well Name: N/A
Location: SW corner of 216-B-46	Project: 9 (+12 Optional) Direct Push Borings in 200-DV-1 OU
Prepared By: Tracy Mallgren — Date: 4-26-16	Reviewed By: Kelly Whitley — Date: 12-1-16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Type I/II Portland Cement Grout: 52.4 - 202.2 ft bgs

1-in O.D. Schedule 80, PVC: 0.0 - 199.0 ft bgs

Resistivity Electrode Array: Individual sensors installed every 10 ft beginning at 199.0 ft bgs.



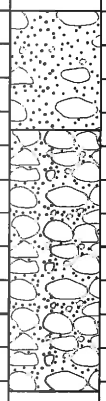
Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 45.3 bgs

Borehole drilled with 6-in O.D. casing from 45.3 - 202.2 ft bgs

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 180, 190, 200, 210, 220, 230, 240, 250, 260



Lithologic Description (ft bgs)

157.2 - 187.2 gravelly Sand (gS)

187.2 - 202.2 sandy Gravel (sG)

Total Depth: 202.3 (2-17-16)

WELL SUMMARY SHEET

Start Date: 10-21-15	Page 1 of 3
Finish Date: 05-03-16	

Well ID: C8706	Well Name: N/A
Location: NE corner of 216-B-46	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/20/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description

High Strength Concrete: 0 - 2.5 ft bgs

Vault

Resistivity Electrode Array: Individual sensors installed every 10 ft beginning at 199.0 ft bgs.

Type I/II Portland Cement Grout: 2.5 - 45.7 ft bgs

30-50 mesh Granular Bentonite: 45.7 - 46.6 ft bgs

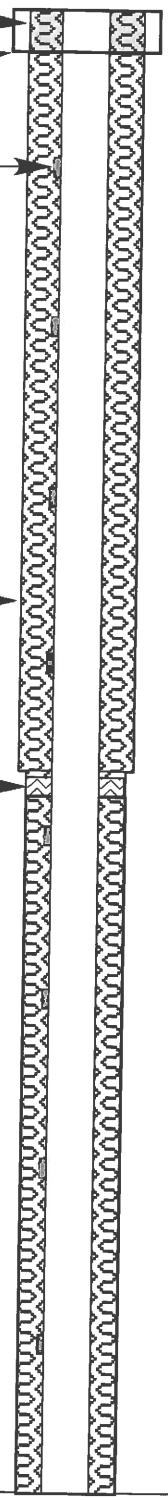
Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 45.3 ft bgs

Borehole drilled with 6-in O.D. casing from 45.3 - 202.3 ft bgs

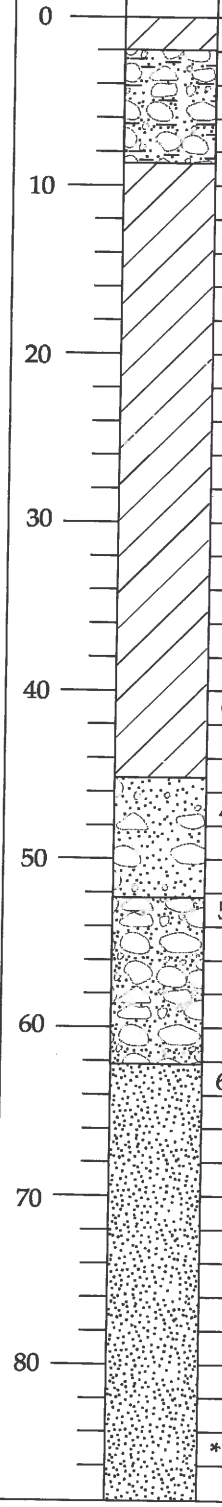
All temporary drill casing was removed from the ground.

Diagram



GEOLOGIC/HYDROLOGIC DATA

Depth in Feet / Graphic Log



Lithologic Description (ft bgs)

0 - 2.0 Unable to determine*

2.0 - 8.4 silty sandy Gravel (msG)

8.4 - 45.3 Unable to determine*

@ 45.3 ft bgs Begin Sonic Drilling

45.3 - 52.2 gravelly Sand (gS)

52.2 - 62.2 sandy Gravel (sG)

62.2 - 137.2 Sand (S)

* = Drilling method did not produce cuttings at this depth.

WELL SUMMARY SHEET

Start Date: 10-21-15
Finish Date: 05-03-16

Well ID: C8706	Well Name: N/A
Location: NE corner of 216-B-46	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10-20-16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Type I/II Portland Cement Grout: 45.7 - 202.3 ft bgs

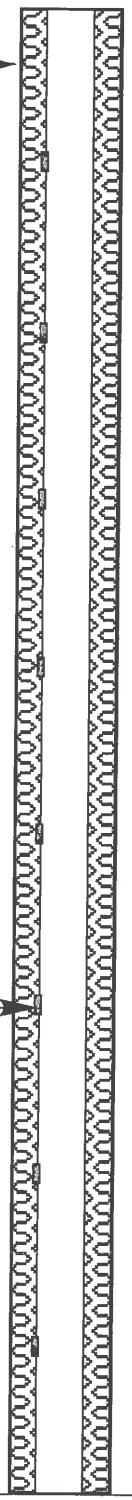
Resistivity Electrode Array: Individual sensors installed every 10 ft beginning at 199.0 ft bgs.

Depths are in ft below ground surface.

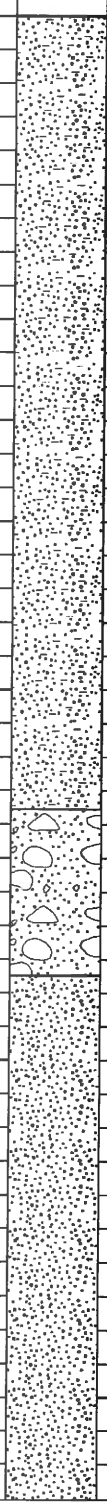
Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 45.3 ft bgs

Borehole drilled with 6-in O.D. casing from 45.3 - 202.3 ft bgs

All temporary drill casing was removed from the ground.



GEOLOGIC/HYDROLOGIC DATA



Depth in Feet	Lithologic Description (ft bgs)
90	62.2 - 137.2 Sand (S)
100	
110	
120	
130	
140	137.2 - 147.1 gravelly Sand (gS)
150	147.1 - 182.3 Sand (S)
160	
170	

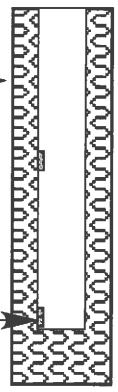
WELL SUMMARY SHEET

Start Date: 10-21-15
Finish Date: 05-03-16

Well ID: C8706	Well Name: N/A
Location: NE corner of 216-B-46	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10-20-16	Reviewed By: Kelly Whitley — Date: 12/1/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
Type I/II Portland Cement Grout: 45.7 - 202.3 ft bgs	
Resistivity Electrode Array: Individual sensors installed every 10 ft beginning at 199.0 ft bgs.	



Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 45.3 ft bgs

Borehole drilled with 6-in O.D. casing from 45.3 - 202.3 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 180, 190, 200, 210, 220, 230, 240, 250, 260

Graphic Log

Lithologic Description (ft bgs)

- 147.1 - 182.3 Sand (S)
- 182.3 - 187.3 gravelly Sand (gS)
- 187.3 - 192.3 sandy Gravel (sG)
- 192.3 - 197.3 gravelly Sand (gS)
- 197.3 - 202.3 sandy Gravel (sG)

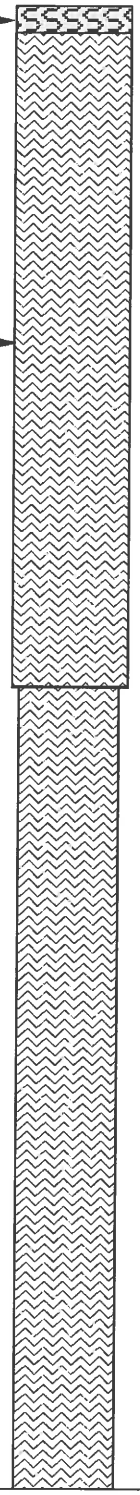
WELL SUMMARY SHEET

Start Date: 11-10-15
Finish Date: 09-08-16

Well ID: C9492	Well Name: N/A
Location: 216-T-5 Trench	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10-11-16	Reviewed By: Kelly Whitley — Date: 12/1/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
High Strength Concrete Mix: 0.0 - 1.8 ft bgs	
3/8-in Bentonite Chips: 1.8 - 102.0 ft bgs	



Depths are in ft below ground surface.

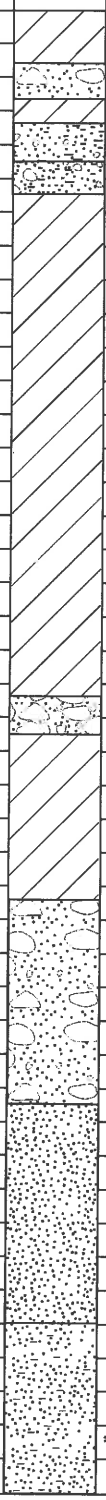
Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 40.5 ft bgs

Borehole drilled with 6-in O.D. casing from 40.5 - 100.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 0, 10, 20, 30, 40, 50, 60, 70, 80



Graphic Log

Lithologic Description (ft bgs)

- 0 - 3.0 Unable to Determine*
- 3.0 - 5.0 Gravelly Sand (gS)
- 7.1 - 9.1 Gravelly Silty Sand (gmS)
- 9.1 - 11.0 Slightly Silty Gravelly Sand ((m)gS)
- 11.0 - 40.5 Unable to Determine*
- @ 40.5 bgs. Begin Sonic Drilling
- 40.5 - 42.7 Sandy Gravel (sG)
- 42.7 - 52.4 Unable to Determine*
- 52.4 - 67.0 Gravelly Sand (gS)
- 67.0 - 78.0 Sand (S)
- 78.0 - 87.6 Slightly Silty Sand ((m)S)

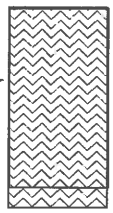
* = Drilling method did not produce cuttings at this depth.

WELL SUMMARY SHEET

Start Date: 11-10-15
Finish Date: 09-08-16

Well ID: C9492	Well Name: N/A
Location: 216-T-5 Trench	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10-11-16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
3/8-in Bentonite Chips: 1.8 - 102.0 ft bgs	

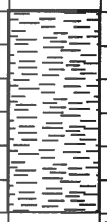
Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 40.5 ft bgs

Borehole drilled with 6-in O.D. casing from 40.5 - 100.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
90		87.6 - 102.0 Silt (M)
100		Total Depth: 102.0 (06-02-16)
110		
120		
130		
140		
150		
160		
170		

WELL SUMMARY SHEET

Start Date: 11-12-15
Finish Date: 09-12-16

Well ID: C9494	Well Name: N/A
Location: 216-T-5 Trench (South)	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/03/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
High Strength Concrete Mix: 0.0 - 2.1 ft bgs	
3/8-in Bentonite Chips: 2.1 - 100.6 ft bgs	

Depths are in ft below ground surface.

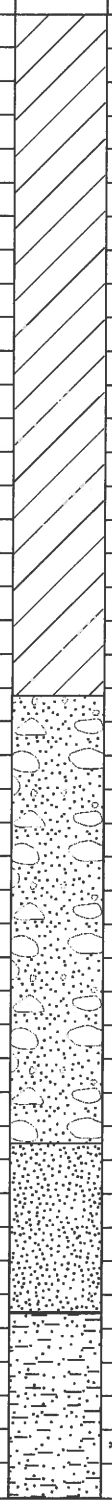
Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 40.4 ft bgs

Borehole drilled with 6-in O.D. casing from 40.4 - 100.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
0		0 - 40.4 Unable to Determine*
10		
20		
30		
40		@ 40.4 bgs. Begin Sonic Drilling
		40.4 - 67.0 Gravelly Sand (gS)
50		
60		
70		67.0 - 77.0 Sand (S)
80		77.0 - 87.0 Silty Sand (mS)



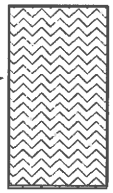
* = Drilling method did not produce cuttings at this depth.

WELL SUMMARY SHEET

Start Date: 11-12-15
Finish Date: 09-12-16

Well ID: C9494	Well Name: N/A
Location: 216-T-5 Trench (South)	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/03/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
3/8-in Bentonite Chips: 1.8 - 100.6 ft bgs	

Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 40.4 ft bgs

Borehole drilled with 6-in O.D. casing from 40.4 - 100.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

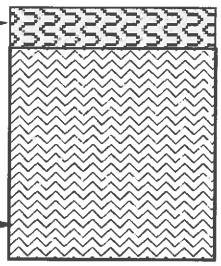
Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
90		87.6 - 102.0 Silt (M)
100		Total Depth: 100.6 (05-25-16)
110		
120		
130		
140		
150		
160		
170		

WELL SUMMARY SHEET

Start Date: 12-02-15
Finish Date: 12-03-15

Well ID: C9502	Well Name: N/A
Location: 216-T-6 Crib #2	Project: 9 Direct (+12 Optional) Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10-11-16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
High Strength Concrete Mix: 0 - 2.5 ft bgs	
3/8-in Bentonite Chips: 2.5 - 15.0 ft bgs	

Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 15.0 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
0		0 - 15.0 Unable to Determine*
10		Total Depth: 15.0 ft bgs (12-02-2015)
20		
30		
40		
50		
60		
70		
80		

* = Drilling method did not produce cuttings at this depth.

A-6003-643 (REV 1)

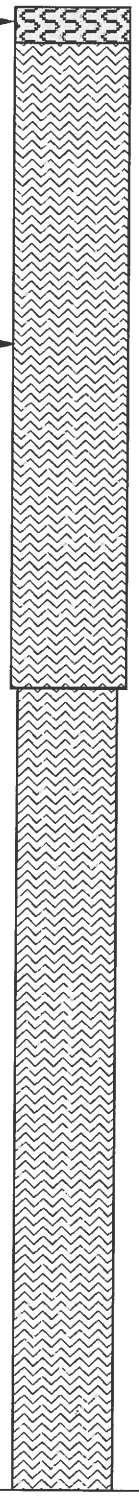
WELL SUMMARY SHEET

Start Date: 03-11-16
Finish Date: 09-15-16

Well ID: C9554	Well Name: N/A
Location: 216-T-6 Crib #2	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/03/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature:

CONSTRUCTION DATA

Description	Diagram
High Strength Concrete Mix: 0.0 - 2.1 ft bgs	
3/8-in Bentonite Chips: 2.1 - 107.5 ft bgs	



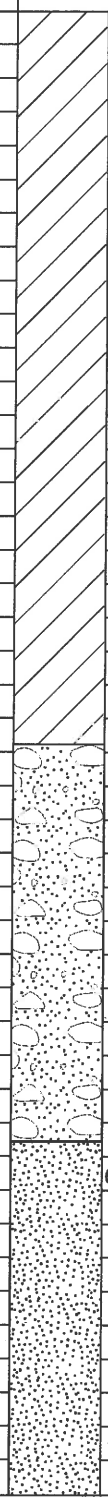
Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 43.4 ft bgs
Borehole drilled with 6-in O.D. casing from 43.4 - 105.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
0		0 - 43.7 Unable to Determine*
10		
20		
30		
40		
		@ 43.7 bgs. Begin Sonic Drilling
		43.7 - 67.0 Gravelly Sand (gS)
50		
60		
		67.0 - 107.5 Sand (S)
70		
80		



* = Drilling method did not produce cuttings at this depth.

WELL SUMMARY SHEET

Start Date: 03-11-16
Finish Date: 09-15-16

Well ID: C9554	Well Name: N/A
Location: 216-T-6 Crib #2	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/03/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
3/8-in Bentonite Chips: 2.0 - 107.0 ft bgs	

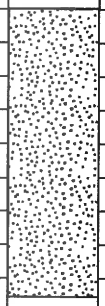
Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 43.4 ft bgs

Borehole drilled with 6-in O.D. casing from 43.4 - 105.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
90		67.0 - 107.5 Sand (S)
100		
		Total Depth: 107.5 (06-22-16)
110		
120		
130		
140		
150		
160		
170		

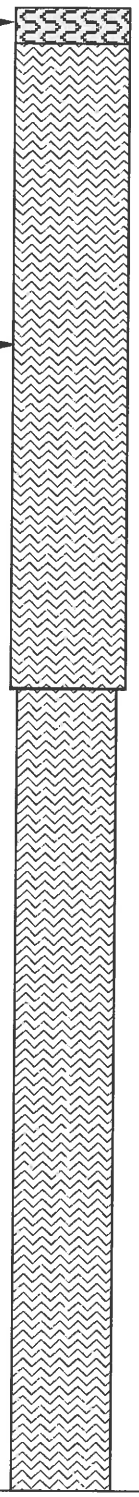
WELL SUMMARY SHEET

Start Date: 03-14-16
Finish Date: 09-14-16
Page 1 of 2

Well ID: C9499	Well Name: N/A
Location: 216-T-6 Crib #1	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10-11-16	Reviewed By: Kell Whitley — Date: 12/1/16
Signature:	Signature:

CONSTRUCTION DATA

Description	Diagram
High Strength Concrete Mix: 0.0 - 2.0 ft bgs	
3/8-in Bentonite Chips: 2.0 - 107.0 ft bgs	



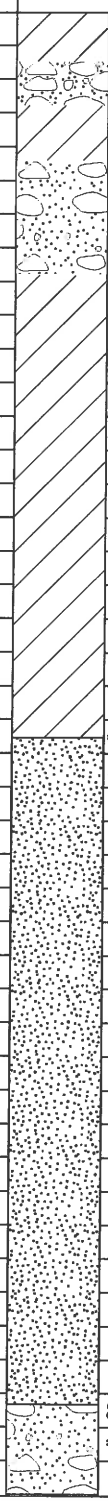
Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 43.4 ft bgs
Borehole drilled with 6-in O.D. casing from 43.4 - 105.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 0, 10, 20, 30, 40, 50, 60, 70, 80



Graphic Log

Lithologic Description (ft bgs)

- 0 - 3.0 Unable to Determine*
- 3.0 - 5.5 Sandy Gravel (sG)
- 5.5 - 8.6 Unable to Determine*
- 8.6 - 15.5 Gravelly Sand (gS)
- 15.5 - 43.0 Unable to Determine*
- @ 43.4 bgs. Begin Sonic Drilling
- 43.4 - 82.4 Sand (S)
- 82.4 - 97.0 Gravelly Sand (gS)

* = Drilling method did not produce cuttings at this depth.

A-6003-643 (REV 1)

WELL SUMMARY SHEET

Start Date: 03-14-15
Finish Date: 09-14-16

Well ID: C9499	Well Name: N/A
Location: 216-T-6 Crib #1	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10-11-16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
3/8-in Bentonite Chips: 2.0 - 107.0 ft bgs	

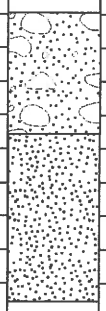
Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 43.4 ft bgs

Borehole drilled with 6-in O.D. casing from 43.4 - 105.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
90		82.4 - 97.0 Gravelly Sand (gS)
		97.0 - 107.0 Sand (S)
100		
		Total Depth: 107.0 (06-27-16)
110		
120		
130		
140		
150		
160		
170		

WELL SUMMARY SHEET

Start Date: 11-16-15
Finish Date: 09-20-16
Page 1 of 2

Well ID: C9495	Well Name: N/A
Location: 216-T-14 Trench	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/03/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
High Strength Concrete Mix: 0.0 - 2.0 ft bgs	
3/8-in Bentonite Chips: 2.0 - 106.0 ft bgs	

Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 35.75 ft bgs
Borehole drilled with 6-in O.D. casing from 35.75 - 105.2 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
0		0 - 57.0 Unable to Determine*
10		
20		
30		
40		@ 35.75 bgs. Begin Sonic Drilling
50		
60		57.0 - 77.0 Sand (S)
70		77.0 - 100.0 Gravelly Sand (gS)
80		

* = Drilling method did not produce cuttings at this depth.

A-6003-643 (REV 1)

WELL SUMMARY SHEET

Start Date: 11-16-15
Finish Date: 09-20-16

Well ID: C9495	Well Name: N/A
Location: 216-T-14 Trench	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/03/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

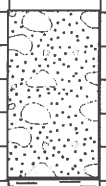
Description	Diagram
3/8-in Bentonite Chips: 2.0 - 106.0 ft bgs	

Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 35.75 ft bgs
Borehole drilled with 6-in O.D. casing from 35.75 - 105.2 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
90		77.0 - 100.0 Gravelly Sand (gS)
100		100.0 - 106.0 Silt (M)
		Total Depth: 106.0 (05-31-16)
110		
120		
130		
140		
150		
160		
170		

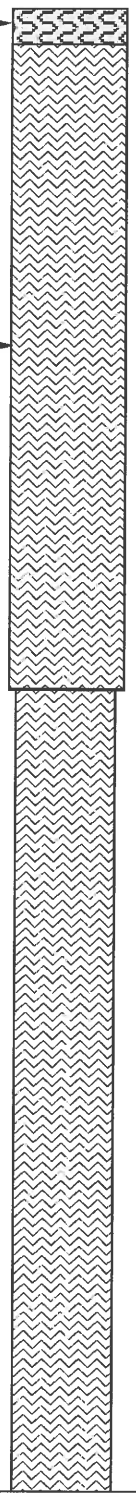
WELL SUMMARY SHEET

Start Date: 11-16-15
Finish Date: 09-21-16

Well ID: C9496	Well Name: N/A
Location: 216-T-15 Trench (North)	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/03/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
High Strength Concrete Mix: 0.0 - 2.1 ft bgs	
3/8-in Bentonite Chips: 2.1 - 106.1 ft bgs	



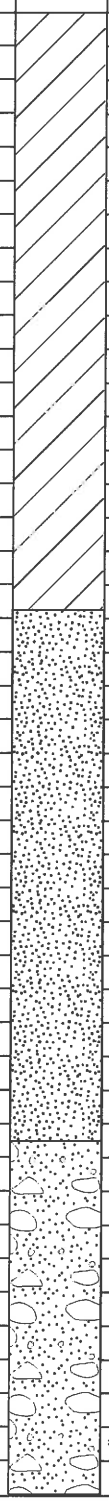
Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 35.7 ft bgs
Borehole drilled with 6-in O.D. casing from 35.7 - 105.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
0		0 - 35.7 Unable to Determine*
10		
20		
30		
		@ 35.7 bgs. Begin Sonic Drilling
		35.7 - 67.0 Sand (S)
40		
50		
60		
		67.0 - 87.0 Gravelly Sand (gS)
70		
80		



* = Drilling method did not produce cuttings at this depth.

WELL SUMMARY SHEET

Start Date: 11-16-15
Finish Date: 09-21-16

Well ID: C9496	Well Name: N/A
Location: 216-T-15 Trench (North)	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/03/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
3/8-in Bentonite Chips: 2.1 - 106.1 ft bgs	

Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 35.7 ft bgs

Borehole drilled with 6-in O.D. casing from 35.7 - 105.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
90		87.0 - 97.0 Slightly Silty Gravelly Sand ((m)gS)
100		97.0 - 106.1 Silty Sand (mS)
		Total Depth: 106.1 (06-14-16)
110		
120		
130		
140		
150		
160		
170		

WELL SUMMARY SHEET

Start Date: 11-20-15
Finish Date: 09-21-16

Well ID: C9505	Well Name: N/A
Location: 216-T-15 Trench (South)	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/03/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
High Strength Concrete Mix: 0.0 - 2.0 ft bgs	
3/8-in Bentonite Chips: 2.0 - 106.4 ft bgs	

Depths are in ft below ground surface.

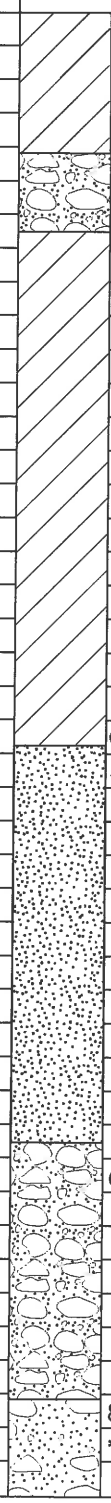
Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 43.5 ft bgs
Borehole drilled with 6-in O.D. casing from 43.5 - 105.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 0, 10, 20, 30, 40, 50, 60, 70, 80

Graphic Log



Lithologic Description (ft bgs)

0 - 8.3 Unable to Determine*

8.3 - 12.9 Sandy Gravel

12.9 - 43.6 Unable to Determine*

@ 43.6 bgs. Begin Sonic Drilling

43.6 - 67.2 Sand (S)

67.2 - 82.3 Sandy Gravel (sG)

82.3 - 87.3 Gravelly Sand (gS)

* = Drilling method did not produce cuttings at this depth.

WELL SUMMARY SHEET

Start Date: 11-20-15
Finish Date: 09-21-16

Well ID: C9505	Well Name: N/A
Location: 216-T-15 Trench (South)	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/03/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
3/8-in Bentonite Chips: 2.0 - 106.4 ft bgs	

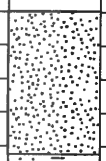
Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 43.5 ft bgs

Borehole drilled with 6-in O.D. casing from 43.5 - 105.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
90		87.3 - 98.3 Sand (S)
100		98.3 - 106.4 Silty Sand (mS)
		Total Depth: 106.4 (06-13-16)
110		
120		
130		
140		
150		
160		
170		

WELL SUMMARY SHEET

Start Date: 03-17-16
Finish Date: 09-13-16

Well ID: C9506	Well Name: N/A
Location: 216-T-18 Crib	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/03/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
High Strength Concrete Mix: 0.0 - 2.0 ft bgs	
3/8-in Bentonite Chips: 2.0 - 95.0 ft bgs	

Depths are in ft below ground surface.

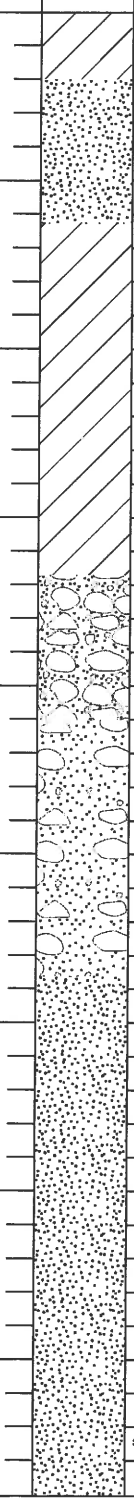
Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 33.5 ft bgs

Borehole drilled with 6-in O.D. casing from 33.5 - 100.52 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
0		0 - 4.0 Unable to Determine*
		4.0 - 12.5 Sand (S)
10		
		12.5 - 33.5 Unable to Determine*
20		
30		
		@ 33.5 bgs. Begin Sonic Drilling
		33.5 - 42.1 Sandy Gravel (sG)
40		
		42.1 - 57.2 Gravelly Sand (gS)
50		
		57.2 - 87.2 Sand (S)
60		
70		
80		



* = Drilling method did not produce cuttings at this depth.

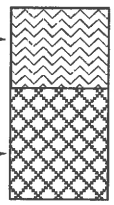
WELL SUMMARY SHEET

Start Date: 03-17-16
Finish Date: 09-13-16

Well ID: C9506	Well Name: N/A
Location: 216-T-18 Crib	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/03/16	Reviewed By: Kelly Whitley — Date: 12-7-16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
3/8-in Bentonite Chips: 2.0 - 95.0 ft bgs	
3/8-in Bentonite Pellets: 95.0 - 101.8 ft bgs	



Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 33.5 ft bgs

Borehole drilled with 6-in O.D. casing from 33.5 - 100.52 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
90		87.2 - 101.8 Silty Sand (mS)
100		Total Depth: 101.8 (06-29-16)
110		
120		
130		
140		
150		
160		
170		

WELL SUMMARY SHEET

Start Date: 04-05-16
Finish Date: 09-27-16

Well ID: C9507	Well Name: N/A
Location: North End of 216-T-19 Crib	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/03/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

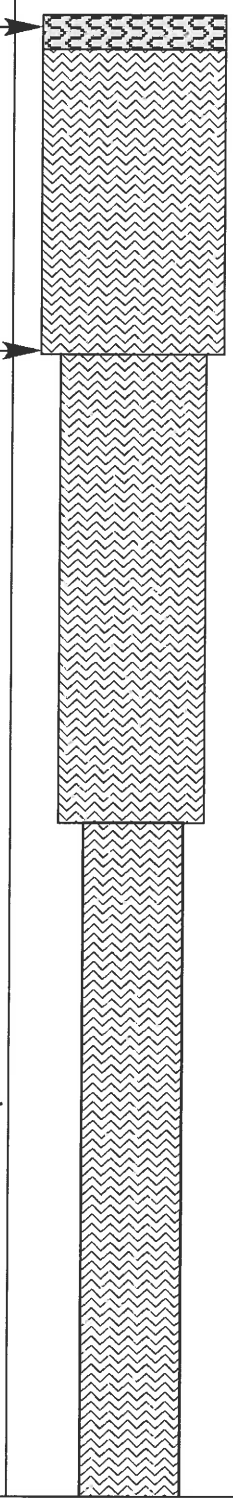
High Strength Concrete Mix:
0.0 - 2.0 ft bgs

3/8-in Bentonite Chips:
2.0 - 243.4 ft bgs

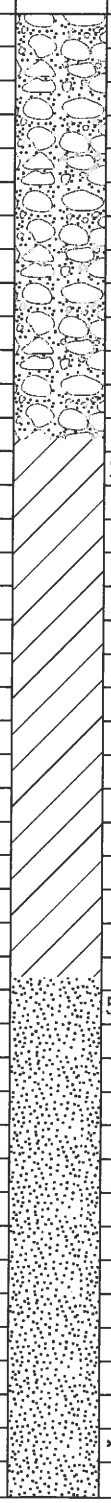
Depths are in ft below ground surface.

Borehole drilled with 10 3/4-in O.D. casing from 0.0 - 20.3 ft bgs
Borehole drilled with 8 5/8-in O.D. casing from 20.3 - 48.1 ft bgs
Borehole drilled with 6-in O.D. casing from 48.1 - 157.0 ft bgs
Borehole drilled with 4 7/8-in O.D. casing from 157.0 - 240.5 ft bgs

All temporary drill casing was removed from the ground.



GEOLOGIC/HYDROLOGIC DATA



0 - 25.3 Sandy Gravel (sG)

25.3 - 57.3 Unable to Determine*

57.3 - 94.1 Sand (S)

* = Drilling method did not produce cuttings at this depth.

WELL SUMMARY SHEET

Start Date: 04-05-16
Finish Date: 09-27-16

Well ID: C9507	Well Name: N/A
Location: North End of 216-T-19 Crib	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/03/16	Reviewed By: Kelly Whitley — Date: 12/1/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description

3/8-in Bentonite Chips:
2.0 - 243.4 ft bgs

Depths are in ft below ground surface.

Borehole drilled with 10 3/4-in O.D. casing from 0.0 - 20.3 ft bgs
Borehole drilled with 8 5/8-in O.D. casing from 20.3 - 48.1 ft bgs
Borehole drilled with 6-in O.D. casing from 48.1 - 157.0 ft bgs
Borehole drilled with 4 7/8-in O.D. casing from 157.0 - 240.5 ft bgs

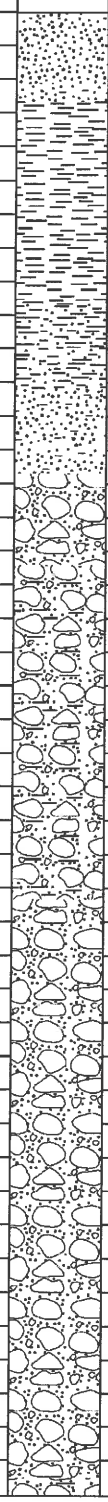
All temporary drill casing was removed from the ground.

Diagram

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 90, 100, 110, 120, 130, 140, 150, 160, 170

Graphic Log



Lithologic Description (ft bgs)

57.3 - 94.1 Sand (S)
94.1 - 95.1 Slightly Silty Sand ((m)S)
95.1 - 107.3 Silt (M)
107.3 - 112.3 Sandy Silt (sM)
112.3 - 117.4 Slightly Silty Sand ((m)S)
117.4 - 122.5 Sandy Gravel (sG)
122.5 - 142.6 Silty Sandy Gravel (msG)
142.6 - 177.0 Sandy Gravel (sG)
177.0 - 243.4 Silty Sandy Gravel (msG)

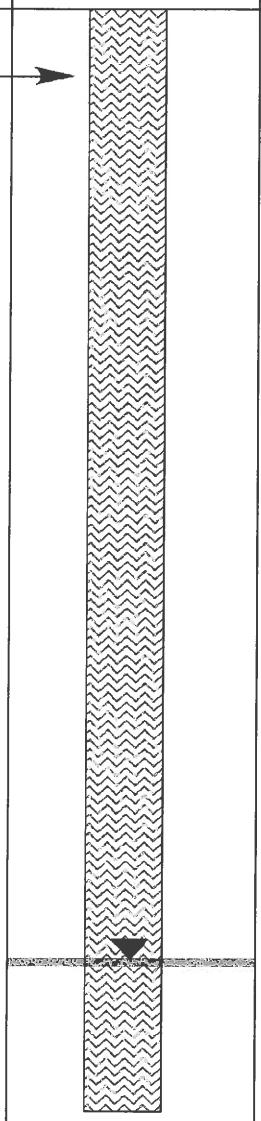
WELL SUMMARY SHEET

Start Date: 04-05-16
Finish Date: 09-27-16

Well ID: C9507	Well Name: N/A
Location: North End of 216-T-19 Crib	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/03/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
3/8-in Bentonite Chips: 2.0 - 243.4 ft bgs	



Depths are in ft below ground surface.

Borehole drilled with 10 3/4-in O.D. casing from 0.0 - 20.3 ft bgs
Borehole drilled with 8 5/8-in O.D. casing from 20.3 - 48.1 ft bgs
Borehole drilled with 6-in O.D. casing from 48.1 - 157.0 ft bgs
Borehole drilled with 4 7/8-in O.D. casing from 157.0 - 240.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
180		177.0 - 243.4 Silty Sandy Gravel (msG)
190		
200		
210		
220		
230		Depth to Water: 234.6 (06-16-16)
240		Total Depth: 243.4 (06-16-16)
250		
260		

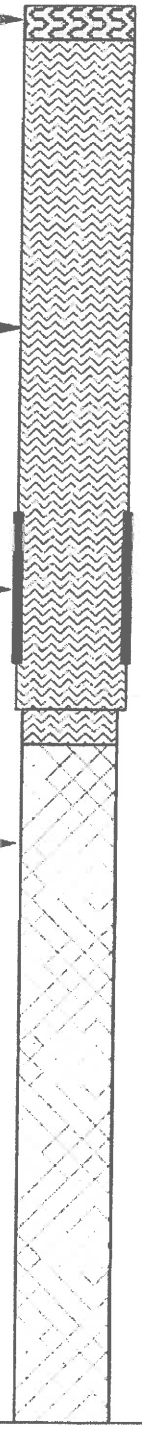
WELL SUMMARY SHEET

Start Date: 11-19-15
Finish Date: 09-28-16

Well ID: C9511	Well Name: N/A
Location: 216-T-23 Trench	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10-11-16	Reviewed By: Kelly Whitley — Date: 12/1/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
High Strength Concrete Mix: 0.0 - 2.0 ft bgs	
3/8-in Bentonite Chips: 2.0 - 46.0 ft bgs	
9.2 ft of 8 5/8-in O.D. casing and shoe remains in the borehole. Estimated depth: 31.7 - 40.9 ft bgs	
3/8-in Bentonite Pellets: 46.0 - 117.2 ft bgs	



Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 43.9 ft bgs
Borehole drilled with 6-in O.D. casing from 43.9 - 115.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
0		0 - 4.5 Unable to Determine*
		4.5 - 7.6 gravelly Sand (gS)
10		7.6 - 10.0 slightly silty Sand ((m)S)
		10.0 - 43.9 Unable to Determine*
20		
30		
40		
		@ 43.9 bgs. Begin Sonic Drilling
		43.9 - 54.6 Sand (S)
50		
		54.6 - 63.1 gravelly Sand (gS)
60		
		63.1 - 106.5 sandy Gravel (sG)
70		
80		
		* = Drilling method did not produce cuttings at this depth.

A-6003-643 (REV 1)

WELL SUMMARY SHEET	Start Date: 11-19-15 Finish Date: 09-28-16	Page 2 of 2

Well ID: C9511	Well Name: N/A
Location: 216-T-23 Trench	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/03/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
3/8-in Bentonite Pellets: 46.0 - 117.2 ft bgs	

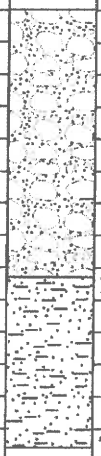
Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 43.9 ft bgs

Borehole drilled with 6-in O.D. casing from 43.9 - 115.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
90		63.1 - 106.5 sandy Gravel (sG)
100		
		106.5 - 117.2 silty Sand (mS)
110		
		Total Depth: 117.2 (07-07-16)
120		
130		
140		
150		
160		
170		

A-6003-643 (REV 1)

WELL SUMMARY SHEET

Start Date: 11-18-15
Finish Date: 09-29-16

Well ID: C9510	Well Name: N/A
Location: 216-T-25 Trench (East)	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/03/16	Reviewed By: Kelly Whitley — Date: 10/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

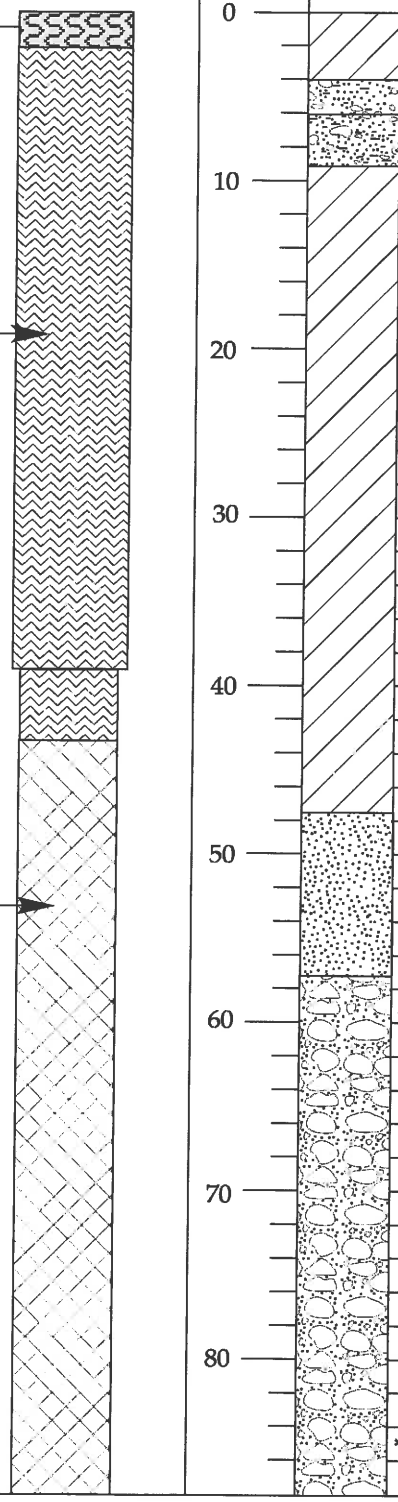
Description	Diagram
High Strength Concrete Mix: 0.0 - 2.0 ft bgs	
3/8-in Bentonite Chips: 2.0 - 43.5 ft bgs	
3/8-in Coated Bentonite Pellets: 43.5- 122.4 ft bgs	

Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 39.0 ft bgs

Borehole drilled with 6-in O.D. casing from 39.0 - 122.0 ft bgs

All temporary drill casing was removed from the ground.



GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
0		0 - 4.0 Unable to Determine*
		4.0 - 6.2 Gravelly Silty Sand (gmS)
10		6.2 - 9.2 Slightly Silty Gravelly Sand ((m)gS)
		9.2 - 47.5 Unable to Determine*
20		
30		
40		@ 39.0 bgs. Begin Sonic Drilling
50		47.5 - 57.4 Sand (S)
60		57.4 - 102.5 Sandy Gravel (sG)
70		
80		

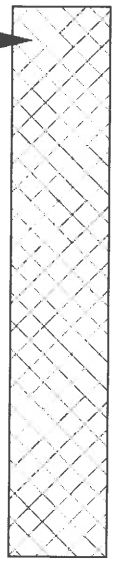
* = Drilling method did not produce cuttings at this depth.

WELL SUMMARY SHEET

Start Date: 11-18-15
Finish Date: 09-29-16

Well ID: C9510	Well Name: N/A
Location: 216-T-25 Trench (East)	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/03/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
3/8-in Coated Bentonite Pellets: 43.5- 122.4 ft bgs	

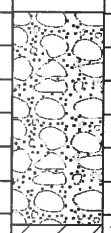
Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 39.0 ft bgs

Borehole drilled with 6-in O.D. casing from 39.0 - 122.0 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
90		57.4 - 102.5 Sandy Gravel (sG)
100		102.5 - 112.3 Unable to Determine*
110		112.3 - 122.4 Silty Sand (mS)
120		Total Depth: 122.4 (07-13-16)
130		
140		
150		
160		
170		

* = Drilling method did not produce cuttings at this depth.

WELL SUMMARY SHEET

Start Date: 11-24-15
Finish Date: 09-22-16

Well ID: C9512	Well Name: N/A
Location: 216-S-9 Crib	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/03/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
High Strength Concrete Mix: 0.0 - 2.0 ft bgs	
3/8-in Bentonite Chips: 2.0 - 100.2 ft bgs	

Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 36.4 ft bgs

Borehole drilled with 6-in O.D. casing from 36.4 - 140.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
0		0 - 3.2 Unable to Determine*
		3.2 - 8.2 slightly silty Sand ((m)S)
10		8.2 - 13.0 Unable to Determine*
		13.0 - 15.3 slightly silty Sand ((m)S)
20		15.3 - 36.4 Unable to Determine*
30		
		@ 36.4 bgs. Begin Sonic Drilling
40		36.4 - 42.2 gravelly Sand (gS)
		42.2 - 47.2 Sand (S)
50		47.2 - 57.4 sandy Gravel (sG)
60		57.4 - 76.9 Sand (S)
70		
80		76.9 - 132.0 slightly silty Sand ((m)S)
		* = Drilling method did not produce cuttings at this depth.

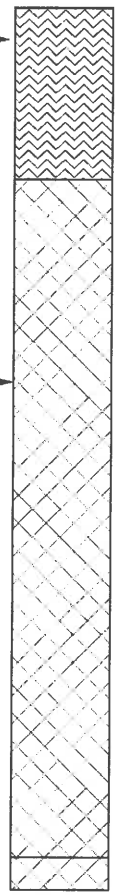
WELL SUMMARY SHEET

Start Date: 11-24-15
Finish Date: 09-22-16

Well ID: C9512	Well Name: N/A
Location: 216-S-9 Crib	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/03/16	Reviewed By: Kelly Whitley — Date: 12/7/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
3/8-in Bentonite Chips: 2.0 - 100.2 ft bgs	
3/8-in Bentonite Pellets: 100.2 - 142.5 ft bgs	



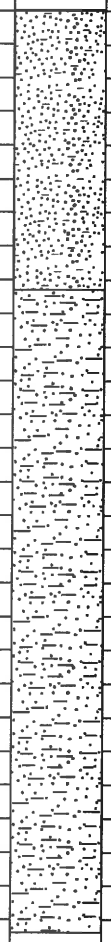
Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 36.4 ft bgs
Borehole drilled with 6-in O.D. casing from 36.4 - 140.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
90		76.9 - 132.0 slightly silty Sand ((m)S)
100		
		132.0 - 142.5 silty Sand (mS)
110		
120		
130		
140		
		Total Depth: 142.5 (07-27-16)
150		
160		
170		



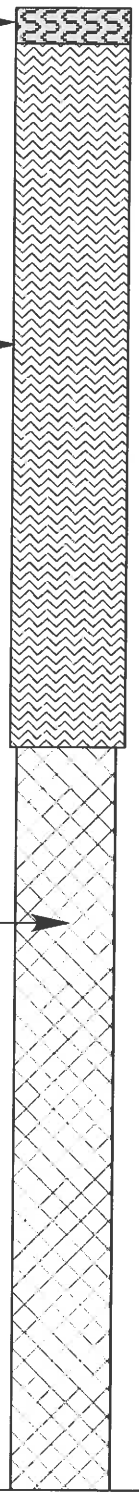
WELL SUMMARY SHEET

Start Date: 04-07-16
Finish Date: 09-26-16

Well ID: C9514	Well Name: N/A
Location: 216-S-21 Crib	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/03/16	Reviewed By: Kelly Whitley — Date: 12/1/16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
High Strength Concrete Mix: 0.0 - 2.0 ft bgs	
3/8-in Bentonite Chips: 2.0 - 44.2 ft bgs	
3/8-in Coated Bentonite Pellets: 44.2 - 127.6ft bgs	



Depths are in ft below ground surface.

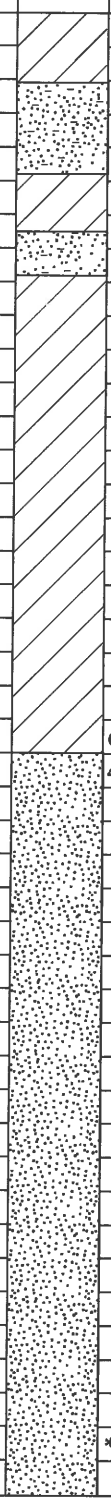
Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 44.0 ft bgs

Borehole drilled with 6-in O.D. casing from 44.0 - 127.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 0, 10, 20, 30, 40, 50, 60, 70, 80



Graphic Log

Lithologic Description (ft bgs)

- 0 - 4.1 Unable to Determine*
- 4.1 - 9.5 Slightly Silty Sand ((m)S)
- 9.5 - 13.1 Unable to Determine*
- 13.1 - 15.6 Gravelly Sand (gS)
- 15.6 - 44.0 Unable to Determine*
- @ 44.0 bgs. Begin Sonic Drilling
- 44.0 - 102.0 Sand (S)

* = Drilling method did not produce cuttings at this depth.

WELL SUMMARY SHEET

Start Date: 04-07-16
Finish Date: 09-26-16

Well ID: C9514	Well Name: N/A
Location: 216-S-21 Crib	Project: 21 Direct Push Borings in 200-DV-1-OU
Prepared By: Tracy Mallgren — Date: 10/03/16	Reviewed By: Kelly Whitley — Date: 12-1-16
Signature:	Signature: Kelly Whitley

CONSTRUCTION DATA

Description	Diagram
3/8-in Coated Bentonite Pellets: 44.2 - 127.6 ft bgs	

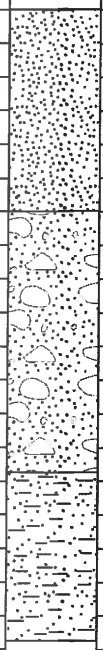
Depths are in ft below ground surface.

Borehole drilled with 8 5/8-in O.D. casing from 0.0 - 44.0 ft bgs

Borehole drilled with 6-in O.D. casing from 44.0 - 127.5 ft bgs

All temporary drill casing was removed from the ground.

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description (ft bgs)
90		44.0 - 102.0 Sand (S)
100		102.0 - 117.4 Gravelly Sand (gS)
110		
120		117.4 - 127.6 Silty Sand (mS)
		Total Depth: 127.6 (07-21-16)
130		
140		
150		
160		
170		

Appendix B

Borehole Geologic Logs for the Characterization Boreholes in 200-DV-1 Operable Unit

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BOREHOLE LOG

Page 1 of 6
Date: 11-5-15

Well ID: C9487	Well Name: N/A	Location: ~15m North of B Tank Farm
Project: 9 Direct Push Borings (+1 optional) in 200-DV-1 OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description (Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level)
0	Drive Time	Split Spoons		0-3' : Gravel backfill	Direct Push with Becker Hammer, 8 5/8" OD Temp. Casing. Split Spoons taken @ 3, 7, and 10' bgs using a 2.5' split spoon.
	2min				
	4min	30sec 80% Rec.		3-17 : Silty Sandy Gravel (msG) 30% Gravel, 40% Sand, 30% Silt. Sand: VFS-CS, avg: fs-ms. Gravel: 2-50mm avg: 10mm	drilled with 8 5/8" casing to 33.4' bgs. Casing was removed 3/8/16 and re-drilled with 10 3/4" OD casing to 34.1' with cable tool.
5					
	16min	40sec 83% Rec.		@ 7' bgs Gravel ↑ 100mm max	
10					
	18min	1min 100% Rec.		@ 13' bgs ↓ silt 20%, ↑ Gravel 50%	
15					
				17-27' Sandy Gravel (SG) 60% gravel 40% Sand, tr. Silt. Gravel: 20-50mm avg= 20mm, R-SR, Max = 120mm. Sand: VFS-VCS, poorly sorted	sediments from slough 0-17' bgs. May not be representative of formation (backfill?) 17-20' slough
20					
	52min			@17-20', Gravel ↓ 40%, sand 55% silt 5%, loosely compacted silt/clay + sand & gravel, slightly moist	
25				@20' gravel ↑ 60%, 35% Sand 5% Silt. Gravel size ↑ 20-70mm avg= 40mm, more silt/clay w/ sand & gravel	20-22' slough @ 23' drill rate ↑
30	76min			@ 21' 200mm large cobble @ 25' ↑ silt to 10%, sand 50% gravel 40%, sand m-VF, mod. sorted avg=m	
35			No recovery	27'-31' Silty Sandy Gravel (msG) 30% gravel, 50% Sand, 20% Silt/clay Gravel: 20-100mm, cobbles, avg=VCP Sand: m-F, well sorted, loosely compacted Sandy silt w/clay, silt stringers, slightly moist @ 28' moist more clay present	10 gal/min 3/8/16 Drilled with 8 5/8" casing to 54.7'

Reported By: Cameron Penner-Ash / Kim Schuyler		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature: [signature]	Date: 11-5-15	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 2 of 6
Date: 3/9/16

Well ID: C9487 | Well Name: N/A | Location: ~15m North of B Tank Farm

Project: 9+12 optional Direct Push Borings in 200-DV-1 OU | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description (Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level)
40				31 - 34.1 Sandy Gravel (SG) 60% gravel, 30% Sand, tr. silt, Gravel: 5-60mm (avg=vcf), SR. Sand: m-c mod. sorted, slightly moist	Direct Push with Becker Hammer, 8 5/8" casing beginning at 34.1' bgs
45			No recovery		
50					
55				55'-187.2' Sand (S)	
				55'-64.8': Sand (S) g=9% s=91% m=T (m=4/12/16) Sand: vfs-cs avg. ms Gravel: max 10mm, SR, vf-m pebble	
60					
65				64.8'-69.5': Sand (S) g=2% s=98% m=T Sand: vfs-fs Gravel: max 2mm - 4mm vf pebble	
70				69.5'-72.0': Sand (S) g=T s=95% m=5% Sand: vfs-fs Gravel: Trace at 2mm	
75				72.0'-77.0': Sand (S) g=5% s=90% m=5% Sand: vf-fs gravel: max 10mm, SR, vf-m pebble	

Reported By: Kim Schuyler / Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: geologist

Signature: Kim Schuyler [signature] Date: 3/9/16 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 6
Date: 4/7/16

Well ID: C9487 | Well Name: N/A | Location: ~15m North of B Tank Farm

Project: 9+12 optional Direct Push borings in 200-DV-100 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80				77.0'-87.2': Sand (S) g=5% s=95% m=Ø Sand: vfs-vcs avg. cs (Gravel): 2-4mm, sr, vf pebble	
85				87.2'-117.0': Sand (S) g=Ø s=100% m=Ø Sand: vfs-vcs avg. ms	
90				92.2'-117.0': Sand & vfs-cs avg. ms	
95					
100					
105					
110					
115				117.0'-127.0': Sand (S) g=Ø s=95% m=5% Sand: vfs-cs avg. ms.	

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer
Title: Geologist | Title: geologist
Signature: [signature] Date: 4/7/16 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 4 of 6

Date: 4/7/16

Well ID: C9487 | Well Name: N/A | Location: ~15m North of B Tank Farm

Project: 9&12 optional Direct Push Borings in 200-OU-1 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
120					
125				127.0'-152.0': Sand (s) g=Ø s=98% m=2%	
				Sand: vfs-vcs avg. vcs	
130					
135					
				137.0'-142.2': Sand avg & ms-cs	
140					
				142.2'-152.0': Sand avg cs	
145					
150				152.0'-162.0': Sand (s) g=Ø s=95% m=5%	
				Sand: vfs-cs avg ms	
155					

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: geologist

Signature: [signature] Date: 4/7/16 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 5 of 6

Date: 4/7/16

Well ID: C9487 | Well Name: N/A | Location: ~15m North of B Tank Farm

Project: 9+12 optional Direct Push Borings in 200-DV-10 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
160				162.0'-167.2': Sand (S) g=Ø s=91% m=9% Sand: vfs-vcs avg. m-c s	
165				167.2'-172.0': Sand (S) g=5% s=90% m=5% Gravel: 2-4mm, SR, vf pebble Sand: vf-vcs avg. m-c s	
170				172.0'-187.2': Sand (S) g=Ø s=97% m=3% Sand: vf-vc avg m-c s	
175					
180					
185				187.2'-197.2': gravelly Sand (gS) 187.2'-192.2': gravelly Sand (gS) g=15% s=82% m=3% Gravel: 2-15mm, SR, vf-m pebble. Sand: f-vcs avg. c-vcs	
190				192.2'-197.2': gravelly Sand (gS) g=11% s=86% m=3% Gravel: 2-15mm, SR, vf-m pebble. Sand: f-vcs avg. c-vcs.	
195					

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: geologist

Signature: [signature] Date: 4/7/16 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 6 of 6
Date: 4-7-16

Well ID: C9487 | Well Name: N/A | Location: ~15 m North of B Tank Farm

Project: 9+12 optional Direct Push Borings in 200-DV-40 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
200				197.2'-216.5': Sand (S)	
				197.2'-212.0': Sand (S) g=Ø s=97% m=3%. Sand: vfs-cs avg. ms	
205					
210					
				212.0'-216.5': Sand (S) g=Ø s=95% m=5%. Sand: vfs-cs avg. fs	
215				216.5-227.2: Silt/clay (M) Upper Cold Creek Unit m=95% s=5% vfs	
220					
225					
				227.2-232.0 silty Sand (mS) g=Ø s=60% m=40% wet Sand: vf-fs	227.2' bgs - estimated depth of top of saturated zone
230					
				232.0-~~235.0~~ 234.0 (approx) slightly silty Sand (m)S) wet m=~10 s=90% vf-fs	
235				234.0-235.0: Sandy Silt (sM): moisture ↑ moist/slightly moist. m=70% s=30% Sand: vfs-fs. Mica noticed 232-235.0	Moisture ↑ @ ~234.0 Last sample to 235.0' Clean out to 235.5'
				Depth of 6-in casing = 235.5 → 3/30/16 ←	Total Depth 235.5'

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature:	Date: 4/7/14	Signature:	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 6
Date: 3/8/16

Well ID: C9488 | Well Name: N/A | Location: 216-B-8 Southern End of Crib and Tile Field

Project: 9(+12 optional) Boreholes in 200-DV-1 OU | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description (Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level)
0	Drill Time	Split-Spoon		0-10' gravelly Sand (gs)	Direct-Push with Becker Hammer, 8 5/8" OD Temporary Casing, to a depth of ~~22.6~~ 43.6' bgs
	90 sec				
5	30 ~~20~~ sec	20 sec 30% recovery			No drill cuttings were produces, lithology was inferred or based upon split spoon samples
	20 sec	30 sec 20% recovery			
	5 sec			10-43.5 Sandy Gravel (SG) 60% gravel 35% Sand, 5% Silt. Gravel 20-50mm SA-A	
10	10 sec	20 sec 20% recovery			
15				no cuttings produced. Lithology estimated/assumed	
20	7 min				
25		107 sec 100% recovery			
30	135 min			no cuttings produced. Lithology estimated/assumed	
35	45 min				

Reported By: Kim Schuyler | Reviewed By: Sarah Springer
Title: Geologist | Title: Geologist
Signature: Geologist | Date: 3/8/16 | Signature: [signature] | Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 2 of 6
Date: ~~3/22~~ 3/22/16

Well ID: C9488 | Well Name: N/A | Location: 216-B-8 Crib and Tile Field

Project: 9(+12 optional) Boreholes in 200-DV-1 OU | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40	drill time				Sonic w/split core barrel. Continuous core samples w/ 6-in OD temp casing
	45 min			10-43.5 Sandy Gravel (SG) 60% gravel, 35% Sand, 5% Silt. Gravel 10-50mm, SA-A	
	10 sec	core 100% recovery			
45	10 sec	core 100% recovery		43.5'-44.5': slightly silty Sand ((m)S): g=0% S=80% m=20% Sand: vfs-ms	BAD: 43.5'-44.5': 120,000 dpm beta/gamma direct on lexan liner
	14 sec	core 100% recovery		44.5'-67.5': Sand (S) 44.5'-54.5': Sand(S) g=0% S=90% m=10% Sand: vf-m	44.7'-47.2': 50,000 dpm beta/gamma direct on lexan liner.
50	11 sec	core 100% recovery			47.1'-49.6': 10,000 dpm beta/gamma direct on sediment
	8 sec	core 100% recovery			
55	10 sec	core 100% recovery		54.5'-59.7': Sand (S) g=0% S=100% m=Trace Sand: vf-vc avg. vc	49.6'-52.1': 5,000 dpm beta/gamma direct on sediment.
	14 sec	core 100% recovery			
60	14 sec	core 100% recovery		59.7'-67.5': Sand (S) g=0% S=90% m=10% Sand: vf-m	Grab samples were not collected per project Scientist and DOW. Descriptions based on visual inspection through lexan liners (4-in) and may not be representative
65	12 sec	core 100% recovery			
	14 sec	core 100% recovery		67.5'-72.0': slightly silty Sand ((m)S): g=0% S=80% m=20% Sand: vf-vc avg. m	
70					
	15 sec	core 100% recovery		72.0'-162.3': Sand (S) 72.0'-92.2': Sand (S): g=0% S=95% m=5% Sand: vf-vc avg. m	
75					
	25 sec	core 100% recovery			

Reported By: Kim Schuyler / Tracy Mallgren | Reviewed By: Sarah Springer
Title: Geologist | Title: Geologist
Signature: Kim Schuyler | Date: 3/22/16 | Signature: Sarah Springer | Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 6

Date: 4-26-16

Well ID: C9488 | Well Name: N/A | Location: Southern End of 216-B-8 Crib + Tile field

Project: 9112 optional boreholes in 200-DV-1 OU | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description (Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level)
80	Drill Time	Core recovery		77.0'-92.2': Sand (S): g=0% s=95% m=5%	Sonic w/split core barrel. Continuous core samples w/ 6-in OD temp. casing
	25 sec	core 100% recovery		Sand: vf-vc avg m	
85	20 sec	core 100% recovery			Grab samples were not collected per project scientist and DOW. Descriptions based on visual inspection through Lexan liners (4-in) and may not be representative
				87.0'-92.2': Sand vf-c avg m.	
90	25 sec	core 100% recovery			
				92.2'-102.3': Sand (S) g=0% s=100% m=0%	
95	20 sec	core 100% recovery		Sand: vf-m avg ms	
100	15 sec	core 100% recovery			
				102.3'-112.3': Sand (S) g=0% s=95 m=5%	
105	15 sec	core 100% recovery		Sand: vf-m avg. ms	
110	20 sec	core 100% recovery			
				112.3'-117.3': Sand (S) g=2% s=98% m=0%	
115	10 sec	core 100% recovery		Gravel: vf-vc SR pebble avg 2-8 mm occ. 45 mm. Sand: vf-vc avg cs	
				117.3'-122.3': Sand (S) g=2% s=95% m=3%	
	10 sec	core 100% recovery		Moist Sample Gravel: 2-20 mm SR vf-c pebble. Sand: vf-c avg. ms	

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: Geologist

Signature: [signature] | Date: 4/26/16 | Signature: [signature] | Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 41 of 66
Date: 4-26-16

Well ID: C9488	Well Name: N/A	Location: Southern End of 216-B-8 Crib & Tile Field
Project: 9+12 optional boreholes in 200-DV-1 OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
120	Drive Time	Core Recovery		117.3'-122.3': Sand (S) g=2% s=95% m=3%	Sonic w/ split core barrel. Continuous core samples w/ 6-in OD temp. casing
	10 sec	core 100% recovery	0'	Moist Sample Gravel: 2-20mm se vf-c pebble	
				Sand: vf-c avg. m	
			0'		
				122.3'-127.1': Sand (S) g=9% s=91% m=0%	
125	15 sec	core 100% recovery	0	Gravel: 2-8mm vf-f pebble, sr. Sand: vf-vc avg c.s. DRY	Grab samples were not collected per project scientist and DOW. Descriptions based on visual inspection through Lexan liners (4-in) and may not be representative
			0		
				127.1'-142.2': Sand (S) g=0% s=100% m=0%	
130	15 sec	core 100% recovery		Sand: vf-vc avg. cs	
135	20 sec	core 100% recovery			
				137.3'-142.2' Sand avg to ms	
140	20 sec	core 100% recovery			
				142.2'-147.2': Sand (S) g=0% s=97% m=3%	
145	20 sec	core 100% recovery		Sand: vf-c avg ms	
				147.3-162.3': Sand (S): g=0% s=95% m=5%	
150	10 sec	core 100% recovery		Sand: vf-m avg. ms	
155	20 sec	core 100% recovery			
	20 sec	100% core Recovery			

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: Geologist	
Signature: [signature]	Date: 4/26/16	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 5 of 6

Date: 4-26-16

Well ID: C9488 | Well Name: N/A | Location: Southern End of 216-B-8 Crib & Tile Field

Project: 9+120 prioral boreholes in 200-DV-1 OU | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
160	Drive Time	core Recovery		147.3'-162.3': Sand (S) g=0% s=95% m=5%	Sonic w/split core barrel. Continuous core samples w/ 6-in OD temp casing
	20 sec	core 100% recovery		Sand: vf-m avg. ms	
				162.3'-164.7': silty Sand (mS) g=0% s=70% m=30%	
165	20 sec	core 100% recovery		Moist Sand: vf-f	
				164.7'-206.3': Sandy Gravel (sG)	Grab samples were not collected per project Scientist and DOW. Descriptions based on visual inspection through Lexan liners (4-in) and may not be representative
				164.7'-~~20~~ 192.0': Sandy Gravel (sG) g=30% s=70% m=0% Gravel: 2-7mm, SR, vf-f pebble. Sand: vf-f	
170	15 sec	core 100% recovery		167.3'-182.3 Gravel & 2mm vf pebble	
175	20 sec	core 100% recovery			
180	40 sec	core 100% recovery			
				182.3'-192.0': Gravel & 2mm-45mm, SR, vf-vc pebble Sand & vf-vc avg. c	
185	15 sec	core 100% recovery			
190	15 sec	core 100% recovery			
				192.0'-197.3': Sandy Gravel (sG): g=30% s=65% m=5% Gravel: 2mm-45mm SR, vf-vc pebble Sand: vf-vc avg. c	
195	30 sec	core 100% recovery			
				197.3'-206.3': Sandy Gravel (sG) g=30% s=70% m=0% Gravel: 2-10mm, SR, vf-m pebble Sand: vf-vc avg. c	
	15 sec	core 100% recovery			

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: geologist

Signature: [signature] Date: 4-26-16 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 6 of 6
Date: 4-26-16

Well ID: CG488 | Well Name: N/A | Location: Southern End of 216-B-8 Crib + Tile Field

Project: 9/12 optional boreholes in 200-DV-1 OU | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
200	Drive Time	core Recovery		197.3-206.3: Sandy Gravel (SG) g=30% s=70%	Sonic w/split core
	15 sec	core 100% Recovery		m=0% Gravel: 2-10mm, SR, vf-m pebble	barrel. continuous
				Sand: vf-vc avg c	core samples
					w/ 6-in OD temp.
	25 sec	core 100% Recovery			casing.
205				206.3-212.3: Silt (M): g=0% m=100% s=~Trace	Grab samples
				CCU7 upper silt	were not collected
					per project scientist
	20 sec	core 100% Recovery			and DOW. Descriptions
210					based on visual inspection
					through lexan liners
					(4-in) and may not
				212.3-223.1: Sand (S): g=0% m=~Trace s=100%	be representative
	10 sec	core 77% Recovery		Sand: vf-f MOIST	
215					
					212' ~ depth to
					perched aquifer
					4/26/16
220					
				223.1 - 226.0: Silt (m) 5% sand (VF)	
				95% Silt (60% clay) w/ low-mod plasticity	
225				at the shoe 4/25/16, tightly compacted	
				pale brown, CCU2 lower, slightly moist	
				TD = 226.0' bgs (4-26-16)	
				NOT USED 5/24/16	

Reported By: Tracy Mallgren / Kim Schuyler | Reviewed By: Sarah Springer

Title: Geologist | Title: geologist

Signature: [signature] Kim Schuyler | Date: 4/26/16 | Signature: [signature] | Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 7
Date: 11-5-15

Well ID: C9489 | Well Name: N/A | Location: Western Boundry of 216-B-9

Project: 9 1/2" Direct Push Borings in 200-DV-100 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	Drive Time	Split Spoons			Direct Push drilling with Becker Hammer using 8 5/8" OD Temporary casing from 0.0-34.2' bgs. 3 split spoon samples collected 3.0'-5.5', 7.0'-9.5', 10.1'-12.6'
	30sec				
5	30sec	10sec 50% Rec.		3-7': Gravelly Sand (gS) 20% Gravel 80% Sand, Lt. Olive Brown	
	65sec	25sec 65% Rec.		7-12.6': Sandy Gravel (sG) 30% Gravel 65% Sand, 5% Silt Dark Olive Brown.	Sonic drilling using 6" OD Temporary casing from 34.2'-250.5' bgs Continuous core sampling collected with 3 3/4" OD Lexan Liners. Descriptions based on visual inspection through liners & may not be representative.
10		30sec 25% Rec.			
15					
20	37min				
25					
30					
35	1 min	40% recovery		34.2-37.6': sandy Gravel (sG) m=5% s=65% g=30% Gravel: 2-20mm, vf-c pebble, SA. Sand: vf-vc avg m-c, SA	RAD: 34.2'-36.7': 10,000dpm beta/gamma direct through lexan
	1 min	92% recovery			

Reported By: Cameron Penner-Ash | Reviewed By: Sarah Springer

Title: Geologist | Title: Geologist

Signature: [signature] Date: 11-5-15 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 2 of 7

Date: 8/30/16

Well ID: C9489	Well Name: N/A	Location: Western Boundary of 216-B-9
Project: 9+12 optional Boreholes in 200 DU, OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40	30 sec	100% recovery		37.6 ~~[illegible]~~ 104.8' TW 8/30/16: Sand (s) m=5% s=90% g=5%. Sand: vf-vc avg m-c, SA. Gravel: 2-10mm vf-m, SA, pebble.	Sonic drilling using 6" OD temporary casing from 34.2'-250.5' bgs. Continuous core sampling collected with 3 8/4" OD Lexan Liners. Descriptions based on visual inspection & may not be representative.
	35 sec	100% recovery		@ 39.6' Gravel size ↑ 2-4mm	
45	15 sec	68% recovery		@ 42.1' m=5% s=95%.	
	30 sec	100% recovery			RAD: Beta/gamma direct through lexan liner unless otherwise noted
50	1 min	0% recovery			• 37.6'-40.1': 10,000 dpm • 39.6-42.1': 10,000 dpm • 42.1-44.6': 8,000 dpm • 44.5'-47.0': 8,000 dpm
55	20 sec	100% recovery			
60	10 sec	100% recovery			
65	15 sec	100% recovery			
70	10 sec	100% recovery			
75	15 sec	100% recovery			
				@ 77.6' Sand: vf-c avg. m, SA	

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: Geologist	
Signature: [signature]	Date: 8/30/16	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 7

Date: 8/30/16

Well ID: C9489	Well Name: N/A	Location: Western Boundary of 216-B-9
Project: 9+12 optional Boreholes in 200-DV-10U		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	20 sec	100% recovery		77.6'-104.8': Sand (S) m=5% s=95% Sand: vf-c avg m, SA	Sonic drilling using 6" OD Temporary casing from 342'-250.5' bgs. Continuous core sampling collected with 3 3/4" OD Lexan liners. Descriptions based on visual inspection & may not be representative.
85	25 sec	100% recovery			
90	15 sec	100% recovery			
95	10 sec	100% recovery			
100	15 sec	100% recovery			
105	15 sec	100% recovery		104.8'-105.3': Silt (M) layer ~85% m ~15% s vf	
				105.3'-227.6': Sand (S) m=5% s=95% Sand: vf-c avg m, SA	
110	20 sec	100% recovery			
115	15 sec	100% recovery			

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: Geologist	
Signature: [signature]	Date: 8/30/16	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 8130116

Well ID: C9489	Well Name: N/A	Location: Western Boundary of 216-B-9
Project: 9+12 optional Boreholes in 200-DV-1 OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
120	15 sec	100% recovery		105.3-227.6': Sand (s) m=5% s=95% Sand: vf-c avg m, sA	Sonic drilling using 6" OD temporary casing from 34.2-350.5' bgs Continuous core sampling collected with 3 3/4" OD Lexan liners. Descriptions based on visual inspection & may not be representative.
125	15 sec	100% recovery			
130	25 sec	100% recovery			
135	15 sec	100% recovery			
140	40 sec	100% recovery		@ 137.4' m=8% s=92% vf-vc avg m-c SA.	
145	25 sec	100% recovery			
150	30 sec	100% recovery			
155	30 sec	100% recovery			

Reported By: Tracy Mallagen		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature: [signature]	Date: 8/30/16	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 8/30/2016

Well ID: C9489	Well Name: N/A	Location: Western Boundary of 216-B-9
Project: 9/12 optional Boreholes in 200-OU-100		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
160	15 sec	100% recovery		137.4'-227.6': Sand (S) m=8% s=92%. Sand vf-vc avg m-c, SA	Sonic drilling using 6" OD Temporary casing from 34.2'-250.5' bgs. Continuous core sampling using 3 3/4" OD Lexan liners. Descriptions based on visual inspection & may not be representative.
165	20 sec	100% recovery			
170	15 sec	100% recovery			
175	10 sec	100% recovery			
180	20 sec	100% recovery			
185	20 sec	100% recovery			
190	25 sec	100% recovery			
195	10 sec	100% recovery			

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: Geologist	
Signature:	Date: 8/30/16	Signature:	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 8/30/2016

Well ID: C9489	Well Name: N/A	Location: Western Boundary of 216-B-9
Project: 9+12 optional Boreholes in 200-DV-1 OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
200	15 sec	100% recovery		137.4-227.6': m=8% s=92% Sand (S) Sand: vf-vc avg m-c SA	Sonic drilling using 6" OD Temporary casing from 34.2-250.5' bgs Continuous core sampling collected using 3 3/4" OD Lexanliners. Descriptions based on visual inspection through liners. & may not be representative.
205	10 sec	100% recovery			
210	10 sec	100% recovery			
215	25 sec	100% recovery			
220	15 sec	100% recovery			
225	20 sec	100% recovery			
230	1 min 15 sec	95% recovery		227.6'-242.7': gravelly Sand (gS) m=T s=85% g=15% Sand: f-vc avg m SA. Gravel: 2-20mm, vf-c, SR pebble.	
235	1 min 15 sec	100% recovery			

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: Geologist	
Signature:	Date: 8/30/16	Signature:	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 8/30/2016

Well ID: C9489	Well Name: U1A	Location: Western Boundary of 216-B-9
Project: 9+12 optional Boreholes in 200-DV-100		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
240	1 min 10 sec	100% recovery		227.6-242.7': gravelly Sand (gS) m=T s=85% g=15%. Sand: f-vc avg m, SR. Gravel: 2-20mm, vf-c, SR pebble	Sonic drilling using 6" OD Temporary casing from 34.2-250.5' bgs. Continuous core sampling collected using Lexan Liners 3 3/4" OD Descriptions based on visual inspection through liners + may not be representative.
245	2 min	100% recovery		242.7-246.4: Sandy Gravel s=25% g=75%. Sand: vf-m Gravel: 2-15mm vf-m SR pebble. @ 245-246.4 Gravel 50% Sand 50%	
	1 min 15 sec	100% recovery		246.4-247.0': sandy Silt (sM) s=40% m=60% Sand: vf-f	
250				247.0-253.1: gravelly Sandy Silt (gsM) m=45% s=35% g=20% Sand: vf-f Gravel: 2-15mm vf-m pebble, SR.	
253.1	Borehole Total Depth				

Total Depths:
8 5/8" casing: 34.2'
6" casing: 250.5'
Borehole: 253.1'
(8-24-16) TD

Not used

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature:	Date: 8/30/16	Signature:	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 11-5-15

Well ID: C9490	Well Name: N/A	Location: Southern Boundry of Z16-B-9	
Project: 9+12 optional direct push borings in 200-DV-1 OU		Reference Measuring Point: ground surface	

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	Drive Time	Split Spoons			Direct Push with Becker Hammer using 8 5/8" OD Temporary casing to 34.5' bgs. 3 split spoon samples were collected: 3.0'-5.5', 7.0'-9.5' and 10.1'-12.6' bgs
	1 min				
	1 min	5 sec 65% Rec		2.5 – 7': Sandy Gravel (sG) 30% Gravel, 70% Sand. Lt. Olive Brown	
5					
	1.5 min	30 sec 25% Rec.		7 – 12.6 Silty Sandy Gravel (msG) 40% Gravel, 30% Sand, 30% Silt	Sonic drilling using 6" OD Temporary Casing from 34.5'-252.0' bgs. Continuous core samples collected with 3 3/4" colexan liners Descriptions based on visual inspection through liners & may not be representative.
10		15 sec 75% Rec.			
15					
20	34 mins				
25					
30					RAD: 34.5'-37.0': 15,000 dpm beta/gamma direct through lexan. 37.0'-39.5': 30,000 dpm beta/gamma direct through lexan.
				34.2 – Top of Gravel ~~34.5'-59.5'~~: Sand (S) m=5 s=95 g=0	
35	35 sec	100% recovery		Sand: vf-vc avg m. SA Dry	
	35 sec	100% recovery			

Reported By: Cameron Penner-Ash		Reviewed By: Sarah Springer	
Title: Geologist		Title: Geologist	
Signature: Cam Penner-Ash	Date: 11-5-15	Signature: Sarah Springer	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 8/17/16

Well ID: C9490 | Well Name: N/A | Location: Southern Boundary of 216-B-9

Project: 9+12 optional Boreholes in 200-DV-100 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40	30 sec	100% recovery		~~34.5~~ 34.2-59.5: Sand (S) m=5 s=95 g=0% Sand: vf-vc avg m, SA, Dry	Sonic Drilling using 6" OD Temporary casing from 34.5-252.0' bgs Continuous core sampling collected with 3 3/4" OD Lexan Liners. Descriptions based on visual inspection through liners & may not be representative
	40 sec	80% recovery			
45	30 sec	100% recovery			
	30 sec	100% recovery			
50	20 sec	100% recovery			RAD: Beta/gamma direct through lexan liner unless otherwise noted
	15 sec	100% recovery			
55	40 sec	100% recovery			• 39.6'-42.1': 45,000 dpm
	55 sec	100% recovery			• 42.0'-44.5': 60,000 dpm
					• 44.5-47.0: 50,000 dpm
					• 47.0'-49.5': 20,000 dpm
					• 49.5-52.0: 60,000 dpm
60	20 sec	100% recovery		59.5-79.9: slightly silty Sand (lmS) m=15% s=85% g=0% Sand: vf-m avg m. Dry	• 52.0-54.5: 40,000 dpm
					• 54.5-57.0: 35,000 dpm
	30 sec	100% recovery			• 57.0-59.5: 20,000 dpm
					• 59.5'-62.0': 15,000 dpm
					• 62.5'-65.0': 20,000 dpm
65	20 sec	80% recovery			• 64.6-67.1': 10,000 dpm
					• 67.3-69.8': 10,000 dpm
					• 69.7'-72.2': 10,000 dpm
	30 sec	100% recovery			
70	35 sec	100% recovery			
	30 sec	100% recovery			
75	~~30~~ 35 sec	100% recovery			
	20 sec	100% recovery			

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: geologist

Signature: [signature] Date: 8/17/16 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 8/17/16

Well ID: C9490 | Well Name: N/A | Location: Southern Boundary of 216-B-9

Project: 9+12 optional Boreholes in 200-DU-1OU | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	15 sec	100% recovery		79.9'-227.0': Sand (s) m=5% s=95% g=0% Sand: vf-vc, avg m, SA Dry	Sonic drilling using 6"OD Temporary casing from 34.5-252.0' bgs. Continuous core sampling using 3 3/4" OD Lexan Liners. Descriptions based on visual inspection through liners + may not be representative.
85	15 sec	100% recovery			
90	15 sec	100% recovery			
95	10 sec	100% recovery			
100	10 sec	100% recovery			
105	5 sec	100% recovery			
110	5 sec	92% recovery			
115	10 sec	100% recovery			

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: Geologist

Signature: [signature] Date: 8/17/16 | Signature: [signature] Date: 12-8-16

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BOREHOLE LOG

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Date: 8/17/16

Well ID: C9490	Well Name: N/A	Location: Southern Boundary of 216-B-9
Project: 9412 optional Boreholes in 200-DU-10U		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
120	15 sec	100% recovery		79.9-227.0: Sand (S) m=5% s=95% g=0%. Sand vf-vc avg m, SA, Dry	Sonic drilling using 6" OD Temporary casing from 34.5'-252.0' bgs Continuous core sampling using 3 3/4" OD Lexan Liners Descriptions based on visual inspection through liners & may not be representative.
125	15 sec	100% recovery			
130	10 sec	100% recovery			
135	10 sec	100% recovery			
140	10 sec	100% recovery			
145	10 sec	100% recovery			
150	20 sec	100% recovery			
155	10 sec	100% recovery			

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature:	Date: 8/17/16	Signature:	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 5 of 7

Date: 8/17/16

Well ID: C9490	Well Name: N/A	Location: Southern Boundary of 216-B-9
Project: 9+12 optional Boreholes in 200-DV-100		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
160	10 sec	100% recovery		79.9-227.0': Sand (S) m=5% s=95% g=0% Sand: vf-vc avg m, SA, Dry	Sonic drilling using 6" OD Temporary casing from 34.5'-252.0' bgs Continuous sampling using 3 3/4" OD Lexan liners. Descriptions based on visual inspection through liners & may not be representative.
165	15 sec	100% recovery			
170	20 sec	100% recovery			
175	10 sec	100% recovery			
180	10 sec	100% recovery			
185	10 sec	100% recovery			
190	20 sec	100% recovery			
195	15 sec	100% recovery			

Reported By: Tracy Wallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature:	Date: 8/17/16	Signature:	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 8/17/16

Well ID: C9490	Well Name: N/A	Location: Southern Boundary of 216-B-9
Project: C9412 Optional Boreholes in 200-DV-100		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
200	20 sec	100% recovery		79.9-227.0': Sand (S) m=5% s=95% g=0% Sand: vf-vc avg m, SA, Dry	Sonic drilling using 6" OD Temporary casing from 34.5-252.0' bgs Continuous sampling using 3 3/4" OD Lexan Liners Descriptions based on visual inspection through liners & may not be representative.
205	10 sec	100% recovery			
210	15 sec	100% recovery			
215	15 sec	100% recovery			
220	35 sec	100% recovery			
225	10 sec	82% recovery			
230	15 sec	80% recovery		227.0-237.5: gravelly Sand (gS) m=5% s=75% g=20% Gravel: 2-25mm vf-c pebbles, SA-SR. Sand: vf-vc avg. m, SA, Dry	
235	20 sec	0% recovery			

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature:	Date: 8/17/16	Signature:	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 8/17/16

Well ID: C9490 | Well Name: N/A | Location: Southern Boundary of 216-B-9

Project: 9+12 optional Boreholes in 200-DV-100 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
240	45 sec	100% recovery		237.5'-250.4': Sandy Gravel (SG) m=5% s=50% g=45%. Gravel: 2-40mm, vf-vc pebble, SA-SR. Sand: vf-vc avg m, SA Dry	Sonic drilling using 6" OD Temporary casing from 34.5-252.0' bgs
	1.5 min	100% recovery		@ 242.6: G↑55% S↓40%	Continuous core sampling using 3 7/4" OD Lexan Liners
245				@ 247.0: G↑70% S↓25%	Descriptions based on visual inspection through liners & may not be representative.
	1.5 min	100% recovery			
250				250.4'-252.6': Sandy Silt (SM): ~~Sand:~~ m=55% s=45%. Sand: vf-f Silt: mod plasticity	
252.6	Borehole Total Depth				Total Depths: 8" casing: ~~34.5'~~ 34.2' 6" casing: 252.0' Borehole: 252.6" (8/15/2016)

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: geologist

Signature: [signature] Date: 8/17/16 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 6
Date: 10-26-15

Well ID: C9491 | Well Name: N/A | Location: 60m West of BX Tank Farms

Project: 9+12 Optional Direct Push Borings in 200-DV-1 OU | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description (Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level)
0	Drive Time	Split Spoon		0-3.0 no samples	Direct push w/ Becker Hammer 8 5/8" temp Casing
	1 min				
	1 min	20 sec 50% recovery		3.0-5.5 silty Sandy Gravel (msG) 55% Gravel, 30% Sand, 15% Silt. Fines olive brown, gravels sub-rounded	Sediment descriptions are based upon visual inspection of split spoon liner ends, where available
5	1 min			5.5-7.1 No Sample/sediment recovery	
	30 sec	15 sec 30% recovery		7.1-9.6 Silty Sandy Gravel (msG) ↓silt 12%, ↓Sand 28%, gravel ↑60% olive brown, gravels subrounded	
10		10 sec 30% recovery		10.2-12.7 Silty Sandy Gravel (msG) 12% Silt, Sand 28%, gravel ↑60%	No Sediment recovery from 12.7-51.5' → 9.6-10.2 no samples or sediment recovered
	25 min				
15					
20					
	47 min				
25					
30					
	84 min				
35					

Reported By: Cameron Penner-Ash/Kim Gehyler
Title: Geologist
Signature: [signature] / Kim Gehyler — Date: 10-27-15
on behalf of Cameron-Penner Ash

Reviewed By: Sarah Springer
Title: geologist
Signature: [signature] — Date: 12-08-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 2 of 6
Date: 11-10-15

Well ID: C4491	Well Name: N/A	Location: 60 m West of BX Tank Farms
Project: 9112 optional Direct Push Borings in 200-BY-1 OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40				KS 6/30/16 ~~3-51.5 Silty Sandy Gravel (mSG)~~	Direct push with Becker Hammer, 8 5/8" temporary casing. No sediment recovery until 51.5'
45	18 mins		Not Used		8 5/8" casing to 51.2' (10-27-15)
					Begin drilling with Sonic drill rig and 6-in temp casing at 51.5
50	4 mins			51.5'-177.7' Sand (S)	
	30 sec	100% recovery		51.5'-57.8' Sand (S) g=5% s=95% m=0%	BAD: 50,000 dpm beta/gamma direct through lexan liner (51.5'-52.5')
	30 sec	100% recovery		Gravel: 2-8mm, SR, vf-f pebble. Sand: f-vc avg. m s	
55				51.5'-55.2': slightly moist	10,000 dpm beta/gamma direct through lexan liner (52.7'-55.2')
	30 sec	100% recovery		@ 57.8'-60.3' Sand (S) g=0% s=100% m=0%	
	15 sec	100% recovery		Sand: vfs-ms avg. ms	Geology is described looking through Lexan liners and may not be representative of actual formation
60	10 sec	100% recovery		@ 60.3'-77.6' Sand (S) g=0% s=97% m=3%	
				Sand: vfs-vcs avg m-cs	
65	30 sec	100% recovery			
70	30 sec	100% recovery			
75	30 sec	100% recovery		KS 6/30/16 @ 77.6'-~~147.7~~': Sand (S) g=0% s=95% m=5%	
				Sand: vfs-cs avg. cs	
	30 sec	100% recovery			

Reported By: Cameron Penner-Ash/T. Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature: [signature]	Date: 11-10-15	Signature: [signature]	Date:

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 6

Date: 4-14-16

Well ID: C9491	Well Name: N/A	Location: 600m West of BX Tank Farms
Project: 9+12 optional Direct Push Borings in 200-DV-1 OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	30 sec	100% recovery		~~77.6-147.7: Sand (S) g=0% s=95% m=5%~~ TM 4/19/16 ~~Sand: vfs-cs avg ms cs~~ TM 4/19/16 KS 6/20/16	Sonic drilling w/6-in temp. casing continuous core Samples were collected
	30 sec	100% recovery	@	51.5-177.7: Sand(S) KS 6/20/16 80'-177.7' g=0%, s=95%, m=5%, vfs-cs avg=cs	
85					Soil classifications are estimated through Lexan liner and may not be representative
	30 sec	100% recovery			
90					
	30 sec	100% recovery			
95					
	30 sec	100% recovery			
100					
	30 sec	100% recovery			
105					
	30 sec	100% recovery	@	107.7-112.7 Sand size: vfs-ms avg ms	
110			@	112.7'-177.7': Sand size: vfs-vcs avg ms	
	15 sec	100% recovery			
115			@	KS 6/20/16 117.7-~~127.8~~: Sand size: vfs-cs avg. ms	
	30 sec	100% recovery			

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature:	Date: 4-14-16	Signature:	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 4-14-16

Well ID: C9491	Well Name: N/A	Location: 100m West of BX Tank Farms
Project: 9412 optional Direct Push Borings in 200-DV-100		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
120	30 sec	100% recovery		51.5-177.7': Sand (S)	Sonic drilling w/6-in temp. casing
				@120'-~~127.8~~ KS 6/20/16 g=0%, s=95%, m=5%, vfs-cs	continuous core
				avg=ms	Samples were collected
125	15 sec	100% recovery			
				@127.8-132.7 Sand size: vfs-ms avg ms	Soil classifications are estimated through Lexan liner and may not be representative
130	20 sec	100% recovery			
				@132.7-147.7 Sand size: vfs-cs avg ms	
135	15 sec	100% recovery			
140	15 sec	100% recovery			
145	15 sec	100% recovery			
				@147.7-~~147.8~~ KS 6/20/16: Sand (S) g=0% s=98% m=2%	
				Sand: vf-c avg ms	
150	15 sec	100% recovery			
155	15 sec	100% recovery			
	15 sec	100% recovery			

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature: [signature]	Date: 4-14-16	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 5 of 6

Date: 4-14-16

Well ID: C9491	Well Name: N/A	Location: 60m West of 13x Tank Farms
Project: 9812 optional Direct Push Borings in 200-DV-1 OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
160	15 sec	100% recovery		~~147.7'-167.8': Sand (S) g=0% s=98% m=7%~~ KS 6/30/16	Sonic drilling w/ 6-in temp. casing continuous core samples were collected
				~~Sand: vf-c avg m~~	
				51.5-177.7': sand (S)	
				@160': gravel=0%, sand=98%, silt=2% vf-vc, average=ms	
165	10 sec	100% recovery			Soil classifications are estimated through Lexan liner and may not be representative
				@167.8'-177.7' Sand (S) g=5% s=93% m=2%	
				Gravel: 2mm, SR vf pebble Sand: vf-c avg. c s	
170	20 sec	100% recovery			
175	30 sec	100% recovery		177.7-192.8 gravelly Sand (gS)	
				177.7'-192.8': gravelly Sand (gS) g=15% s=82% m=3%	
				Gravel: 2-8mm, SR, vf-f pebble. Sand: vf-vc avg. c s (Gravel v. occ. 45mm vc. pebble	
180	20 sec	100% recovery			
185	20 sec	100% recovery			
190	20 sec	100% recovery		192.8-212.7': sand (S)	
				192.8'-212.7': Sand (S) g=5% s=92% m=3%	
				Gravel: 2mm, SR, vf pebble. Sand: vf-vc avg m-c s.	
195	20 sec	100% recovery			
	20 sec	100% recovery			

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: Geologist	
Signature: [signature]	Date: 4-14-16	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 6 of 6

Date: 4-14-16

Well ID: C9491	Well Name: N/A	Location: 100m West of BX Tank Farms
Project: 9 & 12 optional Direct Push Borings in 200-DV-100		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
200	20 sec	100% recovery		~~192.8'-212.7': Sand (S) g=5% s=92% m=3%~~ KS 6/30/16	Sonic drilling with 6-in temp. casing
				~~Gravel: 2mm, SR, vf pebble. Sand: vf-vc avg m-c~~	continuous core
				192.8-212.7': Sand (S)	Samples were
				@ 200' gravel=5%, sand=92%, silt=3%	collected
205	30 sec	100% recovery		Gravel: 2mm, SR, vf pebble. Sand: vf-vc	
				SVG = m-c	
					Soil classifications
					are estimated through
210	30 sec	100% recovery			Lexan liner and
					may not be
					representative
				212.7'-222.7': slightly silty Sand (slS)	
				g: 0% s=85% m=15% Sand: vfs-fs	
215	10 sec	100% recovery			
220	20 sec	100% recovery			
				222.7'-227.7': sandy Gravel (sG) g=50% s=50%	
				m=0% Gravel: 2-50mm, SR, vf-vc pebble	
				Sand: vf-vc avg c-s	
225	15 sec	100% recovery			Total Depth: 227.7'
					KS 6/30/16 ~~(3-30-16)~~ (3-15-16)
					Casing @ 227.7'
227.7					
230					
				Not used KS 4/14/16	

Reported By: Tracy Mallgren, Kim Schuyler	Reviewed By: Sarah Springer
Title: Geologist	Title: geologist
Signature: [signature] Kim Schuyler Date: 4-14-16	Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 1
Date: 7/20/15

Well ID: C8711 | Well Name: N/A | Location: ~31m NW of 216-B-50

Project: 4" (+12 optional) Direct Push Borings in 200-PW-1-OU | Reference Measuring Point: Ground surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	Drive Time			0-20: silty sandy Gravel (msG)	Direct Push with
	4 min	35%		40% Gravel, 45% Sand, 15% Silt	Geo Probe, 4½" OD
				Gravel: vfp-fp Sand: vfs-ms	Temp casing.
					Continuous core with
					Lexan liners 3" OD
5					except where noted.
	6 min	NA			Soil classifications
					are estimated through
					Lexan liner, other
					details are based on
10					299-E33-40 (5'-10' &
	3 min	100%			13'-27.6')
13					5'-10' + 13'-27.6'
	5 min	NA			Core samples not
15					collected
	13 min	NA			
20				20-27.6: sandy Gravel (sG)	
	36 min	NA		40% Gravel, 50% Sand, 10% Silt	
				Gravel: vfp-vcp. Sand: ms-vcs	
25					
	12 min	NA			27.6'
27.6					Total Depth: ~~29.7~~ KS 10/19/16
30					

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: geologist

Signature: [signature] Date: 7/20/15 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 11-9-15

Well ID: C9550	Well Name: N/A	Location: ~31m NW of 216-B-9 50
Project: 9 Direct Push Borings in 200-OU-1 OU + 12 optional		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	drive time	split spoons			Direct Push with Becker Hammer, 8 5/8" OD Temp. Casing. Split Spoon taken at 8.2' bgs using a 2.5' Split spoon.
				0-8.2': no sediment recovery	
5	10mins				
					sediment descriptions are based upon visual inspection of split spoon liner ends, where available
	1min	2mins 100% Rec.		8.2-10.7: Silty Sandy Gravel (mSG), 60% Gravel, 25% Sand, 15% silt, ~80% basalt grains	
10				10.7-~~43.5~~ 43.5': no sediment recovery	
15	20mins				
20					
25	67mins				
30					
35	58mins				

Reported By: Cameron Penner-Ash		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature: [signature]	Date: 11-9-15	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 11-9-15

Well ID: CASSO	Well Name: N/A	Location: ~31 m NW of 216-B-50
Project: G+12 Optional Direct Push Borings in 200-OU-1 OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40	Drive Time	Split Spoons / core recovery		10.7 - 43.7': no Sediment recovery	Sonic drilling w/ 6-in temp. casing @ 43.5'
	10 mins			43.5'	continuous core
				43.7' - 123.1': Sand (S)	Samples were
				@ 43.7' - 83.1': Sand (S) g=0%, s=100% m=0%	collected beginning at
45				Sand: f-vc s, avg. m-c	43.7' (12-17-15)
	2 min	100% recovery			Soil classifications
					are estimated through
					Lexan liner and may
					not be representative
50	1 min	100% recovery			
					While removing inner
					rods for 47.9-52.9'
					sample, 4,000 dpm →
55	2 min	100% recovery			up to 40,000 dpm (direct)
					of beta/gamma was
					detected on inner
					rod (12/17/15)
					Subsequent survey
60	1 min	100% recovery			↳ no contamination (1/11/16)
65	3 min	100% recovery			
70	2 min	100% recovery			RAD: 68'-73' Lexan liner
					had 1,000 dpm beta/gamma
					direct.
75	3 min	100% recovery			

Reported By: Cameron Penner-Ash / Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature: [signature]	Date: 11-9-15	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 4-13-16

Well ID: C9550 | Well Name: N/A | Location: ~31m NW of 216-B-50

Project: 9+12 optional Push Borings in 200-OU-100 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	4 min	100% recovery		43.7-123.1: Sand (S)	Sonic drilling w/6-in temp. Casing. Continuous core samples were collected
				@80'	
				~~83'-123.1~~: Sand (S): g=0% s=97% m=3%	
				Sand: vfs-vcs avg ms	
85	2 min	100% recovery			Soil classifications are estimated through Lexan liner and may not be representative
90	2 min	100% recovery			
95	2 min	100% recovery			
100	1 min	100% recovery			
105	2 min	100% recovery			
110	2 min	100% recovery			
115	2 min	100% recovery			

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: geologist

Signature: [signature] | Date: 4/13/16 | Signature: [signature] | Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 4/13/16

Well ID: C9550	Well Name: N/A	Location: ~31 m NW of 216-B-50
Project: Geophysical Direct Push Borings in 200-DV-1 OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
120	1 min	100% recovery		43.7'-123.1': Sand (S)	Sonic drilling w/ 6-in temp. casing. Continuous core samples were collected
				@120': gravel: 0%, Sand=97%, m=3%. sand: vfs-vcs avg= ms	
				123.1'-128.1': Sandy Gravel (sG): g=35% s=62% m=3%	
				Sand: vfs-cs avg. ms (Gravel): 2-4mm pebbles. SR vf pebble	
125	2 min	100% recovery			Soil classifications are estimated through Lexan liner and may not be representative
				128.1'-133.1': gravelly Sand (gS): g=15% s=85% m=0% (Gravel): 2-4mm SR, vf pebbles Sand: vf-c avg. ms	
130	1 min	100% recovery			
				133.1'-~~173.0~~ 158.0': Sandy Gravel (sG) TM 4/13/16	
				133.1'-138.2': Sandy Gravel (sG) g=35% s=65% m=0%	
135	2 min	100% recovery		Gravel: 2-4mm, SR, vf pebble Sand: f-vcs ms avg	
				@138.2'-143.0': sandy Gravel (sG) g=35% s=60%	
140	2 min	100% recovery		m=5% Gravel: 2-4mm, SR, vf pebble. Sand: vf-vcs avg. ms	
				@143.0'-148.0': sandy Gravel (sG) g=40% s=~~45%~~ 55% TM 4/13/16	
145	2 min	100% recovery		m=5% Gravel: 2-4mm, SR, vf pebble. Sand: vf-vcs avg meds.	
				@148.0'-158.0': sandy Gravel (sG) g=50% s=45% m=5%	
150	1 min	100% recovery		Gravel: 2-6mm, SR, vf-f pebble Sand: vf-vc avg m	
				148.0-153.0: mica noticed	
				153.0-158.0 Gravel increases to ~10mm med. pebble.	
155	2 min	100% recovery			

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature: [signature]	Date: 4/13/16	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 5 of 5

Date: 4/13/16

Well ID: C9550 | Well Name: N/A | Location: ~31m NW of 216-B-50

Project: 9112 optional Direct Push Borings in 200-DV-1 OU | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
160	1 min	100% recovery		158.0-168.0: silty sandy Gravel (msG): g=45% s=40% m=15% Gravel: 2-15mm, SR, vf-m pebble Sand: vfs-cs avg. ms	Sonic drilling w/6-in temp casing. Continuous core samples were collected
165	1 min	100% recovery		163.0-168.0: Gravel size increases to ~45mm vf-vc pebbles + mica noticed	Soil classifications are estimated through Lexan liner and may not be representative
170	2 min	100% recovery		168.0-173.0: sandy Gravel (sG): g=30% s=65% m=5% Gravel: 2-6mm vf-f, SR, pebble Sand: vf-c avg. m	
175	1 min	100% recovery		173.0-178.2: gravelly Sand (gS): g=25% s=70% m=5% Gravel: 2-45mm vf-m SR pebble Sand: vf-c avg m	
180	2 min	100% recovery		178.2-183.2: sandy Gravel (sG) g=70% s=25% m=5% Gravel: 2-30mm vf-c, SR pebble Sand: vf-vc avg. m-c	
185	2 min	100% recovery		183.1-193.2: silty sandy Gravel (msG) g=60% s=25% m=15% Gravel: 2-6mm vf-f, SR pebble. Sand: vf-vc avg. m	
190	1 min	100% recovery		188.1-193.2: g≈55% s≈30% m=15%	
195	193.2 200 5 min	193.2' 100% 198.2' 41.77. 200.0' Total Depth		sandy Silt 193.2-195.2: (sM) s=20% m=80% Sand: vfs CCU 200.7 JM 5/13/16 ~~200.0~~ LS 1/11/16 195.2-~~198.2~~: sandy Gravel (sG) g=70% s=20% m=5%	possible contact with CCU silt-dominated unit at 193.2' bgs
2000	~~198.2~~	~~Total Depth~~			Total Depth = 200.7' ~~(2-1-16)~~ LS 1/19/16 Casing = 200.5' ~~(2-1-16)~~ LS 1/19/16

TJM 5/13/16

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: Geologist

Signature: [signature] Date: 4/13/16 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 1
Date: 7/20/15

Well ID: C8707 | Well Name: N/A | Location: ~31m E of 216-B-46

Project: 9th optional Direct Push Borings in 200-DV-1-OU | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	Drive Time			0-15: silty sandy gravel (msG)	Direct Push with
	2 min	50%		Gravel: 40%, Sand 45%, Silt 15%	GeoProbe, 3½" OD
				Gravel: fp Sand: f-med	Temp. casing.
					Continuous core
5					with 2" OD Lexan
	2 min	30%			liners except where
					noted. Soil classifications
					are estimated
					through Lexan
					liner, other details
10					are based upon
	1 min	17%			299-E33-342
					(approx. 150m SW
13					of C8707) (15'-29.7')
	1 min	N/A		29.7' TM 10/13/16	
15				15-~~25~~: Sand (s): 98% Sand, 2%	13-29.7: Core
	4 min	N/A		Silt. Sand: predom vc	samples not collected
					RAD: Beta/Gamma direct
20					12': 80,000 dpm
					13': 1.4 million dpm
	4 min	N/A			
				TM 10/13/16 (S)	
25				@ 25-29.7: ~~gravelly~~ sand ~~(gS)~~:	
	36 min	N/A		90% Sand, 8% gravel, 2% silt	
				Gravel: vfp, 2-vcp, vfp	
				predom. Sand: predom. vc	
29.7 30					Total Depth: 29.7'

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer
Title: Geologist | Title: Geologist
Signature: [signature] Date: 7/20/15 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 3
Date: 7/16/15

Well ID: C9548 | Well Name: N/A | Location: ~31 m E of 216-B-46

Project: 9 + 12 optional Direct Push Borings in 200-DV-1-OU | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	Drive Time 1 min	NA		0-15': silty sandy gravel (msG) Gravel 40%, Sand 45%, Silt 15%. Sand: f-med Gravel: fp	Direct push with GeoProbe, 3½" OD Temp. casing. Continuous core with 2" OD Lexan liners except where noted. Soil classifications are ~~based on~~ TM 7/16 estimated through Lexan liner, other details are based upon C8707 (0-15') (~1m W of C9548) and 299-E33-342 (approx 150m SW of C9548) (15'-45').
5	1 min	NA			
10	1 min	NA			
15	2 min	NA		45' TM 10/13/16 15-~~25~~': Sand (S): 98% sand, 2% silt Sand: predom vc	0-45' Core samples not collected.
20	1 min	NA			
25	4 min	NA		TM 10/13/16 @25-40: ~~gravelly~~ sand (~~g~~S): 90% Sand, 8% gravel, 2% silt. Sand: predom vc. Gravel: vfp, c-vcp vfp predom.	
30	6 min	NA			
35	3 min	NA			

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: geologist

Signature: [signature] Date: 7/16/15 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 2 of 3

Date: 7/16/15

Well ID: C9548 | Well Name: N/A | Location: ~31 m E of 216-B-46

Project: 9 + 12 optional Direct Push Borings in 200-DV-1 OU | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40	4 min	N/A		40-45: Sand (S) with occasional pebbles. Sand: vc	Direct push w/ GeoProbe, 3 1/2" OD Temp casing. Continuous core w/ 2" Lexan liners.
45	3 min	88%		45-47.5: silty sand (mS) Sand: vc occ. vfp	
47.5	1 min	64%		47.5-52.4: gravelly sand (gS) 20% Gravel, 80% Sand	RAD: Beta/gama direct 47.5': 40,000 dpm 47.5-49.45': 10,000 dpm 49.45'-52.4': 8000 dpm 52.4'-54.4': 7,000 dpm
49.45 50	3 min	75%			
52.4	1 min	80%		52.4-69.4: Sand (S) med.-very coarse with occasional very fine pebble	Soil classifications are estimated through Lexan liner,
54.4 55	3 min	76%			
59.4 60	4 min	68%			
64.4 65	3 min	80%			
69.4 70	4 min	96%		90.6 (slightly) 69.4-~~89.4~~: silty sand (~~m~~S): 85% Sand 15% silt. Sand: vfs-cs	
74.4 75	74.4-79.4 5 min	88%			

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: geologist

Signature: [signature] Date: 7/16/15 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 3

Date: 7/16/15

Well ID: C9548 | Well Name: N/A | Location: ~31m E of 216-B-46

Project: 9 + 12 Optional Direct Push Borings in 200-BW-1 OU | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
79.4					Direct Push w/
80	4 min	85%			GeoProbe, 3 1/2"
					temp casing.
				90.6 TMB w/ 12"	Continuous core
84.4				84.4-89.1: 0.2' cap of fine	w/ 2" Lexan liners
85				grained sand 2.5Y 3/3 dark olive	
	10 min	96%		brown at 84.6' followed by	Soil classifications
				2.7' of silty sand 2.5Y 5/2 grayish	are estimated
				brown from 84.8'-87.5', 87.5'-87.7	through Lexan Liners
89.1				another cap of 2.5Y 3/3 f sand	
90				followed by 2.5Y 5/2 silty sand to	
				89.1	
					Total depth: 90.6' bgs
					7/15/15
				not used	

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: geologist

Signature: [signature] Date: 7/16/15 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 6
Date: 11-9-15

Well ID: C9549 | Well Name: N/A | Location: ~31m E of 216-B-46

Project: 9+12 optional Direct Push Borings in 200-BV-1 OU | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description (Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level)
0	Drive Time	Split Spoons		0-7.2: no sediment recovery	Direct push w/ Becker Hammer 8 5/8" temp casing Split Spoon taken @ 7.2' w/ 2.5' Split Spoon
		7 min			
5					
		30 sec 75% recovery		7.2-9.7' Silty Sandy Gravel (msG) Gravel 40%, Sand 47%, Silt 13% 85% basaltic grains	Sample descriptions were noted from sediments in Lexan liners
10					
				9.7-45.4': no sediment recovered	
15	13 min				
20					
25	40 min			* 8 5/8" casing was left in the ground 26.2-45.4' bgs	
30					
35	162 min				

Reported By: Cameron Penner-Ash / Kim Schuyler | Reviewed By: Sarah Springer

Title: Geologist | Title: Geologist

Signature: Kim Schuyler | Date: 11-9-15 | Signature: Sarah Springer | Date: 12-8-16

↳ on behalf of CPA

A-6003-642 (03/03)

BOREHOLE LOG

Page 2 of 6
Date: 11-9-15

Well ID: CA549	Well Name: N/A	Location: ~31m E of 216-B-46
Project: 9 (+12 optional) Direct Push Borings in 200-DV-1		Reference Measuring Point:

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40	Drive Time				Sonic drilling using 6"OD Temporary casing from 45.4-200.5' bgs Continuous core sampling using 3 1/4" OD Lexan Liners. Descriptions based on visual inspection through liners & may not be representative.
	21 min			* 8 5/8" casing & Shoe left in borehole from 26.2'-45.4' bgs	
	25 min	Coring			
45	1.5 min	Core 100% Recovery		45.8-65.6': Sandy Gravel (sG) 60% Gravel, 40% Sand, Trace Silt. Gravel: 2-4 mm, very moist.	
50	1 min	Core 100% Recovery		@ 50.7' bgs ↑ max gravel: 45 mm, ↓ moist.	
55	1 min	Core 100% Recovery			
60	30 secs	Core 100% Recovery			
65	1 min	Core 100% Recovery		65.6-85.7': CPA 11-9-15 Sand (S) Trace Gravel, 100% Sand, Trace Silt. Sand: mS-vcS, equal distribution of mafic + felsic grains.	
70	1 min	Core 100% Recovery		@ 70.6' bgs: ↑ gravel 5%, ↓ Sand 95%. Gravel: ~2mm.	
75	1 min	Core 100% Recovery			

Reported By: Cameron Penner-Ash		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature: [signature]	Date: 11-9-15	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 6
Date: 2-5-16

Well ID: C9549 | Well Name: N/A | Location: ~31m E of 216-B-46

Project: 9 (+12 optional) Direct Push Boring in 200-BU-1 | Reference Measuring Point: ground surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	Drive Time	Coring			Sonic drilling using 6" OD Temporary casing from 45.4-200.5' bgs. Continuous core sampling using 3 7/4" OD Lexan liners. Descriptions based on visual inspection through liners & may not be representative.
	1 min	Core 100% Recovery		65.6-85.7': Sand (S) 5% Gravel, 95% Sand, Trace Silt. Sand: CS-VCS, equal distribution of mafic + felsic grains	
85					
	2 min	Core 100% Recovery		85.6-90.6': Slightly Silty Sand (m) S) Alternating light and dark stringers ranging between 0.5-1.0". 15% m, 85% c + Trace g.	
90					
	2 min	Core 100% Recovery		90.6-140.7': Sand (S) 5% Gravel, 86% Sand, ~~10~~ 9% Silt. Sand: CS-VCS. Gravel: ~2mm.	
95					
	1 min	Core 100% Recovery		@ 95.7' bgs: ↓ Trace Gravel, ↑ 95% Sand, ↓ 5% Silt. Sand: MS-CS.	
100					
	1 min	Core 100% Recovery		@ 100.8' bgs: ↓ Gravel 0%, ↑ Sand 97%, ↓ Silt 3%. Sand: FS-MS.	
105					
	1 min	Core 100% Recovery		@ 105.7' bgs: ↓ Trace Gravel, ↑ Sand 100%, ↓ Trace Silt.	
110					
	1 min	Core 100% Recovery		@ 110.6' bgs: ↓ Gravel 0%, Sand: FS-CS	
115					
	1 min	Core 100% Recovery		@ 115.8' bgs: ↓ Sand 95%, ↑ Silt 5%. Sand: FS-VCS.	

Reported By: Cameron Penner-Ash | Reviewed By: Sarah Springer
Title: Geologist | Title: Geologist
Signature: [signature] Date: 2-5-16 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 4 of 6
Date: 2-5-16

Well ID: CA549 | Well Name: N/A | Location: ~31 m E of 216-B-46

Project: 9 (112 optional) Direct Push Borings in 200-DV-1 | Reference Measuring Point: ground surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
	Drive Time	Coring			Sonic drilling using 6" OD temporary casing from 45.4-70.5' bgs. Continuous core sampling using 3 3/4" OD Lexan liners ~~after~~ TM 3/15/16 Descriptions based on visual inspection through liners & may not be representative.
120	30 sec	Core 100% Recovery		90.6-140.7': Sand (S) Sand 95%, Silt 5%. Sand: vfS-fS	
125	1 min	Core 100% Recovery		@ 125.8' bgs: ↑Sand 100%, Sand: fS-vcS, 85% vcS.	
				@ 127.3 ~1 ft of alternating 1" light and dark layers.	
130	30 sec	Core 100% Recovery		@ 130' bgs: Sand: only coarse.	
135	30 sec	Core 100% Recovery		↓ cap @ 135.7' bgs: ↑ Sand 98%, ↑ Gravel 2%.	
140	30 sec	Core 100% Recovery		140.6-145.6': Gravelly Sand (gS) 25% Gravel, 75% Sand. Gravel: 2-4mm, 8-10mm, bimodal.	
145	30 sec	Core 100% Recovery		145.6-150.8': Sand(s) 95% Sand, 5% Gravel.	
150	1 min	Core 100% Recovery		150.8-155.7': Sandy Gravel (sG) 50% Gravel, 50% Sand. Gravel: 2-30mm, Sand: fS-cS	
155	30 sec	Core 20% Recovery			
	1 min	Core 100% Recovery		155.7-160.6': Gravelly Sand (gS) 25% Gravel, 75% Sand. Gravel: 2-10mm, Sand: fS-vcS.	

Reported By: Cameron Penner-Ash | Reviewed By: Sarah Springer
Title: Geologist | Title: Geologist
Signature: [signature] Date: 2-5-16 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 5 of 6
Date: 2-5-16

Well ID: C9549 | Well Name: N/A | Location: ~31m E of 216-B-46

Project: 9 (+12 optional) Direct Push Borings in 200-PW-1 | Reference Measuring Point: ground surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
160	Drive Time	Coring			Sonic drilling using 6"ø temporary casing from 45.4-200.5' bgs. Continuous core sampling using 3"x4' Lexan liners. Descriptions based on visual descriptions through liners & may not be representative.
	30sec	Core 100% Recovery		160.6-190.8': Sand (S) 5% Gravel, 95% Sand. Sand: vfs-ms. Gravel: 4mm.	
165				@ 165.8' bgs: ↓ Gravel 0%, ↑ Sand 100%. Sand: fs-vcs, 95% vcs.	
	30sec	Core 100% Recovery			
170					
	1 min	Core 100% Recovery		@ 170.7' bgs: ↓ Sand 95%, ↑ Silt 5%. Sand: fs-ms.	
175					
	30sec	Core 100% Recovery			
180				@ 180.6' bgs: ↑ Gravel 5%.	
	30sec	Core 100% Recovery			
185					
	1 min	Core 100% Recovery		@ 185.8' bgs: ↓ Gravel 5%, ↑ Silt 5%. Sand: vfs-cs.	
190				~~Time to refusal~~ 200.7 190.7 - ~~195.7~~': Sandy Gravel (sG). Gravel: 60%, Sand: 30%, Silt: 10%. Gravel: max: 45mm	
	1 min	Core 100% Recovery			
195					
	1 min	Core 100% Recovery			

Reported By: Cameron Penner-Ash | Reviewed By: Sarah Springer
Title: Geologist | Title: Geologist
Signature: [signature] Date: 2-5-16 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 6 of 6
Date: 2-5-16

Well ID: ~~C9~~ C9549 (2-5-16 CDA) | Well Name: N/A | Location: ~31 m E of 216-B-~~96~~ 46 (CDA)

Project: 9 (+12 optional) Direct Push Borings in 200-BP | Reference Measuring Point: ground surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
200	Drive Time 1min	Coring Core 100% Recovery		200.7' TM 10/28/16	Sonic drilling using 6" OD Temporary casing from 45.4-200.5' bgs. Continuous core sampling using 3 7/8" OD Lexan liners. Descriptions based on visual inspection through liners & may not be representative.
				190.7 - ~~195.7~~: Sandy Gravel (sG) Gravel 60%, Sand: 30%, Silt: 10%. Gravel: max: 45mm.	
205				8 5/8" casing and shoe left in borehole at 216.2-45.4' bgs	
210				10/28/16	Total Depths 8 5/8" casing: 45.38' 6" casing: 200.5' Borehole: 200.7'
215					
220					
225				Not used	
230					
235					

Reported By: Cameron Penner-Ash | Reviewed By: Sarah Springer
Title: Geologist | Title: Geologist
Signature: [signature] Date: 2-5-16 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 1

Date: 11-9-10

Well ID: C8709	Well Name: N/A	Location: SW Corner of 216-B-46
Project: 9 +1/2 optional Direct Push Boring in 200-OU-1 OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	Drive Time	Split Spoons			Direct push with
	30secs				Becker Hammer, 8 5/8"
					Temp. Casing. Split spoons
		10sec 75% Rec.		2-4': Silt (M) 2% Gravel, 20% Sand,	taken @ 2, 4, and
				78% Silt. Dry.	6' bgs with 25'
5		10sec 80% Rec.			Split spoon.
	1min			4-6: Gravelly Sandy Silt (gsM)	
		10sec 100% Rec.		10% Gravel, 20% Sand, 70% M. Gravel:	
				~70% of Clasts 30mm + WR. Silts: moist.	
				@6' bgs Gravel ↑ 25%, Sand ↑ 30%	
10				Silt ↓ 45%. Dry.	
				6.2-8.7' Gravelly sandy Silt (gsM)	
	3hrs			25% gravel, 30% Sand, 45% Silt	
15					Layne head driller
					calls refusal @ 16.3'
					bgs. on 10-13-15.
					Borehole is decomissed.
20					Casing Shoe left
					in borehole 15.1-16.3'
25					
30				Not used	
35					

Reported By: Cameron Penner-Ash		Reviewed By: Sarah Springer	
Title: Geologist		Title: Geologist	
Signature: [signature]	Date: 11-9-15	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 1

Date: 11-10-15

Well ID: C9551	Well Name: N/A	Location: SW Corner of 216-B-46
Project: 9 + 12 optional Direct Push Borings in 200-DV-1		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	Drive Time	Split Spoons			Direct Push with
				0-12.9 no drill cuttings	Becker Hammer, 8 5/8"
				were observed	Temp Casing
	5 mins				
5					
					Refusal @
					12.9' (10-14-15)
10	32 mins				
15					
20					
25					
30					
35					

Not used

Reported By: Cameron Penner-Ash		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature: [signature]	Date: 11-10-15	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 6
Date: 11-10-15

Well ID: C9552	Well Name: N/A	Location: SW Corner of 216-B-46	
Project: 9 1/2 optional Direct Push Borings in 200-OU-1 OU		Reference Measuring Point: Ground Surface	

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	Drive Time	Split Spoons		0-45.5: no sediment recovery	Direct Push w/ Becker Hammer, 8 5/8" Temp. Casing. Split Spoons were not collected due to previously collected cores from a Cascade borehole.
5	4 mins	None Collected			No sediment recovery due to drilling method
10					
15	44 mins				
20					
25	41 mins				
30					
35	56 mins		8 5/8" casing remains		*9.2' of 8 5/8" casing was left in the ground. Estimated depth: 36.1-45.3'

Reported By: Cameron Penner-Ash		Reviewed By: Sarah Springer	
Title: Geologist		Title: Geologist	
Signature: [signature]	Date: 11-10-15	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 2 of 6
Date: 3-7-16

Well ID: C9552 | Well Name: N/A | Location: SW corner of 216-B-46

Project: 9+12 optional Direct Push borings in 200-DV-1 OU | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40	7 min.	None collected	8 5/8" casing remains		Direct push w/ Becker Hammer, 8 5/8" Temp. casing to a depth of 45.3'
45	30 sec.	coring core 100% recovery		45.5'-47.0': Sand (S), m=0% s=95% g=5%. Sand: f-vc. Gravel: 2-4mm, SR. Moist	Begin sonic drilling w/ 6-in casing @ 45.5' continuous core samples were collected
	30 sec.	core 100% recovery		47.0-49.5: Sandy Gravel (SG), m=0% s=55% g=45%. Sand: f-vc Gravel: 2-40mm, SR vf-vc pebble	
50	1 min.	core 100% recovery		49.5-52.0': Sandy Gravel (SG), m=Ø s=35% g=65%. Sand: f-vc. Gravel 2-65mm, SR vf pebble - sm cobble	Soil classifications are estimated through Lexan liner and may not be representative
55	30 sec.	core 100% recovery		52.0'-57.2': Sandy Gravel (SG), m=Ø, s=35% g=65%. Sand: f-vc. Gravel 2-4mm, SR, vf pebble	
60	30 sec.	core 100% recovery		57.2'-62.2': Sandy Gravel (SG), ~~m=Ø, s=~~ TMM 3/7/16 m=5%, s=30%, g=65%. Sand: f-c avg. m Gravel: 2-4mm, SR. Silt is non plastic	* 9.2' of 8 5/8" casing was left in the ground Estimated depth: 36.1-45.3' *
65	1 min.	core 100% recovery		62.2'-67.1': gravelly Sand (gS) m=Ø s=75% g=25% Sand: f-c avg. m Gravel: 2-4mm, SR, vf pebble	
70	30 sec.	core 100% recovery		67.1-117.2: Sand (S) 67.1'-72.1': Sand (S) m=5% s=95% g=Ø% Sand: f-c avg m.	
75	1 min.	core 100% recovery		72.1'-77.2': Sand (S) m=5% s=95% g=Ø% Sand: f-c avg. m.	
	30 sec	core 100% recovery		77.2'-82.2': Sand (S) m=5% s=95% g=Ø% Sand: f-c avg. m.	

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer
Title: Geologist | Title: geologist
Signature: [signature] Date: 3/7/16 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 6
Date: 3-7-16

Well ID: C9552 | Well Name: N/A | Location: SW corner of 216-B-46

Project: 9+12 optional Direct Push Borings in 200-DV4-00 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	30 sec.	core 100% recovery		67.1-117.2 Sand (S)	sonic drilling w/6-in temp. casing. Continuous core samples were collected
	1 min	core 100% recovery		82.2'-87.2': Sand (S) m=0% s=100% g=0% Sand: vfs-ms	
85					Soil classifications are estimated through Lexan liners and may not be representative
	1 min.	core 100% recovery		87.2'-92.1': Sand (S) m=5% s=90% g=5% Sand: vfs-ms Gravel: 2-4 mm, vf pebble SR.	
90					
	1 min	core 100% recovery		92.1'-97.2' Sand (S) m=5% s=95% g=0% Sand: vfs-cs avg f-m	
95					
	1 min.	core 100% recovery		97.2'-102.2': Sand (S) m=5% s=95% g=0% Sand: vfs-cs avg f-m	
100					
	30 sec.	core 100% recovery		102.2'-107.2': Sand (S) m=5% s=95% g=0% Sand: vfs-cs avg. f-m	
105					
	30 sec.	core 100% recovery		107.2'-112.2': Sand (S) m=5% s=95% g=0% Sand: vfs-cs avg f-m	
110					
	30 sec.	core 100% recovery		112.2'-117.2': Sand (S) m=7% s=93% g=0% Sand: vfs-cs avg f-m	
115					
	30 sec	core 100% recovery		117.2-127.5: Slightly silty Sand (m)S	

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: Geologist

Signature: [signature] Date: 3-7-16 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 4 of 6
Date: 3-7-16

Well ID: C9552 (optional) | Well Name: N/A | Location: SW corner of 216-B-46

Project: 9+12 Direct Push Borings in 200-DV-100 | Reference Measuring Point: Ground surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
120	30 sec	core 100% recovery		117.2-122.1: slightly silty sand (m) S m=15%. S=85%. g=0%. Sand: vf-vc avg. m-c	Sonic drilling w/ 6-in temp. casing. continuous core samples were collected
	30 sec	core 100% recovery		117.2-127.5: slightly silty sand (m) S m=15%. S=85%. g=0%. Sand: vf-vc. avg m-c	
125					Soil classifications are estimated through Lexan liners and may not be representative
				127.5'-142.2': Sand (S)	
	30 sec.	core 100% recovery		127.5'-132.3': sand (S) m=5% S=95% g=0%. Sand: vf-vc. avg. m	
130					
	30 sec.	core 100% recovery		132.3'-137.1': Sand (S) m=5% S=95% g=0%. Sand: vf-vc avg. c	
135					
	30 sec.	core 100% recovery		137.1'-142.2': Sand (S) m=5% S=95% g=0%. Sand: vf-vc avg. m-c	
140					
				142.2'-157.2': sandy Gravel (sG)	
	30 sec.	core 100% recovery		142.2'-147.3': sandy Gravel (sG). m=5% S=60%. g=35%. Sand: vf-c avg. m. Gravel: 2-45mm, avg 15 mm, SR, vf-vc pebble	
145					
	30 sec.	core 100% recovery		147.3'-152.3': sandy Gravel (sG) m=5% S=60%. g=35%. Sand: vf-c avg. m. Gravel: 2-45mm, avg. 15mm, SR, vf-vc pebble	
150					
	30 sec.	core 100% recovery		152.3'-157.2': sandy Gravel (sG) m=5% S=60%. g=35%. Sand: vf-vc avg. m. Gravel: 2-45mm avg. 15mm, SR, vf-vc pebble	
155					
	30 sec	core 100% recovery		157.2'-187.2': gravelly Sand (gS)	

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: geologist

Signature: [signature] Date: 3-7-16 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 5 of 6
Date: 3-7-16

Well ID: C9552
Well Name: N/A
Location: SW corner of 216-B-46
Project: 9+12 Direct Push Borings in 200-DV-100 (optional)
Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
160	30 sec.	core 100% recovery		157.2'-162.2': gravelly Sand (gS) m=5% s=75% g=20% Sand: vf-c avg. f-m Gravel: 2-16mm avg. 2mm, SR, vf-f pebble.	Sonic drilling w/6-in temp casing. continuous core samples were collected
165	30 sec.	core 100% recovery		162.2'-167.2': gravelly Sand (gS) m=5% s=80% g=15% Sand: vfs-cs avg f-m Gravel: 2-45mm avg. 2-6mm, v. occ 45mm, SR, vf-vc pebble	Soil classifications are estimated through Lexan liners and may not be representative
170	30 sec.	core 100% recovery		167.2'-172.3': gravelly Sand (gS) m=5% s=80% g=15% Sand: vf-c avg m-c Gravel: 2-45mm avg. 2-6mm, SR, vf-vc pebble	
175	30 sec.	core 100% recovery		172.3'-177.3': gravelly Sand (gS) m=5% s=80% g=15% Sand: vf-c avg. m-c Gravel: 2-45mm avg. 2-6mm, SR, vf-vc pebble	
180	30 sec.	core 100% recovery		177.3'-182.1': gravelly Sand (gS) m=5% s=85% g=10% Sand: vf-c avg. m-c Gravel: 2-4mm SR, vf pebble	
185	30 sec.	core 100% recovery		182.1'-187.2': gravelly Sand (gS) m=5% s=85% g=10% Sand: vf-c avg m-c Gravel: 2-4mm SR, vf pebble	
190	30 sec.	core 100% recovery		187.2-202.2 = Sandy Gravel (sG) 187.2'-202.2': m=5%, s=45%, g=50% Sand: vf-vc avg cs. Gravel: 2-50mm, SR, f-vc pebble	
195	1 min.	core 100% recovery			
	30 sec	core 100% recovery			

Reported By: Tracy Mallgren
Title: Geologist
Signature: [signature] Date: 3-7-16

Reviewed By: Sarah Springer
Title: geologist
Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 6 of 6
Date: 4-26-16

Well ID: C9552
Well Name: N/A
Location: SW corner of 216-B-46
Project: 9417 optional Direct Push Borings in 200-DV-1 OU
Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
200	30 sec	core 100% Recovery		187.2-202.2: m Sandy Gravel (s(a) m=5% s=45% g=50% Sand: vf-vc avg cs Gravel: 2-50mm, sr, vf-vc pebble	
TD 202.2					Total Depth: 202.2' (2/17/16)
205					Casing @ 202.2'

Not used 4/26/16

Reported By: Tracy Mallgren
Title: Geologist
Signature: [signature] Date: 4/26/16

Reviewed By: Sarah Springer
Title: geologist
Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 5

Date: 11-9-15

Well ID: C8706	Well Name: N/A	Location: NE of 216-B-46
Project: 9 *12 optional Direct Push Borings in 200-DV-1		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
	Drive Time	Split Spoons			
0	13 secs	N/A	N/A	0-2' Crushed gravel pad	Direct Push w/ Becker Hamer, 8 5/8" OD Temp Casing. Split spoons at 2, 3.9, and 5.9' bgs using a 2.5' split spoon.
	1 min	28 sec 65% Rec.		2-45.5: Silty Sandy Gravel (ms6) 50% Gravel, 38% Sand, 12% Silt. Gravel: 2-30mm, 70% Basalt, Sand: vfs-ms.	
5	37 sec	37 secs 70% Rec.			
	6 mins	42 secs 75% Rec.		@ 3.9' bgs Sand ↓ 28%, Gravel ↑ 60% @ 5.9' bgs Sand ↓ 14%, Gravel ↑ 75%	Sediment was not recovered from 8.4'-45.5', unable to describe lithology
10			Not used		casing was advanced without producing drill cuttings
15	17 mins				
20					
25	61 mins				
30	61 mins				
35	23 mins		Not used		

Reported By: Cameron Penner-Ash		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature: [signature]	Date: 11-9-15	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 2 of 5

Date: 10/23/15

Well ID: C8706 | Well Name: N/A | Location: NE of 216-B-46

Project: 9+12 optional Direct push borings (in 200-BP-1) | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40	Drive Time / 28 min (push)	core sample / N/A	Not used	2-45.5 Silty Sandy Gravel (msG) Sand-14%, gravel-75, Silt-11%	Direct push w/ Becker Hammer, 8 5/8" OD temp. casing to a depth of 45.3' bgs
					sediment was not recovered from 8.4-45.5'
45	7 min	Begin core ↓		45.5-52.2' gravelly Sand (gS) 75% sand, 25% gravel	Begin drilling w/ Sonic rig w/ 6-in temp. casing. Continuous core samples were collected
	10 sec	100%			
	30 sec	100%			
50	30 sec	100%		52.2'-62.2' sandy Gravel (sG) 55% Sand, 40% gravel, 5% silt	Soil classifications are estimated through Lexan liner (3-in diameter)
55	30 sec	100%			45.5-47.0' - 5,000 dpm direct on soil, 10,000 dpm direct through liner radon?
60	30 sec	100%		62.2-137.2' Sand (S), 95% Sand 5% gravel. Gravel ↓ 2-6mm, Sand=ms-vcs avg=cs	
65	30 sec	100%		@67.3' gravel size ↓ 2mm Sand=vfs-cs, avg=ms	
70	30 sec	100%			
75	30 sec	100%			
	30 sec	100%			

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: geologist

Signature: [signature] Date: 2/22/16 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 5

Date: 2/22/16

Well ID: C8706	Well Name: N/A	Location: NE of 216-B-46
Project: 9+12 optional direct push borings in 200-DV-100		Reference Measuring Point: Ground surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	drive time 30 sec	core sample 100%		62.2 - 137.2' Sand (S) 95% sand 5% gravel. Gravel = 2mm, sand = vfs-cs avg = ms	Continuous core w/ sonic rig and 3-in Lexan liners, 6-in temp. casing
85	30 sec	100%			Soil classifications are estimated through Lexan liner
90	30 sec	100%			
95	30 sec	100%			
100	30 sec	100%			
105	60 sec	100%			
110	30 sec	100%			
115	10 sec	100%			
	30 sec	100%			

Reported By: Kim Schuyler		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature: Kim Schuyler	Date: 2/23/16	Signature: Sarah Springer	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 4 of ~~4~~ 5 (KS 3/7/16)

Date: 2-24-16

Well ID: C8706 | Well Name: N/A | Location: NE of 216-B-46

Project: 9+12 optional direct push borings in 200-DV-1 OU | Reference Measuring Point: Ground surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description (Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level)
120	Drive Time 30 sec	Core Sample 100%		62.2 - 137.2' Sand (S) 95% Sand 5% gravel. Gravel = 2mm, Sand = vfs - cs, avg = ms	continuous core w/sonic rig and 3-in Lexan liners 6-in temp casing
125	30 sec	100%			Soil classifications are estimated through Lexan liners
130	30 sec	100%			
135	30 sec	100%			
140	30 sec	100%		137.2 - 147.1' gravelly Sand (gS) 20% gravel, 77% Sand, 3% Silt Sand: vfs - cs, avg = ms, gravel ↑8mm SR	
145	30 sec	100%			
150	30 sec	100%		147.1 - 182.3' Sand (S) 95% sand 5% silt, Sand = vfs - cs, avg = ms	
155	30 sec	100%			
	30 sec	100%			

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: geologist

Signature: [signature] Date: 2-24-16 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 2/24/16

Well ID: C8706 | Well Name: N/A | Location: NE of 216-B-46

Project: 9+12 optional direct push borings in 200-BV-1 OU | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
160	Drive time 30 sec	core sample 100%		147.1- 182.3' sand (S) 95% sand 5% silt, sand = vfs-cs, avg = ms	continuous core w/ sonic rig and 3-in diameter Lexan liners 6-in temp casing
165	30 sec	100%			Soil classifications are estimated through Lexan liners
170	30 sec	100%			
175	30 sec	100%		@ 177.3' sand size ↑ vfs-vcs avg = cs	
180	30 sec	100%			
185	30 sec	100%		182.3- 187.3- gravelly sand (gS) 25% gravel, 72% sand, 3% silt, ↑gravel size to 8mm SR	
190	30 sec	~~100%~~ 28% (KS 2/29/16)		187.3-192.3' sandy gravel (SG) 35% gravel, 62% sand, 3% silt ↑gravel size to 90mm	187.8-188.8' color change and noticable finer grains through liner. CCU?
195	60 sec	100%		192.3-197.3' gravelly sand (gS) 25% gravel, 72% sand, 3% silt sand: vfs-vcs, avg = cs, gravel up to 8mm	
	60 sec	100%	T.D.	197.3'- 202.3' sandy gravel (SG) 57% gravel, 40% sand, 3% silt Total Depth = 202.3' 2/29/16	

Reported By: Tracy Mellgren | Reviewed By: Sarah Springer

Title: Geologist | Title: geologist

Signature: [signature] Date: 2/29/16 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 3
Date: 11-11-15

Well ID: C4492	Well Name: N/A	Location: 216-T-5 trench
Project: 9+12 optional boreholes in 200-DV-1 OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	Drive Time	Split Spoon			Direct Push w/ Becker
	2 min		Not Used		Hammer, 8 5/8" Temp.
					Casing. Split spoons @
				3-5' Gravelly Sand (gS), 20% Gravel	3, 7, and 9' bgs using
		15 sec 75% Rec.		75% Sand, 5% Silt. Gravel: Subrounded,	a 2.0' Split Spoon.
5	1 min			30-60 mm. Sand: vfs-vcs. Silt: Non plastic.	
				Dry.	
			Not Used		
	20 sec	10 sec 100% Rec.		7-9.1' Gravelly Silty Sand (gmS), 10% Gravel,	
				60% Sand, 30% Silt. Gravel: ~2mm.	
10	1 min	16 sec 60% Rec.		Sand: vfs-ms. Silt: Mod. Plastic. Moist.	
				9.1-11.0 Slightly Silty Gravelly Sand ((m)gS)	
				Gravel: A-SR, 2-30mm, Sand: vfs-vcs.	
				Moist.	
15	10 min				
20					
25	13 min				
			Not Used		
30					
35	25 min				

Reported By: Cameron Penner-Ash		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature: Cameron Penner-Ash	Date: 11-11-15	Signature: Sarah Springer	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 2 of 3

Date: 10/03/16

Well ID: C9492	Well Name: N/A	Location: 216-T-5 Trench
Project: 9+12 optional Boreholes in 200-PU-1 OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40	15 sec	55% recovery		40.5'-42.7': sandy Gravel: m=5% s=55% g=45% Gravel: 2-75mm, vf pebble-sm cobble, avg 2-8mm, SA. Sand: vf-vc avg m-c	Sonic drilling using 6" OD casing from 40.5'-100.5' bgs. Continuous core sampling using 3 3/4" OD Lexan liners. Descriptions based on visual inspection through liners & may not be representative.
45	10 sec	0% recovery	Not used	42.7-52.4: No soil recovery	
50	5 sec	0% recovery			
55	45 sec	40% recovery		52.4'-67.0': ~~m=5%~~ gravelly Sand (gS) m=5% s=75% g=25% Sand: vf-m avg m Gravel: 2-50mm vf-vc pebble, SA-SR	
60	25 sec	82% recovery			
65	45 sec	100% recovery		@ 63.0' m=T s↑85% g↓15% Gravel ↓ 2-45mm Sand: vf-vc avg↑c	
70	45 sec	100% recovery		67.0'-78.0': Sand (S) m=T s=91% g=9% Sand: vf-vc avg m-c Gravel: 2-20mm vf-c pebble, SA-SR	During clean out of the borehole 2.5 gal of H_2O was added between 67-72' bgs
75	40 sec	100% recovery		@ 73.0': m↑5% s↑95% g↓0%	

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: Geologist	
Signature:	Date: 10/03/16	Signature:	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 3

Date: 10/03/16

Well ID: C9492	Well Name: N/A	Location: 216-T-5 Trench
Project: 9+12 Optional Boreholes in 200-DV-100		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	30 sec	100% recovery		78.0'-87.6': slightly silty Sand (cm) S) m=15% s=80% g=5% Sand: vf-vc avg m Gravel: 2-6mm vf-f pebble, SR @ 82.6': s↑85% g↓0%	Sonic drilling using 6" OD casing from 40.5'-100.5' bgs. Continuous core sampling using 3 3/4" OD Lexan liners. Descriptions based on visual inspection through liners & may not be representative.
85	45 sec	100% recovery			
	30 sec	100% recovery		87.6'-102.0': Silt (ML) m=85% s=15% g=0% Sand: vf-f	
90				@ 92.5': m↑90% s↓10%	
95	30 sec	100% recovery			
100	30 sec	100% recovery			Total Depths: 8 5/8" casing: 40.5' 6" casing: 100.5' (6-2-16) Borehole: 102.0'
102.0	Borehole Total Depth				

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: Geologist	
Signature: [signature]	Date: 10/03/16	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 3

Date: 11-13-15

Well ID: C9494	Well Name: N/A	Location: 216-T-5 Trench (South)
Project: 9 Direct (+12 optional) Push Borings in 200-OU-1		Reference Measuring Point: ground surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	Drive Time			0-40.7 unknown	Direct Push w/ Becker Hamer, 8 5/8" Temp. Casing. No Samples Collected.
5	3min				
10		No samples collected	No sediment recovery		
15	7min				
20					
25	12min				
30					
35	27min				

Reported By: Cameron Penner-Ash		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature: [signature]	Date: 11-13-15	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 5-31-16

Well ID: C9494	Well Name: N/A	Location: 216-T-5 (South)
Project: 9412 optional Direct Push Borings in 200-DV-1 OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40	Drive Time	Core Recovery		40.7'-67.0': gravelly Sand (gS) g=30%. S=70% m=0%. Gravel: 2-40mm, vf-vc pebble avg 10mm med pebbles. 90% maf. 10% felsic a-sa. Sand: m-vc avg c-vc 80% maf 20% felsic, SA slightly moist.	Sonic drilling using 6"OD Temporary casing from 40.4'-100.6'. Continuous ~~sampling using 3 7/4" OD texan liners. Descriptions based on visual observations through liners & may not be representative.~~ No samples collected. TM 5/31/16
45	1 min			47.0'-57.0': G ↑ 2mm-180mm vf-pebble-large cobble avg 10mm SA.	
50	1.5 min				
55				57.0'-67.0': g↓15% S↑85% m=T Gravel: 2mm-90mm, vf pebble-sm cobble avg 8mm f.pebble. Sand avg m-c. Dry	
60	5 min				
65				67.0'-77.0': Sand (S) g=5% s=95% m=T Gravel: 2mm vf pebble, 90% maf 10% fel. SA-SR. Sand: vf-c, avg m, 80% maf 20% fel SA-SR. Dry	
70	6 min 15 sec				
75				77.0'-87.0': silty Sand (mS) g=0% s=65% m=35% Sand: vf-f 90% fel, 10% maf. Dry. Silt: med plasticity	
	5 min 45 sec				

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature:	Date: 5/31/16	Signature:	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 3

Date: 5-31-16

Well ID: C9494	Well Name: N/A	Location: 216-T-5 (South)
Project: 9112 optional Direct Push Borings in 200-DV-1 OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	5 min 45 sec			77.0'-87.0': silty Sand (mS) g=0% s=65% m=35% Sand vf-f 90% fel, 10% maf Dry. Silt: med plasticity	Sonic drilling using 6" OD casing from 40.4-100.6' bgs. No samples collected
85				87.0'-95.0' Silt (M) 0% g T=S 100% m. Trace sand: vf, fel. Silt: med plasticity	
90	12 min				
95	7 min			95.0-100.6': sandy Silt (sM) 0% g 30% s 70% silt. Sand: vf-f 90% fel. DRY M: Low plasticity Caliche nodules up to ~45 mm noticed	
100 / 100.6				Total Depth 100.6' (5/25/16) Casing to 40.4'	

Not Used
KG
10/26/16

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature: [signature]	Date: 5/31/16	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 1

Date: 10/26/16

Well ID: C9502 | Well Name: N1A | Location: 216-T-Cs Crib #1

Project: 9+12 optional Boreholes in 200-DV-100 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	Drive Time	No sediment recovered		0-15 No sediment recovery	Direct push with Becker Hammer using 8 5/8" OD Temporary Casing to 15.0' bgs
5	1 min				
10	37 min				
15					Casing refusal at 15 ft bgs.

Not Used
TM 10/26/16

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature:	Date: 10/26/16	Signature:	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 3

Date: 7/5/16

Well ID: C9554

Well Name: N/A

Location: 216-T-6 C crib #2

Project: 9 + 12 optional Boreholes in 200-DV-10U

Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	Drive Time			0-43.7: Direct push drilling with no soil recovery.	Direct Push with Becker Hammer, 8 5/8" OD Temporary casing to 43.7' bgs No samples collected.
5	2 min				
10			Becker Hammer Direct Push		
15	43 min				
20					
25	50 min		No soil recovery		
30	43 min				
35	131 min				

Reported By: Tracy Mallgren

Title: Geologist

Signature: [signature] Date: 7/5/16

Reviewed By: Sarah Springer

Title: Geologist

Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 2 of 3

Date: 7/15/16

Well ID: C9554	Well Name: N/A	Location: 216-T-6 Crib #7
Project: 9+12 optional Boreholes in 200-DV-100		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40	131 min	Direct Push Becker Hammer	Not Used	0-43.7': Direct push drilling with no soil recovery.	Direct Push with Becker Hammer 8 5/8" OD Temp. casing to 43.7' bgs. Sonic drilling with 6" OD Temp. casing from 43.7'-107.5' bgs. No samples collected.
45	20 sec			43.7'-67': gravelly Sand (gS). g=15%, s=85, m=T Gravel: 2mm-15mm, vf-m Pebble, max 15mm, SA, 85% mcf 15% fel Sand: c-vc, avg c, SA, 80% mcf, 20% fel Moist.	
50	30 sec	Sonic Drilling			
55					During clean out of borehole 1 gal H_2O was added between 57'-67' bgs.
60	3.5 min				
65				67-107.5': Sand (S). g=5%, s=90%, m=5% Gravel: 2mm-10mm vf-m pebble, max 10mm, SA, 80% mcf, 20% fel. Sand: f-c avg m, SA, 50% mcf, 50% fel. Dry.	
70	2.5 min				
75					

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature: [signature]	Date: 7/15/16	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 3

Date: 7/15/16

Well ID: C9554	Well Name: N/A	Location: 216-T-6 Crib #2
Project: G+12 optional Boreholes in 200-DV-1 OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	Drive Jam			67-107.5': Sand (S): g=5%, s=90%, m=5%, Gravel: 2mm-10mm, uf-m pebble, max 10mm SA, 80% maf, 20% fel. Sand: f-c avgm, SA, 50% maf 50% fel. Dry	Sonic drilling with 6" OD Temp. casing from 43.7-107.5' bgs. No samples collected.
85	30 sec				
90		Sonic Drilling			
95	2 min				
100					
105					
107	Total	Depth			

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: Geologist	
Signature:	Date: 7/15/16	Signature:	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 3

Date: 7/5/16

Well ID: C9499	Well Name: N/A	Location: 216-T-16 Crib #1
Project: 9 + 12 optional Boreholes in 200-PW-1OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	Drive Time	% recovery	not used	0-3: Direct push drilling with no soil recovery.	Direct Push with Becker Hammer, 8 5/8" OD Temp. casing. Split spoons at 3.0', 8.6', & 13.0' bgs using a 2.5' split spoon. Direct push to 43' bgs
	5 sec				
	5 sec	~~20%~~ 20% recovery		3.0'-5.5: sandy Gravel (sG): g=70%, s=25%, m=5%. Gravel: 2mm-70mm, vf pebble-sm cobble, SR. Sand: vf-c, SA, avg m. Moist	
5	30 sec		not used		
	30 sec	100% recovery		8.6'-15.5': gravelly Sand (gS) g=25%, s=75%, m=T Gravel: 2mm-45mm, vf-vc pebble, SA. Sand: vf-c, SA, avg m. Dry	
10	6 min		not used		
	30 sec	100% recovery		15.5-43': Direct push drilling with no soil recovery.	
15	138 min	Becker Hammer Direct Push			
20					
25	100 min	No soil recovery			
30	177 min		not used		
35	100 min				

Reported By: Tracy Mallgren	Reviewed By: Sarah Springer
Title: Geologist	Title: geologist
Signature: [signature] Date: 7/5/16	Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 2 of 3

Date: 7/5/16

Well ID: C9499 | Well Name: N/A | Location: 216-T-6 Crib #1

Project: 9+12 optional Boreholes in 200-DV-10 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40	Drivetime	% recovery	Not Used		Direct Push with Becker Hammer 8 5/8" OD Temp Casing to 43' bgs.
	100 min	Direct Push			
	12 min			43.0-82.4': Sand(S): m=T, s=95, g=5 Gravel: 2-8mm, vf-f pebble, SA. Sand: m-vc avg. c. Moist	43'-107' Sonic drilling with 6" OD Temp. casing Continuous core sampling using 3 7/4" OD Lexan Liners. Descriptions based on visual inspection through liners & may not be representative.
45	10 sec	100% recovery			
				47': m 5% non plastic. Sand: vf-vc s 90%	
	15 sec	100% recovery			
50	10 sec	100% recovery		49.6': g 0% Sand: vf-c avg m. Dry s 95%	
	15 sec	100% recovery			
55	20 sec	100% recovery			
	10 sec	100% recovery			
60				62.4: g 5% s 90% Gravel: 2-10mm vf-m pebble, SA	
65	15 sec	100% recovery			
70	15 sec	100% recovery			
75	15 sec	100% recovery			

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: Geologist

Signature: [signature] Date: 7/5/16 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 3

Date: 7-5-2016

Well ID: C9499	Well Name: N/A	Location: 216-T-6 Crib #1
Project: 9+12 optional Boreholes in 200-DV-1 OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	Drive Time	% recovery		62.4'-82.4': Sand (S): m=5%, s=90%, g=5%. Gravel: 2-10mm, vf-m pebble, SA. Sand: vf-c. avg. m. Dry	Sonic drilling with 6" OD Temp. casing from 43'-107'. Continuous core sampling using 3 3/4" OD Lexan Liners. Descriptions based on visual inspection through liners & may not be representative.
	10 sec	100% recovery			
	10 sec	100% recovery		82.4'-97.0': gravelly Sand (gS): m=5% s=85%, g=10%. Gravel: 2-8mm, vf-f pebble, SA-SR Sand. vf-c avg m. Dry	
85					
	15 sec	100% recovery			
90					
	10 sec	100% recovery			
95				97.0'-107.0': Sand (S). m=5% s=95%. g=Ø Sand: vf-vc, avg m, SA-SR. Dry	
	15 sec	100% recovery			
100					
	10 sec	100% recovery			
105					
107	Total	Depth			Total Depths: 8 5/8" casing: 43.4' 6" casing: 105.5' Borehole: 107.0' (6/27/16)
110					

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: Geologist	
Signature:	Date: 7/5/16	Signature:	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 3

Date: 11-16-15

Well ID: C4495	Well Name: N/A	Location: 216-T-14 Trench
Project: 9 Direct (+12 optional) Push Boring in 200-DV-1		Reference Measuring Point: ground surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	Drive Time	Split Spoons		0-35.75 unknown	Direct Push w/ Becker Hammer, 8 5/8" Temp. Casing. No Split Spoons.
5	3.25 min		No sediment recovery		
10		Becker Hammer			
15	4 min	Direct Push			
20					
25	7 min				Sonic drilling using 6" to Temporary Casing from 35.75' - 105.2' bgs. No samples collected.
30					
35	16 min			35.75-57.0' Due to RAD controls all soils in this interval were double bagged in yellow sleeving + tagged as RAD waste preventing soil identification.	35.75-37.0': RAD ~400,000 dpm beta/gamma direct on soil through plastic sleeving

Reported By: Cameron Penner-Ash		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature: Cameron Penner-Ash	Date: 11-18-15	Signature: Sarah Springer	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 5-31-16

Well ID: C9495 | Well Name: N/A | Location: 216-T-14 Trench

Project: 9412 optional Direct Push Borings in 200-PU-1 OU | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40	Drive Time 45 sec			35.75'-57.0': Due to RAD controls all soils in this interval were double bagged in yellow sleeving + tagged as RAD waste preventing soil identification.	Sonic drilling using 6"OD Temporary casing from 35.75'-105.2' bgs. No samples collected
45	45 sec				
50	30 sec		Not Used		
55	15 sec				
60	1min 10 sec			57.0'-77.0': Sand (S) g=0% s=100% m=0% Sand: vf-m 60% fel 40% maf moist	
65					
70	30 sec			67.0'-77.0' g↑5% s↓95% m=T (Gravel: 2-10mm vf-m pebble avg. 4mm SR. Sand vf-vc avg < 60% fel SA. moist	
75	1min 30sec			77.0'-100.0' gravelly Sand (gS) g=15% s=85% m=T (Gravel: 2-10mm vf-m pebble 90% m SR. Sand: vf-vc avg < 60% fel	

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: geologist

Signature: [signature] Date: 5/31/16 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 5-31-16

Well ID: C9495	Well Name: N/A	Location: 216-T-14 Trench
Project: 9112 optional Direct Push Borings in 200-DV-1 OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	Drive Time			77.0'-100.0': gravelly Sand (gS) g=15% s=85% m=T Gravel: 2-10mm vf-m pebble 90% mf SR. Sand: vf-vc avg. c 60% fel SA moist.	Sonic drilling using 6" ∞ temporary casing from 35.75'-105.2' bgs. No samples collected.
85	1min 30sec				
90	15 sec				
95	1min 30sec				
100	2 min			100.0-106.0: Silt (M) g=0% s=0% m=100% Silt: mod plasticity.	
105					
106	Total Depth				Total Depths: 8 5/8" casing: 35.75' 6" casing: 105.2' Borehole: 106.0' (5/31/2016)

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature: [signature]	Date: 5/31/16	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 3
Date: 11-16-15

Well ID: C9496 | Well Name: N/A | Location: 216-T-15 (N)

Project: 9 Direct (+12 optional) Push Boring in 200-DV-1 OU | Reference Measuring Point: ground surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	Drive Time	Split Spoons		0-35.7' unknown	Direct Push w/ Becker Hammer, 8 5/8" Temp casing. No split spoons Taken. 0-35.7' bgs
5	2.5min				
10			Becker Hammer Direct Push		
15	7min				
20			No soil recovery		
25	14min				
30					
	15min				Sonic drilling using 6" Temporary casing from 35.7'-105.5' bgs. No Samples collected.
35	~~15min~~ CPA 11-18-15			35.7'-67': Sand (S) g=5% s=95% Gravel: 2-70mm, vf-c, SA pebble. Avg. 15-20mm max 70mm. 95% mcf 5% fel. Sand: vf-vc, avg m-c 70% mcf 30% fel, SA	

Reported By: Cameron Penner-Ash		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature: Cameron Penner	Date: 11-16-15	Signature: Sarah Springer	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 2 of 3

Date: 8/30/16

Well ID: C9496	Well Name: N1A	Location: 216-T-15 (N)
Project: 9+12 optional Boreholes in 200-DV-100		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40	3.5 min			35.7-67': Sand (S) g=5% s=95%. Gravel: 2-20mm, vf-c, SA pebble. avg 15-20mm max 20mm 95% maf 5% fel Sand: vf-vc, avg m-c, SA 70% maf 30% fel	Sonic drilling using 6" OD Temporary casing from 35.7'-105.5' bgs. No samples collected
45				@47' Sand: avg m, 50/50 maf-fel	
50	3.5 min				
55				@57' Gravel size: 2-8mm vf-f pebble 95% maf 5% fel	
60	2.5 min				
65				67'-87': gravelly Sand (gS) g=25% s=70% m=5% Gravel: 2-8mm vf-f, SA pebble 95% maf 5% fel, Sand: vf-vc avg m, SA. 50/50 maf-fel Silt: Low-mod plasticity	During clean out of borehole 1/2 gal H_2O was added between 67'-77'
70	2 min				
75					

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature:	Date: 8/30/16	Signature:	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 3
Date: 8130116

Well ID: C9496	Well Name: N1A	Location: 216-T-15
Project: 9+12 optional Boreholes in 200 DU-100		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	2.5 min			67-87' gravelly Sand (gS) g=25% s=70% m=5% Gravel: 2-8mm vf-f, SA, pebble 95% maf 5% fel Sand: vf-vc, avg m, SA 50/50 maf-fel, Silt: Low-mod plasticity	Sonic drilling using 6" OD Temporary casing from 35.7'-105.5' bgs. No samples collected
85					During clean out of borehole 2½ gal H2O was added between 77'-87' bgs.
90	3.5 min			87-97: slightly silty gravelly Sand (mgS) g=25% s=60% m=15% Gravel: 2-4mm, vf, SA pebble. max 4mm. 95% maf 5% fel Sand: vf-m, avg f, 70% fel 30% maf Silt: Low to mod plasticity.	
95					
100	2.5 min			97'-106.1' silty Sand (mS): g=5% s=55% m=40% Gravel: 2-4mm, vf se pebble. 95% maf 5% fel. Sand: vf-m, avg f. 70% fel 30% maf. Silt: low to mod plasticity	During clean out of borehole 2 gal H2O was added between 97'-106' bgs.
105					
106.1	Borehole Total Depth				Total Depths: 8 5/8" casing: 35.7' 6" casing: 105.5' Borehole: 106.1' 6/14/16

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature: [signature]	Date: 8/30/16	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 3

Date: 7/5/16

Well ID: C9505 | Well Name: N/A | Location: 216-T-15 Trench (South)

Project: 9+12 optional Boreholes in 200-DU-1(a) | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	Drive Time	% recovery	Not used	0-8.3': Direct push drilling with no soil recovery	Direct Push with Becker Hammer 8 5/8" OD Temp. casing to 43.6' bgs. Splitspoons at 8.3' + 10.6' with 2.3' split spoon.
5	1 min				
10	10 sec	split spoon 25% recovery		8.3'-12.9': Sandy Gravel (SGr) g: 70%, s: 25% m: 5%. Gravel: 2 mm-70mm, vf pebble-sm cobble. Max 70mm, SR, 80% mcf, 20% fel, Sand: vf-c avg m, SR, Silt: nonplastic Moist.	
	15 sec	split spoon 25% recovery			
	2 min				
15	8 min	Becker Hammer Direct Push		12.9-43.6': Direct push drilling with no soil recovery.	
20					
25	6 min	No soil recovery	Not used		
30					Sonic drilling with 6" Temporary casing from 43.6'-105.5' bgs Continuous sampling collected with 3 3/4" OD Lexan Liners. Descriptions based on visual inspection through liners & may not be representative
35	78 min				

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: geologist

Signature: [signature] Date: 7/5/16 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 2 of 3

Date: 7-5-16

Well ID: C9505	Well Name: N/A	Location: 216-T-15 Trench (South)
Project: 9+12 optional Boreholes in 200-DV-100		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40	Drive Time 78 min	% recovery Direct push	Not Graded	12.9-43.6': Direct push drilling with no soil recovery.	Direct Push with Becker Hammer 8 5/8" OD Temp casing to 43.6' bgs
45	35 sec	35% recovery		43.6'-67.2': Sand (S) g=Ø s=95% m=5% Sand: vf-c avg. m	Sonic drilling with 6" OD Temporary casing to 105.5'
	25 sec	100% recovery		47' m↑T g↑T Sand 100% f-c avg m.	RAD: 43.6'-47.0' 20,000 direct + 1,000 removable dpm beta/gamma on lexan liner
50	20 sec	100% recovery		49.5' s↑95% g↑5% Gravel: 2mm-20mm vf-c pebble, SR. Sand: vf-vc avg c.	
	20 sec	100% recovery		52.3' m↑3% s↑97% g=Ø Sand vf-c avg. m	
55					During clean out of the borehole 1/2 gal H_2O added between 54'+57'
	10 sec	100% recovery		57.3' s↑95% g↑2% Gravel: 2-4mm vf pebble, SR	
60				62.2' m↑2% s↓93% g↑5%	During clean out of the borehole 1/2 gal H_2O added between 57'+62'
65	10 sec	100% recovery			
70	10 sec	100% recovery		67.2'-82.3': Sandy Gravel (SG) g=75% s=25% m=T Gravel: 2-20mm vf-c pebble, SR. Sand: f-vc avg m., SA	
75	10 sec	100% recovery		77.3': g↑40% s↑60% sand avg↑c	During clean out of the borehole 1/2 gal H_2O added between 77'+82'

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature:	Date: 7-5-16	Signature:	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 3

Date: 7-5-16

Well ID: C9505 | Well Name: N/A | Location: 216-T-15 Trench (South)

Project: 9+12 optional boreholes in 200-PU-100 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
	Drive Time	% recovery			Sonic drilling with 6"OD Temp. casing from 43.6'-105.5' bgs. Continuous core samples collected with 3 3/4" OD Lexan liners. Descriptions based on visual inspection throughliners & may not be representative.
80	10 sec	100% recovery		82.3'-87.3': gravelly Sand (gS): g=25% s=75% m=T Gravel: 2-4mm vf pebble SR, Sand: f-vc avg c, SA-SR	
85	10 sec	100% recovery			
	15 sec	100% recovery		87.3'-98.3': Sand (S). g=T s=100% m=T Sand: vf-vc avg c, SA-SR	
90					
95	10 sec	100% recovery			
100	15 sec	100% recovery		98.3-106.4: (mS) silty Sand: g=Ø s=70% m=30% Sand: vf Silt: Low plasticity	
105	10 sec	100% recovery			
106.4	Total	Depth	6/13/16		

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: Geologist

Signature: [signature] Date: 7-5-16 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 3
Date: 8/2/16

Well ID: C4SOC6 | Well Name: N/A | Location: 216-T-18 Crib

Project: 9+12 optional Boreholes in 200-DV-100 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	Drive Time	Core Recovery	not used	0.0-4.0: No soil recovered	Direct Push drilling using Becker Hammer with 8 5/8" OD casing from 0.0-33.5' bgs. 3 split spoon samples: 4.0-6.5, 7.0-9.5, 10.0-12.5'
	20 sec				
5	30 sec	split spoon 100% recovery		4.0-12.5: Sand (S) g=0% s=95% m=5% Sand: vf-ms avg.f. Moist.	
	1 min				
	20 sec	split spoon 100% recovery			
10	2 min				
	30 sec	split spoon 100% recovery		@10.0' Sand: vf-c avg.m	
	4 min				
15	7 min				
20					
25	199 min		Not used		
30					Sonic drilling using 6" OD casing from 33.5'-100.52' bgs. Continuous core samples collected using 3 3/4" OD lexan liners. Descriptions based on visual inspection through liners & may not be representative.
	29 min				
35	15 sec	100% recovery		33.5'-~~37'~~ 42.0' (KS 10/25/16) (TM 8/2/16): sandy Gravel (sG) g=35 s=60% Gravel: 2-15 mm vf-m pebble SA. Sand: vf-vc avg c SA	
				@37' s↑65% g↓30% Gravel: 2-8mm, vf-f pebble, SA. Sand avg m.	

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: geologist

Signature: [signature] | Date: 8/2/16 | Signature: [signature] | Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 2 of 3
Date: 8/2/16

Well ID: C9506	Well Name: N/A	Location: 216-T-18 Crib
Project: 9+12 optional Boreholes in 200-DV-100		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40	10 sec	100% recovery			Sonic drilling with 6" ∞ casing from 33.5'-100.52'
				42.1'-57.2': gravelly Sand (gS) g=15% s=80% m=5%. Gravel: 7-8mm vf-f pebble, SA. Sand: vf-vc, avg m, SA	Continuous core sampling using 3 3/4" ∞ Lexan liners
	15 sec	100% recovery			Descriptions based on visual inspection through lexan liner & may not be representative.
45					
	10 sec	100% recovery			
50					
	10 sec	100% recovery			During clean out of the borehole 1 gal H_2O added between 52'+57'
55					
	5 sec	100% recovery		57.2'-87.2': Sand (S) g=0% s=95% m=5%. Sand: vf-c avg m, SA	
60				57.2'+72.1': Samples moist	
	5 sec	100% recovery			During clean out of borehole 1 gal H_2O added between 62'+67'
65					
	10 sec	100% recovery			
70					
	10 sec	100% recovery			
75					

Reported By: Tracy Mallaren		Reviewed By: Sarah Springer	
Title: Geologist		Title: Geologist	
Signature: [signature]	Date: 8/2/16	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 3
Date: 8/2/16

Well ID: C9506	Well Name: N/A	Location: 216-T-18 Crib
Project: 9+12 optional Boreholes in 200-DV-100		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	TM 8/2/16 ~~10~~ 5 sec	100% recovery		57.2-87.2': Sand (S) g=0 s=95% m=5 Sand: vf-c, avg m, SA	Sonic drilling with 6" OD Temp casing from 33.5'-100.52' bgs. Continuous core samples collected with 3 3/4" OD Lexan liners. Descriptions based on visual inspection through liner & may not be representative.
85	10 sec	100% recovery			
				87.2-101.8: silty Sand (mS) g=0% s=70% m=30%. Sand: vf-m avg f Silt: ~~mod~~ low plasticity. Moist. TM 8/2/16	
90	25 sec	100% recovery			During clean out of borehole 1 gal H_2O added between 92'+97'
95	15 sec	100% recovery			
100	15 sec	100% recovery			
101.8	Borehole Total Depth				Total Depths: 8 5/8" casing 33.5' 6" casing 100.52' Borehole 101.8' 6/29/2016

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: Geologist	
Signature: [signature]	Date: 8/2/16	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 5-31-16

Well ID: C9507 | Well Name: N/A | Location: North End of 216-T-19 Crib

Project: 9+12 optional Boreholes in 200-DV-1 OU | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
	Drive Time	core recovery			
0	25 sec	0 core 50% recovery		0-25.3': Sandy Gravel (SG) g=60% s=40% Gravel: 2mm-140mm vf pebble-large cobble avg 60mm SR. Sand: vf-c avg m	Sonic drilling with 10 1/2" / 10" casing from 0-20.3' bgs
5	3 min	5.0 No sample			
10		10.0 0% recovery			
15	4 min	15.0 No sample			
20	5 min	20.3 60% recovery			Direct Push with Becker Hammer using 8 5/8" OD casing from 20.3'-48.1' bgs - No soil recovery
25		25.3 Becker Hammer Direct Push			
30	18 min	No soil Recovery	not used		
35					

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: geologist

Signature: [signature] Date: 6/20/16 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 2 of 7

Date: 5-31-16

Well ID: C9507 | Well Name: N/A | Location: North End of 216-T-196 crib

Project: 9112 optional Boreholes in 200-DV-100 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description (Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level)
40	Drive Time	core recovery			Direct Push with Becker Hammer using 8 5/8" OD Temp. casing from 20.3-48.1'.
	116 min	Becker Hammer Direct Push			
45	120 min	No soil recovery			Sonic drilling with 6" OD Temp. casing from 48.1' - 157.0'.
	43 min			48.1'-57.3': Due to RAD controls, soils in this interval were double bagged in yellow sleeving + tagged as RAD waste - preventing soil identification.	
50	5 min		Not used		RAD: 48.1'-52.5': 459,000 dpm beta/gamma direct on soil through plastic sleeving. 52.5'-57.3': 1,000,000 direct dpm beta/gamma through sleeving (one hot spot)
55				57.3'-94.1': Sand (S) g=0%, s=95%, m=5% (5% TM 5/20/16) Sand: vf-ms avg ms	RAD: 57.3'-59.8' 160,000 dpm beta/gamma direct through lexan liner
	20 sec	100% recovery			
60	15 sec	100% recovery		59.8'-82.0': m↓T s↑ 100% Sand size ↑ vf-c with trace gravels starting at 77.5' 8mm f/m pebbles SR-SR	
	10 sec	100% recovery			
65	30 sec	100% recovery			
	40 sec	100% recovery			
70	20 sec	100% recovery			
	30 sec	100% recovery			
75	15 sec	100% recovery			

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: Geologist

Signature: [signature] | Date: 6/20/16 | Signature: [signature] | Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 5-31-16

Well ID: C9507	Well Name: N/A	Location: North End of 216-T-19 Crib
Project: GH2optional Boreholes in 200-DV-100		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	Drive Time	Core recovery			Sonic drilling with 6" OD Temp casing from 48.1-157.0'
	15 sec	100% recovery		82.0'-84.1': Sand (S) g=5% s=95% m=T Gravel: 2-8mm, SA vf-f pebble Sand: vf-c avg m	
	30 sec	100% recovery			
85					
	15 sec	100% recovery			
90				92.1'-94.1': g 0% s 100%	
	20 sec	100% recovery		94.1'-95.1': slightly silty Sand (cmS) s=80% m=20% Sand: vf-m avg. f	
95				95.1-107.3': Silt (M) 95.1-97.5: M=90% S=10% Sand: vf-f avg. vf.	
	20 sec	100% recovery			
100				97.5'-107.3': M=85% S=15%	
	25 sec	100% recovery		102.4'-107.3': Caliche nodules	
105					
	30 sec	100% recovery		107.3'-112.3': Sandy Silt (sM) S=80% M=20% Sand: vf-ms avg. f Caliche nodules	
110					
	30 sec	100% recovery		112.3'-117.4': slightly silty Sand (cmS) S=89% M=11% Sand: vf-ms avg m Caliche until ~114.8'	
115					
	1 min	100% recovery		117.4'-122.5': sandy Gravel (sG) g=75% S=25% Gravel: 2mm-~75mm vf pebble-sm cobble, SA-SR, Sand: vf-vc avg c	

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: Geologist	
Signature:	Date: 6/20/16	Signature:	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 5-31-16

Well ID: C9507	Well Name: N/A	Location: North End of 216-T-19 Crib
Project: 9+12 optional boreholes in 200-DV-1 OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
120	Drive time	core recovery			Sonic drilling with 6" OD temp. casing from 48.1-157.0'
	1 min	100% recovery		122.5'-142.6': silty sandy Gravel (msG) g=65% s=20% m=15% Gravel: 2-75mm vf pebble - sm cobble SA-SR. Sand: vf-vc avg. c, SA	
125	30 sec	75% recovery			
130	30 sec	50% recovery			
135	30 sec	40% recovery			
140	30 sec	80% recovery			140.1' bgs 27.5 gal H_2O to aid in sample recovery + clean out drilling
				142.6'-177.0: sandy Gravel (sG) g=40% s=60% m=T Gravel: 2mm-40mm vf-vc pebble, SA-SR Sand: f-vc avg c	
145	30 sec	60% recovery			
150	45 sec	0% recovery			
	30 sec	0% recovery			
155	1 min 45 sec	0% recovery			
	1 min	100% recovery			

Reported By: Tracy Mellgren	Reviewed By: Sarah Springer
Title: Geologist	Title: geologist
Signature: [signature] Date: 6/20/16	Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 5-31-16

Well ID: C9507	Well Name: N/A	Location: North End of 216-T-19 Crib
Project: 9+12 optional Boreholes in 200-BP-1 OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
160	Drive Time	Core recovery		142.6'-177.0': Sandy Gravel (SG) g=40% S=60% m=T Gravel: 2mm-40mm vf-vc pebble, SA-SR. Sand: f-vc avg C	Sonic drilling with 4 7/8" OD Temp. casing from 157.0'-140.5'
	1 min	100% recovery		162.7'-177.0': g ≈ 65% S ≈ 25% m ≈ 10% Gravel: 2-70mm, avg. 45mm, vf pebble-sm cobble, poor sort, SA-SR. Sand: f-c avg. m, 40% maf, 70% fel. 60% maf, 40% fel, SA. Silt: low-mod plast.	
	2.75 min				
165	2 min				
170	3 min			166.7'-177': Gravel size ≈ 120mm max sm. cobble.	167-177: 3 gal H2O added to aid drilling
175				177.0-243.4': silty sandy Gravel (msG) g=65% S=20% m=15% Gravel: 2-120mm vf pebble-sm. cobble, poor sort, 30% maf 70% fel, SR. Sand: f-c avg m 60% maf 40% fel, SA. Silt: low-mod plast. Wet.	177-183: 4 gal H2O added to aid drilling
180	6.5 min				
185	5 min			183': Gravel max ≈ ~45mm	183-190: 2 gal H2O added to aid drilling
190	7 min				190-194: 2½ gal H2O added to aid drilling
195	7 min			194': Gravel max ≈ ~90mm 197-200: 3' lense of vf-m sand 80% S & 20% g 2mm vf pebble	194-200: 3 gal H2O added to aid drilling

Reported By: Tracy Mallagen		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature: [signature]	Date: 6/20/16	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 6-20-16

Well ID: C9507 | Well Name: N1A | Location: North End of 216-T-19 Crib

Project: 9+12 optional boreholes in 200-BU-1 OU | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
200	Drive Time			200-~~203~~ 243.4: silty sandy Gravel (msG) G: 65%. S: 20%. M: 15%. Gravel: 2-45mm vf pebble - vc pebble, poor sort. 70% fel 30% maf. SR. Sand: f-c angm 30% maf 70% fel SA-SR. MOIST. Silt: Low-mod plast.	Sonic drilling with 4 7/8" OD Temp. casing from 157.0-140.5'
	9 min				
205	4.5 min				202-207: Add 3 gal H_2O to aid drilling
210	4 min				207-211: Add 2 gal H_2O to aid drilling
215	6.5 min			217: Gravel ≈ 50%. Sand ≈ 38%. Silt: ≈ 12%. Gravel ≈ 90mm	217-223: Add 3 gal H_2O to aid drilling
220	3 min				223-227: Add 3 gal H_2O to aid drilling
225	2.5 min				227-230: Add 5 gal H_2O to aid drilling
230	6 min			230: Gravel ≈ 65%. Sand ≈ 24%. Silt ≈ 11%. Gravel 85% fel 15% maf	
235	2 min	234.6		237: Gravel ≈ 50%. Sand ≈ 35%. Silt ≈ 15%.	DTW: 234.6' bgs 6/16/16

Reported By: Tracy Mallagen | Reviewed By: Sarah Springer

Title: Geologist | Title: geologist

Signature: [signature] | Date: 6/20/16 | Signature: [signature] | Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 6-20-16

Well ID: C9507	Well Name: N/A	Location: North End of 216-T-19 Crib
Project: 9+12 Optional Boreholes in 200-BP-1OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
240	1.5 min			237-243.4': silty Sand Gravel (msG) g: 50% s: 35% m: 15% Gravel: 2-90 mm, vf pebble, sm cobble, poor sort, 85% fel, 15 maf SR. Sand: f-c avg m 70% fel, 30 maf SA-SR. Wet. Silt: Low to mod plast.	Sonic drilling with 4 7/8" OD Temp. casing from 1570 240.5'
	Total Depth				
245				TD = 234.6' (6/16/16) DTW = 234.6' (6/16/16)	

Not used KS 10/26/16

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature:	Date: 6/20/16	Signature:	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 11-20-15

Well ID: CGS11	Well Name: N/A	Location: ~~CaSt~~ SDA 11/20/15	216-T-23 Trench
Project: G Direct (+12 optional) Push Boring in 200-DV-1		Reference Measuring Point:	ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	Drive Time	Split Spoons	Not used	0-4.5 unknown	Direct Push w/ beener hammer using 8 5/8" temp casing. Split-spoons planned for 4, 7, and 12' bgs using a 2.5' spoon.
	20sec			4.5 - 7.6': Gravelly Sand (gS) 10% Gravel, 88% Sand, 2% Silt. Gravel: 2-40mm, SR. Sand: vfS-vcS, majority = fS. Slightly moist.	
5	10sec	11 sec 50% Rec.		7.6 - 10.0: Slightly Silty Sand (sm) S) 5% Gravel, 80% Sand, 15% Silt. Gravel: 2-15mm, SR. Sand: vfS-fS. Silt: non-plastic. Slightly moist.	
10	1min	3 sec 69% Rec.			@ 12' Split Spoon not ~~collect~~ collected due to 3.2mil dpm direct.
				10 - 43.9 unknown	
	1min	20sec Not collected			Drill cuttings were not produced from 0-4.5 and 10.0-43.9'
15					
20	9min				** 9.2' of 8 5/8" casing was left in the ground from 31.7'-40.9' bgs (9/27/16)
25			Not used		
30	14min				
35	22min				

Reported By: Cameron Penner-Ash		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature: [signature]	Date: 11-20-15	Signature: [signature]	Date: 01-03-17

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 8-20-16

Well ID: C9511	Well Name: N1A	Location: 216-T-23 Trench
Project: 9+12 optional Boreholes in 200-DV-100		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40	51 min	8 5/8" casing	Not used		Direct Push with Becker Hammer using 8 5/8" OD casing from 0.0-43.9 Sonic drilling with 6" OD casing from 43.9-~~127.0~~ TM 8/12/16 1155
45	30 sec	100% recovery		43.9'-54.6': Sand (S) g=5% s=95% m=T Gravel: 2-4mm vf, SA, pebble Sand: vf-c avg m. SA Moist to 46.6' then dry samples.	BAD: 44.1'-46.6': 170,000 dpm beta/gamma direct on lexan liner
	15 sec	100% recovery			
50	10 sec	100% recovery			Continuous sampling using 3 3/4" OD Lexan liners. Descriptions based on visual inspection through the liners & may not be representative.
	25 sec	100% recovery			
55	20 sec	100% recovery		54.6'-63.1': gravelly Sand (gS) g=25% s=70% m=5% Gravel: 2-25mm vf-c SA-SR pebbles. Sand: f-vc avg m SA	
60	40 sec	100% recovery			
65	1.5 min	75% recovery		63.1'-100.5': sandy Gravel (sG) g=75% s=25% m=T Gravel: 2-45mm vf-vc SA-SR pebble. Sand: f-vc avg m. SA	
70	30 sec	60% recovery			
75	30 sec	75% recovery		@ 72.1' g↑55% s↑40% m↓5% Gravel size ↑ max 80mm SR sm cobble	

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: Geologist	
Signature:	Date: 8/12/16	Signature:	Date: 8-1-17

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 3
Date: 8/2/16

Well ID: C9511	Well Name: N/A	Location: 216-T-23 Trench
Project: 9+12 optional Boreholes in 200-DV-100		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	45 sec	100% recovery		72.1'-106.5': Sandy Gravel (SG) g=55% s=40% m=5% Gravel: 2-80mm vf pebble - sm cobble, SA-SR. Sand: f-vc avg m - SA	Sonic drilling using 6"OD casing from 43.9' ~~117.2~~ 115.5' T.M. 8/2/16
85	1 min	100% recovery			Continuous core sampling collected using Lexan liners. Descriptions based on visual inspection through liners & may not be representative
90	1 min	40% recovery		@ 92.4' s↓25 g↑70	
95	1.5 min	100% recovery			
100	45 sec	50% recovery		@ 98' s↑45% g↓50%	
105	1 min 20 sec	100% recovery		106.5'-~~115.5'~~ 117.2 T.M. 8/2/16: silty Sand (mS): s=65% m=35% Sand: vf-f	
110	15 sec	100% recovery			
115	15 sec	100% recovery			
117.2	Borehole Total Depth				Total Depths: 8" casing: 43.9 6" casing: 115.5 Borehole: 117.2 (7-7-16)

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: Geologist	
Signature:	Date: 8/2/16	Signature:	Date: 01-03-17

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 11-20-15

Well ID: CA510	Well Name: N/A	Location: 216-T-25 Trench
Project: 9 Direct (+12 optional) Push Borings in 200-OU-1		Reference Measuring Point: ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	Drive Time	Split Spoon	Not used KS 2/16/16	0-4 unknown	Direct push w/ becker hammer using 8 5/8" OD Temp. casing. Split Spoons planned for 4, 6, and 12' bgs using a 2.2' spoon. 12' Sample canceled due To 150k dpm detected on 6' bgs sample.
	80sec				
5	30sec	15sec 50% Rec.		4-6.2': Gravelly Silty Sand (gmS) 30% Gravel, 60% Sand, 10% Silt. Gravel: MP-VFP, well rounded. Sand: VFS. dark olive brown.	
	15sec	20sec 75% Rec. (not collected)			
10				6.2-9.2: Slightly Silty Gravelly Sand ((m)gS), 20% Gravel, 60% Sand, 20% Silt. Gravel: MP-VFP, well rounded. Sand: VFS. dark olive brown.	
	2min				
15					
20			Not used		
	11min				
25					
30					
	58min				
35					

Reported By: Cameron Penner-Ash		Reviewed By: Sarah Springer	
Title: Geologist		Title: Geologist	
Signature: Cameron Penner-Ash	Date: 11-20-15	Signature: Sarah Springer	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 8-2-16

Well ID: C9510 | Well Name: N/A | Location: 216-T-25 Trench

Project: 9+12 optional Boreholes in 200-DV-1 OU | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40				39.0-47.5: No soil identified. Due To rad concerns all soil sleeved in yellow sleeving.	Sonic drilling using 6"oo casing from 39.0-122.0' bgs
	1 min		Not used		RAD: 39.0'-47.5' 150,000 dpm direct beta/gamma on soil
45					
	15 sec	78% recovery		47.5'-57.4': Sand (S) g=0% s=95% m=5% Sand: vf-vc avg m-C, SA	Continuous core sampling collected with 3 3/4" oo Lexan Liners. Descriptions based on visual inspection through liners & may not be representative.
50	15 sec	50% recovery			
	1.5 min	100% recovery			
55					
	15 sec	57% recovery		57.4'-102.5: Sandy Gravel (SG) g=40% s=55% m=5% Gravel: 2-90mm vf pebble - small cobble, SA-SR, avg 20mm Sand: vf-vc avg m, SA	
60					
	1.5 min	17% recovery			
65					
	1 min	60% recovery			
70					
	1 min	100% recovery			
75				@77.5 g↑75% s↓25% m↓T	

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: geologist

Signature: [signature] | Date: 8/2/16 | Signature: [signature] | Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 4

Date: 8-2-16

Well ID: C9510	Well Name: N/A	Location: 216-T-25 Trench
Project: 9+12 optional Boreholes in 200-DV-1 OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	1 min	70% recovery		77.5'-102.5': sandy Gravel (sG) g=75% s=25% m=T Gravel: 2-90mm vf peb-sm cobble, SA-SR, avg 20mm. Sand: vf-vc avg m, SA	Sonic drilling using 6" OD casing from 39.0'-122.0' bgs. Continuous core sampling collected using 3 3/4" OD Lexan liners. Descriptions based on visual inspection through liners & may not be representative.
85	2.5 min	88% recovery		@ 87.5' g↑=60% s↑=35% m↑=5%	
90	1.5 min	90% recovery			
95	2 min	58% recovery			
100	1 min	50% recovery			
105	1.5 min	0% recovery		102.5'-112.3': No soil recovery 102.5-107.4: Sample liner possibly blocked off by cobbles 107.4-112.3: ~85mm small cobble stuck in shoe of lexan liner	
110	4 min	0% recovery	Unknown	4 TM 8/2/16 112.3'-122.3': silty Sand (mS) g=0% s=65% m=35% Sand: vf-f Silt: Low-mod plasticity	
115	2 min	100% recovery			

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature: [signature]	Date: 8/2/16	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 8/2/16

Well ID: C9510	Well Name: N/A	Location: 216-T-25 Trench
Project: 9+12 optional Boreholes in 200-DV-100		Reference Measuring Point: Ground surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
120	1.5 min	100% recovery		112.3-122.4: silty Sand (mS): g=0% S=65% m=35% Sand: vf-f Silt: Low to mod plasticity	Sonic drilling using 6" OD casing from 39.0'-122.0' Continuous sampling collected with 3 3/4" Lexanliners. Descriptions based on visual inspection through liners + may not be representative.
122.4	Borehole Total Depth				Total Depths: 8" casing: 39.0' 6" casing: 122.0' Borehole: 122.4' (7-13-16)

NOT USED KS 10/26/16

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature: [signature]	Date: 8/2/16	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 11/23/15

Well ID: C9S12	Well Name: N/A	Location: 216-S-9 Crib
Project: 9 Direct (+12 optional) Push Borings in 200-DV-10V		Reference Measuring Point: ground surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	Drill Time / Split Spoons			0-3.2 - ~~assume~~ unknown ~~it is also slightly silty sand.~~ KS 10/26/16 Drilling method did not generate cuttings	Direct Push with Becker Hammer using 8 5/8" OD casing from 0.0-36.4' bgs - No soil recovery during push. 3 split spoon samples ~~using~~ TM 8/11/16 at 3.2'-~~5.5~~ TM 8/11/16 5.5', 6.0'-8.2', 13.0'-15.3' bgs.
	30sec		KS 10/26/16		
5	10sec	20sec 60% Rec.		3.2-8.2: Slightly Silty Sand (m)S). Gravel: T, Sand: 80%, Silt: 20%. Gravel: SR, max: 20mm, avg: 2mm. Sand: vfS-mS, avg: mS. Silt: low plasticity. Slightly moist.	
	15sec	5sec 30% Rec.			
10	50sec		KS 10/26/16	8.2-13 unknown	
				13-15.3 @ 13' bgs Slightly Silty Sand ((m)S) ↓ Sand 75%, ↑ Gravel 5%, Silt 20%	
15	1 min	5sec 100% Rec.		15.3-36.4 unknown	
20	20min				
25			KS 10/26/16		
30	88 min.	Not Collected			@ ~29' bgs, 4,000-5000 dpm beta/gamma contamination detected ~~through~~ KS at the middle of the split spoon (through wall). Nothing detected at the shoe
	181 min.				
35	151 min			@ 36.4' begin sonic drilling	
	30sec	100% recovery			Refusal @ 36.4'

Reported By: Cameron Penner-Ash		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature: [signature]	Date: 11/23/15	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 2 of 4

Date: 8/2/16

Well ID: C9512 | Well Name: N1A | Location: 216-S-9 Crib

Project: 9+12 optional Boreholes in 200-DV-100 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40	1.5 min	100% recovery		36.4'-42.2': gravelly Sand (gS) g=15% s=83% m=2% Gravel: 2-45mm vf-vc pebble, SA Sand: vf-vc avg. m SA moist.	Sonic drilling with 6" OD casing from 36.4-140.5' Continuous core sampling collected with 3 3/4" OD Lexan liners. Descriptions based on visual inspection through liners & may not be representative.
45	3 min	100% recovery		42.2'-47.2': Sand (S) g=5% s=90% m=5% Gravel: 2-8mm vf-f pebble, SA. Sand: vf-vc avg m. SA Dry	
50	4.5 min	100% recovery		47.2'-57.4': sandy Gravel (sG) g=70% s=25% m=5% Gravel: 2-60mm, vf-vc pebble, SA-SR. Sand: vf-vc avg m SA Dry	
55	1.5 min	100% recovery			
60	30 sec	100% recovery		57.4'-76.9': Sand (S) g=5% s=90% m=5% Gravel: 2-6mm vf-fine pebble, SA-SR Sand: vf-vc avg m. SA Dry	
65	1.5 min	100% recovery			
70	1 min	100% recovery		@ 67.2' g↓0% s↑95%	
75	1.5 min	100% recovery		76.9'-132.0': slightly silty Sand ((m)S) g=0% s=85% m=15% Sand: vf-m Dry	

Reported By: Tracy Mallgren | Reviewed By: Sarah Springer

Title: Geologist | Title: geologist

Signature: [signature] | Date: 8/2/16 | Signature: [signature] | Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 4
Date: 8/2/16

Well ID: C9512	Well Name: N1A	Location: 216-S-9 Crib
Project: 9+12 optional Boreholes in 200-OU-1 OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	2 min	100% recovery		76.9-132.0: slightly silty Sand (cmS) S=85%. m=15%. Sand: vf-m Dry	Sonic drilling using 6"OD casing from 36.4'-140.5' bgs. Continuous core sampling using 3 3/4" OD Lexan liners. Descriptions based on visual observations through liners & may not be representative.
85	1.5 min	100% recovery			
90	1.5 min	100% recovery			
95	1.5 min	100% recovery		@ 97' Sand size vf-c avg m. SA	
100	1 min	100% recovery			
105	2 min	100% recovery			
110	1.5 min	100% recovery			
115	1 min	100% recovery			

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature:	Date: 8/2/16	Signature:	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 4 of 4

Date: 8/2/16

Well ID: C9512	Well Name: N/A	Location: 216-S-9 Crib
Project: 9+12 optional Boreholes in 200-DV-100		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
120	2 min	100% recovery		76.9'-132.0': slightly silty Sand (cmS) g=0% s=85% m=15% Sand: vf-c, sa. avg m. Dry	Sonic drilling using 6"OD casing from 36.4'-140.5' bgs. Continuous core sampling collected using 3 7/4" Lexan liners. Descriptions based on visual inspection through liner & may not be representative.
125	1.5 min	100% recovery			
130	1.5 min	100% recovery		132.0-142.5: sandy Silt (sM) g=0% ~~s=70% m=30%~~ TM 8/11/16 s=40% m=60% Sand: vf-f Silt: mod plasticity	
135	1 min	100% recovery			
140	1 min	100% recovery			Total Depths 6" casing: 140.5 Borehole: 142.5 8 5/8" casing: 36.4 (7/27/16
142.5	Borehole Total Depth				

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: Geologist	
Signature: [signature]	Date: 8/2/16	Signature: [signature]	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 4

Date: 8/12/16

Well ID: C9514	Well Name: N/A	Location: 216-S-21 Crib
Project: 9+12 optional Boreholes in 200-DV-100		Reference Measuring Point: Ground surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	Drive Time	Core recovery	Not used	0.0-4.1': No soil recovery	Becker Hammer push drilling using 8 5/8" OD casing from 0.0-44.0 3 split spoon samples 4.1-6.6, 7.0-9.5 & 13.1-15.6
	20 sec			9.5 4.1'-~~6.6~~ 7.0': slightly silty Sand (cm) S m=15 s=85 g=0 Sand: vf-c avg m	
5	2 sec	50% recovery		6.6-7.0: No soil recovery	
	10 sec		Not used	@ 7.0'	
	2 sec	40% recovery		~~7.0'-9.5'~~ slightly silty Sand (cm) S m=15 s=85 g=0 Sand: vf-c avg m	
10	20 sec		Not used	9.5'-13.1': No soil recovery	
	5 sec	40% recovery		13.1-15.6: gravelly Sand (gS) g=20% s=75% m=5% Gravel: 2-20mm vf-coarse SA pebble Sand: vf-vc avg c.	
15				15.6'-44.0': No soil recovery	
20	3.5 min				
25	31 min		Not used		
30					
35	41 min				

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature:	Date: 8/2/16	Signature:	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 2 of 4
Date: 8/2/16

Well ID: C9514	Well Name: N/A	Location: 216-S-21 Crib
Project: 9+12 optional Boreholes in 200-DV-100		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40	41 min		Not used		Sonic drilling using 6" OD casing from 44.0-127.5' bgs.
45	1 min	100% recovery		44.0'-102.0': Sand (S): g=0% s=95% m=5% Sand: vf-c avg m SP	RAD: 44.1'-46.6': 3,000 dpm direct beta/gamma through lexan liner
	30 sec	100% recovery			
50	15 sec	100% recovery		@ 49.6 sand size vf-m avg m.	Continuous core sampling collected with 3 3/4" Lexan Liners. Descriptions based on visual inspection through liners & may not be representative
	30 sec	100% recovery			
55	45 sec	100% recovery		@ 57.1' bgs ↑m=8% ↓s=92%	
60	15 sec	100% recovery			
65	15 sec	100% recovery			
70	30 sec	100% recovery			
75	20 sec	100% recovery			

Reported By: Tracy Mallgren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature:	Date: 8/2/16	Signature:	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 4

Date: 8/2/16

Well ID: C9514	Well Name: N/A	Location: 216-S-21 Crib
Project: 9+12 optional Boreholes in 200-DAH OU		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	2.5 min	100% recovery		57.1'-102.0': Sand (S) m=8% s=92% Sand vf-m avg m.	Sonic drilling with 6" casing from 44.0'-127.5' Continuous core sampling collected with 3 3/4" Lexan liners. Descriptions based on visual inspection through liners & may not be representative.
85	1.5 min	100% recovery			
90	30 sec	100% recovery			
95	1.5 min	100% recovery			
100	20 sec	100% recovery		102.0'-117.4': gravelly Sand (gS) g=25% s=70% m=5% Gravel: 2-50mm vf-vc, SA-SR, pebbles. Sand: vf-vc avg m, SA	
105	20 sec	16% recovery			
110	15 sec	100% recovery			
115	15 sec	100% recovery		117.4'-127.6': silty Sand (mS) s=70% m=30% Sand: vf-m avg f-m	

Reported By: Tracy Mallaren		Reviewed By: Sarah Springer	
Title: Geologist		Title: geologist	
Signature:	Date: 8/2/16	Signature:	Date: 12-8-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 4 of 4

Date: 8/2/16

Well ID: C9514 | Well Name: N1A | Location: 216-S-21 Crib

Project: 9+12optional Boreholes in 200-DV-10U | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
120	15 sec	100% recovery		117.4'-127.6' silty Sand (mS) s=70% m=30%	Sonic drilling using 6"ID casing from 44.0'-127.5' bgs.
				Sand: vf-m aug f-m	
	20 sec	90% recovery			Continuous sampling collected using 3 3/4" Lexan liners. Descriptions based on visual inspection through liners & may not be representative.
125					
127.6	Borehole Total Depth				Total Depths 8 5/8" casing 44.0' 6" casing 127.5' Borehole 127.6' (7/21/16)

Not used KS 10/26/16

Reported By: Tracy Mallaren | Reviewed By: Sarah Springer

Title: Geologist | Title: geologist

Signature: [signature] Date: 8/2/16 | Signature: [signature] Date: 12-8-16

A-6003-642 (03/03)

Appendix C

Survey Data Reports for 200-DV-1 Operable Unit Boreholes

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WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/08/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 09/15/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Vault Handhole for DV-1 Borehole C9552 located in the B-Complex in 200E Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200E

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:
Washington State Reference Network

Vertical Control Monuments:
Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9552	C9552	573616.00	137679.33	192.06	Top C/L 18" Dia. Vault Handhole

Notes:

Surveyed location on top center of 18 inch diameter vault handhole.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

A-6003-659 (REV 1)

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/08/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 09/15/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Vault Handhole for DV-1 Borehole C9550 located in the B-Complex in 200E Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200E

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:
Washington State Reference Network

Vertical Control Monuments:
Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9550	C9550	573549.49	137719.05	190.18	Top C/L 18" Dia. Vault Handhole

Notes:

Surveyed location on top center of 18 inch diameter vault handhole.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

A-6003-659 (REV 1)

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/08/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 09/15/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Vault Handhole for DV-1 Borehole C9549 located in the B-Complex in 200E Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200E

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:
Washington State Reference Network

Vertical Control Monuments:
Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9549	C9549	573663.52	137697.13	189.61	Top C/L 18" Dia. Vault Handhole

Notes:

Surveyed location on top center of 18 inch diameter vault handhole.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

A-6003-659 (REV 1)

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/08/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 09/15/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9548 located in the B-Complex in 200E Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200E

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:
Washington State Reference Network

Vertical Control Monuments:
Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9548	C9548	573662.29	137696.87	189.59	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

A-6003-659 (REV 1)

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/08/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 09/15/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9491 located in the B-Complex in 200E Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200E

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:

Washington State Reference Network

Vertical Control Monuments:

Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9491	C9491	573466.26	137319.46	202.94	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/08/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 09/15/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9490 located in the B-Complex in 200E Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200E

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:
Washington State Reference Network

Vertical Control Monuments:
Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9490	C9490	573856.96	136810.33	208.16	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/08/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 09/15/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9489 located in the B-Complex in 200E Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200E

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:

Washington State Reference Network

Vertical Control Monuments:

Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9489	C9489	573842.20	136849.94	207.92	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/08/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 09/15/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9488 located in the B-Complex in 200E Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200E

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:
Washington State Reference Network

Vertical Control Monuments:
Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9488	C9488	573784.63	137469.69	195.35	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

A-6003-659 (REV 1)

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/08/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 09/15/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9487 located in the B-Complex in 200E Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200E

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:

Washington State Reference Network

Vertical Control Monuments:

Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9487	C9487	573802.32	137396.10	198.74	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/08/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 09/15/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C8707 located in the B-Complex in 200E Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200E

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:
Washington State Reference Network

Vertical Control Monuments:
Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C8707	C8707	573661.64	137697.00	189.57	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

A-6003-659 (REV 1)

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/08/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 09/15/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Vault Handhole for DV-1 Borehole C8706 located in the B-Complex in 200E Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200E

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:
Washington State Reference Network

Vertical Control Monuments:
Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C8706	C8706	573636.73	137698.47	189.72	Top C/L 18" Dia. Vault Handhole

Notes:

Surveyed location on top center of 18 inch diameter vault handhole.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

SURVEY DATA REPORT

Request No. 164-132

Project No.	Title	File No.
	B-Complex DV-1 Boreholes Final Surveys	2EWA-060

Job. No.	Prepared By	Date	Reviewer
CACN: 302632-JPRC	N.P. Fastabend	9/15/16	

DESCRIPTION OF WORK	DISTRIBUTION	SDR	PLOT	DWG
Obtain final coordinates and elevations of completed DV-1 Boreholes C8706, C8707, C9487, C9488, C9489, C9490, C9491, C9548, C9549, C9550 and C9552 located in the B-Complex of 200E Area.	Survey File	OR		
	J.D. Mehrer	1		
	K.M. Whitley	1		
	J.B. Geiger	1		
	A.J. Green	1		
Horizontal Coordinate System: WCS83S/91 (Meters)				
Vertical Datum: NAVD88 (Meters)				

SURVEY RESULTS AND COMMENTS

See Attached Well Survey Data Report Sheets

FOR OFFICE USE ONLY

OR Doc Type:	WMU Code(S):

A-6006-495 (REV 1)

SURVEY DATA REPORT

Request No. 164-132

Project No.	Title	File No.
	B-Complex DV-1 Boreholes Final Surveys	2EWA-060

Job. No.	Prepared By	Date	Reviewer
CACN: 302632-JPRC	N.P. Fastabend	9/15/16	

DESCRIPTION OF WORK	DISTRIBUTION	SDR	PLOT	DWG
Obtain final coordinates and elevations of completed DV-1 Boreholes C8706, C8707, C9487, C9488, C9489, C9490, C9491, C9548, C9549, C9550 and C9552 located in the B-Complex of 200E Area.	Survey File	OR		
	J.D. Mehrer	1		
	K.M. Whitley	1		
	J.B. Geiger	1		
	A.J. Green	1		
Horizontal Coordinate System: WCS83S/91 (Meters)				
Vertical Datum: NAVD88 (Meters)				

SURVEY RESULTS AND COMMENTS

See Attached Well Survey Data Report Sheets

FOR OFFICE USE ONLY

OR Doc Type:	WMU Code(S):

A-6006-495 (REV 1)

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/08/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 09/15/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Vault Handhole for DV-1 Borehole C8706 located in the B-Complex in 200E Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200E

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:

Washington State Reference Network

Vertical Control Monuments:

Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C8706	C8706	573636.73	137698.47	189.72	Top C/L 18" Dia. Vault Handhole

Notes:

Surveyed location on top center of 18 inch diameter vault handhole.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/08/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 09/15/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C8707 located in the B-Complex in 200E Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200E

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:

Washington State Reference Network

Vertical Control Monuments:

Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C8707	C8707	573661.64	137697.00	189.57	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/08/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 09/15/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9487 located in the B-Complex in 200E Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200E

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:

Washington State Reference Network

Vertical Control Monuments:

Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9487	C9487	573802.32	137396.10	198.74	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/08/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 09/15/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9488 located in the B-Complex in 200E Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200E

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:

Washington State Reference Network

Vertical Control Monuments:

Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9488	C9488	573784.63	137469.69	195.35	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/08/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 09/15/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9489 located in the B-Complex in 200E Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200E

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:

Washington State Reference Network

Vertical Control Monuments:

Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9489	C9489	573842.20	136849.94	207.92	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/08/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 09/15/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9490 located in the B-Complex in 200E Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200E

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:

Washington State Reference Network

Vertical Control Monuments:

Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9490	C9490	573856.96	136810.33	208.16	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/08/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 09/15/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9491 located in the B-Complex in 200E Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200E

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:

Washington State Reference Network

Vertical Control Monuments:

Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9491	C9491	573466.26	137319.46	202.94	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/08/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 09/15/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9548 located in the B-Complex in 200E Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200E

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:

Washington State Reference Network

Vertical Control Monuments:

Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9548	C9548	573662.29	137696.87	189.59	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/08/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 09/15/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Vault Handhole for DV-1 Borehole C9549 located in the B-Complex in 200E Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200E

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:

Washington State Reference Network

Vertical Control Monuments:

Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9549	C9549	573663.52	137697.13	189.61	Top C/L 18" Dia. Vault Handhole

Notes:

Surveyed location on top center of 18 inch diameter vault handhole.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/08/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 09/15/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Vault Handhole for DV-1 Borehole C9550 located in the B-Complex in 200E Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200E

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:
Washington State Reference Network

Vertical Control Monuments:
Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9550	C9550	573549.49	137719.05	190.18	Top C/L 18" Dia. Vault Handhole

Notes:

Surveyed location on top center of 18 inch diameter vault handhole.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/08/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 09/15/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Vault Handhole for DV-1 Borehole C9552 located in the B-Complex in 200E Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200E

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:
Washington State Reference Network

Vertical Control Monuments:
Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9552	C9552	573616.00	137679.33	192.06	Top C/L 18" Dia. Vault Handhole

Notes:

Surveyed location on top center of 18 inch diameter vault handhole.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

SURVEY DATA REPORT

Request No. 171-001

Project No.	Title	File No.
	200W S/T-Complex DV-1 Boreholes Final Surveys	2EWA-060

Job. No.	Prepared By	Date	Reviewer
CACN: 302632-JPRC	N.P. Fastabend	10/03/16	

DESCRIPTION OF WORK

Obtain final coordinates and elevations of Brass Cap Markers for completed DV-1 Boreholes C9492, C9494, C9495, C9496, C9499, C9502, C9505, C9506, C9507, C9510, C9511, C9512, C9514 and C9554 located in the S and T-Complex of 200W Area.

Horizontal Coordinate System: WCS83S/91 (Meters)
Vertical Datum: NAVD88 (Meters)

DISTRIBUTION	SDR	PLOT	DWG
Survey File	OR		
J.D. Mehrer	1		
K.M. Whitley	1		
J.B. Geiger	1		
A.J. Green	1		

SURVEY RESULTS AND COMMENTS

See Attached Well Survey Data Report Sheets

FOR OFFICE USE ONLY

OR Doc Type:	WMU Code(S):

A-6006-495 (REV 1)

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/28/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 10/03/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9492 located in the T-Complex in 200W Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200W

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:

Washington State Reference Network

Vertical Control Monuments:

Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9492	C9492	566675.38	136732.60	206.83	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/28/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 10/03/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9494 located in the T-Complex in 200W Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200W

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:
Washington State Reference Network

Vertical Control Monuments:
Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9494	C9494	566673.43	136718.92	206.80	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/28/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 10/03/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9495 located in the T-Complex in 200W Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200W

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:

Washington State Reference Network

Vertical Control Monuments:

Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9495	C9495	566948.09	136809.11	212.89	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/28/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 10/03/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9496 located in the T-Complex in 200W Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200W

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:

Washington State Reference Network

Vertical Control Monuments:

Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9496	C9496	566975.07	136868.82	213.01	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/28/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 10/03/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9499 located in the T-Complex in 200W Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200W

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:

Washington State Reference Network

Vertical Control Monuments:

Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9499	C9499	567202.86	136657.88	216.33	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/28/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 10/03/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9502 located in the T-Complex in 200W Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200W

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:

Washington State Reference Network

Vertical Control Monuments:

Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9502	C9502	567176.95	136670.61	216.66	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/28/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 10/03/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9505 located in the T-Complex in 200W Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200W

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:
Washington State Reference Network

Vertical Control Monuments:
Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9505	C9505	566975.41	136801.24	213.21	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/28/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 10/03/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9506 located in the T-Complex in 200W Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200W

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:

Washington State Reference Network

Vertical Control Monuments:

Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9506	C9506	566948.95	136471.97	205.14	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/28/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 10/03/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9507 located in the T-Complex in 200W Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200W

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:

Washington State Reference Network

Vertical Control Monuments:

Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9507	C9507	566847.78	136032.03	202.64	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/28/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 10/03/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9510 located in the T-Complex in 200W Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200W

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:

Washington State Reference Network

Vertical Control Monuments:

Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9510	C9510	566569.52	136228.59	206.39	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/28/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 10/03/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9511 located in the T-Complex in 200W Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200W

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:

Washington State Reference Network

Vertical Control Monuments:

Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9511	C9511	566583.67	136172.25	206.21	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/28/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 10/03/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9512 located in the S-Complex in 200W Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200W

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:

Washington State Reference Network

Vertical Control Monuments:

Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9512	C9512	567186.30	134419.87	207.61	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/28/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 10/03/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9514 located in the S-Complex in 200W Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200W

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:

Washington State Reference Network

Vertical Control Monuments:

Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9514	C9514	566615.64	134412.24	202.51	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

WELL SURVEY DATA REPORT

Project:	**Prepared By:** Neil P. Fastabend
	Company: CHPRC
Date Requested: 09/28/16	Requestor: James D. Mehrer (CHPRC)
Date of Survey: 10/03/16	Surveyor / Company: Neil P. Fastabend / CHPRC
Description of Work: Obtained final survey coordinates and elevation of Brass Cap Marker for DV-1 Borehole C9554 located in the T-Complex in 200W Area.	Horizontal Datum: NAD83 (91)
	Vertical Datum: NAVD88
	Units: Meters
	Hanford Area Designation: 200W

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments:

Washington State Reference Network

Vertical Control Monuments:

Washington State Reference Network

Well ID	Well Name	Easting	Northing	Elevation	
C9554	C9554	567178.25	136670.78	216.65	Brass Cap Survey Marker in Concrete

Notes:

Surveyed location on top center of Brass Cap in Concrete.

Equipment Used: Trimble R8 RTK GPS

Surveyor Statement:

Appendix D

Soil and Core Sample Collection Details for 200-DV-1 Operable Unit Boreholes

Tables

Table D-1 Borehole C9487 (216-B-7 A&B) D-1
Table D-2. Borehole C9488 (216-B-8 Crib and Tile Field) D-6
Table D-3. Borehole C9489 (216-B-9 Crib and Tile Field) D-11
Table D-4. Borehole C9490 (216-B-9 Crib) D-16
Table D-5. Borehole C9491 (216-B-37 Trench) D-21
Table D-6. Borehole C9550 (replacement for C8711) (BY Cribs) D-25
Table D-7. Borehole C9549 (replacement borehole for C8707, C9548) (BY Cribs) D-29
Table D-8. Borehole C9552 (replacement borehole for C8709, C9551) (216-B-45/49) D-33
Table D-9. Borehole C8706 (216-B-46 Crib) D-37
Table D-10. Borehole C9492 (216-T-5 Trench) D-41
Table D-11. Borehole C9499 (216-T-6 Crib #1) D-43
Table D-12. Borehole C9505 (216-T-15 Trench) D-45
Table D-13. Borehole C9506 (216-T-18 Crib) D-47
Table D-14. Borehole C9507 (216-T-19 Crib and Tile Field) D-49
Table D-15. Borehole C9511 (216-T-23 Trench) D-52
Table D-16. Borehole C9510 (216-T-25 Trench) D-54
Table D-17. Borehole C9512 (216-S-9 Crib) D-56
Table D-18. Borehole C9514 (216-S-21 Crib) D-59

Table D-1 Borehole C9487 (216-B-7 A&B)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
Becker Hammer						
10/29/2015	3.0 - 5.5	80	-	-	-	B33B25, B33B30
10/29/2015	7.0 - 9.5	83	-	-	-	B33BD6, B33BN2
10/29/2015	13.0 - 15.5	100	-	-	-	B33BN4, B33BN5, B33BN6
Sonic						
3/16/2016	55.0 - 57.0	75	69	-	Unreadable	B34W59, B34W56
3/16/2016	55.0 - 56.0	100	69	-	84	B34W60
3/16/2016	56.0 - 57.0	100	86	90.2	111	B34W61
3/17/2016	57.2 – 58.2	100	60	-	104	B34W65, B34W62
3/17/2016	58.2 – 59.2	100	77	-	Did not register	B34W66
3/17/2016	59.2 – 59.7	100	81	59.5	Did not register	B34W67
3/17/2016	59.5 – 60.5	100	84	-	Did not register	B34WN7, B34WN4
3/17/2016	60.5 – 61.5	100	81	-	93	B34WN8
3/17/2016	61.5 – 62.0	100	92	83.6	108	B34WN9
3/17/2016	62.3 – 64.8	100	62.3 ft bgs = 69 64.8 ft bgs = 71	94.6	-	B34W69, B34W68
3/17/2016	64.5 – 67.0	100	64.5 ft bgs = 77 67.0 ft bgs = 97	94.8	-	B34W71, B34W70
3/17/2016	67.0 – 69.5	100	67.0 ft bgs = 81 69.5 ft bgs = 110	102	-	B34W73
3/17/2016	69.5 – 72.0	100	69.5 ft bgs = 64 72.0 ft bgs = 71	83.2	-	B34W75
3/17/2016	72.0 – 74.5	100	72.0 ft bgs = 65 74.5 ft bgs = 70	75.3	-	B34W77
3/17/2016	74.5 – 77.0	100	74.5 ft bgs = 64 77.0 ft bgs = 79	71.6	-	B34W79
3/21/2016	77.0 – 82.0	100	77.0 ft bgs = 60 79.5 ft bgs = 64 82.0 ft bgs = 70	68.4	-	B34W81

Table D-1 Borehole C9487 (216-B-7 A&B)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
3/21/2016	82.3 – 87.3	100	82.3 ft bgs = 62 84.8 ft bgs = 59 87.3 ft bgs = 73	74.4	-	B34W83
3/21/2016	87.2 – 92.2	100	87.2 ft bgs = 65 89.7 ft bgs = 71 92.2 ft bgs = 88	92.8	-	B34W85
3/21/2016	92.2 – 97.2	100	92.2 ft bgs = 71 94.7 ft bgs = 68 97.2 ft bgs = 117	102.2	-	B34W87
3/21/2016	97.2 – 102.2	100	97.2 ft bgs = 74 99.7 ft bgs = 68 102.2 ft bgs = 93	87.8	-	B34W89
3/21/2016	102.0 – 107.0	100	102.0 ft bgs = 78 104.5 ft bgs = 68 107.0 ft bgs = 86	94.8	-	B34W91
3/21/2016	107.0 – 112.0	100	107.0 ft bgs = 72 109.5 ft bgs = 66 112.0 ft bgs = 76	86.6	-	B34W93
3/21/2016	112.3 – 117.3	100	112.3 ft bgs = 68 114.8 ft bgs = 66 117.3 ft bgs = 90	103.8	-	B34WK3
3/22/2016	117.2 – 122.2	100	117.2 ft bgs = 60 119.7 ft bgs = 59 122.2 ft bgs = 94	69.2	-	B34WK5
3/22/2016	122.2 – 127.2	100	122.2 ft bgs = 62 124.7 ft bgs = 58 127.2 ft bgs = 116	92.2	-	B34WK7
3/22/2016	127.0 – 128.0	100	73	-	Did not register	B34W95
3/22/2016	128.0 – 129.0	100	61	-	Did not register	B34W96
3/22/2016	129.0 – 130.0	100	61	-	Did not register	B34W97
3/22/2016	130.0 – 131.0	100	62	-	Did not register	B34W98

Table D-1 Borehole C9487 (216-B-7 A&B)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
3/22/2016	131.0 – 132.0	100	83	72.8	Did not register	B34W99
3/22/2016	132.1 – 133.1	100	67	-	Did not register	B34WB1
3/22/2016	133.1 – 134.1	100	64	-	Did not register	B34WB2
3/22/2016	134.1 – 135.1	100	64	-	Did not register	B34WB3
3/22/2016	135.1 – 136.1	100	72	-	Did not register	B34WB4
3/22/2016	136.1 – 137.1	100	115	87.8	Did not register	B34WB5
3/22/2016	137.0 – 138.0	100	80	-	84	B34WB7
3/22/2016	138.0 – 139.0	100	72	-	Did not register	B34WB8
3/22/2016	139.0 – 140.0	100	72	-	84	B34WB9
3/22/2016	140.0 – 141.0	100	78	-	Did not register	B34WC0
3/22/2016	141.0 – 142.0	100	117	91.2	84	B34WC1
3/22/2016	142.2 – 147.2	100	142.2 ft bgs = 62 144.7 ft bgs = 62 147.2 ft bgs = 107	79.8	-	B34WC3
3/22/2016	147.1 – 152.1	100	147.1 ft bgs = 65 149.6 ft bgs = 62 152.1 ft bgs = 110	79.8	-	B34WC5
3/22/2016	152.0 – 157.0	100	152.0 ft bgs = 71 154.5 ft bgs = 65 157.0 ft bgs = 104	89.6	-	B34WC7
3/22/2016	157.2 – 162.2	100	157.2 ft bgs = 71 159.7 ft bgs = 64 162.2 ft bgs = 105	86.4	-	B34WC9
3/23/2016	162.0 – 167.0	100	162.0 ft bgs = 71 164.5 ft bgs = 71 167.0 ft bgs = 111	91.2	-	B34WD1
3/23/2016	167.2 – 172.2	100	167.2 ft bgs = 61 169.7 ft bgs = 62 172.2 ft bgs = 86	71.6	-	B34WD3

Table D-1 Borehole C9487 (216-B-7 A&B)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
3/23/2016	172.0 – 177.0	100	172.0 ft bgs = 65 174.5 ft bgs = 61 177.0 ft bgs = 86	79.2	-	B34WD5
3/23/2016	177.2 – 182.2	100	177.2 ft bgs = 69 179.7 ft bgs = 64 182.2 ft bgs = 91	65.4	-	B34WD7
3/23/2016	182.3 – 187.3	100	182.3 ft bgs = 66 184.8 ft bgs = 64 187.3 ft bgs = 91	84.2	-	B34WD9
3/23/2016	187.2 – 192.2	100	187.2 ft bgs = 73 189.7 ft bgs = 71 192.2 ft bgs = 88	59.6	-	B34WF1
3/23/2016	192.2 – 197.2	100	192.2 ft bgs = 70 194.7 ft bgs = 69 197.2 ft bgs = 118	101.6	-	B34WF3
3/23/2016	197.1 – 202.1	100	197.1 ft bgs = 75 199.6 ft bgs = 77 202.1 ft bgs = 132	105.2	-	B34WF5
3/24/2016	202.2 - 207.2	100	202.2 ft bgs = 58 204.7 ft bgs = 58 207.2 ft bgs = 117	77.4	-	B34WF7
3/24/2016	207.2 - 212.2	100	207.2 ft bgs = 64 209.7 ft bgs = 66 212.2 ft bgs = 129	77.2	-	B34WF9
3/28/2016	212.0 - 214.5	100	212.0 ft bgs = 63 214.5 ft bgs = 72	60.4	-	B34WH1
	214.5 - 217.0	100	214.5 ft bgs = 58 217.0 ft bgs = 70	73.4	-	B34WH3
3/29/2016	217.3 – 219.8	100	217.3 ft bgs = 57 219.8 ft bgs = 71	66.8	-	B34WK9
3/29/2016	219.5 – 222.0[a]	70	53	-	84	B34WH5

Table D-1 Borehole C9487 (216-B-7 A&B)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
3/29/2016	219.5 – 222.0[a]	100	54	-	Missing after drilling	B34WH6
3/29/2016	219.5 – 220.0	100	58	-	Did not register	B34WH7
3/29/2016	220.0 – 221.0	100	61	-	Missing after drilling	B34WH8
3/29/2016	221.0 – 222.0	100	67	73.4	Did not register	B34WH9
3/29/2016	222.4 – 224.9[a]	40	60	-	Did not register	B34WJ2
3/29/2016	222.4 – 222.9	100	64	-	Did not register	B34WJ3
3/29/2016	222.9 – 223.9	100	63	-	Did not register	B34WJ4
3/29/2016	223.9 – 224.9	100	70	79.8	Did not register	B34WJ5
3/29/2016	224.7 – 227.2[a]	50	65	-	Did not register	B34WJ7
3/29/2016	224.7 – 227.2[a]	100	65	-	Did not register	B34WJ8
3/29/2016	224.7 – 225.2	100	66	-	Did not register	B34WJ9
3/29/2016	225.2 – 226.2	100	67	-	Did not register	B34WK0
3/29/2016	226.2 – 227.2	100	73	76.7	Did not register	B34WK1
3/29/2016	227.2 – 227.7	100	66	-	Did not register	B354L1
3/29/2016	227.7 – 228.7	100	67	-	Did not register	B354L2
3/29/2016	228.7 – 229.7	100	73	80.4	Did not register	B354L3
3/29/2016	229.5 – 230.0	100	67	-	Did not register	B354L7
3/29/2016	230.0 – 231.0	100	73	-	Did not register	B354L8
3/29/2016	231.0 – 232.0	100	83	69.8	Did not register	B354L9
3/30/2016	232.0 - 235.0[a]	65	81	-	Did not register	B354M1
3/30/2016	232.0 - 235.0[a]	100	60	-	Did not register	B354M2
3/30/2016	232.0 - 233.0	100	60	-	Did not register	B354M3
3/30/2016	233.0 - 234.0	100	79	-	Did not register	B354M4
3/30/2016	234.0 - 235.0	100	69	73.4	Did not register	B354M5

Notes:
a. Excess borehole sediment.
bgs = below ground surface.
HEIS = Hanford Environment Information System.
IR = Infrared.

Table D-2. Borehole C9488 (216-B-8 Crib and Tile Field)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
Becker Hammer					
3/8/2016	4.0 - 6.5	30	-	-	B33Y32, B33Y38, B33Y43, B33Y48
3/8/2016	7.0 - 9.5	20	-	-	B33Y39, B33Y44, B33Y49
3/8/2016	10.0 -12.5	20	-	-	B33Y40, B33Y45, B33Y50
3/22/2016	23.0 - 25.5	100	-	-	B33Y42, B33Y52, B33Y47, B33Y34
Sonic					
4/14/2016	43.5 – 44.5	100	43.5 ft bgs = 48 44.5 ft bgs = 81	61.8	B355B1, B355B0(RS)
4/14/2016	44.7 – 47.2	100	44.7 ft bgs = 61 46 ft bgs = 65 47.2 ft bgs = 68	70.8	B355B3, B355B2(RS)
4/14/2016	47.1 – 49.6	100	47.1 ft bgs = 71 48.3 ft bgs = 71 49.6 ft bgs = 66	75.2	B355B5, B355B4(RS)
4/14/2016	49.6 – 52.1	100	49.6 ft bgs = 68 50.2 ft bgs = 68 52.1 ft bgs = 72	76.2	B355B7, B355B6(RS)
4/14/2016	52.2 – 54.7	100	52.2 ft bgs = 68 53.5 ft bgs = 68 54.7 ft bgs = 74	84.8	B355B9
4/14/2016	54.5 – 57.0	100	54.5 ft bgs = 72 55.6 ft bgs = 71 57.0 ft bgs = 85	77.2	B355C1
4/14/2016	57.2 – 59.7	100	57.2 ft bgs = 63 58.5 ft bgs = 71 59.7 ft bgs = 83	77.4	B355C3
4/14/2016	59.7 – 62.2	100	59.7 ft bgs = 63 61.0 ft bgs = 74 62.2 ft bgs = 97	114.2	B355C5

Table D-2. Borehole C9488 (216-B-8 Crib and Tile Field)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
4/14/2016	62.2 – 67.2	100	62.2 ft bgs = 82 64.7 ft bgs = 74 67.2 ft bgs = 84	96.2	B355C7
4/14/2016	67.5 – 72.0	100	67.5 ft bgs = 75 69.8 ft bgs = 69 72.0 ft bgs = 94	85.2	B355C9
4/18/2016	72.2 – 77.2	100	72.2 ft bgs = 71 74.7 ft bgs = 68 77.2 ft bgs = 91	109.2	B355D1
4/18/2016	77.1 – 82.1	100	77.1 ft bgs = 87 79.6 ft bgs = 77 82.1 ft bgs = 103	92.2	B355D3
4/18/2016	82.1 – 87.1	100	82.1 ft bgs = 91 84.6 ft bgs = 78 87.1 ft bgs = 122	112.4	B355D5
4/18/2016	87.0 – 92.0	100	87.0 ft bgs = 90 89.5 ft bgs = 85 91.0 ft bgs = 116	108.8	B355D7
4/18/2016	92.2 – 97.2	100	92.2 ft bgs = 82 94.7 ft bgs = 78 97.2 ft bgs = 92	89.4	B355D9
4/18/2016	97.3 – 102.3	100	97.3 ft bgs = 84 99.8 ft bgs = 79 102.3 ft bgs = 96	92.4	B355F1
4/18/2016	102.0 – 107.0	100	102.0 ft bgs = 86 104.5 ft bgs = 79 107.0 ft bgs = 94	95.2	B355F3
4/19/2016	107.4 -112.4	100	107.4 ft bgs = 66 109.9 ft bgs = 59 112.4 ft bgs = 112	115.6	B355F5

Table D-2. Borehole C9488 (216-B-8 Crib and Tile Field)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
4/19/2016	112.3 – 117.3	100	112.3 ft bgs = 68 114.8 ft bgs = 62 117.3 ft bgs = 107	108.8	B355F7
4/19/2016	117.3 – 122.3	100	117.3 ft bgs = 75 119.8 ft bgs = 68 122.3 ft bgs = 124	108.4	B355F9
4/19/2016	122.1 – 127.1	100	122.1 ft bgs = 73 124.6 ft bgs = 72 127.1 ft bgs = 132	107.6	B355H1
4/19/2016	127.2 – 132.2	100	127.2 ft bgs = 75 129.7 ft bgs = 75 132.2 ft bgs = 95	89.6	B355H3
4/19/2016	132.1 – 137.1	100	132.1 ft bgs = 80 134.6 ft bgs = 79 137.1 ft bgs = 99	93.2	B355H5
4/19/2016	137.3 – 142.3	100	137.3 ft bgs = 89 139.8 ft bgs = 81 142.3 ft bgs = 118	105.4	B355H7
4/19/2016	142.2 – 147.2	100	142.2 ft bgs = 83 144.7 ft bgs = 76 147.2 ft bgs = 103	96.6	B355H9
4/19/2016	147.3 – 152.3	100	147.3 ft bgs = 86 149.8 ft bgs = 79 152.3 ft bgs = 102	110.4	B355J1
4/20/2016	152.3 – 157.3	100	152.3 ft bgs = 68 154.8 ft bgs = 71 157.3 ft bgs = 96	79.6	B355J3
4/20/2016	157.1 – 162.1	100	157.1 ft bgs = 73 159.6 ft bgs = 74 162.1 ft bgs = 122	106.8	B355J5

Table D-2. Borehole C9488 (216-B-8 Crib and Tile Field)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
4/20/2016	162.3 – 167.3	100	162.3 ft bgs = 71 164.8 ft bgs = 79 167.3 ft bgs = 108	106.4	B355J7
4/20/2016	167.3 – 172.3	100	167.3 ft bgs = 82 169.8 ft bgs = 79 172.3 ft bgs = 112	95.8	B355J9
4/20/2016	172.3 – 177.3	100	172.3 ft bgs = 83 174.8 ft bgs = 75 177.3 ft bgs = 106	97.2	B355K1
4/20/2016	177.1 – 182.1	100	177.1 ft bgs = 93 179.6 ft bgs = 98 182.1 ft bgs = 160	115.6	B355K3
4/20/2016	182.3 – 187.3	100	182.3 ft bgs = 85 184.8 ft bgs = 79 187.3 ft bgs = 101	95.6	B355K5
4/21/2016	187.3 - 192.3	100	187.3 ft bgs = 61 189.8 ft bgs = 64 192.3 ft bgs = 122	106.4	B355K7
4/21/2016	192.0 – 197.0	100	192.0 ft bgs = 66 194.5 ft bgs = 71 197.0 ft bgs = 105	94.2	B355K9
4/21/2016	197.3 – 202.3	100	197.3 ft bgs = 84 199.8 ft bgs = 71 202.3 ft bgs = 106	93.5	B355M9
4/21/2016	202.0 – 207.0	100	202.0 ft bgs = 82 104.5 ft bgs = 81 207.0 ft bgs = 116	98.2	B355N1
4/21/2016	207.3 – 212.3	100	207.3 ft bgs = 78 209.8 ft bgs = 75 212.3 ft bgs = 89	99.4	B355N3

Table D-2. Borehole C9488 (216-B-8 Crib and Tile Field)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
4/21/2016	212.4 – 217.4	77	212.4 ft bgs = 69 214.9 ft bgs = 60 217.4 ft bgs = 70	77.2	B355N5
4/26/2016	217.3 – 218.3	100	57	-	B355L1
4/26/2016	218.3 – 219.3	100	-	-	B355L2
4/26/2016	219.3 – 220.3	100	84	-	B355L3
4/26/2016	220.3 – 221.3	100	-	-	B355L4
4/26/2016	221.3 – 222.3	100	84	72.8	B355L5
4/26/2016	222.5 – 225.5[a]	100	61	-	B355L7
4/26/2016	222.5 – 225.5[a]	100	-	-	B355L8
4/26/2016	222.5 – 223.5	100	64	-	B355L9
4/26/2016	223.5 – 224.5	100	-	-	B355M0
4/26/2016	224.5 – 225.5	100	67	68.8	B355M1

Notes:
a. Excess borehole sediment.
bgs = below ground surface.
HEIS = Hanford Environment Information System.
IR = Infrared.

Table D-3. Borehole C9489 (216-B-9 Crib and Tile Field)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
Becker Hammer					
11/4/2015	3.0 - 5.5	50	-	-	B33BX4, B33BX5
11/4/2015	7.0 - 9.5	65	-	-	B33BX7, B33BX8
11/4/2015	10.1 - 12.6	25	-	-	B33BX9, B33BY0, B33BY1, B33BY2, B33BY4, B33BY5, B33BY6
Sonic					
8/15/2016	34.2 - 36.7	40	~1ft sample = 83	93.2	B353D2, B353D1
8/16/2016	37.6 – 40.1	92	37.6 ft bgs = 65 40.1 ft bgs = 67	74.6	B353D4, B353D3
8/16/2016	39.6 – 42.1	100	39.6 ft bgs = 70 42.1 ft bgs = 75	81.2	B353D6, B353D5
8/16/2016	42.1 – 44.6	100	42.1 ft bgs = 81 44.6 ft bgs = 98	114.6	B353D8, B353D7
8/16/2016	44.5 – 47.0	68	44.5 ft bgs = 71 47.0 ft bgs = 73	84.2	B353F0, B353D9
8/16/2016	47.4 – 49.9	100	47.4 ft bgs = 88 49.9 ft bgs = 81	91.4	B353F2
8/16/2016	49.7 - 52.2	0	-	-	-
8/16/2016	52.2 - 54.7	0	-	-	-
8/16/2016	54.7 – 57.2	100	54.7 ft bgs = 81 57.2 ft bgs = 80	93.8	B353F6
8/16/2016	57.4 – 62.4	100	57.4 ft bgs = 102 59.9 ft bgs = 87 62.4 ft bgs = 91	98.4	B353F8
8/16/2016	62.4 – 67.4	100	62.4 ft bgs = 89 64.9 ft bgs = 87 67.4 ft bgs = 85	103.6	B353H0

Table D-3. Borehole C9489 (216-B-9 Crib and Tile Field)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
8/16/2016	67.4 – 72.4	100	67.4 ft bgs = 95 69.9 ft bgs = 80 72.4 ft bgs = 86	101.4	B353H2
8/16/2016	72.6 – 77.6	100	72.6 ft bgs = 84 75.1 ft bgs = 80 77.6 ft bgs = 82	93.8	B353H4
8/18/2016	77.6 – 82.6	100	77.6 ft bgs = 74 80.1 ft bgs = 77 82.6 ft bgs = 83	102	B353H6
8/18/2016	82.5 – 87.5	100	82.5 ft bgs = 88 85.0 ft bgs = 80 87.5 ft bgs = 87	111.8	B353H8
8/18/2016	87.5 – 92.5	100	87.5 ft bgs = 76 90.0 ft bgs = 78 92.5 ft bgs = 83	96.2	B353J0
8/18/2016	92.6 -97.6	100	92.6 ft bgs = 76 95.1 ft bgs = 78 97.6 ft bgs = 83	101	B353J2
8/18/2016	97.6 – 102.6	100	97.6 ft bgs = 76 100.1 ft bgs = 78 102.6 ft bgs = 83	103.8	B353J4
8/18/2016	102.6 – 107.6	100	102.6 ft bgs = 76 105.1 ft bgs = 81 107.6 ft bgs = 80	94.2	B353J6
8/18/2016	107.4 – 112.4	100	107.4 ft bgs = 83 109.9 ft bgs = 80 112.4 ft bgs = 93	103.8	B353J8
8/18/2016	112.5 – 117.5	100	112.5 ft bgs = 80 115.0 ft bgs = 82 117.5 ft bgs = 87	107.8	B353K0

Table D-3. Borehole C9489 (216-B-9 Crib and Tile Field)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
8/18/2016	117.5 – 122.5	100	117.5 ft bgs = 83 120.0 ft bgs = 82 122.5 ft bgs = 112	122.8	B353K2
8/18/2016	122.5 – 127.5	100	122.5 ft bgs = 81 125.0 ft bgs = 84 127.5 ft bgs = 90	108.7	B353K4
8/18/2016	127.4 – 132.4	100	127.4 ft bgs = 83 129.9 ft bgs = 89 132.4 ft bgs = 102	121.8	B353K6
8/18/2016	132.1 – 137.1	100	132.1 ft bgs = 87 134.6 ft bgs = 85 137.1 ft bgs = 99	112.4	B353K8
8/22/2016	137.4 – 142.4	100	137.4 ft bgs = 80 139.9 ft bgs = 77 142.4 ft bgs = 90	103.4	B353L0
8/22/2016	142.5 – 147.5	100	142.5 ft bgs = 73 145.0 ft bgs = 75 147.5 ft bgs = 88	99.8	B353L2
8/22/2016	147.4 – 152.4	100	147.4 ft bgs = 89 149.9 ft bgs = 87 152.4 ft bgs = 108	117.6	B353L4
8/22/2016	152.4 – 157.4	100	152.4 ft bgs = 76 154.9 ft bgs = 74 157.4 ft bgs = 94	108.2	B353L6
8/22/2016	157.6 – 162.6	100	157.6 ft bgs = 75 160.1 ft bgs = 78 162.6 ft bgs = 95	105.4	B353L8
8/22/2016	162.4 – 167.4	100	162.4 ft bgs = 82 164.9 ft bgs = 77 167.4 ft bgs = 91	98.8	B353M0

Table D-3. Borehole C9489 (216-B-9 Crib and Tile Field)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
8/23/2016	167.6 – 172.6	100	167.6 ft bgs = 68 170.1 ft bgs = 68 172.6 ft bgs = 74	84.2	B353M2
8/23/2016	172.6 – 177.6	100	172.6 ft bgs = 67 175.1 ft bgs = 68 177.6 ft bgs = 69	81.2	B353M4
8/23/2016	177.6 – 182.6	100	177.6 ft bgs = 69 180.1 ft bgs = 69 182.6 ft bgs = 75	102	B353M6
8/23/2016	182.6 – 187.6	100	182.6 ft bgs = 71 185.1 ft bgs = 71 187.6 ft bgs = 79	109.6	B353M8
8/23/2016	187.4 – 192.4	100	187.4 ft bgs = 74 189.9 ft bgs = 75 192.4 ft bgs = 79	89.8	B353N0
8/23/2016	192.4 – 197.4	100	192.4 ft bgs = 79 194.9 ft bgs = 77 197.4 ft bgs = 78	81.4	B353N2
8/23/2016	197.5 – 202.5	100	197.5 ft bgs = 80 200.0 ft bgs = 81 202.5 ft bgs = 87	97.2	B353N4
8/23/2016	202.6 – 207.6	100	202.6 ft bgs = 75 205.1 ft bgs = 79 207.6 ft bgs = 85	110.2	B353N6
8/23/2016	207.6 – 212.6	100	207.6 ft bgs = 78 210.1 ft bgs = 75 212.6 ft bgs = 79	98.2	B353N8
8/24/2016	212.4 – 217.4	100	212.4 ft bgs = 74 214.9 ft bgs = 78 217.4 ft bgs = 91	114.2	B353P0

Table D-3. Borehole C9489 (216-B-9 Crib and Tile Field)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
8/24/2016	217.5 – 222.5	100	217.5 ft bgs = 71 220.0 ft bgs = 72 222.5 ft bgs = 98	110.4	B353P2
8/24/2016	222.6 – 227.6	100	222.6 ft bgs = 70 225.1 ft bgs = 75 227.6 ft bgs = 96	107.8	B353P4
8/24/2016	227.6 – 232.6	95	227.6 ft bgs = 76 230.1 ft bgs = 78 232.6 ft bgs = 88	94.4	B353P6
8/24/2016	232.6 – 237.6	100	232.6 ft bgs = 82 235.1 ft bgs = 79 237.6 ft bgs = 92	106.3	B353P8
8/24/2016	237.7 – 242.7	100	237.7 ft bgs = 77 240.2 ft bgs = 77 242.7 ft bgs = 78	98.4	B353R0
8/24/2016	243.0 – 247.0	100	243.0 ft bgs = 82 245.0 ft bgs = 81 247.0 ft bgs = 95	96.4	B353R2
8/24/2016	247.6 – 251.6	100	247.6 ft bgs = 83 249.6 ft bgs = 87 251.6 ft bgs = 95	113.6	B353R4

Notes:
bgs = below ground surface.
HEIS = Hanford Environment Information System.
IR = Infrared.

Table D-4. Borehole C9490 (216-B-9 Crib)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
Becker Hammer					
11/4/2015	3.0 - 5.5	65	-	-	B33BV8, B33BV9
11/4/2015	7.0 - 9.5	25	-	-	B33BW1, B33BW2
11/4/2015	10.1 - 12.6	75	-	-	B33BW3, B33BW4, B33BW5, B33BW6
Sonic					
8/3/2016	34.5 – 37.0	100	34.5 ft bgs = 74 37.0 ft bgs = 92	122	B354N3, B354N2
8/3/2016	37.0 – 39.5	100	37.0 ft bgs = 83 39.5 ft bgs = 87	113	B354N5, B354N4
8/3/2016	39.6 – 42.1	100	39.6 ft bgs = 85 42.1 ft bgs = 94	105	B354N7, B354N6
8/4/2016	42.0 – 44.5	80	42.0 ft bgs = 68 44.5 ft bgs = 82	96	B354N9, B354N8
8/4/2016	44.5 – 47.0	100	44.5 ft bgs = 74 47.0 ft bgs = 86	94	B354P1, B354P0
8/4/2016	47.0 – 49.5	100	47.0 ft bgs = 85 49.5 ft bgs = 85	85	B354P3, B354P2
8/4/2016	49.5 – 52.0	100	49.5 ft bgs = 73 52.0 ft bgs = 77	102	B354P5, B354P4
8/4/2016	52.0 – 54.5	100	52.0 ft bgs = 77 54.5 ft bgs = 72	103	B354P7, B354P6
8/4/2016	54.5 – 57.0	100	54.5 ft bgs = 77 57.0 ft bgs = 91	114	B354P9, B354P8
8/4/2016	57.0 – 59.5	100	57.0 ft bgs = 87 59.5 ft bgs = 105	103	B354R1, B354R0
8/8/2016	59.5 – 62.0	100	59.5 ft bgs = 65 62.0 ft bgs = 73	70.8	B354R3, B354R2
8/8/2016	62.5 – 65.0	100	62.5 ft bgs = 70 65.0 ft bgs = 73	80.8	B354R5, B354R4
8/8/2016	64.6 – 67.1	80	64.6 ft bgs = 70 67.1 ft bgs = 71	74.2	B354R7, B354R6

Table D-4. Borehole C9490 (216-B-9 Crib)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
8/8/2016	67.3 – 69.8	100	67.3 ft bgs = 73 69.8 ft bgs = 77	82.8	B354R9, B354R8
8/8/2016	69.7 – 72.2	100	69.7 ft bgs = 73 72.2 ft bgs = 77	81.8	B354T1, B354T0
8/8/2016	72.3 – 74.8	100	72.3 ft bgs = 72 74.8 ft bgs = 77	91.2	B354T3
8/8/2016	74.6 – 77.1	100	74.6 ft bgs = 72 77.1 ft bgs = 74	87	B354T5
8/8/2016	77.4 – 79.9	100	77.4 ft bgs = 71 79.9 ft bgs = 75	90.4	B354T7
8/8/2016	79.8 – 82.3	100	79.8 ft bgs = 72 82.3 ft bgs = 81	93.4	B354T9
8/9/2016	82.5 – 87.5	100	82.5 ft bgs = 67 85.0 ft bgs = 65 87.5 ft bgs = 87	82.6	B354V1
8/9/2016	87.4 – 92.4	100	87.4 ft bgs = 68 89.9 ft bgs = 67 92.4 ft bgs = 80	92.2	B354V3
8/9/2016	92.4 – 97.4	100	92.4 ft bgs = 67 94.9 ft bgs = 64 97.4 ft bgs = 76	93.6	B354V5
8/9/2016	97.3 – 102.3	100	97.3 ft bgs = 69 99.8 ft bgs = 69 102.3 ft bgs = 74	84.8	B354V7
8/9/2016	102.3 – 107.3	100	102.3 ft bgs = 65 104.8 ft bgs = 68 107.3 ft bgs = 78	93.2	B354V9
8/9/2016	107.5 – 112.5	92	107.5 ft bgs = 70 110.0 ft bgs = 69 112.5 ft bgs = 70	94.4	B354W1

Table D-4. Borehole C9490 (216-B-9 Crib)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
8/9/2016	112.4 – 117.4	100	112.4 ft bgs = 71 114.9 ft bgs = 71 117.4 ft bgs = 91	95.2	B354W3
8/9/2016	117.5 – 122.5	100	117.5 ft bgs = 72 120.0 ft bgs = 70 122.5 ft bgs = 92	94.6	B354W5
8/9/2016	122.4 – 127.4	100	122.4 ft bgs = 73 124.9 ft bgs = 72 127.4 ft bgs = 86	102.4	B354W7
8/9/2016	127.4 – 132.4	100	127.4 ft bgs = 75 129.9 ft bgs = 74 132.4 ft bgs = 81	91.6	B354W9
8/9/2016	132.5 – 137.5	100	132.5 ft bgs = 72 135.0 ft bgs = 72 137.5 ft bgs = 80	97.2	B354X1
8/9/2016	137.5 – 142.5	100	137.5 ft bgs = 71 140.0 ft bgs = 71 142.5 ft bgs = 79	96.6	B354X3
8/9/2016	142.5 – 147.5	100	142.5 ft bgs = 73 145.0 ft bgs = 72 147.5 ft bgs = 89	92.8	B354X5
8/10/2016	147.3 – 152.3	100	147.3 ft bgs = 64 149.8 ft bgs = 68 152.3 ft bgs = 78	82.4	B354X7
8/10/2016	152.5 – 157.5	100	152.5 ft bgs = 66 155.0 ft bgs = 67 157.5 ft bgs = 71	86.3	B354X9
8/10/2016	157.5 – 162.5	100	157.5 ft bgs = 69 160.0 ft bgs = 70 162.5 ft bgs = 75	92	B354Y1

Table D-4. Borehole C9490 (216-B-9 Crib)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
8/10/2016	162.3 – 167.3	100	162.3 ft bgs = 71 164.8 ft bgs = 71 167.3 ft bgs = 85	91.6	B354Y3
8/10/2016	167.4 – 172.4	100	167.4 ft bgs = 71 169.9 ft bgs = 75 172.4 ft bgs = 87	99.2	B354Y5
8/10/2016	172.5 – 177.5	100	172.5 ft bgs = 77 175.0 ft bgs = 79 177.5 ft bgs = 91	99	B354Y7
8/10/2016	177.5 – 182.5	100	177.5 ft bgs = 72 180.0 ft bgs = 73 182.5 ft bgs = 79	94.4	B354Y9
8/10/2016	182.5 – 187.5	100	182.5 ft bgs = 72 185.0 ft bgs = 73 187.5 ft bgs = 81	95.2	B35501
8/10/2016	187.3 – 192.3	100	187.3 ft bgs = 82 189.8 ft bgs = 78 192.3 ft bgs = 92	102.8	B35503
8/10/2016	192.4 – 197.4	100	192.4 ft bgs = 81 194.9 ft bgs = 75 197.4 ft bgs = 91	96.2	B35505
8/10/2016	197.5 – 202.5	100	197.5 ft bgs = 76 200.0 ft bgs = 75 202.5 ft bgs = 92	99.2	B35507
8/11/2016	202.6 – 207.6	100	202.6 ft bgs = 69 205.1 ft bgs = 70 207.6 ft bgs = 83	82.2	B35509
8/11/2016	207.4 – 212.4	100	207.4 ft bgs = 77 209.9 ft bgs = 72 212.4 ft bgs = 94	92	B35511

Table D-4. Borehole C9490 (216-B-9 Crib)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
8/11/2016	212.4 – 217.4	100	212.4 ft bgs = 79 214.9 ft bgs = 71 217.4 ft bgs = 94	98.4	B35513
8/11/2016	217.5 – 222.5	100	217.5 ft bgs = 76 220.0 ft bgs = 70 222.5 ft bgs = 95	97.8	B35515
8/11/2016	222.4 – 227.4	82	222.4 ft bgs = 81 224.9 ft bgs = 71 227.4 ft bgs = 73	97.2	B35517
8/11/2016	227.0 – 232.0	80	227.0 ft bgs = 81 229.5 ft bgs = 71 232.5 ft bgs = 73	97.2	B35519
8/11/2016	232.6 - 237.6	0	-	-	-
8/15/2016	237.5 – 242.5	100	237.5 ft bgs = 68 240.0 ft bgs = 72 242.5 ft bgs = 76	87.8	B35523
8/15/2016	242.6 – 247.6	100	242.6 ft bgs = 87 245.1 ft bgs = 94 247.6 ft bgs = 105	122.4	B35525
8/15/2016	247.0 – 252.0	100	247.0 ft bgs = 92 249.5 ft bgs = 103 252.0 ft bgs = 116	126.6	B35527

Notes:
bgs = below ground surface.
HEIS = Hanford Environment Information System.
IR = Infrared.

Table D-5. Borehole C9491 (216-B-37 Trench)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
Becker Hammer					
10/26/2015	3 - 5.5	50	-	-	B33BP9, B33BR0
10/26/2015	7.1 - 9.6	30	-	-	B33BR2, B33BR3
10/26/2015	10.2 - 12.7	30	-	-	B33BT2, B33BR5, B33BR6, B33BR7
Sonic					
3/8/2016	51.5 – 52.5	100	51.5 ft bgs = 60 52.5 ft bgs = 63	58.4	B34RM6, B34RM5
3/8/2016	52.7 – 55.2	100	52.7 ft bgs = 55 55.2 ft bgs = 73	72.8	B34RM8, B34RM7
3/8/2016	55.1 – 57.6	100	55.1 ft bgs = 63 57.6 ft bgs = 76	81.2	B34RN0
3/8/2016	57.8 – 60.3	100	57.8 ft bgs = 76 60.3 ft bgs = 80	88.2	B34RN2
3/8/2016	60.0 – 62.5	100	60.0 ft bgs = 62 62.5 ft bgs = 68	72	B34RN4
3/8/2016	62.8 – 67.8	100	62.8 ft bgs = 69 64.3 ft bgs = 60 67.8 ft bgs = 74	73	B34RN6
3/8/2016	67.5 – 72.5	100	67.5 ft bgs = 71 70.0 ft bgs = 61 72.5 ft bgs = 90	83.6	B34RN8
3/8/2016	72.6 – 77.6	100	72.6 ft bgs = 87 74.1 ft bgs = 71 77.6 ft bgs = 90	81.4	B34RP0
3/9/2016	77.5 – 82.5	100	77.5 ft bgs = 64 80.0 ft bgs = 53 82.5 ft bgs = 79	68.6	B34RP2
3/9/2016	82.8 – 87.8	100	82.8 ft bgs = 59 85.3 ft bgs = 62 87.8 ft bgs = 119	93.2	B34RP4

Table D-5. Borehole C9491 (216-B-37 Trench)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
3/9/2016	87.6 – 92.6	100	87.6 ft bgs = 67 90.1 ft bgs = 61 92.6 ft bgs = 76	71.4	B34RP6
3/9/2016	92.7 – 97.7	100	92.7 ft bgs = 73 95.2 ft bgs = 73 97.7 ft bgs = 149	96.8	B34RP8
3/9/2016	97.8 – 102.8	100	97.8 ft bgs = 67 100.3 ft bgs = 61 102.8 ft bgs = 71	77.4	B34RR0
3/9/2016	102.6 – 107.6	100	102.6 ft bgs = 71 105.1 ft bgs = 64 107.6 ft bgs = 111	76.2	B34RR2
3/9/2016	107.7 – 112.7	100	107.7 ft bgs = 74 110.2 ft bgs = 64 112.7 ft bgs = 162	94.2	B34RR4
3/9/2016	112.7 – 117.7	100	112.7 ft bgs = 72 115.2 ft bgs = 64 117.7 ft bgs = 118	91.8	B34RR6
3/9/2016	117.5 – 122.5	100	117.5 ft bgs = 79 120.0 ft bgs = 64 122.5 ft bgs = 113	86.8	B34RR8
3/9/2016	122.8 – 127.8	100	122.8 ft bgs = 72 125.3 ft bgs = 66 127.8 ft bgs = 109	83.6	B34RT0
3/10/2016	127.7 – 132.7	100	127.7 ft bgs = 72 130.2 ft bgs = 66 132.7 ft bgs = 141	97.4	B34RT2
3/10/2016	132.7 – 137.7	100	132.7 ft bgs = 70 135.2 ft bgs = 65 137.7 ft bgs = 130	95.8	B34RT4

Table D-5. Borehole C9491 (216-B-37 Trench)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
3/10/2016	137.7 – 142.7	100	137.7 ft bgs = 74 140.2 ft bgs = 61 142.5 ft bgs = 112	78.6	B34RT6
3/10/2016	142.7 – 147.7	100	142.7 ft bgs = 65 145.2 ft bgs = 62 147.7 ft bgs = 99	78.2	B34RT8
3/10/2016	147.6 – 152.6	100	147.6 ft bgs = 70 150.1 ft bgs = 60 152.6 ft bgs = 105	88.6	B34RV0
3/10/2016	152.5 – 157.5	100	152.5 ft bgs = 70 155.0 ft bgs = 60 157.5 ft bgs = 103	82.2	B34RV2
3/10/2016	157.8 – 162.8	100	157.8 ft bgs = 70 160.3 ft bgs = 61 162.8 ft bgs = 91	92.8	B34RV4
3/14/2016	162.5 – 167.5	100	162.5 ft bgs = 62 164.0 ft bgs = 62 167.5 ft bgs = 116	90.2	B34RV6
3/14/2016	167.8 – 172.8	100	167.8 ft bgs = 68 170.3 ft bgs = 61 172.8 ft bgs = 120	94.8	B34RV8
3/14/2016	172.7 – 177.7	100	172.7 ft bgs = 67 175.2 ft bgs = 68 177.7 ft bgs = 110	78.2	B34RW0
3/14/2016	177.7 – 182.7	100	177.7 ft bgs = 75 180.2 ft bgs = 64 182.7 ft bgs = 108	89.6	B34RW2
3/14/2016	182.5 – 187.5	100	182.5 ft bgs = 72 185.0 ft bgs = 70 187.5 ft bgs = 106	77.2	B34RW4

Table D-5. Borehole C9491 (216-B-37 Trench)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
3/14/2016	187.8 – 192.8	100	187.8 ft bgs = 74 190.3 ft bgs = 70 192.8 ft bgs = 92	79.4	B34RW6
3/15/2016	192.8 – 197.8	100	192.8 ft bgs = 49 195.3 ft bgs = 52 197.8 ft bgs = 50	69.6	B34RW8
3/15/2016	197.7 – 202.7	100	197.7 ft bgs = 81 200.2 ft bgs = 56 202.7 ft bgs = 98	97.8	B34RX0
3/15/2016	202.5 – 207.5	100	202.5 ft bgs = 77 205.0 ft bgs = 69 207.5 ft bgs = 93	86	B34RX2
3/15/2016	207.7 – 212.7	100	207.7 ft bgs = 84 210.2 ft bgs = 71 212.7 ft bgs = 96	89.5	B34RX4
3/15/2016	212.7 – 217.7	100	212.7 ft bgs = 69 215.2 ft bgs = 68 217.7 ft bgs = 107	96.4	B34T58
3/15/2016	217.5 – 222.5	100	217.5 ft bgs = 83 220.0 ft bgs = 64 222.5 ft bgs = 68	76.8	B34T60
3/15/2016	222.7 – 227.7	100	222.7 ft bgs = 71 225.2 ft bgs = 67 227.7 ft bgs = 64	81.2	B34T62

Notes:
bgs = below ground surface.
HEIS = Hanford Environment Information System.
IR = Infrared.

Table D-6. Borehole C9550 (replacement for C8711) (BY Cribs)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
C8711 (Geoprobe®)						
7/8/2015	0 - 5	35	-	-	-	B320V6, B320V7
7/8/2015	10 - 13	100	-	-	-	B320W3, B320W4, B320W8, B320W9
C9550 (Replacement for C8711) (Becker Hammer)						
10/1/2015	8.2 - 10.7	100	-	-	-	B320H9, B320W0, B32195
C9550 (Replacement for C8711) (Sonic)						
12/17/2015	43.7 - 48.7	100	-	-	-	B340T1, B340T0
1/11/2016	47.9-52.9	100	-	-	-	B340T3
1/11/2016	53.0-58.0	100	-	59.3	Unreadable	B340T5
1/11/2016	58.0-63.0	100	58.0 ft bgs = 69.8 60.0 ft bgs = 63.5 63.0 ft bgs = 105.9	-	Unreadable	B340T7
1/12/2016	63.2 - 68.2	100	63.2 ft bgs = 78.2 65.7 ft bgs = 78.0 68.2 ft bgs = 116.9	71.5	Did not register Did not register 99	B340T9
1/12/2016	68.0 - 73.0	100	68.0 ft bgs = 92.6 70.5 ft bgs = 74.1 73.0 ft bgs = 129	71.7	-	B340V1, B340V0
1/12/2016	73.1 - 78.1	100	73.1 ft bgs = 83.8 75.6 ft bgs = 100 78.1 ft bgs = 127	78.8	Did not register 84 129	B340V3
1/12/2016	78.1 - 83.1	100	78.1 ft bgs = 70.7 80.6 ft bgs = 80.6 83.1 ft bgs = 97.3	76.8	Did not register	B340V5
1/13/2016	83.2 - 88.2	100	83.2 ft bgs = 70.8 85.7 ft bgs = 65 88.2 ft bgs = 77	55	84 Did not register Did not register	B340V7
1/13/2016	88.0 - 93.0	100	88.0 ft bgs = 58.6 90.5 ft bgs = 71.7 93.0 ft bgs = 83.3	63.5	Did not register	B340V9

Table D-6. Borehole C9550 (replacement for C8711) (BY Cribs)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
1/13/2016	93.3 - 98.3	100	93.3 ft bgs = 61.7 95.8 ft bgs = 72.8 98.3 ft bgs = 103.6	72.8	Did not register	B340W1
1/13/2016	98.1 - 103.1	100	98.1 ft bgs = 50.0 100.3 ft bgs = 72.8 103.1 ft bgs = 77.0	68.4	Did not register	B340W3
1/13/2016	103.2 - 108.2	100	103.2 ft bgs = 73.5 105.7 ft bgs = 88.4 108.2 ft bgs = 105.8	69.4	Did not register	B340W5
1/13/2016	108.2 - 113.2	100	108.2 ft bgs = 78.0 110.7 ft bgs = 83.3 113.2 ft bgs = 137.8	101.1	Did not register Did not register 115	B340W7
1/13/2016	113.0 - 118.0	100	113.0 ft bgs = 72.8 115.5 ft bgs = 86.0 118.0 ft bgs = 115	81.1	Did not register Did not register 84	B340W9
1/13/2016	118.0 - 123.0	100	118.0 ft bgs = 87 120.5 ft bgs = 90 123.0 ft bgs = 125	83	Did not register 84 111	B340X1
1/14/2016	123.1 - 128.1	100	123.1 ft bgs = 54.8 125.6 ft bgs = 66.5 128.1 ft bgs = 80.2	55.5	Did not register	B340X3
1/14/2016	128.0 - 133.0	100	128.0 ft bgs = 62.7 130.5 ft bgs = 66.0 133.0 ft bgs = 87.8	71.6	Did not register	B340X5
1/14/2016	133.2 - 138.2	100	133.2 ft bgs = 87.0 135.7 ft bgs = 77.5 138.2 ft bgs = 126.5	81.8	84 Did not register 115	B340X7
1/14/2016	138.0 - 143.0	100	138.0 ft bgs = 86.1 140.5 ft bgs = 81.5 143.0 ft bgs = 118.2	67.6	84 84 111	B340X9

Table D-6. Borehole C9550 (replacement for C8711) (BY Cribs)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
1/14/2016	143.0 - 148.0	100	143.0 ft bgs = 77.8 145.5 ft bgs = 73.9 148.0 ft bgs = 109.2	71.3	Did not register Did not register 111	B340Y1
1/18/2016	148.0 - 153.0	100	148.0 ft bgs = 71.3 150.5 ft bgs = 74.8 153.0 ft bgs = 118.5	64	84 84 104	B340Y3
1/18/2016	153.3 - 158.3	100	153.3 ft bgs = 71.0 155.8 ft bgs = 64.0 158.3 ft bgs = 99.8	60	Did not register Did not register 84	B340Y5
1/18/2016	158.0 - 163.0	100	158.0 ft bgs = 72.9 160.5 ft bgs = 63.8 163.0 ft bgs = 96.6	72.3	84 Did not register 84	B340Y7
1/18/2016	163.1 - 168.1	100	163.1 ft bgs = 73.2 165.6 ft bgs = 73.7 168.1 ft bgs = 111.7	80.2	Did not register Did not register 99	B340Y9
1/18/2016	168.0 - 173.0	100	168.0 ft bgs = 75.9 170.5 ft bgs = 72.6 173.0 ft bgs = 98.8	74.7	Did not register Did not register 84	B34101
1/18/2016	173.2 - 178.2	100	173.2 ft bgs = 70.3 175.7 ft bgs = 74.1 178.2 ft bgs = 98.8	68.7	Did not register Did not register 99	B34103
1/19/2016	178.0 - 183.0	100	178.0 ft bgs = 92.3 180.5 ft bgs = 90.5 183.0 ft bgs = 147.9	129.7	102.3 Did not register 129	B34105
1/19/2016	183.1 - 188.1	100	183.1 ft bgs = 102.3 185.6 ft bgs = 86.5 188.1 ft bgs = 102.0	84.5	84 Did not register 93	B34106
1/19/2016	188.1 - 193.1	100	188.1 ft bgs = 95.0 190.6 ft bgs = 76.2 193.1 ft bgs = 107.6	62.7	Did not register Did not register 93	B34109

Table D-6. Borehole C9550 (replacement for C8711) (BY Cribs)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
1/19/2016	193.2 - 198.2	100	193.2 ft bgs = 75.7 195.7 ft bgs = 105.9 198.2 ft bgs = 118.0	113.1	Did not register 99 111	B34111
1/19/2016	198.0 - 200.0	41.67	200.0 ft bgs = 74.6	-	Did not register	B34113

Notes:
bgs = below ground surface.
HEIS = Hanford Environment Information System.
IR = Infrared.

Table D-7. Borehole C9549 (replacement borehole for C8707, C9548) (BY Cribs)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
C8707 (Geoprobe®)						
7/13/2015	0 - 2.5	50	-	-	-	B320N6, B320N7
7/13/2015	5 - 6.5	30	-	-	-	B320P2, B320P3
C9548 (Geoprobe®)						
7/14/2015	47.5 - 49.45	64	-	-	-	B320P8, B320P9
7/15/2015	64.4 - 66.4	80	-	-	-	B320R1, B320R2
7/15/2015	84.4 - 86.4	96	-	-	-	B320R4, B320R5
C9549 (Replacement for C8707 and C9548) (Becker Hammer)						
10/6/2015	7.2 - 9.7	75	-	-	-	B33122, B33123
C9549 (Replacement for C8707 and C9548) (Sonic)						
1/20/2016	45.6 - 50.6	100	45.6 ft bgs = 70.5 48.1 ft bgs = 70.1 50.6 ft bgs = 84.4	84	84 Did not register Did not register	B34115, B34114
1/20/2016	50.7 - 55.7	100	50.7 ft bgs = 62.7 53.2 ft bgs = 47.4 55.7 ft bgs = 77.9	107.4	Did not register 84 84	B34117, B34116
1/20/2016	55.6 - 60.6	100	55.6 ft bgs = 71.6 58.1 ft bgs = 70.7 60.6 ft bgs = 88.5	61.3	Did not register Did not register 84	B34119
1/21/2016	60.6 - 65.6	100	60.6 ft bgs = 64.5 63.1 ft bgs = 64.5 65.6 ft bgs = 80.9	61.5	84 84 84	B34121
1/21/2016	65.7 - 70.7	100	65.7 ft bgs = 70.7 68.2 ft bgs = 68.3 70.7 ft bgs = 107.8	77	84 84 93	B34123

Table D-7. Borehole C9549 (replacement borehole for C8707, C9548) (BY Cribs)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
1/21/2016	70.6 - 75.6	100	70.6 ft bgs = 66.7 73.1 ft bgs = 65.4 75.6 ft bgs = 89.2	78	93 Did not register Did not register	B34125
1/21/2016	75.6 - 80.6	100	75.6 ft bgs = 62.0 78.1 ft bgs = 65.4 80.6 ft bgs = 73.9	65.3	84 Did not register 93	B34127
1/21/2016	80.7 - 85.7	100	80.7 ft bgs = 64.4 83.2 ft bgs = 65.1 85.7 ft bgs = 81.6	55.5	Did not register	B34129
1/21/2016	85.6 - 90.6	100	85.6 ft bgs = 80.4 88.1 ft bgs = 82.7 90.6 ft bgs = 114.0	102.9	Did not register Did not register 108	B34131
1/25/2016	90.6 - 95.6	100	90.6 ft bgs = 69 93.1 ft bgs = 91 95.6 ft bgs = 112	136.2	111[a] 144[a] 129[a]	B34133
1/25/2016	95.7 - 100.7	100	95.7 ft bgs = 68 98.2 ft bgs = 48 100.7 ft bgs = 89	61.2	Did not register Did not register 84	B34135
1/25/2016	100.8 - 105.8	100	100.8 ft bgs = 63 103.3 ft bgs = 67 105.8 ft bgs = 84	73.3	Did not register Did not register 84	B34137
1/25/2016	105.7 - 110.7	100	105.7 ft bgs = 62 108.2 ft bgs = 65 110.7 ft bgs = 87	76.8	Did not register Did not register 84	B34139
1/25/2016	110.6 - 115.6	100	110.6 ft bgs = 71 113.1 ft bgs = 68 115.6 ft bgs = 75	83.1	Did not register Did not register 84	B34141
1/25/2016	115.8 - 120.8	100	115.8 ft bgs = 67 118.3 ft bgs = 75 120.8 ft bgs = 108	84.7	Did not register Did not register 93	B34143

Table D-7. Borehole C9549 (replacement borehole for C8707, C9548) (BY Cribs)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
1/25/2016	120.7 -125.7	100	120.7 ft bgs = 67 123.2 ft bgs = 57 125.7 ft bgs = 83	82.7	Did not register	B34145
1/26/2016	125.8 - 130.8	100	125.8 ft bgs = 51 128.3 ft bgs = 69 130.8 ft bgs = 96	91.2	Did not register Did not register 84	B34147
1/26/2016	130.8 - 135.8	100	130.8 ft bgs = 57 133.3 ft bgs = 60 135.8 ft bgs = 71	58.6	Did not register	B34149
1/26/2016	135.7 - 140.7	100	135.7 ft bgs = 58 138.2 ft bgs = 59 140.7 ft bgs = 71	75.5	Did not register	B34151
1/26/2016	140.6 - 145.6	100	140.6 ft bgs = 61 143.1 ft bgs = 65 145.6 ft bgs = 72	73.5	Did not register	B34153
1/26/2016	145.8 - 150.8	100	145.8 ft bgs = 58 148.3 ft bgs = 58 150.8 ft bgs = 64	75.5	Did not register	B34155
1/27/2016	150.7 - 153.2	100	150.7 ft bgs = 61 153.2 ft bgs = 107	98.2	Did not register 84	B34157
1/27/2016	153.2 - 155.7	20	Mid Sample = 55	83.2	Did not register	B34159
1/27/2016	155.6 - 160.6	100	155.6 ft bgs = 69 158.1 ft bgs = 69 160.6 ft bgs = 77	87.2	Did not register	B34161
1/27/2016	160.6 - 165.6	100	160.6 ft bgs = 67 163.1 ft bgs = 69 165.6 ft bgs = 61	62.4	Did not register Did not register 84	B34163
1/27/2016	165.8 - 170.8	100	165.8 ft bgs = 61 168.3 ft bgs = 61 170.8 ft bgs = 71	56.4	Did not register Did not register 93	B34165

Table D-7. Borehole C9549 (replacement borehole for C8707, C9548) (BY Cribs)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
1/27/2016	170.7 - 175.7	100	170.7 ft bgs = 61 173.2 ft bgs = 61 175.7 ft bgs = 71	53	Did not register	B34167
1/27/2016	175.8 - 180.8	100	175.8 ft bgs = 62 178.3 ft bgs = 65 180.8 ft bgs = 69	68.7	Did not register Did not register 84	B34169
1/27/2016	180.6 - 185.6	100	180.6 ft bgs = 55 183.1 ft bgs = 53 185.6 ft bgs = 62	70.7	Did not register Did not register 84	B34171
1/28/2016	185.8 - 190.8	100	185.8 ft bgs = 61 188.3 ft bgs = 71 190.8 ft bgs = 93	74.6	Did not register Did not register 111	B34173
1/28/2016	190.7 - 195.7	100	190.7 ft bgs = 49 193.2 ft bgs = 53 195.7 ft bgs = 75	72.6	Did not register Did not register 84	B34175
1/28/2016	195.7 - 200.7	100	195.7 ft bgs = 80 198.2 ft bgs = 95 200.7 ft bgs = 110	101.3	99 129 104	B34H95

Notes:
a. Tapes were damaged may not reflect actual temperatures.
bgs = below ground surface.
HEIS = Hanford Environment Information System.
IR = Infrared.

Table D-8. Borehole C9552 (replacement borehole for C8709, C9551) (216-B-45/49)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
C8709 (Becker Hammer)						
10/9/2015	2.2 - 4.7	75	-	-	-	B339Y3, B339Y4, B339Y5
10/9/2015	4.3 - 6.8	80	-	-	-	B339Y7, B339Y8, B339Y9, B33B00, B33B12
10/9/2015	6.2 - 8.7	100	-	-	-	B33B02, B33B03, B33B04, B33B05
C9552 (replacement for C8709, C9551) (Sonic)						
2/8/2016	45.5 - 47.0	100	45.5 ft bgs = 65 47.0 ft bgs = 67	103.4	Did not register 93	B34177
2/8/2016	47.2 - 49.7	100	47.2 ft bgs = 65 49.7 ft bgs = 82	48.9	93 Did not register	B34179
2/8/2016	49.5 - 52.0	100	49.5 ft bgs = 56 52.0 ft bgs = 73	59.7	56 73	B34181
2/8/2016	52.2 - 57.2	100	52.2 ft bgs = 46 54.7 ft bgs = 57 57.2 ft bgs = 70	70.3	Did not register Did not register 93	B34183
2/8/2016	57.2 - 62.2	100	57.2 ft bgs = 45 59.7 ft bgs = 61 62.2 ft bgs = 89	81.6	111 84 99	B34185
2/8/2016	62.1 - 67.1	100	62.1 ft bgs = 36 64.6 ft bgs = 36 67.1 ft bgs = 48	61.1	84 84 93	B34187
2/8/2016	67.1 - 72.1	100	67.1 ft bgs = 53 69.6 ft bgs = 61 72.1 ft bgs = 72	70	111 Did not register 99	B34189
2/8/2016	72.2 - 77.2	100	72.2 ft bgs = 72 74.7 ft bgs = 51 77.2 ft bgs = 63	62.9	115 84 84	B34191
2/9/2016	77.2 - 82.2	100	77.2 ft bgs = 58 79.7 ft bgs = 58 82.2 ft bgs = 62	54.1	Did not register Did not register 84	B34193

Table D-8. Borehole C9552 (replacement borehole for C8709, C9551) (216-B-45/49)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
2/9/2016	82.2 - 87.2	100	82.2 ft bgs = 61 84.7 ft bgs = 61 87.2 ft bgs = 75	68.1	Did not register	B34195
2/9/2016	87.1 - 92.1	100	87.1 ft bgs = 108 89.6 ft bgs = 69 92.1 ft bgs = 91	64.1	115 84 104	B34197
2/9/2016	92.2 - 97.2	100	92.2 ft bgs = 67 94.7 ft bgs = 61 97.2 ft bgs = 62	55.4	93 Did not register 84	B34K31
2/9/2016	97.2 - 98.2	100	84	-	84	B34199
2/9/2016	98.2 - 99.2	100	67	-	-	B34H32
2/9/2016	99.2 - 100.2	100	61	-	84	B34H33
2/9/2016	100.2 -101.2	100	62	-	-	B34H34
2/9/2016	101.2 - 102.2	100	67	61.8	84	B34H35
2/9/2016	102.2 - 103.2	100	69	-	84	B341B1
2/9/2016	103.2 - 104.2	100	58	-	-	B34H36
2/9/2016	104.2 - 105.2	100	59	-	84	B34H37
2/9/2016	105.2 - 106.2	100	59	-	-	B34H38
2/9/2016	106.2 - 107.2	100	60	59.3	84	B34H39
2/9/2016	107.2 - 108.2	100	80	-	84	B341B3
2/9/2016	108.2 - 109.2	100	78	-	-	B34H40
2/9/2016	109.2 - 110.2	100	76	-	104	B34H41
2/9/2016	110.2 - 111.2	100	76	-	-	B34H42
2/9/2016	111.2 - 112.2	100	85	109.6	93	B34H43
2/9/2016	112.2 - 117.2	100	112.2 ft bgs = 51 114.7 ft bgs = 45 117.2 ft bgs = 48	47.8	84 84 84	B341B5
2/10/2016	117.1 - 122.1	100	117.1 ft bgs = 66 119.6 ft bgs = 59 122.1 ft bgs = 94	81.6	Unreadable Did not register Did not register	B341B7
2/10/2016	122.5 - 127.5	100	122.5 ft bgs = 117 125.0 ft bgs = 67 127.5 ft bgs = 91	68.1	129 Did not register Did not register	B341B9

Table D-8. Borehole C9552 (replacement borehole for C8709, C9551) (216-B-45/49)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
2/10/2016	127.3 - 128.3	100	75	-	84	B341C1
2/10/2016	128.3 - 129.3	100	71	-	-	B34H45
2/10/2016	129.3 - 130.3	100	66	-	84	B34H47
2/10/2016	130.3 - 131.3	100	65	-	-	B34H49
2/10/2016	131.3 - 132.3	100	80	62.2	84	B34H51
2/11/2016	132.1 - 133.2	100	70	-	84	B341C3
2/11/2016	133.1 - 134.1	100	72	-	-	B34H53
2/11/2016	134.1 - 135.1	100	72	-	84	B34H55
2/11/2016	135.1 - 136.1	100	73.2	-	-	B34H57
2/11/2016	136.1 - 137.1	100	113.2	77.7	104	B34H59
2/11/2016	137.2 - 138.2	100	90	-	93	B341C5
2/11/2016	138.2 - 139.2	100	68	-	-	B34H61
2/11/2016	139.2 - 140.2	100	66	-	Did not register	B34H63
2/11/2016	140.2 - 141.2	100	68	-	-	B34H65
2/11/2016	141.2 - 142.2	100	113	91.6	84	B34H67
2/11/2016	142.3 - 147.3	100	142.3 ft bgs = 103 144.8 ft bgs = 66 147.3 ft bgs = 91	74.4	93 84 84	B341C7
2/11/2016	147.3 - 152.3	100	147.3 ft bgs = 70 149.8 ft bgs = 63 152.3 ft bgs = 95	76.2	Did not register Did not register 84	B341C9
2/11/2016	152.2 - 157.2	100	152.2 ft bgs = 82 154.7 ft bgs = 70 157.2 ft bgs = 109	81.5	84 Did not register 104	B341D1
2/11/2016	157.2 - 162.2	100	157.2 ft bgs = 77 159.7 ft bgs = 68 162.2 ft bgs = 106	85.2	93 84 84	B341D3
2/16/2016	162.2 - 167.2	100	162.2 ft bgs = 68 164.7 ft bgs = 64 167.2 ft bgs = 80	67.4	84 84 96	B341D5
2/16/2016	167.3 - 172.3	100	167.3 ft bgs = 69 169.8 ft bgs = 66 172.3 ft bgs = 77	53.4	84 84 84	B341D7

Table D-8. Borehole C9552 (replacement borehole for C8709, C9551) (216-B-45/49)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
2/16/2016	172.3 - 177.3	100	172.3 ft bgs = 75 174.8 ft bgs = 71 177.3 ft bgs = 84	71.4	84 84 84	B341D9
2/16/2016	177.1 - 182.1	100	177.1 ft bgs = 72 179.6 ft bgs = 69 182.1 ft bgs = 80	66.5	90 84 104	B341F1
2/16/2016	182.2 - 187.2	100	182.2 ft bgs = 78 184.7 ft bgs = 73 187.2 ft bgs = 70	71.9	93 84 84	B34K33
2/17/2016	187.2 - 188.2	100	65	-	84	B341F3
2/17/2016	188.2 - 189.2	100	63	-	-	B34H69
2/17/2016	189.2 - 190.2	100	65	-	Did not register	B34H71
2/17/2016	190.2 - 191.2	100	66	-	-	B34H73
2/17/2016	191.2 - 192.2	100	89	74.6	93	B34H75
2/17/2016	192.2 - 193.2	100	71	-	Did not register	B34H74
2/17/2016	193.2 - 194.2	100	69	-	-	B34H77
2/17/2016	194.2 - 195.2	100	64	-	Unreadable	B34H79
2/17/2016	195.2 - 196.2	100	70	-	-	B34H81
2/17/2016	196.2 - 197.2	100	81	89.9	108	B34H83
2/17/2016	197.3 - 198.3	100	74	-	111	B341F7
2/17/2016	198.3 - 199.3	100	69	-	-	B34H85
2/17/2016	199.3 - 200.3	100	75	-	84	B34H87
2/17/2016	200.3 - 201.3	100	82	-	-	B34H89
2/17/2016	201.3 - 202.3	100	108	80.7	99	B34H91

Notes:
bgs = below ground surface.
HEIS = Hanford Environment Information System.
IR = Infrared.

Table D-9. Borehole C8706 (216-B-46 Crib)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
Becker Hammer					
10/22/2015	2 - 4.5	65	-	-	B33B16, B33B17
10/22/2015	3.9 - 6.4	70	-	-	B33B19, B33B20, B33B22, B33B23, B33B24, B33B26
10/22/2015	5.9 - 8.4	75	-	-	B33B25, B33B29, B33B31
Sonic					
2/17/2016	45.5 - 47.0	100	45.5 ft bgs = 68 47.0 ft bgs = 64	70	B324N7, B34PN6
2/22/2016	47.0 - 49.5	100	47.0 ft bgs = 53 49.5 ft bgs = 75	62.8	B324N8
2/22/2016	49.5 - 52.0	100	49.5 ft bgs = 65 52.0 ft bgs = 80	65	B324N9
2/22/2016	52.2 - 57.2	100	52.2 ft bgs = 85 54.7 ft bgs = 68 57.2 ft bgs = 104	76.8	B324P0
2/22/2016	57.2 - 62.2	100	57.2 ft bgs = 89 59.7 ft bgs = 74 62.2 ft bgs = 113	87.2	B324P1
2/22/2016	62.2 - 67.2	100	62.2 ft bgs = 87 64.7 ft bgs = 70 67.2 ft bgs = 97	113.6	B324P2
2/22/2016	67.3 - 72.3	100	67.3 ft bgs = 85 69.8 ft bgs = 65 72.3 ft bgs = 80	79.4	B324P3
2/22/2016	72.1 - 77.1	100	72.1 ft bgs = 73 74.6 ft bgs = 66 77.1 ft bgs = 85	72.6	B324P4
2/22/2016	77.0 - 82.0	100	77.0 ft bgs = 77 79.5 ft bgs = 62 82.0 ft bgs = 80	82.4	B324P5

Table D-9. Borehole C8706 (216-B-46 Crib)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
2/23/2016	82.2 - 87.2	100	82.2 ft bgs = 53 84.7 ft bgs = 54 87.2 ft bgs = 85	68.8	B324P6
2/23/2016	87.3 - 92.3	100	87.3 ft bgs = 71 89.8 ft bgs = 64 92.3 ft bgs = 92	61	B324P7
2/23/2016	92.2 - 97.2	100	92.2 ft bgs = 71 94.7 ft bgs = 67 97.2 ft bgs = 120	107.2	B324P8
2/23/2016	97.1 - 102.1	100	97.1 ft bgs = 84 99.6 ft bgs = 68 102.1 ft bgs = 107	86.8	B324P9
2/23/2016	102.1 - 107.1	100	102.1 ft bgs = 72 104.6 ft bgs = 69 107.1 ft bgs = 113	59.2	B324R0
2/23/2016	107.2 - 112.2	100	107.2 ft bgs = 82 109.7 ft bgs = 71 112.2 ft bgs = 104	85.4	B324R1
2/23/2016	112.1 - 117.1	100	112.1 ft bgs = 79 114.6 ft bgs = 68 117.1 ft bgs = 78	76.6	B324R2
2/23/2016	117.2 - 122.2	100	117.2 ft bgs = 74 119.7 ft bgs = 69 122.2 ft bgs = 80	72.4	B324R3
2/24/2016	122.5 - 127.5	100	122.5 ft bgs = 68 125.0 ft bgs = 73 127.5 ft bgs = 96	72.4	B324R4
2/24/2016	127.0 - 132.0	100	127.0 ft bgs = 109 129.5 ft bgs = 71 132.0 ft bgs = 93	78.2	B324R5

Table D-9. Borehole C8706 (216-B-46 Crib)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
2/24/2016	132.4 - 137.4	100	132.4 ft bgs = 77 134.9 ft bgs = 65 137.4 ft bgs = 95	76.8	B324R6
2/24/2016	137.2 - 142.2	100	137.2 ft bgs = 88 139.7 ft bgs = 68 142.2 ft bgs = 114	87.6	B324R7
2/24/2016	142.3 - 147.3	100	142.3 ft bgs = 82 144.8 ft bgs = 68 147.3 ft bgs = 107	82.8	B324R8
2/24/2016	147.1 - 152.1	100	147.1 ft bgs = 80 149.6 ft bgs = 71 152.1 ft bgs = 127	87.2	B324R9
2/24/2016	152.1 - 157.1	100	152.1 ft bgs = 81 154.6 ft bgs = 69 157.1 ft bgs = 102	87.4	B324T0
2/24/2016	157.0 - 162.0	100	157.0 ft bgs = 81 159.5 ft bgs = 69 162.0 ft bgs = 101	82.2	B324T1
2/24/2016	162.1 - 167.1	100	162.1 ft bgs = 88 164.6 ft bgs = 78 167.1 ft bgs = 107	89	B324T2
2/25/2016	167.1 - 172.1	100	167.1 ft bgs = 56 169.6 ft bgs = 57 172.1 ft bgs = 87	61.2	B324T3
2/25/2016	172.3 - 177.3	100	172.3 ft bgs = 65 174.8 ft bgs = 61 177.3 ft bgs = 79	70.6	B324T4
2/25/2016	177.3 - 182.3	100	177.3 ft bgs = 61 179.8 ft bgs = 60 182.3 ft bgs = 89	78.6	B324T5

Table D-9. Borehole C8706 (216-B-46 Crib)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
2/25/2016	182.3 - 187.3	100	182.3 ft bgs = 65 184.8 ft bgs = 65 187.3 ft bgs = 86	80.2	B324T6
2/25/2016	187.3 - 192.3	28	187.3 ft bgs = 72 188.8 ft bgs = 72	114.8	B324T7
2/25/2016	192.3 - 197.3	100	192.3 ft bgs = 80 194.8 ft bgs = 70 197.3 ft bgs = 117	87.4	B324T8
2/29/2016	197.3 - 202.3	100	197.3 ft bgs = 57 200.8 ft bgs = 68 202.3 ft bgs = 82	66.8	B324T9

Notes:
bgs = below ground surface.
HEIS = Hanford Environment Information System.
IR = Infrared.

Table D-10. Borehole C9492 (216-T-5 Trench)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
Becker Hammer					
11/10/2015	3 - 5	75	-	-	B33M89, B33M90
11/10/2015	7.1 - 9.1	100	-	-	B33M92, B33M93
11/10/2015	9.0 - 11.0	90	-	-	B33M96, B33M97
Sonic					
6/1/2016	40.7 - 42.7	55	40.7 ft bgs = 75 42.7 ft bgs = 93	105	B35VX0
6/1/2016	42.1 - 47.1	0	-	-	-
6/1/2016	47.8 - 52.8	0	-	-	-
6/1/2016	52.4 - 57.4	40	52.4 ft bgs = 91 54.9 ft bgs = 94 57.4 ft bgs = 94	104.6	B35VX2
6/1/2016	57.6 - 62.6	82	57.6 ft bgs = 95 60.1 ft bgs = 92 62.6 ft bgs = 95	112.6	B35VX4
6/1/2016	63.0 - 68.0	100	63.0 ft bgs = 92 65.5 ft bgs = 92 68.0 ft bgs = 95	107.6	B35VX6
6/1/2016	67.0 - 72.0	100	67.0 ft bgs = 134 69.5 ft bgs = 91 72.0 ft bgs = 95	116	B35VX8
6/2/2016	73.0 - 78.0	100	73.0 ft bgs = 68 75.5 ft bgs = 71 78.0 ft bgs = 83	103.4	B35VY0
6/2/2016	77.5 - 82.5	100	77.5 ft bgs = 72 80.0 ft bgs = 73 82.5 ft bgs = 79	88.6	B35VY2

Table D-10. Borehole C9492 (216-T-5 Trench)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
6/2/2016	82.6 - 87.6	100	82.6 ft bgs = 71 85.1 ft bgs = 76 87.6 ft bgs = 82	94.8	B35VY4
6/2/2016	87.2 - 92.2	100	87.2 ft bgs = 74 89.7 ft bgs = 77 92.2 ft bgs = 79	91.2	B35VY6
6/2/2016	92.5 - 97.5	100	92.5 ft bgs = 72 95.0 ft bgs = 73 97.5 ft bgs = 84	116	B35VY8
6/2/2016	97.4 - 100.5	100	97.4 ft bgs = 77 99.9 ft bgs = 82 102.4 ft bgs = 93	106.2	B35W00

Notes:
bgs = below ground surface.
HEIS = Hanford Environment Information System.
IR = Infrared.

Table D-11. Borehole C9499 (216-T-6 Crib #1)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
Becker Hammer					
3/15/2016	3.0 - 5.5	20	-	-	B33Y63, B33Y67, B33Y71
3/15/2016	8.6 - 11.1	100	-	-	B33Y57, B33Y64, B33Y68, B33Y72
3/15/2016	13.0 - 15.5	100	-	-	B33Y58, B33Y65, B33Y69, B33Y73
Sonic					
6/23/2016	43.0 - 47.0	100	43.0 ft bgs = 68 47.0 ft bgs = 70	123.4	B360V1, B360V0
6/23/2016	47.0 - 49.5	100	47.0 ft bgs = 78 49.5 ft bgs = 82	92.4	B360V3
6/23/2016	49.6 - 52.1	100	49.6 ft bgs = 76 52.1 ft bgs = 81	88.2	B360V5
6/23/2016	52.2- 54.7	100	52.2 ft bgs = 82 54.7 ft bgs = 80	93.2	B360V7
6/23/2016	54.5 - 57.0	100	54.5 ft bgs = 77 57.0 ft bgs = 83	88.6	B360V9
6/23/2016	57.4 - 62.4	100	57.4 ft bgs = 85 59.9 ft bgs = 79 62.4 ft bgs = 87	94.2	B360W1
6/23/2016	62.4 - 67.4	100	62.4 ft bgs = 77 64.9 ft bgs = 78 67.4 ft bgs = 86	95.8	B360W3
6/23/2016	67.2 - 72.2	100	67.2 ft bgs = 86 69.7 ft bgs = 78 72.2 ft bgs = 95	121.2	B360W5
6/23/2016	72.1 - 77.1	100	72.1 ft bgs = 84 74.6 ft bgs = 78 77.1 ft bgs = 84	96.4	B360W7
6/27/2016	77.5 - 82.5	100	77.5 ft bgs = 73 80.0 ft bgs = 75 82.5 ft bgs = 77	90.6	B360W9
6/27/2016	82.4 - 87.4	100	82.4 ft bgs = 78 84.9 ft bgs = 79 87.4 ft bgs = 87	87.4	B360X1

Table D-11. Borehole C9499 (216-T-6 Crib #1)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
6/27/2016	87.2 - 92.2	100	87.2 ft bgs = 82 90.7 ft bgs = 78 92.2 ft bgs = 83	97.8	B360X3
6/27/2016	92.1 - 97.1	100	92.1 ft bgs = 77 94.6 ft bgs = 78 97.1 ft bgs = 82	96.6	B360X5
6/27/2016	97.0 - 102.0	100	97.0 ft bgs = 88 100.0 ft bgs = 81 102.5 ft bgs = 89	96.2	B360X7
6/27/2016	102.1 - 105.1	100	102.1 ft bgs = 88 104.6 ft bgs = 82 107.1 ft bgs = 84	101.6	B360X9

Notes:
bgs = below ground surface.
HEIS = Hanford Environment Information System.
IR = Infrared.

Table D-12. Borehole C9505 (216-T-15 Trench)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
Becker Hammer					
11/20/2015	8.3 - 10.6	25	-	-	B33W13, B33W14, B33W15, B33W16
11/20/2015	10.6 -12.9	25	-	-	B33W18, B33W19, B33W20
Sonic					
6/7/2016	43.6 - 47.0	35	43.6 ft bgs = 96 47.0 ft bgs = 101	106.8	B35WT9, B35WT8
6/9/2016	47.1 - 49.6	100	47.1 ft bgs = 65 49.6 ft bgs = 75	78.4	B35WV1
6/9/2016	49.5 - 52.0	100	49.5 ft bgs = 67 52.0 ft bgs = 75	76.8	B35WV3
6/9/2016	52.3 - 54.8	100	52.3 ft bgs = 71 54.8 ft bgs = 77	87.2	B35WV5
6/9/2016	54.5 - 57.0	100	54.5 ft bgs = 72 57.0 ft bgs = 87	96.2	B35WV7
6/9/2016	57.3 - 62.3	100	57.3 ft bgs = 72 59.8 ft bgs = 72 62.3 ft bgs = 83	105.4	B35WV9
6/9/2016	62.2 - 67.2	100	62.2 ft bgs = 81 64.7 ft bgs = 73 67.2 ft bgs = 77	94.4	B35WW1
6/9/2016	67.2 - 72.2	100	67.2 ft bgs = 78 69.7 ft bgs = 71 72.2 ft bgs = 85	95.6	B35WW3
6/9/2016	72.2 - 77.2	100	72.2 ft bgs = 79 74.7 ft bgs = 70 77.2 ft bgs = 86	96.8	B35WW5
6/9/2016	77.3 - 82.3	100	77.3 ft bgs = 76 79.8 ft bgs = 74 82.3 ft bgs = 80	88.2	B35WW7
6/9/2016	82.3 - 87.3	100	82.3 ft bgs = 80 84.8 ft bgs = 82 87.3 ft bgs = 82	99.6	B35WW9

Table D-12. Borehole C9505 (216-T-15 Trench)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
6/13/2016	87.4 - 92.4	100	87.4 ft bgs = 68 89.9 ft bgs = 69 92.4 ft bgs = 77	89.4	B35WX1
6/13/2016	92.4 - 97.4	100	92.4 ft bgs = 76 94.9 ft bgs = 73 97.4 ft bgs = 74	96.2	B35WX3
6/13/2016	97.3 - 102.3	100	97.3 ft bgs = 75 99.8 ft bgs = 76 102.3 ft bgs = 83	97.2	B35WX5
6/13/2016	102.4 - 105.5	100	102.4 ft bgs = 74 105.5 ft bgs = 82	118.6	B35WX7

Notes:
bgs = below ground surface.
HEIS = Hanford Environment Information System.
IR = Infrared.

Table D-13. Borehole C9506 (216-T-18 Crib)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
Becker Hammer					
3/18/2016	4.0 - 6.5	100	-	-	B33W28, B33W29, B33W30, B33W31
3/18/2016	7.0 - 9.5	100	-	-	B33W32, B33W33, B33W34, B33W35
3/18/2016	10.0 - 12.5	100	-	-	B33W36, B33W37, B33W38, B33W39, B33W40
Sonic					
6/28/2016	33.3 - 37.0	100	33.3 ft bgs = 75 37.0 ft bgs = 78	88.2	B361T5
6/28/2016	37.0 - 42.0	100	37.0 ft bgs = 75 39.5 ft bgs = 75 42.0 ft bgs = 83	92.2	B361T7
6/28/2016	42.1 - 47.1	100	42.1 ft bgs = 83 44.7 ft bgs = 79 47.1 ft bgs = 92	115.6	B361T9
6/28/2016	47.0 - 52.0	100	47.0 ft bgs = 82 49.5 ft bgs = 78 52.0 ft bgs = 85	96.6	B361V1
6/28/2016	52.0 - 57.0	100	52.0 ft bgs = 81 54.5 ft bgs = 78 57.0 ft bgs = 86	97.6	B361V3
6/28/2016	57.2 - 62.2	100	57.2 ft bgs = 77 59.7 ft bgs = 77 62.2 ft bgs = 79	103.8	B361V5
6/28/2016	62.3 - 67.3	100	62.3 ft bgs = 78 64.8 ft bgs = 77 67.3 ft bgs = 81	97.2	B361V7
6/28/2016	67.1 - 72.1	100	67.1 ft bgs = 77 69.6 ft bgs = 76 72.1 ft bgs = 82	97.6	B361V9

Table D-13. Borehole C9506 (216-T-18 Crib)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
6/28/2016	72.4 - 77.4	100	72.4 ft bgs = 81 74.9 ft bgs = 82 77.4 ft bgs = 85	111.4	B361W1
6/28/2016	77.2 - 82.2	100	77.2 ft bgs = 77 79.7 ft bgs = 78 82.7 ft bgs = 83	100.6	B361W3
6/28/2016	82.4 - 87.4	100	82.4 ft bgs = 81 84.9 ft bgs = 79 87.4 ft bgs = 82	100.6	B361W5
6/29/2016	87.2 - 92.2	100	87.2 ft bgs = 72 89.7 ft bgs = 77 92.2 ft bgs = 85	98.2	B361W7
6/29/2016	92.3 - 97.3	100	92.3 ft bgs = 71 94.8 ft bgs = 75 97.3 ft bgs = 85	96.6	B361W9
6/29/2016	97.1 - 101.1	100	97.1 ft bgs = 70 99.6 ft bgs = 72 102.1 ft bgs = 84	112.2	B361X1

Notes:
bgs = below ground surface.
HEIS = Hanford Environment Information System.
IR = Infrared.

Table D-14. Borehole C9507 (216-T-19 Crib and Tile Field)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
Sonic						
4/5/2016	0.0 - 5.0	50	-	-	-	B353Y4, B353Y5, B353Y6, B353Y7
4/5/2016	10.0 - 15.0	0	-	-	-	-
4/6/2016	20.3 - 25.3	60	-	-	-	B35406, B35407
5/16/2016	57.3 – 59.8	100	57.3 ft bgs = 74 59.8 ft bgs = 85	95.3	-	B35411, B35410
5/16/2016	59.7 – 62.2	100	59.7 ft bgs = 78 62.2 ft bgs = 85	76.8	-	B35413
5/16/2016	62.3 – 64.8	100	62.3 ft bgs = 80 64.8 ft bgs = 86	98.2	-	B35415
5/16/2016	64.5 – 67.0	100	64.5 ft bgs = 89 67.0 ft bgs = 95	97.6	-	B35418, B35417
5/16/2016	67.2 – 69.7	100	67.2 ft bgs = 83 69.7 ft bgs = 97	106.8	-	B35420
5/16/2016	69.5 – 72.0	100	69.5 ft bgs = 89 72.0 ft bgs = 86	99.4	-	B354C9
5/16/2016	72.6 – 77.6	100	75.1 ft bgs = 89 77.6 ft bgs = 88	105.8	-	B35422, B35423
5/17/2016	77.5 – 82.5	100	77.5 ft bgs = 68 80.0 ft bgs = 70 82.5 ft bgs = 89	97.4	-	B35425
5/17/2016	82.0 – 87.0	100	82.0 ft bgs = 85 84.5 ft bgs = 81 87.0 ft bgs = 119	115.4	-	B35427
5/17/2016	87.4 – 92.4	100	87.4 ft bgs = 79 89.9 ft bgs = 80 92.4 ft bgs = 109	116.4	-	B35430, B35429
5/17/2016	92.1 – 93.1	100	83	-	104	B35432
5/17/2016	93.1 – 94.1	100	77	-	91	B35433
5/17/2016	94.1 – 95.1	100	80	-	108	B35434

Table D-14. Borehole C9507 (216-T-19 Crib and Tile Field)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
5/17/2016	95.1 – 96.1	100	88	-	115	B35435
5/17/2016	96.1 – 97.1	100	98	106.4	149	B35436
5/17/2016	97.5 – 102.5	100	97.5 ft bgs = 86 100.0 ft bgs = 87 102.5 ft bgs = 95	103.2	-	B35439, B35438
5/17/2016	102.4 – 103.4	100	81		108	B35441
5/17/2016	103.4 – 104.4	100	81		84	B35442
5/17/2016	104.4 – 105.4	100	85		120	B35443
5/17/2016	105.4 – 106.4	100	97		115	B35444
5/17/2016	106.4 – 107.4	100	119	116.8	129	B35445
5/17/2016	107.3 – 112.3	100	107.3 ft bgs = 88 109.8 ft bgs = 94 112.3 ft bgs = 120	114.2	-	B35447
5/17/2016	112.3 – 117.3	100	112.3 ft bgs = 87 114.8 ft bgs = 90 117.3 ft bgs = 114	119.2	-	B35450, B35449
5/17/2016	117.4 – 122.4	100	117.4 ft bgs = 107 119.9 ft bgs = 92 122.4 ft bgs = 150	166	-	B35452
5/18/2016	122.5 – 127.5	75	122.5 ft bgs = 80 125.0 ft bgs = 91 127.5 ft bgs = 103	116.6	-	B35455, B35454
5/18/2016	127.4 – 132.4	50	127.4 ft bgs = 81 129.9 ft bgs = 90 132.4 ft bgs = 104	122.4	-	B35457
5/18/2016	132.7 – 137.7	40	132.7 ft bgs = 110 135.3 ft bgs = 104 137.7 ft bgs = 95	120.6	-	B35459
5/18/2016	137.6 – 142.6	80	137.6 ft bgs = 102 140.1 ft bgs = 94 142.6 ft bgs = 104	128.2	-	B35461

Table D-14. Borehole C9507 (216-T-19 Crib and Tile Field)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
5/18/2016	142.6 – 147.3	60	142.6 ft bgs = 96 145.1 ft bgs = 95 147.6 ft bgs = 103	121.6	-	B35463
5/18/2016	147.3 - 152.3	0	-	-	-	-
5/19/2016	152.5 - 153.0	0	-	-	-	-
	153.0 - 158.0	0	-	-	-	-
5/24/2016	157.7 - 162.7	100	157.7 ft bgs = 75 160.2 ft bgs = 73 162.7 ft bgs = 120	168.8	-	B354D1
6/14/2016	165.0 - 168.0	100	-	-	-	B35483, B35YB2, B35YB3
6/15/2016	215.0 - 217.0	100	-	-	-	B354C1, B354C2, B35YB4, B35YB5

Notes:
bgs = below ground surface.
HEIS = Hanford Environment Information System.
IR = Infrared.

Table D-15. Borehole C9511 (216-T-23 Trench)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
Becker Hammer					
11/19/2015	4.5 - 6.9	50	-	-	B33MH6, B33MH7
11/19/2015	7.6 - 10.0	69	-	-	B33MH9, B33MJ0
Sonic					
7/5/2016	44.1 - 46.6	100	44.1 ft bgs = 79 46.6 ft bgs = 78	93.8	B360M1, B360M0
7/5/2016	47.1 - 49.6	100	47.1 ft bgs = 88 49.6 ft bgs = 79	99.3	B360M3
7/6/2016	49.6 - 52.1	100	49.6 ft bgs = 66 52.1 ft bgs = 70	73.8	B360M5
7/6/2016	52.2 - 54.7	100	52.2 ft bgs = 75 54.7 ft bgs = 74	79.6	B360M7
7/6/2016	54.6 - 57.1	100	54.6 ft bgs = 82 57.1 ft bgs = 89	84.2	B360M9
7/6/2016	57.2 - 62.2	16	~1ft sample = 78	99.4	B360N1
7/6/2016	63.1 - 67.1	75	63.1 ft bgs = 85 65.1 ft bgs = 75 67.1 ft bgs = 77	95.6	B360N3
7/6/2016	67.1 - 72.1	60	67.1 ft bgs = 83 69.1 ft bgs = 85 72.1 ft bgs = 100	95.6	B360N5
7/6/2016	72.1 - 77.1	75	72.1 ft bgs = 103 74.6 ft bgs = 104 77.1 ft bgs = 105	113.4	B360N7
7/6/2016	77.4 - 82.4	100	77.4 ft bgs = 79 79.9 ft bgs = 75 82.4 ft bgs = 94	98.7	B360N9
7/6/2016	82.3 - 87.3	100	82.3 ft bgs = 78 84.8 ft bgs = 76 87.3 ft bgs = 84	94.6	B360P1

Table D-15. Borehole C9511 (216-T-23 Trench)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
7/7/2016	87.4 - 92.4	40	87.4 ft bgs = 72 89.9 ft bgs = 68 92.4 ft bgs = 67	95.4	B360P3
7/7/2016	92.4 - 97.4	100	92.4 ft bgs = 75 94.9 ft bgs = 72 97.4 ft bgs = 91	104.8	B360P5
7/7/2016	98.0 - 102.0	50	98.0 ft bgs = 84 100.0 ft bgs = 72 102.0 ft bgs = 71	91.6	B360P7
7/7/2016	102.7 - 107.7	100	102.7 ft bgs = 75 105.2 ft bgs = 77 107.7 ft bgs = 86	116.8	B360P9
7/7/2016	107.2 - 112.2	100	107.2 ft bgs = 77 109.7 ft bgs = 75 112.2 ft bgs = 90	93.6	B360R1
7/7/2016	112.5 - 115.5	100	112.5 ft bgs = 73 115.5 ft bgs = 93	107.6	B360R3

Notes:
bgs = below ground surface.
HEIS = Hanford Environment Information System.
IR = Infrared.

Table D-16. Borehole C9510 (216-T-25 Trench)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
Becker Hammer						
11/18/2015	4.0 - 6.2	50	-	-	-	B33MD7, B33MD8
11/18/2015	7.0 - 9.2	75	-	-	-	B33MD9, B33MF0, B33MF1
Sonic						
7/12/2016	47.5 - 50.0	78	47.5 ft bgs = 74 50.0 ft bgs = 74	96.4	-	B361J7
7/12/2016	49.6 - 52.1	50	49.6 ft bgs = 79 52.1 ft bgs = 77	94.4	-	B361J9
7/12/2016	52.4 - 57.4	100	52.4 ft bgs = 86 54.9 ft bgs = 96 57.4 ft bgs = 137	103	-	B361K1
7/12/2016	57.5 - 62.5	57	57.5 ft bgs = 87 60.0 ft bgs = 82 62.5 ft bgs = 87	98.2	-	B361K3
7/12/2016	62.4 - 67.4	17	~1ft sample = 95	104.6	-	B361K5
7/12/2016	67.0 - 72.0	60	67.0 ft bgs = 83 69.5 ft bgs = 86 72.0 ft bgs = 132	137	-	B361K7
7/12/2016	72.5 - 77.5	100	72.5 ft bgs = 80 75.0 ft bgs = 79 77.5 ft bgs = 82	118	-	B361K9
7/13/2016	77.5 – 82.5	70	77.5 ft bgs = 66 80.0 ft bgs = 69 82.5 ft bgs = 79	86.8	-	B361L1
7/13/2016	82.4 – 87.4	88	82.4 ft bgs = 81 84.9 ft bgs = 88 87.4 ft bgs = 117	116.2	-	B361L3

Table D-16. Borehole C9510 (216-T-25 Trench)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
7/13/2016	87.5 – 92.5	90	87.5 ft bgs = 93 90.0 ft bgs = 73 92.5 ft bgs = 127	109.8	-	B361L5
7/13/2016	92.4 – 97.4	58	92.4 ft bgs = 76 94.9 ft bgs = 79 97.4 ft bgs = 117	107.6	-	B361L7
7/13/2016	97.5 – 102.5	50	97.5 ft bgs = 89 100.0 ft bgs = 83 102.5 ft bgs = 83	102.4	-	B361L9
7/13/2016	102.5 – 107.4	0	-	-	-	-
7/13/2016	107.6 – 112.6	0	-	-	-	-
7/13/2016	112.3 – 113.3	100	80	-	80	B361M7
7/13/2016	113.3 – 114.3	100	81	-	Unreadable	B361M9
7/13/2016	114.3 – 115.3	100	81	-	93	B361N1
7/13/2016	115.3 – 116.3	100	88	-	120	B361N3
7/13/2016	116.3 – 117.3	100	144	134.2	Unreadable	B361N5
7/13/2016	117.3 – 118.3	100	132	-	108	B361N7
7/13/2016	118.3 – 119.3	100	104	-	149	B361N9
7/13/2016	119.3 – 120.3	100	122	-	160	B361P1
7/13/2016	120.3 – 121.3	100	109	-	149	B361P3
7/13/2016	121.3 – 122.3	100	103	126.8	129	B361P5

Notes:
bgs = below ground surface.
HEIS = Hanford Environment Information System.
IR = Infrared.

Table D-17. Borehole C9512 (216-S-9 Crib)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
Becker Hammer						
11/24/2015	3.2 - 5.5	60	-	-	-	B33XT8, B33XV3, B33XT3
11/24/2015	6.0 - 8.2	30	-	-	-	B33XT4, B33XT9, B33XV4
11/24/2015	13.0 - 15.3	100	-	-	-	B33XR7, B33XT5, B33XV0, B33XV5, B33XT0
Sonic						
7/25/2016	35.5 - 37.0	100	35.5 ft bgs = 75 37.0 ft bgs = 94	127	-	B36159
7/25/2016	37.0 - 42.0	100	37.0 ft bgs = 98 39.5 ft bgs = 88 42.0 ft bgs = 114	110	-	B36161
7/25/2016	42.2 - 47.2	100	42.2 ft bgs = 93 44.7 ft bgs = 86 47.2 ft bgs = 131	110	-	B36163
7/25/2016	47.2 - 52.2	88	47.2 ft bgs = 125 49.7 ft bgs = 145 52.2 ft bgs = 124	283	-	B36165
7/25/2016	52.4 - 57.4	100	52.4 ft bgs = 115 54.9 ft bgs = 107 57.4 ft bgs = 141	128	-	B36167
7/25/2016	57.5 - 62.5	100	57.5 ft bgs = 88 60.0 ft bgs = 87 62.5 ft bgs = 95	118	-	B36169
7/26/2016	62.2 – 63.2	100	80	-	84	B36173
7/26/2016	63.2 – 64.2	100	81	-	84	B36175
7/26/2016	64.2 – 65.2	100	82	-	99	B36177
7/26/2016	65.2 – 66.2	100	83	-	84	B36179
7/26/2016	66.2 – 67.2	100	89	95	104	B36181
7/26/2016	67.2 – 68.2	100	86	-	93	B36183
7/26/2016	68.2 – 69.2	100	87	-	99	B36185
7/26/2016	69.2 – 70.2	100	93	-	115	B36187
7/26/2016	70.2 – 71.2	100	92	-	104	B36189

Table D-17. Borehole C9512 (216-S-9 Crib)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
7/26/2016	71.2 – 72.2	100	102	95	108	B36191
7/26/2016	72.3 – 73.3	100	76	-	93	B36193
7/26/2016	73.3 – 74.3	100	80	-	84	B36195
7/26/2016	74.3 – 75.3	100	81	-	84	B36197
7/26/2016	75.3 – 76.3	100	82	-	84	B36199
7/26/2016	76.3 – 77.3	100	91	109	115	B361B1
7/26/2016	76.9 – 81.9	100	76.9 ft bgs = 126 79.4 ft bgs = 100 81.9 ft bgs = 124	115	-	B361B3
7/26/2016	82.9 – 87.9	100	82.9 ft bgs = 98 85.4 ft bgs = 89 87.9 ft bgs = 113	100	-	B361B5
7/26/2016	87.0 – 92.0	100	87.0 ft bgs = 98 89.5 ft bgs = 98 92.0 ft bgs = 139	100	-	B361B7
7/26/2016	92.5 – 97.5	100	92.5 ft bgs = 96 95.0 ft bgs = 90 97.5 ft bgs = 104	101	-	B361B9
7/27/2016	97.0 – 102.0	100	97.0 ft bgs = 77 99.5 ft bgs = 78 102.0 ft bgs = 94	136	-	B361C1
7/27/2016	102.6 – 107.6	100	102.6 ft bgs = 89 105.1 ft bgs = 85 107.6 ft bgs = 113	103	-	B361C3
7/27/2016	107.0 – 112.0	100	107.0 ft bgs = 85 109.5 ft bgs = 77 112.0 ft bgs = 89	99	-	B361C5
7/27/2016	112.0 – 117.0	100	112.0 ft bgs = 104 114.5 ft bgs = 86 117.0 ft bgs = 89	105	-	B361C7
7/27/2016	117.0 – 118.0	100	127	-	144	B361C9
7/27/2016	118.0 – 119.0	100	130	-	160	B361D1

Table D-17. Borehole C9512 (216-S-9 Crib)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	Irreversible Temperature Label	HEIS #
			(°Fahrenheit)			
7/27/2016	119.0 – 120.0	100	135	-	Unreadable	B361D3
7/27/2016	120.0 – 121.0	100	124	-	160	B361D5
7/27/2016	121.0 – 122.0	100	122	109	199	B361D7
7/27/2016	122.0 – 123.0	100	96	-	129	B361D9
7/27/2016	123.0 – 124.0	100	83	-	115	B361F1
7/27/2016	124.0 – 125.0	100	90	-	120	B361F3
7/27/2016	125.0 – 126.0	100	90	-	129	B361F5
7/27/2016	126.0 – 127.0	100	119	105	129	B361F7
7/27/2016	127.2 – 132.2	100	127.2 ft bgs = 105 129.7 ft bgs = 108 132.2 ft bgs = 119	122	-	B361F9
7/27/2016	132.0 – 137.0	100	132.0 ft bgs = 95 134.5 ft bgs = 95 137.0 ft bgs = 111	106	-	B361H1
7/27/2016	137.0 – 142.0	100	137.0 ft bgs = 99 139.5 ft bgs = 107 142.0 ft bgs = 110	108	-	B361H3

Notes:
bgs = below ground surface.
HEIS = Hanford Environment Information System.
IR = Infrared.

Table D-18. Borehole C9514 (216-S-21 Crib)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
Becker Hammer					
4/7/2016	4.1 - 6.6	50	-	-	B33XN2, B33XP0, B33XP4, B33XP6
4/7/2016	7.0 - 9.5	40	-	-	B33XN3, B33XP1, B33XP5, B33XP7
4/7/2016	13.1 - 15.6	40	-	-	B33XN4, B33XN6, B33XP2, B33XP8, B33XR0
Sonic					
7/19/2016	44.1 - 46.6	100	44.1 ft bgs = 79 46.6 ft bgs = 115	107	B36107, B36106
7/20/2016	47.4 – 49.9	100	47.4 ft bgs = 68 49.9 ft bgs = 72	91.8	B36109
7/20/2016	49.6 – 52.1	100	49.6 ft bgs = 67 52.1 ft bgs = 71	83.4	B36111
7/20/2016	52.5 – 55.0	100	52.1 ft bgs = 75 55.0 ft bgs = 79	99.2	B36113
7/20/2016	54.7 – 57.2	100	54.7 ft bgs = 70 57.2 ft bgs = 75	91.4	B36115
7/20/2016	57.1 – 62.1	100	57.1 ft bgs = 78 59.6 ft bgs = 76 62.1 ft bgs = 95	115	B36117
7/20/2016	62.1 – 67.1	100	62.1 ft bgs = 85 64.6 ft bgs = 76 67.1 ft bgs = 110	117.8	B36119
7/20/2016	67.1 – 72.1	100	67.1 ft bgs = 108 69.6 ft bgs = 80 72.1 ft bgs = 111	118.6	B36121
7/20/2016	72.0 – 77.0	100	72.0 ft bgs = 92 74.5 ft bgs = 76 77.0 ft bgs = 98	101.8	B36123
7/20/2016	77.1 – 82.1	100	77.1 ft bgs = 87 79.6 ft bgs = 84 82.1 ft bgs = 125	114	B36125

Table D-18. Borehole C9514 (216-S-21 Crib)

Date	Depth Interval (ft bgs)	Recovery %	IR LEXAN Temperature	IR Drill Shoe Temperature	HEIS #
			(°Fahrenheit)		
7/20/2016	82.5 – 87.5	100	82.5 ft bgs = 95 85.0 ft bgs = 81 87.5 ft bgs = 125	135	B36127
7/20/2016	87.2 – 92.2	100	87.2 ft bgs = 100 89.7 ft bgs = 81 92.2 ft bgs = 93	96.4	B36129
7/20/2016	92.2 – 97.2	100	92.2 ft bgs = 104 94.7 ft bgs = 81 97.2 ft bgs = 104	104	B36131
7/21/2016	97.1 - 102.1	100	97.1 ft bgs = 72 99.6 ft bgs = 76 102.1 ft bgs = 106	106.8	B36133
7/21/2016	102.0 - 107.0	16	~1' sample= 92	96.4	B36135
7/21/2016	107.2 - 112.2	100	107.2 ft bgs = 87 109.7 ft bgs = 74 112.2 ft bgs = 102	113.6	B36137
7/21/2016	112.2 - 117.2	100	112.2 ft bgs = 78 114.7 ft bgs = 74 117.2 ft bgs = 83	108.6	B36139
7/21/2016	117.4 - 122.4	100	117.4 ft bgs = 77 119.9 ft bgs = 77 122.4 ft bgs = 106	114.8	B36141
7/21/2016	122.0 - 127.0	90	122.0 ft bgs = 87 124.5 ft bgs = 80 127.0 ft bgs = 94	116.2	B36143

Notes:
bgs = below ground surface.
HEIS = Hanford Environment Information System.
IR = Infrared.

Appendix E

Other Supporting Information for 200-DV-1 Operable Unit Boreholes

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E1 Variance to Drill 28 Direct Push Environmental Investigation Wells to be Drilled Beyond 30 feet to support the 200-DV-1 Operable Unit

VARIANCE TO DRILL 28 DIRECT PUSH ENVIRONMENTAL INVESTIGATION WELLS TO BE DRILLED BEYOND 30 FEET TO SUPPORT THE 200-DV-1 OPERABLE UNIT
May 12, 2015

Name, address, and telephone number of the person requesting the variance:
J.G. Morse, Department of Energy-Richland Operations, Federal Building, Richland, WA 99352, (509) 376-0057
[Provided by S.J. Trent, CHPRC, Soil & Groundwater Remediation Project, Well Coordinator, (509) 373-5869]

Address of the well sites:
Hanford Site, Richland, WA 99352

Well Name	Well ID	Waste Site	Proposed Total Depth (ft bgs)	Township, Range, Section 1/4,1/4
C8705	C8705	216-B-46	200	T13N, R26E, S34, SE 1/4, NE 1/4
C8706 [b]	C8706	216-B-46	200	T13N, R26E, S34, SE 1/4, NE 1/4
C8707 [b]	C8707	NE BY Cribs	200	T13N, R26E, S34, SE 1/4, NE 1/4
C8708	C8708	216-B-45	200	T13N, R26E, S34, SE 1/4, NE 1/4
C8709 [b]	C8709	216-B-45	200	T13N, R26E, S34, SE 1/4, NE 1/4
C8710	C8710	NW BY Cribs	200	T13N, R26E, S34, SE 1/4, NE 1/4
C8711 [b]	C8711	NW BY Cribs	200	T13N, R26E, S34, SE 1/4, NE 1/4
C9487	C9487	216-B-7A&B	240	T13N, R26E, S34, SE 1/4, NE 1/4
C9490	C9490	216-B-9	250	T12N, R26E, S3, NE 1/4, NE 1/4
C9491	C9491	216-B-37	225	T13N, R26E, S34, SE 1/4, NE 1/4
C9488	C9488	216-B-8	225	T13N, R26E, S34, SE 1/4, NE 1/4
C9489	C9489	216-B-9	250	T12N, R26E, S3, NE 1/4, NE 1/4
C9495	C9495	216-T-14	105	T12N, R25E, S1, NE 1/4, NW 1/4
C9496	C9496	216-T-15	105	T12N, R25E, S1, NE 1/4, NW 1/4
C9504	C9504	216-T-15	105	T12N, R25E, S1, NE 1/4, NW 1/4
C9505	C9505	216-T-15	105	T12N, R25E, S1, NE 1/4, NW 1/4
C9499	C9499	216-T-6	105	T12N, R25E, S1, NE 1/4, NW 1/4
C9501	C9501	216-T-6	105	T12N, R25E, S1, NE 1/4, NW 1/4
C9502	C9502	216-T-6	105	T12N, R25E, S1, NE 1/4, NW 1/4
C9506	C9506	216-T-18	100	T12N, R25E, S1, NE 1/4, SW 1/4
C9508	C9508	216_T-23	115	T12N, R25E, S1, SW 1/4, NE 1/4
C9509	C9509	216-T-25	115	T12N, R25E, S1, NW 1/4, SE 1/4
C9510 [a]	C9510	216-T-25	115	T12N, R25E, S1, NW 1/4, SE 1/4
C9511 [a]	C9511	216-T-23	115	T12N, R25E, S1, SW 1/4, NE 1/4
C9512	C9512	216-S-9	140	T12N, R25E, S12, SE 1/4, NW 1/4
C9514	C9514	216-S-21	125	T12N, R25E, S12, SW 1/4, NE 1/4
C9492	C9492	216-T-5	100	T12N, R25E, S1, NW 1/4, NE 1/4
C9493	C9493	216-T-5	100	T12N, R25E, S1, NW 1/4, NE 1/4
C9494	C9494	216-T-5	100	T12N, R25E, S1, NW 1/4, NE 1/4

a. Only one of these two will be drilled based upon geophysical logging results of proximate boreholes.
b. An electrode sting will be installed in the during borehole decommissioning.
ft bgs = feet below ground surface

The specific regulation(s) that cannot be followed; comparable alternative specification; and justification for the request:

A variance to Washington State Administrative Codes (WAC) 173-160-451 is requested to allow direct push wells to be greater than thirty feet depth for 28 direct push environmental investigation wells listed above. Figures 1 through 3 display locations of the direct push environmental investigation wells.

The specific requirement found in WAC 173-160-451 that may not be met for the construction of this well includes the following:

> 451(2)(d) Direct push wells shall not be greater than thirty feet in depth unless a variance is obtained.

The variance is to allow the direct push environmental investigation wells to be drilled up to 250 feet below ground surface (bgs) in order to reach the target sample depth. The environmental investigation wells will be decommissioned after sample collection and geophysical logging. Decommissioning will be completed by back pulling casing while adding bentonite from total depth to 10 feet bgs followed by cement grout from 10 ft bgs to ground surface (Figure 1). A brass marker with well ID will be placed in the cement at the surface of the decommissioned well.

An electrode string will be installed in four direct push environmental investigation wells during decommissioning. The electrodes will be strapped to a solid rod or grout filled PVC in 20 ft intervals through the length of the borehole. The borehole will be filled with cement grout from total depth to the surface. A brass marker with well ID will be placed in the cement at the surface.

Concurrence & date: 5/12/2015 S.J. Trent,
S&GRP Well Coordinator

Concurrence & date: 5/13/15 Jeff Ayres,
WDOE
Nuclear Waste Program
Richland, WA 99354

Concurrence & date: 5/20/15 Cheryl Whalen,
WDOE, Section Manager
Nuclear Waste Program
Richland, WA 99354

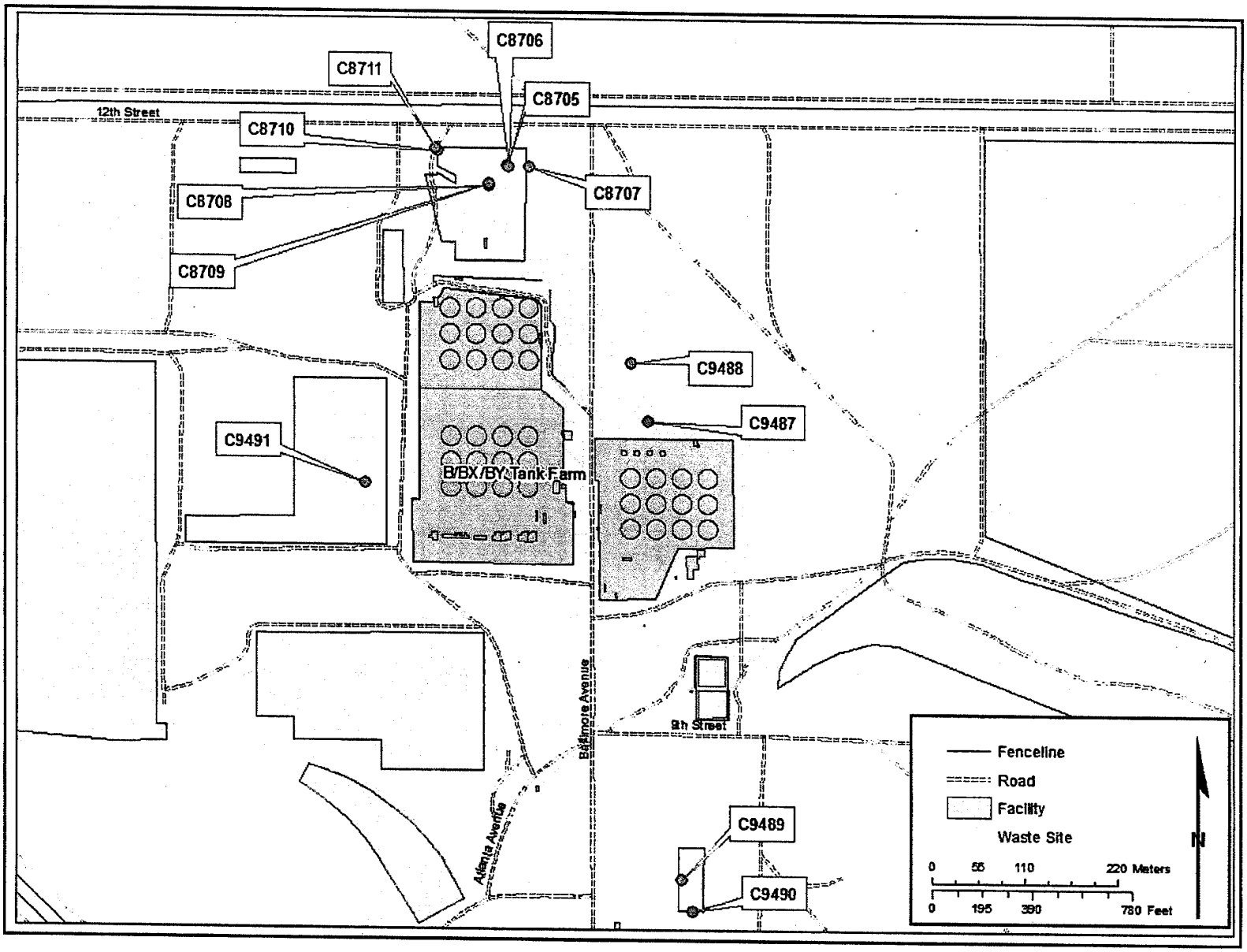


Figure 1. Map Showing Locations of 200-DV-1 Environmental Investigation Wells in B Complex, 200 East

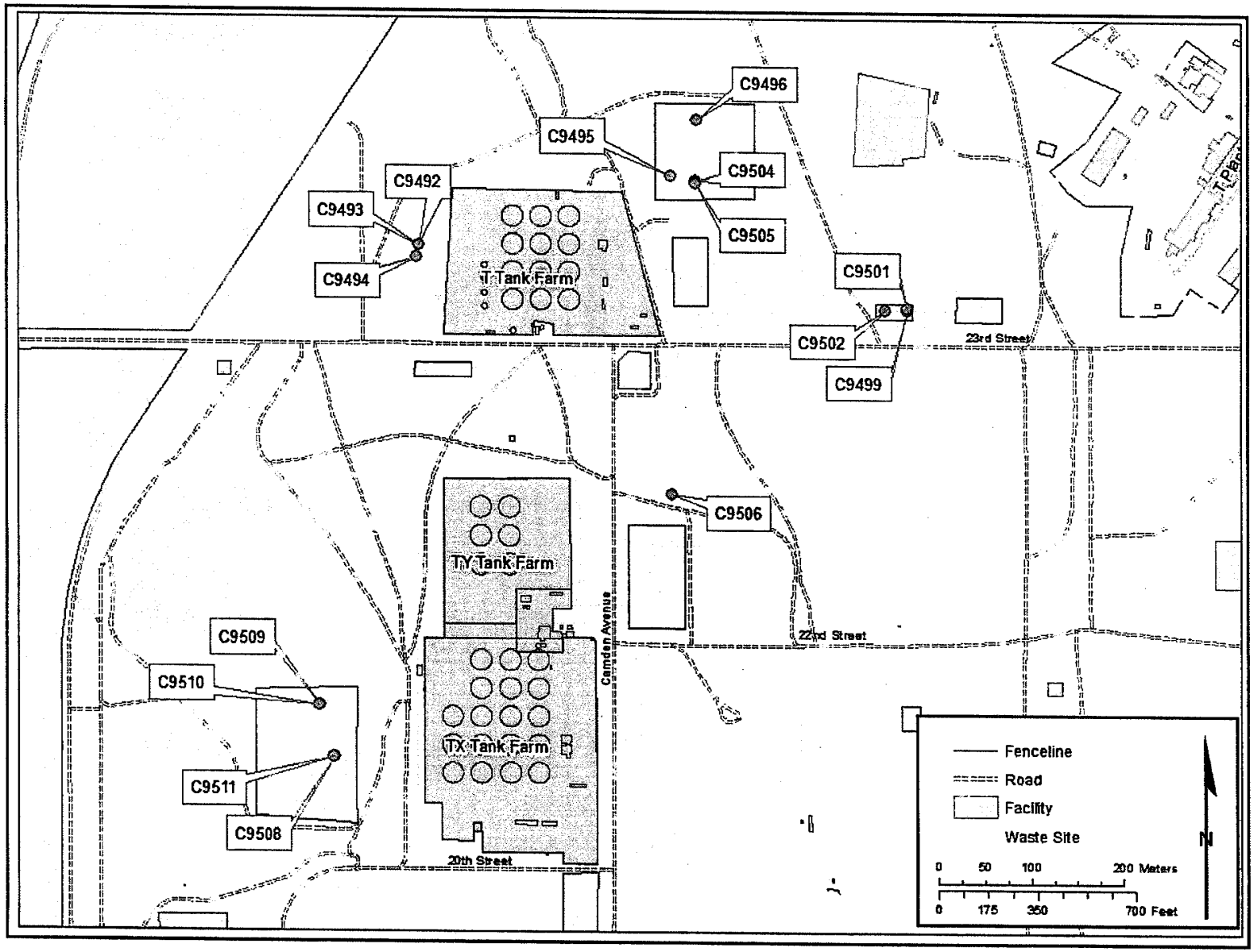


Figure 2. Map Showing Locations of 200-DV-1 Environmental Investigation Wells in T Complex, 200 West Area

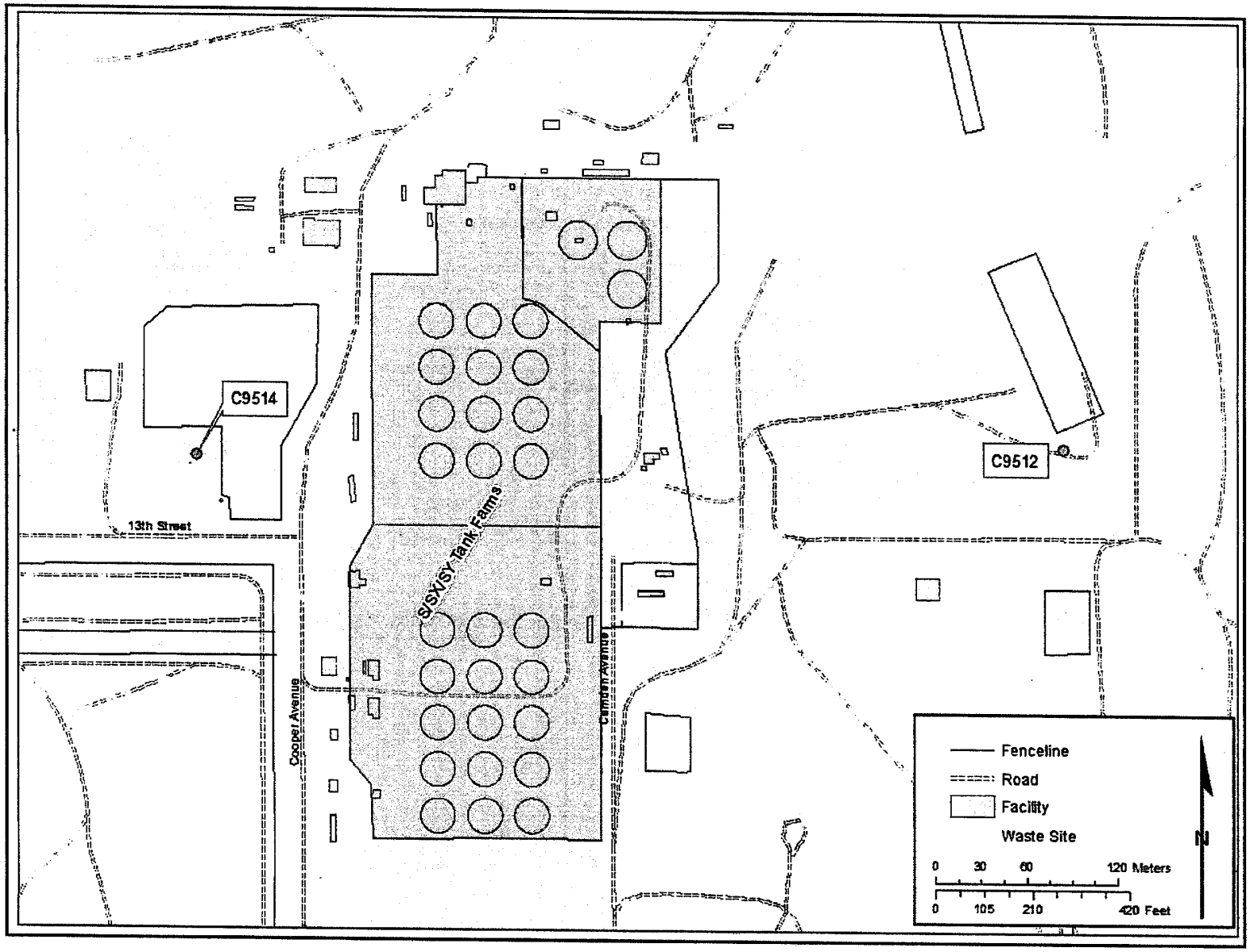


Figure 3. Map Showing Locations of 200-DV-1 Environmental Investigation Wells in S Complex, 200 West Area

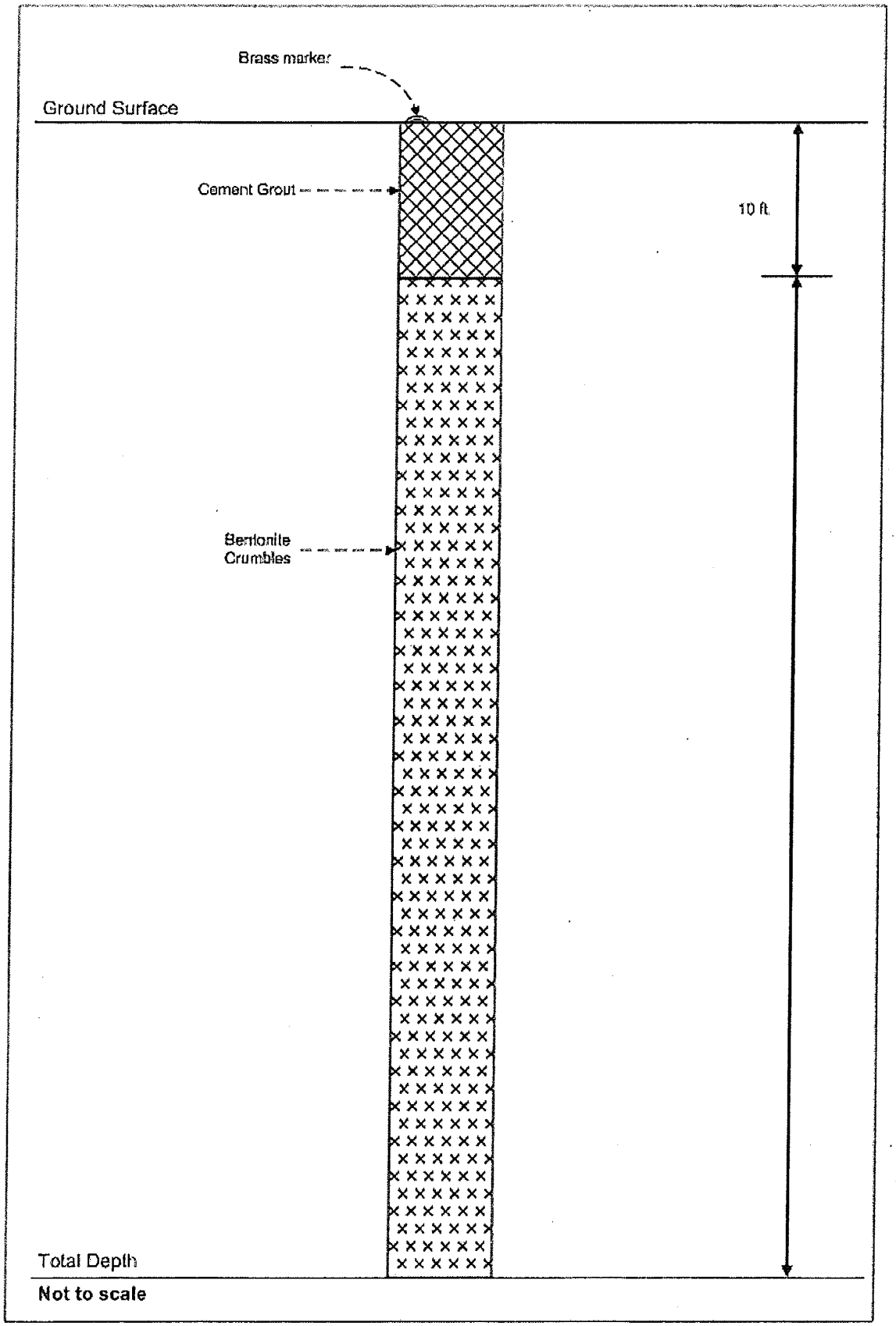


Figure 4. 200-DV-1 Borehole Decommissioning

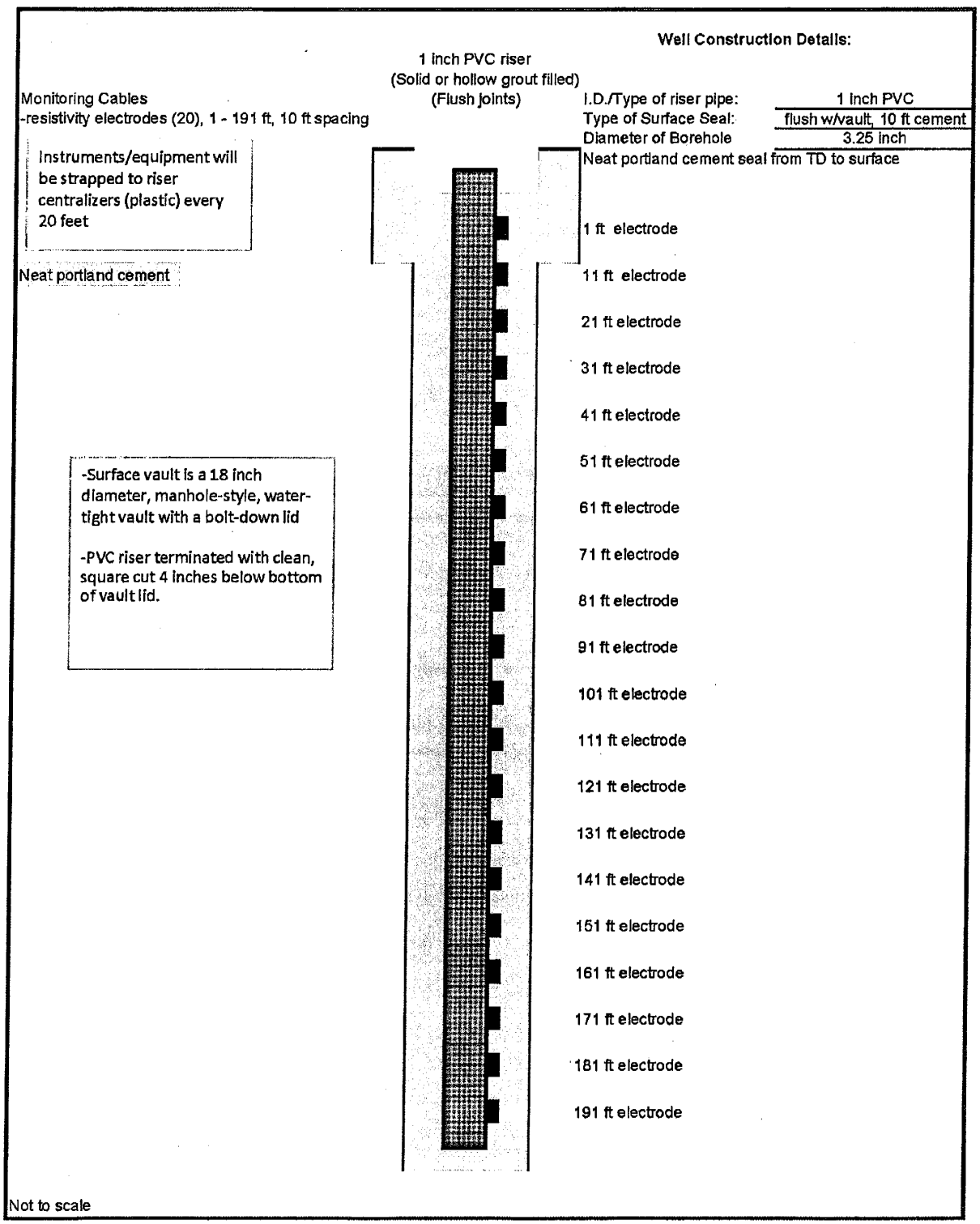


Figure 5. Borehole Decommissioned with Electrode String Installation

E2 Variance to Leave Temporary Casing in Place During Decommissioning of One Environmental Investigation Well, 200-DV-1 Operble Unit (C9511)

VARIANCE TO LEAVE TEMPORARY CASING IN PLACE DURING DECOMMISSIONING OF ONE ENVIRONMENTAL INVESTIGATION WELL,
200-DV-1 OPERABLE UNIT
September 30, 2016

Name, address, and telephone number of the person requesting the variance:
J.P. Hanson, Department of Energy-Richland Operations, Federal Building, Richland, WA 99352, (509) 373-9068
[Provided by K.M. Whitley, CHPRC, Soil & Groundwater Remediation Project, Well Coordinator, (509) 373-4929]

Address of the well sites:
Hanford Site, Richland, WA 99352

Well Name	Well ID	Waste Site	Easting (X)	Northing (Y)
C9511	C9511	216-T-23	566583.00	136172.3

The specific regulation(s) that cannot be followed; comparable alternative specification; and justification for the request:
A variance to Washington State Administrative Codes (WAC) 173-160 is requested to allow a portion of temporary casing to remain in place for one decommissioned environmental investigation well listed above. Figure 1 displays location of the environmental investigation well.

The specific requirement found in WAC 173-160-450 (3) that may not be met for the construction of this well includes the following:

> 450(3) The completed annular seal shall fully surround the permanent casing, be evenly distributed, free of voids, and extend from the permanent casing to undisturbed or recompacted soil.

The boreholes were installed by employing two drilling technologies, direct push via Becker Hammer and sonic. The Becker Hammer installed 8.625 inch casing to approximately 43.9 ft bgs surpassing the high radioactively contaminated interval. The sonic rig then proceeded to install 6 inch temporary casing to total depth while collecting continuous core samples. After all characterization samples were collected the drilling contractors proceeded with decommissioning the borehole. All of the 6 inch temporary casing was successfully removed.

After verifying the 8 inch casing was moving freely, removal of the 8 inch casing and decommissioning resumed. It was determined that the shoe and last piece of casing broke off and were grouted into the borehole during decommissioning totaling 9.2 ft of material. The variance is to allow the casing and drive shoe to remain in place from 31.7 to 40.9 ft bgs at C9511 as shown in Figures 2.

Concurrence & date: Kelly Whitley 9/30/16 — K.M. Whitley, S&GRP Well Coordinator

Concurrence & date: 10/3/16 — Jeff Ayres, WDOE, Nuclear Waste Program, Richland, WA 99354

Concurrence & date: 10/3/16 — Cheryl Whalen, WDOE, Section Manager, Nuclear Waste Program, Richland, WA 99354

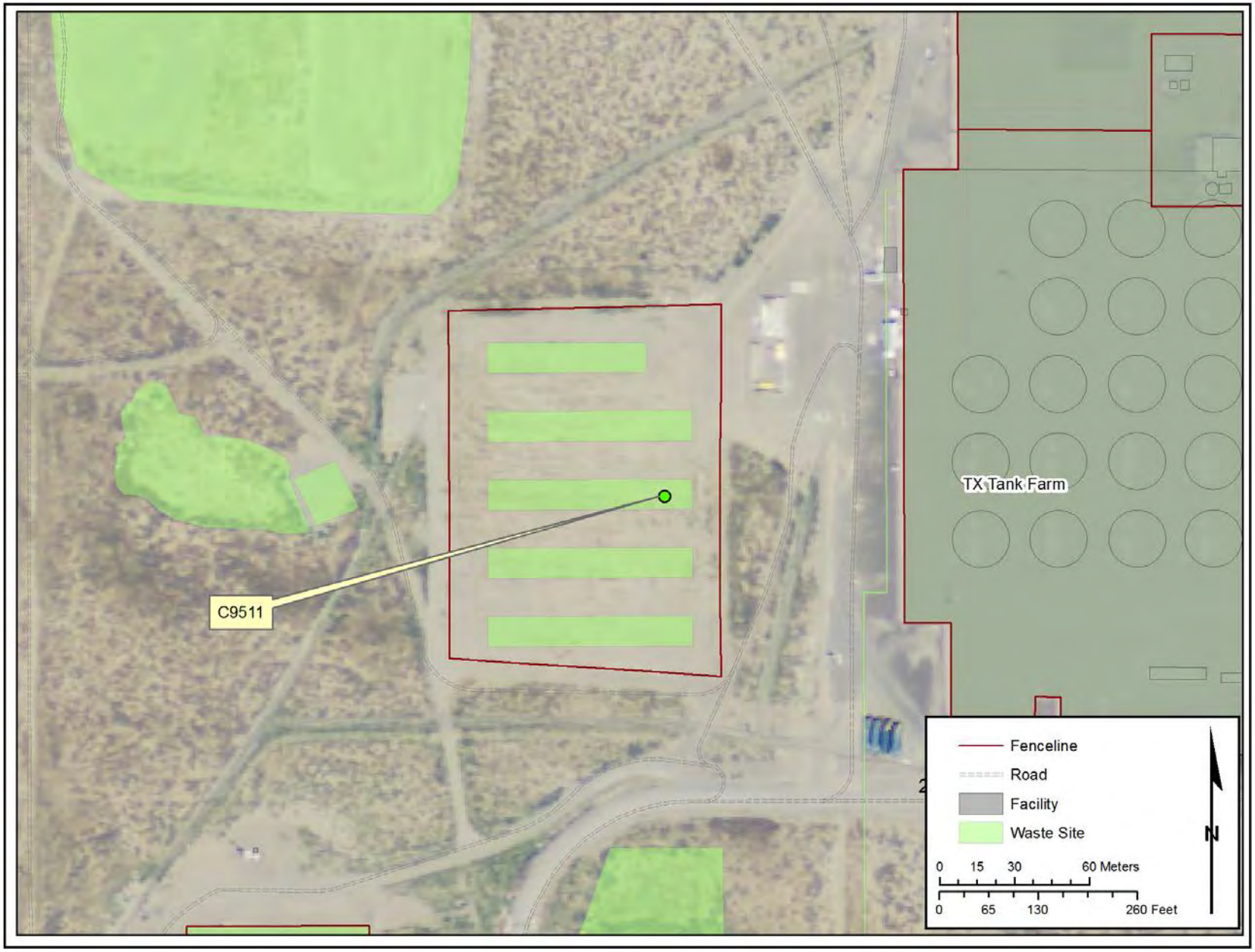


Figure 1. Map Showing C9511 Location, 200 West

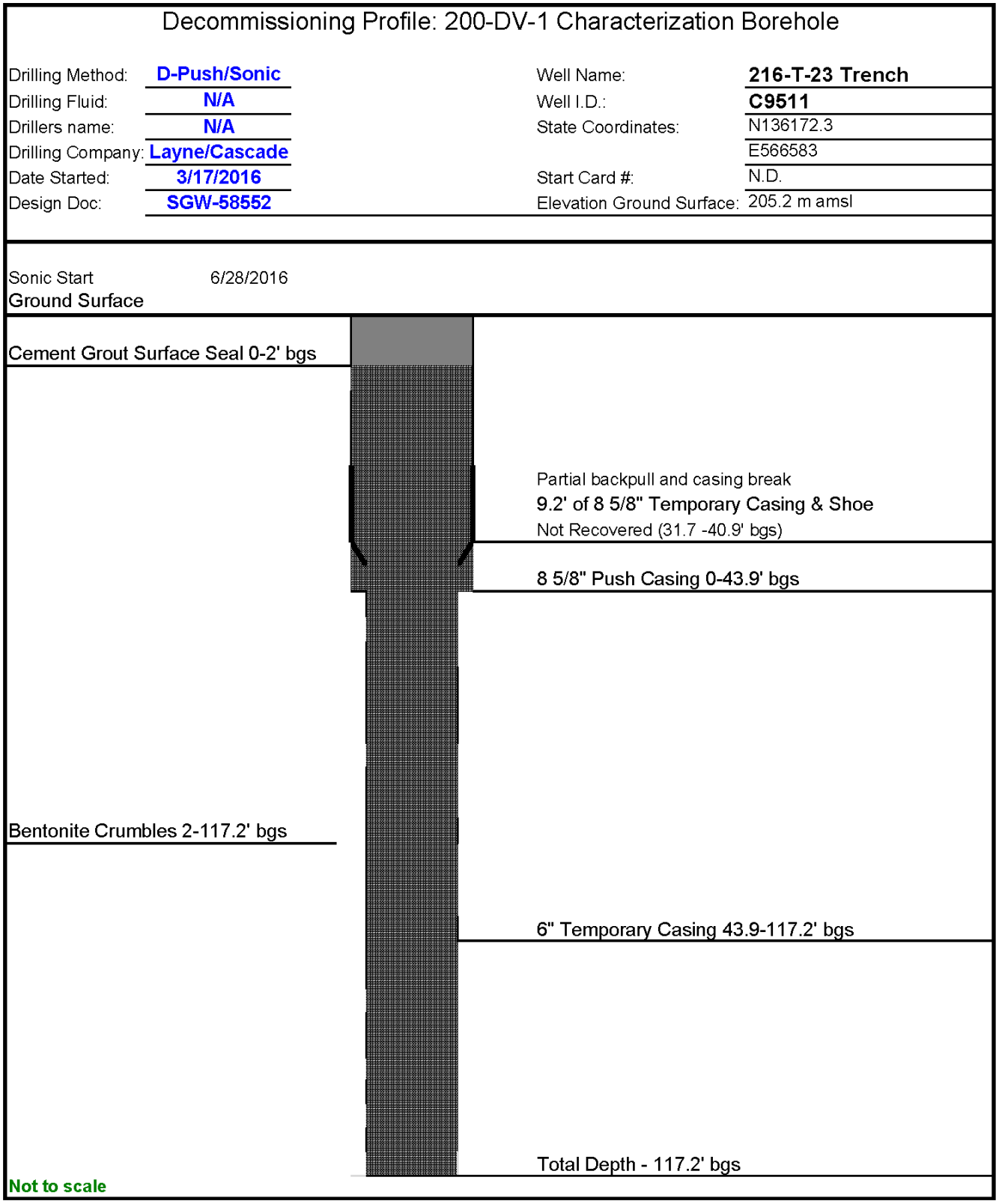


Figure 2. Borehole C9511 Decommissioned

E3 Variance to Leave Temporary Casing in Place During Decommissioning of Two Environmental Investigation Wells, 200-DV-1 Operble Unit (C9549 and C9552)

VARIANCE TO LEAVE TEMPORARY CASING IN PLACE DURING DECOMMISSIONING OF TWO ENVIRONMENTAL INVESTIGATION WELLS, 200-DV-1 OPERABLE UNIT
April 29, 2016

Name, address, and telephone number of the person requesting the variance:
J.P. Hanson, Department of Energy-Richland Operations, Federal Building, Richland, WA 99352, (509) 373-9068
[Provided by K.M. Whitley, CHPRC, Soil & Groundwater Remediation Project, Well Coordinator, (509) 373-4929]

Address of the well sites:
Hanford Site, Richland, WA 99352

Well Name	Well ID	Waste Site	Township, Range, Section 1/4,1/4
C9549 (formally C8707)[a]	C9549 (formally C8707)[a]	NE BY Cribs	T13N, R26E, S34, SE 1/4, NE 1/4
C9552 (formally C8709)[b]	C9552 (formally C8709)[b]	216-B-45	T13N, R26E, S34, SE 1/4, NE 1/4

a. An electrode sting will be installed in the during borehole decommissioning.
ft bgs = feet below ground surface

The specific regulation(s) that cannot be followed; comparable alternative specification; and justification for the request:
A variance to Washington State Administrative Codes (WAC) 173-160 is requested to allow a portion of temporary casing to remain in place for two environmental investigation wells with electrode installations listed above. Figure 1 displays locations of the direct push environmental investigation wells.

The specific requirement found in WAC 173-160-450 (3) that may not be met for the construction of this well includes the following:

> 450(3) The completed annular seal shall fully surround the permanent casing, be evenly distributed, free of voids, and extend from the permanent casing to undisturbed or recompacted soil.

The boreholes were installed by employing two drilling technologies, direct push via Becker Hammer and sonic. The Becker Hammer installed 8.625 inch casing to approximately 45 ft bgs surpassing the high radioactively contaminated interval. The sonic rig then proceeded to install 6 inch temporary casing to total depth while collecting continuous core samples. An electrode string was installed in the two environmental investigation wells during decommissioning. The electrodes were strapped to PVC (to be grout filled) in 20 ft intervals through the length of the borehole. The boreholes were filled with cement grout from total depth to the surface.

During the installation of the 8 inch casing at C9549 and C9552 the threads on the deep strings of casing broke. Therefore during the electrode installation and decommissioning those strings of casing and drive shoes were not retrieved and grouted in place. The variance is to allow the casing and drive shoes to remain in place from 26.2 to 45.4 ft bgs at C9549 and from 36.1 to 45.3 ft bgs at C9552 as shown in Figures 2 and 3.

Concurrence & date: _____ K.M. Whitley,
S&GRP Well Coordinator

Concurrence & date: _____ 5/2/16 Jeff Ayres,
WDOE
Nuclear Waste Program
Richland, WA 99354

Concurrence & date: _____ 5/2/16 Cheryl Whalen,
WDOE, Section Manager
Nuclear Waste Program
Richland, WA 99354

Figure 1. Map Showing Locations of 200-DV-1 Environmental Investigation Wells in BY Cribs, 200 East

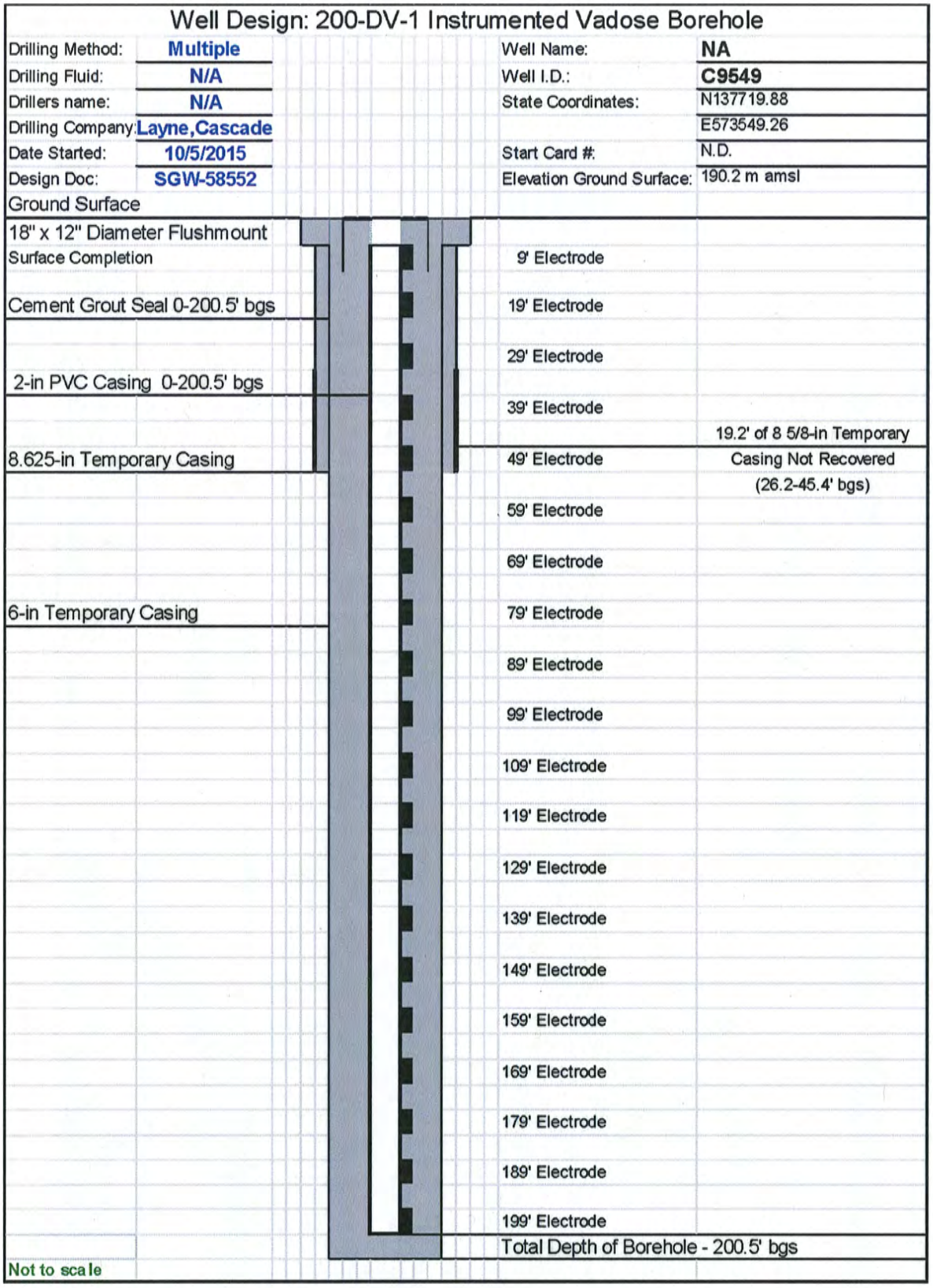


Figure 2. Borehole C9549 Decommissioned with Electrode String Installation

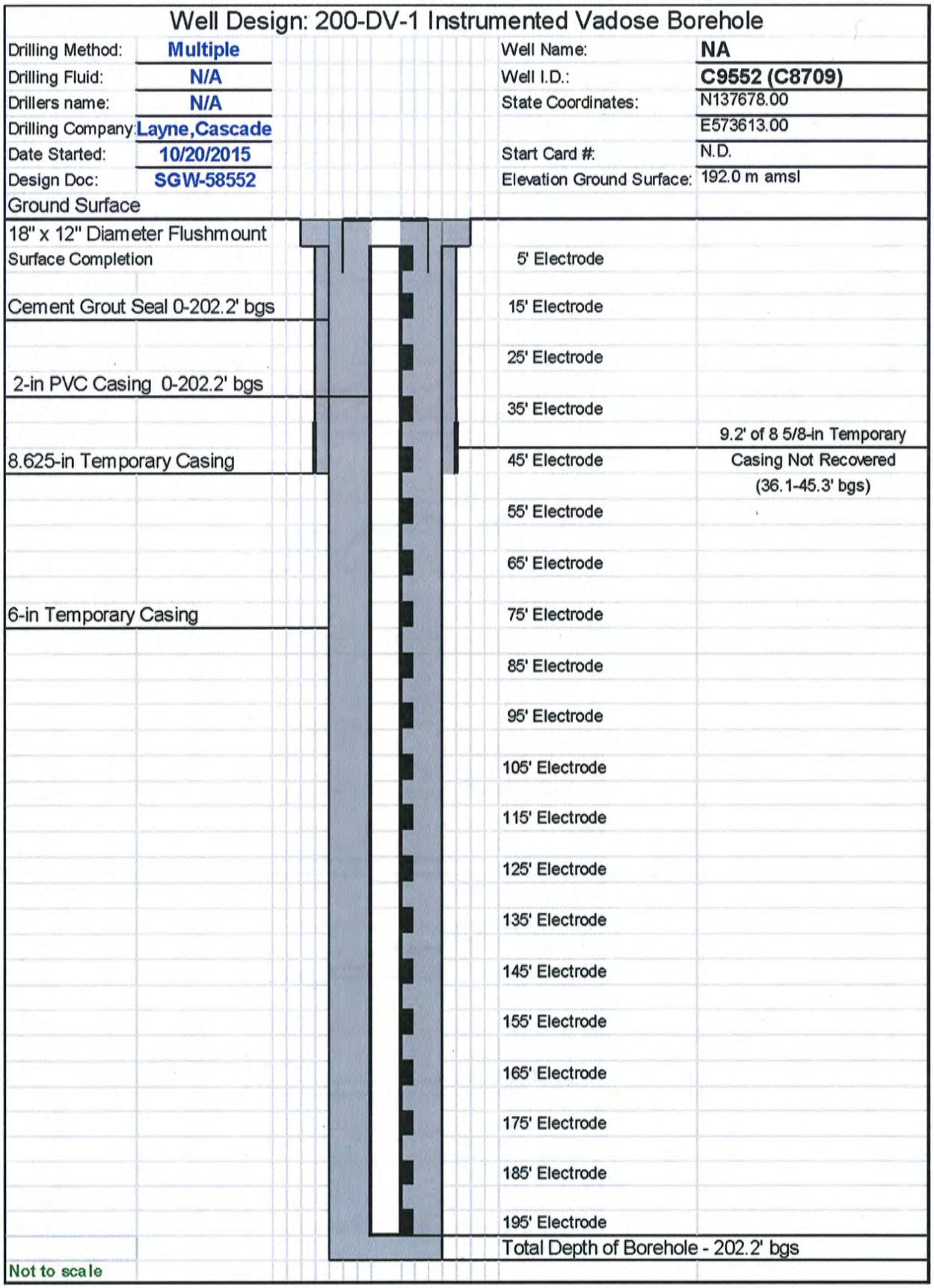


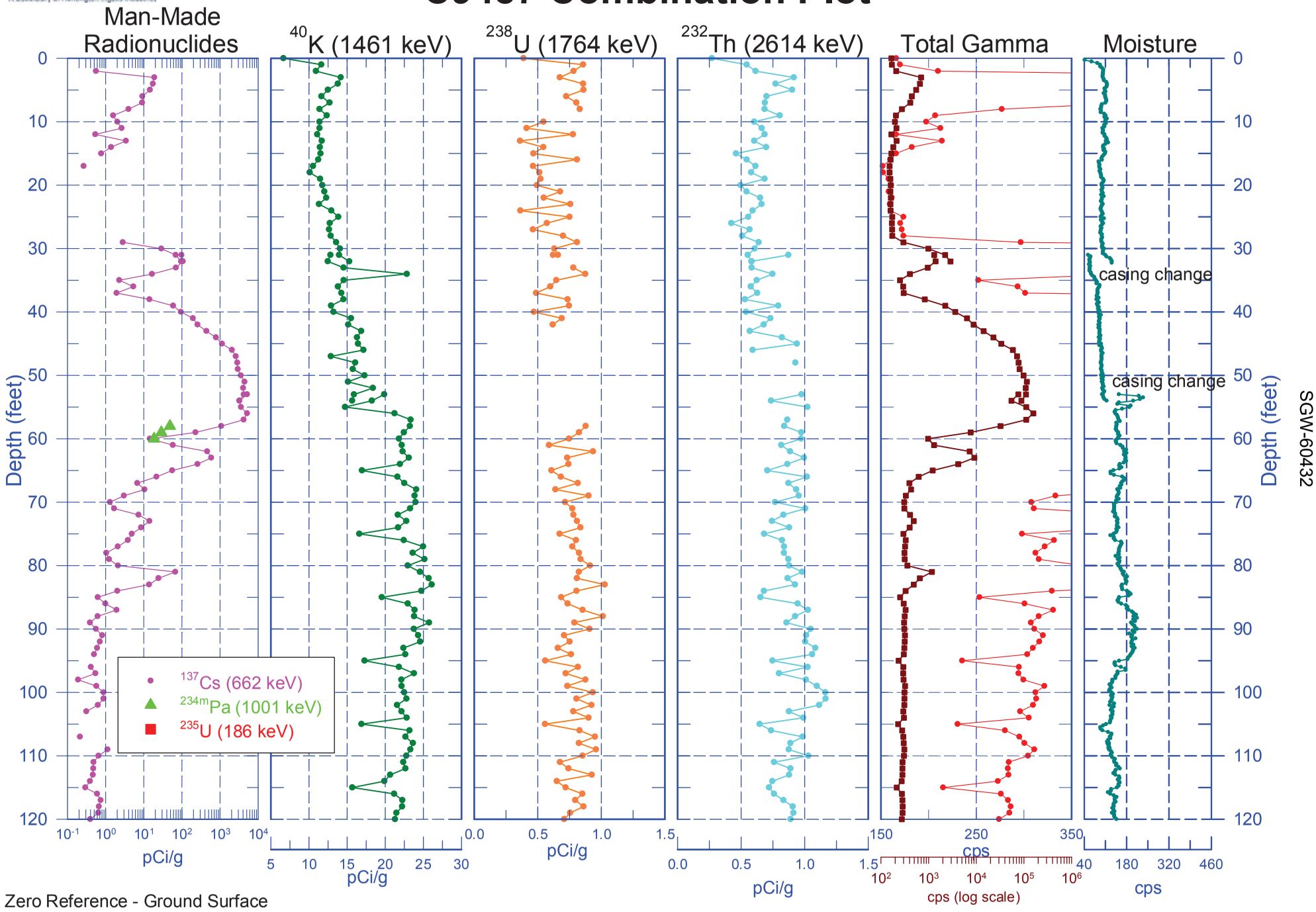
Figure 3. Borehole C9552 Decommissioned with Electrode String Installation

Appendix F

Geophysical Logging Combination Plots for 200-DV-1 Operable Unit Boreholes

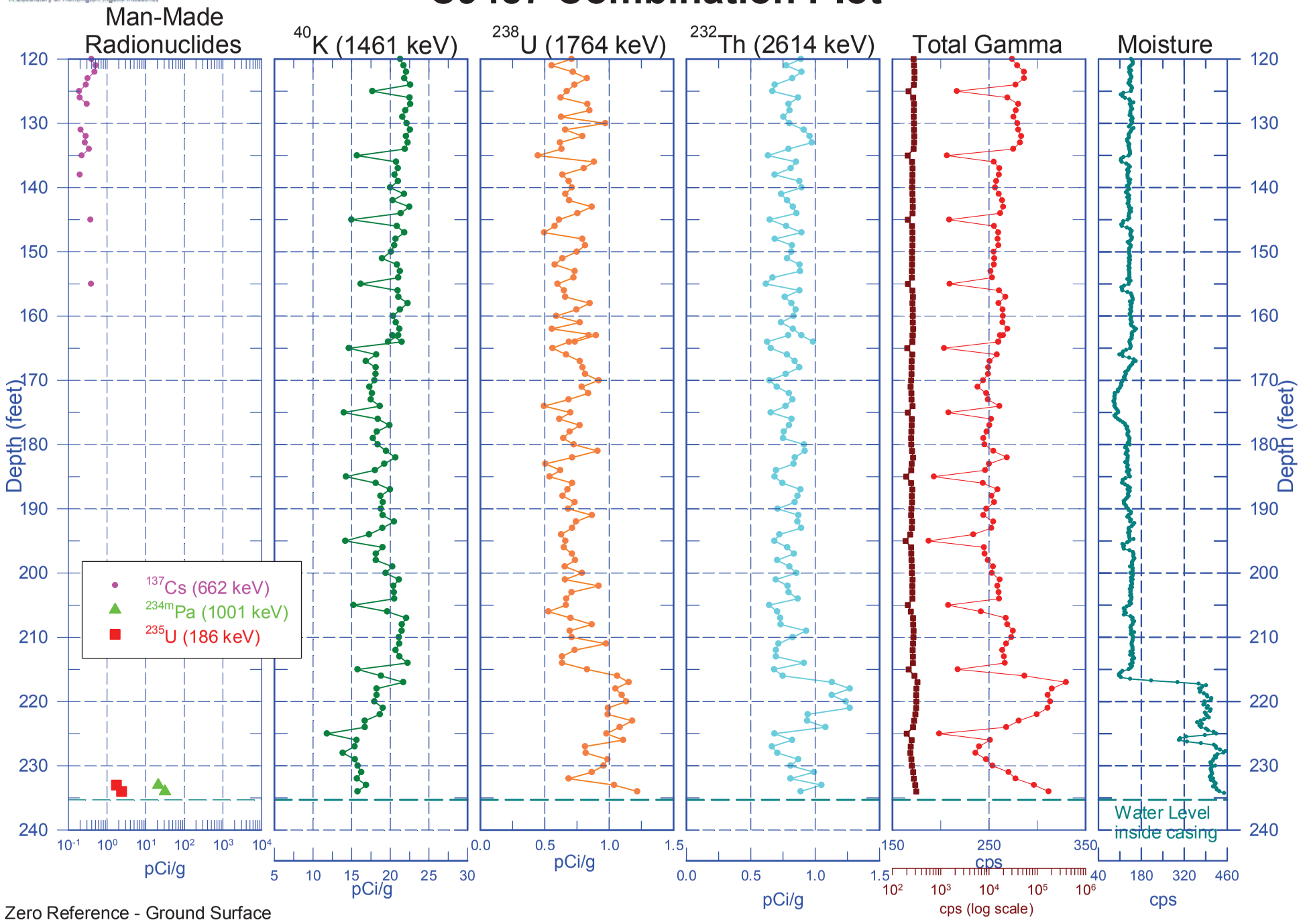
Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

C9487 Combination Plot



Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

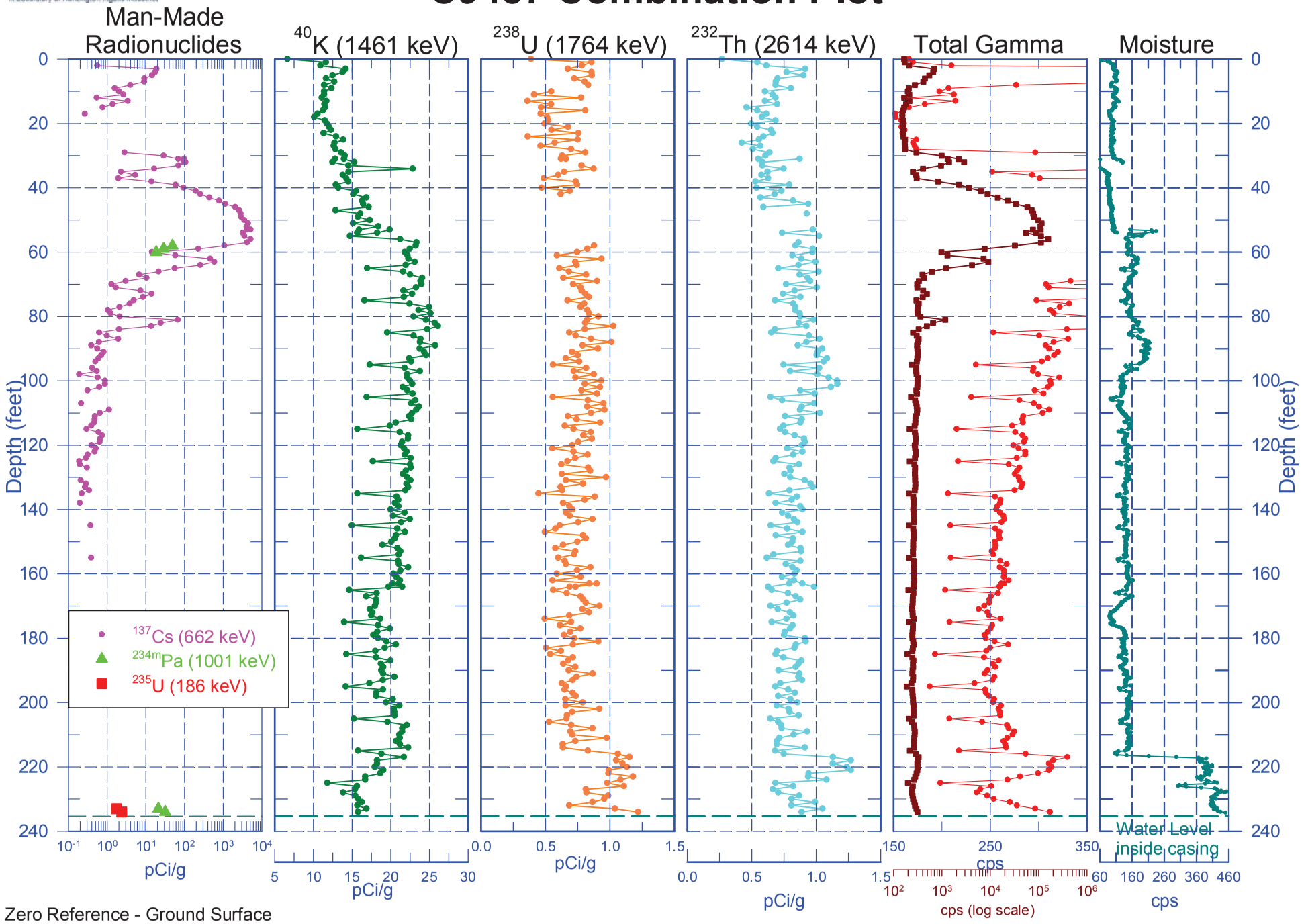
C9487 Combination Plot



Zero Reference - Ground Surface

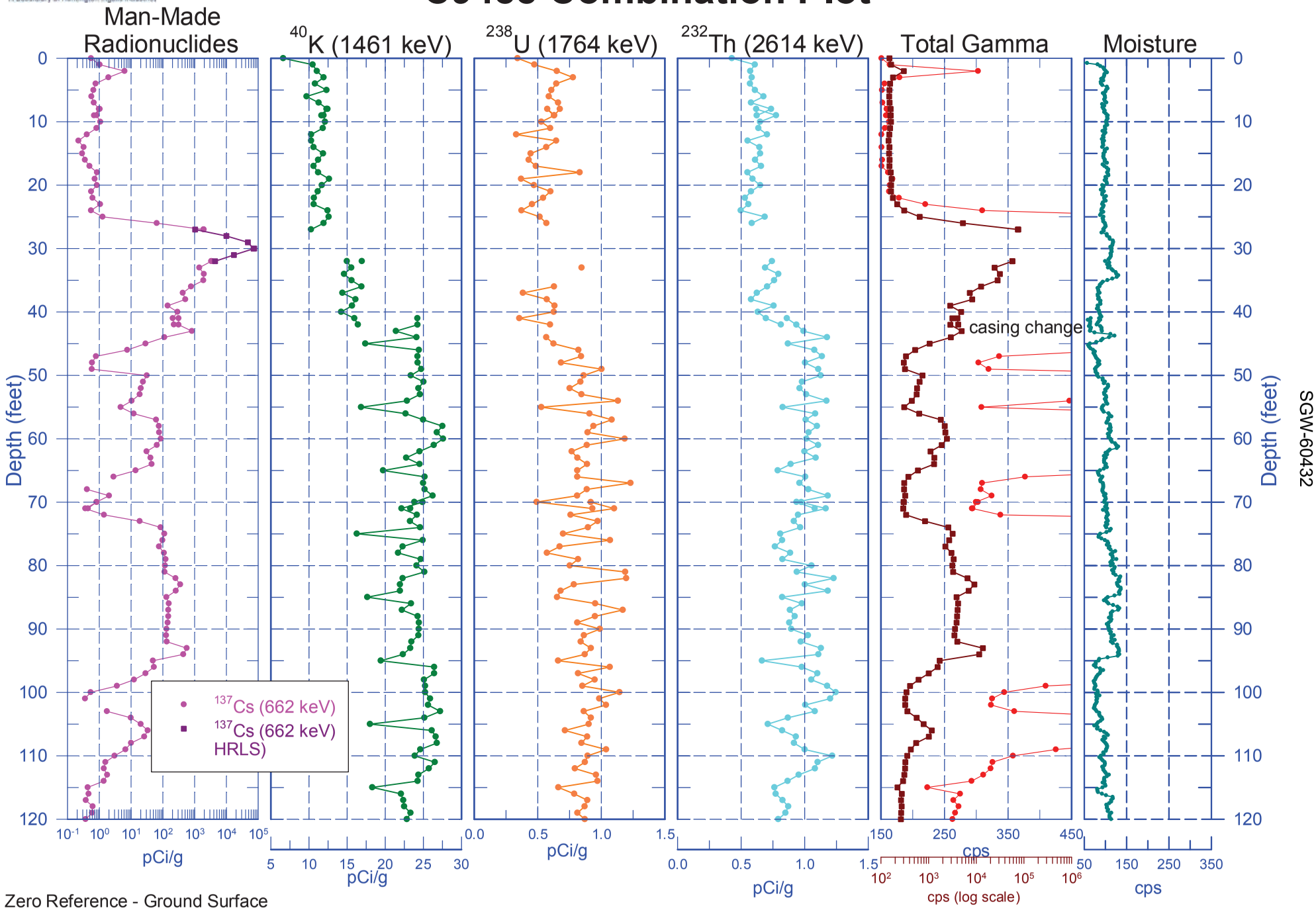
Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

C9487 Combination Plot



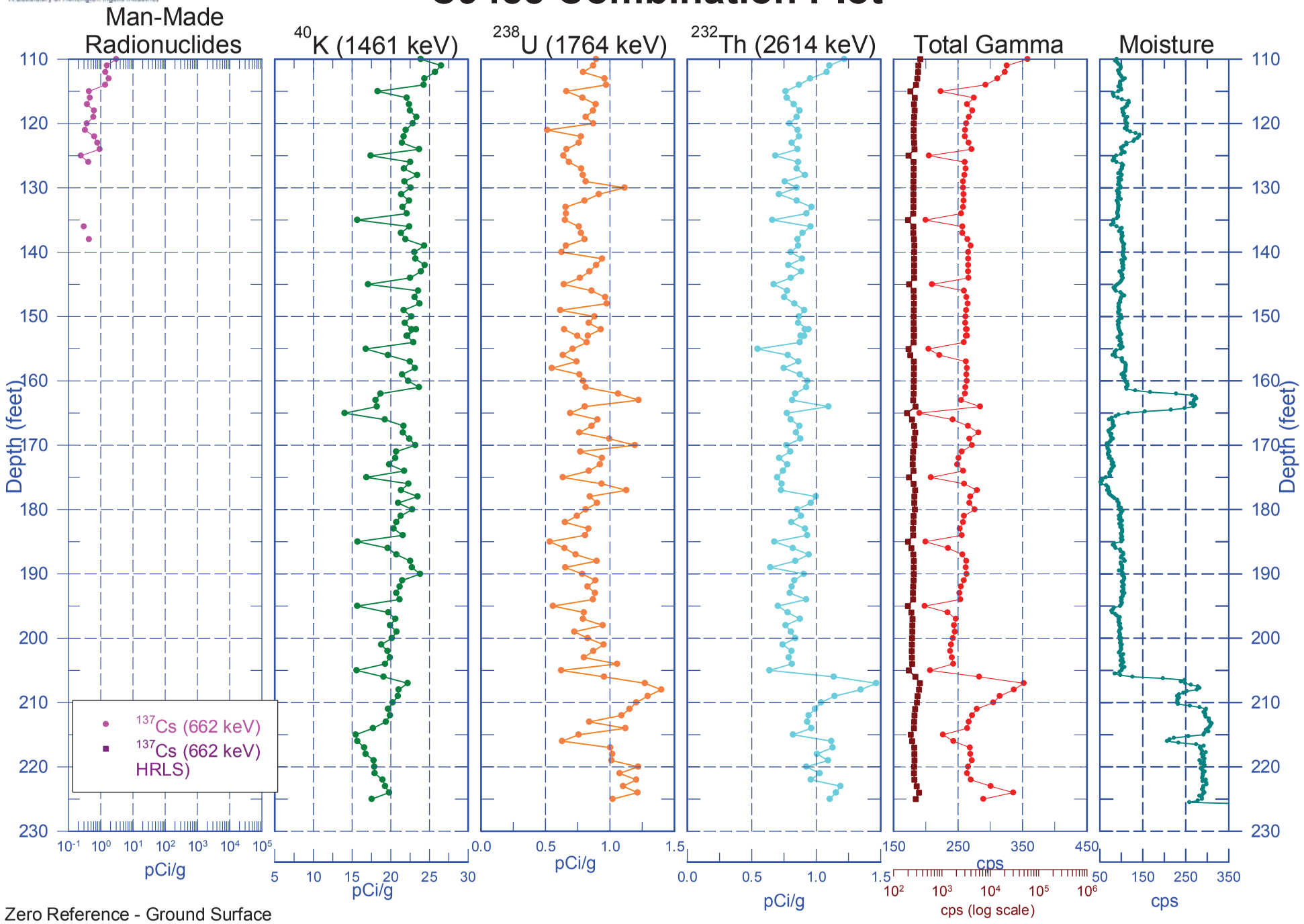
Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

C9488 Combination Plot



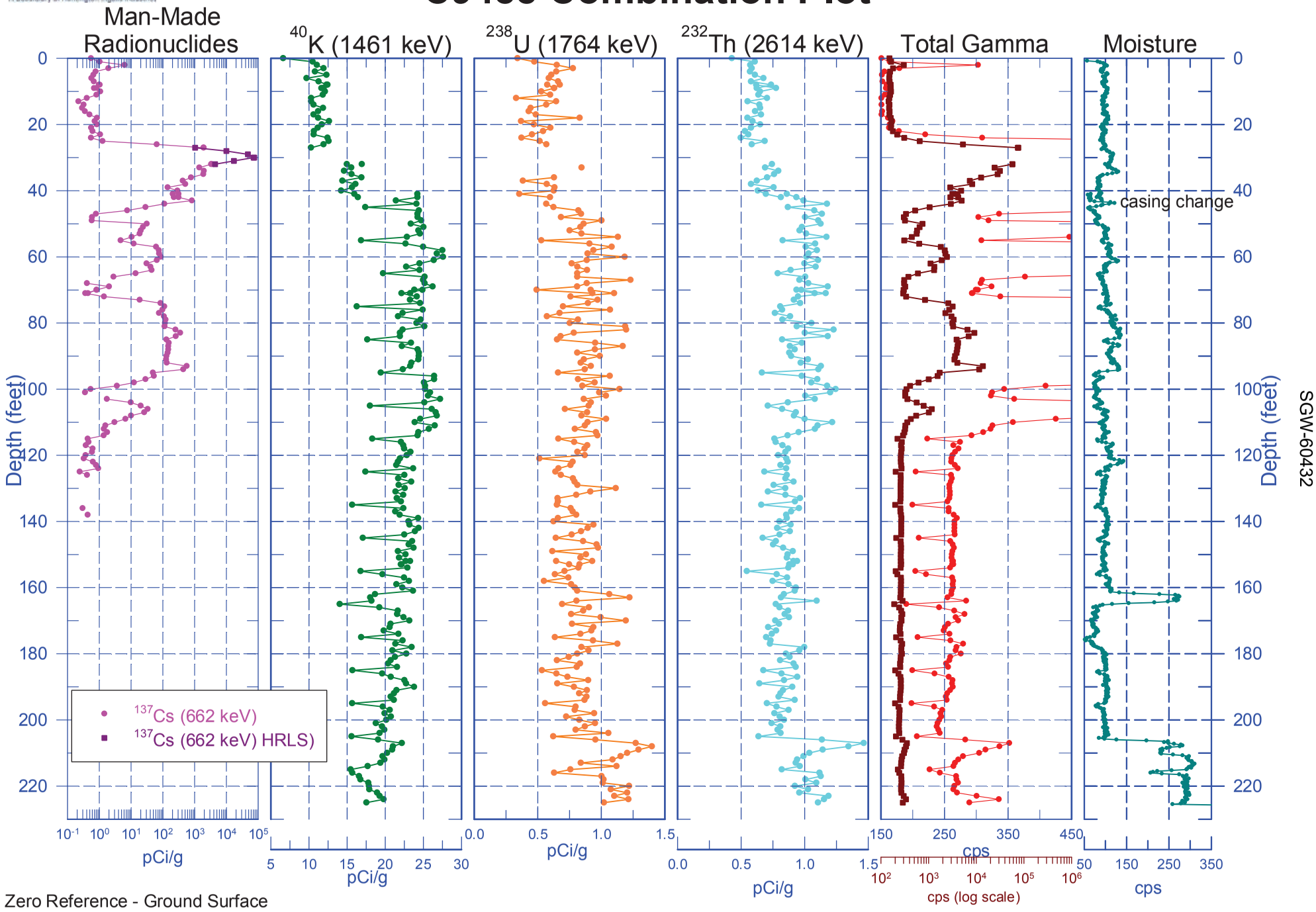
Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

C9488 Combination Plot



Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

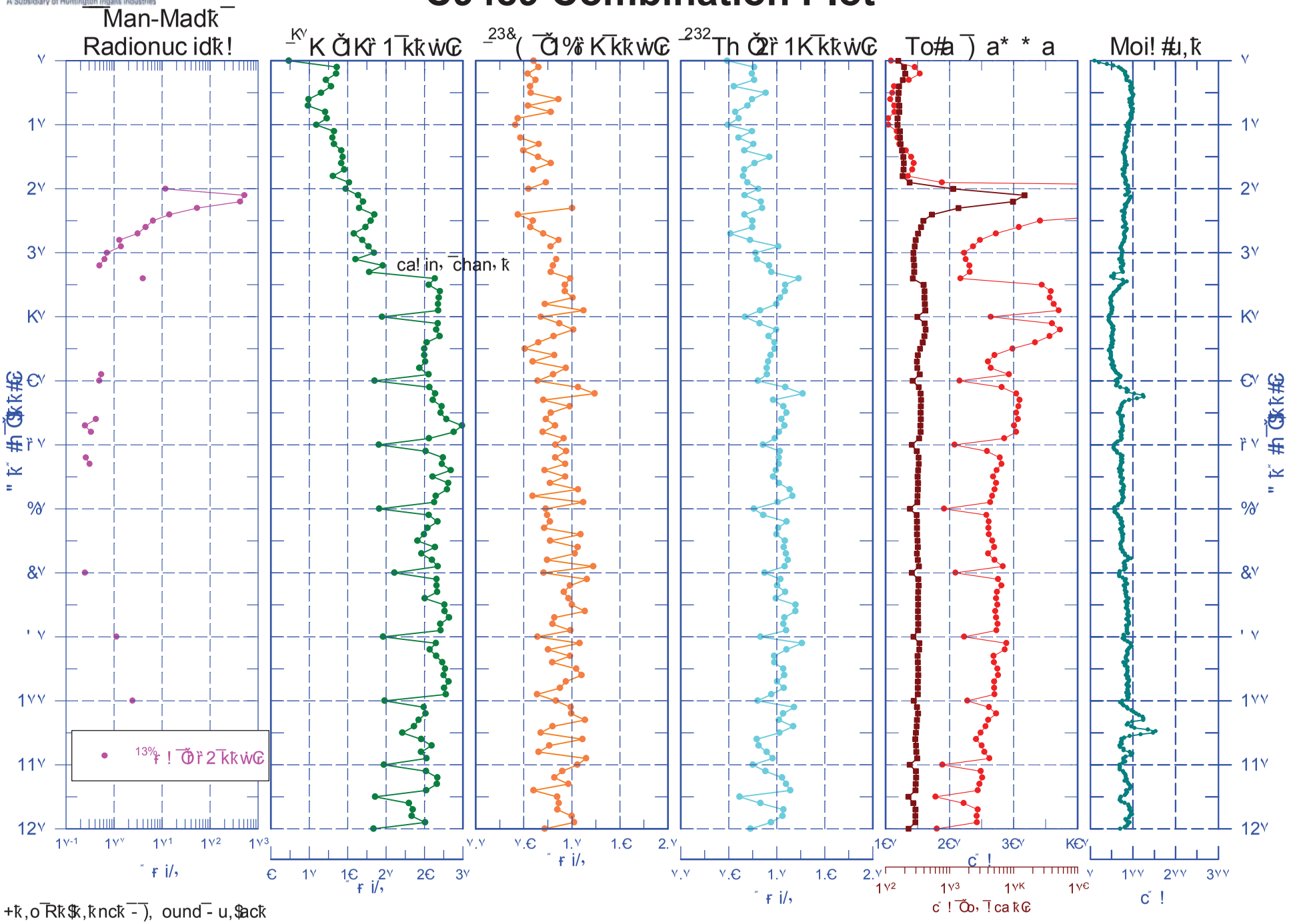
C9488 Combination Plot



Zero Reference - Ground Surface

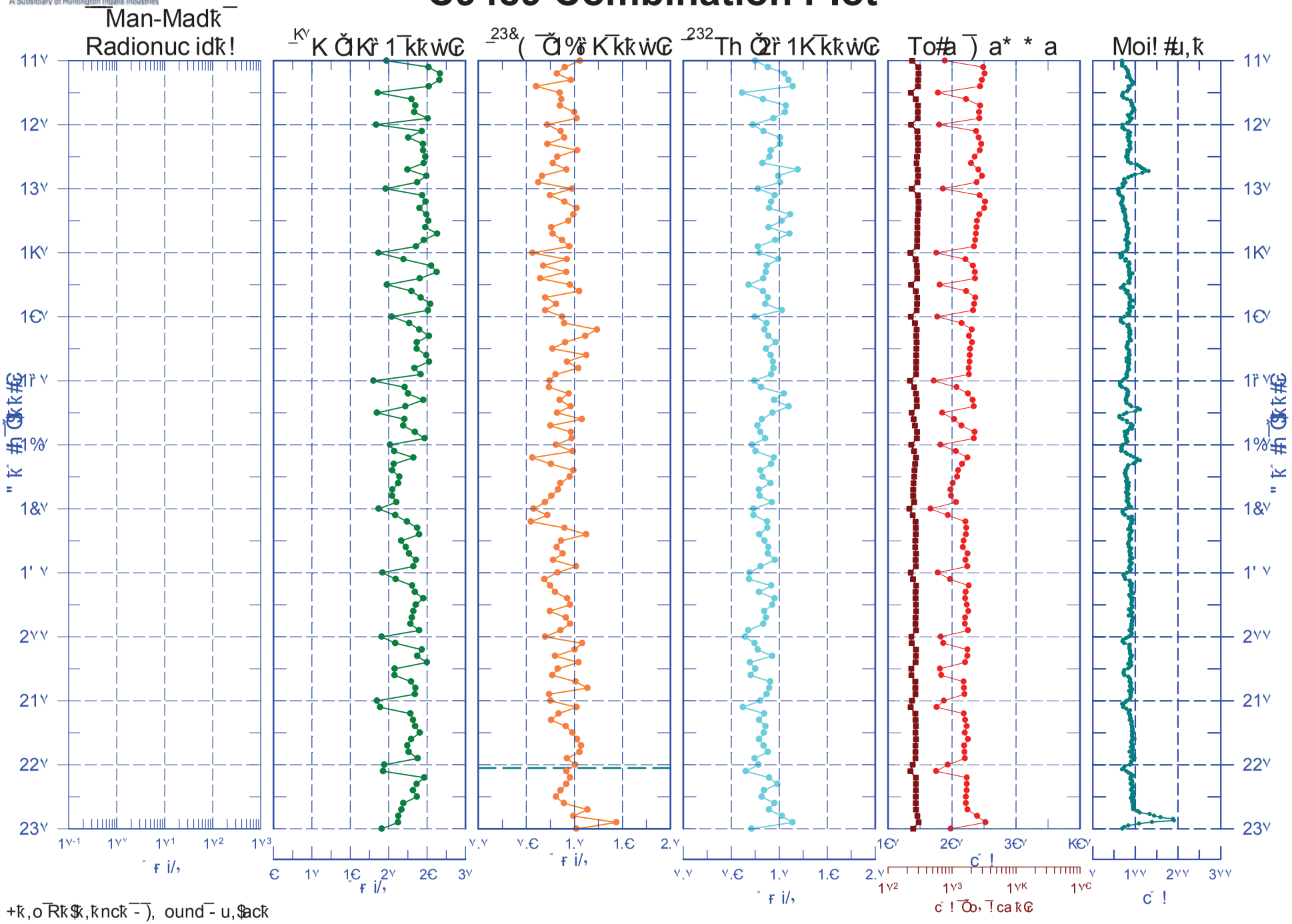
Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

C9489 Combination Plot



Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

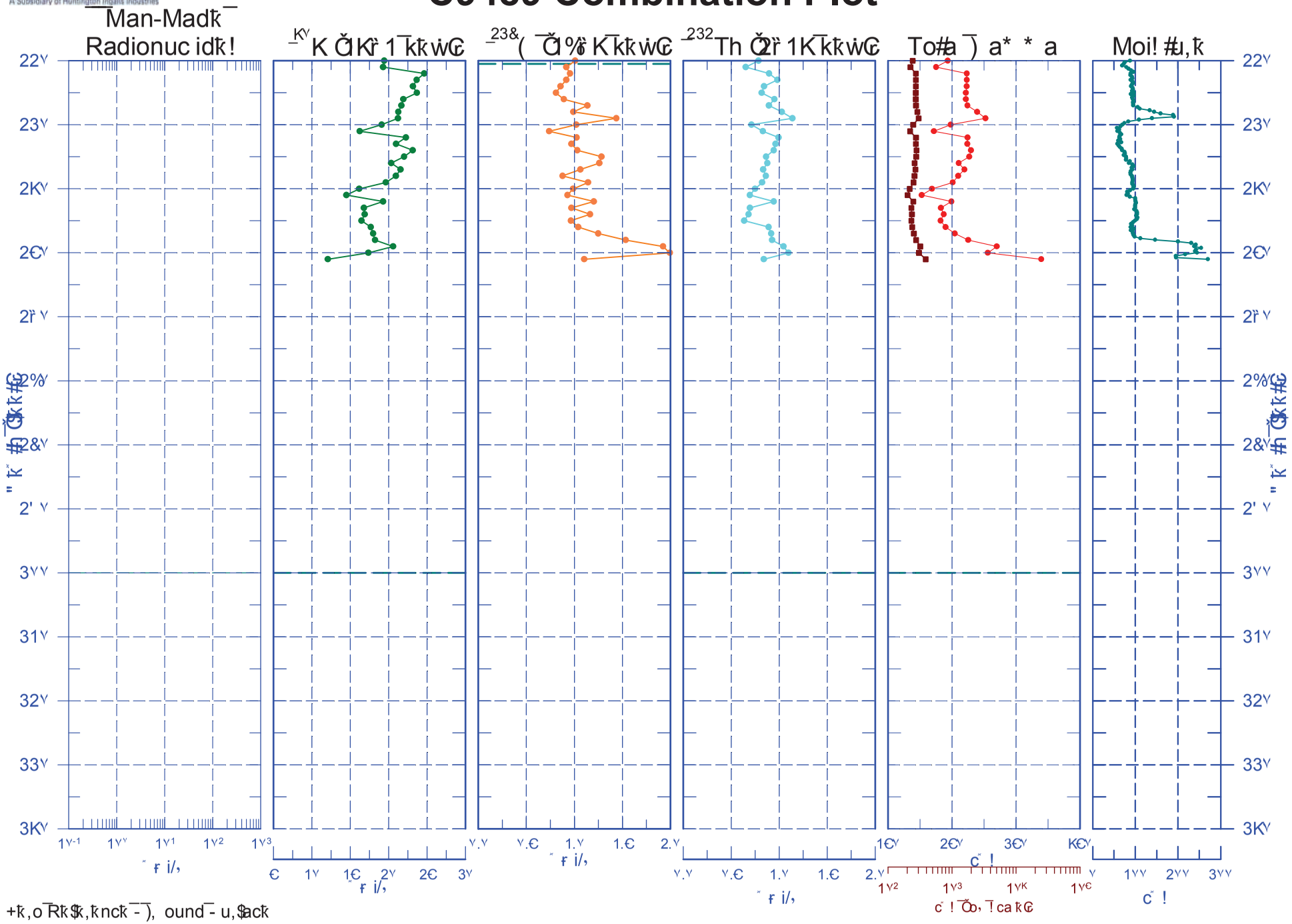
C9489 Combination Plot



+k,o Rk$k,knck -), ound - u,$ack

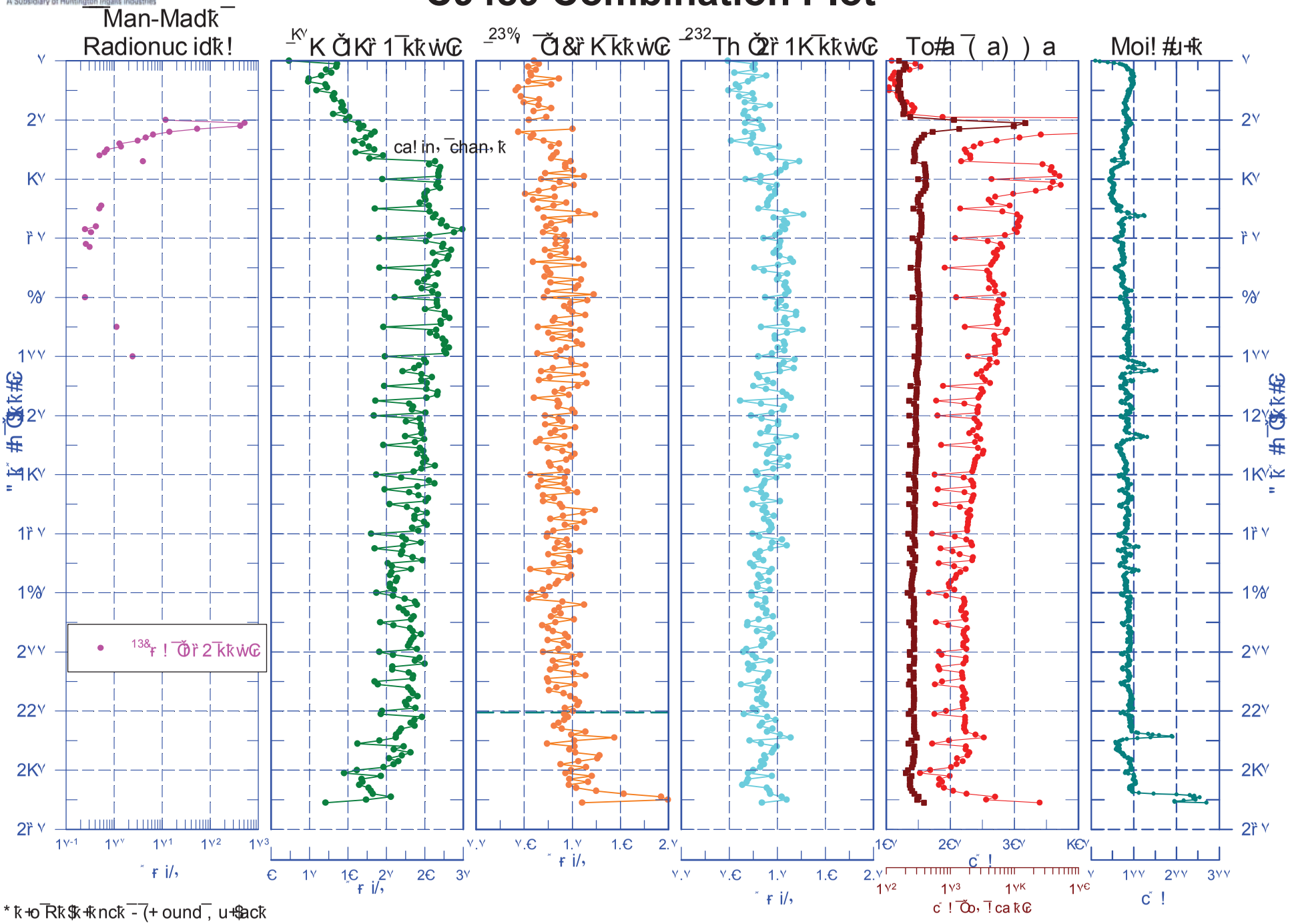
Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

C9489 Combination Plot



Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

C9489 Combination Plot



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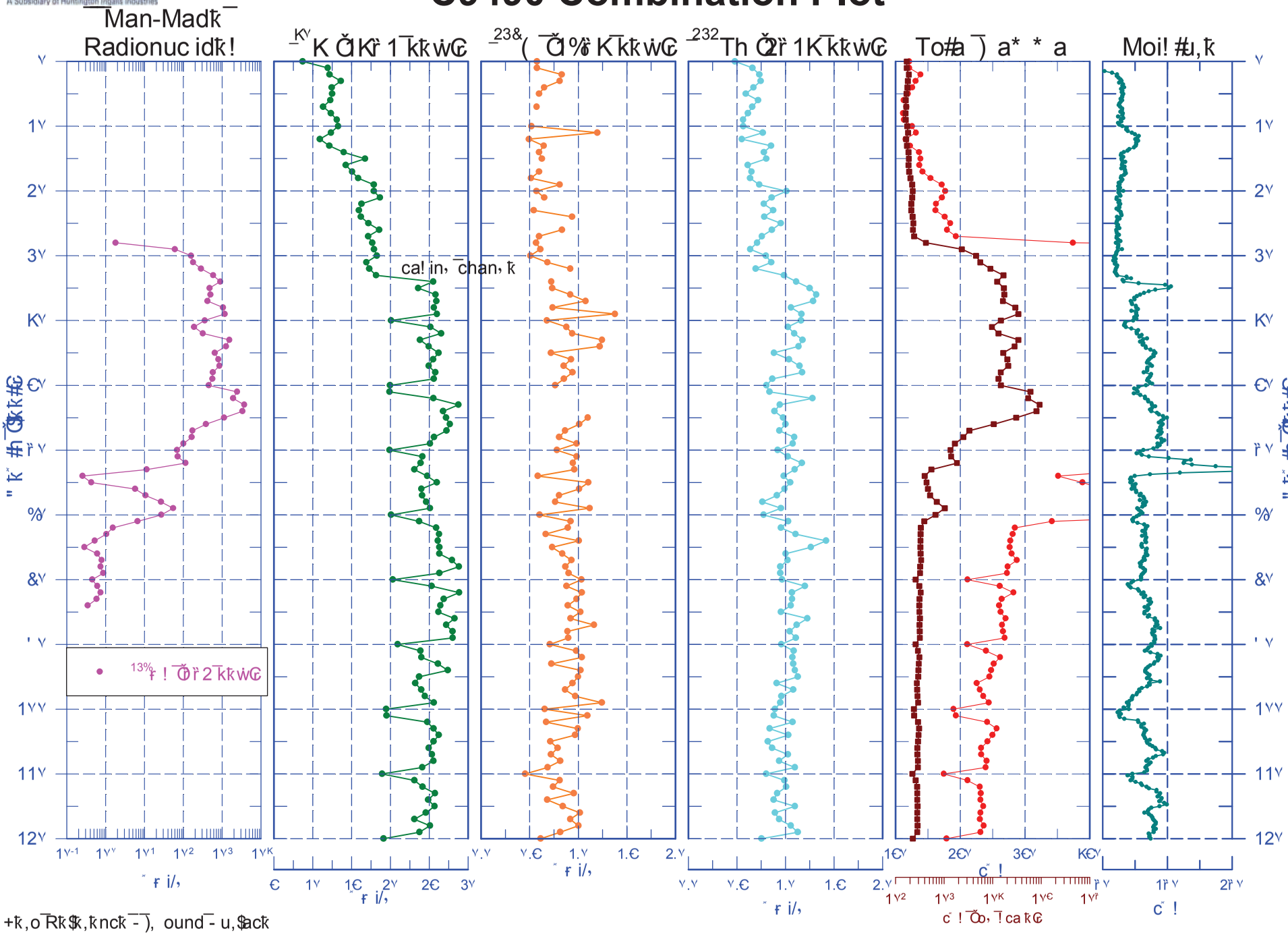
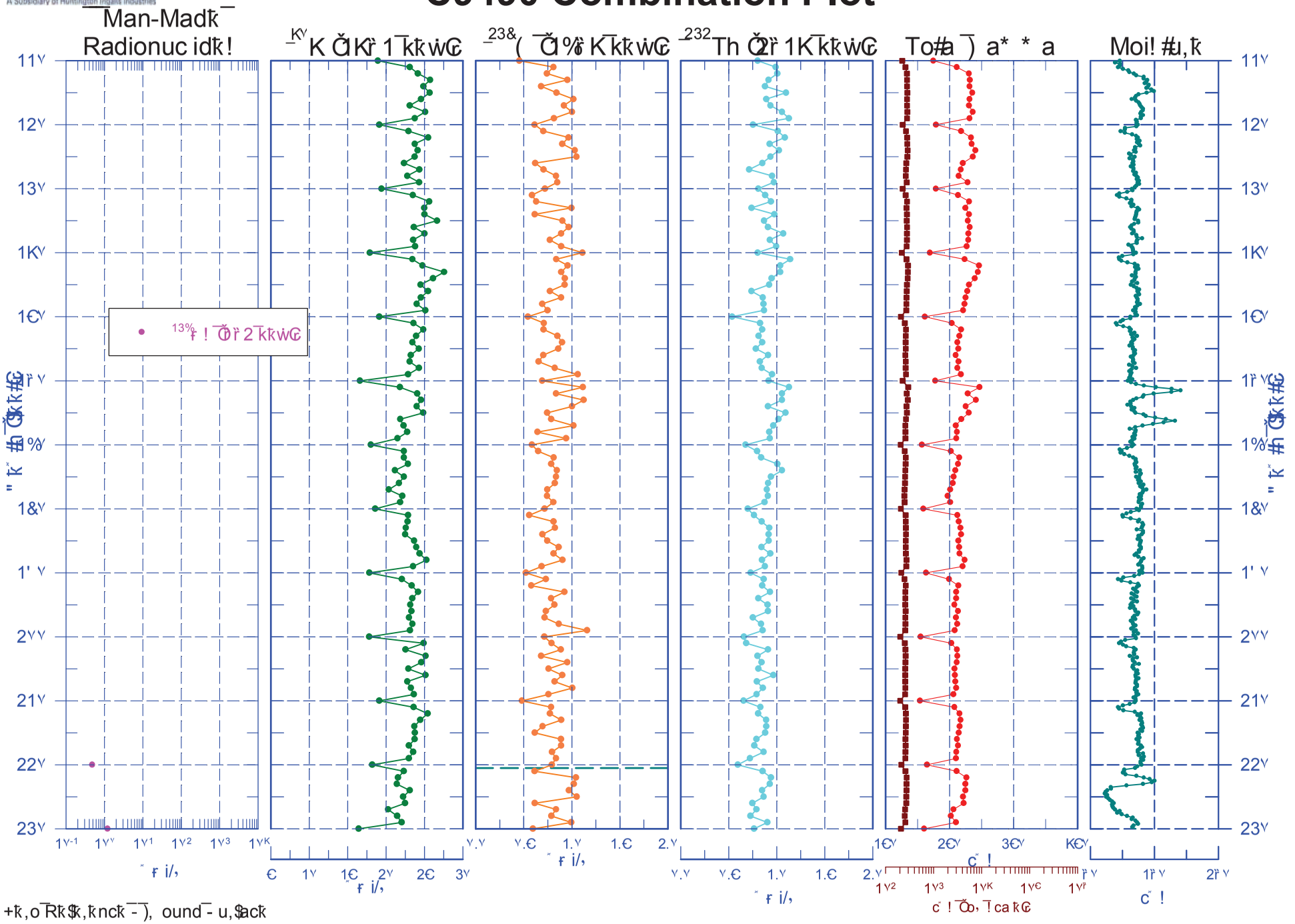
Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

C9490 Combination Plot



Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

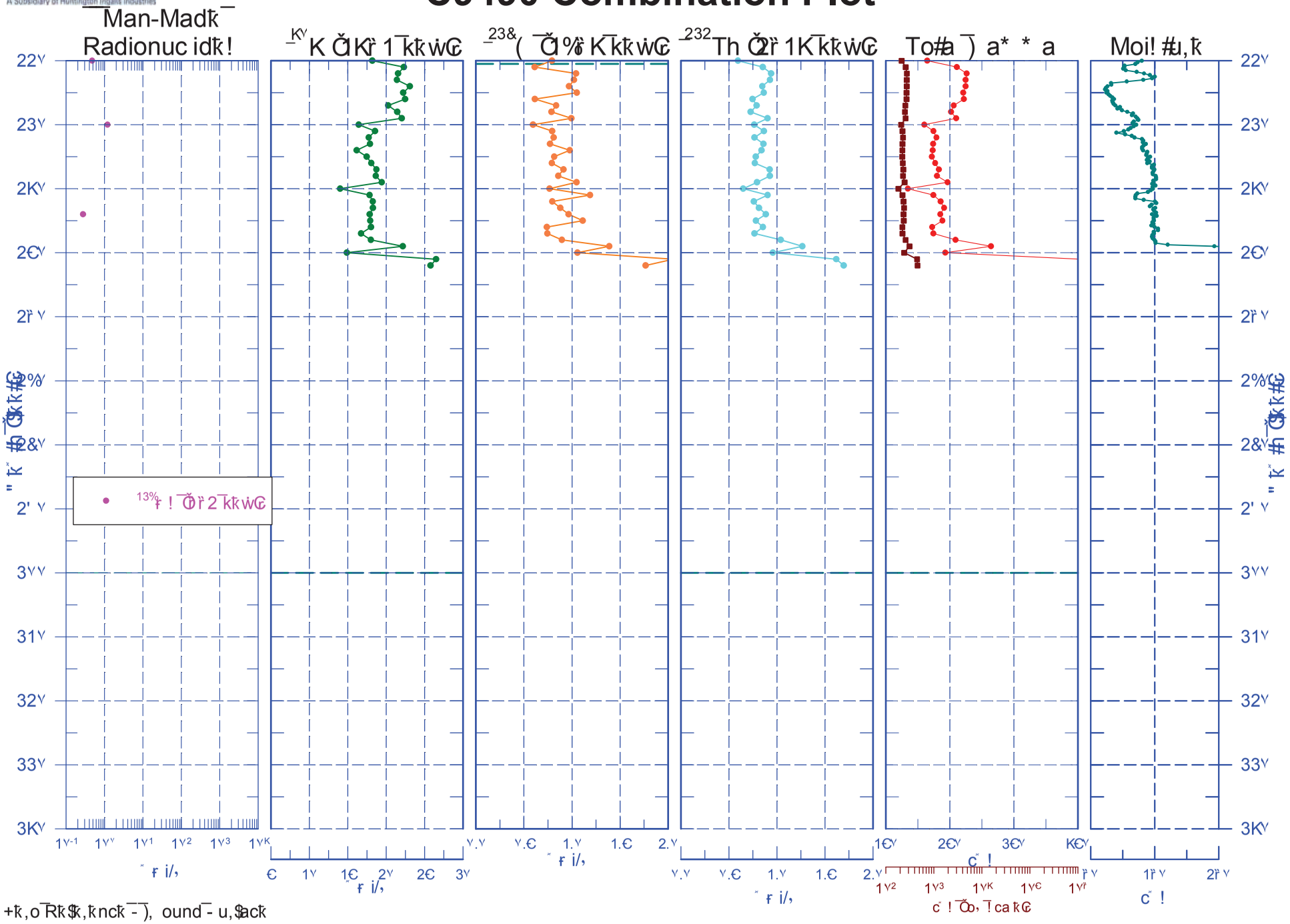
C9490 Combination Plot



+k,o Rk$k,knck -), ound - u,$ack

Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

C9490 Combination Plot



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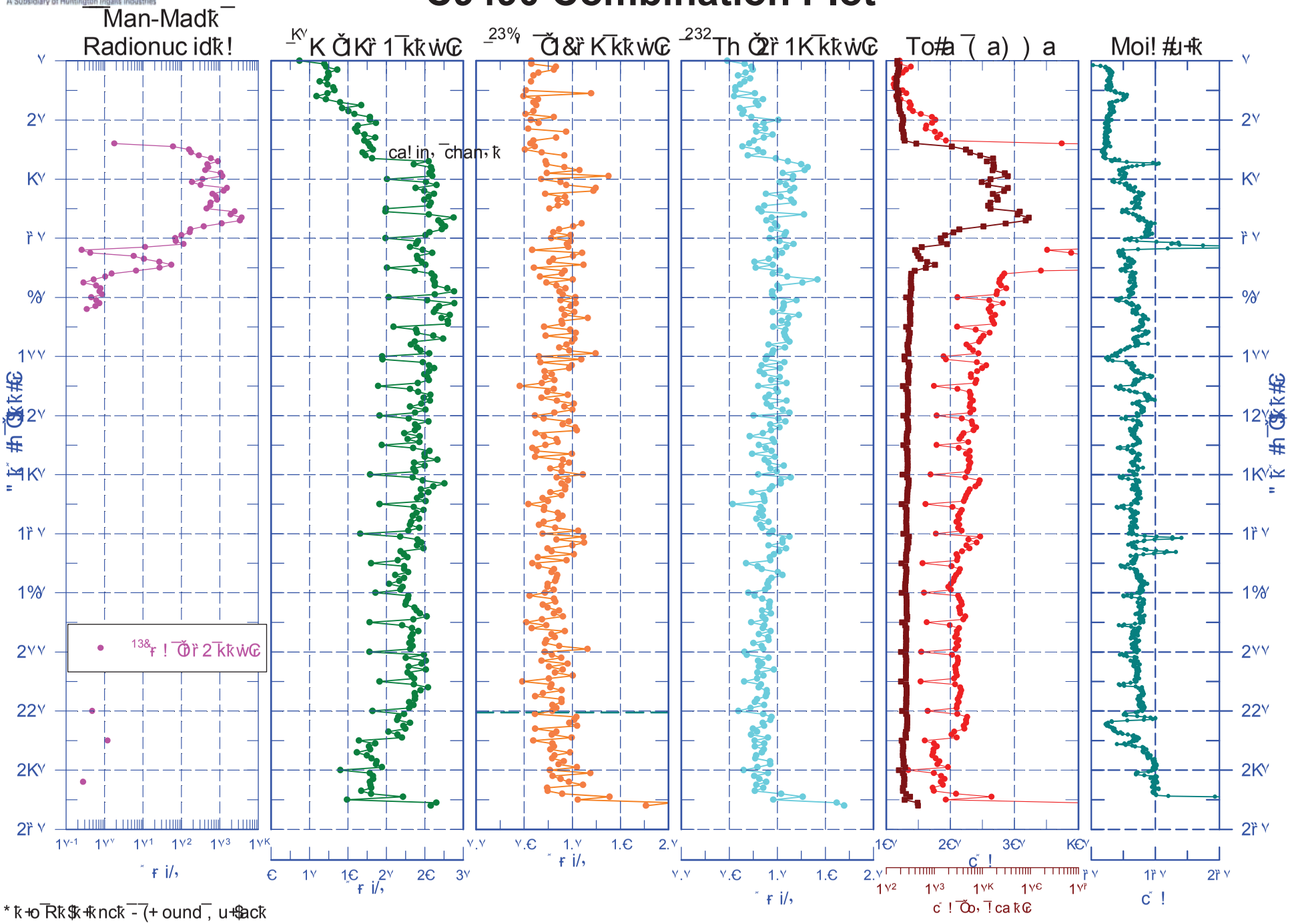
Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

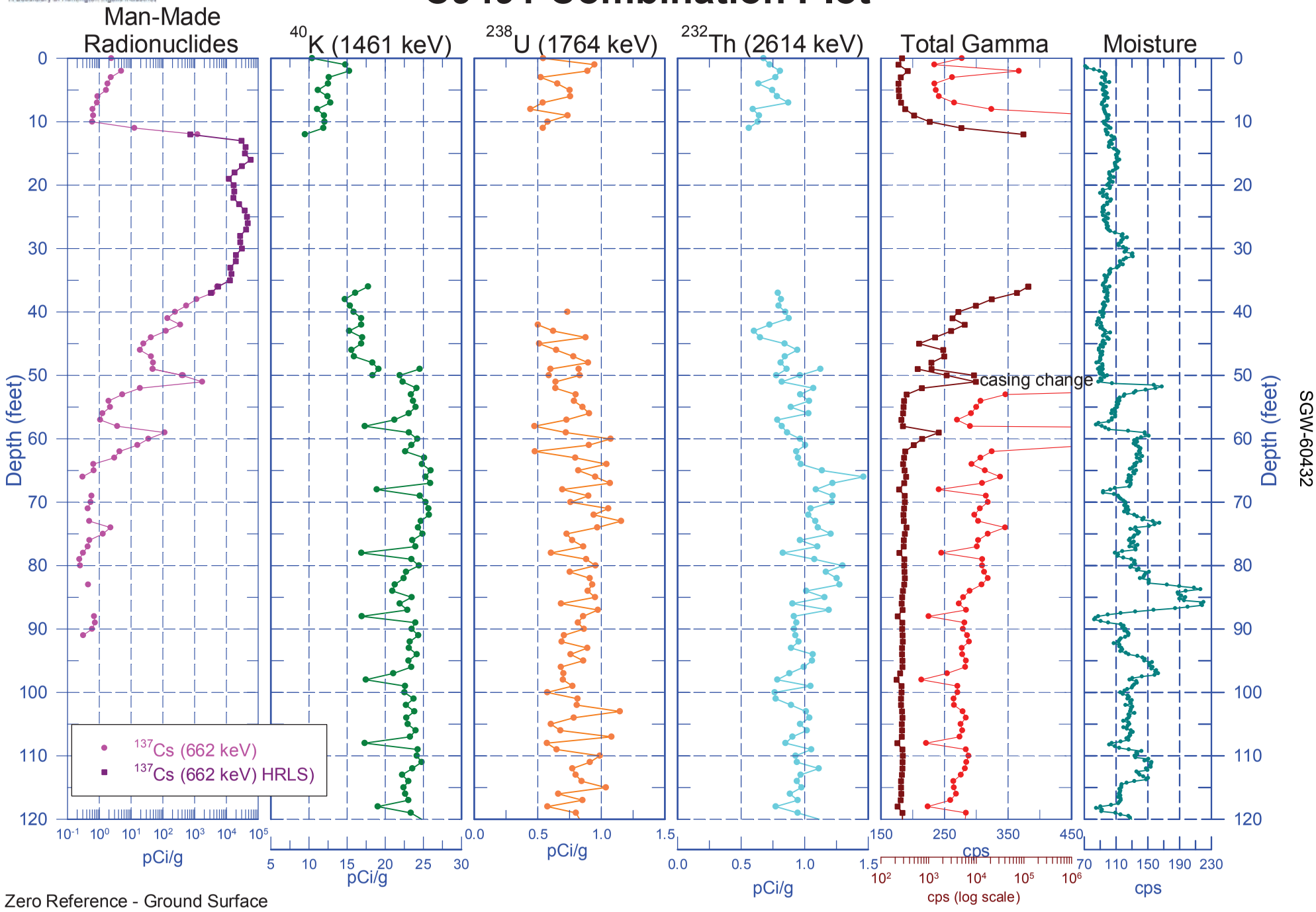
C9490 Combination Plot



* k o Rk $k k nck - (+ ound, u $ack

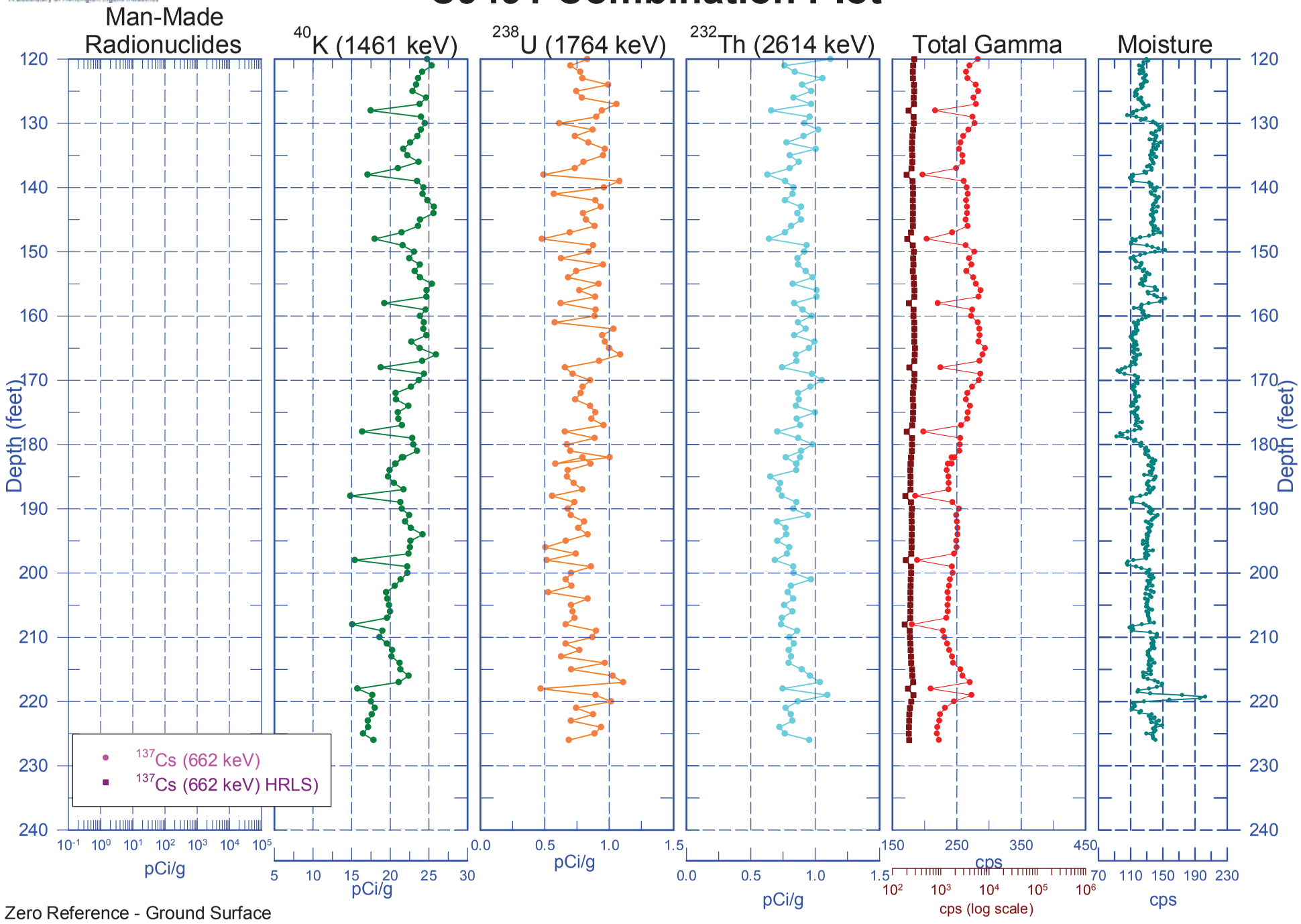
Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

C9491 Combination Plot



Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

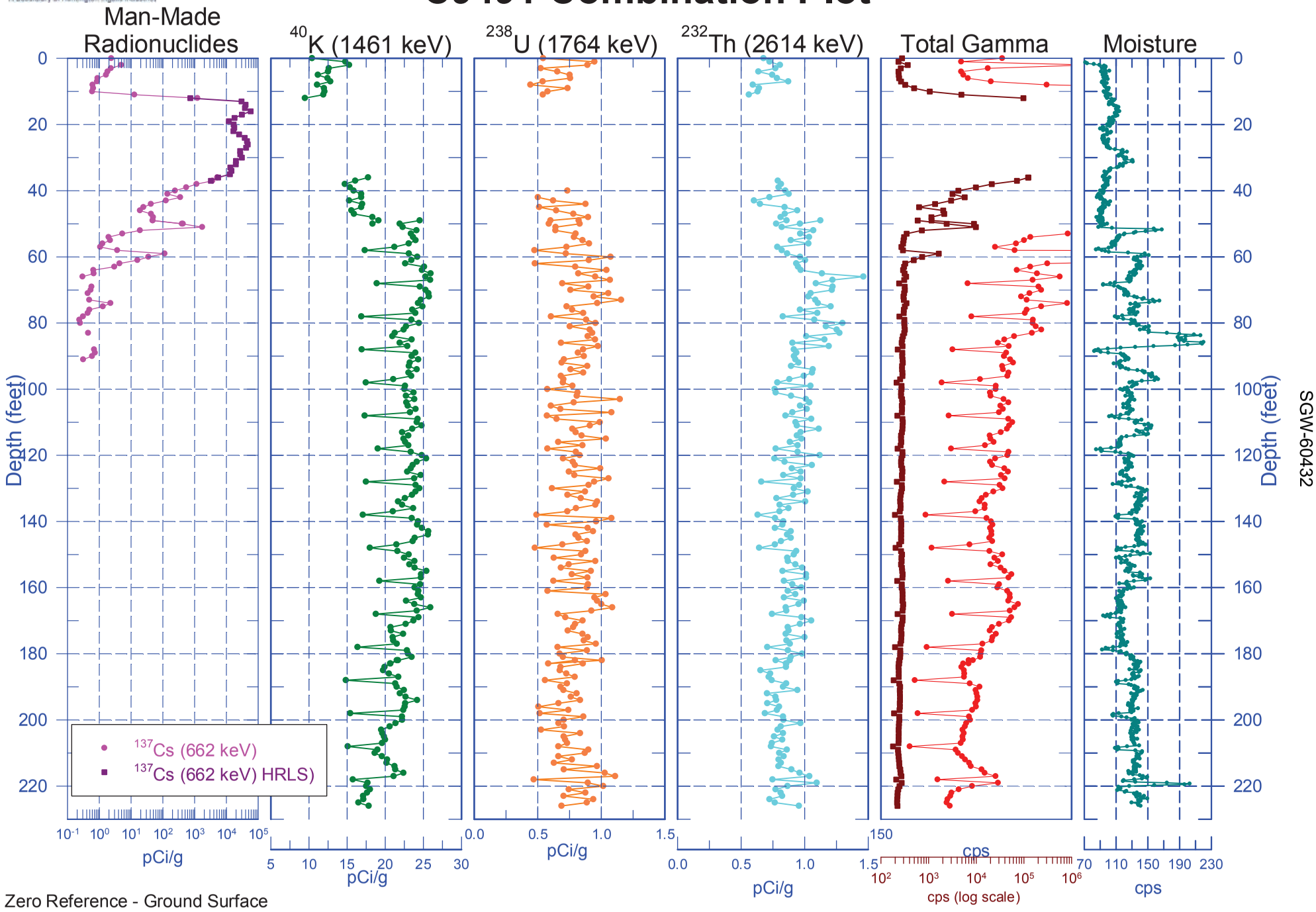
C9491 Combination Plot



Zero Reference - Ground Surface

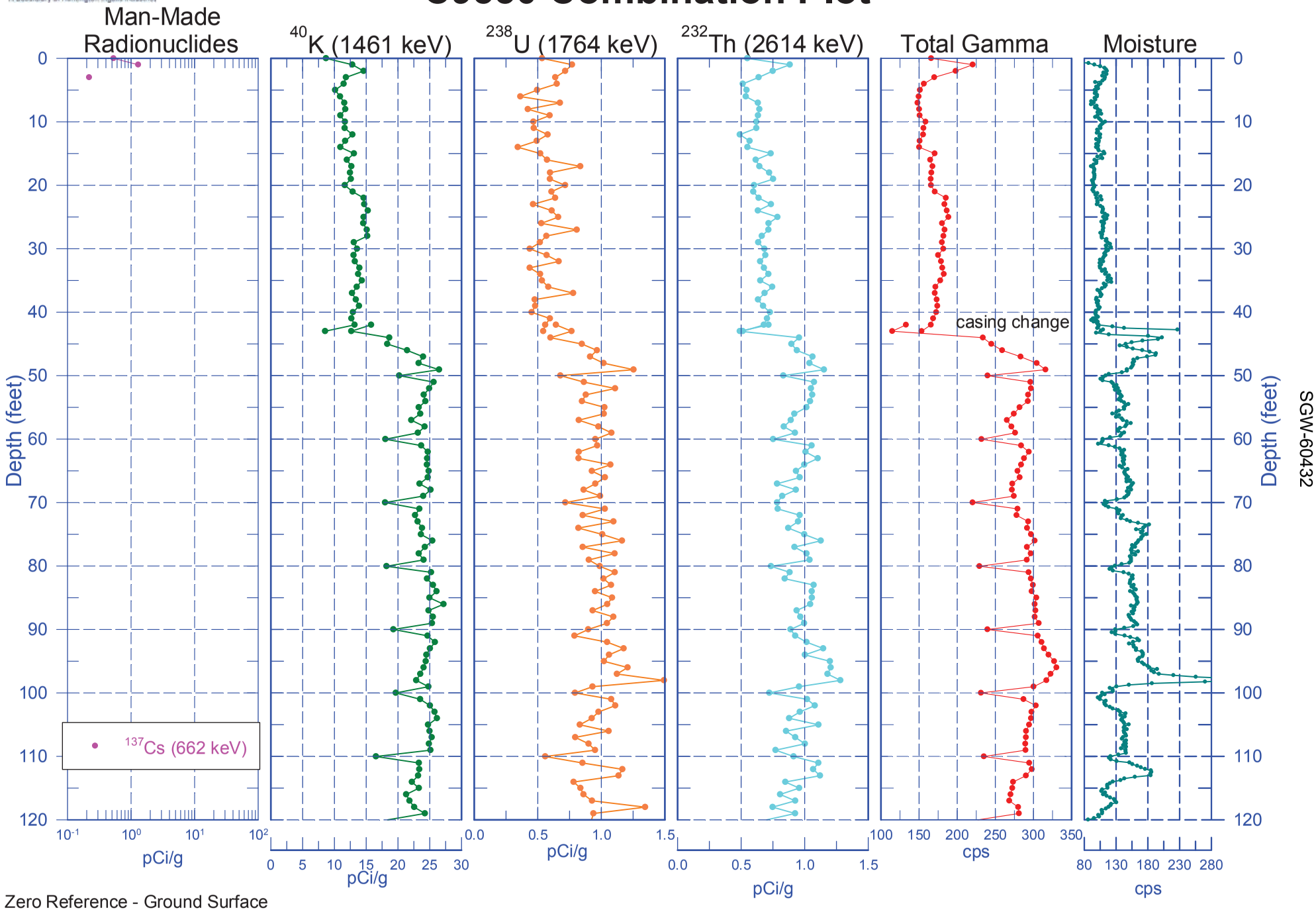
Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

C9491 Combination Plot



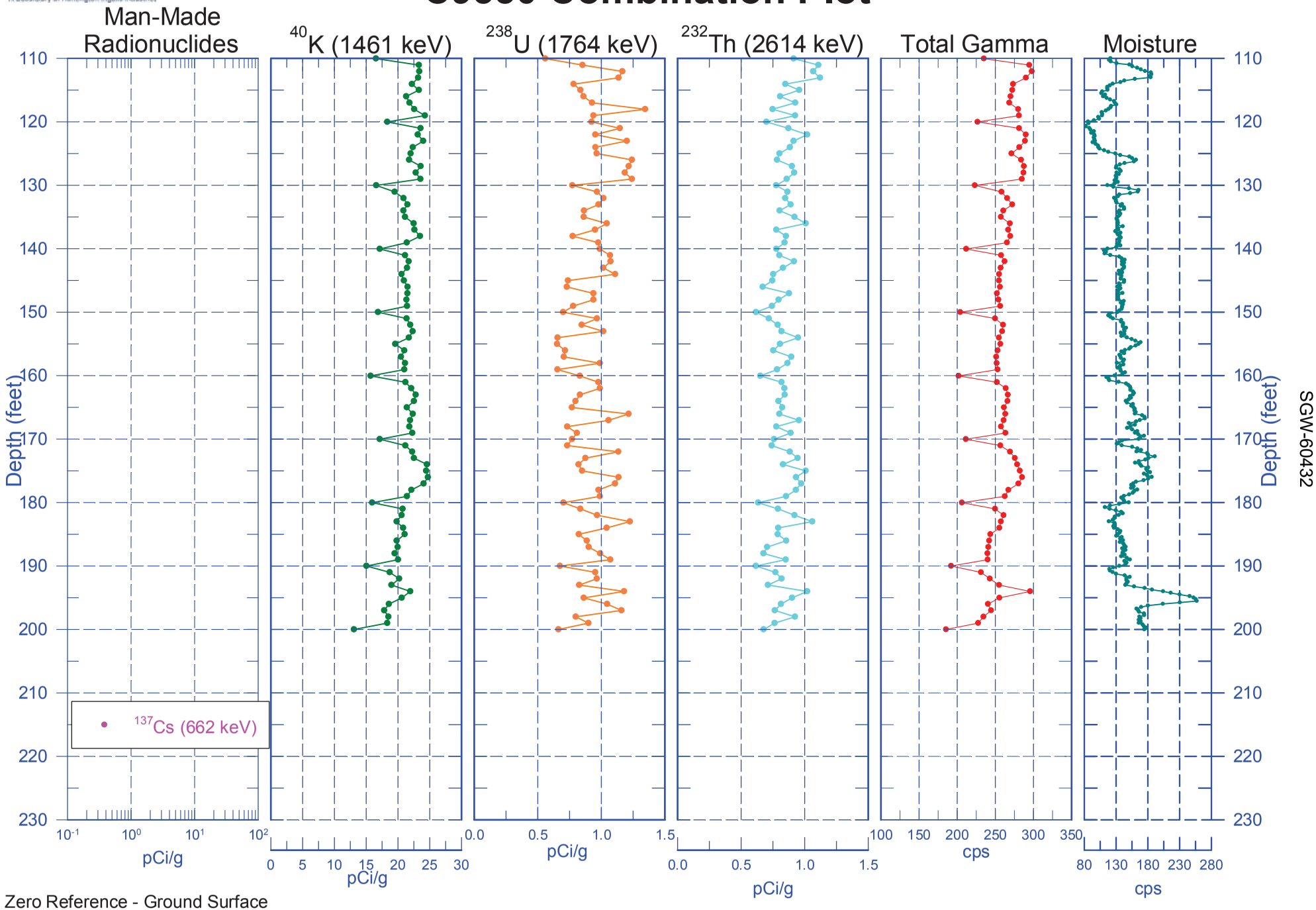
Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

C9550 Combination Plot



Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

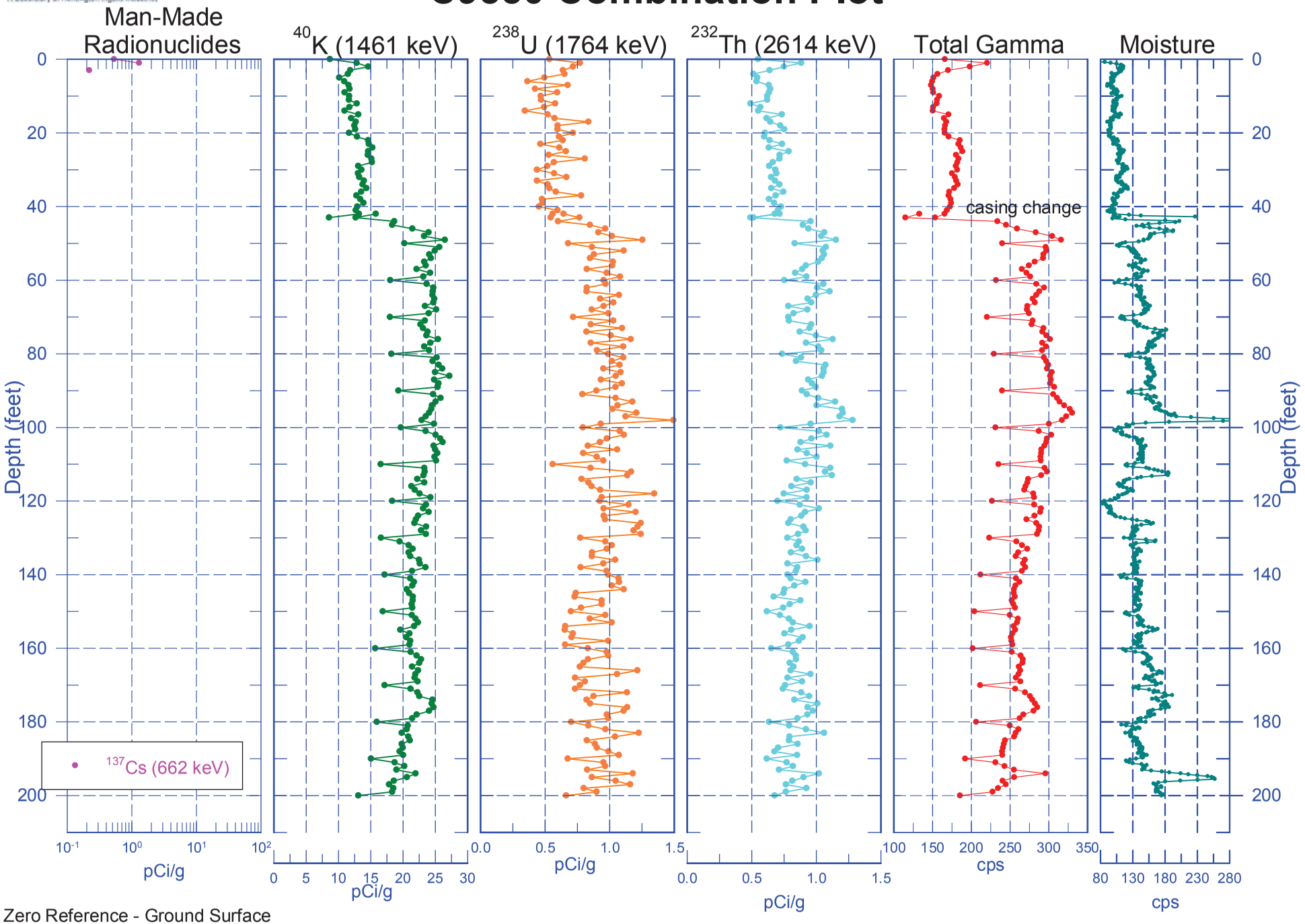
C9550 Combination Plot



Zero Reference - Ground Surface

Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

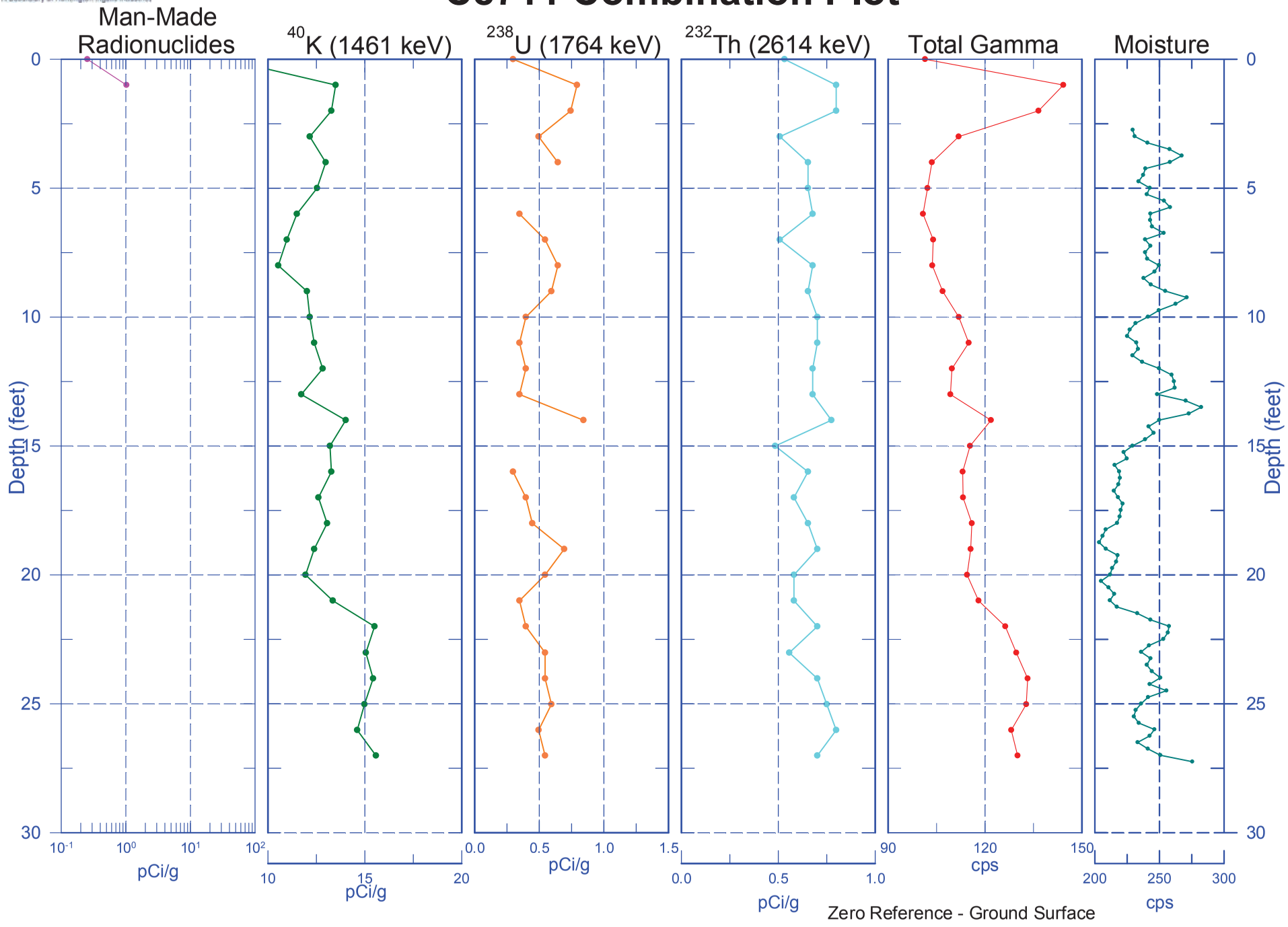
C9550 Combination Plot



Zero Reference - Ground Surface

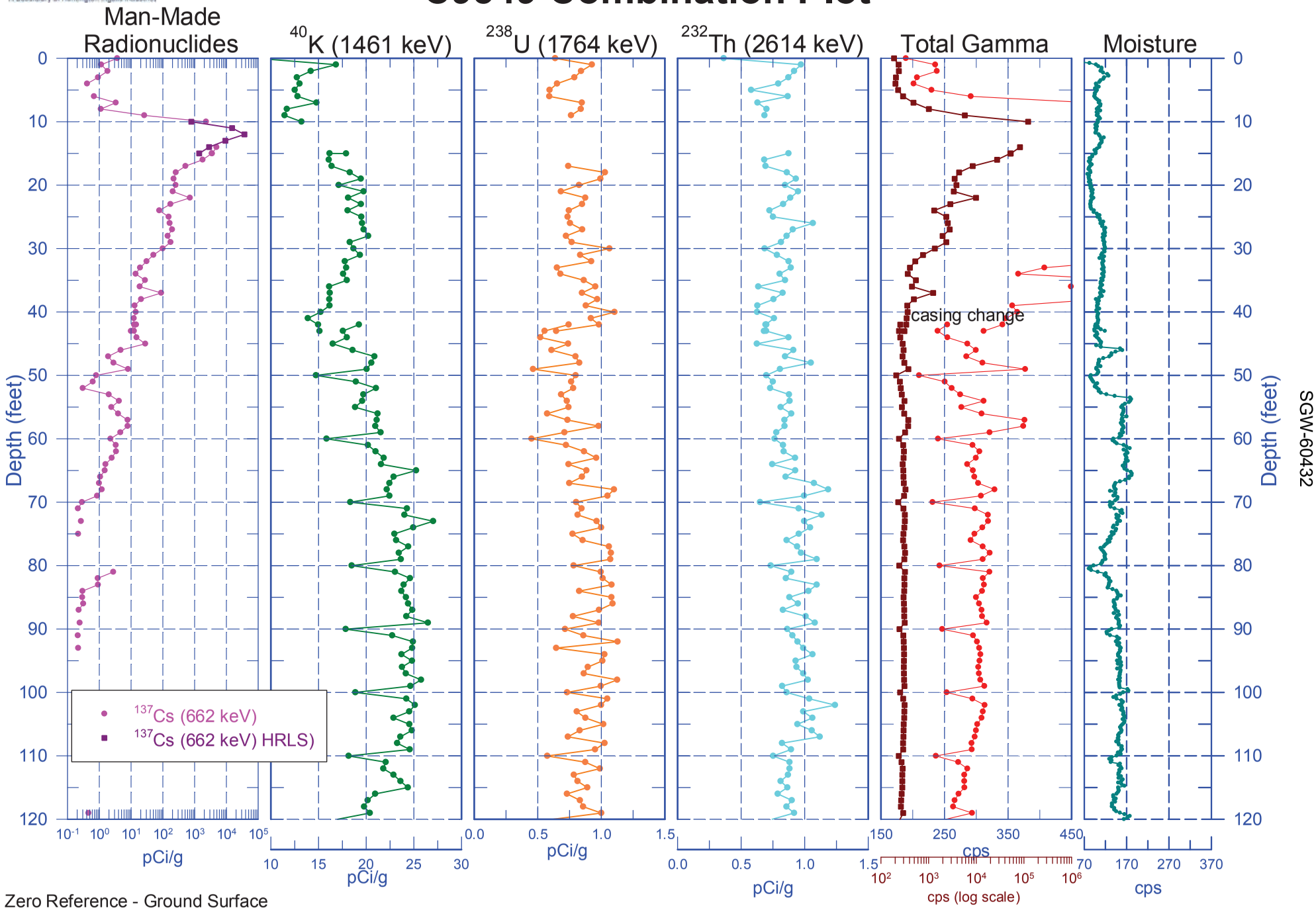
Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

C8711 Combination Plot



Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

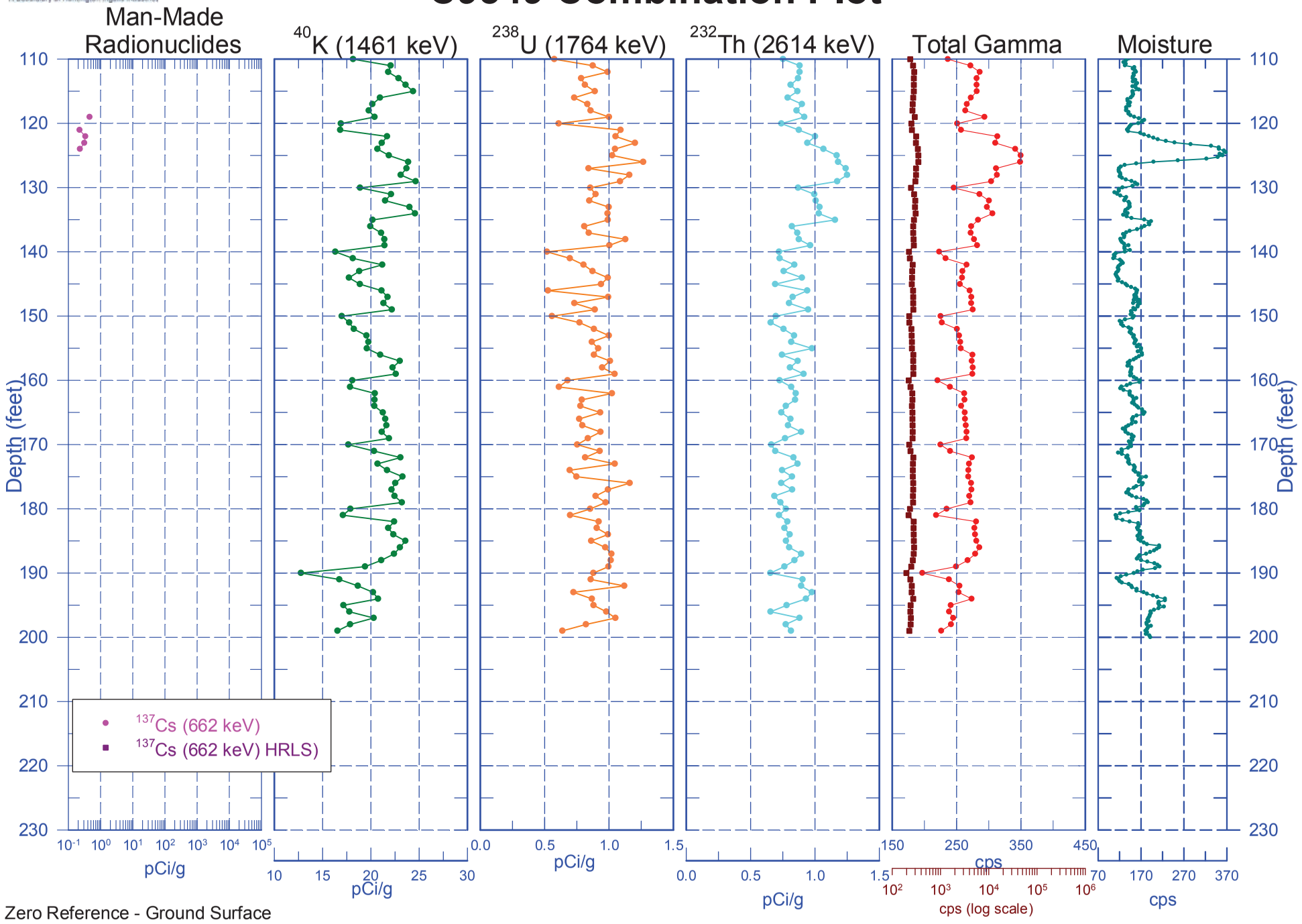
C9549 Combination Plot



Zero Reference - Ground Surface

Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

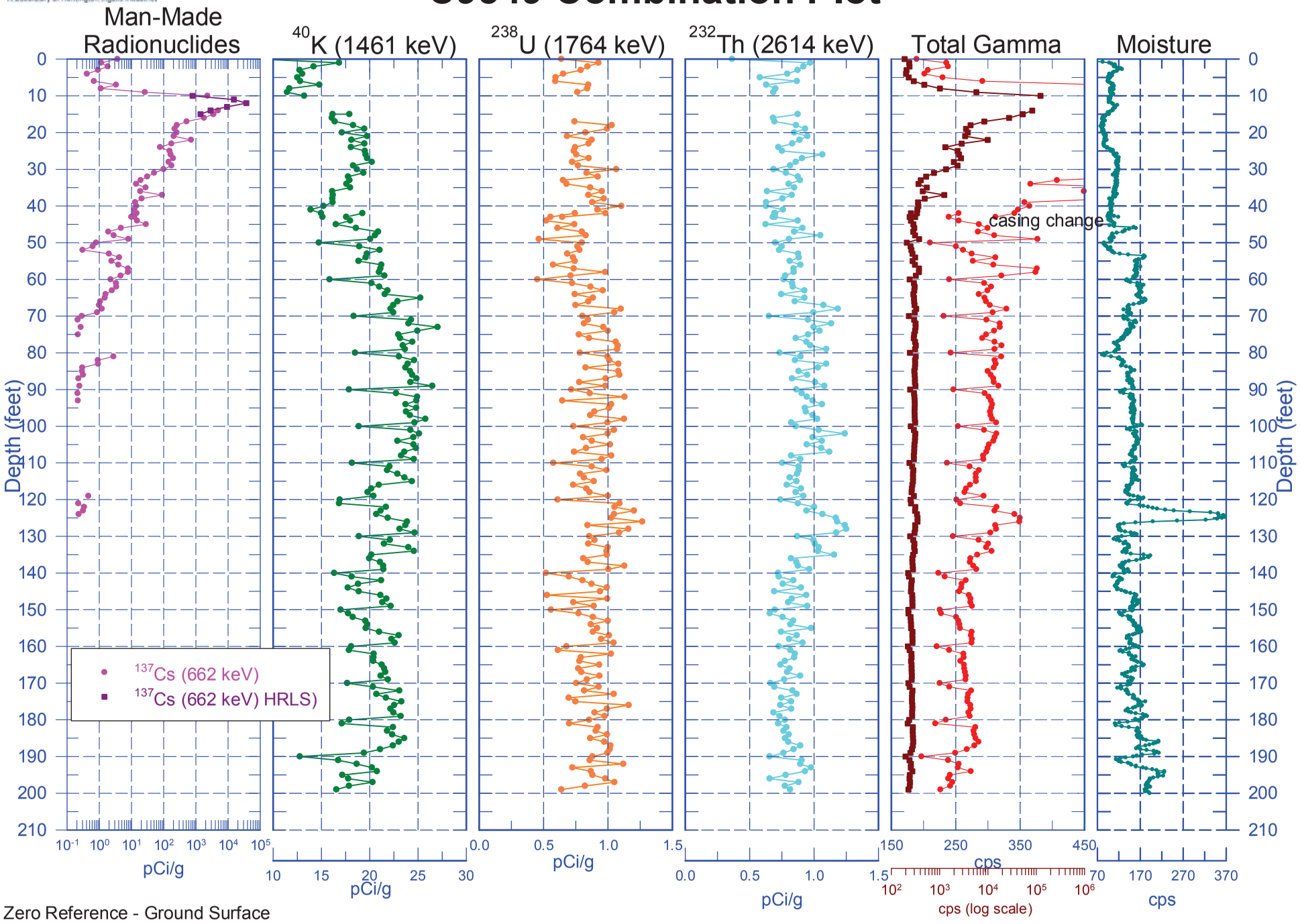
C9549 Combination Plot



Zero Reference - Ground Surface

Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

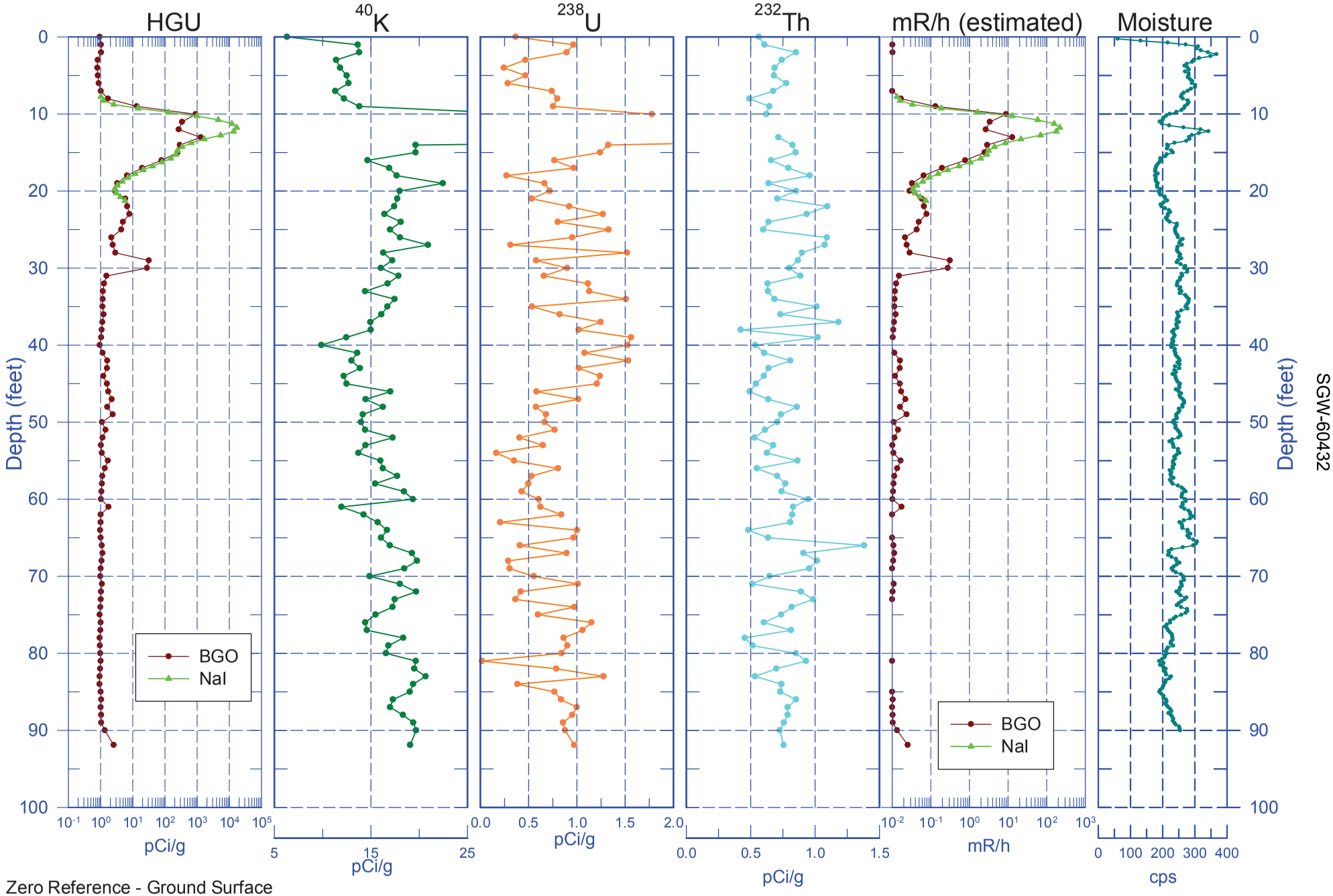
C9549 Combination Plot



Zero Reference - Ground Surface

Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

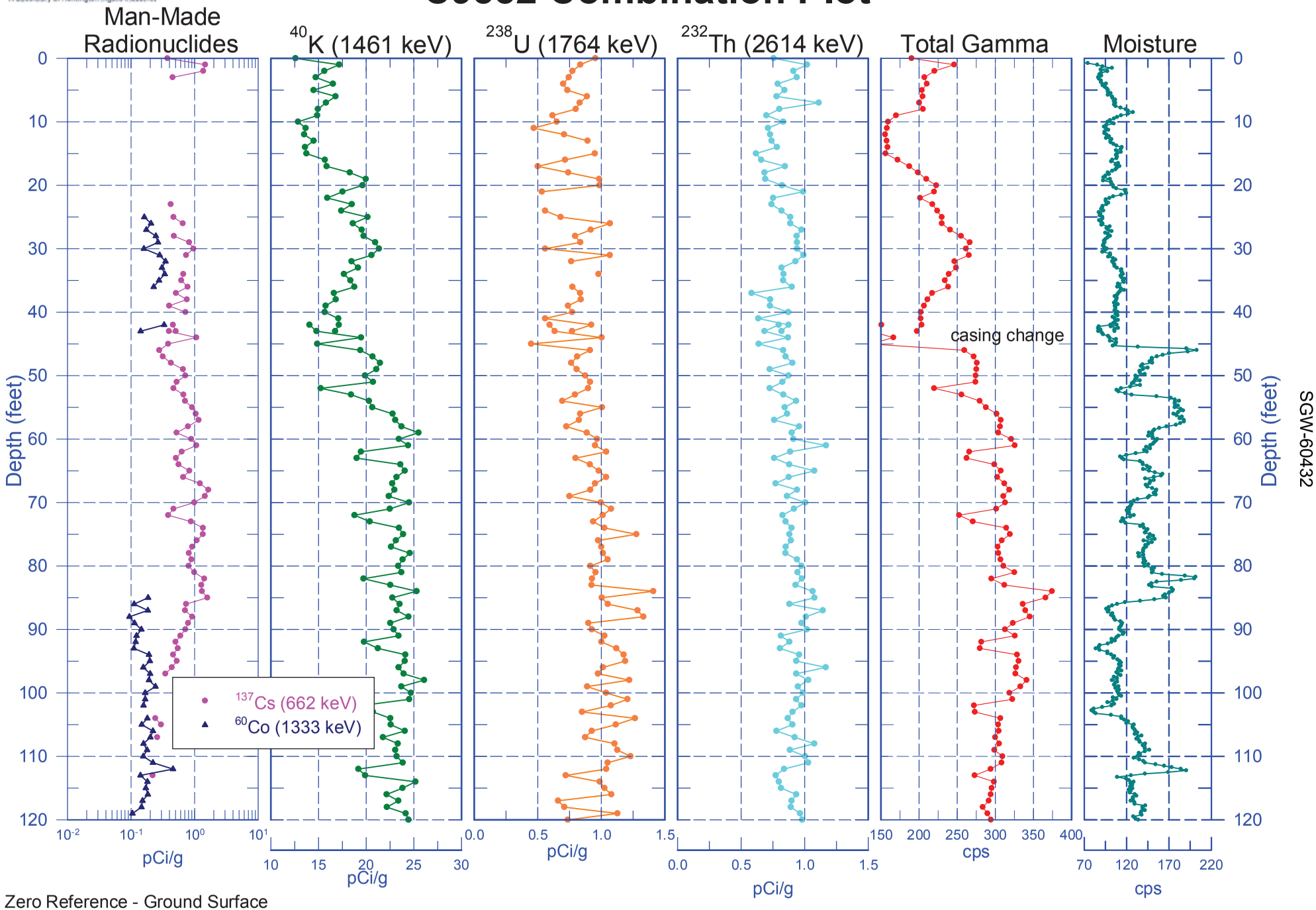
C9548 Combination Plot



Zero Reference - Ground Surface

Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

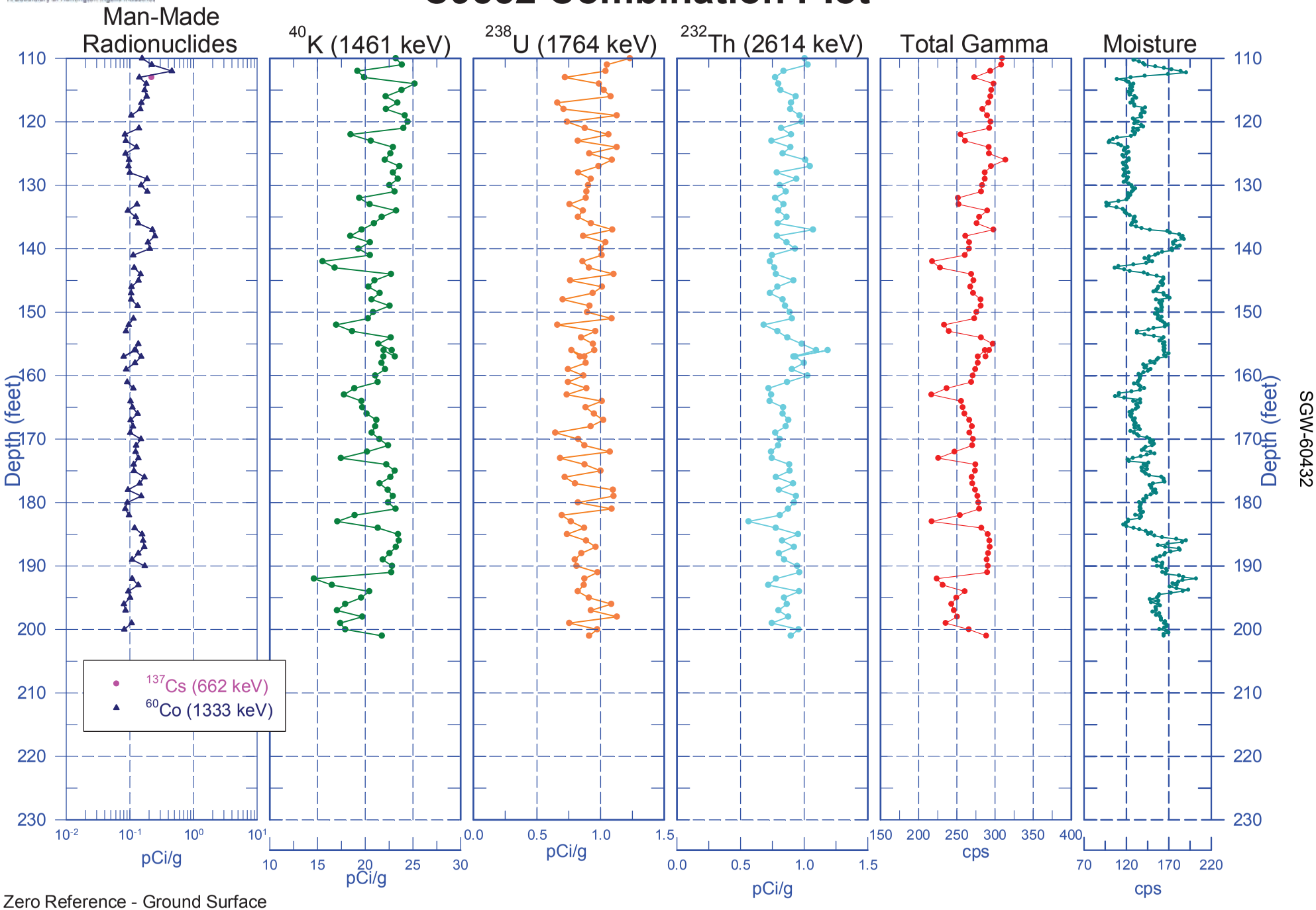
C9552 Combination Plot



Zero Reference - Ground Surface

Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

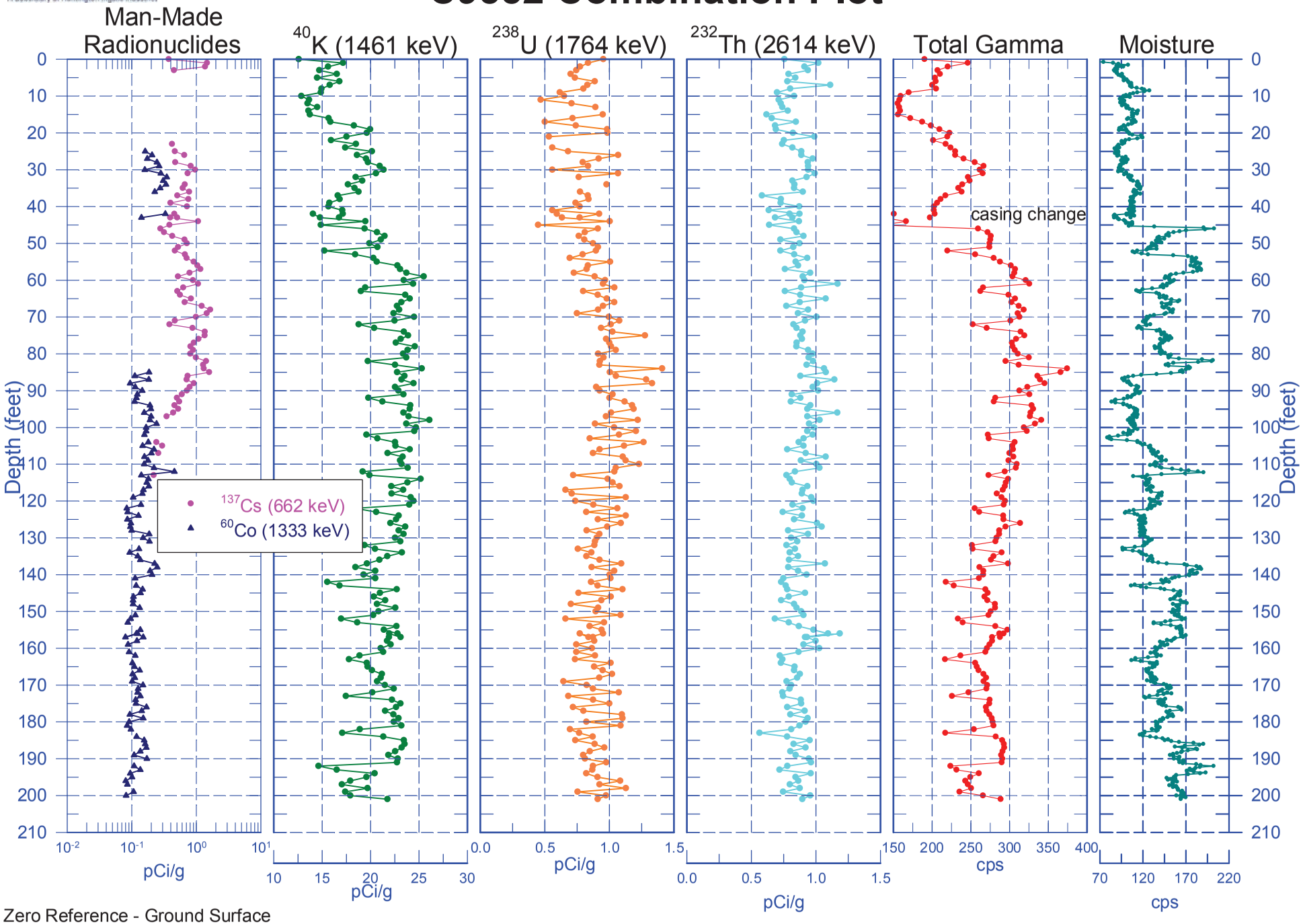
C9552 Combination Plot



Zero Reference - Ground Surface

Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

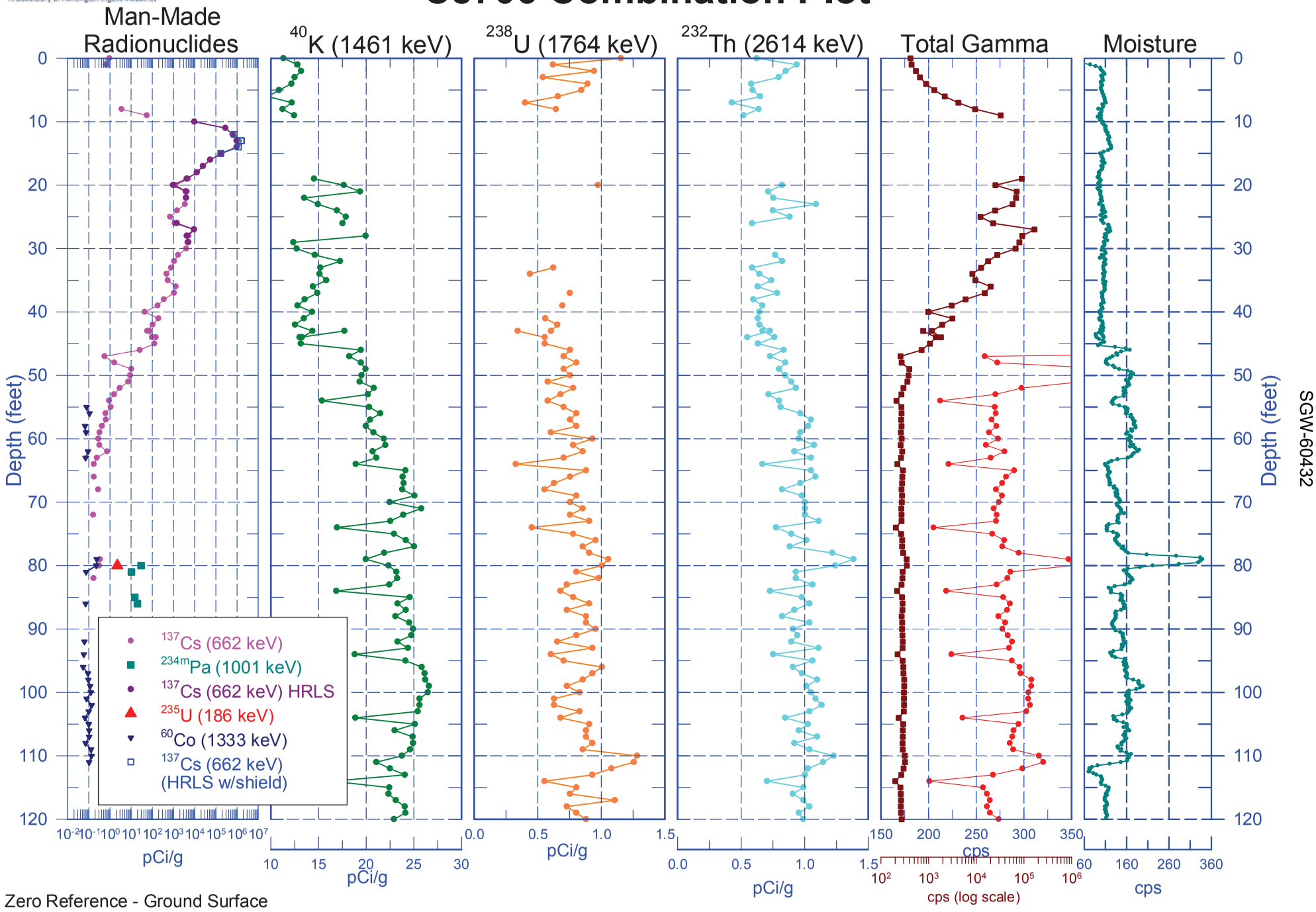
C9552 Combination Plot



Zero Reference - Ground Surface

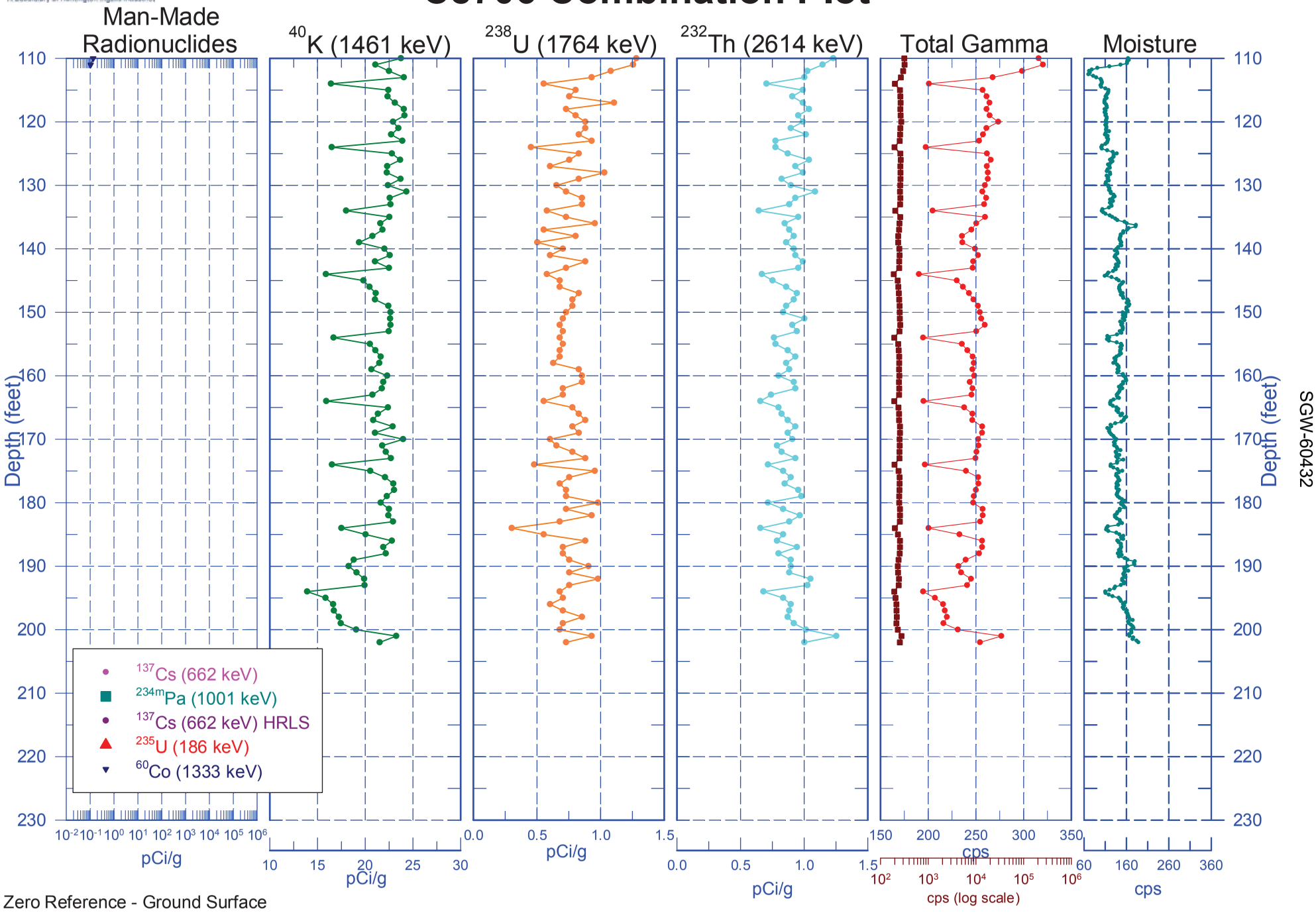
Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

C8706 Combination Plot



Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

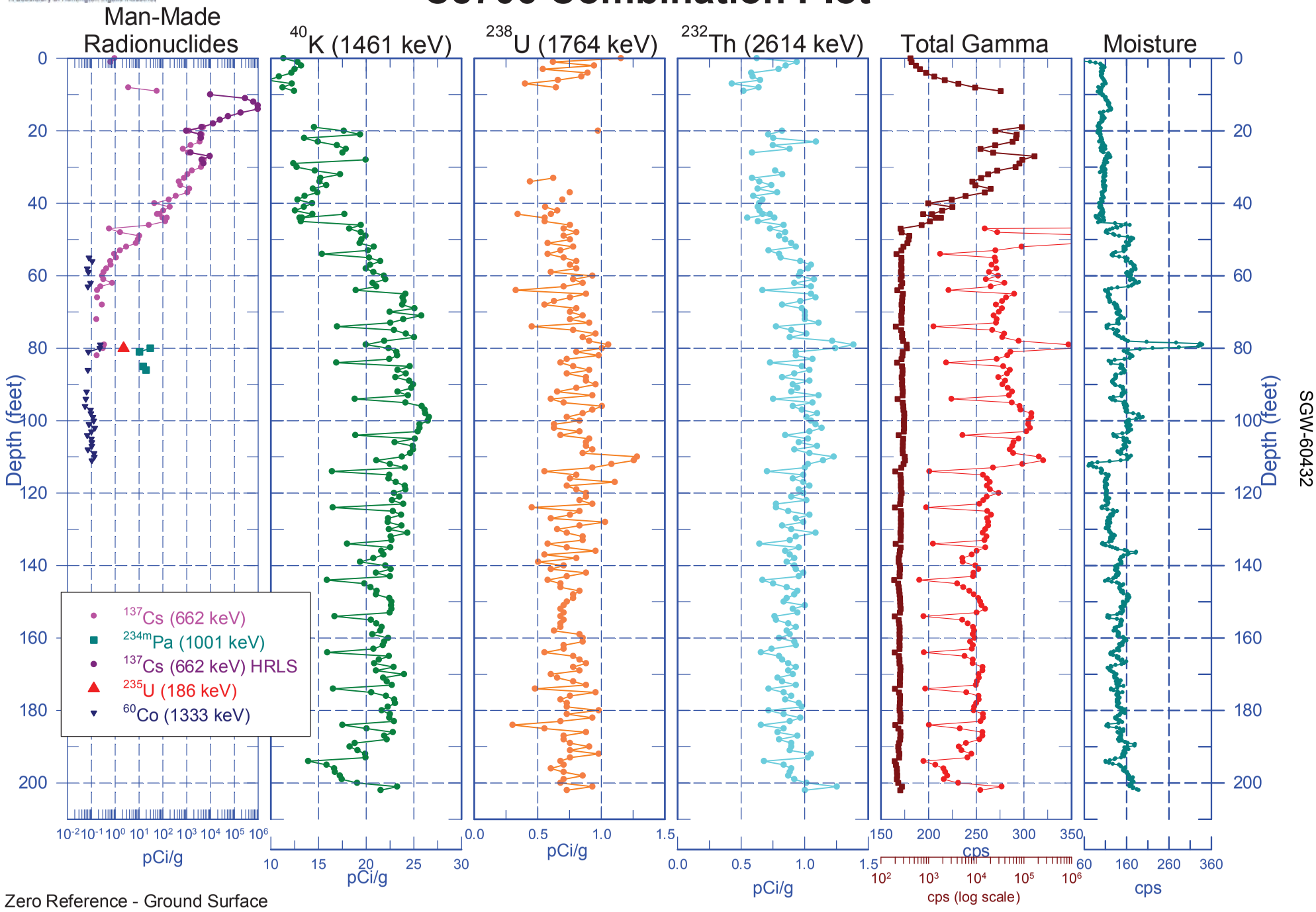
C8706 Combination Plot



Zero Reference - Ground Surface

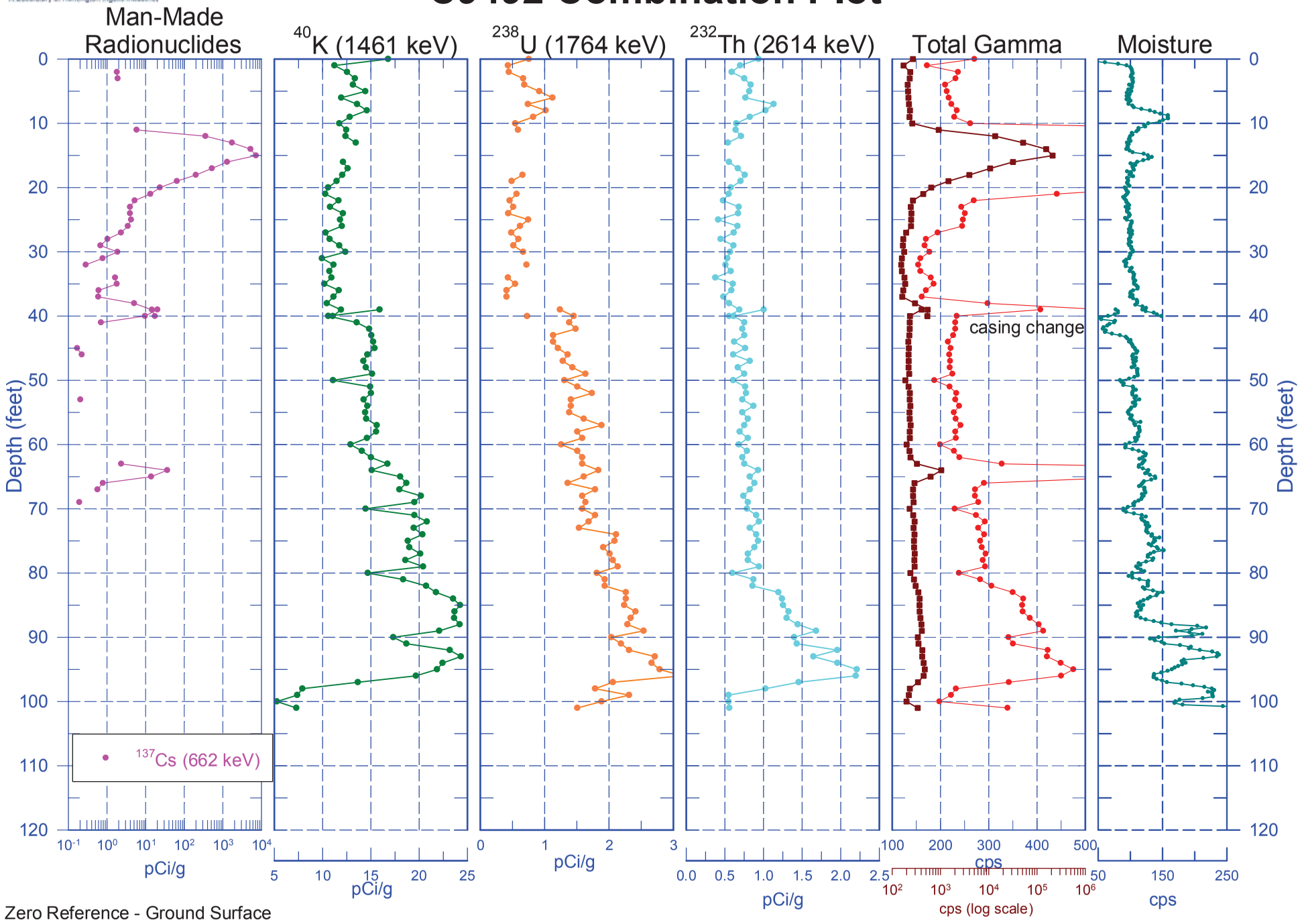
Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

C8706 Combination Plot



Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

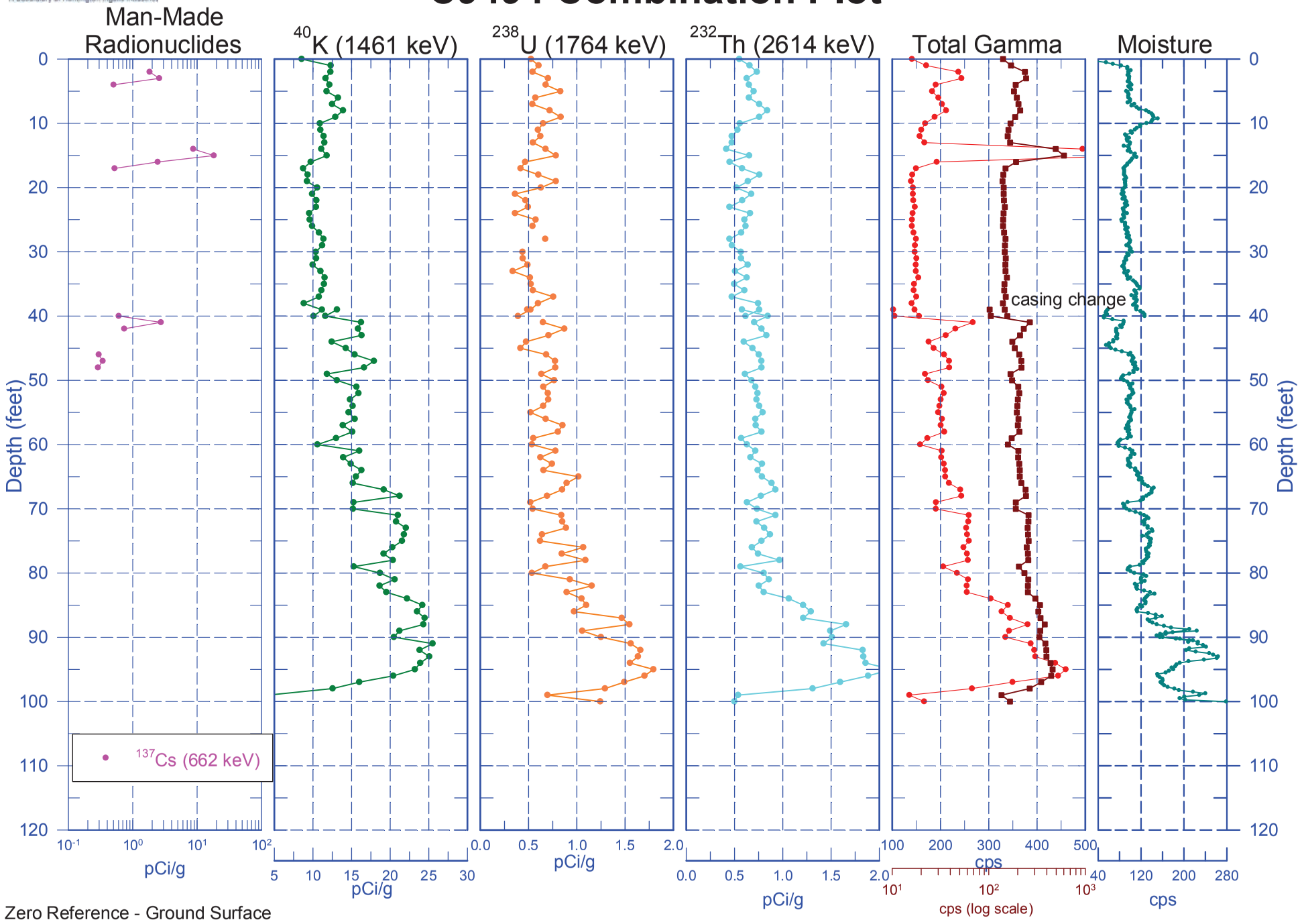
C9492 Combination Plot



Zero Reference - Ground Surface

Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

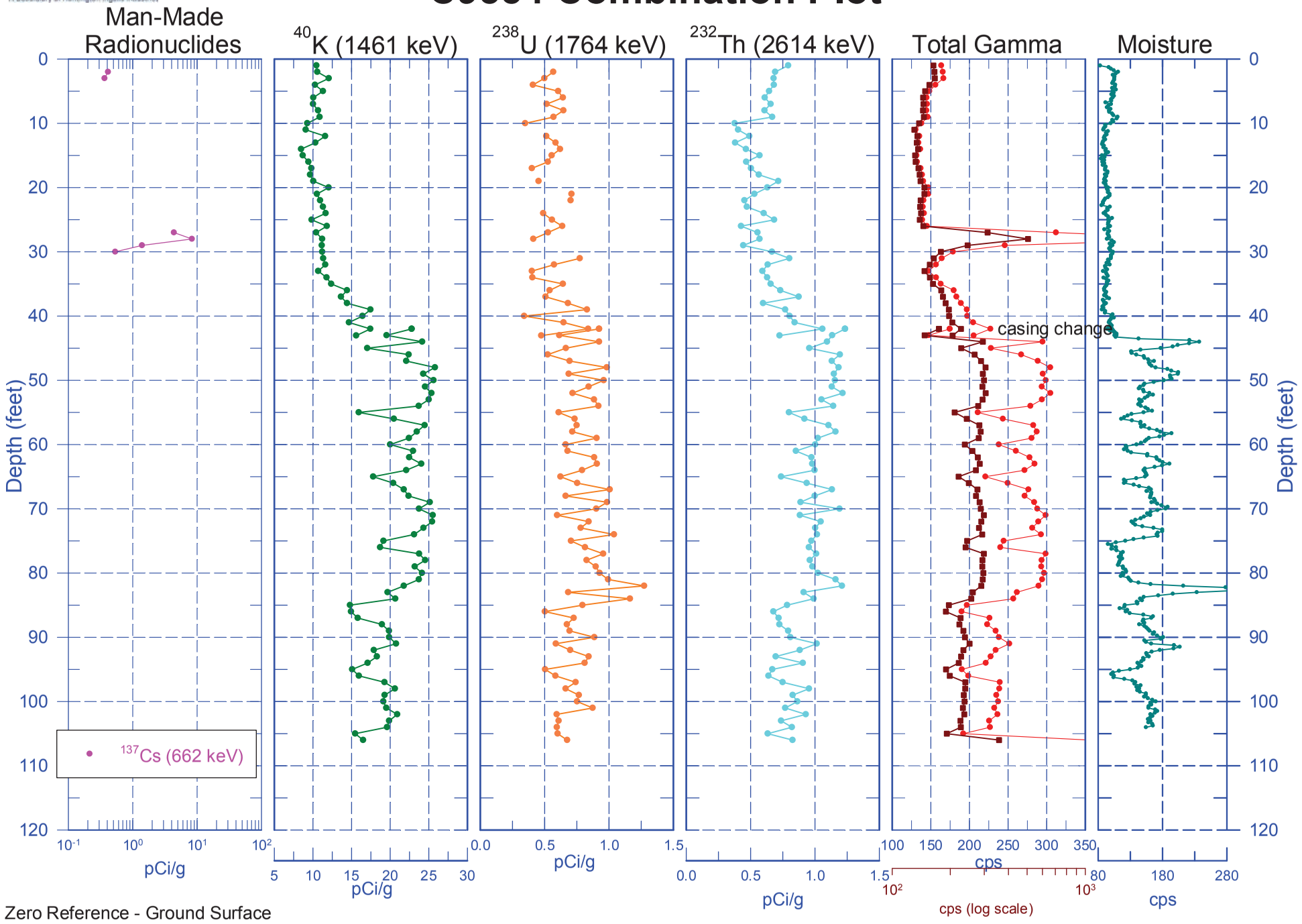
C9494 Combination Plot



Zero Reference - Ground Surface

Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

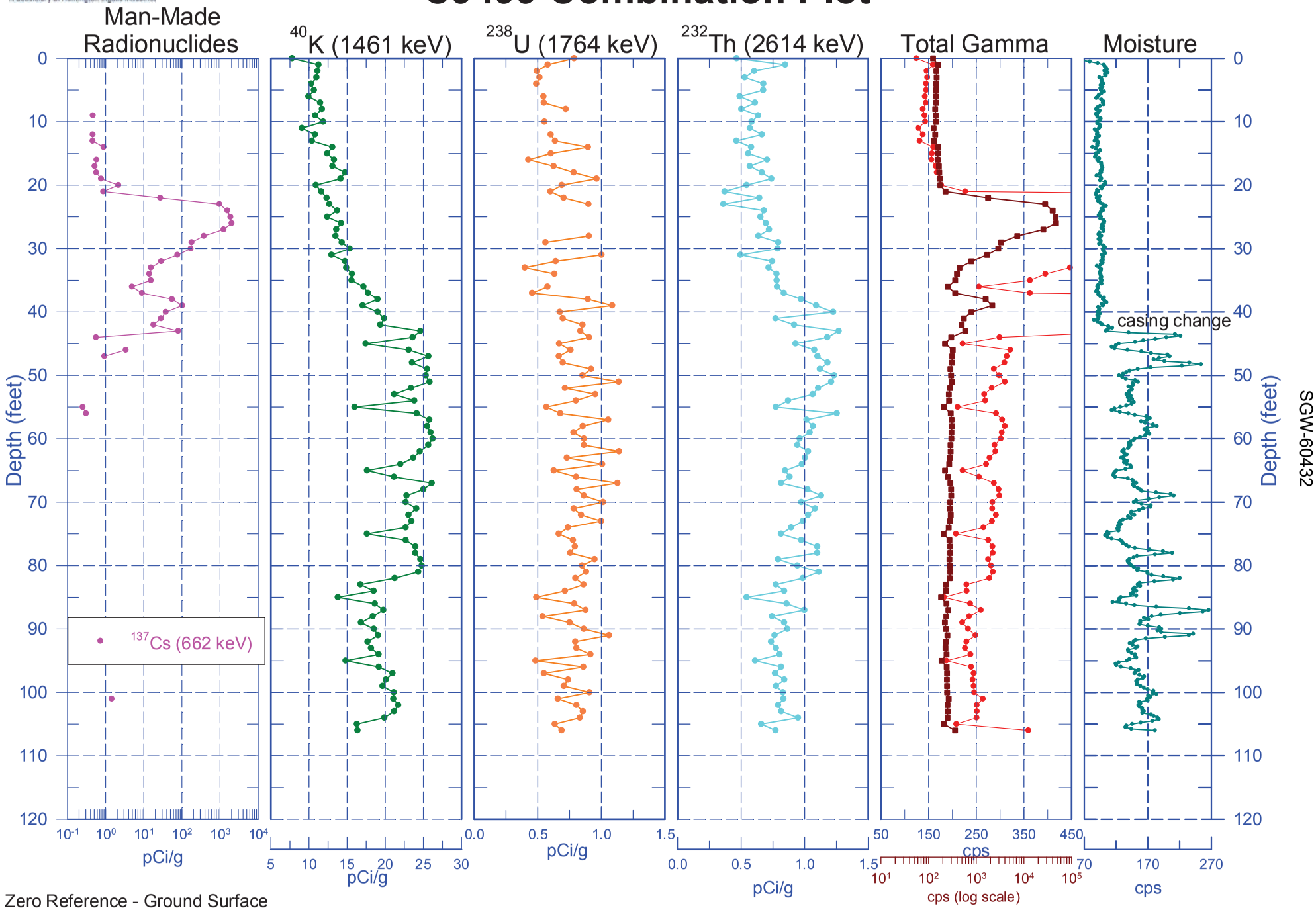
C9554 Combination Plot



Zero Reference - Ground Surface

Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

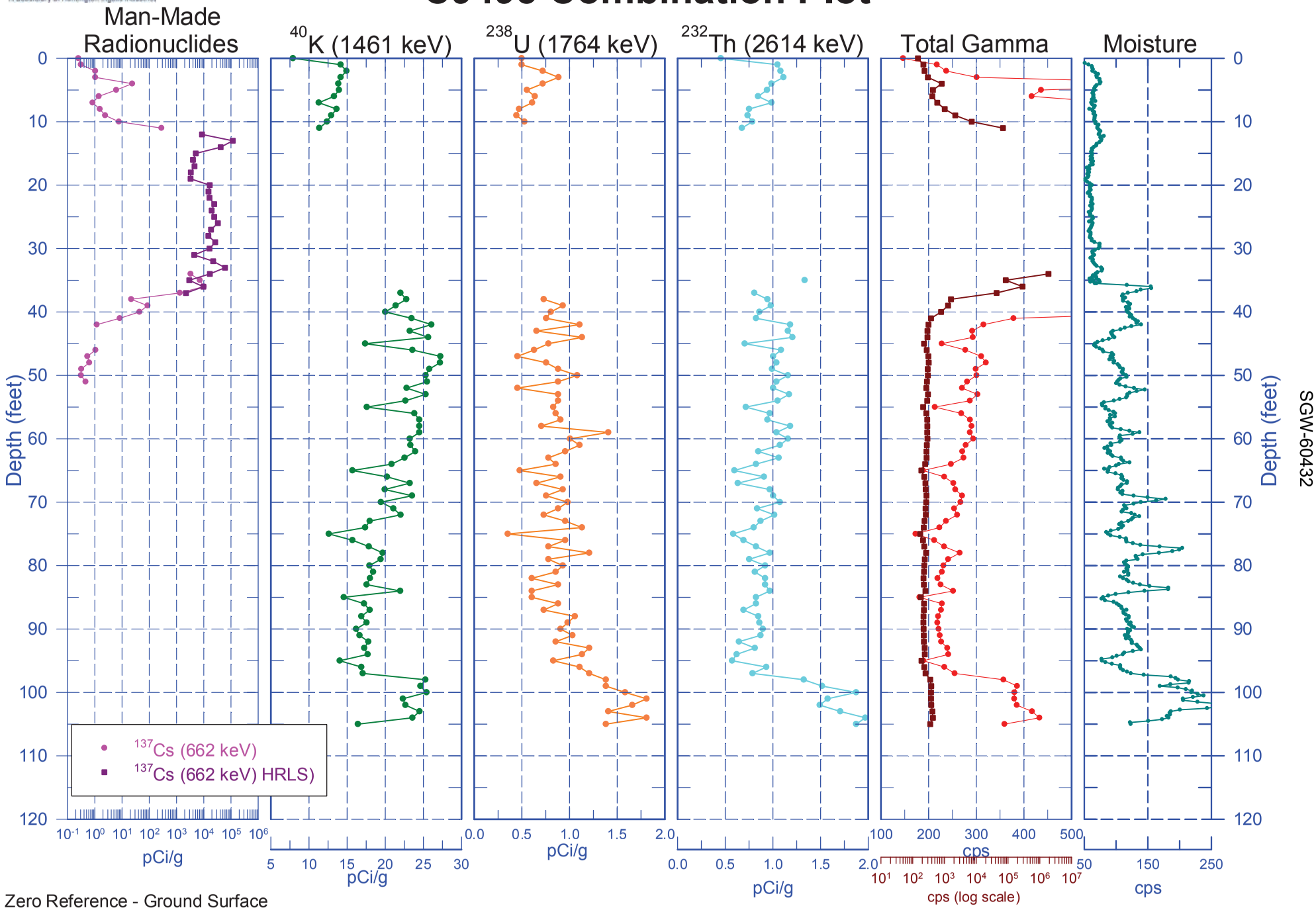
C9499 Combination Plot



Zero Reference - Ground Surface

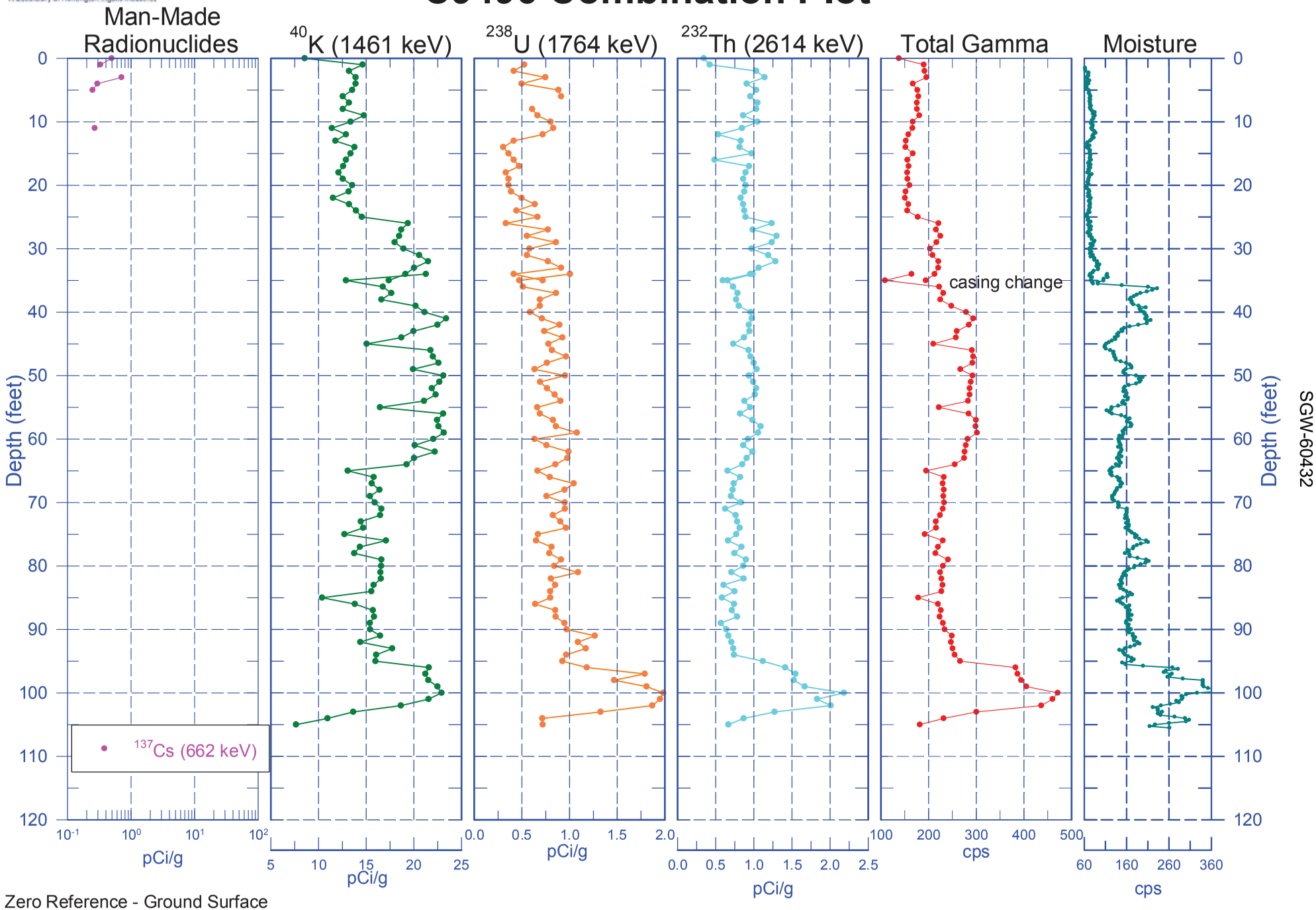
Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

C9495 Combination Plot



Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

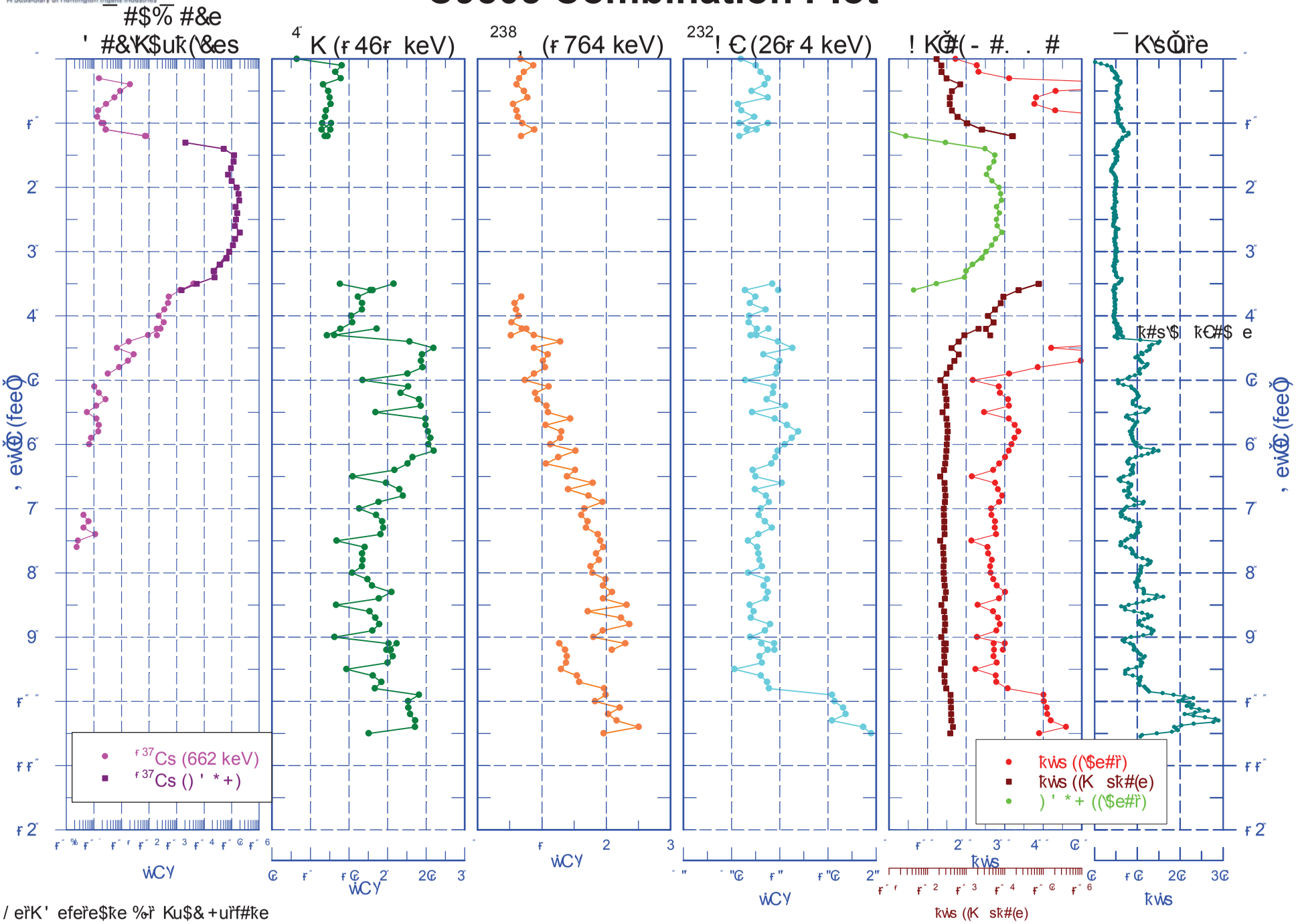
C9496 Combination Plot



Zero Reference - Ground Surface

Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

C9505 Combination Plot



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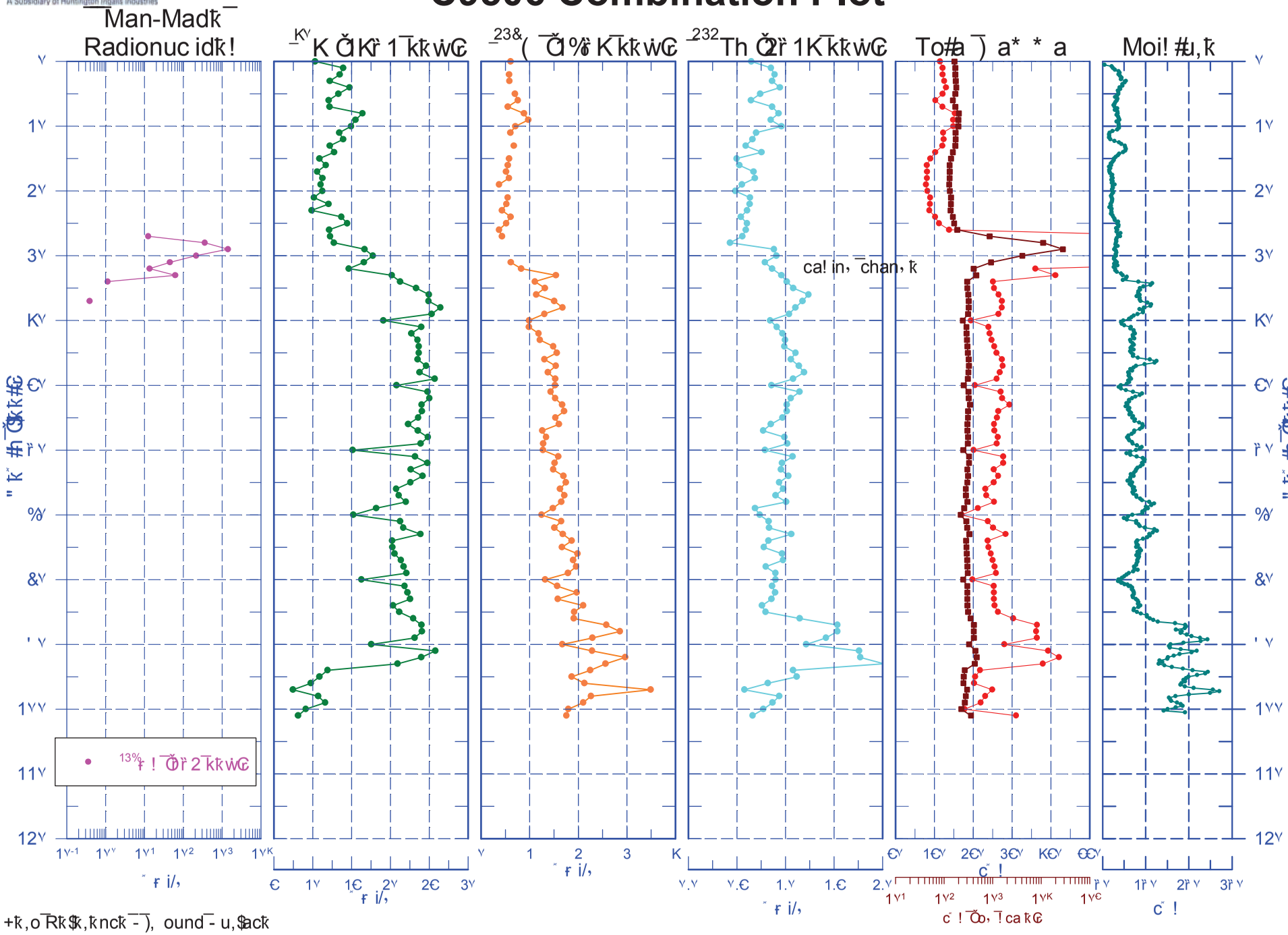
Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

C9506 Combination Plot



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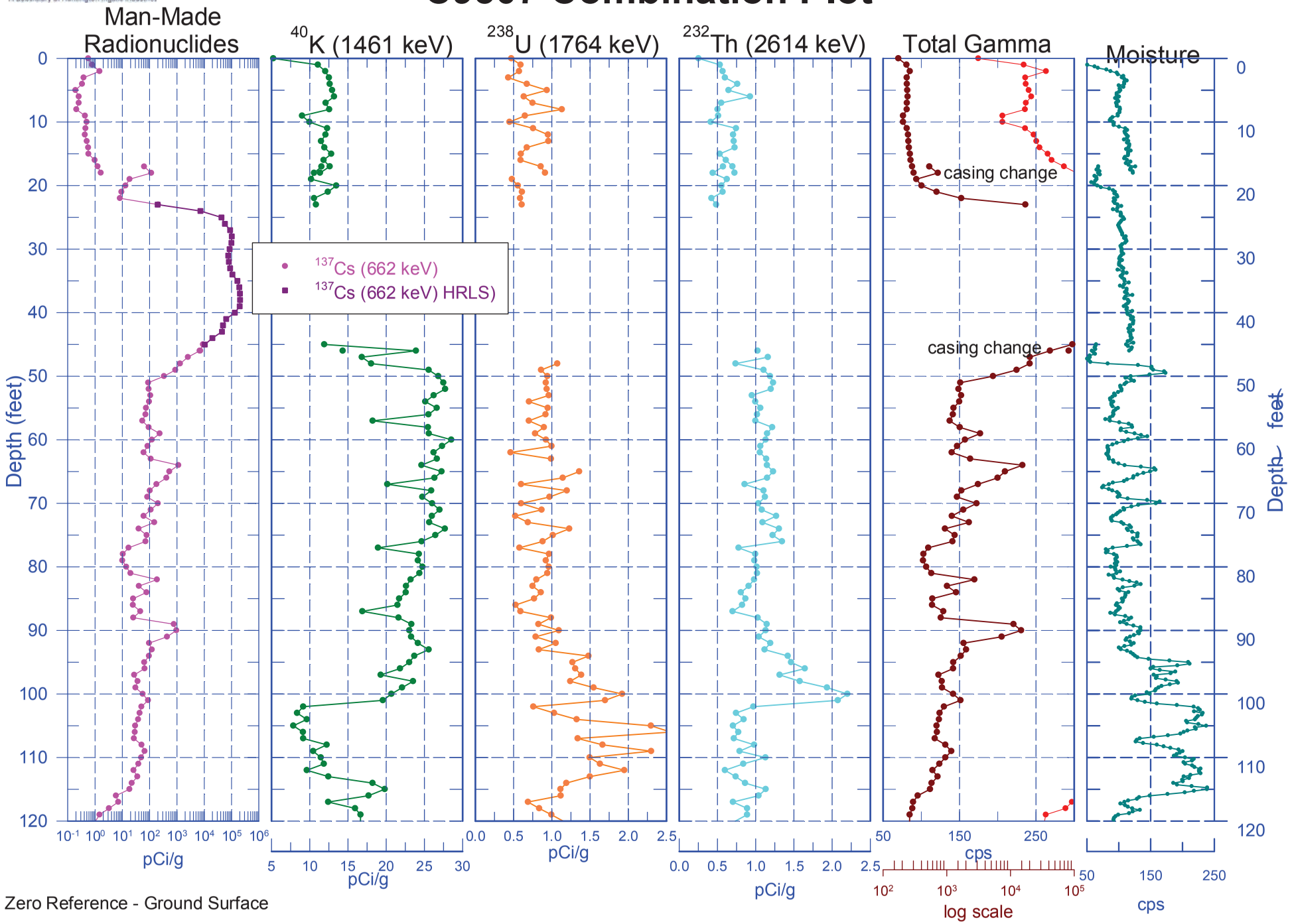
Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

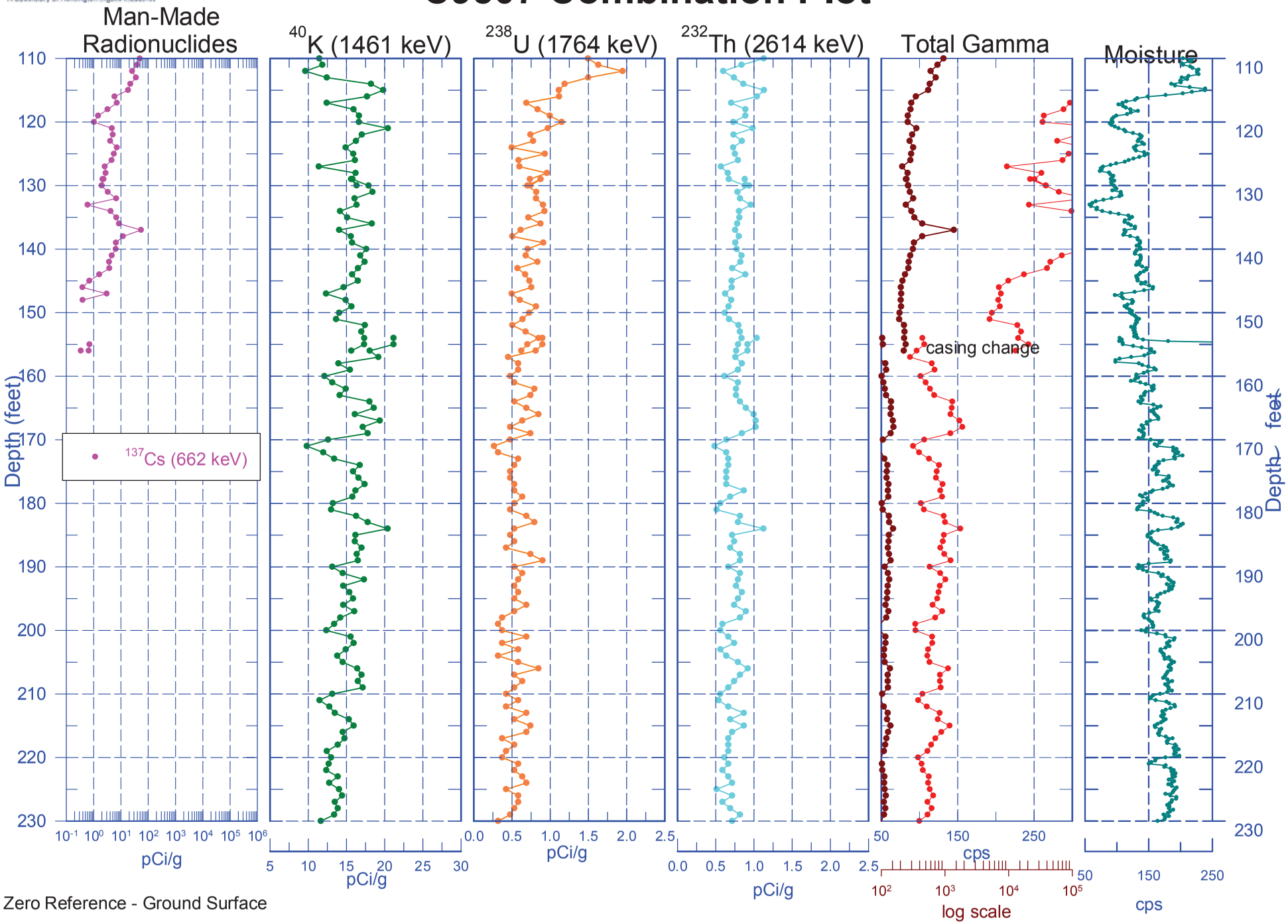
C9507 Combination Plot



Zero Reference - Ground Surface

Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

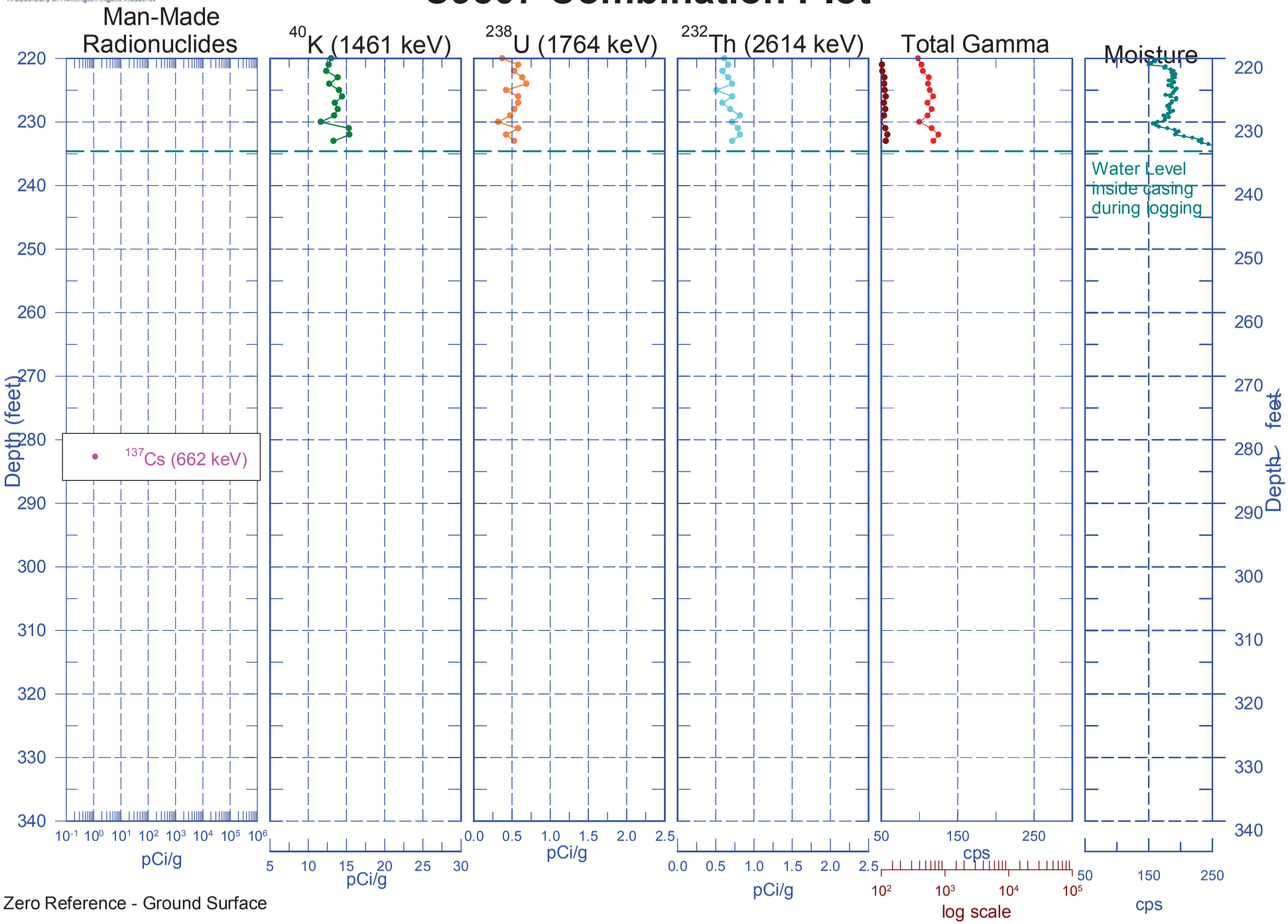
C9507 Combination Plot



Zero Reference - Ground Surface

Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

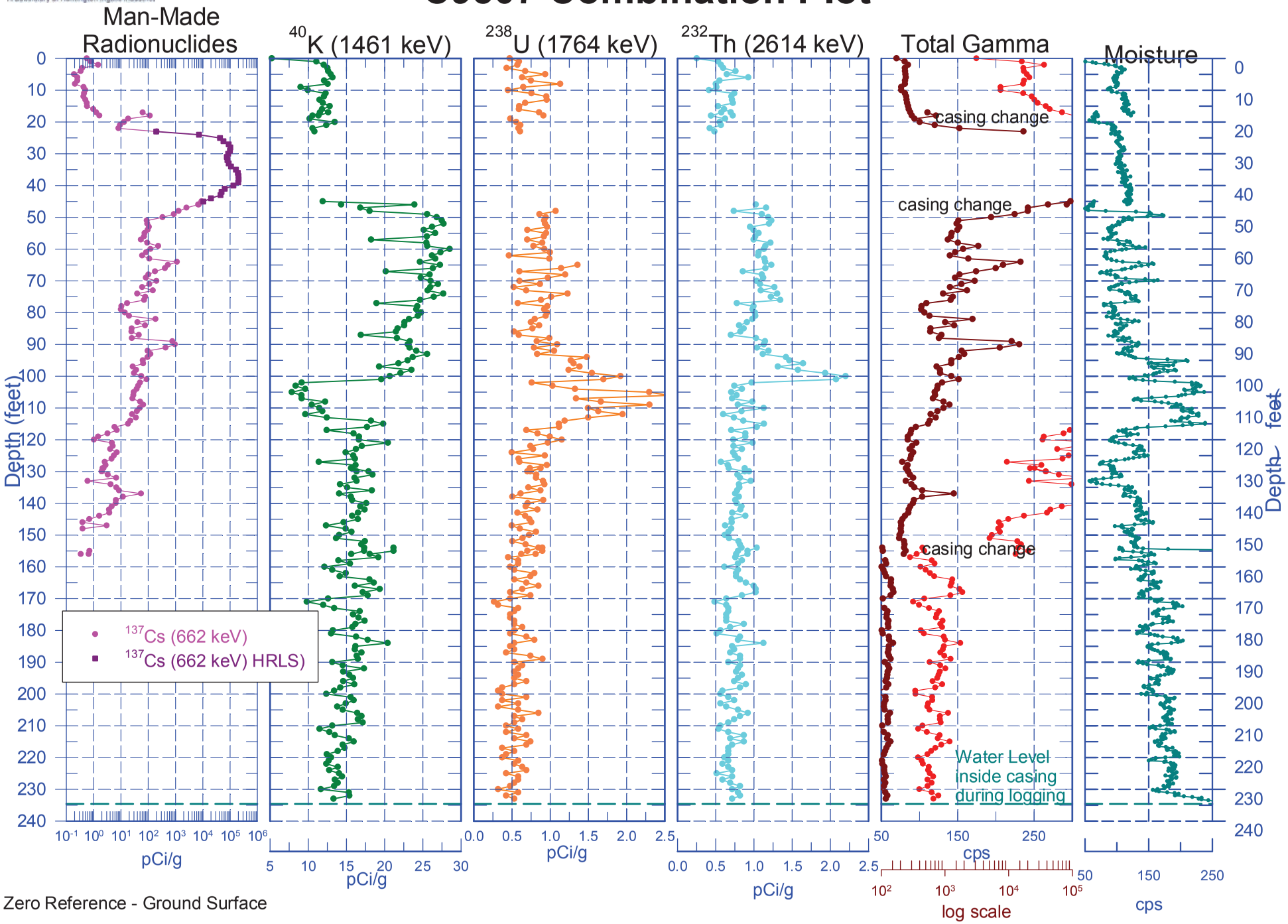
C9507 Combination Plot



Zero Reference - Ground Surface

Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

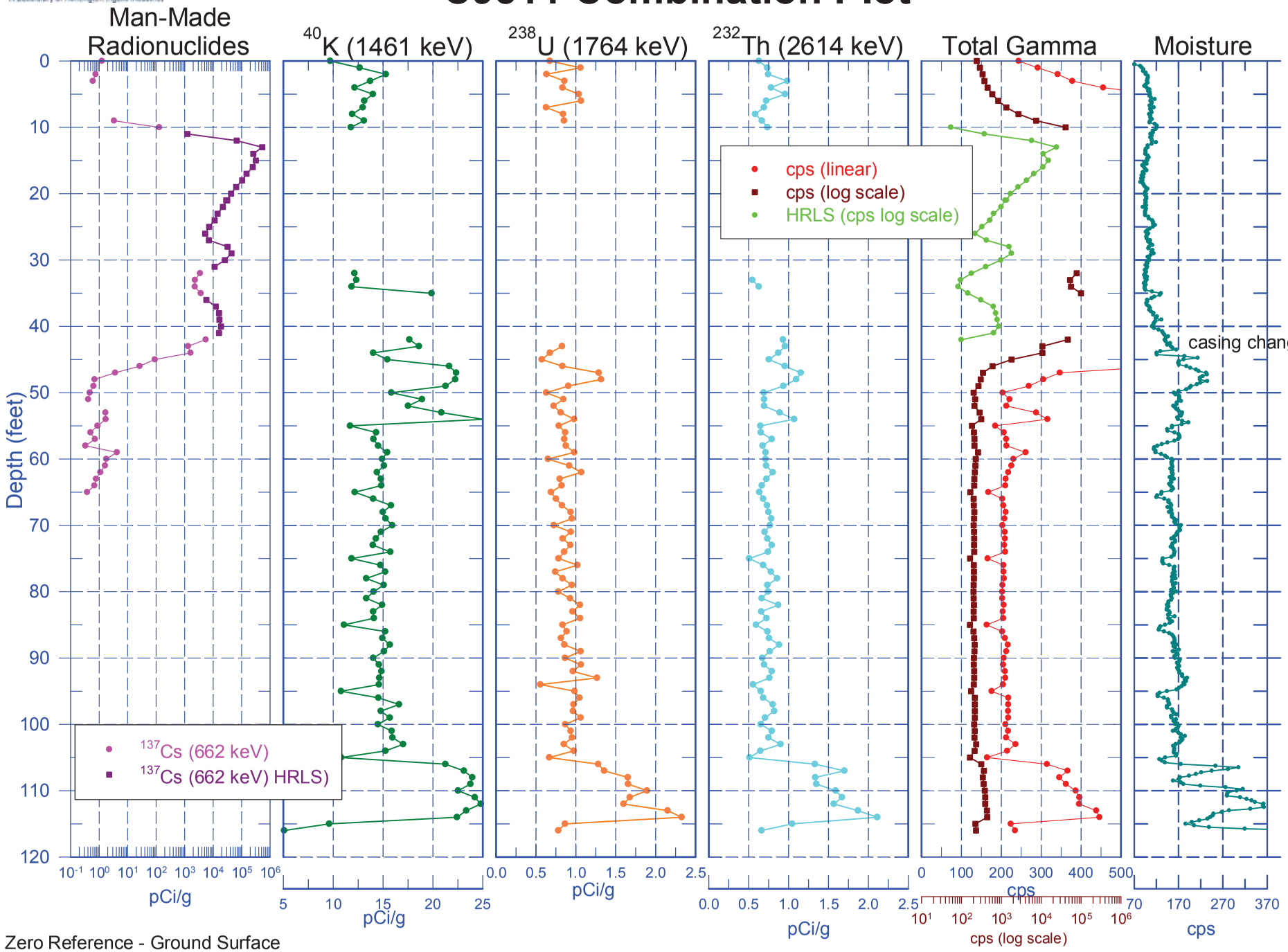
C9507 Combination Plot



Zero Reference - Ground Surface

Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

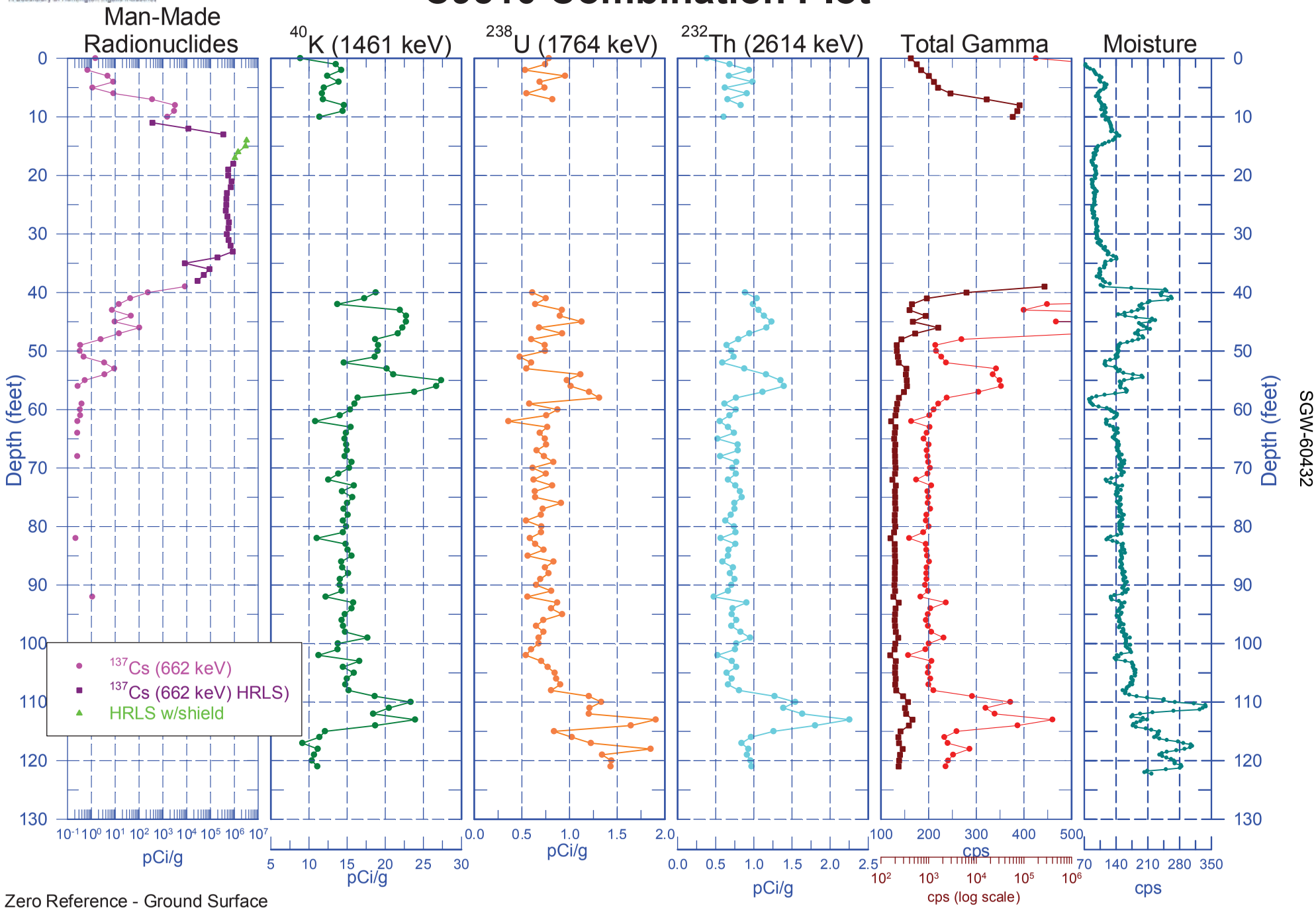
C9511 Combination Plot



Zero Reference - Ground Surface

Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

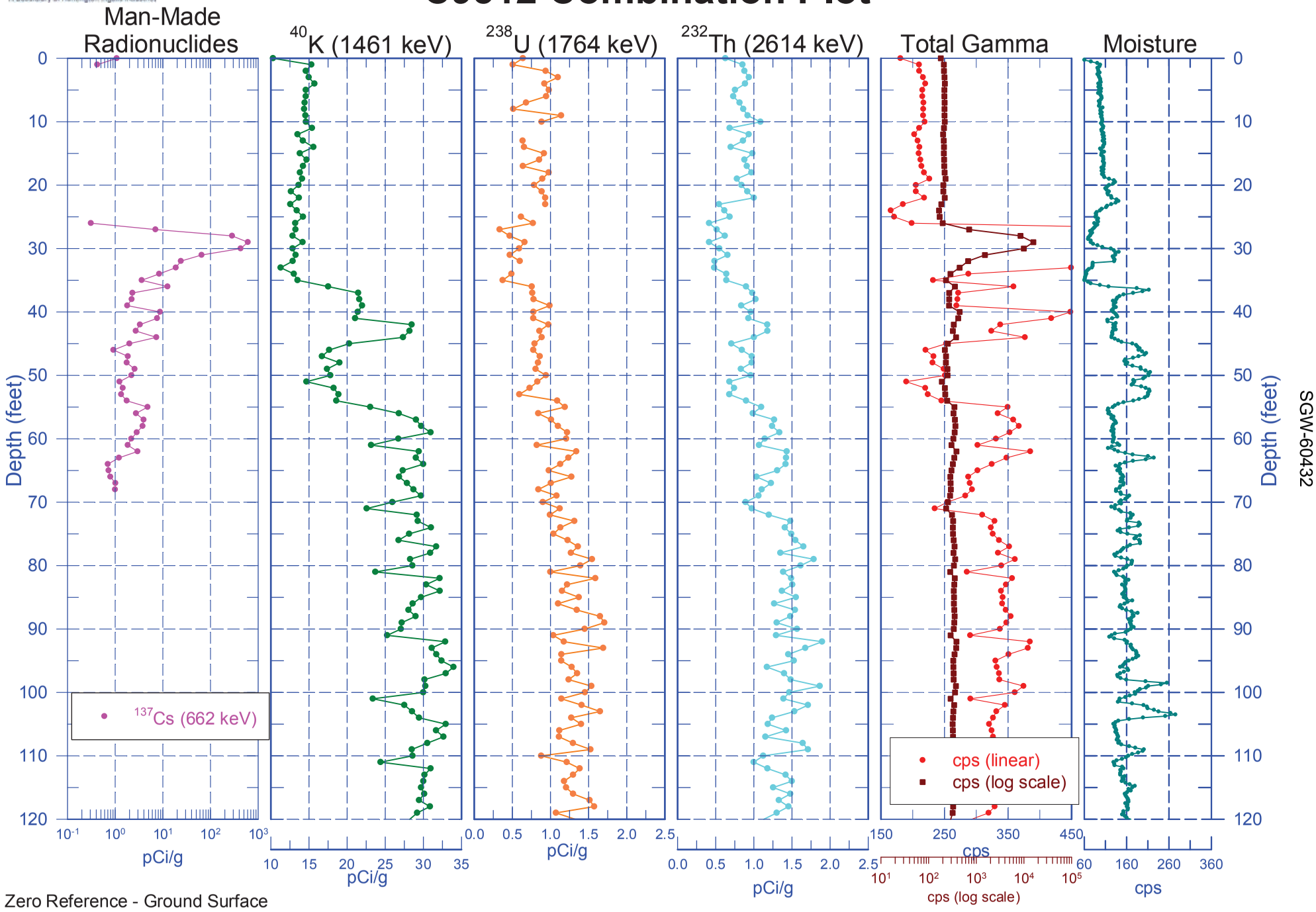
C9510 Combination Plot



Zero Reference - Ground Surface

Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

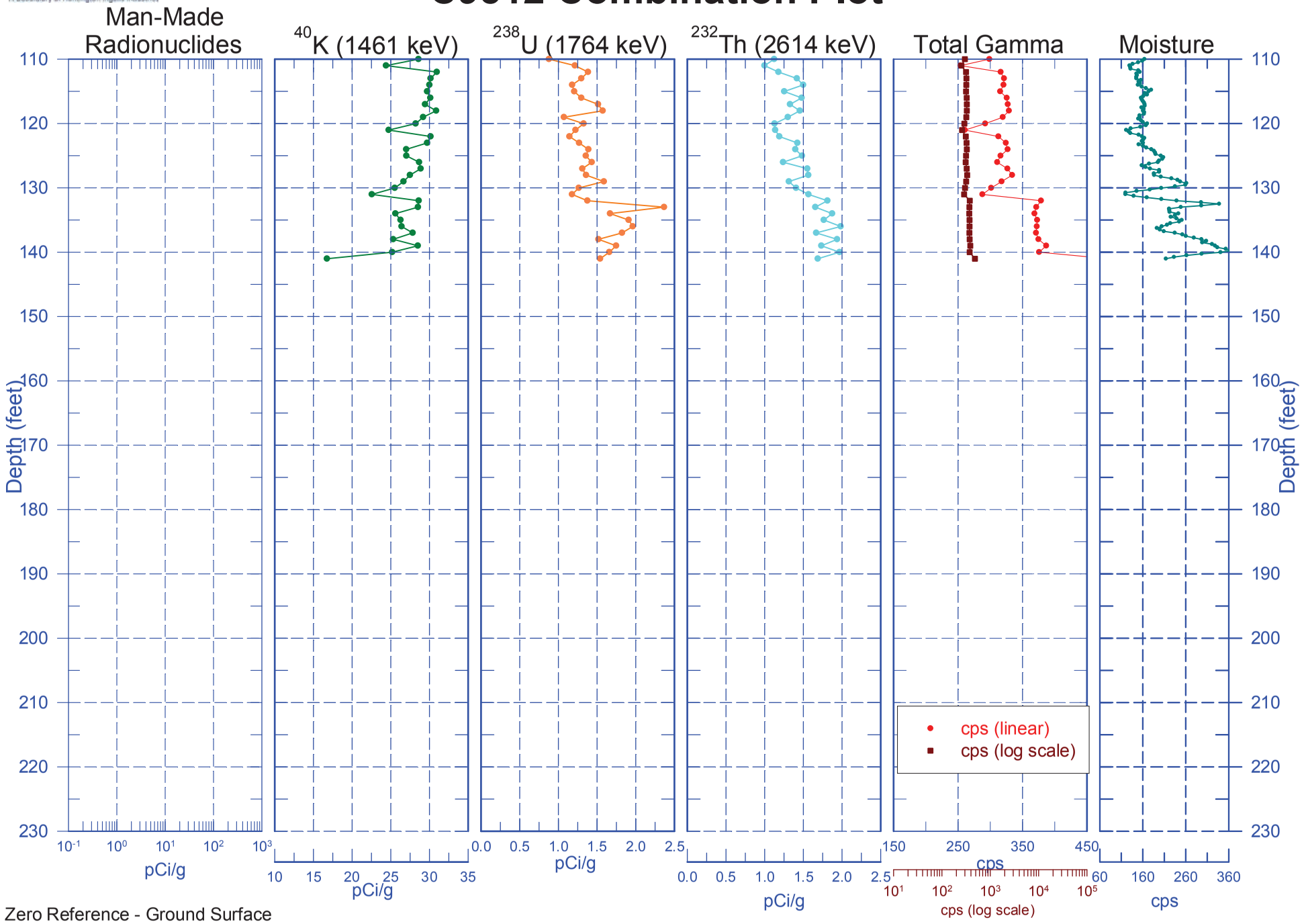
C9512 Combination Plot



Zero Reference - Ground Surface

Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

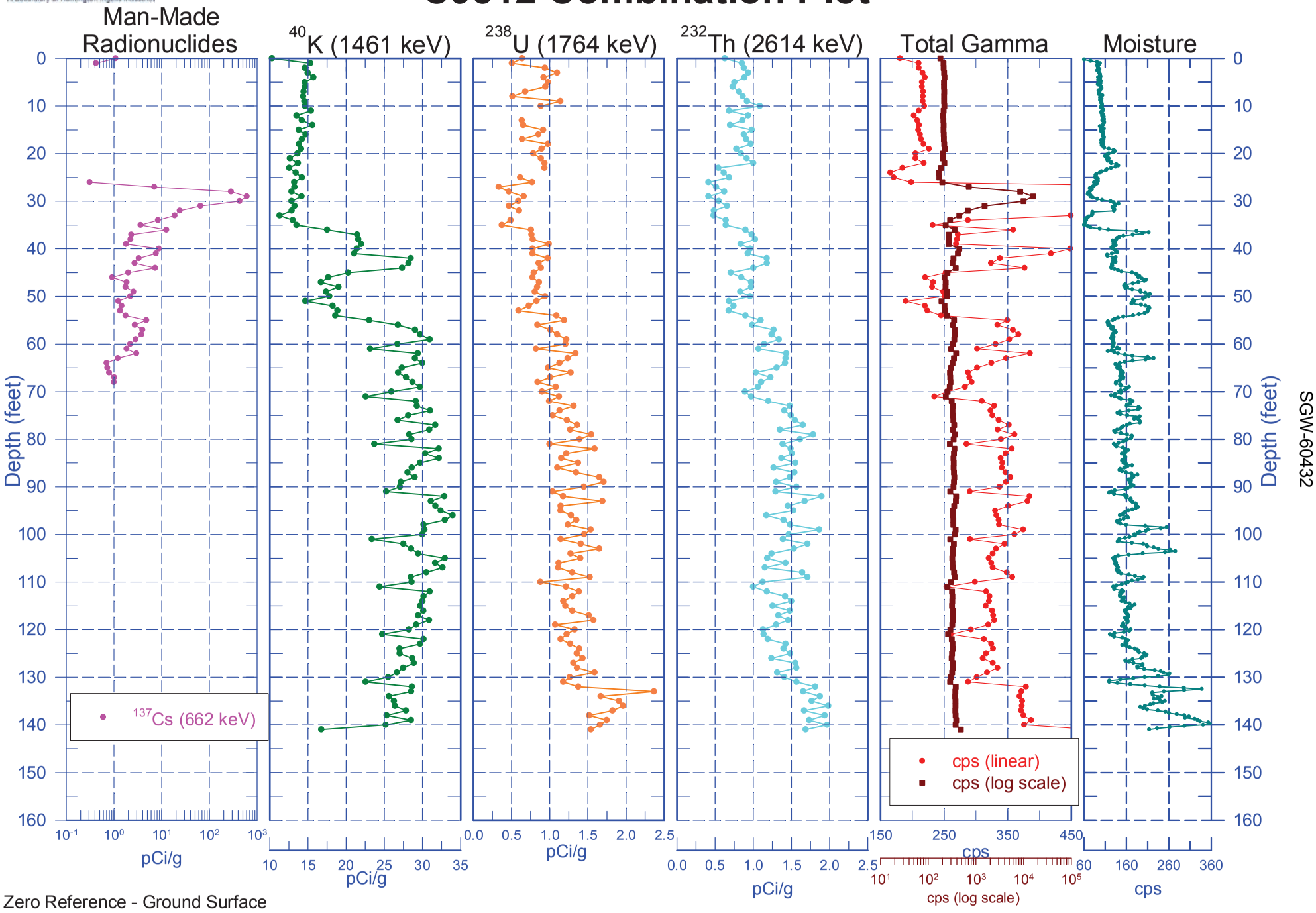
C9512 Combination Plot



Zero Reference - Ground Surface

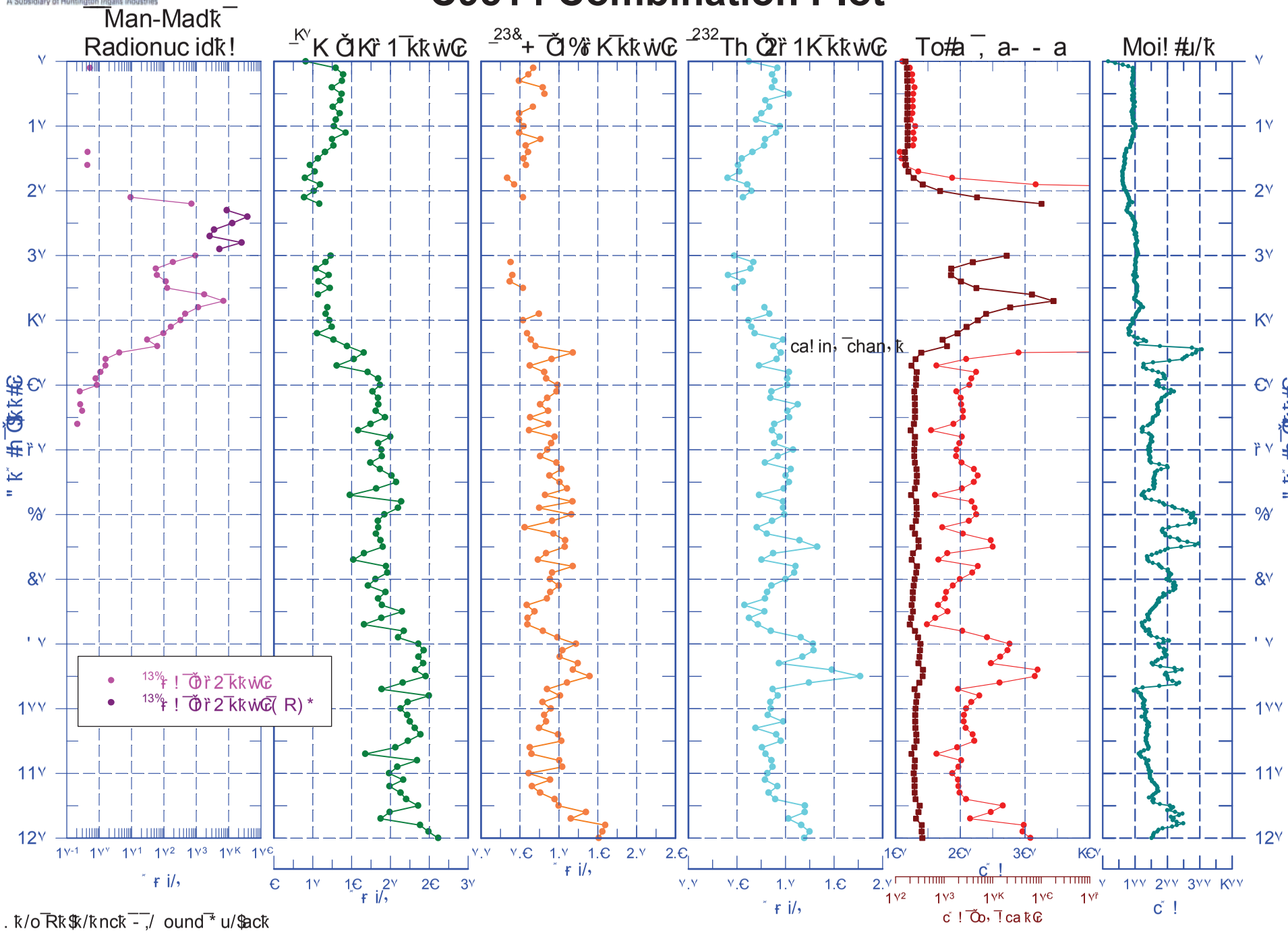
Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

C9512 Combination Plot



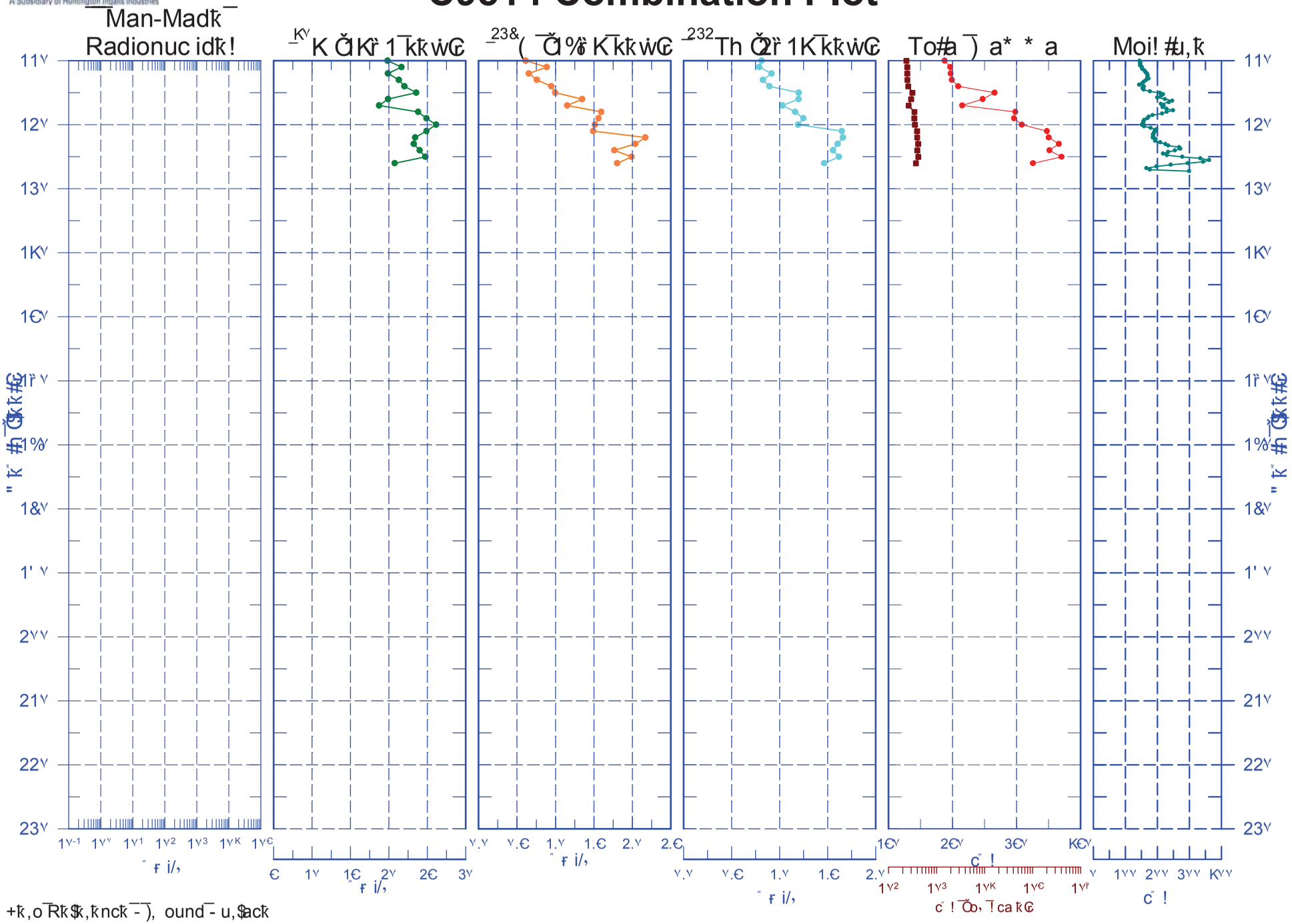
Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

C9514 Combination Plot



Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

C9514 Combination Plot



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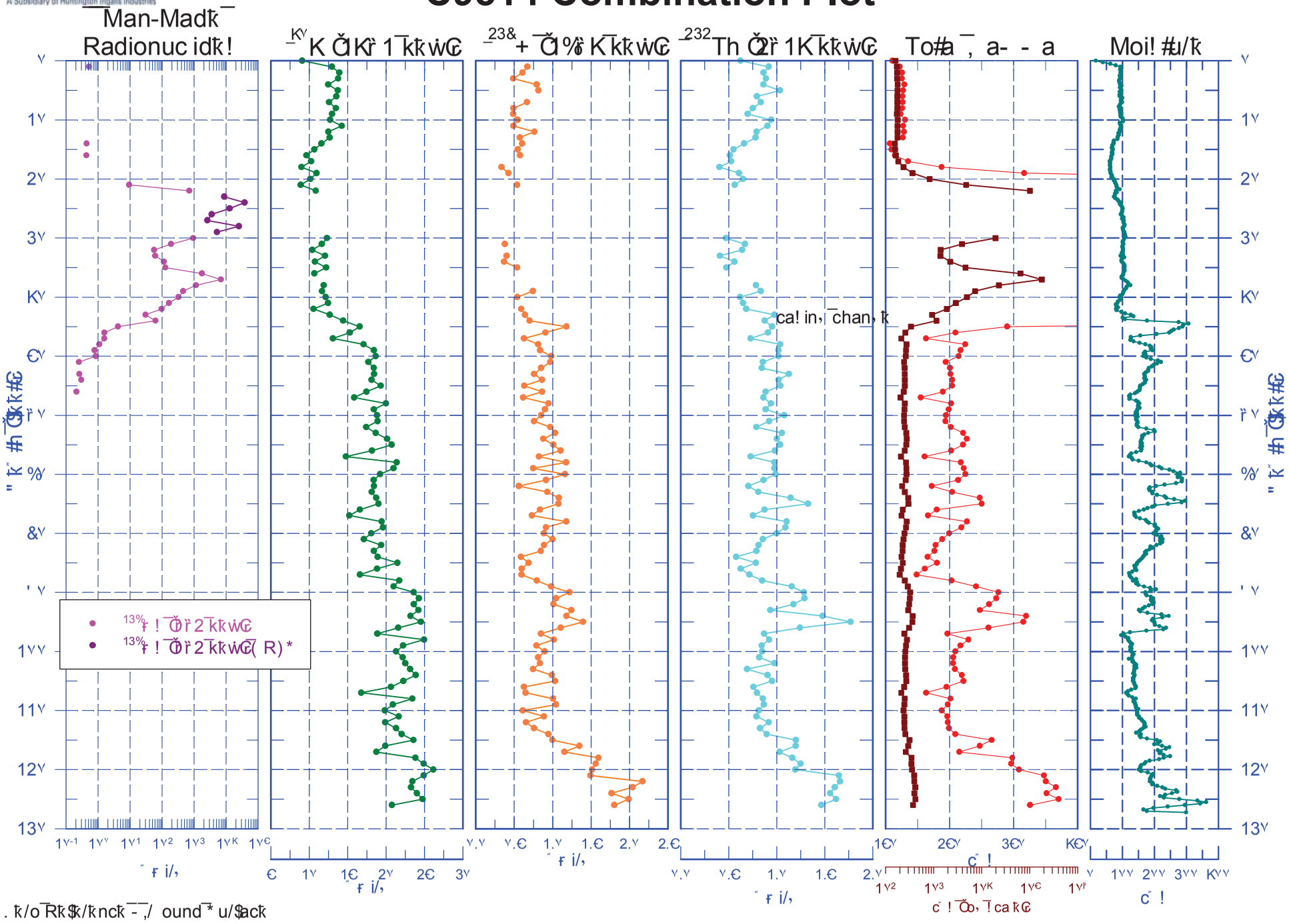
Stoller Newport News Nuclear
A Subsidiary of Huntington Ingalls Industries

C9514 Combination Plot



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Appendix G

Core Borehole Geologic Logs for 200-DV-1 Operable Unit Boreholes

BOREHOLE LOG

Page 1 of 9

Date: 4·5·16

Well ID: C9550	Well Name: N4	Location: BY Cribs N.W. ~~of Corner~~ Corner (GC) 11-21-16	
Project: 200-DV-1		Reference Measuring Point: Ground Surface	

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0-40'	DPT			0-43.7 - DPT no Returns	0-43.7 Direct Push.
40					No Recovery.
					Compact/Overdriven. soil.
42.5		DPT	No Recovery 0-40'		
				(GC) 11-21-16 (GC) 11-21-16	43.7-200: Sonic w/ 5' core
				43.7-47.4' ~~silty~~ sandy Gravel ~~w/SG~~ (80% g, 60% s, 10-5%)	5'x4" lexan liners.
				pr. srtd. v.fn.-v.c. sub-ang. S. of 25% mafic/75% felsic w/	43.7-48.7: Core 1: B340T1
				~~95% mafic~~ sub.ang. v.fn.-c. pbl. of 95% mafic/5% Qtz. flds.	Driven 12·17·15 (0900)
45				2.5Y 5/3 lt.olv.brn. slight plastic silt (5%) moist. graded contact. below. pot. slough.	
				44.4-46.0: Sand. (S.) (100%) pr. srtd. m.-v.c. sub-ang.	
				S. of 75% mafic/25% Qtz flds. 2.5Y 4/1 drk. gry. moist.	
		#1		46.0-47.9': Sand S. (100%) pr.→w. srtd downward. 50/50 mafic/felsic. overall. 2.5Y 5/1 lt.olv. brn.	
				Int bed: 46.0-47.8 pr. srtd. fn.-m. S. (46.0-46.8)	(no rxn w/ HCl.)
47.5				47.8-48.2' ~~mod. srtd. fn.-c.S.~~ 3-30-16. (47.4-47.9: w. srtd. crs. S.) -48-48.7' overdriven -	
				47.9-52.9': Sand. S. (100% S) mod. srtd.-well srtd.	47.9-52.9' Core 2: B340T3
				ang. 90% G-v.c. S. 10% m. S. of 50%/50% felsic, mafic	Driven 1·11·16
				trc. fn. mica. no visible grading. massive.	Aliquote: B34T20, B34T21
				trc. (sprs. fn.-m. rndd. pbl. of bslt.) slight moist. 2.5Y 5/3	(3·18·16) from (~~50.0-52~~) 47.9-51.9
50	B34T20 B34T21	#2 100%		lt. olv. brn. no rxn w/ HCl. sprs. hemmatite alt. of grains.	
				10YR 5/4 yellowish brn.	47.9-48.7: pot. slough.
				•51.9': 1" thick zone: modal fine grain. Sand. 80% C.-v.C. S.	
				20% v.fn.-fn. Qtz. dom. Sand.	
52.5					
				53.0-57.5': Sand. (98% S, <2% M)	53.0-58.0: Core 3: B340T5
				70% crs.-fn. Qtz. felds. S. / 30% v.Crs. sub-ang.	Driven 1·11·16.
				Mafic. S. trc. fn. sub-rndd. pbl. of bslt.	
				unconsolidated. slightly moist. 2.5Y 5/3 lt. olv. brn.	
55.0				•53.6': 0.2' thick int. bed.: slightly more fn. matl.	
				of 90% m-fn. S. of 95% felsic/5% mafic. comp.	
		#3 100%		no rxn w/ HCl. (trc. mica.) weak hem. alt. of	
				sprs. grains.	
				•57.2': 0.2' thick bed of m-fn. matl. of 100% S,	
57.5				60% m.-crs. sub-ang. S. / 40% v.fn.-S. of 99%	
				Qtz. flds. / 1% mafic. wk. rxn w/ HCl. Color: 2.5Y 6/3	58.0-63.0: Core 4
				lt. ylwsh. brn.	Next. Page.
				57.5-58: ~~m~~ S. (90% S, 10% M. trc. pbl.)	
		#4 100%		(GC) 11-21-16	
60.0 TC 11-22-16				90% crs. ang. crs.-v.fn. S. of 80% Qtz. felds. / 20% mafic.	

Reported By: A. Lantzen		Reviewed By: T. Clark	
Title: Geo. Tech.		Title: Geologist	
Signature: A. Lantzen	Date: 4.5.16	Signature: [signature]	Date: 11/21/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 2 of 9
Date: 4.5.16

Well ID: C9550 | Well Name: NA | Location: BY Cribs NW Corner
Project: 200 DV-1 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
60.0		100% #4		57.5-58: ~~m~~ S. (90% S. 10% m, trc. g.) pr. srtd.	Sonic w/ 5' core
				80% m-crs. ang. S. / 20% fn.-v.fn. Qtz. S. (TC 11-21-16)	58.0-63.0: Core 4: B340T7
				compact. w/ < 3% v.fn.-m. w.rndd. pbl. of bslt.	Driven 1.11.16
				color 2.5Y 6/3 lt. yloish brn. mod. rxn. w/ HCl.	overdriven 62-63' w/ sluff.
				slight. moist. non plastic v. porous.	
				sharp contact w/ above.	
62.5				58.0-63.0: Sand. S. (100% S) w. srtd.	63.2-68.2: Core 5: B340T9
		100% #5		sub.ang. m.-crs. S. of 50% felsic / 50% mafic.	Driven 1.12.16
				no vis. structure. trc. fn. mica. v.wk. rxn w/ HCl	Aliquot: 67.6-66.6': 3.24.16
				~~2.5Y 6/3~~ lt. olv. brn. slight moist. 2.5Y 5/3 lt. olv. brn. (AR 3-24-16)	NEIS# B34T23, B34T22
65.0				• 62-63': Sed. compacted by being overdriven.	
				mod. rxn w/ HCl. crushed Qtz.	
				63.2-68.2': Sand S. (100%) mod. srtd. m-c. sub-ang.	- 1-2' downward coarsening beds.
	B34T23 B34T22			S. of 60% Qtz flds. / 40% mafic. largest grains are mafic.	
				trace sub.rndd. m. pbl. of bslt. 2mm thick beds of	
67.5				v.crs. ang. S. (67.7-65.0'). trc. mod. mica.	
				• 67.5-~~68~~ 67.8': ~~Sandy silt~~ SM() silty Sand m. S (AR 3-24-16)	68.0-73.0 Core 6 B340V1
				(25% m, 75% S) sub rnd. v.f.-m. S. bed. w/ non-	Driven 1.12.16
				plastic silt. moist 2.5Y 5/3 lt. olv. brn. st. rxn HCl.	
				faint Fe stain patchy. above fn. grain bed.	
70.0		100% #6		• 68-68.2': 2" thick bed ~~slightly silty Sand fn~~ S (90% S, 10% m) (TC 11-21-16)	
				v.f.-c. sub ang. S. w/ non plastic M. 2.5Y 4/2 dark grysh. brn. (TC 11-21-16)	
				sharp contact below. pot. slough. moist wk. rxn HCl.	
				68.2-73.0': Sand S. (100%) mod. srtd. 2.5Y 5/3 lt. olv. brn. moist.	
				• 68.2-70.2': mod. srtd. m.-c. subang. S. of 50/50 maf./fels.	
72.5				• 70.2-73.0': down coarsen m-c. subang. S. 50/50 maf:fels.	72.2-73.0': overdriven.
				2-3mm Fe staining.	73.1-78.1 Core 7 B340V3
				73.0-78.1': Sand S. (100%) mod.-w. srtd.	Driven 1.12.16
				f.-m. ang. S. of 70% Qtz. flds / 30% mafics. 2.5Y 5/3	
				lt. olv. brn. moist no rxn HCl. trc. med. mica.	
75.0				• @ 75.0': faint 2-5mm bedding of f. S. colored	
				10YR 4/3 brn. no rxn HCl. moist. Qtz. flds.	
		#7		@ 76.0': faint 1" bed of f. S. colored 10YR 4/3 brn.	of Qtz. flds.
					~~77.1-78.1'~~: ~~177.1-178.1'~~ overdriven (AR 3-30-16)
77.5				78.1-83.1: Sand (S) (100%) w. srtd. v.f.-f. S.	
				sub.rndd. massive bedding / no vis. structure. moist. 2.5Y 5/3	78.1-83.1: Core 8 B340V5
				lt. olv. brn. no rxn HCl. 10% mafic / 90% felsic.	¼-½" rind on core walls.
80 TC 11-22-16		#8			82.1-83.1: overdriven.

Reported By: A. Lantau | Reviewed By: T. Clark
Title: Geo Tech. | Title: Geologist
Signature: A. Lantau | Date: 4.5.16 | Signature: [illegible] | Date: 11/21/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 9
Date: 4·5·16

Well ID: C9550 | Well Name: NA | Location: B4 Crib NW. Corner
Project: 200-BY-1 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80.0		100% #8		78.1-83.1: Sand (S) (100%) w. srtd. v.f.-f. S. of 10% mafic/90% Qtz. flds. no vis. bed. moist 2.5Y 5/3 lt. olv. brn. no rxn HCl. trc. mica.	Sonic w/ 5" core 78.1-83.1 Core 8 B340V5 Driven 1·12·16
82.5				83.1-88.0: Sand S (100%) w. srtd. f.-m. S. of 20% mafic/80% Qtz. flds. trc. mica. sprs. fn. layers (2-4 mm thick) of v.f.-f. S. throughout. moist 2.5Y 5/3 lt. olv. brn. 5-10mm thick laminar bedding.	82.1-83.1': overdriven 83.2-88.2 Core 9 B340V7 Driven 1·13·16
85.0		100% #9		e84.5: faint 1/4" thick bed of fn. w. srtd. S. color 2.5Y 5/4 lt. olv. brn. no rxn HCl.	
				e 84.2': 3mm thick silty sand layer w/ light & dark filimentous beds.	
87.5					87.7-88.2': overdriven.
87.7 TC 11-22-16				88.0-89.8': Sand. S. (100%) sub-ang. fn.-m. S. of 45% Qtz. flds./55% mafic. low compaction. no rxn w/ HCl slight moist 2.5Y 3/3 lt. olv. brn. sprs. mica. -sharp contact. bedding.	88.0-93.0: Core 10: B340V9 Drilled 1·13·16
90.0		97.8% 99% #10		89.8-93.0': Sand (S) (100%) ang.-sub-ang. vf.-f. S. of 45% Qtz. flds./55% mafic. no rxn w/ HCl, slight moist. 2.5Y 3/3 lt. olv. brn. v.fn. grading to fn. S. bed contains 2-3mm thick v.fn. bedding of fn. + v.fn. S. sprs. mica.	
92.5					93.3-98.3: Core 11: B340W1
		100% #11		93.3-98.1: Sand. S (100%) sub-ang. v.fn.-m. S. 90% Qtz. flds./10% mafic. (v.w. srtd.) 4-8mm thick layers w/ v.fn. 1mm thick layers of v.fn. Qtz. flds. 2% fn. mica + biotite. slight moist 2.5Y 5/3 lt. olv. brn. no rxn w/ HCl.	Drilled 1·13·16
95.0					
97.5				98.1-103.1: Sand. S (100%) Next pg.	98.1-103.1 Core 12: B340W3 Drilled 1·13·16
100.0	TC 11-22-16	100% #12			

Reported By: A. Lantau | Reviewed By: T. Clark
Title: Geo. Tech. | Title: Geologist
Signature: A. Lantau | Date: 4·5·16 | Signature: [signature] | Date: 11/21/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 4 of 9
Date: 4.5.16

Well ID: C9550 | Well Name: NA | Location: BY Cribs N.W. Corner

Project: DV-1 | Reference Measuring Point: Ground Surface.

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
100	3.24.16			98.1-103.1: Sand S. (100% S) mod.-pr. srtd. down hole.	Soni: w/ 5' core
				m.-v.c. S. down coarsening of 60% Qtz flds./40% Mafic.	98.1-103.1': Core 12: B340W3
	B34T24 B34T25			5% sub rndd. v.f.-f. pbl. of bslt at base of bed. dry 2.5Y	Drilled 1.13.16
		100% #12		5/2 grysh brn. no rxn HCl	Aliquot 100.8-101.8': 3.24.16
				103.1-100.8-103.1': Sand (100% S) mod. srtd. m.-c. subang.	B34T24, B34T25
102.5				S. 60% felsic/40% Mafic. dry. 2.5Y 5/3 H. olv. brn. no rxn HCl.	
				(TC) 11-22-16	
				103.2-107.7: Sand S. (95 100% S) m.-v.c. ang. S. of	103.2-108.2' Core 13: B340W3
				70% Qtz. flds./30% mafic abnt beds (1.5cm thick) of v.c.S.	Drilled 1.13.16
				w/ 5% sub.ang. v.f.-f. pbl. of 90% mafic comp. beds are	
105				1-1.5' apart slight moist 2.5Y 5/3 H. olv. brn. no rxn HCl.	
				-graded contact	
		100% #13		• 107.7-108.2: Sand cont. gradually increasing occurance	
				(TC) 11-22-16	
				of silt inter beds (1-3mm thic) spaced 1-2cm	Detail photo @ 107.7-108.2
				apart. 2.5Y 5/2 grysh brn. w/ filaments of 2.5Y 7/3	
107.5				pale brn. strong rxn w/ HCl. -may be relict of overdrive.-	
					108.2-113.2' Core 14: B340W7
				108.2-110.7: Sand S. (100% S) mod. srtd. m-v.c. sub-ang.	Drilled 1.13.16
				S. of 70% Qtz flds./30% mafic. moist. 2.5Y 5/3 H. grysh. brn.	110.2-111.2 Aliquot: 3.25.16
				sprs. 1cm thick layers containing v.crs. sub.ang. S. +	B34T26, B340W7
				trc. v.f.n. pbl. no rxn HCl.	
110	B34T26 B340W7			110.7-113.2: Sand S. (100% S.) v.w. srtd. v.f.-m.S. of 90% Qtz	110.7': (72 cpm BG, 0 @ contact)
		1 #14		10% mafic. moist 2.5Y 5/3 H. olv. brn. massive - no visible structure.	(Ludlum 3 w/ 50cm² probe @ 14% Tc-99)
				@ sharp contact (110.7'): 3mm thic silt layer color 10YR 5/3	1.K dpm Bg, 0 g
				brn. mod. plastic.	
				@ 110.9': filiment of black carbon.	
112.5					
					113.0-118.0 Core 15: B340W9
				113.0-118.0: Gravelly Sand (g S) (80% S, 20% G) pr. srtd.	Drilled 1-13-16
				ang. m.-v.c. S of 50/50% mafic/felsic w/ sub ang-	
				sub.rndd. v.f.-c. pbl. of 90% mafic/10% felsic comp.	
115				sprs. lrg. biotite, muscovite. no bedding visible.	
		100% #15		2.5Y 5/2 grysh brn. no rxn HCl.	
117.5				118.0-123.0: Sand S. (100% S) ang. m.-v.c. S. mod.	118.0-123.0, Core 16: B340X1
				srtd. of 50/50% mafic/felsic comp. no visible structure.	Drilled 1.13.16
		#16		2.5Y 5/2 grysh brn. moist. no rxn w/ HCl. sprs. Fe'	
TD TC	11-22-16			staining. 2-4mm. patches.	

Reported By: A. Lantau | Reviewed By: T. Clark

Title: Geo. Tech | Title: Geologist

Signature: A. [illegible] | Date: 4.5.16 | Signature: [illegible] | Date: 11/22/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 5 of 9

Date: 4·5·16

Well ID: C9550	Well Name: NA	Location: BY Cribs NW. Corner
Project: 200-DV-1		Reference Measuring Point: Ground Surface.

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
120		98% #16		118.0-123.0: Sand S. (100% S.) ang. m.-v.c. S. mod. srtd.	Sonic w/ 5' core
				of 50/50% mafic/felsic comp. no visible structure	118.0 - 123.0': Core 16: B340X1
				2.5Y 5/2 grysh brn. moist. no rxn w/HCl sprs. Fe*	Drilled 1·13·16
				staining. 2-4 mm patches.	
122.5				123.1-125.1': Gravelly Sand gS (90% S, 10% G) mod. srtd.	123.1-128.1' Core ~~18~~ 17 : B340X3
				ang. m. S.-v.c. S. of bimodal size+comp.: m.-c. Qtz/	Drilled 1·14·16
				+ v.c. Mafics S. w/ sub. rndd. v.f.-m. pbl. of	
				98% Mafic/2% Qtz. slight moist. no rxn HCl. 2.5Y 3/2	(Downward Coarsening)
125.0				grysh brn. sharp contact below. weathered contact.	
		100% #17		• 125.5-126.0': Silt (M) interbeds. 1.5"-2" thick	← no activity.
				interbeds of silt. non plastic. high delatency.	
				stratified w/ crs. sand. moist 2.5Y 3/4 lt. olv. brn.	
				mod. rxn HCl. 1cm weathered horizon above+below.	
127.5				possible organic carbon at base of horizon.	
				126-128.1': Sand (S.) 100% mod. srtd. m.-v.c. S. ang.	
				of 75% Qtz flds./25% mafic. no structure. moist. 2.5Y 5/2	128.0-133.0: Core 18: B340X5
				grysh brn. no rxn w/ HCl.	Drilled 1·14·16
				128.0-130.3': Sand S. (100% S) mod. srtd. m-v.c. ang. S. of	
130.0	B34T28 B34T29	100% #18		70% Qtz flds. / 30% mafic. 2.5Y 5/2 grysh brn. no rxn HCl.	Aliquot 3·24·16
				• 130.3-130.9': silty Sand mS. (75% S/25% M) pp. srtd.	130.05-129.5': ~~B34T07~~ B34T29, B34T28
				v.f. S. w/ non plastic M. <5% v.c. ang. S. of bslt.	
				• (coarsens down) to v.f. S. → m.S. f. lamina (1-2mm)	
				dark silt present throughout.	
132.5				130.9-133.0': ~~S~~-gravelly Sand (85% S, 15% g) mod. srtd.	
				C.-v.c. ang. S. of 60% mafic, 40% Qtz flds. w/ sub-rndd.	
				v.f.-c. pbl. of 90% bslt, 10% felsics. Downward coarsening.	133.2-138.2': Core 19: B340X7
				133.2-136.1: ~~Sand S.~~ (gravelly ~~Sand~~ (gS) (85% S 15% g)	Drilled 1·14·16
				gravels & rudely stratified in ½"-3" beds.	
135.0				bimodal Sand: m.-c. ang. S. of 25% mafic/75% felsic +	
				v.c. sub rndd S. of 75% bslt./25% Qtz	
		100% #19		Gravel: mod. srtd. beds v.f.-f. sub-ang G. of 95% bslt/5% felsic.	
				interspersed f.-c. pbl. of w. rndd. felsic (non basalt). ~5%	
				black + 2.5Y 5/3 lt. olv. brn. no rxn HCl Dry.	
137.5				136.1-138.2: Sand S. (98% S, 2% g) mod. srtd. m.-crs. S.	
				of 50% mafic/50% felsic. down coarsening from m → crs. S.	137.2-138.2': overdrive
				• @ 136.5': c.-v.c. ang S. bed. 50/50 mafic felsic.	138-143.0': Core 20: B340 X9
		100% #20			Drilled 1·14·16
	11-22-16				Next pg.

Reported By: A. Fontana	Reviewed By: T. Clark
Title: Geo. Tech	Title: Geologist
Signature: A. Fontana Date: 4·5·16	Signature: [illegible] Date: 11/22/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 6 of 9
Date: 4·5·16

Well ID: C9550 | Well Name: Nd | Location: By Cribs NW. Corner
Project: 200-DV-1 | Reference Measuring Point: Ground Surface.

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
140		100% #20		138.2'-143.0': gravelly Sand (gS) (85%S, 15%g) mod srtd. bimodal m.-c. ang. S. of 70% Qtz flds./30% mafic. + v.c. subang. bslt. S. w/ w. srtd. v.f. pbl. of bslt. tr. c. pbl. of bslt. Dry 2.5Y 5/3 lt. olv. brn. w/ black pebbles. no bedding. no rxn HCl.	Sonic w/ 5' core. 138.0-143.0': Core 20: B340X9 Drilled 1·14·16
142.5				143.0- gravelly Sand gS (85%S, 15%g) mod. srtd. overall w/ pr. srtd. beds. 1.5'-2' thick beds of gS m-v.c. ang. S. of 50/50% mafic: felsic comp. w/ v.f.-f. pbl. subang. dry 2.5Y 5/3 lt. olv. brn. no rxn HCl. sprs. med. mica.	142-143': overdriven 143-148': Core 21: B340Y1 Drilled 1·14·16
145		100% #21		• 144.5': Coarse grain. pr. srtd. int. bed. Mafic dom. of crs.-v.c. S., v.f.-m. pbl. • 146.5': 3" thick int. bed. crs. grain m. S.-c. pbl. of 60% mafic/40% qtz. flds. Sharp Top contact. pot. top of bed.	
147.5					147-148': overdriven + heated.
150		100% #22		148.0-153.0': gravelly sand gS (80%S, 20%g) 1.5-2' beds mod-pr. srtd. down coarsening: ang. m.-c. S. of 60% mafic 40% qtz. flds. w/ v.f.-c. pbl. sub-rnd of 50% mafic/50% felsic. Moist 2.5Y 5/3 lt. olv. brn. no rxn HCl. • 148.6': 2" thick more coarse base of bed. max pebble. 15mm. • 148.6-149.6': Down coarsening bed. max pbl.: m.pb. 20mm. • 149.6-151.7': pr. srtd. down crs. bed. max: 32mm C. pbl. • 151.7-153': Down crs. bed. max: C. pbl. 32mm. pr. srtd.	148.0-153.0: Core 22: B340Y3 Drilled 1·18·16
152.5					152.5-153': overdrilled. Drilled 1·18·16
155	B34T30 B34T31	slough. 100% #23		153.3-158.3': Gravelly Sand gS (90%S, 10%g) pr. srtd. crs.-v.crs. S. of 50% mafic/50% felsic w/ sprs. v.f.-c. pbl. of 90% Mafic, 10% Qtz, int. Volcanics. sprs. 4mm clay clots. overall 2.5Y 5/3 lt. olv. brn. • 155.1-155.6': Sand interbed (100%S) w. srtd. crs. ang. Qtz. sand w/ tr. v.f. pbl. of bslt. 2.5Y 5/3 lt. olv. brn.	153.3-158.3': Core 23: B340Y5 154-155.0 Aliquot: 3·25·16 B34T30, B34T31 @154': 34 cpm By, 0 α contact. (Lucium 3, 50cm probe, 14% efficiency) ~~1.2 k cpm~~ 30 cpm By, 0 α KL 4·5·16
157.5		compact. 100% #24			overdriven + heated 157.3-158.3
160					158.0-163.0': Core 24: B34WY7
	11-22-16				

Reported By: A. Santos | Reviewed By: T. Clark
Title: Geo. Tech. | Title: Geologist
Signature: A. Santos | Date: 4·5·16 | Signature: [illegible] | Date: 11/22/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 7 of 9

Date: 4·5·16

Well ID: C9550 | Well Name: NA | Location: BY Cribs N.W. Corner

Project: 200-BV-1 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
160.0		100% #24		158-163.0': gravelly Sand (gS) (85%S, 15%g) 1' thick	Sonic w/ 5' core
				graded bedding downward coarsening mod. srtd. m.-c.S	158-163.0': Core 24: B340Y7
				grading to m.S w/ fn. pbl. at base of beds.	
				Sand: m.-v.c. ang. of 60% mafic/40% felsic Qtz.	
				Gravel: base of beds. contain v.f.-f. pbl. of 95% bslt./5% Qtz	
162.5				<5% m-fn. pbl. sub-rndd. of 80% mafic/20% felsic (int. volc. > meta.)	
				2.5Y 5/3 lt. olv. brn. dry.	161.7-163.0' overdriven & heated.
				•159.0': faint 3mm thick fn. S. of 80% Qtz/20% mafic.	
				163.1-167.6: Gravelly Sand gS (85%S, 15%g) 0.5-1' well	163.1-168.1': Core 25 B340Y9
				graded beds of mod. srt. m.-v.c. ang S. w/ 15% pbl. (fn.) pbl.	Drilled 1·18·16
165.0		100% #25		grading to pr. srtd. m.S.-v.f. pbl. of bslt.	
				Sand: 20% mafic/80% felsic. Gravel: 80% bslt, 20% meta. felsic.	(overall dry 2.5Y 5/3 lt. olv. brn)
				interspersed. (sprs.) m.-v.c. w. rndd pbls of meta. max 50 mm.	(no rxn HCl.)
				•165.6': 4" thick bed sandy Gravel sG (75%g, 25%S)	
				c.-v.c. ang S. of 30% maf, 70% Qtz. w/ v.f.-v.c. rndd pbl. of	167.2-168.1': overdriven.
167.5				80% bslt./20% felsic meta.	
				167.6-167.8: pr. srtd. coarse grain bed. Sandy Gravel sG (75%g, 25%S, <2%m) fn.-m. S. of	
				20% mafic, 80% felsic Qtz. w/ pr. srtd. v.f.-v.c. w. rndd. pbl.	max: 50mm. of 80% bslt. > and/20%
				felsic meta. matrix: 2.5Y 5/3 lt. olv. brn./clasts: black. on top of bed. off clay alt. rocks. (st. weathering)	
				mod. rxn w/ HCl.	
170.0		100% #26		168.0-173.0': gravelly Sand gS. (85%, 15%) same as above	168.0-173.0 Core 26: B341Q1
				(163-167) above. 0.5-1.5' w. graded beds. trc. 3mm mica.	Drilled: 1·18·16
				•171.0': 0.4' thick coarse bed of med.-c. ang S. (70% bslt, 30%	felsic meta.) w/ fn.-c. pbl. of (80% mafic/20%
				felsi.) max. 30mm. trc. carbon chips.	(no Rxn HCl)
				•172.1: 0.1' thick bed fn.-m. pbl. (90% mafic/10% fels.) w/ trc.-5%	clots of silt (2-3mm) 2.5Y 5/6 olv. yellow.
172.5				173.2 (coarse bed may be base of ↓ coarsening beds.)	172.2-173.0: overdriven.
				173.2-177.4: gravelly Sand gS. (15%g, 85%S, trc. M) pr. srtd.	
				fn.-crs. ang. S. w/ 5% v.crs. sub-ang S. of 15% mafic, 85%	173.2-178.2: Core 27: B34103
				Qtz. flds. w/ w. rndd. m. pbl.-sm. cbl. of 30% mafic/70% felsic.	Drilled 1·18·16
				w/ trc. lrg mica. & trc. 2-4mm clots of mod. plastic.	Aliquot: 3·29·16 (175.5-176.5')
175.0				10YR 5/6 ylwsh. brn. (overal color: 2.5Y 5/3 lt. olv. brn.)	B34T32, B34T33
				prob. 1-3' thick downward coarsening beds. 2-4" thick	
	B34T32 B34T33 (3·29·16)	100% #27		base of beds contains up to 20% m.-c. pbl. of 70% bslt. no rxn HCl.	T-96: slough.
				sprs. sm. cbl. 70mm. ~~trace~~	bottom 8" overdriven.
				•177.4-178.2 pr. srtd. v.fn.-v.c. S. bed. of same compl as above.	1/4" chind.
177.5				w/ up to 5% m. contains. 2-5mm. clots of mod. plastic M.	
				178.0	
				183-187: Next pg.	178.0-183.0: Core 28: B341B5
		100% #28			Drilled · 1·19·16
180.0	TK 11-22-16				

Reported By: A. Lantow | Reviewed By: T. Clark

Title: Geo. Tech. | Title: Geologist

Signature: A. Lantow | Date: 4·5·16 | Signature: [illegible] | Date: 11/22/16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 4·5·16

Well ID: C9550	Well Name: NA	Location: B-Cribs NW. Corner	
Project: 200-DV-1		Reference Measuring Point: Ground Surface	

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
180.0		#28	#28	178.0-178.8: ~~Sandy silt~~/silty Sand (50%m/50%s)	Sonic w/ 5' core
				non plastic, v. low dilatancy 2.5Y 4/3 olv. brn. moist	178.0-182.3': Core 28 : B34105
				w/ v.f.-m.S. 4mm bedding. pot. slough.	Drilled 1·19·16
				grades to gravelly Sand. from 178.5-178.8.	–
				•178.6'-178.8': 2" thick bed of v.c.pbl. oil stains on	181.7-183.0': overdriven. end of
182.5				clasts. matrix. black from pulverized bslt. clast.	core tube compacted into core.
183.0				178.8-180.0': gravelly ~~Sand~~ Sand gS (90%s, 10%g) v.pr.srtd.	2" chips of liner in core.
				bed. pot. ↓ fining; v.f.-v.c. subang. S. of 70% felsic/30% mafic	Temp registered. 147.9
				w/ v.f.- v.c. pbl. v.w.rndd. of 80% bslt./20% felsic meta & int. volc.	
				grad. grading to m.pbl. (down. fining).	
				180-183: gravelly Sand (gS) (90%s, 10%g) pr.srtd. m.-v.crs.	
				subang. S. of 40% felsic/60% mafic w/ sprs. v.w.rndd. m.pbl.	
				of 40% felsic, 60% bslt. 2.5Y 5/3 lt.olv.brn. moist. (bslt. > int. volc. > felsic meta.)	
				@ 180.7': pot. rip up clast of palagonite w/ vesicular ~~bslt~~ bslt.	
				v. weathered. to saprolite. mottled multi color olive green, pale yellow, bright white.	
182.5				Sandy Gravel (SG) TC 11-22-16	
183.0				183.1'-195.3': ~~gravelly Sand (gS)~~ (70%s, 30%g). mod. ~~w.~~ stratified.	183.1-188.1': core 29 : B34107
		Pulv.		↓ coarsening beds. 4-10" thick grading (100%) m.S. to m.S w/	Drilled 1·19·16
				c.pbl. of 90% bslt./10% felsic meta.	183.1-183.6: pulverized from
				•4" beds grade from 100% m.S. to 70% m-v.c.S./30% v.f.-f. pbl.	above overdrill
185.0				of 95% bslt./5% felsic. (Sand: 90% Qtz. flds/10% mafic.)	
		100% #29		•sprs. w/. srtd. m.-c. pbl. of 80% bslt, 20% felsic meta.	
				throughout. 2.5Y 5/3 lt.olv.brn moist. no rxn HCl.	
				185.3'-188.1': gravelly Sand gS (80%s/20%g). mod. srtd.	*187.1-188.1': overdrilled-pulverized
				bimodal: v.f.-c. sub.ang. S. of 90% Qtz. flds. w/ a.c. sub.ang.	
187.5		Pulv. *		mafic S. gravel: v.f. pbl. of 90% bslt./10% Qtz. 2.5Y 5/3 lt.olv.brn. moist.	
				no rxn w/ HCl. massive - no vis. bedding.	
					188.1-193.1': Core 30 : B34109
				188.1-193.1': gravelly Sand gS (90%s, 10%g) massive.	Drilled 1·19·16
				no vis. bedding. v.f.-v.c. sub.ang. S. of 60%-50% felsic,	
190.0				50-~~60~~ 40% Mafic. mod. srtd.-pr.srtd. w/ sprs. v.fn.-m.	181.1-181.3': pulverized from above
		100% #30		pbl. of 90% bslt./10% felsic meta. (sub-rndd.) TC 11-22-16	overdrive.
				no vis. bedding. massive? moist 2.5Y 5/3 lt.olv. brn.	
				no rxn HCl.	
					192.5-193.1': overdriven.
192.5					
					193.2-198.2': Core 31 : B34111
				193.2-198.2': Next pg.	~~193.2-194.3'~~: Drilled
					Next pg.
~~195.0~~ TC 11-22-16		#31			

Reported By: A. Lantau		Reviewed By: T. Clark	
Title: Geo. Tech.		Title: Geologist	
Signature: A. Lantau	Date: 4·5·16	Signature:	Date: 4/22/16

A-6003-642 (03/03)

9 (TC) 11-22-16

BOREHOLE LOG

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Date: 4·5·16

Well ID: C9550	Well Name: N/A.	Location: By Cribs NW. Corner
Project: 200-DV-1		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
195.0	B34T34 B34T35 (3·29·16)	100% #31		193.2-194.3': Sand (100%) v.w. srtd. v.f.-m.S of 95% felsic 5% mafic, 2.5Y 5/3 lt. olive brn no rxn HCl. (pot. slough.)	Sonic w/ 5' core 193.2-198.2: Core 31: B34111
				194.3-195.3': ~~silty~~ (TC 11-22-16) sandy gravel ~~mS~~ G (70%g, 20%S, 10%M) v.poor srtd. v.f.-v.c.S. of 70% felsic/30% mafic w/ w. rndd. (TC 11-22-16) v.f.-v.c. pbl. of 80% bslt, 20% felsic meta. w/ mod. plastic clayey silt. 2.5Y 5/3 grysh brn. no rxn HCl.	Drilled 1·19·16 Aliquot: 194.0-198.0 (3.29.16) B34T34, B34T35
197.5				195.3-198.2': ~~slightly silty~~ (TC 11-22-16) sandy gravel ~~mS~~ G (60-70%g, 40-30%S, ≤5%m) mod. srtd. ↓ coarsening v.f.-v.c. ang. S of 80% Qtz 20% mafic w/ ↑ ess. v.f.-v.c. pbl. of 60% felsic meta/40% bslt. overall coarsen. ↑ from v.f. silty S. to C. Sandy Gravel. moist 10YR 5/4 ylwsh brn. no rxn HCl. slight imbrication.	overdriven 197.6-198.2'
198.5				198.0-200.0': ~~gravelly sandy silt. ~~ gravelly silty sand (gmS) (TC 11-22-16) (50%m, 40%S, 20%g). uncompact, soft, non-plastic-low plastic silt. colored 10YR 4/2 dark ~~gray~~ ish brown, 2mm thick beds of v.f. sand colored 10YR 4/4 dark ylwsh brown. Contains v.f.-c. sub-ang. S of 80% Qtz. flds/20% mafic. + Gravel: ang. v.f.-m. pbl. of bslt. shards of metal + scale from drill pipe in top 2" of core.	198.0-200.0' Core 32: B34113 Drilled 1·19·16
200.0	TD	50% #32 slough	T.D.		

not used (TC) 11-22-16

Reported By: A. Lantow		Reviewed By: T. Clark	
Title: Geo. Tech.		Title: Geologist	
Signature:	Date: 4·5·16	Signature:	Date: 11/22/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 9
Date: 4·25·16

Well ID: C9549	Well Name: NA	Location: BY cribs: NE corner.
Project: 200-DV-1		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0				0-45: DPT	0-45.38: DPT
					no recovery
				7.2-9.7': split spoon 75% recovery	pulverized-overdriven.
				NEIS# B33122, B33123	
				see geo. field log. (10·6·2015)	45.6-TD. Sonic w/5' core.
45				45.6'-46.2': slightly silty sand (mSG) (15%m, 85%S, trc.g) v.f.-v.c. sub.rndd. Sand of 50/50% mafic/felsic w/ trc.g. of f. sub-rndd. bslt. pbl. moist soft. 2.5Y 4/2 dark grysh brn.	45.6-50.6': Core 1: B34115 Drilled 1·20·16
					C45.9': 2,400 dpm/100cm² βγ, 0α (open in containment box.)
47.5				46.2-48.8': gravelly Sand (gS) (90%S, 10%g, 0%m) v.pr.srtd. f.-v.c. sub-ang. S. of 50-60% Qtz. flds./50-40% mafic. w/ spcs. v.f.-v.c. sub-ang. pbl. of 50/50% bslt/meta.. 2.5Y 5/3 lt. olv. brn.	
		100% #1		48.0-48.8': Sand (gS) (95%S, 5%g, 0%m) mod. pr.srtd. v.f.-v.c. sub-ang. S. of 90% bslt./10% Qtz. flds. w/ spcs. v.f.-c. pbl of bslt. > int. volc.	
50.0				48.8-50.6': gravelly Sand (gS) (80%S, 20%g, trc.m) v.pr.srtd. v.f.-v.c. sub-ang. S. of 50/50% mafic/felsic w/ f.-v.c. sub-rndd.-w.rndd. pbl. of 70% bslt/30% meta. 2.5Y 5/3 lt. olv. brn.	
				50.7'-51.7': silty sandy gravel (mSG) (40%g, 45%S, 15%m) v.pr.srtd. v.f. S.-v.c. ang.-subang. S. of 50/50% mafic/felsic w/ w.rndd.-ang. v.f. pbl.-sm. cbl. of 50% bslt./50% meta. 2.5Y 4/2 olive brown. moist, no rxn HCl.	50.7-55.7: Core 2: B34117 Drilled 1·20·16
52.5		100% #2		51.7-55.7': Sandy Gravel (SG) (70%S, 30%G, trc.m) v.pr.srtd. massive bed. f.-ang. S.-v.c. subang. S. of 50/50% mafic/felsic w/ v.f.-w.rndd pbl. of bslt. + w.rndd. c. pbl.-sm. cbl. of 50%/50% bslt/metamorphics > int. volcanics. 2.5Y 5/2 grayish brown. no rxn HCl. moist.	(open in containment unit.)
55.0		Slough		55.6-60.6: Gravelly Sand (gS) (90%S, 10%g) v.pr.srtd. m.-v.c. sub-ang. S. of 50% Mafic/50% felsic w/ 50/50% mafic/felsic sub.rndd. m.-v.c. pbl. throughout. massive bed. no vis. structure. 2.5Y 5/3 lt. olv. brn. no rxn HCl. max clast: 64mm	55.6-60.6: Core 3: B34119
57.5		#3			
60.0		slough		60.6-61.4': gravelly Sand (gS) (70%S, 30%g) trc.m v.pr.srtd. v.f.-v.c. subang. S. of 60% felsic/40% mafic w/ sub-rndd. f.-v.c pbl. of bslt. (max 60mm.) trace m. 2.5Y 4/2 dark grysh brn. moist mod. rxn HCl.	60-60.6': overdriven. 60.6-65.6: Core 4: B34121 Drilled 1·21·16
61.0		#4			

Reported By: A. Lantau		Reviewed By: T. Clark	
Title: Geo. Tech.		Title: Geologist	
Signature: A. Lantau	Date: 4·25·16	Signature:	Date: 5/31/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 2 of 9
Date: 4·25·16

Well ID: C9549 | Well Name: NA | Location: BY cribs. NE. corner.
Project: 200-DV-1 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
62.0					
62.5		100% #4		61.4-61.6': gravelly silty sand (gmS) (60% S, 30% m, 10% g)	Tonic w/ 5' core
63.0				Coarsen ↑ from ms → gms. sharp contact below.	60.6-65.6': Core 4 : B34121
				v.f.-c. sub-ang. S. of 70% mafic/30% felsic. w/ v. rnd'd v.f.-f.	
64.0				pbl. of 50/50% mafic/felsic. non plastic high deleterious 2.5Y 4/3	
				drk grysh brn. fn. micas. moist. st. rxn HCl.	
65.0				61.6-65.6': gravelly sand (gS) (80% S, 20% g, trc m) 2-3' thick	beds of ↑ coarsening gS. mod-pr.
				stratified. v.f. S.-v.c. pebbley S. w/ trc. c. pbl. throughout.	
				Sand. v.f.-v.c. ang. S. 50/50% mof./felsic. w/ v.f.-f. sub-rnd'd.	pbl. of 50/50 mof.: felsic
				2.5Y 4/3 olv. brn. wk rxn HCl. moist.	
				@63.6: 2" thick ~~sandy~~ silty sand bed. mS. (70% S, 30% m, trc. g)	sharp lower contact.
				graded upper contact. w. stratified 70-30mm bedding. Colored	2.5Y 5/2 grysh brn. / 2.5Y 4/2 drk grysh.
				brn. coarsening ↑ w/ v.f.-m. ang. mafic/felsic (50/50%) S.	
				moist st. rxn HCl.	lightly overdriven.
65.0					
				65.7'-70.7': Sand (S) (100%) v.w.srtd.-mod.	65.7-70.7': Core 5 : B34123
				srtd. massive bed. c.-v.c. sub-ang. S w/	Drilled: 1·21·16
				trc. v.f. sub rnd'd. pbl. 50%/50% mafic/felsic.	
67.5		100% #5		moist. 2.5Y 4/3 olv. brn. no rxn HCl.	
				very uniform - no structure.	
70.0					end of tube damaged + melted.
				70.6-75.6: Sand (S) (100%) v.w.-mod. srtd.	70-70.6' overdriven. over heated.
				massive bedding. 2-4' thick. faint contacts. no vis.	
				grading. mod.-v.c. S. of 60% mafic/40% felsic.	70.6-75.6': Core 6 : B34125
72.5		#6		@71.9': 5" thick f.-m. S. of 80% felsic/20% mafic.	Drilled 1·21·16
				10YR 4/6 drk yksh brn.	
				@74.2': 5" thick m. to f. S. base of 2' bed.	
				pot. downward fining.	
75.0					75.6-80.6': Core 7 : B34127
		#7		75.6-78.4': Sand (S) (100%) v.w. srtd. m. sub-ang. S	Drilled 1·21·16
				of 50%/50% mafic: felsic 2.5Y 4/3 olv. brn. moist. no rxn HCl.	

Reported By: A. Lantow | Reviewed By: T. Clark
Title: Geo. Tech. | Title: Geologist
Signature: A. Lantow | Date: 4·25·16 | Signature: [illegible] | Date: 5/11/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 9
Date: 4·25·16

Well ID: C9549 | Well Name: NA | Location: BY cribs: NE. corner
Project: 200-DV-1 | Reference Measuring Point: Ground Surface.

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
77.5		#7		78.4-79.5': gravelly Sand (gS.) (85%S, 15%g) mod. srtd. m.-v.c. ang. S. of 50/50% mafic/felsic w/ vf.-f. pbl. ang. of bslt. (coarsest @ 78.8' max 8mm.) 2.5Y 5/3 lt. olv. brn.	Sonic w/ 5' core
				79.5-80.0': sand (S) (100%) fine grained. intbd. v.f.-c. ang. S. of 60% felsic Qtz felds/40% mafic. 2.5Y 6/1 gray. faint 2-5mm patchy Fe. staining. no rxn HCl.	75.1-80.6' Core 7 B34127
80.0				80.0-80.6': Sand (S) (100%) w. srtd. m.-c. ang. S. of 50/50% mafic/felsic. comp. 2.5Y 6/2 lt. brownish gray.	
		#8		80.7-85.7: Sand (S) (100%) mod.-w. srtd. no vis. structure-massive. m.-c. ang. S. of 60% mafic/40% felsic. tr. fn.-m. sub-rndd. pbl. of bslt. throughout. 2.5Y 4/3 olv. brn. moist.	80.7-85.7: Core 8: B34129
82.5					
85.0					84-85.7: overdriven-pulverized.
		#9		85.6-90.6': Sand (S) (100% S. tr. g) mod. srtd. m.-v.c. sub ang. S. of 60% mafic/40% felsic w/ tr. sprs. v.f.-f. sub-rndd. pbl. of bslt. throughout. faint 2-4' downward coarsening. from m. S. to v.c. S. w/ pbl.? 2.5Y 4/3 olv. brn. no rxn HCl	85.6-90.6': Core 9: B34131 Drilled 1·21·16
87.5					89-90.6': overdriven-pulverized.
90.0		#10		90.6-95.6': Sand (S) (100%) mod. srtd. crudely stratified. w/ 4"-2' beds. faint coarsening. w/ sharp lower contacts. f.-v.c. sub-ang. S. of 60% mafic/40% felsic tr. sub-rndd. fn. pbl. of bslt. throughout. 92.9': 1cm thick bed of fn.-m. S. of 90% felsic Qtz. 2.5Y 5/4 lt. olv. brn. moist. no rxn HCl	90.6-95.6: Core 10: B34133 Drilled 1·25·16 Top 2" of liner driven into core.
92.5					
95.0		#11		95.7-~~99.7~~ 98.7': Sand (S) 100% w. Srtd. stratified beds of f.-m S grading to m.v.c. S. of 60% mafic/40% felsic 2.5Y 5/2 grayish brn. no rxn HCl).	94.7'-95.6: overdriven-pulverized 95.7-100.7': Core 11: B34135 Drilled 1·25·16
97.5					

Reported By: A. Lowe | Reviewed By: T. Clark
Title: Geo. Tech. | Title: Geologist
Signature: A. Lowe | Date: 4·25·16 | Signature: [illegible] | Date: 5/11/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 4 of 9
Date: 4·25·16

Well ID: C9549	Well Name: NA	Location: NE corner of BY cribs.
Project: 200-DV-1		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
97.5		100% #11		95.7'-100.7': Sand (S) (100%) fine grain intvl. well stratified v.f.-v.c. S. of 80% Qtz. felsic/20% mafic. 4" layers.	Sonic w/ 5' core. 95.7-100.7': Core 11: B34135 Drilled 1·25·16
				@ 98.2 Top of bed. 2-3mm thick layer of v.f. S. of 99% Qtz flds 2.5Y 5/4 lt yllwsh. brn. trace mica.	
100				@100': 2" thick bed. of v.f.-m. S. of 80% felsic/20% mafic S. mod rxn HCl 2.5Y 6/4 lt. yllwsh brn.	
				100.1-100.7': Sand (S) (100%) w. srtd. massive down from v.c. S. to m. S. of 50/50% mafic/felsic.	coarsening S. ← not over driven
		100% #12		100.8-105.8': Sand S (98% S, <2% g) pr. srtd. v.f.-v.c. S. of 80% felsic/20% mafic w/ sprs. v.f. ang. pbl. of bslt. massive no vis. bedding. no rxn HCl. moist. 2.5Y 5/3 lt. olv. brn.	100.8-105.8': Core 12: B34137 Drilled 1·25·16
102.5					
105.0					← not over driven
				105.7'-110.7': Sand (S) (99% S, tra. g) mod. w. srtd. med.-v.crs. sub-ang. S.: 90% qtz flds./10% felsic. tra. fn. pbl. of bslt. 2.5Y 5/3 lt. olv. brn. moist. no rxn HCl.	105.7'-110.7': Core 13: B34139 Drilled: 1·25·16
102.5		100% #13			
110.0					← Not over driven. 110.6-115.6': Core 14: B34141
				110.6-115.6': Sand (S) (98-95% S, 2-5% g, 0% m) massive-no visible bedding. pr. srtd. m.-v.c. sub-ang. S. of 85% Qtz. flds./15% mafic. coarsest fractions more mafic w/ v.f.-f. w. rndd. pbl. of 95% bslt./5% meta.-int. Vok.	Aliquot 112.6-113.6': ~~Aliquot~~ 4·21·16
112.5	B352W7 B352W8 4·21·16	100% #14			
115.0				115.8'-119.6': Next pg.	115.8-120.8': Core 15: B34143 Drilled: 1·25·16
		100% #15			

Reported By: A. Lawton		Reviewed By: T. Clark	
Title: Geo. Tech.		Title: Geologist	
Signature: A. Lawton	Date: 4·25·16	Signature: [illegible]	Date: 5/11/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 5 of 9 (AZ 4-25-16)
Date: 4·25·16

Well ID: C9549	Well Name: NA	Location: BY cribs NE Corner
Project: 200-DV-1		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
117.5				115.8-119.6': Gravelly Sand (gS) (90%S, 10%g, 0%m) v.pr.srtd. m.-c. ang. S of 40% mafic/60% felsic (Qtz.) w/ v.f.-c. w.rndd pbl. of 70% felsic meta. > int. Volc / 30% bslt. crude & coarsening. 2.5Y 5/3 lt. olv.brn. no rxn HCl.	Sonic w/ 5' core. 115.8-120.8: Core 15: ~~B34142~~ B34143 (AZ 3-14-16) Drilled 1-25-16
120.0	115.8-120.8 Core 15 (AZ 5-9-16)	100% #15		119.6-120.8': Sand (S) (100%S) v.w.srtd. v.f.-f. Sand of 80% felsic, 20% mafic. 2.5Y 6/3 lt.ylwsh. brn. moist wk. rxn HCl. massive. Top 2" of unit contains v.f. S. w/ fn. lamina Colored 2.5Y 5/3 lt. olv. brn.	Sharp contact w/ above unit. not plastic.
122.5				120.8-123.4': Sand (S) (100%) v.w.srtd. v.f. Sand of felsic comp. 2.5Y 6/3 lt. ylwsh. brn. w/ filimentuous layers colored 2.5Y 3/2 v.drk.grysh brn. throughout. no rxn w/HCl moist (2-4 mm lamina) present.	120.7-125.7: Core 16: B34145
125.0	B352W9 B352X0 4-21-16	100% #16		123.4-124.0': Silt. (M) (100%) low. plastic. v. high delatency. med. density. mod. firm. 2.5Y 4/3 olive brown. mod. rxn w/ HCl. sharp contacts. moist. 124.0'-125.7': Sandy silt. (sM) (60% M, 40% S, 0% g) mod. w. srtd. ~~w. stratified~~ c. ang. S. of 80% Qtz. flds./20% mafic. stratified gradationally w/ silt. v. low. plastic. soft v. high delatency. 2.5Y 10.5YR 4/4 drk ylwsh. brn. moist.	123.4-124.7': Aliquot 4-21-16 B352W9, B352X0 m wk. rxn HCl abnt. mica present.
127.5	B352X1 B352X2 4-21-16	#17		125.8-130.8': Sand (S) (100% S) mod. w. srtd. subang.-ang. S. of 80% Qtz. flds./20% mafic. trc. mica. 2.5Y 6/3 2.5Y 6/3 lt. ylw. brn. (TC 5-11-16 slightly) contact observed by slough @ 125.5-127.5-128.0: Silty sand (mS) (85% S, 15% M, 0% g) v.f. S. of-c. S. of 80% Qtz. flds. /20% mafic crudely stratified & mixed matrix w/ w/ firm. non plastic silt. 2.5Y 6/3 lt. ylwsh. brn. moist mod. rxn w/ HCl. - st. rxn w/ HCl	125.8-130.8': Core 17: B34147 127.2-128.3': Aliquot 4-21-16 B352X1, B352X2 mod. impacted from drilling along edges. (rhind).
130.0	130.8-135.8 Core 18: B34149	#18		130.8-135.4': Sand (S) (100%) v.w.srtd. m.-v.c. subang. S of 60% felsic/40% mafic massive bedding. 2.5Y 6/3 lt. ylwsh brn. moist no rxn HCl	130.8-135.8: Core 18: B34149 Drilled 1-25-16
132.5				135.4-135.8: Silty gravelly Sand (mgS) (65% S, 20% g, 15% m) (Slightly TC 5-11-16) v.pr.srtd. v.f.-v.c. subang. S. of 60% felsic, 40% mafic w/ w.-sub-rndd. v.f.-c. pbl. of 95% bslt. / 5% felsic meta. w/ w. stratified 5-10mm beds overall 2.5Y 3/2 v.drk grysh brn. moist sprs. 5-5% c. pbl. max 20mm throughout.	
135.0		#19		@135.5': 3mm silt layer (100% m) non plastic high delatency 2.5Y 3/2 v.drk brn. non plastic.	135.7-140.7: Core 19: Next pg.

Reported By: A. Lantau		Reviewed By: T. Clark	
Title: Geo. Tech.		Title: Geologist	
Signature: [signature]	Date: 4·25·16	Signature: [signature]	Date: 5/11/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 6 of 9
Date: 4.25.16

Well ID: C9549	Well Name: N A	Location: BY Cribs. NE. Corner
Project: 200-DV-1		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
132.5		#19		135.7-140.7': gravelly Sand (gS)(90%S, 10%g, 0%m) AS 5.5.16 mod. w. stratified, 0.5-2' coarsening beds. of f.-m. S. grading to v.pr.srtd. m.-v.c. ang. S. of 50/50 mafic./felsic. w/ sprs. sub-rndd. m-c. pbl. of 50/50 mafic/felsic comp. coarsest pbl. at base of beds. 2.5Y 5/3 lt. olv. brn. moist. no rxn HCl	Sonic w/ 5' core 135.7-140.7': Core 19: B34151 Drilled 1.26.16
140.0				@ 135.5': 2" thick bed of pr.srtd. c. S w/ abnt. v.f. pbl. of 80% bslt./20% felsic meta. @ 137.8': 2" thick base of bed of c. S. @ 140.6-140.3': pr.srtd. intvl. of w. rndd f. S-m. pbl. (70% f. S, 30% c. S + m. pbl. of 70% felsic S/ /30% mafic coarse S. + mafic pbl.	
142.5		100% #20		140.6'-142.5': Sand (S)(95%S, 5%g, 0%m) mod. srtd. mod. w. stratified m-c. S. to v.c. pebbly Sand. of 60% Qtz flds./40% mafic. Beds 6" thick. 5mm blebby Fe staining. moist. AS 5.12.15 142.5-145.6': Sandy Gravel (sG)(60-50%G, 40-50%S) [pot. fining beds. 2.5Y 5/3 lt. olv. brn. no rxn HCl] mod. w. srtd., w. stratified in 6" beds.-2" beds. of fn. pbl.-mpbl. sand: pr.srtd. m.-v.c. ang. S. of 70% Qtz flds., 30% mafic. sprs. c.-v.c. w. rndd. pbl. of 50% bslt/50% felsic meta. throughout.	140.6-145.6': Core 20: B34153 Drilled 1.26.16 + w. srtd f. pbl. of 90% bslt./10% Qtz. moist. 2.5Y 5/2 grysh. brn. no rxn HCl
145.0					145.8-150.8': Core 21: B34155
147.5		98% #21		145.8-150.8: Gravelly Sand (gS)(85%S, 15%g, 0%m) mod. w. srtd.-pr.srtd. m.-v.c. Sand + c.-v.c. Sand w/ v.f.-f. sub-rndd. pbl. sorted into 2" to 6" beds. Sand: 60% Qtz flds./40% mafic. /Gravel: 95% bslt./5% felsic meta. 2.5Y 5/2 lt. olv. brn. no rxn HCl moist. (with) sprs. w. rndd. m.-c. pbl. of bslt. throughout.	Drilled 1.26.16
150.0				150.7'-153.2': Gravelly Sand (gS)(95%S, 5%g) mod. srtd. m.-c. sub-ang. S. of 60% Qtz flds./40% mafic. w/ sub-rndd f.-v.f. pbl. of bslt. similar to above intvl. 2.5Y 5/3 lt. olv. brn. Dry. no rxn HCl. Top + Bottom contain 6" of pulverized sed.	150.7-153.2': Core 22: B34157 Drilled 1.27.16 overdriven slough - pulverized in top of tube + bottom.
152.5		#22			
155.0		35% #23	AS 4.20.16 No Recovery	153.2-155.7: Sand (S) (100%S). Pot. slough. m.-v.c. S. of 85% bslt/15% Qtz flds. trc. fn. pbl. of bslt. throughout. 2.5Y 4/2 drk grysh brn. moist wk. rxn HCl.	153.2-155.7: Core 23: B34159 Drilled 1.27.16 25% recovery
	Aliquot B35 2x3 B35 2x4			155.7-160.6': Next Pg.	155.6-160.6': Core 24: B34161 Drilled 1.27.16 156.6-157.6: Aliquot

Reported By: A. Lantow		Reviewed By: T. Clark	
Title: Geo. Tech.		Title: Geologist	
Signature: A. Lanto	Date: 4.25.16	Signature: [illegible]	Date: 5/11/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 7 of 9
Date: 4-25-16

Well ID: C9549 | Well Name: NA. | Location: NE corner of B'cribs

Project: 200-DV-1 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
157.5	B35ZX3 B35ZX4	100% #24		155.6-160.6': Sand (S) (98%S, 2%g, 0%m) mod. w. srtd. c.-v.c. ang. S. of 85% Qtz. flds./15% mafic w/ faint crude. Stratified 2-3' beds. faint coarsening. @ 159.8': mod. srtd. pebbly sand sub-unit. f.-c. ang. S. similar to above. w/ v.f.-f. sub-rnd. pbl. of 80% bslt/20% meta. overall 2.5Y 6/2 lt. brownish gray. mod. dry. wk rxn HCl.	Sonic w/ 5' core 155.6-160.6': Core 24 B34161
160.0				160.6'-165.6': gravelly Sand (gS) (70%S, 10%g, 0%m) mod.-pr. srtd. m.-v.c. ang. S. of 75% Qtz. flds./25% mafic w/ v.f.-f. pbl. of 95% bslt./5% felsic (sub-rnd.) w/ trc. sprs. w. rnd. c. pbl. of 90% bslt/10% felsic meta > int. vol. faint 2"-5" thick weakly stratified beds throughout. no v.s. grading. trc. crs. mica. 2.5Y 5/3 lt. olv. brn. no rxn HCl.	160.6-165.6': Core 25: B34163 Drilled 1-27-16
162.5		100% #25			
165.0				165.6'-170.6': Gravelly Sand (gS) (90%S, 10%g, 0%m) mod.-pr. srtd. c.-v.c. ang. S. of 70% Qtz. flds./30% mafic w/ sprs. w. rnd. v.f.-f. pbl. of bslt. - trc. w. rnd. c. pbl. of 50% meta./50% bslt. 2.5Y 5/3 lt. olv. brn. moist. no rxn. HCl.	165.6-170.6': Core 26: B34165 Drilled 1-27-16
167.5		100% 95% #26			
					not overdriven
170.0				170.7-175.7': Gravelly Sand (gS) (95%S, 5%G, 0%m) v. similar to above. mod. srtd. c.-v.c. ang. S. of 75% Qtz. flds./25% mafic w/ sub ang. f.-v.f. pbl. of 90% bslt, 10% felsic. Crudely stratified w/ faint mod. w. srtd. beds 1"-6" thick of c. S. 2.5Y 5/3 lt. olv. brn. moist. no rxn HCl @ 171.5': 6" w. srtd. bed of m.-c. S. (75% mafic/25% felsic)	170.7-175.7': Core 27: B34167 Drilled 1-27-16
172.5		100% #27			
175.0				175.8-180.8': Next pg.	175.8-180.8': Core 28: B34169 Drilled 1-27-16
		#28			

Reported By: A. Lantau | Reviewed By: T. Clark

Title: Geo. Tech. | Title: Geologist

Signature: [signature] | Date: 4-25-16 | Signature: [signature] | Date: 5/11/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 8 of 9

Date: 4.25.16

Well ID: C9549 | Well Name: NA | Location: NE. corner of BY cribs

Project: 200-DV-1 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
177.5				175.8-180.8': Gravelly Sand (gS) (90%S, 10%G, 0%m) AK 5-18-16	Sonic w/5' core.
				mod.-pr. srtd. crudely stratified m.-v.c. S. of 85-90% Qtz. flds. /15-10% mafic w/ v.f.-f. sub-rndd.-ang.	175.8-180.8: Core 28 : B34169
		100% #28		pbl. of 90% bslt. /10% felsic. meta. > int. volc.	Drilled 1-27-16
				trc. w. rndd. m. pbl. of felsic. comp. throughout. trc. f. pbl. of carbonate (w. rndd.) present.	
180.0				throughout. 2.5Y 5/3 lt. olv. brn. no rxn HCl. moist	
				@ 180.0: 2-5mm clots of pabogunite clay colored block, yellow brn. + white.	
				2.5Y 6/6 olive yellow, pot. rip up clast.	
				180.6'-185.6': Gravelly Sand (gS) (85%S, 15%g, 0%m)	180.6-185.6: Core 29 : B34171
				poorly stratified. pot. coarsening beds 2' thick grading	Drilled 1-27-16
182.5				from m.-c. ang. S. w/ sprs. v.f. bslt. pbls. -grading to	
				v. pr. srtd. m.-v.c. ang. S. of 50% mafic/50% felsic comp. w/	
		100% #29		up to 15% v.f.-v.c. pbl. of bslt. (10% meta./90% bslt.)	
				max pbl 60mm, avg clast: 4mm-6mm. of 90% bslt.	
				2.5Y 6/2 lt. brownish gray. moist	
185.0				overall coarsest grannuls of bslt. + Sand fraction of	
				Qtz flds. no rxn HCl. trc. clay clots 2-5mm. lt. yl. brn. colored.	
				185.8'-187.5': Gravelly Sand (gS) (85%S, 15%G 0-3%m)	185.8-180.8: Core 30 : B34173
				m.-c. ang. S. of 80% Qtz flds/20% mafic. w/ v.f.-v.c. pbl. (sub-ang.)	Drilled 1-27-16
	Aliquot. B352X5 B352X6 (4-25-16)			of 70% meta./30% bslt. slight coarsening similar to above. 2.5Y 4/2 lt. brownish gray. slight brown + tan coating	
187.5				of silt. on largest clasts. 2.5Y 6/6 olive yellow + 7.5YR 4/6 strong brown. w/k rxn HCl. sharp contact below.	
	187.8-188.8'			187.7-188.1': Sandy Gravel (sG) (40%S, 60%G, trc. m) AK 4-25-16	Aliquot: 186.8-187.8'
		100% #30		v.f. felsic S. w/ 10% c.-v.c. ang. mafic S. matrx. w/ f.-v.c. pbl. of 60% meta./40% bslt. (sub-w. rndd.)	
				no rxn HCl. moist 10YR 5/3 brn. no clay. non plastic.	
				188.1-190.8': Sandy Gravel (gsG) (75%G, 15-20%S, 5-10%m)	v. pr. srtd. v.f.-v.c. ang. S. of 60% Qtz. flds.
190.0				40% mafic w/ w. rndd. sub-rndd v.f.-v.c. pbl. of 75% meta > int. volc. /	25% bslt. 2.5Y 5/4 lt. olv. brn. matrx.
				moist no rxn HCl.	
				190.7'-195.4': Sandy Gravel (sG) (75%G, 20%S, <5%m)	190.7-195.7: Core 31 : B34175
				v. pr. srtd. m.-v.c. ang. S. of 70% Qtz flds. /30% bslt.	Drilled 1-28-16
		Slough		w/ v.w. rndd. (discoidal + equant) f. pbl.-sm. cbl. of	
192.5				80% Meta > int. volc. /20% bslt. pr.-mod. weathered	
				matrx color 10YR 5/3 brown-10YR 4/3 drk yl wsh. brn. no rxn HCl.	
				Sandy Silty Gravel (mSG) (60%G, 20%S, 15-5%m)	
		80% #31		195.4'-195.7': v. pr. srtd. v.f.-v.c. ang. S. of 80% felsic/20% mafic w/ w. rndd.	
195.0				f. pbl.-sm. cbl. of 80% meta > int. volc. /20% bslt. silt. is	
				10YR 4/3 drk yl wsh brn. mod.-non plastic non-clayey. high	
				delatency. no rxn w/ HCl. moist	195.7-200.7' Core 32: B34194 B34195
		#32		195.7-200.7': Next Pg.	

Reported By: A. Lantau | Reviewed By: T. Clark

Title: Geo. Tech. | Title: Geologist

Signature: A. Lantau | Date: 4.25.16 | Signature: [illegible] | Date: 5/11/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 9 of 9
Date: 4.25.16

Well ID: C9549 | Well Name: NA. | Location: NE. corner of BY cribs.

Project: 200-DV-1 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
197.5	B352X7 B352X8 (4-25-16)	100% #32		195.7'-200.7': Sandy Gravel (SG) (75-80% G, 25-20% S, trace M) mod.-v.pr.srtd. c.-v.c. ang. S. w/ 5-10% f.-m. S. of 80% Qtz.flds./20% mafic. w/ 75% felsic meta./20% bslt. v.w.-sub.rndd. felsic. + sub-rndd-ang. bslt. lith.: (Meta. > Qtzite > int. Volc. lapili tuff > Granitoid. > bslt.) matrix: obscured by pulverization adjacent to lrg. clasts. clasts of fn. pbl.-lrg. cbl. max clast: 130mm. + 10YR 3/3 drk. yellowish brown moist no rxn w/ HCl. -wk. rxn. w/ HCl. under clasts. wk. imbrication. crude stratified. w/ ↓ coarsening over intvl. from m. pbl.-lrg. cbl. avg. sized.	Sonic w/ 5' core 195.7-200.7': Core 32: B34H95 (: Aliquot 4.25.16 197.7-199.2') collect Aliquot between zones of pulverization. AZ 5.19.16 ~~TD@200.7' bgs.~~ TD@200.7' bgs.
200.0		T.D.			
202.5					

Not used. AZ 5.10.16

Not used. AZ. 5.10.16

Not used. AZ. 5.10.16

Reported By: A. Lantow		Reviewed By: T. Clark	
Title: Geo. Tech.		Title: Geologist	
Signature: Adam Lantow	Date: 4.25.16	Signature: [illegible]	Date: 5/11/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 8
Date: 5·10·16

Well ID: C9552 | Well Name: NA | Location: 216-B-45/6 Cribs.
Project: 200-DV-1 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0					0-45.5': DPT
					▨: no Recovery
					▩: Over driven-Pulverized.
45.0		No Core AK 5-10-16			45.5- TD: Sonic w 5' core x 4" diameter.
			150% #1	45.5'-47.0': ~~gravelly~~ Sand. (TD 5-11-16) (S) (95%S, 5%G, 0%m) pr. srtd. m.-v.c. ang. S. of 50/50% mafic:felsic. w/ v.f.-c. pbl. of 50/50% mafic:felsic composition v.w. rndd. max: 20mm. 2.5Y 5/3 lt. olv. brn. moist no rxn HCl	45.5-47.0': Core 1: B34177 Drilled 2·8·16 45.5-45.7': 2" of slough. 45.7-46.0': Compacted & pulverized by DPT
47.5			170% #2	47.2'-49.7': ~~Gravelly~~ Sand (TD 5-11-16) (S) (95%S, 5%G, 0-10%m) pr. srtd. f.-v.c. ang. S. of 50/50% mafic:felsic comp. w/ trc. f. mica. w/ v.f.-m. pbl. of 50/50% felsic:mafic. @47.7': 4" thick silty sand (mS) (80%S, 20%m) soft. 2.5Y 4/4 olive brn. moist mod. rxn HCl. v.f.-c. ang. S. of 50/50% mafic:felsic	47.2-49.7': Core 2: B34179 Drilled 2·8·16
50	B34181	49.5-52.0': B34181	80% #3	49.5'-52.0': gravelly Sand (gS) (85%S, 15%-20%g, trm) pr. srtd. m.-v.c. subang-ang. S. of 70% mafic/30% Qtz. flds. w/ w. rndd. f.-c. pbl. of 50/50% mafic:felsic. 2.5Y 4/4 olv. brn. moist. pot. ↓ coarsen in 2-4' beds. from f. pbl.-c. pbl. max clast sizes. no rxn HCl	47.5-52.0': Core 3: B34181
52.5				52.2-57.2': gravelly Sand (gS) (75-80%S, 25-20%g) 0%m pr. to mod. srtd. mod. w. stratified. sand & gravelly sand. in 4-6" beds. w/ graded contacts. m.-v.c. ang. S. of 70% Qtz. felds/30% mafic. w/ beds of v.f.-m. sub-rndd. pbls of 90% bslt./10% meta > int. volc. 2.5Y 5/3 lt. olv. brn. no rxn HCl.	52.2-57.2': Core 4: B34183 Drilled 2·8·16 53.7-55.7': Aliquot 5·4·16 B35416, B35417, B35530
55.0	5-4-16 B35416 B35417 B35530	52.2-57.2': B34183	#4	56.1-57.2': gravelly Sand (gS) (90%S, 10%g, trm) more fine grained interval. of v.f.-v.c. ang. S. w/ 2" beds of gravelly sand containing f.-c. sub-rndd. pbl. of 90% bslt./10% meta > int. volc. 2.5Y 5/4 lt. olv. brn. no rxn HCl. @55.7': 4mm thick bed of m. S. of 99% Qtz. fc lbs. 2.5Y 5/4 lt. olv. brn. no rxn HCl.	
57.5				57.2-57.6': ~~silty Gravelly silty Sand~~ (gmS) (20%g, 60%S, 20%m) pot. slough. v.f.-v.c. ang. S. w/ v.f.-f. sub-ang. pbl. of 80% bslt./20% Qtz. flds. 2.5Y 4/4 olv. brn. mod-st. rxn HCl. moist.	Slightly silty Gravelly Sand (gmS) 57.2-62.2': Core 5 Drilled 2·8·16
60.0		57.2-62.2': B34185	#5	57.6'-62.2': Sand (S) (99%S, 1%g, 0%m) mod.-w. srtd. mod. w. stratified beds 1-1.5' thick of c. ang. S.; m. ang. S. & pebbly c.-v.c. ang. S. w/ v.f.-f. ang. bslt. pbl. overall comp. 50/50% mafic:felsic. w/ spcs. w. rndd. m. pbl. of mix. lith. throughout. 2.5Y 5/3 lt. olv. brn. @61.1': 4mm thick silty sand bed (mS) (50%m, 50%S) w/ non plastic silt. 10YR 5/6 yellowish brn. no rxn HCl.	no rxn HCl. of v.f.-m. ang. felsic sand.

Reported By: A. Lantau | Reviewed By: T. Clark
Title: Geo. Tech. | Title: Geologist
Signature: A. Lantau | Date: 4/26/16 | Signature: [illegible] | Date: 5/11/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 2 of 8

Date: 5·10·16

Well ID: C9552 | Well Name: NA | Location: BY cribs

Project: 200-DV-1 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
62.5	62.1-67.1: Core 6: B34187	100% #6		62.1-67.1: Sand (S) (99% S, 1% g, 0% M) v.w.srtd.	Sonic w/ 5' core.
				C.-v.c. ang. S. of 50/50% felsic:mafic comp. w/ trc. v.rndd.	62.1-67.1: Core 6: B34187
				f.-m. pbl. of mixed lith. (50/50% mafic:felsic comp.)	Drilled 2·8·16
				2.5Y 5/3 lt. olv. brn. no rxn HCl. moist massive bedding-no v.s. structure.	
				@ 65.7': 1" thick layer of f.-v.c. S. of 20% v.f.-f.	
65.0				Sand of Qtz. flds. + 80% C. ang. Sand of 50% mafic, 50% felsic.	
				10YR 5/4 ylwsh. brn. moist. no rxn HCl.	
				67.1-70.4': Sand (S) (100% S, trc. g) w.srtd. v.w.	
				stratified in ½" to 1.5' beds. of m. Sand of 95% Qtz.	
				felds/5% mafic. + c.-v.c. ang. S. of 70% bslt./30% Qtz. felds.	67.1-72.1: Core 7: B34189
67.5		Compact from above		2.5Y 5/3 lt. olv. brn. no rxn HC. trc. fn. pbl. of bslt.	69.6-70.6': Drilled 2·8·16
				@ 67.5': Pot. slough? f.-m. S. of 60% Qtz. flds./40% mafic.	69.6-70.6': Aliquot (5·5·16)
				2.5Y 5/2 grysh brown. st. rxn HCl. v. firm. (1" thick)	B34189, B35531, B35532
				70.4-72.1': Sand (S) (100% S) v.w.srtd. massive bed.	
	5·5·16 B35531 B35532			C. ang. S. of 80% Qtz flds./20% mafic w/ sprs. fn.	
70.0	67.1-72.1: B34189	#7		w.rndd pbl. of Meta. > int. volc. > bslt. 2.5Y 5/3 lt. olv. brn.	
				no rxn HCl.	
72.5	72.2-77.2: Core 8: B34191	100% #8		72.2-77.2': Sand (S) (100% S, 0% g, 0% m) w.srtd. w.strat.	72.2-77.2': Core 8: B34191
				w/ m.-c. S. + v.c. subang. S. of 70% Qtz. flds, 30% mafic.	Drilled 2·8·16
				w. stratified w/ 1" to 1' thick beds. w/ faint coarsening.	
				@ 72.6': 2" thick bed of silty Sand (m S) (70% S, 30% M, 0% g)	
				70% v.f.-c. sub-ang. qtz. flds. Sand w/ ~30% mafics. in coarser fraction.	
75.0				mod. firm. non-plastic. 2.5Y 5/3 lt. olv. brn. st. rxn w/ HCl	
				-75.3-76.1': w.srtd. bed. of Sand m. S. w/ 2mm thick	
				layer at its base of f.-m. S. colored 10YR 5/4 ylwsh brn. v.wk. rxn HCl.	
					77.2-82.2': Core 9 B34193
77.5	77.2-82.2: B34193	100% #9		77.2-82.2': Sand (S) (100% S) w.srtd. m.-v.c.	Drilled 2·9·16
				sub-ang. S. of 50% felsic/50% mafic comp. massive bed.	
				4 to 5' thick. (75.3' to 80.2') 2.5Y 5/3 lt. olv. brn. no rxn HCl. moist.	
				-80.2-82.2': Top of more fine grained bed. (of:	
				20% f.-m. S. + 80% m.-c. S. of 50/50% mafic:felsic	
81.0				2.5Y 6/3 lt. ylwsh. brn. no rxn HCl.	
				@ 80.9': 2mm thick layer of f. Sand of Qtz. flds.	
				colored 10YR 5/6 ylwsh brn. slight ylwsh brown Fe^{+}	
				staining (pervasive) on 2" above f. sand layer.	
82.5					

Reported By: A. Lontau | Reviewed By: T. Clark

Title: Geo. Tech. | Title: Geologist

Signature: [signature] | Date: 4·27·16 | Signature: [signature] | Date: 5/11/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 8
Date: 5·10·16

Well ID: C9552 | Well Name: NA | Location: B4 Cribs

Project: 200-DV-1 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
82.5	#4 →			82.2'-85.2': Sand (S) (100% S.) v.w.srtd. w.stratified w/	Sonic w/ 5' core
				1.5' beds of w.srtd. m. S. of 85% Qtz. flds., 15% mafic	82.2-87.2': Core 10 : B34195
				colored 2.5Y 5/3 lt.olv.brn. & interspersed 2-5mm beds of f.-m.	Drilled 2·8·16
	5·5·16 B35597 B35598 B35599			S. of 95% Qtz flds. / 5% mafic, 2.5Y 5/4 lt.olv.brn. no rxn HCl.	83.7-86.2': Aliquot (5·5·16)
				85.2-87.2': Sand (S.) (100% S. tr. g.) mod. srtd.	B35597, B35598.
85.0				m.-v.c. sub-ang. S. of 70% bslt. / 30% Qtz. flds. trc. pbl. of	B35599
				bslt. Sharp contact above. 2.5Y 5/2 grysl brn. - 5mm patchy Fe+ stains. -	
	82.2-87.2 : B34195	#10	Inclined beds	@85.2': 1" thick bed. silty Sand (m S) (90% S. 10% M) v.f. S. of Qtz. flds. firm. nonplastic w/ silt	
				2.5Y 5/4 lt.olv.brn. wk.rxn. - Inclined beds	
				@85.55': 4mm thick silty Sand of v.f. S. w/ mod. plastic M. 2.5Y 5/4 lt.olv.brn. wk. rxn HCl.	87.1-92.1': Core 11 : B34197
87.5		Compacted from above		87.1-92.1': gravelly Sand (gS) (90% S, 10% g, 0% M)	Drilled 2·9·16
				mod.-pr.srtd. w. stratified m.-v.c. S. of 50/50% mafic felsic.	
				w/ v.f. sub-rndd. pbl. of bslt. (~10% felsics / 90% bslt.)	
				2.5Y 6/1 gray - 2.5Y 5/3 lt.olv.brn. moist no rxn HCl. (6"-2.5' bedding. & coarsening.)	
				@12.7-12 5mm splotchy stains Fe+ 2.5Y 5/6 lt.olv.brn.	
90.0	87.1-92.1 : B34197	100% #11		@ 89.7-91.0': 6" bed of more coarse matl. contains v.f.-c. pbl.	
				of bslt. in sand matrx. pot. base of bed.	
				sharp contact below.	Tol end full of overpacked
					slough. - bedding curved down
					hole.
92.5				92.2-97.2': Sand (S) (100% S) mod.-w.srtd.	92.2-97.2': Core 12 optional-1
				mod.-pr. stratified S. beds 1"-2ft. thick 1"-2ft. thick	Drilled 2·9·16 B34K31
				w. faint. & coarsening from w.srtd. c. S. to mod. w.	
				srtd. m.-v.c. ang. S. of 70% Qtz. flds. / 30% mafic.	
				2.5Y 6/2 lt. brownish gray. moist. no rxn HCl.	
95.0	92.2-97.2 : B34K31	#12 optional #1		trc. crs. mica.	
97.5				97.5-112.2': no core provided.	
100.0			No Core		
102.5					

Reported By: A. Lanton | Reviewed By: T. Clark

Title: Geo. Tech. | Title: Geologist

Signature: [signature] | Date: 4·28·16 | Signature: [signature] | Date: 5/11/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 4 of 8
Date: 5·10·16

Well ID: C9552 (TC) 5-11-16 | Well Name: N.A | Location: BY Cribs

Project: 200-DV-1 (TC) 5-11-16 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
102.5					
105.0					
107.5					
110.0					
				112.2'-117.2': Sand (S) (99% S, trc. g, 0% m)	112.2-117.2': Core 15: B341B5
112.5	Sloughy, Compressed			pr. srtd. pr. consolidated. dry. m.-v.c. sub.ang. S of 60% Qtz. flds/40% mafic. w/ trc. w.rnd. m.pbl. of bslt. 2.5Y 6/2 lt. brownish gray. v.wk. rxn HCl. @ 116.0': 6" zone of ½" to 1" thick inclined bedding of more mafic matl. ½ beds of 80% mafic/20% Qtz.; 1" beds of 60% Qtz. 40% mafic. grain size all the same. (m-v.c. Sand.) - no Fe staining.	Drilled 2-9-16; 113.2-116.2 Aliquot + DUP; B355V8, B355V9; ~~B355K~~ (B35KB1, B35KB2: DUP)
115.0	5-9-16 B3 B355V8, B355V9 (B35KB1, B35KB2) DUP, B35KB2	112.2-117.2: B341B5	#15		
117.5	Compressed			slightly (TC) 5-11-16 117.2'-118.2': silty sand + Sand (mS + S) beds. mS: (20%m, 80%S); S: (5-10%m, 95-90%S) ½"-3" thick beds of mS. of v.f.-c. sub-ang. S. of 70% Qtz. 30% mafic. w/ non-plastic M. 2.5Y 5/3 lt. olv. brn. st. rxn HCl. w/ 2"-3" beds of S. of v.f.-v.c. sub-ang. S. of 25% mafic/ 75% felsic. 2.5Y 6/2 lt. brownish gray.	117.1-122.1: Core 16: B34B7 Drilled 2-10-16; 117.5-121.6': Aliquot (B355W0, B355W1, B355W2)
120	5-9-16 B3550, B3551, B3552	117.2-122.1: B34B7	#16	118.2-122.1': Sand. (S) (100%) pr. srtd. m.-v.c. sub-ang. S. of 70% Qtz./30% mafic 2.5Y 5/3 lt. olv. brn. no rxn HCl @ 118.2-118.5': Coarse grained bed @ contact of m.-v.c. ang. S. of 20% Qtz. fell/80% mafic (c.-v.c. grains of 100% bslt.) wk. rxn HCl.	(massive bed) (faint ½" patchy Fe stains)
122.5					

Reported By: A. Lantau | Reviewed By: T. Clark

Title: Geo. Tech. | Title: Geologist

Signature: A. Lantau | Date: 4-28-16 | Signature: [illegible] | Date: 5/11/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 5 of 8
Date: 5·10·16

Well ID: C9552
Well Name: N1A (TC) 5-11-16
Location: By Cribs
Project: 200-DV-1
Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
122.5	#16	overdriver slough from above.		122.5-126.8': Sand (S) (99% S, 1% Gr, 0% m) mod. srtd.	1 Sonic w/ 5' core
				c.-v.c. ang. S. of 65% Qtz. flds/45% mafics. w/	122.5-127.5': Core 17: B341B9
				trc. c. pbl. of bslt. throughout. - no grading.-	Drilled 2-10-16
				2.5Y 6/2 lt. grysh. brn. sprs. Fe+ splotchy staining.	
				i trc. white mica. v. wk. rxn HCl.	
125.0	122.5-127.5: B341B9	#17		126.8-127.5': Sand (S) (100% S) w. srtd. w. stratified	
				m. S. grading to c. S. of 60% Qtz flds. -40% mafic.	(2.5Y 6/2 lt. grysh. brn.) moist.
				@126.9': 4mm thick layer of ~~mafics~~ 12-4-28-16 mafics + garnet.	
				2.5Y 3/1 v. drk. grey.	
127.5					
				127.5-142.3': no core provided. AL. 5·10·16	
130.5					
132.5					
135.0			no core	AL. 5·10·16	
137.5					
140.0					
142.5					

Reported By: A. Lontan
Title: Geo. Tech.
Signature: Aaron Lontan
Date: 4-28-16

Reviewed By: T. Clark
Title: Geologist
Signature: [illegible]
Date: 5/11/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 6 of 8
Date: 5·10·16

Well ID: C9552 | Well Name: NA | Location: By Cribs
Project: 200-ZP-1 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
142.5				142.3-142.8: Slightly Silty Gravelly Sand. (gmS)(10%g, 20%m, 70%S)	Sonic w/5' core.
				pr.srtd. v.f. ang. S. of Qtz.flds. of L.-v.c. sub-ang. S. of 65% Qtz flds/35% mafic. w/ sub-rndd. f.-c. pbl. of bslt. w/silt. of non-plastic. v. high dilatancy. moist 2.5Y 4/2 drk. grysh. brn. st. rxn w/HCl. pot. slough.- graded contact below.	142.3-147.3: Core 21: B341C7 Drilled 2·11·16
				142.8'-147.3': Sand (S.) (95%S 5%g, 0%m)	
145.0		100.8 #21		v.pr.srtd. f.-v.c. ang. S. of 65% Qtz flds/35% mafic w/ v.f.-c. pbl. of bslt. > int. volc. throughout. 5mm patchy Fe+ staining throughout. 2.5Y 5/3 lt. olv. brn. v.wk. rxn HCl.	
		142.3-147.3: B341C7 overdriven		(2-6" zones containing additional) f. Sand.	147.3-152.3': Core 22: B341C9 Drilled 2·11·16
147.5				147.3-152.3': Sand (S) (98%S, 2%g, 0%m)	
				w.srtd. w. Stratified Sand (½" to 2.5' beds) of m.-v.c. ang. S. of 70% Qtz flds/30% mafic & v.c. S. of 50% Qtz. flds/50% mafic. Coarse grained beds contain 2% v.w.rndd. f.-v.f. pbl. of int. volc. > bslt. > meta.	
150.0		147.3-152.3: B341C9 #22		Colors: Coarse grained intervals: 2.5Y 6/2 lt. brownish gray moist fn. grained intvls.: 2.5Y 5/3 lt. olv. brn. moist no rxn HCl. - v.wk. rxn HCl. sprs. 5mm patchy Fe+ stains.	
152.5	Slough from surface			152.3-157.2: Sand (S) (99%S, 1%g, 0%m)	152.2-157.2: Core 23: B341D1 Drilled 2·11·16
	5·9·16			v.w. stratified. ½" to 6" beds. of w.srtd. c. sub-ang. S. of 85% Qtz. flds/15% mafic, 2.5Y 5/4 lt. olv. brn. moist no rxn HCl) & pr.srtd. m.-v.c. sub-ang. S. of 65% Qtz, 45% mafic. 2.5Y 5/2 lt. olv. brn. no rxn HCl. beds slightly inclined.	153.7-155.7': Aliquot (5·9·16) B355W3, B355W4
155.0	B355W3 B355W4	152.2-157.2: B341D1 #23			
				157.2 - Sand. (S) (99%S, 1%g, 0%m)	157.2-162.7': Core 24: B341D3 Drilled 2·11·16
157.5				mod. srtd. mod. w. stratified. S. of m.-v.c. ang. S. of 70% Qtz. flds/30% mafic w/ 1/2"-2" beds of m.-v.c. S. of 80% Qtz. flds./20% mafic. sprs. v.w.srtd. f.-m. pbl. of 90% bslt/10% meta. Coars beds: 2.5Y 6/2 lt. brownis. grey moist fn. beds.: 2.5Y 5/3 lt. olv. brn. moist. no rxn - v.wk. rxn HCl. sprs. 5mm patchy Fe+ stains.	
160.0		152.2-162.7' #24			
162.5					

Reported By: A. Zantua | Reviewed By: T. Clark
Title: Geo. Tech. | Title: Geologist
Signature: A. Zantua | Date: 5·10·16 | Signature: [illegible] | Date: 5/11/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 7 of 8
Date: 5·2·16

Well ID: C9552	Well Name: NA	Location: 13 Cribs	
Project: 200-DV-1		Reference Measuring Point: Ground Surface	

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description (Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level)
162.5	162.2-167.2: B341D5	#25		162.2'-167.2': Gravelly Sand (gS) (75-80%S, 20-25%g)	Sonic w/ 5' core.
				pr. srtd. m.-v.c. ang.-sub-ang. S. of 60% Qtz. flds.	162.2-167.5: Core 25: B341D5
				40% bslt. w/ v.f.-f. pbl. of bslt.	Drilled 2·16·16
				@163.4': 1" bed of mod. w. srtd. f. pbl. of	
				bslt. sub-rndd. w/ <10% Sand. — broken clast of chert. colored red. in bed.	
165.0				@ 134.7': 1" bed of 70% f. pbl. of bslt. + 10%	
				m.-v.c. ang. S. of 70% bslt. / 10% Qtz. flds.	
				overall 2.5Y 6/2 lt. grysh. brn. moist no rxn HCl.	
				trace w. rndd. m. pbl. of bslt. throughout.	
				faint 5mm patchy Fe+ staining.	
167.5	167.3-172.3: B341D7	#26		167.3-169.3': gravelly Sand (gS) (90%S, 10%g, 0%m)	167.3-172.3': Core 26: B341D7
				similar to above. pr. srtd. m.-v.c. ang.-subang. S. of	Drilled 2·16·16
				60% Qtz. flds. / 40% mafic. w/ trc. f.-m. pbl. of 50% bslt / 50% mafic.	
				2.5Y 6/2 lt. brownish. gry. no rxn HCl.	
170.0				169.3'-172.3': gravelly Sand (gS) (95%S, ~5%g, 0%m)	
				mod. srtd.-pr. srtd. more fine grained intvl. of Bimodal	
				Bimodal: f.-m ang. S. of 90% Qtz. flds. / 10% mafic + v.c. ang.	
				S. of 80% mafic, 20% Qtz. flds. w/ 5% fn. pbl. of bslt. +	
				sprs. w. rndd. m.-c. pbl. of 70% Meta. / 30% bslt.	
				2.5Y 5/3 lt. olv. brn. moist. no rxn HCl	172.3-177.3: Core 27: B341D7
172.5				172.3'-177.3': gravelly Sand (gS) (90%S, 10%g, 0%m)	Drilled 2·16·16
				v. pr. srtd. massive bed of m.-v.c. ang. S. of	173.3-176.3': Aliquot (5·10·16)
	5·10·16			70-80% Qtz. flds. / 30-20% mafic. w/ v.f. sub-ang. pbl.	B35F0, B35F1, B35F2
	B35F0, B35F1, B35F2			of bslt. contains trc. sub-rndd. m. pbl. of 50% bslt /	
				50% meta. > int. vole. throughout. 2.5Y 5/3 lt. olv. brn.	
175.0	173.3-177.3: B341D7	#27		no rxn HCl. moist	
				@173.0-173.4': faint coarsening bed from m-c. S. of	
				80% Qtz. flds. / 20% mafic. to 70% c.-v.c. sub-ang. S. of	
				70% Qtz. flds. / 30% mafic.	
				@176': 6" zone of faint 50% inclined bedding (steep)	177.1-182.1: Core 28: B341F1
177.5	177.1-182.1: B341F1	#28		177.1-182.1: gravelly Sand (gS) (90%S, 10%G, 0%m)	Drilled 2·16·16
				mod.-w. srtd. m.-v.c. sub-ang. S. of 80% Qtz. flds. / 20%	
				mafic. w/ m.-c. sub-rndd. pbl. of 50% bslt. / 50% meta. > int. vole.	
				@ 178.8': w. srtd. f.-c. ang. S. of 90% Qtz. flds. / 10% mafic. (more fine grained bed ~2" thick)	
				overall 2.5Y 5/3 lt. olv. brn. no rxn HCl.	
180.0				1-2mm Fe+ staining.	
				mod. consolidated.	
182.5					

Reported By: A. Lantau		Reviewed By: T. Clark	
Title: Geo. Tech.		Title: Geologist	
Signature: A. Lantau	Date: 5·2·16	Signature: [illegible]	Date: 5/11/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 8 of 8
Date: 5·10·16

Well ID: C9552 | Well Name: NA | Location: BY Cribs.
Project: 200-DV-1 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
182.5	5·10·16 B35JF3 B35JF4	182.2-187.2: B34 & B35 #29 option #2	no core TK 5·10·16	182.2-187.2: gravelly Sand (gS) (90% S, 10% g, 0% m) gr. sftd. massive bed. of m.-v.c. sub-ang. S. of 75% Qtz. flds./25% mafic. w/ v.f.-f. w. rndd. pbl. of bslt. sprs. sub-ang. m. pbl. of bslt. throughout. 2.5Y 6/3 H. yllwsh brn. no rxn HCl -lrg. (4mm) mica ~1%	Sonic w/ 5' core. 182.2-187.2: Core 29 optional 2 184.6-186.6: Aliquot 5·10·16 1 B35JF3, B34JF4
185.0				@ 186.6': 2" thick decomposed gravelly silty Sand. (60% S, 40% m, 10% g). Pot. rip up clast of palagonite or in-situ chemical altd. to clay. multi color. consists of v.f.-c. S. of 75% Qtz flds, 25% Mafic w/ v.f.-m. pbl. of Qtz > Meta. > Qtzite. > int. volc. > bslt. weathered or altered to silty clay colored. 2.5Y 8/1 white, 2.5Y 8/1 gray, 5Y 5/4 olive, 2.5Y 3/1 v. dk. gray & 10YR 5/6 yellowish brown. mod. firm. low-non plastic. v.st. rxn HCl.	
187.5				187.2-202.0': No Core Provided.	
190.0					
192.5					
195.0					
197.5					
200					
202.0					TD: 202.0'

Reported By: A. Lantau | Reviewed By: T. Clark
Title: Geo. Tech. | Title: Geologist
Signature: A. Lantau | Date: 5·10·16 | Signature: [illegible] | Date: 5/11/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 14
Date: 5-11-16

Well ID: C8706 | Well Name: NA | Location: BY cribs 216-B-46 crib

Project: 200-DV-1 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0					0-45.3': DPT
2	B33B16 B33B17	Split spoon S.Sp.			2-4.5': Split spoon (S.Sp.)
4		S.Sp.			3.9-6.4: S.Sp.
6		S.Sp.			5.9-8.4: S.Sp.
8		S.Sp.			
10					▨: no recovery; ▩: pulverized from overdrive
20				not used/no core (TD) 6-7-16	
30					
40	Change Scale				
42.5					
45.0	END	TPT		45.5-47.0: Gravelly Silty Sand (25% G, 45% S, 30% M)	
		40% rec.		Gravel: 75% Mafic, 25% Felsic, vf pebbles - sm cobbles, SR Sand: 70% Qtz/feldspar Felsic, 30% Mafic; SA-SR, M-VC; moist, mod-p sorted	45.5-TD: Sonic w/ 4" x 5' core; 45.5-47.0: Core 1: B324N7 Drilled 2/17/16
47.5		140% rec.		2.5Y 4/1 Dark gray, non plastic - coarse K feldspar sand grains present from @ 46.5' - wk rxn w/ HCl from 46.0-46.4	47.0-49.5: Core 2: B324N8. Alignment: ✱ Sizers JK 6.2.16
49.5					~~Probe drove greater than 2.5'~~ (TD) 6-6-16

Reported By: A. Lantau / Jen Russell | Reviewed By: Tessa Clark

Title: Geo Tech / Geologist | Title: Geologist

Signature: A. Lantau / Jen Russell | Date: 5-11-16 | Signature: [signature] | Date: 6/7/16

6.2.16

A-6003-642 (03/03)

BOREHOLE LOG

Page 2 of 14
Date: 6/2/16

Well ID: C8706 | Well Name: NA | Location: 216-B-46 Crib

Project: 200-DV-1 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
45.5		#1			
47.5					
				move down AZ 5-25-16	
47.5		140% #2		47.0-47.3': gravelly Sand (gS) (85%S, 15%g, 0%m) pr. srtd. c.-v.c. sub-rnd. S. of 50%felsic, 50%mafic w/ f. pbl. of bslt. (sub ang.). 2.5Y 5/2 grysh brn. moist no rxn HCl. pot. ↓ Coarsening.	47.0-49.5': Core 2: B324N8 Aliquot: AZ 5-25-16 Drilled: 2-22-16
50.0				47.3-47.5': slightly silty gravelly sand (m) (gS) (15%m, 10%g, 75%S) v.f.-v.c. sub-ang. S. of 50%mafic/50%bslt. w/ v.f.-c. pbl. of 50%mafic/50%felsic w/ nonplastic m. 2.5Y 4/1 dark gray. v.wk. rxn HCl. sharp contact below. ↓ Coarsening.	
				47.5-49.5': gravelly Sand (gS) (80-75%S, 20-25%g 0%m): mod.-pr. srtd. ↓ Coarsening. m.-v.c. ang. S of 50/50%mafic:felsic w/ v.f.-v.c. pbl. (ang.-sub-rnd.) of 95%bslt./5%meta 2.5Y 4/3 lt. olv. brn. non compact. moist. no rxn HCl.	

Reported By: A. Lantow / Jen Russell | Reviewed By: Tessa Clark

Title: Geo. Tech. / Geologist | Title: Geologist

Signature: A. Lantow / Jen Russell | Date: 5-25-16 | Signature: [signature] | Date: 6/6/16

6-2-16

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 14

Date: 5-12-16

Well ID: C8706	Well Name: NA	Location: 216-B-41 ~~B~~
Project: 200-DV-1		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
50.0	49.5-52.0' 80% #3			49.5-51.0': Gravelly Sand (gS) (80% S, 20% g, 0% m) pr. srtd. massive bed. f.-v.c. sub-rndd. S. of 50% mafic/50% felsic w. sub-rndd. v.f.-c. pbl. of 50/50% mafic:felsic. comp. 2.5Y 8/1 lt. olv. brn. moist. mod. rxn HCl. 51.0-51.5': ~~slightly silty~~ gravelly Sand (gS) (10% g, 80% S, 10% m) coarse grained matl. same as above w/ added silt.	Sonic w/ 4"x5' core 49.5-52.0': Core 3: B324N9 Drilled 2-22-16 470 dpm/ppcm above background. Bgr, Ox
52.5	move down	move down	move down	pr. srtd. v.f.-v.c. sub-rndd. S. of 50/50% mafic/felsic w/ v.f.-c. sub.rndd.-rndd. pbl. of 50%/50% mafic/felsic. 2.5Y 5/3 lt. olv. brn. moist. no rxn HCl. 51.5-52.0': Same as (49.5-51.0')	
52.5					52.2-57.2': Core 4: B324P0
53				52.2'-52.6': gravelly Sand (gS) (80% S, 20% g, ~0-5% m) pr. srtd. ↓fining m.-v.c. S. of 65% Qtz. flds./35% mafic. w/ w. rndd. m.-v.c. pbl. of 80% meta./20% bslt. 2.5Y 5/3 lt. olv. brn. no rxn HCl.	
53.5				52.6-53.4': gravelly ~~Sand~~ (gS) (20 ~~40~~ % G, 80 ~~60~~ % S, 0% m) ↓coarsening m.-v.c. ang. S. of 70% Qtz. flds./30% mafic. w/ v.f.-m. pbl. of bslt. + coarsening from v.f. pbl. to m. pbl. (coarsest pbl.s. of 70% meta./30% bslt.) @ 52.8': bed. of w. srtd. m. ang. S. of 98% Qtz. flds. 2% mafic. 2.5Y 6/4 lt. yellsh. brn. no rxn HCl	
54					
54.5					
55.0		100% #4			
57.5				53.4-54.4': gravelly Sand (gS) (80% S, 20% g, 0% m) mod. srtd. ↓coarsening (c.r.s.) from m. S. w/ v.f. pbl. to v.c. S. w/ v.c. pbl. (Sand of 60%-50% felsic Qtz./40-50% mafic. trc. sub.rndd pbl. of bslt. throughout. 2.5Y 5/2 grysh brn. trc. m. mica. 54.0-55.0': Sand (S). (95% S, trc. g., 0% m) v. w. srtd. bed. of c.-v.c. S. of 70% Qtz. flds./30% mafic. w. trc. v.f. ang. pbl. of bslt. 2.5Y 5/3 lt. olv. brn. grading to bed below. (Coarsening downward?) 55.0-55.9': gravelly Sand (gS) (~~70~~ 80% S, ~~30~~ 20% G) v. pr. srtd. m.-v.c. ang. S. of 50% felsic/50% mafic w/ pbl.s. of (90% v.f. pbl. + 10% c. pbl. of bslt. > meta. throughout. 2.5Y 5/3 lt. olv. brn. moist. no rxn HCl. 55.9-56.7': gravelly Sand (gS) (80-~~90~~% S, ~~20~~-10% g) ↓fining, mod. srtd. m.-v.c. S. of 50% felsic/50% mafic grading to f.-c. S. of 60% Qtz./40% mafic. 2.5Y 5/3 lt. olv. brn. wk. rxn HCl. w/ v.f.-pbl. in top of unit. 56.7-57.2': sandy Gravel (sG) (70% g, ~~60~~ 80% S, 0% m) pr. srtd. no fabric. f.-v.c. ang. S. of ~~80~~ 80% Qtz. flds./20% mafic. w/ f.-m. pbl. (w. rndd.) of 80% bslt./20% meta > int. vole. 2.5Y 5/3 lt. olv. brn. no rxn HCl.	3.0 TC 6-6-16 -discoidal gravel. no imbrication.
	move down	move down	move down		

Reported By: A. Lantau		Reviewed By: T. Clark	
Title: Geo. Tech.		Title: Geologist	
Signature: A. [illegible]	Date: 5-12-16	Signature: [illegible]	Date: 6/6/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 4 of 14

Date: 5-16-16

Well ID: C8706	Well Name: NA	Location: 216-B-46 crib	
Project: 200-DU-1		Reference Measuring Point: Ground Surface	

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
57.5				57.2'-58.0': ~~gravelly Silty Sand (gmS)~~ slightly silty gravelly sand (10%G, 70%S, 20%m) pr.srtd. v.f.-c. S. of 40%Qtz.flds. 40%mafic. w/ v.w.rndd. m.-c. pbl. of 50%mafic/50%felsic. non plastic, v.high dilatancy, 2.5Y 5/2 grayish brn. st. rxn HCl	Sonic w/ 4"x5' core
	57.2-62.2: B324P1	100% #5		58.0'-58.8': gravelly Sand (gS) (80%S, 20%G, 0%m) m.-c. ang. S. of 70%Qtz. flds./30%mafic w/ v.w.rndd. discoidal m.-c. pbl. of 80%meta./20%bslt. 2.5Y 5/4 lt. olv. brn. no rxn HCl.	57.2-62.2': Core 5: B324P1 Drilled 2.22.16 @57.2': 1275 dpm/100cm² Bg/0α
60.0				58.8-60.0': gravelly Sand (gS) (90%S, 10%G, 0%m) more coarse, bed. mod. srtd. c.-v.c sub-ang. S. of 40%Qtz flds./60%mafic. w/ w.rndd. f.-v.f. pbl. of bslt. no ~~rxn~~ NCS felsic gravel. 2.5Y 4/2 dk grayish brn. no rxn HCl.	
62.5		over driven		~~60.0-60.8~~: 60.0-61.2: Sand. (S.) (95%S, 5%G, 0%m) Coarsening. mod.w.srtd. f.-m. S. of 60-80%Qtz. flds. 40-20%bslt. grading to f.-c. S. of 75%Qtz.flds/30% mafic. 2.5Y 5/3 lt. olv. brn. (50%/50% mafic/felsic) @61.0': 2" thick bed of m.-c. ang. S. w/ 20%G. of v.w. rndd. C. pbl. of 100%meta. @61.2': at contact 1/2mm graded-faint bed of v.f.-c. S. of 75%Qtz. flds/25%mafic color 2.5Y 5/6 lt. olv. brn. no rxn HCl.	
65.0		move down to 5.18.16		61.2'-62.2': gravelly Sand (gS) (75%S, 25%G, 0%m) more coarse, pr.srtd.-mod.srtd. c.-vC. sub-ang. S. of 50%mafic/50%felsic. w/ v.w.srtd. w. rndd. f. pbl. of 90%bslt./20% int. volv. > meta. 2.5Y 5/4 grayish brn. no rxn HCl. spns. v.c. pbl. of v.w.rndd. lapilli tuff.	
62.5	B35N89 B35N90 5.25.16	100% #6		62.2-67.2: Sand. (S) (100%S, tr. m.) mod. to w.srtd. w. stratified beds ~~1/2 to 5 1/2"~~ 3" thick. of m.-c. sub-ang. S. of 50%mafic/50%felsic. 2.5Y 6/2 lt. brownish gray. no rxn HCl, moist. @62.6-62.3': bed of Sand darker. grading from fn. sand to v.c. sub-ang. S. of 50-60%mafic/50-40%qtz. flds. w/ f. S. bed ~2-3mm thick on top + bottom colored 10YR 5/4 yellowish brn. moist no rxn HCl. @64.6': 4mm layer of 10YR 5/4 yellowish brown colored med. Sand. faint Fe+ staining-pervasive in layer.	62.2-67.2': Core #6: B324P2 Drilled 2.22.16 62.9-64.9': Aliquot: B35N89, B35N90 (5.25.16)
67.5		move down to 5.25.16			
70.0					

Reported By: A. Lantau		Reviewed By: T. Clark	
Title: Geo. Tech.		Title: Geologist	
Signature: A. Lantau	Date: 5.16.16	Signature: [illegible]	Date: 6/7/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 5 of 14
Date: 5-16-16

Well ID: C8706 | Well Name: NA. | Location: 216-B-46 crib

Project: 200-DV-1 | Reference Measuring Point: Ground Surface.

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
67.5	72.3-72.3: B324P3	100% #7		67.3-72.3': Sand (S) (100%S.) mod.w.stratified. mod.w.srtd. m.-c. ang. S. of 60% felsic Qtz. flds/ 40% mafic. 2.5Y 5/3 lt. olv. brn. no rxn HCl. moist.	Sonic w/ 4"x5' core. 67.3-72.3': Core 7: B324P3 Drilled: 2.22.16
70.0				@67.7-68.2': slightly silty Sand ((m)S)(20%m, 80%S) v.f.-c. S. of 60% felsic, 40% mafic w/ matrix of non plastic v. high dilatancy silt. 2.5Y 5/3 lt. olv. brn. st. rxn HCl.	↓ coarsening. (silt content decreasing w/ depth)
				@68.6': 1" bed of w.srtd. v.c. slab. rndd. S. of 80% mafic/20% Qtz. flds.	
				@69.4': ½ thick bed of v.w.srtd. S. of 77% Qtz. flds./trc. mafics.	
72.5				@71.1': ½" bed of v.c. ang. S. of bslt. slightly inclined ~40% inclination.	
				@72.0': faint sprs. 3mm Fe' staining patchy. no rxn HCl.	
	72.1-77.1: B324P4	100% #8		72.1'-77.1': Sand (S) (77%S, trc.g, 0%m) w.srtd. mod.w.stratified. 6" to 2.5' beds of c. Sand & m.-c. S. downward coarsening to v.c. sub-ang. Sand.	72.1-77.1': Core 8: B324P4 Drilled 2.22.16
75.0				72.1-72.7': m.-c. ang. S. of 80% Qtz. flds/20% mafic. moist 2.5Y 5/4 lt. olv. brn. no rxn HCl. moist.	
				72.7-74.8': m.-v.c. sub-ang. S. of 50% mafic/50% felsic. w/ trc. sprs. v.f. pbl. of bslt.	
				@73.5': ½" thick v.f.-c. S. of 80% Qtz. flds/20% mafic. 2.5Y 5/4 lt. olv. brn. no rxn HCl. trc. f. mica.	
77.5		move down AZ 5-25-16		77.8'-78.0': massive mod. srtd. c.-v.c. ang. S. bed of 50%/50% mafic:felsic. 2.5Y 6/3 lt. olv. brn. H. brnish gray. no rxn HCl. trc. crs. mica.	
				76.0-77.0': mod. srtd. m.-c. ang. S. of 70% Qtz./30% mafic.	
				@76.0': contact.-2mm. bed of v.f.-c. S. of 80% Qtz. flds. 2.5Y 6/4 lt. yllwsh brn. no rxn HCl	
77.5				77.0-78.3' slight incline bed. ~20%	
	B35N91	100% #9		78.3-80.4': Sand (S)(100%S) v.srtd. m. S. of 50% mafic 50% felsic. same as above.	77.0-82.0': Core 9: B324P5 79.3-82.4': Aliquot 5-25-16 B35N91, B35N92
				78.3-80.4': 78.3-79.4': silty Sand (mS)(40%m, 60%S) ↓ coarsening. v.f. ang. S. of 50% mafic/50% felsic w/ wet. low dilatancy silt. 2.5Y 6/4 yellowish brown. no rxn HCl (grading from v.f. S. to v.c. S.). ½" flame structure 2mm wide by 2" tall flowing from base of bed upwards into more coarse unit. flame structure colored 10YR 5/4 grayish brown. no rxn. HCl.	@78.5 peak reading of 4,414 dpm/100cm² βα.
80.0	B35N92	77.0-82.0: B324P5			
82.5		move down AZ 5-25-16		79.4-80.4': Silt (m) (95%m, trc. S. trc. g). low.-mod. dilatancy. wet. silt. colored 10YR 5/3 brown. no rxn HCl. w/ v.f.-c. ang. S. 50/50% mafic/felsic. w/ sprs. trc. ang. f. pbl. of bslt.	
				— Next pg. 6 →	

Reported By: A. Santos | Reviewed By: Tessa Clark

Title: Geo. Tech. | Title: Geologist

Signature: A. Santos | Date: 5-16-16 | Signature: [illegible] | Date: 6/7/16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 5.25.16

Well ID: C8706 | Well Name: NA- | Location: 216-B-46 Crib.

Project: 200-DV-1 OU | Reference Measuring Point:

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
81.5				79.4-80.4': Silt. (M) (95% m, trace S, trace g) wet. low-mod. dilatancy silt. colored 10YR 5/3 brown. w/ v.f. grading downwards to v.c. sub-ang. S. of 50%/50% mafic/felsic w/ trc. sprs. f. pbl. of bslt sand & grave content gradually increase w/ depth from 0% to ~5%. @ base (80.4): 3mm f. lamina of m. colored. 10YR 4/2 dk grayish brown. @ 79.6': ½" thick bed of silty sand (75% S, 25% m.) v.f.-v.f. sub-ang. S. of 50/50% mafic:felsic. colored 10YR 5/3 brown. no rxn HCl. wet. 80.4-82.0': Sand (S) (100% S) w. srtd. w. stratified. v.f. S., v.c. S. & m. S. stratified into 2" to 1' thick beds. v.f.-m.S beds of 50%/50% mafic/felsic & c.-v.c. Sand beds of 80% bslt/20% Qtz. Flds. moist. no rxn HCl. 2.5Y 5/4 H. olv. brn.	Continue Previous. 77.0-82.0: Core 9: Continued.
82.5					

Move down AK 5.25.16

Move down AK 5.25.16

AK 5.25.16

AK 5.25.16

Reported By: A. Lantau | Reviewed By: Tessa Clark

Title: Geo. Tech. | Title: Geologist

Signature: Aaron Lantau | Date: 5.25.16 | Signature: [illegible] | Date: 6/7/16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 5-16-16

Well ID: C 8706	Well Name: NA	Location: 316-13 4b crib
Project: 200-DV-1		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
82.5	82.2-87.2: B324P6 100% #10			82.2'-87.5': Sand (100%S) (S) (mod. w. srtd. - w. srtd. m.-C. ang. S. of 75%-70% Qtz flds./25-30% mafic. massive. no structure. ~~@ 2.5Y 5/3~~ lt. olv. brn. no rxn HCl. moist. @ 82.6': ½ thick bed of slightly silty Sand ((m) S.) (15% m, 85% S) v.f.-c. S. of 60% Qtz./40% mafic. non plastic 2.5Y 4/2 drk. grysh brn. moist st. rxn HCl. 4mm sprs. Fe+ staining.	Sonic w/4"X5' core 82.2-87.2': Core 10: B324P6 Drilled 2-23-16
85.0					
87.5	87.3-92.3: B324P7 100% #11			87.3'-92.3': Sand (S) (100%S). mod.-w. srtd. mod. w. stratified. 2"-6" beds. of m.-v.c. S. of 75% Qtz. flds./15% mafic 2.5Y 6/2 lt. ~~grysh~~ brownish gray TC 6-7-16 ~~brn.~~ no rxn HCl. pot. ~~& coarsen.~~ & f.-m. S. of ~~80-85%~~ Qtz flds/15% mafic 2.5Y 5/4 lt. olv. brn. moist no rxn HCl. @ 88.1': 2" thick bed of m. S. of 85-90% Qtz. flds. 15-10% mafic. 2.5Y 5/4 lt. olv. brn. no rxn HCl.	87.3-92.3': Core 11: B324P7 Drilled: 2-23-16 TC 6-7-16
90.0					
92.5	92.2-97.2: B324P8 100% #12			92.3-97.5: Sand (S) (100% S) mod. srtd. m.-C. sub.ang. S. of 60% Qtz. flds./40% mafic w/ sprs. trc. sub-rndd. v.f. pbl. of 50%/50% mafic/felsic. abnt. 2-4mm beds. ~2-10" intervals apart. of f.-m. ang. Sand of 85% Qtz. flds/15% mafic. 2.5Y 5/4 lt. olv. brn. no rxn HCl. moist.	92.2-97.2': Core 12: B324P8 Drilled 2-23-16
95.0					
97.5	97.1-102.1: B324P9 100% #13			97.1'-99.2': Sand (S) (100%S) v.f.-v.c. ang. Sand ~~of~~ of 85% Qtz. flds./15% mafic. 2.5Y 7/2 lt. gry. 2-5mm beds of f.-Sand. occurring increasing abundancy towards base of unit. 2.5Y 5/4 lt. olv. brn. of 90% Qtz./10% mafic. abnt. 3mm clots of silt. 2.5Y 5/4 lt. olv. brn. no rxn HCl.	97.1-102.1': Core 13: B324P9 Drilled 2-23-16
100.0				99.2-102.1': Sand (S) (100%S) mod. srtd. massive. f.-v.c. S. of 85% Qtz. flds./15% mafic. sprs. f. mica. faint sprs. 2-3mm Fe+ staining. overall 2.5Y 6/2 lt. brnish. gray. no rxn HCl.	
102.2					

Reported By: A. Lantau	Reviewed By: Tessa Clark
Title: Geo. Tech.	Title: Geologist
Signature: A. Lantau — Date: 5-16-16	Signature: [illegible] — Date: 6/7/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 8 of 14
Date: 5-16-16

Well ID: C8706 | Well Name: NA | Location: 216-B-46 crib

Project: 200-DV-1 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
102.5				102.1-107.2 Sand (S) (100%)	Sonic w/4"x5' core
				mod. srtd. m.-c. ang. S. of 85% Qtz. flds/15%	102.1-107.1: Core 14: B324R0
				mafic. 2.5Y 4/1 lt. olv. brn. no rxn HCl. moist. abnt.	Drilled 2-23-16
				f. mica. 2.5Y 5/3 lt. ylwsh. brn.	No sigs of overdrive.
				102.1-104.1': faint 3-5mm. beds of v.f.-m. S.	
105.0				of 99% Qtz. flds/trc. mafic. 2.5Y 5/4	
	102.1-107.1: B324R0	100% #14		lt. olv. brn. moist no rxn HCl.	
				107.2-109.5: Sand (S) (100% S.)	107.2-112.2': Core 15: B324R1
107.5				massive bed. v.w. srtd. m.-v.c. Sand of 85% Qtz./	Drilled 2-23-16
				15% mafic. 2.5Y 5/2 lt. ylwsh. brn. no rxn HCl.	108.2-110.2': Aliquot: 5-25-16
				109.5-111.5': Sand (S.) (100%) v.w. srtd. v.w. stat.	B324N94, B324N93
				v.f.-m. S. of 85% Qtz. flds/15% mafic. 2.5Y 5/2 light gray.	(B35N94, B35N93)
	B324N93 B324N94 2-25-16			no rxn HCl. v.f. lamina & filaments of m.-c. v.f. Sand.	5mm. patchy Fe+ staining
	B324R1	100% #15		@ 110.9': 2" thick ↓ coarsening bed. from v.f. S. to c. pbl.	of 50% mafic/felsic. comp.
110.0				~110.9-111.5': massive bed of v.w. srtd. v.f. S. 2.5Y 5/2 lt. gray. no rxn HCl.	
				111.5-112.2': Sand (S) (90% S, 10% G, 0% m)	
	102.2-112.2: B324R1			w. srtd. w. stratified. v.f. S. grading to c. S. w/ m matrix.	→ @ 110.9" 15 deg/course 8 by 0 α
				Coarsening ↓ m.→c. S. 2.5Y 5/3 lt. olv. brn. no rxn HCl.	slight inclined bedding 1-2" thick.
112.5				112.1-117.1: Sand (S) (90% S. 10% G, 0% m)	112.1-117.1: Core 16: B324R2
				mod. srtd. mod. w. stratified. 6" to 2' beds. downward	Drilled 2-23-16
				coarsening. from m.-c. ang. S. of 70% Qtz. flds/30% mafic	
				to v.c. S. w/ v.f. pbl. of 30% Qtz. flds./70% bslt.	Top pulverized from above drive
				2.5Y 7/2 lt. gray. dry. no rxn HCl.	
115.0				sprs. w. mod. c. pbl. @ 116.2'-117.1	
	112.1-117.1: B324R2	100% #16		faint. trace. 2-4mm Fe staining in splotches.	
				117.2-122.2': Sand (S) (99% S, trc. g, 0% m)	117.2-122.2': Core 17: B324R3
117.5				mod.-v.w. srtd. pr. stratified. ↓ coarsening 2-5' beds	
				of m.-c. ang. S of 70% Qtz./30% mafic grading to	
				c.-v.c. sub-ang. S. of 70% Qtz./30% mafic w/ trc.	
	117.2-122.2: B324R3	100% #17		w. rndd. f. pbl. of bslt. no rxn HCl. dry. 2.5Y 7/2 lt. gray.	
120.0				v. unconsolidated.	
				@ 120.0': Top of 2.5' bed. grading from f.-c. S. grading	
				to v.c. S.	

Reported By: A. Lantow | Reviewed By: Tessa Clark

Title: Geo. Tech | Title: Geologist

Signature: A. Lantow | Date: 5-16-16 | Signature: [illegible] | Date: 6/7/16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 5·17·16

Well ID: C8706 | Well Name: NA | Location: 216-B-4bcrib

Project: 200-DV-1 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
122.5		#17		122.5-~~127.5~~ 124.9: Sand (S) (98%S, 2%G, trc. m)	Bonic w/ 4"x5' core.
				Pr. srtd. w. stratified. c.-v.c. ang. S. of 70% Qtz. flds.	122.5-127.5: Core 18: B324R4
				30% mafic w/ coarsening 1.5-2' beds. coarsen from	Drilled 2.23.16
				m.-c. S. to c.-v.c. S. w/ trc. v.f. pbl. of bslt.	
				2.5Y 7/2 H. gray. dry. no rxn HCl. vs unconsolidated	Top pulverized from above
125.0				sprs. mica. sprs. 4mm. Fe+ staining. - splotchy.	drive.
				124.9'-127.5': Sand (S) (99% S. trc. m)	
	B324R4	#18		v.w. stratified. mod.-vw. srtd. beds. of 2"-6" thick	
	122.5-127.5:	100%		beds of m.-v.c. ang. S. of 80% Qtz. flds. & 2-5mm	
				thick beds of f.-m. S. of 70% Qtz. flds / 10% mafic	
127.5				2.5Y 5/3 H. olv. brn. ~~sprs. 5mm beds of Sand w/~~ AE 5.17.16	
				sprs. clay chips or saprolite chips 2-4mm. of Tan, black, olive	
				green & red brown. throughout coarse grained beds.	
				Unit coarsend downward from bedded f. & c. Sands	
				to 1' massive & coarsening bed of Sand from f.-c. S. to	
				c. S. (v.w. srtd.)	
				- @ 127.0', ½ thick bed of saprolitic w/ f. pbl.	
				of Tan Qtz. > brn Qtz. > green gray into. volc. > red.	Top & bottom over driven
				brn. mafics. (2-4mm in size)	pulverized.
127.5				127.0-132.0': Sand (S) (100% S, 0% g, 0% m)	127.0-132.0': Core 19: B324R5
				mod. srtd. massive bed. med.-c. S. of 60% Qtz. flds.	Drilled 2.24.16
				40% mafic w/ sprs. v.c. sub-ang. S. of 60% Qtz / 40% mafic.	Top pulverized from above drive.
				2.5Y 5/3 H. olv. brn. dry. no rxn HCl	Top & bottom over driven.
130.0				131.0'	pulverized.
				@ ~~130.0~~: faint 1" bed of m. S. of 80% Qtz. flds / 20%	
				AE 5.17.16 mafic. 2.5Y 5/3 H. olv. brn. no rxn HCl. TC 6.7.16	
132.5				132.4-136.2': Sand (S) (100% S) mod.-v. srtd. beds.	132.4-137.4': Core 20: B324R6
				2'-6" thick ~~of~~ AE 5.17.16 downward coarsening of	Drilled 2.24.16
				m.-v.c. subang. S. of 50-80% Qtz. flds. / 50-20% mafic.	
				2.5Y 6/2 H. brownish gray. moist no rxn HCl. sprs. f. mica.	135.4-136.9': Aliquot 5.26.16
					B35N95, B35N96
135.0				136.2-137.4': gravelly Sand (g S) ~~trc. (m)~~ TC 6.7.16 mod. srtd. poorly	
				stratified into v.f.-m. S. & mo.-v.c. sub-ang. S. of	(80% S, 20% g, trc. m)
				75% Qtz. flds. / 25% mafic. no rxn. HCl. 2.5Y 5/4 H. olv. brn.	
				w/ v.f.-f. pbl. of bslt.	
	B324R5	#19			
	127.0-132.0:	100%			
	B324R6	#20			
	132.4-137.4:				
	5.26.16 B35N95 B35N96				
137.0					

Reported By: A. Lantau | Reviewed By: Tessa Clark

Title: Geo. Tech. | Title: Geologist

Signature: Aaron Lantau | Date: 5·17·16 | Signature: [illegible] | Date: 6/7/16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 5.17.16

Well ID: C8706	Well Name: NA.	Location: 216-B-46 crib
Project: 200-DV-1		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
137.5		C24		136.2-137.4': gravelly Sand (gS) (80%S, 20%g, trace m) mod. srtd. pr. stratified. downward coarsening beds 2"-½" thic of v.f.-m.S. & m-v.C. subang. S. of >75% Qtz. flds/25% mafic. w. sub-rndd. v.f.-f. pbl. of bslt. throughout. 2.5Y 5/4 lt. olv. brn. moist no rxn HCl.	Sonic w/ 4"x5' core
137.5				137.2-138.9': Gravelly Sand (gS) (80%S, 20%G, 0%m) v.pr. srtd. m.-v.C. sub-ang. S. of 50% felsic/50% mafic w/ sub-rndd. v.f.-f. pbl. of bslt. & sprs. w. rndd. m. pbl. of bslt. weakly stratified. w/ faint beds of c. & v.C. S. 2.5Y 5/3 lt. olv. brn. no rxn HCl moist. no Fe+ staining.	137.2-142.2': Core 21: B324R7 Drilled 2.24.16
140	137.2-142.2: B324R7	100% #21		138.9'-142.2': Sand (S) (100% S) pr. srtd. massive bed of m.-v.C. sub-ang. S. of 50% Qtz. flds/ 50% mafic. 2.5Y 5/3 lt. olv. brn. no rxn HCl. TC 6-7-16	Pot. ↓ fining. sharp contact
142.5				142.3'-147.3': gravelly Sand (gS) (80%S, 20%g, 0%m) mod. w. srtd. v.w. stratified m.-c. ang. S. of 50%-60% Qtz. flds w/ 50-40% mafic. 2.5Y 5/3 lt. olv. brn. w/ 1-2" beds of pebbly Sand of v.c. S. of 70% Qtz. flds. /30% mafic w/ v.f. sub-rndd. pbl. of bslt. moist no rxn HCl. v. gradual ↓ coarsening from m.-v.C. S. overall. sprs. w. rndd m. pbl. of bslt. > int. volc. faint 20-50% inclined bedding. sprs. mica & pyrite.	142.3-147.3': Core 22: B324R8 Drilled 2.24.16
145.0	142.3-147.3: B324R8	100% #22			
147.5	147.1-152.1: B324R9	100% #23		147.1'-148.2': Gravelly Sand (gS) (80%S, 20%g, 0%m) ↓ coarsening. pr. srtd. bed of m.-v.C. ang. S. of 60% Qtz. flds. /40% mafic. w/ v.w. rndd. c. pbl. of 90% ancta/10% bslt. 2.5Y 5/3 lt. olv. brn. moist no rxn HCl	147.1-152.1': Core 23: B324R9 Drilled 2.24.16
150.0				148.2'-152.1': Sand (S) (100% S 0%g, 0%m) mod. srtd. mod. stratified. m. S. of 90% Qtz. flds. /10% mafic w/ 2-3" beds of c.-v.C. ang. S. of 70% Qtz. flds 30% mafic. 2.5Y 6/4 lt. brnish gray. no rxn HCl. TC 6-7-16	← (½"-1" beds)
152.5		#24		148.2'-155.2': Sand (S) (100% S) mod. srtd. m.-v.C. subang. S. of 50% mafic/50% felsic. 2.5Y 6/2 lt. brnish. gray. moist. no rxn HCl. faint. ½" inclined beds of 70% mafic/30% felsic c. ang. Sand.	152.1-157.1': Core 24: B324T0 Drilled 2.24.16
155.5					not overdriven.

Reported By: A. Zontow	Reviewed By: Tessa Clark
Title: Geo. Tech.	Title: Geologist
Signature: Aaron Zontow Date: 5.17.16	Signature: [illegible] Date: 6/7/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 11 of 14

Date: 5·17·16

Well ID: C8706	Well Name: NA	Location: 216-B-46 crib
Project: 200-DV-1		Reference Measuring Point: Ground Surface.

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
155.0				155.2-157.1': gravelly Sand (gS) (80% S, ~~10~~ TC 6-7-16 20% g) 0% m	Sonic w/4"x5' core
155.0 TC 6-7-16				fining. sub-rndd. fn. pbl. of bslt. spacing to	152.1-157.1: Core 24: B324T0
		157.1-152.1: B324T0 100% #27		pr. srtd. m.-v.c. S. of 70% Qtz. flds/30% mafic.	Drilled 2-24-16
				2.5Y 5/2 grysh brn. moist no rxn HCl.	not overdriven.
157.0				157.0-162.0 gravelly Sand (gS) (90% S, 10% g 0% m)	157.0-162.0: Core 25: B324T1
				pr. srtd. pr.-mod. stratified 3'-2" beds. of m.-c.S.	Drilled 2-24-16
				& m.-v.C. S. w/f.-c. w.rndd. pbl. of 50% bslt/50%	158.5-160.5' Aliquot 5-25-16
	B25N97 B35N98 5-26-16	157.0-162.0: B324T1 100% #28		meta. 2.5Y 5/3 lt. olv. brn. no rxn HCl. abnt. mica.	
160.0				Sand of 75% Qtz/25% mafic. sprs. 10mm Fe+ staining	
				w/ abnt. ~20% Fe+ oxidation or weathering of mafic grains of sand.	
				wk. carbonate rinds developing under larger clasts.	
162.5				162.1-167.1' gravelly Sand (gS) (90% S, 10% g. 0% m)	162.1-167.1: Core 26: B324T2
				v. pr. srtd. m.-vc. subang. S. of 60-70% Qtz. flds/40-30%	Drilled 2-24-16
				felsic w/ v. w. rndd. c. pbl. of bslt. slightly weathered clasts.	
				abnt. weathered crs. grained mafics. Fe+ staining.	
				1-3mm. filiments of carbon throughout.	
165.0		162.1-167.1: B324T2 100% #26		2.5Y 5/2 ~~grysh brn~~ ~~olive gray~~ moist no rxn HCl	
				TC 6-7-16 ^ TC 6-7-16 olive gray	
167.5				167.1 - 172.1': Sand (S) (98% S, tr. g.) 0% m	167.1-172.1: Core 27: B324T3
				pr. srtd. m.-v.c. S. of 70-75% Qtz. flds/25-30% mafic. w/	Drilled 2-25-16
				sprs. m.-vc. pbl. of bslt. AL 5-17-16 ~~massives~~ 6"-2' bedding	
				of above material + 6" beds of c. ang. S. of 50% mafic	
				50% felsic. comp. overall ~~2.5Y 5/2~~ TC 6-7-16 ~~AL 5-17-16~~ lt. olv. gray. moist	
170.0		167.1-172.1: B324T3 100% #27		no rxn HCl.	
				sprs. 4mm Fe+ staining.	
172.5				172.1-177.3: Sand (S) (98% S, 2% G)	172.1-177.3: Core 28:
				Gravel: vf pebbles - small cobbles; 40% Mafic	Drilled 2-25-16
				40% felsic; SR Sand: m-vc, SA, 70% Qtz	
		#28		Felsic, 30% Mafic; 2.5Y 5/3 Light olive brn;	
				dry, no rxn w/ HCL, mod. sorted. - 4mm Iron staining	

Reported By: A. Foster / Jen Russell	Reviewed By: Tessa Clark
Title: Geo Tech. / Geologist	Title: Geologist
Signature: Aaron Foster / Jen Russell Date: 5-17-16	Signature: [illegible] Date: 6/7/16

6-2-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 5-18-16

Well ID: C8706 | Well Name: NA | Location: 216-B-46crib

Project: 200-DV-1 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
	172.3-177.3	100% rec. #28		172.1-177.3: Sand(S)(98%S, 2%G) Gravel: vf peb - sm cob; 60% Mafic, 40% Felsic, SR; Sand: m-vc, SA, 70% Qtz felsic, 30% Mafic; 2.5Y 5/3 lt. olive brn; dry, no rxn w/HCl, mod sort. - ~1mm iron staining throughout - f-c grained from 172.9-173.0	Sonic w/ 4" x 5' core; core 28; Drilled 2.25.16
175.0					
177.5	177.3-182.3: B324T5	100% #29		182.3 TC 6-7-16 ~~177.3~~ 177.3-~~180.3~~: gravelly Sand (gS) (90%S, 10%g, 0%m) mod-poor srtd. well stratified, beds ~~of~~ 2" to 6" thick of c.-v.c. ang. S. of 80% Qtz. felds./20% mafic. w/ v.f. ang. pbl. of bslt.; trc. w. rndd. m. pbl. of bslt. throughout. inclined beds e-50% grading. 2.5Y 6/3 lt. brnish gry. no rxn HCl. ~~177.3~~ 179.0: 1" thick bed of Sand (w/ trc. g.) (95%S, trc. g) AZ 5-18-16 90% Qtz. flds./10% mafic. m.-c. ang. S. w/ f. pbl. of bslt. 2.5Y 6/3 lt. ylwsh. brn. no rxn HCl. ~50% inclined. 179.1: 1" thick sandy gravel bed. ~50% inclined of (75%g, 25%S, 0%m) AZ 5-18-16 c.-v.c. ang. S. of 80% Qtz. flds., 20% mafic, + w/ v.f.-f. ang.-subang. pbl. of 90% bslt, 10% meta. 2.5Y 3/1 v. dark gray. no rxn HCl.	177.3-182.3: Core 29: B324T5; Drilled 2.25.16
180.0					
182.5		no rec. drum AZ 5-18-16		~~177.3-182.3: Gravelly Sand (gS) (90% S, 10% g, 0% m)~~ TC 6-7-16 ~~mod. srtd. c. v.c. ang. S. of 85% Qtz felds./15% mafic~~ TC 6-7-16 ~~w/ spts. v.w. rndd. sm. cbl. of meta. 2.5Y 6/3 lt. ylwsh. brn. no rxn HCl.~~ TC 6-7-16 182.3-187.3: Gravelly Sand (gS) (85%S, 15%g, 0%M) mod-poorly sorted Sand: 80% Qtz-felsic, 20% mafic m-vc, SAng-ang. Gravel: 50% felsic, 50% Mafic, vf peb - vc peb, SR-SA; 2.5Y 5/1 gray; dry; no rxn w/HCl - f-c sand 183.3'-183.4' / 184.3'-184.8': vc peb - sm cobbles 185.6-185.9': coarse-vc pebbles, dec. sand content	183.3-185.3: Core 30 B324T6; Driller 2.25.16
185.0		100% rec.			

Reported By: A. Lanton / Jen Russell | Reviewed By: Tessa Clark

Title: Geo. Tech. / Geologist | Title: Geologist

Signature: Aaron Lanton / Jen Russell Date: 5-18-16 6-2-16 | Signature: [signature] Date: 6/7/16

A-6003-642 (03/03)

BOREHOLE LOG

Date: 5-18-16

Well ID: C8706	Well Name: NA	Location: 216-B-46 crib
Project: 200-DV-1		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
182.5				182.3-187.3: Gravelly Sand/gS) (85%S, 15%G, 0%M) Mod-poorly sorted; Sand: 80% felsic, 20% Mafic, m-vc, SA-A; Gravel: 50% Felsic, 50% Mafic, vfpeb-vc.peb; SR-SA; 2.5Y5/1 Gray; dry; no rxn w/HCL	Sonic w/4"x5' core.
				187.3'-189.0' TC 6-7-16: Sand (S) (100%S) mod.srtd. massive bedding. c.-v.c. ang. S. of 85-90% Qtz. flds/15-10% mafic. trc. f. pbl. of bslt. 2.5Y 6/3 H. ylwsh. brn, moist. no rxn HCl. 20-25% S	187.3-192.3': Core 31: B324T7
190.0				189.0'-? : Sandy Gravel (sG) (70%G, 25%S, 5-10%M) v. pr. srtd. f. pbl. - sm. cbl. (max 130mm) of 80% bslt./20% meta. > int. volc. w/ v.f.-v.c. subang. S. of 60% Qtz. flds./40% mafic. w/ low. plastic silt colored 5Y4/2 olive gray. v. high. dilatency.	
192.5				192.3'-194.8': gravelly Sand (gS) (75-80%S, 25-20%G, 0%M) v. pr. srtd. f.-v.c. ang. S. of 60% Qtz. flds./40% mafic w/ c. pbl.-v.c. pbl. (max 64mm) of 60% meta./40% bslt. (v.w.rndd.) 2.5Y 5/2 grysh brn. wk. rxn HCl. moist. wk. weathered. slight imbrication. clasts v.w.rndd. discoidal.	192.3-197.3: Core option 1 B324T8 Drilled 2-25-16
195.0				↓ Coarsening. 194.8-196.3': Sandy Gravel (sG) (60-75%G, 40-25%S, trc. M) v. pr. srtd. ↓ Coarsening. m.-v.c. sub-ang.-ang. S. of 60% Qtz. flds, 40% mafic w/ m. pbl. - sm. cbl. v.w.rndd. of 60% bslt. > And. > int. volc./40% meta. > felsic volc. > felsic granit. discoidal to equant, no imbrication. 2.5Y 4/2 drk grysh brn. wk rxn HCl.	
197.5				sprs. Carbonate rinds on clasts. v. wk. Fe weathering. 196.3-197.3': Sandy Gravel (sG) (75%G, 20%S, 5%M) mod.-pr. srtd. w. rndd. v.f. pbl. - v.c. pb. of 90% int. volc. lapilli tuff./10% meta. almost clast supported. w/ v.f.-v.c. ang. S. of ~~80% mafic/20% felsic~~ 50% mafic/50% felsic. slightly plastic. 5Y 5/2 olive gray. wk. rxn HCl. silt content increasing down hole.	
200.0		100% rec.		197.3-201.3: Sandy Gravel (sG) (75%G, 20%S, 5%M) Gravel: PR, R-SR, 50% Mafic, 50% felsic, vf pebbles - 10cm cobbles; Sand: m-vc, SA, 70% felsic, 30% Mafic; dry, no rxn w/ HCl, 10YR 5/6 yellowish brn.	198.3-201.3': Core (Optional) 2 B324T9

Reported By: A. Lantau / Jen Russell	Reviewed By: Tessa Clark
Title: Geo. Tech. Geologist	Title: Geologist
Signature: A. Lantau / Jen Russell Date: 5-18-16	Signature: [illegible] Date: 6/7/16

6-2-16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 6·1·16

Well ID: C8706	Well Name: NA	Location: 216-B-46 crib	
Project: 200-DV-1		Reference Measuring Point: Ground Surface	

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
202.5		100% rec.		197.3-202.3: Sandy Gravel (SG): (75% G, 20% S, 5% M)	Sonic w/ 4"x5' core
				Gravel: 50% Felsic, 50% Mafic, vf peb-10cm cobble; R-SR	
				Sand: m-vc, SA, 70% Qtz feldspar, 30% Mafic;	
				dry, non w/ HCL, 10YR 5/4 yellowish brn,	198.3'-201.3': Optional
				Poorly sorted	Core 2 B324T9
				- Gravel size increasing w/depth	

NOT USED
UR 6/2/16

Reported By: Jen Russell		Reviewed By: Tessa Clark	
Title: Geologist		Title: Geologist	
Signature: Jenny Russell	Date: 6/2/16	Signature: [illegible]	Date: 6/7/16

A-6003-642 (03/03)

BOREHOLE LOG

JB 7/7/16 1

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Date: 7/6/16

Well ID: C9491	Well Name: NA	Location: 216-B-37 Trench
Project: 200-DV-10U Characterization Ph 3		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40					Sonic Core
42.5				NO CORES TAKEN 0'-51.5' bgs	
45					
47.5					
50				51.5-52.5: Sand 100%(S), 60% Mafic, 40% Felsic, f-c, coarse predom., SA, WS, moist, 10YR 4/4 dk yellowish brn 1 cobble - slough? in upper 3 in.	Core 1 B34RM6 51.5'-52.5' #2,889 cpm thru liner [20,635 dpm]
52.5	Core 1			52.5'-55.5: Sand (S) 100%, 30% Mafic 70% Felsic qtz/feldspar, subangular, moist, well sorted, 2.5Y 4/2 Dk grayish brn, wk rxn w/ HCL - sample has an orange/red discoloration	Core 2 B34RM8 JB 7/25/16 ~~52.5'-55.5'~~ 52.7-55.2 480 ~~cmp~~ cpm JB 7/22/16 Aliquot 53'-55'
	Core 2	100%			
55				55.1-57.6: Sand (S) 95% Sand 5% Gravel 40% Mafic 60% Felsic qtz/feldspar, subangular dry, well sorted, c-vc sand - fine pebbles 2.5Y 4/2 Dk grayish brn, no rxn w/ HCL	Core 3 B34RN0 55.1'-57.6'
	Core 3	100%			
57.5	Core 4			57.8-60.3: Sand (S) 95% Sand 5% Gravel 50% Mafic 50% Felsic qtz/feldspar, SA, dry, well sorted, c-vc. sand - fine peb. 2.5Y 4/2 Dk grayish brn, no rxn w/ HCL - Iron spot staining throughout	Core 4 B34RN2 57.8'-60.3'

Reported By: Jen Russell		Reviewed By: Tessa Clark	
Title: Geologist		Title: Geologist	
Signature: Jen Russell	Date: 7/7/16	Signature:	Date: 5/15/17

A-6003-642 (03/03)

JR 7/7/16 2

BOREHOLE LOG

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Date: 7/7/16

Well ID: C9491	Well Name: NA	Location: 216-B-37 Trench	
Project: 200-DV-1 OU Characterization Ph 3		Reference Measuring Point: Ground Surface	

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
60	Core 5	100%		60.3-72.6 Sand (S): 50% Felsic 50% Mafic (same as above) - over driven in upper 0.5'; 5% Gravel; vf pebb - sm cobbles	Sonic Core Core 5 B34RN4 60.0-62.5
62.5	Core 6	100%		JR 6/29/16 - no gravel from 62.8 ~~67.8~~ 72.6'	Core 6 B34RN6 62.8-67.8
65				Lamina JR 6/29/16 @66.0 - vf sand & silt ~~lamination~~ 0.5 cm ~~66.0~~ 66.5-67.8: decreased grain size f-c, coarse dominant size	
67.5	Slough/ overdriven			67.5-68.0 - overdriven/slough	Core 7 B34RN8 67.5-72.5
70	Core 7	100%		@68.4: vf sand & silt lamination 0.5 cm 68.9-72.5 iron staining (~~spots~~) throughout & no gravel @70.0 - slight decrease in grain size avg. m-c	
72.5	Core 8	100%		72.6-82.8 Sand (S): 60% Mafic basalt 40% felsic w/70% Qtz, f-vc, c-1mm avg., WS, SA, dry, 2.5Y 4/2 Dk grayish brn, no rxn w/HCl, iron oxidation noted on grains 72.6-73.0 - overdriven/slough 73.0-73.2 - Sand (as above) 73.2-73.4 - vf sand/silt w/ fine peb.; thin bed 5cm thick 73.4-74.8 - Sand (as above) 74.8-74.9 - vf sand & silt lamina - 1 cm thick 74.9-77.6 - m-c sand, fining upward to vf-m @ ~76.2', mafic content dec. to 30%	Core 8 B34RP0 72.6-77.6
75					
77.5	Slough Core 9			77.5-79.0 - vf-m sand w/ 2% basalt, SA-SR, 2-3mm pebbles 79.0-82.5 - vf-f sand; 20% Mafic, 80% felsic, 2.5Y 4/2 light brownish gray	Core 9 B34RP2 77.5-82.5

Reported By: Jen Russell		Reviewed By: T. Clark	
Title: Geologist		Title: Geologist	
Signature: Jen Russell	Date: 6/29/16	Signature:	Date: 5/15/17

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 6/21/16

Well ID: C9491 | Well Name: NA | Location: 216-B-37 Trench

Project: 200 DV-1 OU Characterization Ph 3 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	Core 9	100%		72.6-82.5: Sand (S) 100%: 80% Felsic, 20% Mafic, vf-f, WS, SA, dry, 2.5Y 6/2 light brownish gray, iron staining 72.6-77.6	Sonic Core Core 9 B34RP2 77.5-82.5
82.5					
85	Core 10	100%		82.8-83.3: Sandy Silt (SM): 40% Sand, 60% Silt sand: vf, WS; moist, 2.5Y 5/2 grayish brn, no rxn w/HCL - 1mm laminae from 83.1-83.3 83.3-83.8: Silt (M): 5% Sand, 95% Silt; Sand: c, SA, 90% Mafic, 10% Felsic, mod-p sorted; moist, 10YR 5/6 Yellowish brn, non-plastic, no rxn w/HCL - vc. sand lenses from 83.6-83.8 83.8-87.8 Sandy Silt (SM): 25% Sand 75% Silt; Sand: vf-vc, SA, 80% Mafic, 20% Felsic, 3mm max	Core 10 B34RP4 82.8-87.8 Aliquot 83.8-85.8
87.5	Core 11	100%		- Interbedded w/ 1-3in vc-m (sand) rhythmites fining downward ~~- vc sand lenses from~~ 7/25/16 - Increased felsic content 85.8-86.0 - Decreased grain size @ 86.8 m-c	Core 11 B34RP6 87.6-92.6
90				87.6-152.5 Sand (S): 100%, 40% Mafic, 60% Felsic qtz., WS SA, dry, 2.5Y 4/2 dk grayish brn, f-vc, no rxn w/HCL, thinbeds (3-5cm), fine peb-vf sand from 91.0-91.5 - f-c sand (decreased grain size) 91.5-92.6	
92.5	Core 12	100%		92.7-93.9: m-vc, 60% Mafic, 40% Felsic 93.9-94.3: vf-m, 60% Felsic, 40% Mafic 94.3 - vf sand/silt lamina - 3mm thick 94.3-95.5: vf sand - f peb (0.25-0.5mm average) 2cm max, 60% Mafic, 40% Felsic, 5% Gravel - 90% Mafic, SA-SR, PS 95.5-95.9: vf-m sand 95.9-97.7: Interbedded rhythmites, fining downward, 0.5-3 cm thick	Core 12 B34RP8 92.7-97.7
95					
97.5	Core 13	100%		97.7-100.3: 60% Mafic, 40% Felsic, vf-vc, iron staining throughout, mod sorted	Core 13 B34RR0 97.8-102.8

Reported By: Jen Russell | Reviewed By: T. Clark

Title: Geologist | Title: Geologist

Signature: Jen Russell | Date: 7/7/16 | Signature: [illegible] | Date: 5/15/17

A-6003-642 (03/03)

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BOREHOLE LOG

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Date: 4/29/16

Well ID: C9491	Well Name: NA	Location: 216-B-37 Trench	
Project: 200 DV-1 OU characterization Ph 3		Reference Measuring Point: Ground Surface	

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
100	Core 13	100%		87.4 – 152.5 Sand (100%): 40% Mafic, 40% Felsic, vf-vc, med sort-well sorted, SA, dry, 2.5Y4/2 dk grayish brn, no rxn w/ HCL, iron oxidation spots throughout	Sonic Core Core 13 B34RR0 97.8 – 102.8
102.5	Slowly overdriven			100.3 – 102.8: ↓ Mafic 40%, 60% Felsic, vf-cs (decreased gr. size) interbedded rhythmites – fining downward / coarsening-upward 102.6 – 107.6: vf-c, iron oxidation, gradational change @ 105.4: decrease in grain size	Core 14 B34RR2 102.6 – 107.6
105	Core 14	100%			
107.5	Core 15	100%		107 – 110.2: Interbedded rhythmites, beds range 1cm – 5cm thick, vf – vc sand & fine pebbles, 90% Mafic 10% Felsic pebbles 110.2 – 112.7: fining downward, vc → vf sand laminae noted throughout (0.5cm silt @ 111.2) (111.9 – 0.5cm silt/vf sand lamina) vf sand	Core 15 B34RR4 107.7 – 112.7
110					
112.5	Core 16	100%		112.5: vf-m sand, trace mica, 30% ~~Felsic~~ Mafic 70% Felsic JR 6/29/16 ★ 113.2: 5cm vf sand/silt bed (90% Sand, 10% silt) 2.5Y6/4 Light yellowish brn, sharp contact 113.8: 0.5cm lamina vf sand/silt 113.9 – 117.7: f-vc sand, 40% Mafic 60% Felsic qtz, iron oxidation throughout, SA, WS, no rxn w/ HCL, 2.5Y4/2 dk grayish brn, trace fine pebbles	Core 16 B34RR6 112.7 – 117.7
115		100%			
117.5	Overdriven Core 17	100%		117.7 – 122.5 Interbedded f-c sands, iron stain (oxidation) throughout, decreasing grain size @ 119.5 gradational change; thinner laminae 119.5 – 122.5	Core 17 B34RR8 117.5 – 122.5

Reported By: Jen Russell		Reviewed By: T. Clark	
Title: Geologist		Title: Geologist	
Signature: Jen Russell	Date: 6/29/16	Signature:	Date: 5/15/17

A-6003-642 (03/03)

JR 7/7/16 5

BOREHOLE LOG

Page ~~7~~ of 10

Date:

Well ID: C9491	Well Name: NA	Location: 216-B-37 Trench
Project: 200-DV-1 OU Characterization Ph 3		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
120	Core 17	100%		87.6 – 152.5 Sand (100%): 40% Mafic 60% Felsic qtz, f-vc, SA, WS, no rxn w/ HCl, 2.5Y 5/2 grayish brn, iron oxidation stain, dry	Sonic Core
					Core 17 B34RR8 117.5 – 122.5
122.5				122.8-127.8: same as above	
	Core 18				Core 18
				124.2: 0.25cm vc sand lamina 80% Mafic 20% Felsic	122.8 – 127.8 B34RT0
125		100%			
127.5				127.5-128.3: increased grain size m-vc 50% Mafic 50% Felsic	
	Core 19			128.3-130.3: Interbedded rhythmites	Core 19 B34RT2 127.7 – 132.7
130		100%		130.3: Sharp contact; very fine-fine Sand; 2.5Y 4/3 light yellowish brn 130.7-131.7: vf sand/silt laminae, up to 0.25cm thick	
132.5				132.7-133.8: vf-c, 2.5Y 6/1 Gray, ~~grades~~ JR 4/21/16 contact @ 133.8	
	Core 20			133.8-134.6: increased grain size f-vc grading to vf-m, fining downward @ 134.6	Core 20 B34RT4 132.7 – 137.7
135		100%			
					JR 7/5/16
137.5	Core 21			137.7-142.7 vf-m well sorted sand w/ trace mica	Core 21 B34RT~~R~~6 137.7 – 142.7
		100%			

Reported By: Jen Russell		Reviewed By: T. Clark	
Title: Geologist		Title: Geologist	
Signature: Jen Russell	Date: 7/7/16	Signature:	Date: 5/15/17

A-6003-642 (03/03)

JR 7/7/14 6

BOREHOLE LOG

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Date: 7/5/14

Well ID: C9491 | Well Name: NA | Location: 216-B-37 Trench

Project: 200-DV-1 OU Characterization Ph3 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
140	Core 21	100%		87.6-152.5: Sand (100%): 40% Mafic, 60% felsic, gdtn, vf-m, SA, WS, no rxn w/HCL, 2.5Y5/2 gray, dry, trace mica.	Sonic Core Core 21 B34RT6 137.7-142.7
142.5	Core 22	100%		142.7-147.7: (same as above) no structure vf-m, iron stain in grains	Core 22 B34RT8 142.7-147.7
145					
147.5	Core 23	100%		147.7-150.0: (same as above)	Core 23 B34RV0 ~~147.7-152.7~~ 147.6-152.6 JR 7/25/14
150				150.0: Sharp contact: vf sand/silt (70% vf sand, 5% Pebbles, 25% Silt) 1cm v. thin vf sand bed, sharp contact, vf sand/silt w/ pebb 4 cm thin bed, grading to: JR 6/22/14 ~~150.2~~ 150.2-152.6: m-c sand 152.5-~~157.5~~ 153.0: 30% Sand 70% Silt Sandy Silt (sM): Sand: f-vc, 20% Mafic 80% Felsic, SA, dry, poorly sorted, 2.5Y 6/3 light yellowish brn, mod rxn w/HCL JR 6/22/14 - gradational contact (TC) 5-15-17	Likely slough
152.5	Core 24	100%		153.0-157.5 ~~Slightly silty~~ Sand (m) S: 90% Sand 10% Silt; Sand: f-vc, 70% Felsic 30% Mafic, SA, mod sorted; dry, 10YR 7/1 Light gray, no rxn w/HCL JR 7/6/14 - Silt lens from 153.9-154.1 - silt (1 in thick) 154.2 - bedding @ 156.0-156.4 JR 7/6/14	Core 24 B34RV2 152.5'-157.5' Aliquot 153.5'-156.5'
155					
157.5	Core 25	100%		157.5-172.8 Sand(S) ~~100%~~ 95% Sand 5% Gravel	Core 25 B34RV4 157.8-162.8

Reported By: Jen Russell | Reviewed By: T. Clark

Title: Geologist | Title: Geologist

Signature: Jen Russell | Date: 7/7/14 | Signature: [illegible] | Date: 5/15/17

A-6003-642 (03/03)

JR 7/7/16 7

BOREHOLE LOG

Page ~~8~~ of ~~10~~ 10

Date: 7/5/16

Well ID: C9491	Well Name: NA	Location: 216-B-37 Trench
Project: 200-DV-1 OU Characterization Ph 3		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
160	Core 25	100%		157.5-172.8 Sand (S) 95% Sand 5% Gravel; Sand: f-vc, 70% Felsic, 30% Mafic, SA; Gravel: vf peb - ~~med~~ coarse peb, JR 7/6/16 predom. coarse 0.25cm, SA, 80% Mafic basalt, 20% Felsic; dry, mod-poorly sorted, no rxn w/ HCL; 2.5Y 4/1, Gray.	Sonic Core
					Core 25 B34RV4 ~~157.5-162.5~~ 157.8-162.8
162.5				158.6-161.4: Interbedded f-c sand & pebble beds up to 3.5cm thick - gradational	JR 7/25/16 JR 7/6/16
	Core 26	100%		162.5-163.5: Slough / Overdriven	Core 26 B34RV6 162.5-167.5
165				163.5-167.5: Sand (S) 100% Sand: vf-vc, predom. med., 45% Felsic, 35% Mafic, SA, mod sorted, dry, 2.5Y 5/1 light gray, no rxn w/ HCL	
167.5	JR 7/5/16 NO overlap			167.8-172.8: (same as above) 2.5Y 6/2 light gray brn; 169.9: vf peb lens (mafic ~25mm); 169.0: vf pebble lens (mafic JR 7/5/16 ~2.5mm)	Core 27 B34RV8 167.8-172.8
170	Core 27	100%			
172.5	Core 28	100%		172.8-190.6 Gravelly Sand (gS): 90% Sand 10% Gravel; Sand: 70% Felsic qtz, 30% Mafic basalt; SA, f-c, predom. med. Gravel: 80% Mafic, 20% Felsic, vf peb-2cm, predom. 0.25cm, SA-SR; dry, poorly sorted, 2.5Y 7/1 Light gray, no rxn w/ HCL	Core 28 B34RW0 172.7-177.7
175				7/1 - gradational change @ 173.7 - fining downward; JR 7/6/16 - gradation change @ 174.6 - coarse, fining downward	
177.5	Core 29	100%		177.7-182.7: (Same as above) no structures noted. Massive	Core 29 B34RW2 177.7-182.7

Reported By: Jen Russell		Reviewed By: T. Clark	
Title: Geologist		Title: Geologist	
Signature: Jen Russell	Date: 7/7/16	Signature: [signature]	Date: 5/15/17

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JE 7/7/16 8

BOREHOLE LOG

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Date: 7/5/16

Well ID: C9491 | Well Name: NA | Location: 216-B-37 Trench

Project: 200-DV-1OU Characterization Ph 3 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
180	Core 29	100%		172.8 – 190.6 Gravelly Sand (gS) 90% Sand 10% gravel; Sand: 70% Felsic qtz, 30% Mafic basalt, SA, f-c, predom. med; Gravel: 80% Mafic, 20% Felsic, vf peb – 2cm, predom. 0.25cm, SA-SR; dry, PS, 2.5Y 7/1 light gray, no rxn w/ HCl JE 7/14/16 JE 7/14/16	Sonic Core. Core 29 B34RW2 177.7 – 182.7
182.5	Core 30	100%		182.5 – 187.5: Same as above, w/ iron oxidation stain. 186.3: Color change 2.5Y 5/1 gray to 2.5Y 7/1 light gray increased iron staining	Core 30 B34RW4 182.5 – 187.5
185					
187.5	Core 31	100%		187.8 – 190.6: 2.5Y 5/1 Gray, decreased iron staining, vf peb – 3.5cm peb. Gradational contact @ 190.6 fining downward	Core 31 B34RW6 187.8 – 192.8
190				190.6 – 207.7 Sand (S): 100% 75% Felsic qtz, 25% Mafic, SA, f-c, predom. med, dry, no rxn w/ HCl, 2.5Y 7/1 light gray, mod sorted	
192.5	Core 32	100%		192.8: Increased grain size f-vc 197.8. color change 2.5Y 5/1 gray. no structures, minor amt. iron staining	Core 32 B34RW8 192.8 – 197.8
195				Massive Sand	
197.5	Core 33	100%		197.8 – 202.7: 95% Sand 5% Gravel minor iron staining, Gravel: vf peb – 1cm, 4mm predom., 80% Mafic Basalt 20% Felsic feldspar, SA 7 JE 7/25/16	Core 33 B34RX0 197.8 – 202.7

Reported By: Jen Russell | Reviewed By: T. Clark

Title: Geologist | Title: Geologist

Signature: Jen Russell | Date: 7/7/16 | Signature: [signature] | Date: 5/15/17

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 7/7/16

Well ID: C9491 | Well Name: NA | Location: 216-B-37 Trench

Project: 200 DV-1 OU Characterization Ph3 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description (Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level)
200	Core 33	100%		190.6-207.7: Sand(S): 95% Sand, 5% Gravel; Sand: 75% Felsic qtz, 25% Mafic, SA, f-vc, predom. med.; Gravel: 80% Mafic basalt, 20% Feldspar Felsic, vf peb-1cm, predom. 4mm, SR-SA; dry, no rxn w/HCL, 2.5Y5/1 Gray, mod. sorted, minor amt. iron staining	Sonic Core, Core 33 B34RX0 197.7 – 202.7
202.5	Core 34	100%		202.5-203.0: Slough 202.5-207.5: Slight increase in grain size; predominantly coarse grained sand; Massive sand	Core 34 B34RX2 202.5 – 207.5
205					
207.5	Core 35	100%		207.7-213.7: Gravelly Sand (gS): 75% Sand, 25% Gravel; Sand: 40 Mafic, 60% Felsic, m-vc, predom coarse, SA; Gravel: 3 cobbles (4in+ diameter) in core, pred. vf-vc pebbles (basalt), SR-SA; dry, no rxn w/HCL in sand, mod. rxn w/HCL around cobbles, 2.5Y5/1 Gray. - Cobbles are quartzite (pink), diorite, & basalt - mica @ 213.4 - gradational contact →	Core 35 B34RX4 207.7 – 212.7
210					
212.5	Optional 1	100%		213.7-217.0: Sand 100%: 80% Felsic, 20% Mafic, trace mica, vf-f, SA, WS, dry, 2.5Y7/2 light gray, no rxn w/HCL - Sharp contact	Optional 1 B34T5B 212.7 – 217.7
215					
217.5	Opt. 2	100%		217.0-218.9: Silt (M) 100% Silt: Sandy Gravel (sG) @ 5/15/17 218.9-222.5: ~~Gravelly Sand (gS)~~: 35% G, 60% Sand, 5% M	CCU Optional 2 B34T60 217.5 – 222.5 Aliquot 218.5-220.5

Reported By: Jen Russell | Reviewed By: T. Clark

Title: Geologist | Title: Geologist

Signature: Jen Russell | Date: 7/7/16 | Signature: [illegible] | Date: 5/15/17

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JR 7/7/14 10

BOREHOLE LOG

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Date:

Well ID: C9491	Well Name: NA	Location: 216-B-37 Trench	
Project: 200-DV-1 OU Characterization Ph 3		Reference Measuring Point: Ground Surface	

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCL	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
220	Core Optional 2	100%		219.9-222.5: ~~Gravelly Sand (GS)~~ Sandy Gravel (SG): 35% G, 60% S, 5% M; Gravel: 80% Mafic, 20% Felsic, vf peb-4cm cobbles, SR; Sand: 70% Mafic, 30% Felsic, SA, m-vc; 10YR 5/1 gray, dry-moist, poorly sorted, wk-no rxn w/ HCL TC 5/15/17	Sonic Core Optional 2 B34T60 217.5-222.5
222.5	Core Optional 3	100%		222.5-227.7: Sandy Gravel (SG): 70% G, 20% S, 5% M; Gravel: 70% Mafic, 30% Felsic, SR-SA, vf peb-10cm cobbles; Sand: vf-vc, SA, 70% Felsic, 30% Mafic; dry-moist, poorly sorted, 10YR 5/1 Gray, no rxn w/ HCL - overdriven in upper 0.5', exhibited mod rxn w/ HCL 75 JR 6/22/14	Core Optional 3 B34T62 222.7'-227.5' 7' JR 7/12/16
225				-sand cont. decr. from 227.1-227.3 10% Sand 90% Gravel 4mm-2cm	
				-gravel lense from 225.0'-225.3' 4mm-2cm	Aliquot 224.7-226.7
227.5				TD = 227.7'	
230					
232.5					
235.0					
237.5					

NOT USED JR 7/7/14

Reported By: Jen Russell		Reviewed By: T. Clark	
Title: Geologist		Title: Geologist	
Signature: Jen Russell	Date: 7/7/14	Signature: [illegible]	Date: 5/15/17

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 4/24/16

Well ID: C9487	Well Name: NA	Location: 216-B-7 A&B Cribs
Project: 200 DV-1 OU Characterization Ph. 3		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description (Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level)
60				CORES OPTIONAL 11, 1 & 2 SENT TO PNNL - NOT LOGGED -	
62.5	Core 3	100%		62.3-64.8: Gravelly Sand: 20% Gravel, 80% Sand; Gravel: 60% Mafic, 40% Felsic, vf peb - 1cm, SR-SA Sand: f-c, predom vc, 70% Felsic, 30% Mafic, SA; dry, PS, 2.5Y 4/3 light yellowish brn, no rxn w/HCL - 2-3cm gravel @ 64.0 - interbedded S & G	Core 3 B34W69 62.3-64.8 GM: 41/48/37 cpm PAM: 0 cpm
	slough			64.5-67.0: Sand (S): 95% Sand 5% Gravel Gravel: vf peb ~~SM-SR~~ JR 8/8/16 SA - c peb, SA, 60% Mafic, 40% Felsic; Sand: f-vc, 40% Mafic, 60% felsic, SA-SR, Qtz/feldspar; dry to sl. moist, mod-well sorted, no rxn w/ HCL, 2.5Y 6/2 light brownish gray - 66.1-66.6: vf-m sand	Core 4 B34W71 64.5-67.0 Aliquot ~~65.5~~ JR 6/24/16 65.0-67.0
65	Core 4	100%			
	slough/ overdriven				
67.5	Core 5	100%		67.0-69.5: Sand (S): 95% Sand, 5% Gravel; Gravel: vf peb-2cm, SA, 60% Mafic, 40% Felsic; Sand: f-vc, 60% Felsic qtz/feldspar, 40% Mafic, SA-SR; dry, m-WS, no rxn w/ HCL, 2.5 5/2 grayish brn, massive - no visible structures	Core 5 B34W73 67.0-69.5
	slough/ overdriven				
70	Core 6	100%		69.5-72.0: Sand (S): 95% Sand, 5% Gravel; Gravel: 2mm-1cm, SA-SR, 80% Mafic, 20% Felsic; Sand: f-vc, 40% Mafic, 60% Felsic, SA, Qtz/feldspar; dry, m-WS, no rxn w/ HCL, 2.5 5/2 grayish brn, iron staining massive	Core 6 B34W75 69.5-72.0
	slough overdriven				
72.5	Core 7	100%		72.0-74.5: Gravelly Sand (gS): 90% Sand, 10% Gravel; Gravel: 80% Mafic, 20% Felsic, 2mm-~~0.25cm~~ JR 8/27/16 6mm, SA; Sand: m-vc, 40% Mafic, 60% felsic (qtz/feldspar), SA; dry, ms, no rxn w/HCL, iron staining, massive, 2.5Y 4/2 dk grayish brn	Core 7 B34W77 72.0-74.5
75	Core 8	100%		74.5-77.0 Gravelly Sand (gS): 80% Sand, 20% Gravel; ~~Gravel~~: 85% Mafic, 15% Felsic, SR, vf peb - 3cm, predom. 0.5cm; Sand: m-vc, 50% Mafic, 50% felsic (qtz/feldspars); SA; dry, PS, no rxn w/HCL, iron staining, massive, 2.5Y 4/2 dk grayish brn	Core 8 B34W79 74.5-77.0
77.5	Core 9	100%		77.0-82.0: Sand (S) 85% Sand, 15% Gravel (gS) JR 8/8/16 Gravelly JR 8/8/16 Gravel: vf peb-3cm, predom 0.5cm, 90% Mafic, ~~10%~~ 10% Felsic JR 8/8/16, SR; Sand: c-vc, 60% felsic (cont.)	Core 9 B34W81 77.0-82.0

Reported By: Jennifer Russell		Reviewed By: Tessa Clark	
Title: Geologist		Title: Geologist	
Signature: Jen Russell	Date: 8/8/16	Signature:	Date: 9/28/16

A-6003-642 (03/03)

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BOREHOLE LOG

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Date: 4/24/16

Well ID: C9487	Well Name:	Location: 216-B-7 A&B Cribs	
Project: DV-1 OU Characterization Ph. 3		Reference Measuring Point: Ground Surface	

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	Core 9	100%		77.0-82.0: Gravelly Sand (gS): (cont.) 40% Mafic, SA, dry, PS, no rxn w/HCL, iron staining, 2.5Y 4/2 dk grayish brn	Sonic Core
				- vf sand & silt beds @ 79.0' bgs & 78.2' bgs 1 cm thick JR 8/8/16	Core 9 B34W81 77.0-82.0
82.5	Core 10	100%		82.3 - 87.3: Sand (S): 95% Sand, 5% Gravel; Gravel: vf-f peb, 80% Mafic, 20% Felsic, SR; Sand: m-vc, predom. c, 70% Felsic, 30% Mafic, SA; dry, mod-ws, no rx w/HCL, 2.5Y 4/2 dk grayish brn; ~2 cm thick vf-f (@ 83.6) sand bed. JR 8/8/16	Core 10 B34W83 82.3-87.3
85				84.0-84.5: Gravelly Sand (gS): 80% Sand, 20% Gravel JR 8/8/16 Gravel: vf peb-3 cm, 90% Mafic, 10% Felsic, A; Sand: vf-f, 90% Felsic, 10% Mafic, dry, no rxn w/HCL, iron staining	
				84.5-87.3: Interbedded rhythmites - stratified f-vc sand & gravel (fine peb-2 cm), iron st., no rxn w/HCL, 10YR 5/2 grayish brn	
87.5	Core 11	100%		87.2-92.2: Sand (S) 100% Sand: 70% Felsic, 30% Mafic, vf-m, well sorted, moist, SA-SR, 2.5Y 5/3 light olive brn, no rxn w/HCL	Core 11 B34W85 87.2-92.2 Aliquot 88.2-91.7
90				JR 8/8/16 ~~50%~~ 5% Gravel 90% JR 8/8/16	
92.5	Core 12	100%		92.2-97.2: Sand (S) 95% Sand 5% Silt↑ Sand: vf-vc, predom. med; varying amt. of Mafic, predom Felsic (~20%/80%), dry, no rxn w/HCL 2.5Y 5/3 light olive brn; Gravel: 75% Mafic, 25% Felsic, vf peb-1 cm SA	Core 12 B34W87 92.2-97.2
95				- vf sand/silt laminae 93.0-93.4' 0.5 cm-2 cm thick - interbedded f-vc sand rhythmites (not well defined) 93.6-97.2'	
97.5	Core 13	100%		97.2-102.2: Sand (S) 100%: 60% Felsic, 40% Mafic, m-c, WS, SA, trace mica, iron staining 2.5Y 5/1 Gray, dry, no rxn w/HCL, massive 99.6 - well defined iron staining 1.0 cm thick 100.0 - well defined iron staining - 0.5 cm thick	Core 13 B34W89 97.2-102.2

Reported By: Jen Russell		Reviewed By: Tessa Clark	
Title: Geologist		Title: Geologist	
Signature: Jen Russell	Date: 8/8/16	Signature:	Date: 9/28/16

A-6003-642 (03/03)

BOREHOLE LOG

Page ~~2~~ 3 of ~~8~~ 9 8/8/16 JR JR 9/28/16
Date: 8/8/16

Well ID: C9487	Well Name: NA	Location: 216-B-7A & B Cribs	
Project: 200 DY-1 Characterization Ph 3		Reference Measuring Point: Ground Surface	

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCL	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
100	Core 13	100%		97.2-102.2: Sand(S) 100%: 60% Felsic, 40% Mafic, m-c, WS, SA, trace mica, qtz, feldspar, JR 8/8/16 basalt, dry, 2.5Y5/1 Gray, dry, no rxn w/ HCL massive, Iron staining throughout - line of iron staining @ 102.0' (0.5cm)	Sonic Core Feldspar Core 13 B34W89 97.2-102.2
102.5	Core 14	100%		102.0-107.0: Sand(S) 100%: 60% Felsic, 40% Mafic, m-c, WS, SA, trace mica, qtz, feldspar, basalt, 10YR 4/1 dark gray, no rxn w/ HCL - m-c grades to f-m @ 103.1' - fining downward to 104.2' - slight grain size increase @ 104.2' (gradational) m-c - minor iron staining JR 8/8/16 throughout	Core 14 B34W91 102.0-107.0
105					
107.5	Core 15	100%		107.0-112.0: Sand(S) 100%: 60% Felsic, 40% Mafic, f-vc, WS, SA, 10YR 4/1 dark gray, no rxn w/ HCL, iron staining - m-vc to 108.3', grades to f-m - f-m 108.3 ~~110.8~~ 110.8' JR 8/8/16 - m-vc JR 8/8/16 110.8-112.0'	Core 15 B34W93 107.0-112.0
110					
112.5	Core Opt. 1	100%		9/28/16 112.3-117.3: Sand(S) 100%, vf-vc, 55% Mafic, 45% Felsic qtz/feldspar, mod-well sorted, dry, SA, 10YR 4/2 Dk grayish brn, no rxn w/HCL 112.3-113.5: vf-f sand 113.5-114.1: c-vc sand 114.1-116.0: interbedded f-c sand (0.5-2in) layers 115.1 - Silt laminae (3mm) JR 8/8/16 116.0-~~116.5~~ JR 8/8/16 - 116.5: vf-m sand 116.5-117.3: c-vc sand	Core. Optional 1 B34WK3 112.3-117.3 Aliquot 113.3-116.3
115					
117.5	Core Opt. 2	100%		117.2-122.2: Sand(S) 100%; vf-vc, JR 8/8/16 ~~4~~ 55% Felsic, 45% Mafic, WS, dry, SA, 10YR 4/2 dk grayish brn, no rxn w/ HCL, iron staining JR 8/8/16 120.7-121.2: vf-fine pebbles, 100% 90% Mafic 10% Felsic, SR-SA, iron staining, no rxn w/ HCL, 10YR 4/1 Dk gray	Optional 2 B34WK5 117.2-122.2

Reported By: Jen Russell		Reviewed By: Tessa Clark	
Title: Geologist		Title: Geologist	
Signature: Jen Russell	Date: 8/8/16	Signature:	Date: 9/28/16

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BOREHOLE LOG

Page ~~7~~ 4 of ~~8~~ 9 JR 8/9/16 JR 9/28/16
Date: 8/8/16

Well ID: C9487	Well Name: NA	Location: 216-B-7A & B Cribs
Project: 200 DV-1 Characterization Phase 3		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description (Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level)
120	optional 2	100%		117.2-122.2: Sand (S) 100%: vf-vc, 55% Felsic, 45% Mafic, WS, dry, SA, 10YR 4/2 grayish brn, no rxn w/ HCl, iron staining	Sonic Core Core Optional 2 B34WK5 117.2-122.2
122.5	optional 3	100%		122.2-127.2 Sand (S) 100%: vf-vc, 55% Felsic, 45% Mafic, WS, dry, SA, 10YR 4/2 DK grayish brn, trace mica, minor amt. iron staining, no rxn w/ HCl 122.2-123.2: vf-m sand, grades to 123.2-123.6: very thin laminae of c-vc sand 123.6-125.0: vf-m sand 125.0-125.4: ~~slight increase~~ very thin laminae of m-vc sand increased mafic 125.4-127.2: f-c, 2.5Y 5/1 gray (lighter color)	Optional 3 B34WK7 122.2-127.2
125					
127.5					
130				SAMPLES/CORES SENT TO PNNL	
132.5				8/9/16 JR	
135				NOT LOGGED	
137.5					

Reported By: Jen Russell		Reviewed By: Tessa Clark	
Title: Geologist		Title: Geologist	
Signature: Jen Russell	Date: 8/9/16	Signature: [illegible]	Date: 9/28/16

A-6003-642 (03/03)

JR 8/9/16 5 of 9

BOREHOLE LOG

Page ~~X~~ of ~~X~~ JR 9/28/16

Date:

Well ID: C9487	Well Name: NA	Location: 216-B-7A&B Cribs	
Project: 200 DV-1 Characterization Phase 3		Reference Measuring Point: Ground Surface	

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
140				~~SAMPLES SENT TO PNNL 8/9/16 JR NOT LOGGED~~	
142.5	Core 19	100%		142.2-147.2: Sand (S) 100%: 70% Felsic, 30% Mafic, f-m, SA, dry, no rxn w/ HCL, trace mica, WS, massive, 2.5Y5/1 gray. 145.8-147.2: increased grain size m-vc w/ 5% fine pebbles	Core 19 B34WC3 142.2-147.2
145					
147.5	Core 20	100%		147.1-152.1: Sand (S) 100%: 60% Felsic, 40% Mafic (increased mafic content), f-c, predom med., WS, SA, 10YR4/1 dark gray, dry, iron staining, no rxn w/ HCL, massive	Core 20 B34WC5 147.1-152.1
150					
152.5	Core 21	100%		152.0-152.5: Slough 152.5-152.8: Sandy silt bed (3cm) 152.8-157.0: Sand (S) 100%: 60% Felsic, 40% Mafic, f-vc, predom c, WS, SA, 10YR4/1 dark gray, dry, iron staining, trace mica, massive, no rxn w/ HCL - fining (vf-m) @ 156.0 downward	Core 21 B34WC7 152.0-157.0
155					
157.5	Core 22	100%		157.2-162.2: Sand (S) 100%: 60% Felsic 40% Mafic, f-vc, predom. c, WS, SA, 10YR4/1 dark gray, dry, iron staining, massive, no rxn w/ HCL	Core 22 B34WC9 157.2-162.2

Reported By: Jen Russell		Reviewed By: Tessa Clark	
Title: Geologist		Title: Geologist	
Signature: Jen Russell	Date: 8/8/16	Signature:	Date: 9/28/16

A-6003-642 (03/03)

JR 8/9/16 6 of 9

BOREHOLE LOG

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Date: 6/27/16

Well ID: C9487	Well Name: NA	Location: 216-B-7A&B Cribs
Project: 200 DV-1 OU Characterization Ph 3		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
160	Core 22	100%		157.2-162.2: Sand(S) 100%: 60% Felsic, 40% Mafic, f-vc, predom c, WS, SA, 10YR4/1, dark gray, dry, iron staining, massive	Sonic Core
162.5	Core 23	100%		162.0-167.0' Sand(S): 95% Sand 5% Gravel; Gravel: 50% Felsic & 50% Mafic, vc peb, SA-A, poorly sorted; Sand: ~~40% Mafic, 60% Felsic~~ JR 8/9/16 60% Mafic, 40% Felsic, f-vc, SA; dry, mod sorted, 10YR4/1 dark gray, no rxn w/HCL -Trace mica throughout	Core 23 B34WD1 162.0-167.0 Aliquot: 163.0'-167.0' JR 6/27/16
165					
167.5	Core 24	100%		167.2-172.2 ~~Gravelly Sand (gS):~~ JR 8/9/16 Sandy Gravel (sG): 40% Gravel, 60% Sand; Gravel: 60% Mafic, 40% Felsic, vf peb-1cm, predom. fine pebbles, SA; Sand: vf-vc, predom. coarse, 60% Felsic, 40% Mafic, SA; dry, no rxn w/HCL, 10YR5/1 gray, minimal iron staining -Interbedded rhythmites up to 6cm thick (whole core)-not well defined	Core 24 B34WD3 167.2-172.2
170					
172.5	Core 25	100%		172.0-174.7: Sandy Gravel (sG): 40% Gravel, 60% Sand; Gravel: 60% Mafic, 40% Felsic, vf peb-2cm predom fine pebbles, SA; Sand: vf-vc, predom. c, 60% Felsic, 40% Mafic, SA; dry, no rxn w/HCL, 10YR4/1 Dark gray, min. iron staining -Interbedded rhythmites throughout - gradational contact	Core 25 B34WD5 ~~170.0-172~~ JR 8/9/16 ~~170~~ JR 8/9/16 172.0-177.0
175		100%		174.7-177.0: Sand(S) 100%: 60% Felsic, 40% Mafic, vf-c, predom. medium, SA, dry, 10YR5/1 gray, iron staining, no rxn w/HCL ~~174.7~~-174.8: vf-f sand grading to m-c JR 8/9/16 174.8-175.0: m-c Sand, grading to vf-f 175.0-175.4: vf-f, grading to m-c 175.4-177.0: m-c Sand	Interbedded rhythmites
177.5	Core 26	100%		177.2-182.2: Sand(S): 100%: Description next page	Core 26 B34WD7 177.2-182.2

Reported By: Jen Russell		Reviewed By: Tessa Clark	
Title: Geologist		Title: Geologist	
Signature: Jen Russell	Date: 8/9/16	Signature:	Date: 9/28/16

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JR 8/9/14 7 of 9

BOREHOLE LOG

Page ~~10~~ of ~~8~~ JR 9/28/16

Date: 4/27/16

Well ID: C9487	Well Name: NA	Location: 216-B-7A&B Cribs	
Project: 200 DV-1 Characterization Ph 3		Reference Measuring Point: Ground Surface	

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl JR 8/9/16	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
180	Core 26	100%		177.2-182.2: Sand (S) 100% 95% Sand 5% Gravel; Gravel: vf peb-2cm, predom. fine peb, 90% Mafic, 10% Felsic; Sand: 60% Felsic, 40% Mafic, SA, trace mica; dry, 10YR 4/1 dk gray, no rxn w/ HCL -	Sonic Core Core 26 B34WD7 177.2-182.2
				177.2-180.3: vf-vc sand rhythmites	
182.5	Core 27	100%		180.3-182.2: no structures, fining downward	
				182.3-~~187.3: Sand (S)~~; Gravelly Sand -186.3: ~~30%~~ JR 8/9/16 25% Gravel, 75% Sand; Gravel: vf peb-2cm, predom. f peb., 80% Mafic, 20% Felsic; Sand: vf-vc, 60% Felsic, 40% Mafic, SA; dry, 10YR 4/1 dk gray, no rxn w/ HCL, dipping interbedded sand & gravel s ~~(~~ ~~50%~~ JR 8/9/16 (~ 50°)	Core 27 B34WD9 182.3-187.3
185				186.3-187.3: Sand (S) 100%, dry, f-vc, predom med, massive, 10YR 4/2 light brnish gray, no rxn w/ HCL, 90% Felsic, 30% Mafic	
187.5	Core 28	100%		187.2-192.2 Sand (S): 5% Gravel 95% Sand; Gravel: 75% Mafic 25% Felsic, SA-SR, fine peb-1cm (small cobble); Sand: 60% Mafic, 40% Felsic, SA, f-vc; mod-well sorted, dry, 10YR 4/1 dark gray; No rxn w/ HCL Dip ~~Crossbedding~~ @ 190.3-191.5, interbedded fine peb. and f-m sand beds ~ 1-2in thick JR 4/27/16	Core 28 ~~B34~~WF1 JR 4/28/16 187.2-192.2 ~~Alt~~ Aliquot 188.2-189.7'
190					
192.5	Core 29	100%		192.2-192.9: Sand 100% (S): vf-vc, predom coarse, 60% Felsic, 40% Mafic, trace mica, dry, 10YR ~~4/1~~ JR 8/9/16 4/2 light brnish gray, no rxn w/ HCL - Sharp contact	Core 29 B34WF3 192.2-197.2
				192.9-196.0: Gravel (G): 80% Gravel, 20% Sand; Gravel: vf peb-7cm, predom. 4mm; 70% Mafic basalt, 30% Felsic rock, vf peb-f peb. basaltic (SA) cobbles (SR) 2cm-7cm felsic rocks; Sand: 70% Felsic (qtz), 30% Mafic, vf-vc, predom. vc; dry, 10YR 4/1 dk gray, no rxn w/ HCL, massive - gradational contact -	
195				196.0-197.2: Sand (S): 95% Sand 5% Gravel; Gravel: f peb-2cm, predom f. peb.; SA-SR, 50% Mafic, 50% Felsic; Sand: vf-c, predom. med, SA, 70% Felsic, 30% Mafic; dry, 2.5Y 6/1 gray, no rxn w/ HCL, no structures	
197.5	Core 30	100%			Core 30 B34WF5 197.1-202.1

Reported By: Jennifer Russell		Reviewed By: Tessa Clark	
Title: Geologist		Title: Geologist	
Signature: Jennifer Russell	Date: 8/9/16	Signature:	Date: 9/28/16

A-6003-642 (03/03)

BOREHOLE LOG

Page ~~11~~ 8 of ~~8~~ 9 JR 8/9/16 JR 9/28/16
Date: 6/27/16

Well ID: C9487	Well Name: NA	Location: 216-B-7A&B Cribs	
Project: 200 DV-1 Characterization Ph 3		Reference Measuring Point: Ground Surface	

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
200	Core 30	100%		197.1-197.6: Slough (Gravel)	Sonic Core
				197.6-202.1: Sand(S) 100%: 30% Mafic, 70% Felsic, dry, iron staining, trace mica, 2mm $CaCO_3$ particles noted in sand (strong rxn w/ HCL), 2.5Y5/1 gray, no rxn w/HCL in sand, massive,	Core 30 B34WF5 197.1-202.1
202.5				197.6-201.0: f-c sand, predom. med.	
				201.0-202.1: vf-f sand	
	Core 31	100%		202.2-207.2: Sand(S) 100%: 70% Felsic, 30% Mafic, dry, 2.5Y4/2 light ~~brownish gray~~ grayish brn JR 8/10/16, no rxn w/HCL, vf-m, massive, WS, SA.	Core 31 B34WF7 202.2-207.2
205					
					Core 32 B34WF9
207.5	Core 32	100%		207.2-212.2: Sand(S) 100%: 70% Felsic, 30% Mafic, dry, trace mica, 2.5Y4/2 light grayish brn, no rxn w/ HCL, vf-m, predom. f., WS, SA	207.2-212.2
				210.9: Grades to vf sand - massive, moist, 85% Felsic, 15% Mafic	
210					
212.5	Core 33	100%		212.0-214.5: Sand(S) 100%: 85% Felsic, 15% Mafic, moist, 2.5Y4/2 light grayish brn, vf sand, massive, WS	Core 33 B34WH1 212.0-214.5
				214.5-216.2: Sand(S) 100%: 85% Felsic, 15% Mafic, moist, 2.5Y4/2 light grayish brn, vf sand, massive, WS	Core 34 B34WH3 214.5-217.0
215	Core 34	100%		216.2-217.0 Silt(M): 85% Silt, 15% Clay, non-plastic - low plasticity, mod rxn w/HCL, laminated, platy, 2.5Y4/4 light yellowish brn, moist	
				216.3-217.3: Silt w/ Sand(ML)*, Suspect Slough 10% vf sand, 90% Silt; 2.5Y4/2 Dk grayish brn, moist, wk rxn w/HCL, non plastic, mica (trace)	*Unified Soil Classification
216.3				217.3-217.8: Silt w/ Sand: 10% vf sand, 90% Silt, trace mica, 2.5Y4/2 Dk grayish brn, moist, wk rxn w/ HCL, non-plastic	Core length 3.5ft: 217.3 JR 9/28/16 219.8 Total Depth; Optional 4' B34WK9 Aliquot 217.0' - 219.0'
217.5	Opt. 4	100%		217.8-219.7: Silt (100%): 2.5Y5/2 grayish brn, moist, wk rxn w/HCL, low plasticity JR 6/27/16	
				218.7-219.8: Silty Clay*: 65% Clay 35% Silt, ~~mod~~ med. plasticity, wk rxn w/HCL 2.5Y5/4 Light olive brn.	

Reported By: Jen Russell		Reviewed By: Tessa Clark	
Title: Geologist		Title: Geologist	
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BOREHOLE LOG

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Date: 9/28/16

Well ID: C9487	Well Name: NA	Location: 216-B-7A&B Cribs
Project:		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
220					Sonic Core
				Sample Cores to PNNL from 219.8-235ft	
222.5		↑ UNKNOWN ↓			
225					
227.5					
230					
232.5					
235.0				Total Depth: 235ft	
237.5					

Reported By: Jen Russell		Reviewed By: Tessa Clark	
Title: Geologist		Title: Geologist	
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BOREHOLE LOG

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Date: 11/9/16

Well ID: C9490	Well Name: NA	Location: 216-B-9 Crib	
Project: 200 DV-1 OU Characterization Phase 3		Reference Measure Point: Ground Surface	

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
30			JR 2/28/17 NOT USED	Sonic Core RS= Rad Screen
32.5				
				Core 1 B354N3
			34.5 – 37.0: Sand (S) 100%, m-vc, predom coarse, 60% Felsic, 40% Mafic, SA, WS, moist, no rxn w/HCL, massive, iron staining, 2.5Y5/2 grayish brn	34.5 - 37.0 RS – B354N2 200-220 cpm
35	Core 1			
			37.0 – 39.5: Sand (S) 100%, f-vc, predom c, 70% Felsic, 30% Mafic, SA, WS, dry, no rxn w/HCL, massive, trace mica, 2.5Y6/2 light brnish gray	Core 2 B354N5 37.0 – 39.5 RS – B354N4 180-200 cpm
37.5	Core 2			
40	Core 3		39.6 – 42.1 Sand (S): 100%, f-vc, predom c, 70% Felsic quartzose & feldspars, 30% Mafic, SA, WS, dry, no rxn w/HCL, massive, 2.5Y6/2 light brnish gray	Core 3 B354N7 39.6 - 42.1 RS – B354N6 220 cpm
42.5	Core 4		42.0 – 44.5: Sand (S): 100%, f-vc, predom m-c, 70% Felsic, 30% Mafic, SA, MS, dry, no rxn w/HCL, massive, 2.5Y6/2 light brnish gray – appears pulverized from drilling on along sides of liner – possible silt JR 2/28/17	Core 4 B354N9 42.0 – 44.5 RS – B354N8
45	Core 5		44.5 – 47.0: Sand (S) 100%: m-vc, predom c., 70% Felsic, 30% Mafic, SA-SR, WS, dry, massive, trace mica, no rxn w/HCL, iron staining, 2.5Y6/2 light brnish gray	Core 5 B354P1 44.5 – 47.0 40 cpm – GM RS – B354P0
			47.0 – 49.5: Sand (S) 100%	Core 6 B354P3

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	2/28/17

Reviewed By:

Print Name	Title	Signature	Date
Tessa Clark	Geologist	[illegible]	3/30/17

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BOREHOLE LOG (Cont.)

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Date: 11/9/16

Well ID: C9490 | Well Name: NA | Location: 216-B-9 Crib

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
47.5	Core 6		47.0-49.5: Sand(S) 100%, m-vc, predom c., 70% Felsic, 30% Mafic, SA-SR, WS, dry, massive, no rxn w/HCL, iron staining, 2.5Y 6/2 light brnish gray	Sonic Core RS = Rad Screen Core 6 B354P3 47.0-49.5 39 cpm - GM RS - B354P2
50	Core 7		49.5-52.0: Sand(S) 5% Gravel, 95% Sand; Gravel: vf-m peb, SA, 80% Mafic, 20% Felsic; Sand: 60% Felsic, 40% Mafic, m-vc, predom c, SA; dry, M-WS, massive, no rxn w/HCL, iron staining, 2.5Y 5/2 grayish brn	Core 7 B354P5 49.5-52.0 (RS) B354P4 569 cpm - GM Bd — ⊛
52.5	Core 8		52.0-54.5: Sand(S): 100%, m-vc, predom c, 65% Felsic, ~~35%~~ 35% Mafic, trace mica, dry, SA-SR, WS, massive, no rxn w/HCL, 2.5Y 5/2 grayish brn	Core 8 B354P7 52.0-54.5 RS - B354P6 140 cpm - GM
55	Core 9		54.5-57.0: Sand(S) 100%, vf-m, predom. med, 80% Felsic, 20% Mafic, SA, WS, dry, massive, no rxn w/HCL, trace mica, 2.5Y 7/3 pale brn	Core 9 B354P9 54.5-57.0 RS - B354P8 40 cpm - GM
57.5	Core 10		57.0-59.5: Sand(S) 100%, vf-m predom f, 80% Felsic, 20% Mafic, SA, WS, dry, massive, no rxn w/HCL, trace mica, ~~2.5Y 3/3 Pap~~ JR 3/1/17 2.5Y 7/3 pale brn	Core 10 B354R1 57.0-59.5 RS - B354R0
60	Core 11		59.5-61.1: Slightly Silty Sand (m) S: 85% Sand, 15% Silt; vf sand, dry, 70% Felsic qtz, 30% Mafic, SA, WS, no rxn w/HCL, 2.5Y 6/3 light yellowish brn (JR 3/29/16)	Core 11 B354R3 RS - B354R2 59.5-62.0
			61.1-61.3: Silt (M) 100%, non-plastic, dry, trace mica, no rxn w/HCL, 2.5Y 7/3 pale brn, rad spike	⊛ 1727 cpm - Gamma ⊛
62.5	Core 12		61.3-62.0: Sand(S) 100%, c-vc, 75% Felsic, 25% Mafic, SA-SR, no rxn w/HCL, 2.5Y 5/2 grayish brn, WS, dry, massive 62.5-62.9: Silt/(M) 100%, NP, moist, wk-no rxn w/HCL, 2.5Y 5/3 light olive brn w/ ~~2.5~~ JR 3/1/17 10YR 5/8 yellowish brn staining @ contact, vertical flow structure/clastic dike	Core 12 B354R5 62.5-65.0 RS - B354R4 160 cpm ⊛ — ⊛ Look @ contact photo
65	Core 13		62.9-67.1: Sand(S) 100%, f-vc, predom c, 80% Felsic, 20% Mafic, SA, WS, dry, no rxn w/HCL, 2.5Y 4/2 light brnish gray, massive. 64.6-65.1: No recovery 65.1-67.1: Sand(S) 5% Gravel, 95% Sand: Gravel:	Core 13 B354R7 64.6-67.1 RS - B354R6 140 cpm ⊛ (cont.) →

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	3/1/17

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BOREHOLE LOG (Cont.)

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Date: 12/14/16

Well ID: C9490 | Well Name: NA | Location: 216-B-9 Crib

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
67.5	Core 14		(cont.) f-med peb, 80% Mafic, 20% Felsic, SA; Sand: m-vc, predom c, 70% Felsic, 30% Mafic, trace mica; dry, massive, no rxn w/HCL, 2.5Y 6/2 light brnish gray (mS) JP 3/29/17	Sonic Core. RS = Rad Screen
			67.3 - ~~68.8~~ 69.8: Silty Sand (mS): 70% Sand, 30% Silt; Sand: m-vc, 80% Felsic, 20% Mafic, SA; dry, NP, PS, mod rxn w/HCL, 2.5Y 6/2 light brnish gray, trace mica, iron staining. Silt/Sand rhythmites 67.9 - 69.1	Core 14 B354R9 67.3 - 69.8
70	Core 15		69.7 - 72.2: Sand (S): 98% m-vc; 2% vf-m peb, 100% Mafic; dry, WS, Sand: 60% Felsic, 40% Mafic, SA; no rxn w/HCL, 2.5Y 5/2 grayish brn, massive (mS) JP 3/27/17	RS - B354R8 230 cpm γ; Core 15 B354T1 69.7 - 72.2; RS - B354T0 188 cpm γ
72.5	Core 16		72.3 - 74.8: Silty Sand (mS): 75% Sand, 25% Silt; Sand: m-c, 20% Mafic, 80% Quartzose, SA; dry, ms, no rxn w/HCL, 2.5Y 6/2 light brnish gray, minor iron staining, massive	Core 16 72.3 - 74.8 B354T3
75	Core 17		74.6 - 77.1: Silty Sand (mS): 75% Sand, 25% Silt; Sand: m-vc, predom c, 20% Mafic, 80% Felsic qtz, SA; dry, ms-ws, no rxn w/HCL, 2.5Y 6/2 light brnish gray, minor iron staining, massive	Core 17 74.6 - 77.1 B354T5
77.5	Core 18		77.4 - 79.9: Silty Sand (mS): 75% Sand, 25% Silt; Sand: m-vc, predom c, 25% Mafic, 75% Felsic, SA; dry, m-ws, no rxn w/HCL, 2.5Y 6/2 light brnish gray.	Core 18 B354T7 77.4 - 79.9
80	Core 19		78.8 - 79.2: Sandy Silt bed (sM): 70% Silt, 30% Sand, dry, mod-strong rxn w/HCL, 2.5Y 7/2 light gray, f-m sand, PS	Core 19 B354T9 79.8 - 82.3
			79.8 - 82.3: Sand (S): 90% Sand, 10% Silt; Sand: m-vc, predom c., 80% Felsic, 20% Mafic, trace mica, SR; dry, no rxn w/HCL, MS-WS, 2.5Y 6/2 light brnish gray, massive, iron staining	
82.5	Core 20		82.5 - 87.5: Sand (S): 100% Sand; vf-vc, 35% Mafic, 65% Felsic, SA, MS-WS, no rxn w/HCL, 5Y 7/1 light gray, massive	Core 20 B354V1 82.5 - 87.5
85			82.5 - 85.4: vc-m, predom c. 85.4 - 87.5: vf-m, predom f	

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	3/2/17

A-6006-993 (REV 0)

BOREHOLE LOG (Cont.)

Date: 12/14/16

Well ID: C9490 | Well Name: NA | Location: 216-B-9 Crib

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
87.5	Core 21		87.4 – 92.4: Sand (S): 100%, vf-c, predom f-m, 75% Felsic, 25% Mafic, trace mica, SR, WS, no rxn w/HCL, trace pebbles in lower 2 ft, 5Y 7/1 lt gry 87.4-89.4: massive, f-c, grading to vf-f @ 89.4 89.4-92.4: vf-f, rhythmites from 90.1 – 90.6 and 91.7 – 92.4	Sonic Core Core 21 B354V3 87.4 – 92.4
90				
92.5	Core 22		92.4 – ~~97.4~~ 96.1 JR 1/4/17: Sand (S): 100% 92.4 – 94.9: vf-f, 80% Felsic, 20% Mafic, trace mica, dry, no rxn w/HCL, SA, WS, massive, 2.5Y 7/2 light gray 94.9 – 96.1: f-vc, 60% Felsic, 40% mafic, dry, no rxn w/HCL, SA, PS, rhythmites throughout, silt lamina (~1cm) @ 95.7', 2.5Y 6/1 gray	Core 22 B354V5 92.4 – 97.4
95				
97.5			96.1 – 97.4: Gravelly Sand (gS): 25% Gravel, 75% Sand; Gravel: 60% Mafic, 40% Felsic, vf-med. pebbles, SA; Sand: vf-vc, predom c., SA, 60% Felsic, 40% Mafic; dry, iron staining, fines from 96.4 – 96.6, 2.5Y 5/1 gray 97.3 – 102.3: Gravelly Sand (gS): 15% Gravel, 85% Sand; Gravel: 70% Mafic, 30% Felsic, vf peb-med peb, SA; Sand: 80% Felsic, 20% Mafic, trace mica, SR (quartzose); dry, PS, finer grained from 99.7 – 100.9, iron staining, massive, 2.5Y 5/1 gray	qtz & feldspars JR 1/4/17 Core 23 B354V7 97.3 – 102.3
100	Core 23			
102.5	Core 24		102.3 – 104.6: Sand (S) 95% Sand, 5% Gravel; Gravel: vf-f peb, 90% Mafic, 10% Felsic, SA; Sand: f-c, predom. c, 80% Felsic qtz, 20% Mafic, SA; dry, MS, no rxn w/HCL, 2.5Y 5/2 grayish brn, massive, trace mica, iron staining 104.6 – 107.3: Gravelly Sand (gS): 75% Sand, 25% Gravel; Gravel: vf peb – 1.5cm, 60% Mafic, 40% Felsic, SR-SA; Sand: f-vc, predom med., 80% Felsic, 20% Mafic, SA; dry, PS, no rxn w/HCL, 2.5Y 6/2 lightbrnish gray	Core 24 B354V9 102.3 – 107.3 Aliquot 103.3 – 104.3
105				

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	1/4/17

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BOREHOLE LOG (Cont.)

Date: 1/4/17

Well ID: C9490 | Well Name: NA | Location: 216-B-9 Crib

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
107.5	Core 25		Gravelly Sand (gS): 107.5-112.5: 10% Gravel, 90% Sand; Gravel: vf-med peb, 60% Mafic, 40% Felsic, qtz & feldspar, SA; Sand: vf-c, predom c, 70% Felsic, 30% Mafic, SA trace mica; dry, no rxn w/ HCL, MS, massive, 2.5Y 6/1 gray JR 3/29/17	Sonic Core Core 25 B354W1 107.5 - 112.5
110				
112.5	Core 26		124 JR 1/4/17 112.4-117.4: Sand (S): 5% Gravel, 95% Sand; Gravel: vf peb-3cm, predom, fine peb, SA-R, 60% Mafic, 40% Felsic; Sand: vf-vc, predom c, 80% Felsic, 20% Mafic, SR, trace mica; dry, rhythmites from 113.0-113.7, layer of iron staining @ 113.5, no rxn w/ HCL, 2.5Y 7/2 light brn gray 114.4-115.6: finer grained, predom med sand 116.9-117.4: vf-f, rhythmites, light yellowish brn 2.5Y 6/4	Core 26 B354W3 112.4 - 117.4
115				
117.5	Core 27		117.5-122.5: Sand (S): 100% Sand; vf-m, 80% Felsic, 20% Mafic, SA, WS, iron staining, trace mica, rhythmites throughout, no rxn w/ HCL, 2.5Y 7/2 light gray w/ ~0.5cm layers of 2.5Y 5/4 light olive brn @ 118.8 & 119.6, fining downward, dry	Core 27 B354W5 117.5 - 122.5
120				
122.5	Core 28		122.4-127.4: Sand (S): 100% Sand; vf-m to 125.8, m-vc from 125.8-127.4, ~~grading downward~~ gradational, 2.5Y 7/2 light gray grading to 2.5Y 6/1 gray, slight rhythmites throughout, dry, WS, SA, 70% Felsic, 30% Mafic, trace mica, no rxn w/ HCL. JR 1/5/17	Core 28 B354W7 122.4 - 127.4
125				

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	1/5/17

A-6006-993 (REV 0)

BOREHOLE LOG (Cont.)

Date: 1/5/17

Well ID: C9490 | Well Name: NA | Location: 216-B-9 Crib

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
127.5	Core 29		127.4-132.4: Sand(S): 100% Sand; 70% Felsic, 30% Mafic, trace mica, SA, WS, no rxn w/HCL, dry, minor iron staining, 2mm silt lamina @ 128.9, not well defined rhythmites 128.9 - 132.4 & 2.5Y5/3 light olive brn 127.4 - 128.9: massive, 2.5Y6/1 gray	Sonic Core Core 29 B354W9 127.4 - 132.4
130				
132.5	Core 30		132.5-137.5: Sand(S): 100% Sand; 60% Felsic quartzose, 40% Mafic, vf-vc, predom med, SA, MS-WS, no rxn w/HCL, trace mica, minor iron staining, massive, dry, 2.5Y4/1 gray JR 1/5/17 135 - 135.0 133.8-~~138.2~~: rhythmites JR 1/5/17	Core 30 B354X1 132.5-137.5
135				
137.5	Core 31		137.5-142.5: Sand(S): 5% Gravel, 95% Sand; Gravel: vf-f pebbles, 90% Mafic, 10% Felsic, SA; Sand: f-vc, 65% Felsic, 35% Mafic, SA; dry, MS, massive, no rxn w/HCL, 2.5Y5/1 gray, iron staining	Core 31 B354X3 137.5 - 142.5
140				
142.5	Core 32		142.5-147.5: Sand(S): 100% Sand; vf-vc, predom med, 80% Felsic qtz & feldspar, 20% Mafic, trace mica, dry, SA, WS, massive, no rxn w/HCL, iron staining, 2.5Y7/1 light gray	Core 32 B354X5 142.5 - 147.5
145				

Reported By:

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Jen Russell	Geologist	Jen Russell	1/5/17

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BOREHOLE LOG (Cont.)

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Date: 1/5/17

Well ID: C9490 | Well Name: NA | Location: 216-B-9 Crib

Depth (ft)	Sample (JR 1/5/17)	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
147.5				Sonic Core
	Core 33		147.5 – 152.3: Sand(S): 2% Gravel, 98% Sand; Gravel: 4cm, felsic, SR, cobble @ 150.0; Sand: vf-m, 80% Felsic, 20% Mafic, trace mica, massive, dry, SA, WS, no rxn w/ HCl, 2.5Y 6/1 gray, 3mm lamina @ 151.8 – 2.5Y 5/2 grayish brn	Core 33 B354X7 147.5 – 152.3
150				
152.5			152.5 – 157.5: Sand(S): 2% Gravel, 98% Sand; Gravel: vf peb, 80% Mafic, 20% Felsic, SA-A; Sand: vf-vc, predom med, SA, 70% Felsic, 30% Mafic; dry, no rxn w/HCl, (JR 2/22/17) 2.5Y 6/2 light grayish brn, trace mica, massive, MS	Core 34 B354X9 152.5 – 157.5
	Core 34			
155				
157.5				
JR 1/12/17 ~~157.8~~			157.5 – 160.5: Sand(S): 2% Gravel, 98% Sand; Gravel: ~~vf~~ (JR 1/12/17), vf-m peb, 70% Mafic, 30% Felsic, SA; Sand: v-c, predom med, trace mica, SA; massive, dry, M-WS, no rxn w/HCl, 2.5Y 6/1 gray. 100% JR 3/29/17	Core 35 B354Y1 157.5 – 162.5
	Core 35		160.5 – 161.6: Silt (M): non-plastic, in upper 0.2', low plasticity in lower 0.4', no rxn w/HCl in upper 0.2', mod rxn w/HCl in lower 0.4', 2.5Y 5/6 light olive brn; vf-f sand layer 160.9 – 161.2, med., basaltic peb from 160.6 – 160.8	
160			161.6 – 162.5: Sand(S) 100%, vf-m, dry, WS, no rxn w/HCl (JR 3/29/17 same as above)	Core 36 B354Y3 162.3 – 167.3
162.5			162.3 – 167.3: Sand(S) 100%, vf-vc, dry, MS-WS, no rxn w/HCl, 70% Felsic qtz, 30% Mafic, trace mica, 2.5Y 6/2 light brnish gray, Stratified	dry, 70% Felsic, 30% Mafic, 2.5Y 6/2 light brn gray, SA
	Core 36		162.3 – 163.7: vf-m sand	Aliquot
			163.7 – 165.1: m-vc sand, 95% Sand, 5% vf-f peb – Mafic	163.8 – 165.8
165			165.1 – 165.9: vf-m sand	
			165.9 – 167.3: Interbedded rhythmites (vf-f peb / vf-c sand) w/ horizontally imbricated (oriented) grains – wood(?) from 165.9 – 166.4	

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Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	2/22/17

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BOREHOLE LOG (Cont.)

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Date: 1/12/17

Well ID: C9490 | Well Name: NA | Location: 216-B-9 Crib

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
167.5				Sonic Core
	Core 37		167.4-172.4: Sand(S): 2% Gravel, 98% Sand; Gravel: med peb, 80% Felsic, 20% Mafic, SA; Sand: vf-vc, predom. m-c, 60% Felsic, 40% Mafic, SA; dry, m-WS, no rxn w/ HCL, trace mica, fining downward; 2.5Y 5/2 grayish brn, massive. JR 1/12/17	Core 37 B354Y5 167.4 - 172.4
170				
172.5			172.5-177.5: Sand(S): 2% Gravel, 98% Sand; Gravel: vf-med peb, SA-A, 80% Mafic, 20% Felsic; Sand: vf-vc, predom med, 70% Felsic, 30% Mafic; dry, MS, trace mica, 2.5Y 5/2 grayish brn, massive.	Core 38 B354Y7 172.5 - 177.5 no rxn w/ HCL
	Core 38		173.3: vf-f sand bed 3 cm thick	
175			175.3-175.6: vc sand - fpeb bed/rhythmites	
			175.6-176.8: rhythmites (not well defined)	
177.5			177.5-182.5: Sand(S): 2% Gravel, 98% Sand; Gravel: vf-f peb, SA-A, 80% Mafic, 20% Felsic; Sand: vf-vc, predom fine, 70% Felsic, 30% Mafic; dry, WS, trace mica, 2.5Y 5/2 grayish brn, no rxn w/ HCL, massive, fining downward (grain size change @ 179.9 to f/vf JR 3/28/17)	Core 39 B354Y9 177.5 - 182.5
	Core 39			
180				
182.5			182.5-187.5: Sand(S): 100%, vf-m, trace mica, 75% Felsic, 25% Mafic, WS, SA, dry, 2.5Y 5/2 grayish brn, no rxn w/ HCL, massive.	Core 40 B35501 182.5 - 187.5
	Core 40			
185				

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Jen Russell	Geologist	Jen Russell	2/22/17

A-6006-993 (REV 0)

BOREHOLE LOG (Cont.)

Date: 2/23/17

Well ID: C9490 | Well Name: NA | Location: 216-B-9 Crib

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
187.5				Sonic Core
	Core 41		187.3-192.3: Sand(S): 100%, f-vc, predom f/med, 70% Felsic, 30% Mafic, trace mica, dry, WS, SA 2.5Y 6/2 light grayish brn, massive, minor amt. iron staining, fining downward, no rxn w/HCL	Core 41 B35503 187.3-192.3
190			189.1: vf grained, 1 cm thick bed 188.1: vf grained, 1 cm thick bed	
192.5	Core 42		192.4-197.4: Sand(S): 100%, vf-c, predom. med, 80% Felsic, 20% Mafic, trace mica, dry, WS, SA, 2.5Y 6/2 light brownish gray, no rxn w/HCL, massive, minor amt. iron staining	Core 42 B35505 192.4-197.4 Aliquot 194.0-195.0
195				
197.5	Core 43		197.5-202.5: Sand(S): 100%, vf-vc, 70% Felsic, 30% Mafic, trace mica, dry, WS, SA, 2.5Y 6/2 Light brownish gray, no rxn w/ HCL, massive 197.5-200.5: m-c grained 200.5-202.5: vf-f grained	Core 43 B35507 197.5-202.5
200				
202.5	Optional 1		JR 2/23/17 202.6-207.6: Sand(S): 100%, vf-vf, 80% Felsic, 20% Mafic, trace mica, SA, WS, dry, no rxn w/ HCL, 2.5Y 6/2 light brownish gray, massive	Optional 1 B35509 202.6-207.6
205				

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	2/23/17

A-6006-993 (REV 0)

BOREHOLE LOG (Cont.)

Date: 3/20/17

Well ID: C9490 | Well Name: NA | Location: 216-B-9 Crib

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
207.5				Sonic Core
	Optional 2		207.4 – 212.4: Sand(S): 100%, vf-vc, predom fine, trace mica, 70% Felsic, 30% Mafic, dry, WS, SA, iron staining, no rxn w/ HCl, 2.5Y 4/2 light brnish gray, massive	Optional 2 B35511 207.4 – 212.4
210			– mafic grains predom. coarse	
212.5	Optional 3		212.4 – 217.4: Sand(S) 100%, vf-vc, predom fine, trace mica, 70% Felsic, 30% Mafic, dry, WS, SA, iron staining, no rxn w/ HCl, 2.5Y 4/2 light brnish gray, massive	Optional 3 B35513 212.4 – 217.4
215			– mafic predom coarse-grained	
217.5	Core Opt. 4		217.5 – 222.5: Sand(S): 100%, vf – c, predom. fine, 70% Felsic, 30% Mafic, WS, SA, massive, no rxn w/ HCl, trace amt. of v.fine pebbles throughout (mafic), dry, trace mica, 2.5Y 4/2 light grayish brn (JR 11/8/14)	Optional 4 B35515 217.5 – 222.5
220			222.2 – 222.5: Silt(M): 100%, sharp contact, 3mm silt lamina @ contact – 2.5Y 5/4 light olive brn, wk rxn w/ HCl; laminated silt bed below – 2.5Y 6/3 light yellowish brn, no rxn w/ HCl; non-plastic, dry	Aliquot 220.0 – 221.0
222.5	Optional 5		222.4 – 222.5: Silt(M): 100%, 3mm silt lamina, dry, n/p, 2.5Y 6/3 light yellowish brn to 2.5Y 5/4 light olive brn, weak rxn w/ HCl	Optional 5 B35517 222.4 – 227.4
225			222.5 – 222.9: Gravelly Sand(gS): 80% Sand, 20% Gravel; Gravel: f-m, predom f, 70% Felsic, 30% Mafic, SR; Sand: vf-vc, predom m, 60% Felsic, 40% Mafic; dry SR, WS, MS (JR 3/20/17 225.8) no rxn w/ HCl, 2.5Y 5/4 light olive brn	
			222.9 – 225.4: Sand(S) 95% Sand, 5% Gravel; Gravel: vf-f, 70% Felsic, 30% Mafic, SR-SA; Sand: f-vc, predom m, 70% Felsic, 30% Mafic, SR; dry, WS, no rxn w/ HCl, 2.5Y 5/4 light olive brn. (cont.)	

JR 3/21/17

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	3/20/17

A-6006-993 (REV 0)

BOREHOLE LOG (Cont.)

Date: 1/12/17

Well ID: C9490 | Well Name: NA | Location: 216-B-9 Crib

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
227.5	Optional 6		225.4-226.4: Sandy Gravel (sG): 30% ~~Sand~~ JR 3/29/17 Gravel, 70% Sand; Gravel: f-c, predom m, 70% Felsic, 30% Mafic, SR-SA; Sand: f-vc, predom m., 70% Felsic, 30% Mafic, SR; dry, PS, no rxn w/HCl, 2.5Y 5/4 light Olive brn.	Sonic Core Optional 6 B35519 227.0 - 232.0
230			226.5-227.4: No return	
			227.4-229.1: Gravelly Sand (gS): 25% Gravel, 75% Sand; Gravel: f-vc, 60% Felsic, 40% Mafic, SR; Sand: vf-vc, predom f, 70% Felsic, 30% mafic, SA; dry, PS, no rxn w/HCL, 2.5Y 5/4 light olive brn.	
			229.1-230.3: Sand 100% (S): vf-vc, predom f, 70% Felsic, 30% Mafic, dry, SA, WS, no rxn w/HCl, iron staining, 15° beds @ 229.7 w/ increased mafic content, 2.5Y 5/4 light olive brn	~~Optional 7 B35521~~ JR 3/30/17
232.5	NO RECOVERY		230.3-230.9: Gravelly Sand (gS): 80% Sand, 20% Gravel; Sand: vf-vc, predom f, SA, 70% Felsic, 30% Mafic; Gravel: f-c, 70% Felsic, 30% Mafic, SR; dry, PS, no rxn w/HCl, 2.5Y 5/4 light olive brn.	No Optional 7 Core No recovery
235			230.9-232.0: No return	
			232.6-237.6: No recovery	
237.5				
240	Core Opt. 8		237.5-242.5: Sandy Gravel (sG): 60% Gravel, 30% Sand, 10% Silt; Gravel: small-large cobbles, SR, 70% Felsic, 30% Mafic; Sand: vf-vc, predom f, 70% Felsic, 30% Mafic; dry, strong rxn w/ HCL, PS, 2.5Y 4/2 dark grayish brn	Optional 8 B35523 237.5 - 242.5
242.5 ~~245~~				
JR 3/29/17 245	Optional 9		242.6-247.6: Sandy Gravel (SG): 60% Gravel, 30% Sand, 10% Silt; Gravel: small-large ~~Sand~~ JR 1/12/17 cobbles, SR, 70% Felsic, 30% Mafic; Sand: vf-vc, predom f, 70% Felsic, 30% Mafic; dry, strong rxn w/ HCL, PS, 2.5Y 4/2 dk grayish brn, iron staining.	Optional 9 B35525 ~~246~~ 242.6-247.6 JR 1/12/17

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Jen Russell	Geologist	Jen Russell	3/20/17
Print Name	Title	Signature	Date

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BOREHOLE LOG (Cont.)

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Date: 11/8/16

Well ID: C9490 | Well Name: NA | Location: 216-B-9 Crib

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
247.5	Optional 10		247.0 – 250.7: Silty Gravel (mG): 60% Gravel, 10% Sand, 30% Silt; Gravel: fine peb – 5cm, predom 2cm, SR-R, 60% Mafic, 40% Felsic; vf Sand, dry, mod rxn w/HCL, PS, CaCO3 layer ~~from~~ at 249.9 – strong rxn w/HCL (3mm thick), 2.5Y5/1 gray JR 11/8/16	Sonic Core Optional 10 B35527 247.0 – 252.0
250			250.7 – 252.0: Silt (M): 90% Silt, 10% Clay, moist, ~~low plasticity~~ JR 11/8/16 non-plastic, 2.5Y6/6 olive yellow	Aliquot 249.8 – 250.5
252.5			Total Depth = 252.0 ft	
255				
257.5				
260				
262.5				
265				

NOT USED 3/30/16 JR

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	11/8/16

A-6006-993 (REV 0)

BOREHOLE LOG

Page 1 of 12
Date: 2/13/17

Well ID: C9489	Well Name: NA	Location: 219-B-9 Tile Field
Project: 200 DV-1 OU Characterization Phase 3		Reference Measure Point: Ground Surface

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
17.5				Core – Sonic
				RS = Rad Screen
20				
22.5				
25				
27.5				
30				
32.5				
	Core Sm		34.2-36.7: Sand (S) 100%: f-vc, predom. c, 60% Felsic, 40% Mafic, SA, mod. sorted, non x n w/ HCL, moist, massive, light brnish gray 2.5Y 6/2	Core 1, 34.2-36.7 B353D2 RS-353D1

NOT USED
JR 3/2/17

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	2/27/17

Reviewed By:

Print Name	Title	Signature	Date
Tessa Clark	Geologist	[illegible]	3/3/17

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OR Doc Type:	WMU Code(s):

A-6003-642 (REV 1)

BOREHOLE LOG

Page 2 of 12
Date: 2/27/17

Well ID: C9489 | Well Name: NA | Location: 219-B-9 Tile Field
Project: 200 DV-1 OU Characterization Phase 3 | Reference Measure Point: Ground Surface

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
35			34.2-36.7: Sand(S) 100% f-vc, predom c, 60% Felsic, 40% Mafic, SA, MS, moist, no rxn w/ HCL, massive, 2.5Y 6/2 light brnish gray (35.2-36.7: No recovery)	Sonic Core RS = Rad Screen
37.5	Core 2		37.6-40.1: Sand(S) 100% f-vc, predom c, 70% Felsic, 30% Mafic, SA, M-WS, dry, no rxn w/HCL, massive, 2.5Y 6/2 light ~~grayish brn~~ brnish gray JR 2/27/17	Core 2 B353D4 RS - B353D3 37.6-40.1 220-240 cpm
40 JR 2/27/17	Core 3		39.6-42.1: Gravelly Sand(gS): 15% Gravel, 85% Sand; Gravel: vf peb-med peb, SA, 60% Mafic, 40% Felsic; Sand: f-vc, predom c, SA, 70% Felsic, 30% Mafic; no rxn w/HCL, dry, massive, 2.5Y 6/2 light brnish gray, M-WS.	Core 3 B353D6 RS - B353D5 39.6-42.1 180-240 cpm
42.5	Core 4		42.1-44.6: Sand(S), 100% m-vc, predom vc, dry, WS, no rxn w/HCL, massive, 2.5Y 6/2 light brnish gray, 70% Felsic, 30% Mafic, SA, trace mica.	Core 4 B353D8 RS - B353D7 42.1-44.6 JR 2/27/17 JR 2/27/17
45	Core 5		44.5-47.0: Gravelly Sand(gS): 15% Gravel, 85% Sand; Gravel: vf-f peb, 80% Mafic, 20% Felsic, SA; Sand: f-vc, predom vc, 70% Felsic, 30% Mafic, SA; dry, M-WS, no rxn w/HCL, massive, 2.5Y 6/2 light brnish gray	Core 5 B353F0 RS - B353D9 44.5-47.0
47.5	Core 6		47.4-49.9: Gravelly Sand (gS): 20% Gravel, 80% Sand; Gravel: vf-f peb, predom vf peb, SA, 60% Mafic, 40% Felsic; Sand: m-vc, predom c, SA, 70% Felsic, 30% Mafic, no rxn w/HCL, dry, M-WS, massive, 2.5Y 6/2 light brownish gray	Core 6 B353F2 47.4-49.9
50			49.9-54.7 - No Core JR 2/27/17	No Core 7

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Jen Russell	Geologist	Jen Russell	2/27/17

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OR Doc Type:	WMU Code(s):

A-6003-642 (REV 1)

BOREHOLE LOG (Cont.)

Date: 2/13/17

Well ID: C9489 | Well Name: NA | Location: 216-B-9 Tile Field

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
52.5			No core 7 (49.9 - 54.7) JR 2/24/17	Sonic Core (No Core 7)
55	Core 8		54.7 - 57.2: Sand (S): 5% Gravel, 95% Sand; Gravel: vf-f peb, predom vf peb, SA, 50% Felsic, 50% Mafic; Sand: f-c, predom c, 70% Felsic, 30% Mafic, dry, SA; no rxn w/HCL, M-WS, massive, 2.5Y 4/2 light brnish gray	Core 8 B353F6 54.7 - 57.2
57.5	Core 9		57.4 - 62.4: Sand (S) 100% Sand: 40% Mafic, 60% Felsic, SA, dry, WS, no rxn w/HCL, trace mica, iron staining, massive, light brnish gray 57.4 - 60.7: c-vc sand 60.7 - 62.4: f-m sand fining downward JR 2/13/17	Core 9 B353F8 ~~54.7~~ 57.4 - 62.4 JR 2/13/17
60				
62.5	Core 10		62.4 - 67.4: Sand (S) 100%: 30% Mafic, ~~60~~ 70% Felsic, SA, dry, m-vc, predom c, trace mica, M-WS, massive, minor amt. iron staining, no rxn w/HCL, 2.5Y 4/2 light brnish gray JR 2/13/17	Core 10 B353H0 62.4 - 67.4
65				
67.5	Core 11		67.4 - 72.4: Sand (S): 5% Gravel, 95% Sand; Gravel: vf-med peb, predom f peb, 60% Mafic, 40% Felsic, SA; Sand: f-vc, predom vc, 60% Felsic, 40% Mafic; dry, M-WS, massive, no rxn w/HCL, 2.5Y 4/2 light brnish gray	Core 11 B353H2 67.4 - 72.4
70				

Reported By:

Jen Russell	Geologist	Jen Russell	2/13/17
Print Name	Title	Signature	Date

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BOREHOLE LOG (Cont.)

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Date: 11/7/16

Well ID: C9489 | Well Name: NA | Location: 216-B-9 Tile Field

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
72.5				Sonic Core X JE 2/13/17
	Core 12		72.6 – 77.6: Sand(S) 5% Gravel, 95% Sand; Gravel: f-c Pebbles, predom f, SA-SR, 70% Mafic, 30% Felsic; Sand: m-vc, predom c, 70% Felsic, 30% Mafic, trace mica, iron staining; dry, massive, no rxn w/ HCL, WS, 2.5Y 4/2 light brnish gray	Core 11 B353H2 67.4 – 72.4
75				Core 12 B353H4 72.6 – 77.6
77.5				
	Core 13		77.6 – 82.6: Sand(S): 100%: vf-vc, 70% Felsic, 30% Mafic, SA, m-ps, dry, no rxn w/ HCL, 2.5Y 4/2 light brnish gray, massive 79.5 – 80.6: rhythmites 81.5 – 81.9: rhythmites	Core 13 C9489 77.6 – 82.6 B353H6 Aliquot 79.0 – 81.0
80				
82.5	Core 14		82.5 – 87.5: Sand(S) 100%: vf-vc, 70% Felsic, 30% Mafic, SA, ms, dry, no rxn w/ HCL, 2.5Y 4/2 light brnish gray, rhythmites throughout	Core 14 C9489 B353H8 82.5 – 87.5
85				
87.5	Core 15		87.5 – 92.5: Sand(S) 100%: vf-c, 75% Felsic, 25% Mafic, trace mica, SA, ws, dry, no rxn w/ HCL, 2.5Y 4/2 light brnish gray, rhythmites from 88.5 – 92.5, massive from 87.5 – 88.5, fining downward – 2mm silt lamina @ 91.3 & 92.2 JE 2/20/14	Core 15 B353J0 87.5 – 92.5
90				

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Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	2/20/17

A-6006-993 (REV 0)

BOREHOLE LOG (Cont.)

Date: 2/20/17

Well ID: C9489 | Well Name: NA | Location: 216-B-9 Tile Field

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
92.5				Sonic Core
	Core 16		92.6 – 97.6: Sand (S) 100% vf – c, predom med, 75% Felsic, 25% Mafic, trace mica, WS, SA, dry, massive, 2.5Y 6/2 light brnish gray, no rxn w/ HCL	Core 16 B353J2 92.6 – 97.6
95				
97.5				
	Core 17		97.6 – 102.6: Sand (S) 100% vf – c, predom. fine, 70% Felsic, 30% Mafic, trace mica, WS, SA, dry, no rxn w/ HCL, 2.5Y 6/2 light brnish gray Rhythmites @ 99.3 & 101.3 – 102.6	Core 17 B353J4 97.6 – 102.6
100				
102.5			102.6 – 104.9: Sand (S) 95% Sand, 5% Gravel; Gravel: vf peb – f peb, SA, 80% Mafic, 20% Felsic; Sand: c – vc, predom c, 60% Felsic qtz., 40% Mafic Basalt, SA; dry, WS, no rxn w/ HCL, 2.5Y 4/1 dk gray, massive	Core 18 B353J6 102.6 – 107.6
	Core 18		104.0 – 104.4: vf sand layer, WS, 2.5Y 6/4 light yellowish brn 95% Felsic, 5% Mafic, trace mica, iron staining	Aliquot 104.0 – 105.6
105			104.9 – 105.2: Silt (M) 95% Silt, 5% Sand; Sand: c – vc, 100% Felsic basalt, SA – A; moist, mod rxn w/ HCL, non-plastic, 2.5Y 5/4 light olive brn	
107.5			105.2 – 107.6: Gravelly Sand (gS): 90% Sand, 10% Gravel; Gravel: vf – m peb., predom. f. 60% Mafic, 40% felsic, SA – predom below silt Sand: m – vc, 70% Felsic qtz & feldspars, 30% Basalt, SA; dry, no rxn w/ HCL, 2.5Y 4/1 dk gray, mod sorted, massive, iron staining	
	Core 19		107.4 ~~JR 2/20/17 112.4~~ 110.4: Gravelly Sand (gS): 90% Sand, 10% Gravel: Gravel: vf – m peb, 60% Mafic, 40% Felsic, SA; Sand: m – vc, 70% Felsic, 30% Mafic, SA; dry, no rxn w/ HCL, 2.5Y 4/1 dk gray, MS, rhythmites throughout	Core 19 ~~B353J6~~ JR 2/20/17 B353J8 107.4 – 112.4
110			110.4 – 112.4: Sand (S) 100%: f – c, predom c, 60% Felsic, 40% Mafic, SA, WS, dry, no rxn w/ HCL, iron staining, trace mica, 2.5Y 4/1 dk gray, massive	

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	2/20/17

A-6006-993 (REV 0)

BOREHOLE LOG (Cont.)

Date: 2/20/17

Well ID: C9489 | Well Name: NA | Location: 216-B-9 Tile Field

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
112.5			JR 2/20/17	Sonic Core
			~~112.4~~	
	Core 20		112.5 - 115.7: Sand(S) 100%: f-c, predom c, 60% Felsic, 40% Mafic, SA, WS, dry, no rxn w/HCL, iron staining, trace mica, 2.5Y4/1 dk gray, massive	Core 20 B353K0 112.5-117.5
115			115.7 - 117.5: Gravelly Sand (gS): 90% Sand, 10% Gravel; Gravel: vf-m peb, 60% Mafic, 40% Felsic, SA; Sand: m-vc, 70% Felsic, 30% Mafic, SA, dry, no rxn w/HCL, 2.5Y4/1 dk gray, MS, massive	
			- 3mm silt lamina @ 117.2	
117.5			117.5 - 122.5: Sand(S) 100%: vf-c, predom fine, 70% Felsic, 30% Mafic, SA, WS, no rxn w/HCL, 2.5Y4/2 light brnish gray, rhythmites throughout	Core 21 B353K2 117.5 - 122.5
	Core 21			
120				
122.5			122.5-127.5: Sand(S) 100%; dry, no rxn w/HCL, 70% Felsic, 30% Mafic, trace mica, iron staining, coarsening downward, 2.5Y4/2 light brnish gray, WS	Core 22 B353K4 122.5-127.5
	Core 22		122.5-124.1: vf-f sand, massive, w/ 2mm vf/silt lamina @ 123.3	
			124.1-125.0: f-m sand, massive, w/ 0.5 laminae @ 124.0 & 124.2	
125			125.0-126.4: m-c sand, massive, w/ 3cm lamina @ 125.0	
			126.4-127.5: c-vc sand/silt rhythmites; moist, 2.5Y4/3 olive brown, wk rxn w/HCL in silt	Aliquot 125.0-126.0
127.5			127.4 - 132.4: Sand(S) 100% f-vc, predom c, 40% Mafic, 60% Felsic, SA, WS, dry, no rxn w/HCL, iron staining, 2.5Y5/1 Gray, trace mica, massive	Core 23 B353K6 127.4-132.4
	Core 23			
130				

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	2/20/17

A-6006-993 (REV 0)

BOREHOLE LOG (Cont.)

Date: 2/20/17

Well ID: C9489 | Well Name: NA | Location: 216-B-9 Tile Field

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
132.5				Sonic Core
	Core 24		132.1 – 137.1 Sand(S): 100%, f-c, predom c, 70% Felsic, 30% Mafic, trace mica, SA, WS, dry, massive, iron staining, 2.5Y 5/2 grayish brn, no rxn w/ HCl	Core 24 B353K8 132.1 – 137.1
			134.5 – 135.0: med peb – 3 cm cobbles	
135			136.0 – 137.1: Rhythmites (not well-defined)	
137.5			137.4 – 142.4: Gravelly Sand (gS): 90% Sand, 10% Gravel; Gravel: vf – f peb, 80% Mafic, 20% Felsic, SA; Sand: f-vc, predom c, 70% Felsic, 30% Mafic, SA; dry, no rxn w/ HCl, iron staining, MS, 2.5Y 5/1 gray	Core 25 B353L0 137.4 – 142.4
	Core 25		– 2cm silt bed @ 138.0	
140			– rhythmites from 139.4 – 140.7	
142.5				
	Core 26		142.5 – 147.5: Sand(S): 100%, f-vc, predom med., 70% Felsic, 30% Mafic, iron staining, WS, SA, trace mica, dry, no rxn w/ HCl, 2.5Y 6/2 light brnish gray, massive, fining downward	Core 26 B353L2 142.5 – 147.5
145				
147.5			147.4 – 152.4: Sand(S): 100%, f-c, predom med., 70% Felsic, 30% Mafic, iron staining, WS, SA, trace mica, dry, no rxn w/ HCl, 2.5Y 6/2 light brnish gray, massive	Core 27 B353L4 147.4 – 152.4
	Core 27		– f-m grained to 148.7	
150			– m-vc grained 148.7 – 149.7	
			– f-m grained 149.7 – 152.4	

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	2/20/17

A-6006-993 (REV 0)

BOREHOLE LOG (Cont.)

Date: 11/7/16

Well ID: C9489 | Well Name: NA | Location: 216-B-9 Tile Field

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
152.5	Core 28			Sonic Core
			152.4 – 157.4: Sand(S) 100%, f-c, predom. med, 60% Felsic, 40% Mafic, trace mica, WS, SA, dry, no rxn w/ HCL, 2.5Y5/1 gray, massive	Core 28 B353L6 152.4 – 157.4
155				
157.5				
	Core 29		157.6 – 162.6: Sand(S) 100%, f-c, predom c, trace mica, 70% Felsic, 30% Mafic, WS, SA, dry, no rxn w/ HCL, 2.5Y6/2 light brnish gray, massive	Core 29 B353L8 157.6 – 162.6
160				
162.5	Core 30		162.4 – 164.2 Sand(S): 100%, vf-c, predom med., 65% Felsic, 35% Mafic, SA, WS, no rxn w/HCL, 2.5Y5/2 grayish brn, massive 164.2 – 164.4: Silt(M): 100%, moist, wk rxn w/HCL, non-plastic, 2.5Y5/4 light olive brn, grades to gravelly sand 164.4 – 167.4: Gravelly Sand: 85% Sand, 15% Gravel; Gravel: vf-f peb, 90% Mafic, 10% Felsic, SA; Sand: vf-c, predom med, SA, 70% Felsic, 30% Mafic; dry, 2.5Y5/2 grayish brn, no rxn w/ HCL, iron staining, rhythmites throughout, fining downward	Core 30 B353M0 162.4 – 167.4 JR 11/7/16 Aliquot 163.0 – 164.0
165				
167.5				
	Core 31		167.6 – 172.6: Sand(S) 100%: m-vc, predom c, 70% Felsic, 30% Mafic, iron staining, dry, no rxn w/ HCL, WS, SA, massive, 2.5Y5/2 grayish brn 169.8 – 170.6: dipping beds of vc sand (20°) – 1 cm thick	Core 31 B353M2 167.6 – 172.6
170				

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	2/21/17

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BOREHOLE LOG (Cont.)

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Date: 2/21/17

Well ID: C9489 | Well Name: NA | Location: 216-B-9 Tile Field

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
172.5	Core 32		172.6-177.6: Gravelly Sand (gS) 20% Gravel 80% Sand; Gravel: vf-f peb, 80% Mafic, 20% Felsic, SA; Sand: m-vc, trace mica, 60% Felsic, 40% Mafic, SA; MS, dry, no rxn w/ HCl, 2.5Y4/2 dark grayish brn, coarsening downward, massive JK 2/21/17	Sonic Core Core 32 B353M4 172.6-177.6
175				
177.5	Core 33		177.6-182.6: Sand (S) 100%, f-vc, predom med., 60% Felsic, 40% Mafic, SA, WS, dry, no rxn w/ HCl, 2.5Y5/2 grayish brn, massive	Core 33 B353M6 177.6-182.6
180				
182.5	Core 34		182.6-187.6: Sand (S) 100%, f-c, predom med., 60% Felsic, 40% Mafic, SA, WS, dry, no rxn w/ HCl, 2.5Y5/3 light olive brn, massive	Core 34 B353M8 182.6-187.6
185				
187.5	Core 35		187.4-192.4: Sand (S) 100%, f-c, predom fine, 75% Felsic, 25% Mafic, trace mica, SA, WS, dry, no rxn w/ HCl, 2.5Y6/2 light brnish gray, massive	Core 35 B353N0 187.4-192.4
190				

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Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	2/21/17

A-6006-993 (REV 0)

BOREHOLE LOG (Cont.)

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Date: 2/21/17

Well ID: C9489 | Well Name: NA | Location: 216-B-9 Tile Field

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
192.5	Core 36		192.4 – 197.4: Sand (S) 100%, vf-m, predom. fine, 75% Felsic, 25% Mafic, SA, WS, dry, no rxn w/ HCL, trace mica, massive, iron staining, 2.5Y 6/2 light brnish gray, ~~MAS~~ JR 2/21/17	Sonic Core Core 36-B353N2 192.4 -197.4
195				
197.5	Core 37		197.5 - 202.5: Sand (S) 100%: vf-m, predom. fine, 80% Felsic qtz, 20% Mafic, SA, WS, dry, no rxn w/HCL, 2.5Y 6/2 light brnish gray, massive, trace mica, minor amt. iron staining	Core 37 B353N4 197.5-202.5 Aliquot 99.0-200.0
200				
202.5	Core 38		202.6 – 207.6: Sand (S) 100%: vf-m, predom fine, 80% Felsic qtz, 20% Mafic, SA, WS, dry, no rxn w/ HCL, 2.5Y 6/2 light brnish gray, massive, trace mica, minor amt. iron staining	Core 38 B353N6 202.6-207.6
205				
207.5	Core 39		207.6 – 212.6: Sand (S) 100%: vf-m, predom fine, 80% Felsic, 20% Mafic, SA, WS, dry, no rxn w/ HCL, ~~2.5Y 6/2 light brnish gray~~ JR 2/21/17, trace mica, massive, 2.5Y 5/2 grayish brn	Core 39 B353N8 207.6-212.6
210				

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	2/21/17

A-6006-993 (REV 0)

BOREHOLE LOG (Cont.)

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Date: 2/21/17

Well ID: C9489 | Well Name: NA | Location: 216-B-9 Tile Field

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
212.5			212.4 – 217.4: Sand(S) 98% Sand 2% Gravel; Gravel: vf peb, 100% mafic, in 212.4-214.4; Sand: vf-m, predom vf, 80% Felsic, 20% Mafic, SA; WS, dry, no rxn w/ HCl, 2.5Y 6/2 light brnish gray, massive (2/21/17 JR)	Sonic Core; Core 40 B353P0 212.4 – 217.4
215	Core 40			
217.5			217.5-222.5: Sand(S) 100%, vf-m, predom vf, 80% Felsic, 20% Mafic, SA, WS, no rxn w/ HCl, 2.5Y 6/2 light brnish gray, massive	Core 41 B353P2 217.5 – 222.5
220	Core 41			
222.5			222.6 – 227.6: Sand(S) 100% vf-c, predom vf, 80% Felsic, 20% Mafic, mafic are m-c, felsic are vf-f, SA, WS, no rxn w/ HCl, 2.5Y 6/2 light brnish gray massive (3 JR 4/4/17; JR 2/21/17)	Core 42 B353P4 222.6 – 227.6
225	Core 42		227.3-227.6: Silt (M) 100%; 2.5Y 5/3 light olive brn, moist, nonplastic, wk rxn w/ HCl	
227.5			227.6 – 232.6: Gravelly Sand(gS): 85% Sand, 15% Gravel; Gravel: vf peb ~~med peb~~ - 2cm peb., predom f peb., 70% Mafic, 30% Felsic, SR-SA; Sand: f-vc, predom c., 60% Felsic, 40% Mafic, SA; dry, PS, no rxn w/ HCl, iron staining, massive, 2.5Y 5/2 grayish brn (JR 4/4/17; JR 2/21/17)	Core 43 B353P6 227.6 – 232.6; Aliquot 229 – 230.0
230	Core 43			

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	2/21/17

A-6006-993 (REV 0)

BOREHOLE LOG (Cont.)

Date: 11/8/16

Well ID: C9489 | Well Name: NA | Location: 216-B-9 Tile Field

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
232.5				Sonic Core
	Optional 1		232.6 - 234.9: Sand (S) 100%, m-vc, predom c, 60% Felsic, 40% Mafic, SA, M-WS, dry, no rxn w/ HCl, 2.5Y5/1 gray, massive, iron staining, trace mica	Optional 1 B353P8 232.6 - 237.6
235			234.9 - 237.6: Gravelly Sand (gS): 80% Sand, 20% Gravel; Gravel: f peb - 3cm, predom fine peb., 80% Mafic, 20% Felsic, SA-SR; Sand: vf - vc, predom c, 70% Felsic, 30% Mafic, SA; dry, PS, wk rxn w/ HCl from ~~236.1~~ 235.8 - 237.6, dipping bed (5cm) 20° @ 236.1, $CaCO_3$ com & finer grain size 236.6 - 237.6, 2.5Y5/1 gray	
237.5				Optional 2
	Optional 2		237.7 - 240.0: Sandy Gravel (sG): 30% Sand, 70% Gravel; Gravel: vf peb - 7cm, SA-SR, peb typically SA/Mafic/Basalt, Cobbles typically Felsic/SR/aise., 50% Felsic, 50% Mafic; Sand: f - vc, SA, 60% Felsic, 40% Mafic; dry, no rxn w/ HCl, 2.5Y5/2 grayish brn, PS, trace mica	B353R0 237.7 - 242.7
240			240.0 - 242.7: Silty ~~Sandy~~ (mG) Gravel (JR 3/20/17): 75% Gravel, 15% Silt, 10% Sand; (mSG): Gravel: vf peb - 7cm, 80% Felsic (granitic, quartzose), 20% Mafic, SA-SR; Sand: vf - c, 80% Felsic, 20% Mafic, SA; dry, PS, ~~no~~ (JR 2/22/17) wk rxn w/ HCl, 2.5Y4/2 dk grayish brn, trace mica, non-plastic	
242.5				Optional 3 B353R2
	Optional 3		243.0 - 246.0: Silty ~~Sandy~~ (mG) Gravel ~~(mSG)~~ (JR 3/20/17): 75% Gravel, 15% Silt, 10% Sand; Gravel: vf peb - 8cm, 80% Felsic, 20% Mafic, SR; Sand: vf - c, 80% Felsic, 20% Mafic, SA; dry, PS, wk rxn w/ HCl, 2.5Y4/2 dk grayish brn, trace mica, non-plastic	243.0 - 247.0
245			246.0 - 247.0: Silt (M): 90% Silt, 10% Clay, non-low plasticity, moist, 2.5Y5/3 light olive brn, wk rxn w/ HCl, laminae from 246.0 - 246.5	
247.5				
	Optional 4		247.6 - 251.6: Silt (M) 90% Silt, 10% Clay, 2.5Y5/3 light olive brown, moist, ~~non-plastic~~ (JR 11/8/16) low plasticity, wk rxn w/ HCl	Optional 4 B353R4 247.6 - 251.6
250			5-10% vf sand 249.1 - 249.9; platy structure	Aliquot 250.0 - 251.0
			TD: 251.6 ft	

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	2/22/17

A-6006-993 (REV 0)

JR 7/28/14

BOREHOLE LOG

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Date: 8/11/14

Well ID: C9492	Well Name: NA	Location: 216-T-5 Crib
Project: 200 DV-1 Characterization Ph 3		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40					Sonic Core
	Core 1	50%		40.7-41.7: No recovery	Core 1 B35VXD
				41.7-42.7: Gravelly Sandy Silt (gsM): 40% Gravel, 15% Sand, 45% Silt	40.7-42.7
42.5				Gravel: 0.5cm-3cm, 60% Mafic basalt, 40% Felsic quartzite/granitic rock, SR-R; Sand: f-m; moist, low plasticity, 2.5Y3/1 very dark gray, wk rxn w/HCL, PS	
45				NO RECOVERY	
47.5				NO CORES COLLECTED JR 8/11/14	
50					
52.5	Core 2	40%		52.4-53.4: No recovery	Core 2 B35VW2 X JR 7/28/14
				53.4-55.4: Silty Gravel (sG): 60% Gravel, 35% Silt, 5% Sand; Gravel: fine peb-6cm, predom. 3cm, SR, 50% Mafic 50% Felsic; Silt: non-plastic; Sand: vf; dry, 2.5Y5/2 grayish brown, PS, wk rxn w/HCL - dk gray from 54.4-54.9, higher moisture * suspect contaminant	52.4-57.4
55					Aliquot 53.4-55.4
57.5				57.6-58.6: No recovery LD.D: JR 8/11/14	
	Core 3	82%	JR 8/11/14	58.6-62.6: Silty Gravel (sG): 65% Gravel, 30% Silt, 5% Sand; Gravel: 0.5cm-7cm, 70% Felsic, 30% Mafic, SR-R; vf-m sand, dry, 2.5Y4/2 dk grayish brn, wk rxn w/HCL, non-plastic, PS	Core 3 B35VX4 57.6-62.6
JR 8/11/14					

Reported By: Jen Russell		Reviewed By:	
Title: Geologist		Title:	
Signature: Jen Russell	Date: 8/11/14	Signature:	Date:

A-6003-642 (03/03)

BOREHOLE LOG

Page 2 of 5
Date: 7/28/16

Well ID: C9492 | Well Name: NA | Location: 216-T-5 Crib

Project: 200 DY-1 OU Characterization Ph 3 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description (Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level)
60	Core 3	82%		58.6-62.0: Silty Gravel (mG): 65% Gravel 30% Silt, 5% Sand; Gravel: 0.5cm-7cm, 70% Felsic w/ quartzite & chlorite, 30% Mafic, SR-R; vf-m sand, dry, 2.5Y 4/2 dk grayish brn, wk rxn w/ HCl, non-plastic, PS	Sonic Core Core 3 B35VX4 57.6 - 62.6
62.5				62.0 - 62.6: No recovery	
65	Core 4	100%		63.0-64.6: Silty Gravel (mG): 65% Gravel, 30% Silt, 5% Sand; Gravel: 0.5cm-7cm, 70% Felsic w/ quartzite, 30% Mafic, SR-R; vf-m sand, dry, 2.5Y 4/2 dk grayish brn, wk rxn w/ HCl, non-plastic, PS → Grades to: 64.6-65.2: Sandy Gravel (sG): 60% Gravel, 40% Sand; Gravel: 50% Felsic, 50% Mafic, 3cm-4cm, R; Sand: 70% Mafic, 30% Felsic, f-c, predom c, SA; moist, PS, 2.5Y 4/2 dk grayish brn, no rxn w/ HCl, grades to sand	Core 4 B35VX6 63.0 - 68.0 Aliquot: 65.2-67.2
67.5		slough			Core 5 B35VX8 67.0 - 72.0
70	Core 5	100%		65.2-72.0: Sand (S) 100%: f-c, predom. c, 70% Felsic, 30% Mafic, mod. sorted, 2.5Y 4/3 olive brn, dry, no rxn w/ HCl 65.3: 4 cm thick silt bed w/ laminae, no rxn w/ HCl 65.5-66.4: Interbedded rhythmites 66.4 - ~~68~~ 67.8: Massive JR 8/2/16 67.8-68.4: Caliche; dry, 10YR 8/2 very pale brn - 2.5Y 5/2 grayish brn, mod. cem ($CaCO_3$), strong rxn w/ HCl, Sandy Silt (sM) 75% Silt 25% Sand	
72.5				69.0-70.5: Increased grain size; vc sand - f. peb, mafic pebbles, SA	
75	Core 6	100%		[CORE 6 DESCRIPTION ON PG 3]	Core 6 B35VY0 73.0 - 78.0
77.5	Core 7	100%		77.5-82.5: Gravelly Sand (gS): 10% Gravel, 90% Sand; Gravel: vf peb-3cm, predom 0.5cm, SA, 90% Mafic, 10% Felsic; Sand: f-vc, predom. c, 40% Mafic, 60% Felsic, SA; dry, strong rxn w/ HCl where cementation is found ($CaCO_3$) - minor amt. throughout	Core 7 B35VY2 77.5 - 82.5 Aliquot 78.5 - 80.0

Reported By: Jen Russell		Reviewed By:	
Title: Geologist		Title:	
Signature: Jen Russell	Date: 8/16/16	Signature:	Date:

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 5
Date: 8/12/16

Well ID: C9492 | Well Name: NA | Location: 216-T-5 Crib

Project: 200 DV-1 OU Characterization Ph 3 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
60					
62.5					
65				JR 8/12/16	
67.5					
70					
72.5				73.0-74.1: Sand(S) 100%: 60% Felsic, 40% Mafic, f-c, predom med., WS, SA, 2.5Y4/3 olive brn, dry, minor amt. of $CaCO_3$ cem throughout	Core 6 B35YY0 73.0 - 78.0
75	Core 6	100%		73.5: vf sand/silt lenticular bed (1-2cm)	
				73.9-74.1: dicr. grain size vf-f grained sand	
				74.1-77.4: Gravelly Sand (gS): 25% Gravel, 75% Sand; Gravel: 90% Mafic, 10% Felsic, vf peb - med peb, predom. 1cm pebbles; Sand: 60% Felsic, 40% Mafic, f-vc; dry, 2.5Y4/3 olive brn, $CaCO_3$ cem throughout, wk-mod cemented, strong rxn w/HCl, PS	
77.5				74 JR 8/12/16	
				77.4-78.0: overdriven/sand	

Reported By: Jen Russell		Reviewed By:	
Title: Geologist		Title:	
Signature: Jen Russell	Date: 8/12/16	Signature:	Date:

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JR 8/12/14 4 ~~3~~ JR 8/12/14

BOREHOLE LOG

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Date:

Well ID: C9492	Well Name: NA	Location: 216-T-5 Crib	
Project: 200DV-1 Characterization Ph 3		Reference Measuring Point: Ground Surface	

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	Core 7	100%		77.5-82.5: Gravelly Sand (gS):	Sonic Core
				- Silt rup-up clasts ~~77.5~~ 77.5 - 77.8 JR 8/1/14	
				- massive sand	Core 7 B35VY2 77.5-82.5
				- 87.6 JR 8/12/14	
82.5				82.6 ~~83.0~~: Sand (S) 100%; vf, dry, vf-m, 80% felsic, 20% Mafic, no rxn w/ HCL, 2.5Y light yellowish brn 6/4 JR 8/1/14	Aliquot 78.5-80.0
				82.6-83.0: f-m sand	
	Core 8			83.0: Silt lamina 0.5cm thick	Core 8 B35VY4 82.6-87.6
				83.0-83.6: vf-f sand grading to	
85		100%		83.6-87.6: f-m Sand	
				- massive	
				JR 8/1/14	
87.5				87.5 87.2-87.7: Slough	Core 9 B35VY6 87.2-92.2
				87.7-88.7: Silt (M): moist, 2.5Y5/3 light olive brn, non-plastic, mod rxn w/ HCL	
	Core 9			88.7-89.4: Sandy Silt (sM): moist, 2.5Y2 light brownish gray, non-plastic, vf sand	Aliquot 88.2-89.7
90		100%		25% Sand, 75% Silt, platy structure, no rxn w/ HCL - sharp contact	
				89.4-90.5: Silt (M): moist, 2.5Y5/3 light olive brn, non plastic, mod rxn w/ HCL	
				90.5-91.1: Sandy Silt (sM): moist, 2.5Y4/2 light brnish gray, non-plastic, vf sand, 25% Sand, 75% Silt, vf laminae, no rxn w/ HCL - gradational contact	
92.5				91.1-92.2: Silt (M): moist, 2.5Y5/4 light olive brn, non-plastic, mod rxn w/ HCL	Core 10 B35VY8 92.5-97.5
	Core 10			92.5-97.5: Silt (M): moist, 2.5Y5/4 light olive brn, non-plastic, mod rxn w/ HCL	
95		100%		93.4: Increased vf sand content (93.4-97.5) to 10%	
				- 102.4 JR 8/1/14	
				~~102.5~~ JR 8/1/14 100%	
97.5				97.4 ~~100.5~~: (M) Silt: moist-dry, non-plastic	Core 11 B35WD0
				97.4-97.8: 2.5Y4/3 olive brn - gradational contact	97.4 ~~100.5~~ ~~102.5~~ JR 8/1/14 102.4
	Core 11			97.8-102.5: Caliche, 10YR 8/3 very pale brown, very strong rxn w/ HCL, w/ f-c sand (~20%)	Aliquot 98.4-99.9
		100%			

Reported By: Jen Russell		Reviewed By:	
Title: Geologist		Title:	
Signature: Jen Russell	Date: 8/1/14	Signature:	Date:

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BOREHOLE LOG

Page 5 of 5
Date: 8/1/16

Well ID: C9492	Well Name: NA	Location: 216-T-5 Crib
Project: 200DV-1 OU Characterization Ph3		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
100	Core 11	100%		97.8-102.4: Caliche: Sandy Silt (sM): 25% Sand (f-c), 75% Silt, strong rxn w/ HCL, 10YR 8/3 very pale brown	Sonic Core Core 11 B35W00 97.4-102.4
102.5				TD: 102.4	Aliquot 98.4-99.9
105					
107.5					
110					
112.5					
115					
117.5					

JR 8/16/16

Reported By: Len Russell		Reviewed By:	
Title: Geologist		Title:	
Signature: Len Russell	Date: 8/1/16	Signature:	Date:

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BOREHOLE LOG

Page 1 of 4
Date: 9/12/16

Well ID: C9510	Well Name: NA	Location: 216-T-25 Trench
Project: 200 DV-1 OU Characterization Phase 3		Reference Measure Point: Ground Surface

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
40				Sonic Core
42.5			JR 10/13/16	
45				
47.5	Core 1		47.5-50.0: Sand(S) 100%: vf-vc, predom med., 70% Felsic quartzose, 30% Mafic, MS, dry, no rxn w/HCL, light brnish gray 2.5Y 6/2, SA, trace mica, massive	Core 1 B361J7 47.5-50.0
50	Core 2		49.6-50.8: Sand(S) 100%: vf-vc, predom med, 70% Felsic qtz, 30% Mafic, MS, dry, no rxn w/HCL, 2.5Y 6/2 light brnish gray, SA, trace mica, massive, $CaCO_3$ nodules - strong rxn w/HCL; 50.8-52.1: No recovery	Core 2 B361J9 49.6-52.1
52.5	Core 3		52.4-53.1: Sand(S) 100%: vf-vc sand, predom. m-c, 70% Felsic, 30% Mafic, SA, mod sorted, dry, no rxn w/HCL, 2.5Y 4/1 Dk gray, JR 9/12/16, trace mica; 53.1-53.6: Silty Sand(mS): 25% Silt, 75% vf sand; dry, no rxn w/HCL, 2.5Y 5/3 light olive brn, laminae (vf) throughout; 53.6-55.8: Sand(S): 100% vf-vc rhythmites, up to 5cm thick, 70% Felsic, 30% Mafic, trace mica, 2.5Y 5/4 light olive brn, dry, no rxn w/HCL; 55.8-56.8: grades to Sandy Silt (sM): 70% Silt, 30% Sand; dry, strong rxn w/HCL, 2.5Y 6/3 light yellowish brn, vf sand; 56.8-57.4: JR 9/12/16 Gravelly Silt (gM): 70% Silt, 20% Gravel, 10% Sand; Gravel: f peb-3cm, SA-SR, 80% Mafic, 20% Felsic, (cont.)	Core 3 B361K1 52.4-57.4; Aliquot 53.7-55.2
55				

Reported By:			
Jen Russell	Geologist	Jen Russell	9/12/16
Print Name	Title	Signature	Date

Reviewed By:			
Tessa Clark	Geologist	[signature]	10/24/16
Print Name	Title	Signature	Date

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BOREHOLE LOG (Cont.)

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Date: 10/18/14

Well ID: C9510 | Well Name: NA | Location: 216-T-25 Trench

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
57.5			54.8-57.4: Gravelly Silt (gM): 70% Silt, 20% Gravel, 10% Sand; Gravel: f peb - 3cm, SA-SR, 80% Mafic, 20% Felsic; Sand: vf; dry, strong rxn w/ HCL, 2.5Y4/1 Dk gray, NP, PS	Sonic Core
			57.5-60.0: No recovery	
60			60.0-62.5: Silty Sandy Gravel (~~mG~~) (msG) JR 10/24/14: 70% Gravel, 15% Sand, 15% Silt; Gravel: f peb - 7cm, 70% Mafic, 30% Felsic, SR-R; Sand: vf-c, predom f; dry, strong rxn w/ HCL, 2.5Y5/1 Gray, hydrocarbon odor (Strong), PS JR 10/24/14 Sandy JR 10/24/14 60% Felsic, 40% Mafic, SA	Core 4 B361K3 57.5-62.5 Aliquot ~~57-62.0~~ JR 9/12/16 60.5-61.5
62.5	Core 5		62.4-63.4: Silty Sandy Gravel (~~mG~~) (msG) JR 10/24/14: 70% Gravel, 15% Sand, 15% Silt; Gravel: f peb - 5cm, 70% Mafic, 30% Felsic, SR-R; Sand: vf-c, predom f; dry, strong rxn w/ HCL, 2.5Y5/1 Gray, no odor, PS	Core 5 B361K5 62.4-67.4
			63.4-67.4: No recovery	
65			60% Felsic, 40% Mafic, SA JR 10/18/14	
67.5			67.0-69.0: No recovery	Core 6 B361K7 67.0-72.0
			-71.0 JR 10/18/14 Sandy JR 10/24/14 (msG) JR 10/24/14	
70	Core 6		69.0 ~~-72.0~~: Silty Sandy Gravel (~~mG~~) (msG): 70% Gravel, 15% Sand, 15% Silt; Gravel: f peb - 9cm, 80% Mafic, 20% Felsic, SR-R; Sand: vf-c, predom f-m, SA, 60% Felsic, 40% Mafic; dry, strong rxn w/ HCL, PS, 2.5Y5/1 Gray	
			71.0-72: Silt (M): 95% Silt, 5% Gravel; Gravel: vf peb - 1cm, SA, 90% Mafic, 10% Felsic; dry, strong rxn w/ HCL, Mod S, 2.5Y7/1 light gray - may be drilling effect - JR 9/12/16	possible mechanical deformation due to overdrilling
72.5			72.5-77.5: ~~Silty~~ Sandy Gravel (~~mG~~) (msG): 80% Gravel, ~~95%~~ 15% Silt, ~~10~~ 5% Sand; Gravel: f peb - 8cm, 60% Mafic, 40% Felsic w/ quartzite cobbles, SR-R; vf-f sand; dry, non-plastic, PS, mod rxn w/ HCL, 2.5Y5/1 gray, $CaCO_3$ nodules	Core 7 B361K9 72.5-77.5 DUP B361K9DUP
75	Core 7			Aliquot (S) 73.5-76.5

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Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	9/12/15

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BOREHOLE LOG (Cont.)

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Date: 10/18/16

Well ID: C9510 | Well Name: NA | Location: 216-T-25 Trench

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
77.5	Core 8		77.5 ~~82.5~~: 79.0: No Recovery 79.0-82.5: Gravel (G): 85% Gravel, 15% Sand; Gravel: f peb-8cm, SR-R, 70% Felsic, 30% Mafic, quartzite, granitic rock; Sand: vf-vc, SA, 60% Felsic, 40% Mafic; dry, strong rxn w/ HCL, PS, 2.5Y 6/1 gray.	Sonic Core Core 8 B361L1 77.5-82.5
80				
82.5	Core 9		82.4-86.9: Silty Gravel (mG): Sand 10%, 20% Silt, 70% Gravel; Gravel: f peb-8cm, SR-R, 70% Mafic, 30% Felsic; Sand: vf-c, predom f, SA, 60% Felsic, 40% Mafic; dry, strong rxn w/ HCL, 2.5Y 6/1 Gray, PS	Core 9 B361L3 82.4-87.4
85				
			86.9-87.4: No recovery	
87.5	Core 10		87.5-92.5: Silty Gravel (mG): 70% Gravel, 20% Sand, 10% Silt; Gravel: 60% Mafic, 40% Felsic, quitzite, f peb-1cm, SR-R; Sand: vf-c, predom f-m; dry, 2.5Y 4/1-2.5 4/1 gray to dark gray, mod rxn w/ HCL, CaCO3 nodules, odor PS unknown VE 10/24/16 70% Felsic, 30% Mafic VE 10/24/16	Core 10 B361L5 87.5-92.5 Aliquot 89.0-90.0
90				
92.5	Core 11		92.4-95.4: Silty Gravel (mG): 70% Gravel, 20% Sand, 10% Silt; Gravel: f peb-7cm, predom. 3cm, 60% Felsic, 40% Mafic, SR-R; Sand: vf-c, predom, med., 70% Felsic, 30% Mafic, SA; dry, strong rxn w/ HCL, light brnish gray 2.5Y 6/2, PS	Core 11 B361L7 92.4-97.4
95				
			95.4-97.4: No recovery	

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	10/18/16

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BOREHOLE LOG (Cont.)

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Date: 10/18/16

Well ID: C9510 | Well Name: NA | Location: 216-T-25 Trench

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
97.5				Sonic Core
	Core 12		97.5-100.0: Silty Gravel (mG): 70% Gravel, ~~20% Sand, 10% Silt~~ JE 10/18/16 20% Silt, 10% Sand; Gravel: 60% Mafic, 40% Felsic, f peb -7cm, SR-R; Sand: 70% Felsic, 30% Mafic, vf-c, predom f-m; dry, 2.5Y5/1 gray, mod rxn w/ HCL in silt, $CaCO_3$ nodules - strong rxn w/ HCL, Odor	Core 12 B36L9 97.5 - 102.5
100				Aliquot 98.0 - 102.0
			100.0-102.5: No recovery	
102.5			Total Depth of Cores: 102.5 ft	
			Total Drilling Depth: 122.3 ft	
105			[102.5-122.3 ft Not Logged]	
107.5				
110			JE 10/18/16	
112.5				
115				

Reported By:

Print Name	Title	Signature	Date
Len Russell	Geologist	Len Russell	9/14/16

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BOREHOLE LOG

Page 1 of 5
Date: 9/8/16

Well ID: C9511	Well Name: NA	Location: 216-T-23 Trench
Project: 200 DV-1 OU Characterization Phase 3		Reference Measure Point: Ground Surface

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
40				
			JR 11/7/16	47.1-47.8: Sandy silt (sM): 70% Silt, 30% Sand; Sand: vf, 90% Felsic, 10% Mafic; dry, non-plastic, 2.5Y5/2 grayish brn, no rxn w/HCL
42.5				
			44.1-45.4: Slough	Core 1 B360M1 44.1-46.6
45	Core 1		45.4-46.6: Sand (S) 95% Sand, 5% Silt; vf-m, SA predom f, moist, 2.5Y5/2 grayish brn, WS, 90% Felsic, 10% Mafic, trace mica, no rxn w/HCL, massive JR 11/28/16	3138 → Interbedded rhythmites vf sand/silt & c-vc sand JR 11/28/16
			47.5 JR 11/28/16	
47.5	Core 2		47.1-49.6: Sand (S) 95% Sand 5% Silt; vf-vc JR 11/28/16 predom vf, moist, 2.5Y5/2 grayish brown, WS, JR 11/28/16 90% Felsic, 10% Mafic, micaceous, no rxn w/HCL, massive JR 11/28/16	Core 2 B360M3 47.1-49.6 Aliquot 47.6-48.6
			49.6-52.1: Sand (S) 95% Sand, 5% Silt; vf-vc, predom f, moist, 2.5Y5/2 grayish brn, PS, 70% Felsic, 30% Mafic, trace mica	
50	Core 3		49.6-50.3: vf-vc, massive, predom f.	Core 3 B360M5 49.6-52.1
			50.3-50.8: Crossbedded vf silt/sand & fine sand	
			50.8-51.1: coarse grained sand bed (grad. contact) JR 9/9/16	
			51.1-51.3: sharp contact - vf sand/silt bed, grades to vc sand in ~~upper~~ 2 cm lower JR 9/9/16	
52.5	Core 4		51.3-52.1: Sharp contact - f-c sand, massive gradational JR 9/9/16	Core 4 B360M7 52.2-54.7
			< CORE 4 DESCRIPTION ON PG 2 >	
55	Core 5		54.6-55.8: Sand (S) 100%: vf-m, predom vf, moist, 2.5Y5/2 grayish brn, WS, 90% Felsic, 10% Mafic, micaceous	Core 5 B360M9 54.6-57.1
			55.8-57.1: Silty Gravel (mG): 70% Gravel, 20% Silt, 10% Sand; Gravel: 70% Mafic, 30% Felsic, vf pob-5cm, predom 3cm SR-R; Sand: vf-c, predom f; moist, 2.5Y4/1 Dark gray, wk rxn w/HCL, PS	Aliquot 54.8-55.6

Reported By:			
Jen Russell	Geologist	Jen Russell	8/31/16
Print Name	Title	Signature	Date

Reviewed By:			
Tessa Clark	Geologist	[signature]	11/10/16
Print Name	Title	Signature	Date

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BOREHOLE LOG

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Date: 9/8/16

Well ID: C9511	Well Name: NA	Location: 216-T-23 Trench
Project: 200 DV-1 OU Characterization Phase 3		Reference Measure Point: Ground Surface

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
40				
			JR 9/8/16 REFER TO PG 1 for CORES 2, 3, 5	
42.5				
45				
47.5				
50				
52.5	Core 4		52.2-53.3: Gravelly Sand (gS): 10% Gravel, 90% Sand; Gravel: 80% Mafic, 20% Felsic, 0.5cm-2cm, SR Sand: f-c, predom med., 70% Felsic, 30% Mafic; dry 2.5Y 6/2 light grayish brn, trace mica, no rxn w/ HCL	Core 4 B360M7 52.2-54.7
55			53.3-54.7: Sand (S) 95% Sand, 5% Silt; sharp contact, vf sand/silt grading downward to med-c sand @ 53.7; 2.5Y 5/4 light olive brn grading to 2.5Y 7/2 light gray, no rxn w/ HCL, dry, 70% Felsic, 30% Mafic	

Reported By: Jen Russell (Print Name)	Geologist (Title)	Jen Russell (Signature)	9/8/16 (Date)
Reviewed By: Tessa Clark (Print Name)	Geologist (Title)	(Signature)	11/10/16 (Date)

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A-6003-642 (REV 1)

BOREHOLE LOG (Cont.)

Date: 9/8/16

Well ID: C9511 | Well Name: NA | Location: 216-T-23 Trench

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
57.5			57.2-61.2: No recovery	Sonic Core
				Core 6 B360N1 57.2-62.2
60			61.2-62.2: Silty Gravel (mG): 55% Gravel, 20% Sand, 25% Silt; Gravel: 85% Mafic, 15% Felsic, 0.5cm-6cm, predom 3cm, SR; Sand: vf-m; moist, 2.5Y4/2 dk grayish brn, $CaCO_3$ nodules - strong rxn w/HCl	
	Core 6			
62.5			(62.2-63.1 - no recovery)	Core 7 B360N3 63.1-67.1
	Core 7		63.1-66.1: Silty Gravel (mG): 75% Gravel, 20% Silt, 5% Sand; Gravel: 60% Mafic, 40% Felsic, 0.5cm-8cm, predom 3cm, SR-R; vc sand; 2.5Y4/2 dk grayish brn, minor amt. $CaCO_3$ nodules - strong rxn w/HCl, moist, silt coating cobbles, odor	
65				
			66.1-67.1: No recovery	
67.5			67.1-70.1: No recovery	Core 8 B360N5 67.1-72.1
				Aliquot 70.6-71.6
70			70.1-72.1: Silty Gravel (mG): 70% Gravel, 20% silt, 10% Sand; Gravel: 70% Mafic, 30% Felsic - qtzite, SR-R, 2cm-8cm, predom 4cm; vf-f sand, dry, PS, 2.5Y4/1 Dk gray, strong rxn w/HCl	
	Core 8			
72.5			72.1-73.6: No recovery	Core 9 B360N7 72.1-77.1
			73.6-77.1: Silty Gravel (mG): 60% Gravel, 30% Silt, 10% Sand; Gravel: 90% Mafic, 10% Felsic, f peb.-5cm, predom 3-4cm, SR-R; vf-m sand; dry, PS, 2.5Y4/1 Dk gray, strong rxn w/HCl, $CaCO_3$ nodules - strong rxn w/HCl	
75	Core 9			

Reported By: Jen Russell (Print Name) | Geologist (Title) | Jen Russell (Signature) | 9/8/16 (Date)

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BOREHOLE LOG (Cont.)

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Date: 8/31/14

Well ID: C9511 | Well Name: NA | Location: 216-T-23 Trench

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
77.5	Core 10		77.4-82.4: Gravel (G): 95% Gravel 5% Sand: Gravel: R, 50% Mafic, 50% Felsic, 2mm-5cm, predom 2-3cm and vf pebbles; Sand: VC, 90% Mafic, 10% Felsic; dry, 2.5Y 3/1 very dk gray, CaCO3 cementation nodules throughout - strong rxn w/ HCL, odor noted, clay coated cobbles	Sonic Core Core 10 B360N9 77.4-82.4 Aliquot 78.4-79.4
80				
82.5	Core 11		82.3-87.3: Gravel (G): 95% Gravel, 3% Sand, 2% Clay; Gravel: 60% Mafic, 40% Felsic, vf peb - 8cm, SR-R, predom 2-3cm and vf peb; Sand: VC, 90% Mafic, 10% Felsic, moist, 2.5Y 3/1 very dark gray, CaCO3 cementation nodules, strong rxn w/ HCL, odor, clay coated cobbles	Core 11 B360P1 82.3-87.3
85				
87.5			87.4 - 88.9: No recovery	Core 12 B360P3 87.4-92.4
90	Core 12		88.9-90.2: Silty Gravel (mG): 70% Gravel, 30% Silt; Gravel: 80% Mafic, 20% Felsic, vf peb-4cm, predom. 2cm, SR-R; Dry, 2.5Y 5/1 gray, strong rxn w/ HCL - likely pulverized from drilling or slough 90.2-91.2: Gravel (G) 95% Gravel, 5% Sand, >1% Clay; Gravel: 60% M, 40% F, vf peb-6cm, R; VC sand, 2.5Y 3/1 vd gray, CaCO3 nodules, strong rxn w/ HCL, d-moist, odor 91.2-92.4: No recovery	
92.5	Core 13		92.4-97.4: Sandy Gravel (sG): Gravel 70% 30% Sand; Gravel: 2mm-7cm, predom. 4cm, 50% Mafic, 50% Felsic, R; Sand: f-vc, predom. c, 60% Felsic, 40% Mafic; dry, 2.5Y 4/2 dk grayish brn, CaCO3 cementation nodules - strong rxn w/ HCL	Core 13 B360P5 92.4-97.4 Aliquot 93.4-94.4
95				

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	8/31/14

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BOREHOLE LOG (Cont.)

Date:

Well ID: C9511 | Well Name: NA | Location: 216-T-23 Trench

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
97.5				Sonic Core
	Core 14		98.0-98.5: No recovery	Core 14 B360P7
			98.5-100.5: Gravel (G): 90% Gravel, 5% Sand, 2% Clay; Gravel: 80% Mafic, 20% Felsic, vf peb-8cm, predom. 0.5-3cm, sr-r; Sand: vf-vc, predom c; moist, 2.5Y3/1 v dk gray, CaCO3 nodules, strong rxn w/ HCL, hydrocarbon odor, upper 0.5-1.0' likely slough, clay-coated cobbles	98.0-102.0
100				
			100.5-102.0: No recovery	
102.5				Core 15 B360P9
	Core 15		102.7-106.4: Sandy Gravel (mG): 75% Gravel, 20% Sand, 5% Silt; Gravel: 80% Mafic basalt, 20% Felsic w/ quartzite, f peb-8cm; ~~predom~~ Sand: vf-vc; 70% Felsic, 30% Mafic; dry-moist, 2.5Y3/1 v. dk gray, CaCO3 nodules, strong rxn w/ HCL, slight odor	102.7-107.7
105			106.4-107.4: Silt (M): 80% Silt, 20% Clay; low-non-plastic, moist, 10YR5/4 yellowish brn, mod-strong rxn w/ HCL	
			107.4-107.7: Sand (S): 95% sand, 5% Silt; Sand: vf-f, 95% Felsic, 5% Mafic, trace mica; dry, 2.5Y5/3 light olive brn, no rxn w/ HCL, WS	
107.5	Core 16		107.2-108.6: Sand (S): 95% sand, 5% Silt; Sand: vf-f, 95% Felsic, 5% Mafic, trace mica, dry, 2.5Y5/3 light olive brn, no rxn w/ HCL	Core 16 B360R1 107.2-112.2
			108.6-112.2: Silt (M): non-plastic, 2.5Y5/3 light olive brn, dry-moist	
110			108.6-109.9: Silt w/ 10% vf sand, mod rxn w/ HCL	
			109.9-111.4: vf laminae, wk rxn w/ HCL	
			111.4-112.2: Silt w/ 10% clay, wk-mod rxn w/ HCL	
112.5			112.5-115.5: Silt (M) 95% Silt, 5% Sand; dry-moist, 2.5Y6/3 light yellowish brn, non-plastic, wk rxn w/ HCL	
	Opt. 17		113.0-113.5: silt w/ fine sand, platy structure	Core Optional 17 B360R3 112.5-115.5
			113.9-115.5: Caliche - cemented silt mod-strong, strong rxn w/ HCL, nodules	
115			115.0: Increased sand content & 1-2 cm cobbles	Aliquot 112.5-113.5
			Total Depth: 115.5	

Reported By:

Jen Russell	Geologist	Jen Russell	9/8/14
Print Name	Title	Signature	Date

A-6006-993 (REV 0)

BOREHOLE LOG

Page 1 of ~~4~~ 5 JR 8/23/14

Date: 7/1/14

Well ID: C9505	Well Name: NA	Location: 216-T-15 Trench	
Project: 200 DV-1 OU Characterization Ph 3		Reference Measuring Point: Ground Surface	

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCL	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40				43.6-45.8: No recovery	Sonic Core
				45.8-46.1: Slightly silty gravelly (slough?) (m)gS Sand w/ canvas debris from drilling activities	
				Gravel 10%, 70% Sand, 20% Silt; Gravel: vf peb - 2cm, SR, 90% Mafic, 20% Felsic; Sand: vf-c, predom med;	
42.5				2.5Y 4/2 dk grayish brn, wk rxn w/ HCL, moist	Core1 B35WT9
				46.1-46.4: Sand (S) 5% Gravel, 95% Sand; moist	43.6 - 47.0
				Gravel: vf peb-f peb, 100% Mafic, SR-SA; Sand: f-m, predom med., 70% Felsic, 30% Mafic; 2.5Y 5/2 grayish brn, wk rxn w/ HCL	
45		35%		46.4-47.0: Sandy Silt (SM) 70% Silt, 30% Sand, vf-f sand, non-plastic, moist, 2.5Y 5/3 light olive brn, no rxn w/ HCL	
	Slough			46.1-47.1: Slough - pulverized sand, silt w/ gravel; 10% gravel; PS, 2.5Y 7/3 Pale brn Strong rxn w/ HCL, dry	Core 2 B35WV1 47.1-49.6
47.5	Core 2			47.1-49.6: Gravelly Sand (gS): 80% Sand, 20% Gravel; Sand: 60% Felsic, 40% Mafic, vf-vc, SA; Gravel: 80% Mafic 20% Felsic, vf peb - 4cm max, SR, avg. 0.5cm; PS, moist 47.1-48.9, dry 48.9-49.6, no rxn w/ HCL, 2.5Y 4/1 Dk gray	Aliquot 47.4-48.9
		100%			Core 3 B35WV3 49.5-52.0
50	Core 3			49.5-52.0: Gravelly Sand (gS): 85% Sand, 15% Gravel; Sand: 60% Felsic, 40% Mafic, m-vc, predom. c, SA; Gravel: 80% Mafic, 20% Felsic, vf-c pebbles, predom. 3-4mm, SA-SR (basalt, quartzite); dry, no rxn w/ HCL, 2.5Y 4/1 Dk gray, m-PS	
		100%			
52.5	Core 4			52.3-54.8: Gravelly Sand (gS): 80% Sand, 20% Gravel; Sand: 70% Felsic qtz, feldspars, 30% Mafic, f-c, predom. c, SA; Gravel: vf peb-1cm, predom. 1cm, 90% Mafic basalt, 10% Felsic, SR; dry, 2.5Y 4/2 dark grayish brn, PS, no rxn w/ HCL, iron staining, grades to vf-f sand (100%) @ 54.3	Core 4 B35WV5 52.3 ~~57.8~~ - 54.8 JR 8/23/14
		100%			
55	Core 5			54.5-3cm silt bed w/ laminae, wk rxn w/ HCL	Core 5 B35WV7 54.5-57.0
		100%		54.6-55.0: vc sand fining downward to vf sand	
				55.0-57.0: Grades to m-vc sand: Sand (S) 5% Gravel, 95% Sand; Gravel: vf peb - 3cm 50% Felsic, 50% Mafic; Sand: 75% Felsic, 25% Mafic, coarsening downward; dry, no rxn w/ HCL, mod-PS, 2.5Y 4/1 gray	
57.5	Core 6			57.3-57.9: Sand (100%) (S):	Core 6 B35WV9 57.3-62.3
				— DESCRIPTION ON NEXT PAGE —	

Reported By: Jen Russell		Reviewed By: Tessa Clark	
Title: Geologist		Title: Geologist	
Signature: Jen Russell	Date: 8/23/14	Signature: [illegible]	Date: 9/28/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 2 of 45 JR 8/23/14
Date: 7/1/14

Well ID: C9505	Well Name: NA	Location: 216-T-15 Trench	
Project: 200 DV-1 OU Characterization Ph3		Reference Measuring Point: Ground Surface	

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
60	Core 6	100%		57.3-57.9: Sand(S) 100% c-vc, 70% Felsic, 30% Mafic. Sonic Core.	
				57.9: Grades to vf-f sand, fining downward to 60.0; vf sand/silt lamina @58.8; 6/1 2.5Y gray	Core 6 B35WV9
				60.0-60.6: Gravelly Sand (gS) 15% Gravel, 85% Sand; Gravel: 80% Mafic, 20% Felsic, feldspar, SR, vf peb-2cm, predom f peb. (4mm); Sand: 75% Felsic, 25% Mafic, SA; dry, 2.5Y4/1 dk gray, no rxn w/HCL	57.3-62.3
62.5	Core 7	100%		60.6-62.3: Sand(S) 100%: vf-f rhythmites from 60.6-61.3, 80% Felsic, 20% Mafic, 2.5Y7/2 light gray no rxn w/HCL	
65				61.3: 3 cm silt bed, wk rxn w/HCL, 2.5Y5/3 light olive brn	
				61.3-4 JR 8/23/14-62.3: f-vc sand w/ 5% f pebbles (95% Mafic, 5% Felsic)	
				<CORE 7 DESCRIPTION ON PG 3>	Core 7 B35WW1
67.5	Core 8	100%		67.2-69.0: Sand(S) 95% Sand, 5% Gravel; Sand: 55% Felsic, 45% Mafic, m-vc: predom med, SA; Gravel: 80% Mafic, 20% Felsic, SA-SR vf peb-0.5cm, 4mm predom., dry, mod sort, 2.5Y5/1, Gray, no rxn w/HCL	62.2-67.2
					Core 8 B35WW3 67.2-72.2
70				69.0: Sharp contact, moist, silt/vf sand grading to silty sandy gravel, grading to sandy gravel @ 69.4, no rxn w/HCL	
				69.4-72.2: Sandy Gravel (sG): 70% Gravel, 30% Sand; Gravel: 80% Mafic basalt, 20% Felsic, vf peb-2cm, predom. 0.5cm, SA-SR; Sand: vf-vc, predom. med sand, SA, 70% Felsic qtz, 30% Mafic; PS, dry, 2.5Y4/1 DK gray, no rxn w/HCL	Core 9 B35WW5 72.2-77.2
72.5	Core 9	100%		72.2-77.2 Sandy Gravel (sG): 60% Gravel 40% Sand, Gravel: vf peb-2cm, predom 0.5cm, SA-SR, 80% Mafic, 20% Felsic; Sand: vf-vc, predom. c., SA, 70% Felsic, 30% Mafic; PS, dry, 2.5Y4/1 Dark gray, no rxn w/HCL, iron staining	
75				77.3-81.0 Sandy Gravel (sG): 60% Gravel, 40% Sand; Gravel: vf peb-2cm, predom. f peb, 90% Mafic, 10% Felsic, SA-SR; Sand: 70% Felsic, 30% Mafic, SA, f-vc, predom. vc.; dry, 2.5Y4/1 dk gray, no rxn w/HCL, iron staining, interbedded rhythmites	Core 10 B35WW7 77.3-82.3
77.5	Core 10	100%			JR 8/23/14

Reported By: Jen Russell		Reviewed By: Tessa Clark	
Title: Geologist		Title: Geologist	
Signature: Jen Russell	Date: 9/28/16	Signature: [illegible]	Date: 9/28/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 5

Date: 8/23/14

Well ID: C9505 | Well Name: NA | Location: 216-T-15 Trench

Project: 200 DV-1 Characterization Ph3 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description (Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level)
60		JR 9/2/16			
				<DESCRIPTION FROM PG 2 - CORE 7>	
62.5	Core 7			62.2-67.2: Sand(S) 100%: vf-vc, predom c, 60% Felsic, 40% Mafic, MS, SA, micaceous, iron staining, no rxn w/ HCl, 2.5Y4/1, DK gray	Core 7 B35WW1 62.2-67.2
				62.5: Silt lamina (1 cm ~~thick~~) JR 8/23/16 thick	
65				64.8-65.2: Gravelly sand bed, 90% Mafic, 10% Felsic, vf peb-2cm, predom 1cm, 25% Gravel, 75% Sand	
				65.2-67.2: 5% Gravel, 95% Sand, vf peb-1 cm predom. fine pebbles	
67.5					
70					
72.5					
75					
77.5					JR 9/2/16

Reported By: Jen Russell | Reviewed By: Tessa Clark

Title: Jen Russell | Title: Geologist

Signature: Geologist | Date: 8/23/16 | Signature: [signature] | Date: 9/28/16

A-6003-642 (03/03)

BOREHOLE LOG

Page ~~3 of 4~~ JR 8/23/16
Date: 7/1/16

Well ID: C9505	Well Name: NA	Location: 216-T-15 Trench
Project: 200 DV-1 OU Characterization Ph3		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	Core 10	100%		77.3-81.0: Interbedded Sandy Gravel rhythmites	Sonic Core
				81.0-82.3: Sand: 95% Sand, 5% Gravel,	
				Gravel: vf peb-2cm, predom. vf peb, 90% Mafic, 10%	Core 10 B35WW7
				Felsic; Sand: 55% Felsic, 45% Mafic, m-vc, predom c,	77.3-82.3
				iron staining, no rxn w/HCL, 2.5Y4/2 dk grayish brn - 2.5Y3/1 v. dk gray	
82.5				~~82.5~~ 82.3-87.3: Sand (S) 90% Sand, 10%	Core 11 B35WW9
				Gravel, Trace Silt; Sand: vf-vc, 60% Felsic	82.3-87.3
				40% Mafic, SA; Gravel: 85% Mafic basalt, 15%	
	Core 11	100%		Felsic, vf peb-1cm, predom. 0.25cm; moist to	
				83.7, dry 83.7-87.3, 2.5Y5/1 Gray, no rxn w/HCL	Aliquot
85				Poorly Sorted	82.9-84.6
				83.0: ~~Sharp contact~~ JR 9/1/16 - vf sand/silt laminae,	
				grading to silty, gravelly sand @ 83.2,	
				grading to gravelly sand @ 83.4 (2.5Y6/3 light yellowish brn)	
				83.7: 2cm silt very thin bed, 2.5Y5/4	
87.5				light olive brn, w/ 3mm pebbles (mafic) throughout	
				83.8-87.3: Interbedded rhythmites, graded	B35WX1 JR 8/23/16
				up to 5cm thick	Core 12 ~~B35WX3~~
	Core 12			87.4-92.4: Sand (S) 100%; 2.5Y5/1 Gray, no rxn w/HCl ~~92.4-97.4~~	
				87.4-88.4: f-c, predom med., 70% Felsic 30%	87.4-92.4 JR 8/23/16
90		100%		88.4-89.3: Dipping beds sand/f gravel mafic (40°)	
				89.3-90.2: Interbedd rhythmites	
				90.2-91.2: Sandy Gravel (SG): 60% Gravel,	
				40% Sand, trace mica, vf peb-0.5cm, 90% Mafic	
				10% Felsic, CaCO3 cementation throughout, 2.5Y4/1 DK gray, strong rxn w/HCL	
92.5				91.2-92.4: f-c, predom. med.	
				dry, 2.5Y4/2 dk grayish brn - 6/2 light brnish gray @ 91.2	
				92.4-97.4: Sand (S) 100%: f-vc, predom. c,	
	Core 13			60% Felsic, 40% Mafic, dry, m-WS, SA, 2.5Y5/1	Core 13 B35WX3
				gray - 5/2 grayish brn @ 96.0, CaCO3 cem.	92.4-97.4
95				throughout, strong rxn w/HCL	
				93.2-93.7: Rhythmites (not well defined)	
				93.9-95.9: 5% fine pebbles - increased cementation	
				95.9-97.4: f-c grained sand rhythmites	
97.5				97.3-98.0 Gravelly Sand (gS) 80% Sand	Core 14 B35WX5
				20% Gravel; Sand: 70% Felsic, 30% Mafic, (Qtz) Felsic,	97.3-102.3
	Core 14	100%		f-vc, SA; Gravel: vf peb-1cm, 70% F, 8% feldspar	
				30% Mafic; pred. 0.5cm, SA-SR; dry, 2.5Y6/1 Gray,	
				PS, wk rxn w/HCL.	

Reported By: Jen Russell		Reviewed By: Tessa Clark	
Title: Geologist		Title: Geologist	
Signature: Jen Russell	Date: 9/28/16	Signature: [signature]	Date: 9/28/16

A-6003-642 (03/03)

BOREHOLE LOG

C9505

Page ~~4 of 4~~ JR 8/23/16

Date: 7/1/16

Well ID: ~~C9509~~ JR 9/28/16 | Well Name: NA | Location: 216-T-15 Trench

Project: 200 DV-1 OU Characterization Ph3 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
100	Core 14	100%		98.0 – 102.3 Silt (M): 95% Silt 5% vf Sand; non plastic, 2.5Y5/3 light olive brn – 2.5Y7/3 pale brn, wk-mod rxn w/ HCL	Sonic Core Core 14 B35WX5 97.3 – 102.3
				99.1 – 101.3: laminated – crossbedded laminae noted from 99.1 – 99.9	
102.5				101.6: Platy structure in silt (along laminae?)	Aliquot 100.0 – 102.3
	Core 15			102.4 – 107.4 Silt (M) 95% Silt 5% Sand; vf sand, non-plastic, 2.5Y5/3 light olive brn, mod rxn w/ HCL, platy structure, moist	Core 15 B35WX7 102.4 ~~105.5~~ – 107.4 JR 8/24/16
105		100%		Total Depth: 107.4	
107.5					
110					
112.5					
115					
117.5					

JR 9/2/16

Reported By: Jen Russell | Reviewed By: Tessa Clark

Title: Geologist | Title: Geologist

Signature: Jen Russell | Date: 8/23/16 | Signature: [illegible] | Date: 9/28/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 6
Date: 10/6/16

Well ID: C9512	Well Name: NA	Location: 216-S-9 Crib	
Project: 200 DV-1 OU Characterization Phase 3		Reference Measure Point: Ground Surface	

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
30			JR 10/12/16	Sonic Core
32.5				
35			35.5-36.2: Slough Sand JR 10/12/16	
	Core 1		36.2-37.0: Sandy Gravel (sG): 60% ~~Gravel~~, 40% Sand, Gravel: vf peb-2cm, predom vf peb, 80% Mafic, 20% Felsic, SA; Gravel JR 10/12/16, Sand: vf-vc, predom vc, 60% Felsic, 40% Mafic, SA; dry, no rxn w/HCL, PS, 2.5Y4/2 dk grayish brn, gravel size increases w/depth	Core 1 B36159 35.5-37.0
37.5	Core 2		37.0-40.7: Sandy Gravel (sG): 60% Gravel, 40% Sand; Gravel: f peb-3cm, predom. ~~2~~ JR 10/6/16 f peb, 70% Mafic, 30% Felsic SA; Sand: 70% Felsic qtz, 30% Mafic, vf-vc, predom vc, SA; dry, $CaCO_3$ nodules (strong rxn w/HCL), iron staining, stratified bedding	Core 2 B36161 37.0-42.0 Aliquot 40.7-41.5
40			40.7 ~~-42.0~~ JR 10/6/16 -40.9: Silt (M) 100%, dry, no rxn w/HCL, non-plastic, 2.5Y4/4 light yellowish brn, grades to vf sand	2.5Y4/2 dk grayish brn JR 10/18/16
			40.9-42.0: Sand (S) 95% Sand, 5% Silt; dry, no rxn w/HCL, 2.5Y4/2 light brnish gray, coarsening downward, vf-c	
42.5	Core 3	0.6' missing core (42.2-42.8)	42.2-44.6: Sand (S) 100%, c-vc, predom. c, 70% Felsic quartzose, 30% Mafic basalt, SA, MS, trace mica, no rxn w/HCL, dry, minor amt. iron staining, massive, grades to (gS), 2.5Y4/2 light brnish gray	Core 3 B36163 42.2-47.2
45			44.6-45.2 ~~Gravelly Sand (gS)~~ JR 10/18/16: 80% Gravel, 20% Sand; Gravel (G): Gravel: 1-3cm, predom. 2cm, SR-R, 90% Mafic, 10% Felsic; Sand: vf-vc, predom c, 70% Felsic, 30% Mafic, SA; dry, no rxn w/HCL, PS, 2.5Y4/1 gray	
			45.2-47.2: Silty Gravel (mG): 60% Gravel, 10% Sand, 30% Silt; Gravel: 1cm-7cm, predom 5cm, SR-R, 70% Mafic, 30% Felsic w/quartzite; Sand: vf; dry-moist, mod rxn w/HCL, PS, suspect contaminant (dk gray/black), no odor; color varies from 2.5Y7/1 light gray to 2.5Y4/2 dk grayish brn ~~, chalcopyrite~~ in silt.	

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	10/6/16

Reviewed By:

Print Name	Title	Signature	Date
Tessa Clark	Geologist	[illegible]	10/20/16

For Office Use Only

OR Doc Type:	WMU Code(s):

A-6003-642 (REV 1)

BOREHOLE LOG (Cont.)

Page 2 of 6

Date: 10/6/16

Well ID: C9512 | Well Name: NA | Location: 216-S-9 Crib

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
47.5			47.2-47.8: No core	Sonic Core
	Core 4		47.8 – 52.2: Silty Gravel (mG): 60% Gravel, 10% Sand, 30% Silt; Gravel: 1-7cm, predom 5cm, SR-R, 70% Mafic, 30% Felsic w/quartzite; Sand: vf-f, predom vf; dry-moist, mod-strong rxn w/HCL, PS, no odor, 2.5Y 4/2 dk grayish brn	Core4 B361165 47.2-52.2
50				
52.5			52.4 – 56.2: Silty Gravel (mG): 60% Gravel, 10% Sand, 30% Silt; Gravel: 1-10cm, predom. 5cm, SR-R, 60% Mafic, 40% Felsic; Sand: vf-f, predom vf; moist, chalcopyrite throughout silt, mod rxn w/ HCL, 2.5Y 4/2 dk grayish brn, PS, $CaCO_3$ nodules throughout – strong rxn w/HCL.	Core 5 B361167 52.4 - 57.4
	Core 5			
55			56.2-57.4: Sand (S) 100%: Dry, vf-c, predom med., 70% Felsic qtz, 30% Mafic basalt, iron staining, SA, MS, no rxn w/ HCL, massive, 2.5Y 4/3 light yellowish brn	
57.5			57.5 – 62.5: Sand (S) 100%; Dry, vf-c, predom. medium, 80% Felsic qtz, 20% Mafic, trace mica, SA	2.5Y 4/3 light yellowish brn, no rxn w/ HCL JR 10/6/16
	Core 6		57.5-58.9: m-c sand 58.9 – 59.6: vf-f sand grades to m-c @ 59.6 – 60.9: m-c 60.9 - 61.9: 70% Silt 5%, Sand 95% silt beds at 61.4 and 61.6, ~1.5cm thick JR 10/6/16 61.9 – 62.5: m sand	Core 6 B361169 57.5-62.5 Aliquot 60.8 – 62.0
60				
62.5				
65			Cores from 62.2 – 77.3 (per supporting documentation provided by CHPRC) TO PNNL NOT LOGGED	

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	10/12/16

A-6006-993 (REV 0)

BOREHOLE LOG (Cont.)

Date: 10/12/16

Well ID: C9512 | Well Name: NA | Location: 216-S-9 Crib

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
67.5				
			Cores from	
70			62.2 - 77.3 (per supporting documentation provided by CHPRC)	
			to	
72.5			PNNL	
			NOT LOGGED	
75				
77.5	Core 11		76.9 - 78.4: Sandy Silt (sM): 80% Silt, 20% Sand; Sand: vf-f, predom. vf, 95% Felsic, 5% Mafic, SA; dry, non-plastic, strong rxn w/HCL, 2.5Y 7/2 light gray, mod sorted, grades to silty sand	Core 11 B361B3 76.9 - 81.9
80			78.4 - 79.7: Silty Sand (mS): 75% Sand, 25% Silt; Sand: vf-m, predom. med, 80% Felsic, 20% Mafic, trace mica, SA; rhythmites throughout (not well defined), dry, PS, no rxn w/HCL, 2.5Y 6/2 light brnish gray	Aliquot 78.5 - 79.8
			79.7 - 80.9: Sand (S) 95% Sand, 5% Silt; Sand: vf, 90% Felsic, 10% Mafic, SA; no rxn w/HCL, WS, dry, laminated, 2.5Y 6/3 light yellowish brn	
82.5			80.9 - 81.9: Silty Sand (mS): 70% Sand, 30% Silt; Sand: 70% Felsic, 30% Mafic, vf-c, predom. med.; moist, laminae/rhythmites (vf), fining downward, PS, no rxn w/HCL, 2.5Y 6/2 light grayish brn	
85	Core 12		82.9 - 86.3: Silty Sand (mS): 70% Sand, 30% Silt; vf-f sand, 90% Felsic, 10% Mafic, SA, rhythmites, no rxn w/HCL, WS, 2.5Y 7/3 Pale brn	Core 12 B361B5 82.9 - 87.9
			86.3 - 87.9: Sandy Silt (sM): 30% Sand, 70% Silt; vf-f sand, predom vf, 90% Felsic, 10% Mafic, SA, MS, wk rxn w/HCL, platy structure, dry, non-plastic, 2.5Y 6/3 light yellowish brn	

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	10/12/16

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BOREHOLE LOG (Cont.)

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Date: 10/12/16

Well ID: C9512 | Well Name: NA | Location: 216-S-9 Crib

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
87.5	Core 13		87.0 - ~~90.5~~ 92.0 JR 10/13/16: Silty Sand (mS): 70% Sand, 30% Silt; vf-f sand, 90% Felsic, 10% Mafic, SA, laminated, no rxn w/HCL, WS, 2.5Y 7/3 Pale brn, dry 90.5: Sand grain size increases to m-c, 2.5Y 7/2 light gray, mod rxn w/HCL, 80% Sand, 20% Silt	Sonic Core Core 13 B361B7 87.0 - 92.0
90				
92.5	Core 14		92.5-97.5 Sand (S): 95% Sand, 5% Silt; sand: vf-c, predom med., 80% Felsic quartzose, 20% Mafic; dry, rhythmites & interbedded, 2.5Y 6/2 light brnish gray, no rxn w/HCL, PS, iron staining 97.1: 2cm silt bed, wk rxn w/HCL	Core 14 B361B9 92.5 - 97.5
95				
97.5	Core 15		~~97.1: 2cm silt bed, wk rxn w/HCL~~ JR 10/13/16 97.0-99.2: Sand (S): 95% Sand, 5% Silt; sand: vf-f, predom. fine, 95% Felsic, 5% Mafic, moist, rhythmites and ~~laminae~~ laminae JR 10/13/16, 2.5Y 6/2 light brnish gray, no rxn w/HCL, MS 97.0-97.3: Coarse grained sand, sharp contact w/ vf sand - Silt bed @ 97.5 - 3cm - wk rxn w/HCL 99.2-102.0: Silty Sand (mS): 75% Sand, 25% Silt; sand: vf-c, predom fine, ~~JR 10/13/16 coarse~~ fining downward (vf @ 100.9), 80% Felsic, 20% Mafic; laminae throughout & JR 10/13/16 ~~vf~~ very thin bedding (1cm), moist, no rxn w/HCL, Mod Sorted, 2.5Y 5/2 grayish brn	Core 15 B361C1 97.0 - 102.0
100				
102.5	Core 16		102.6-103.9: Sandy Silt (SM): 70% Silt, 30% Sand; sand: vf, 95% Felsic, 5% Mafic, SA; dry, laminated from 103.6-103.9, no rxn w/HCL, WS, 2.5Y 6/3 light yellowish brn, w/ mica 103.9-104.0: Silty sand w/ wood bits up to 0.5cm long 104.0-107.6: ~~Silty Sand (mS)~~ JR 10/13/16 ~~Slightly Silty Sand (mS)~~: Sand (S): 90% Sand, 10% Silt; Sand: vf-f from 104.0-104.6, WS, SA f-c, predom. med from 104.6-107.6, massive, 45% Felsic, ~~SA~~ JR 10/13/16, 35% Mafic, trace mica; no rxn w/HCL to 106.6, wk rxn from 106.6-107.6 2.5Y 6/2 light brnish gray 104.0-104.6, 2.5Y 6/1 gray from 104.6-107.6, MS, moist	Core 16 B361C3 102.6 - 107.6 Aliquot 103.1-104.6
105				

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	10/13/16

A-6006-993 (REV 0)

BOREHOLE LOG (Cont.)

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Date: 10/13/16

Well ID: C9512 | Well Name: NA | Location: 216-S-9 Crib

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
107.5			107.0-112.0: ~~Slightly Silty Sand (m/c S)~~ JR 10/18/16 JR 10/18/16: 90% Sand, 10% Silt; dry, no rxn w/ HCl, SA, 80% Felsic, 20% Mafic	Sonic Core
	Core 17		107.0-109.7: vf-f sand interbedded rhythmites, 2.5Y 4/3 light yellowish brn, laminae throughout	Core 17 B361C5 107.0-112.0
110			109.7-110.2: f-vc sand, coarsening downward, silty and iron stain (in lateral) @ 109.8; trace mica, 2.5Y 5/2 grayish brn	
			110.2-112.0: sharp contact at grain size change JR 10/18/16 vf-f faint rhythmites, minor iron staining, 2.5Y 6/2 light brnish gray	
112.5			Slightly (m) S: JR 10/18/16 112.0-117.0: Silty Sand (m/c S): 80% Sand, 20% Silt; Sand: vf-med., 80% Felsic, 20% Mafic, trace mica; dry, no rxn w/ HCl, mod-WS, 2.5Y 6/2 light brnish gray	Core 18 B361C7 112.0-117.0
	Core 18		112.4-113.0: vf sand / silt, rhythmites	
115			113.0-114.5: f-med sand, massive	
			114.5-115.2: vf sand / silt, lamina @ 114.9	
			115.2-117.0: f-med sand, rhythmites throughout	
117.5				
			Cores from	
			117.0 - 127.0 (no recovery from 127.0-127.2)	
120			TO	
			PNNL	
122.5			NOT LOGGED	
125				

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	10/13/16

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BOREHOLE LOG (Cont.)

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Date: 10/11/16

Well ID: C9512 | Well Name: NA | Location: 216-S-9 Crib

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
127.5	Optional 21		127.2 - 130.7: Silt(M) 90% Silt, 10% Sand; Sand: vf - f, 80% Felsic, 20% Mafic, SA, vf throughout, fine grained sand beds ~~from~~ JR 10/11/16 at 127.6 and 128.0, 2 cm thick; moist, laminated, wk rxn w/ HCL, WS, 2.5Y 4/2 light brnish gray, 2.5Y 5/3 light olive brn 129.2 - 129.4, grades to (m) S.	Sonic Core Optional 21 B361F9 127.2 - 132.2 Aliquot 129.2 - 130.2
130			130.7 - 132.2: Slightly Silty Sand (m) S: 85% Sand, 15% Silt; Sand: vf - m, predom f, JR 10/11/16 trace mica, 90% Felsic, 10% Mafic, SA, MS; no rxn w/ HCL, massive, dry, 2.5Y 4/2 light brnish gray.	
132.5	Optional 22		132.0 - 137.0: Silt (M) 100%; moist, laminated, wk - mod rxn w/ HCL, non-plastic, 2.5Y 6/4 light yellowish brn 134.7 - 135.1: 90% Silt, 10% Clay, low plasticity 135.9 - 137.0: 90% Silt, 10% very fine sand.	Optional 22 B361H1 132.0 - 137.0 Aliquot
135				
137.5	Optional 23		137.0 - 142.0: Silt (M) 100%; moist, non-plastic, wk - mod rxn w/ HCL, ~~platy~~ linear structure, 2.5Y 5/3 light olive brn, iron staining 141.5 - 142.0. 138.8 - 140.9: Silt 90%, Clay 10%, low plasticity, wk rxn w/ HCL - mod rxn w/ HCL, 2.5Y 4/4 olive brn, moist	Optional 23 137.0 - 142.0 Aliquot 139.0 - 140.5
140				
			Total Depth: 142.0 ft	
142.5				
145			JR 10/13/16	

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	10/12/16

A-6006-993 (REV 0)

BOREHOLE LOG

Page 3 of 9 (1) — Date: 7/26/16 — JR 7/26/16

Well ID: ~~C9507~~ C9488 (JR 7/26/16) | Well Name: NA | Location: 216-B-8 Crib & Tile Field

Project: 200 DV-1 OU Characterization Ph 3 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description (Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level)
40				JR 7/7/16	Sonic Core
					Core 1 B355B1 43.5-44.5
42.5				43.5-44.0: Sand (S) 100%: 80% Felsic, 20% Mafic, f-c, predom med, dry, iron staining, 2.5Y5/3 light olive brn, no rxn w/HCl	Radscreen B355BQ GM: 41/97/81 cpm x 0.1 PAM: Q cpm
	Core	100%		44.0-44.5: Gravelly Sand: (see below) (gS)	
45	Core 2	100%		44.7-47.2: Gravelly Sand: 20% Gravel, 80% Sand; Gravel: 60% Mafic, 40% Felsic, vf peb-1cm, SR-SA; Sand: f-c, predom c, 70% Felsic, 30% Mafic, SA, dry, PS, 2.5Y6/3 Light yellowish brn, no rxn w/HCl, iron staining	Core 2 B355B3 44.7-47.2 GM: 34 cpm (top) GM: 19 cpm (back)
47.5	Core 3	100%		47.1-49.6: Gravelly Sand: 10% Gravel, 90% Sand; Gravel: 60% Felsic, 40% Mafic, vf peb-2cm, predom 1cm, SA-SR; Sand: 65% Felsic, 35% Mafic, f-c, predom med, dry, 2.5Y5/3 light olive brn, no rxn w/HCl, minor iron staining; 48.6: Gravel content increases to 20%	PAM: Q cpm (JR 8/18/16) PAM: Q cpm Core 3 B355B5 47.1-49.6
50	Core 4	100%		49.6-52.1: Gravelly Sand (gS): 20% Gravel, 80% Sand, Gravel: 70% Mafic, 30% Felsic, vf peb-2cm, predom 1.5cm, SA; Sand: f-vc, predom c, SA-SR, 80% Felsic, 20% Mafic; dry, 2.5Y6/3 light yellowish brn, no rxn w/HCl, trace mica	GM: 37/38/36/30 cpm PAM: Q cpm Core 4 B355B7 49.6-52.1
52.5	Core 5	100%		52.2-54.7: Gravelly Sand (gS): 15% Gravel, 85% Sand; Gravel: 80% Mafic, 20% Felsic, f peb-2cm, predom c peb, SA-A; Sand: m-vc, predom c, SA, 65% Felsic, 35% Mafic; dry, trace mica, no rxn w/HCl, 2.5Y6/1 Gray, PS	RS B355B6 GM: 25/26/28/26 cpm PAM: Q cpm Core 5 B355B9 52.2-54.7
55	Core 6	100%		54.5-57.0: Gravelly Sand (gS): 20% Gravel, 80% Sand; Gravel: 80% Mafic, 20% Felsic, vf peb-4cm, predom c peb, SR-SA; Sand: vf-vc, predom c, 65% Felsic, 35% Mafic; dry, trace mica, no rxn w/HCl, iron staining, 2.5Y6/2 light brownish gray	Core 6 B355C1 54.5-57.0
		Slough			
57.5	Core 7	100%		57.5-59.7: Sand 100% (S): 65% Felsic qtz, 35% Mafic, m-c, SR-SA, WS, 10YR5/3 brown, dry, no rxn w/HCL, massive	Core 7 B355C3 57.2-59.7
					Aliquot 57.2-59.2

Reported By: Jen Russell		Reviewed By: Tessa Clark	
Title: Geologist		Title: Geologist	
Signature: Jen Russell	Date: 7/26/16	Signature: [signature]	Date: 9/23/16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 9/16/16

Well ID: C9488 | Well Name: NA | Location: 216-B-8 Crib & Tile Field

Project: 200 DV-1 OU Characterization Ph 3 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
60	Core 8	100%		57.5-59.7: Sand(S) 100%: 65% Felsic qtz, 35% Mafic, m-c, SR-SA, WS, 10YR 5/3 brn, dry, no rxn w/ HCL, massive	Sonic Core
		100%		59.7-62.2: Sand(S) 100%: 65% Felsic, 35%, vf-c, SA, WS, 2.5Y 6/2 light brownish gray, no rxn w/ HCL, trace mica, massive	Core 8 B355C5 59.7-62.2
62.5				59.7-61.4: vf-m sand	
				61.4-62.2: m-vc sand	
	Core 9			62.2-67.2: Sand(S): 100%; c-vc, WS, trace mica, 60% Felsic, 40% Mafic basalt, massive, no rxn w/ HCL, 2.5Y 4/2 Dk grayish brn	Core 9 B355C7 62.2-67.2
65		100%		>5% f-c pebbles in upper 2.5' (to 64.7) Angular, 80% Mafic, 20% Felsic.	
				JR 9/15/16 67.2-67.5-72.0: Sand(S): 100%; c-vc, WS, trace mica, 60% Felsic, 40% Mafic, massive, no rxn w/ HCL, 2.5Y 4/2 Dk grayish brn, >5% f-c pebbles throughout, iron staining	Core 10 B355C9 67.5-72.0
67.5					
	Core 10				
70		100%			
				72.2-77.2: Sand(S) 100%: f-vc, predom c, coarsening downward, 60% Felsic quartzose & feldspars, 40% Mafic basalt, dry, massive, no rxn w/ HCL, 2.5Y 5/2 grayish brn, >5% fine pebbles, iron staining	
72.5					Core 11 B355D1 72.2-77.2 GM: 61/52/37/56 cpm
	Core 11				
75		100%			
				77.1-82.1: Sand(S) 100%: 65% Felsic, 35% Mafic, f-vc, predom c., dry, iron staining, 2.5Y 5/2 grayish brn, no rxn w/ HCL, fining downward @ 81.0	
77.5	Core 12			79.2: 4 cm vf pebble bed - mafic, SA	Core 12 B355D3 77.1-82.1 GM - 40 cpm
		100%		80.6: 3 cm vf pebble bed	PAM - 8 cpm
				80.9: 2-3 cm vf pebble/vc sand bed	

Reported By:	Jen Russell	Reviewed By:	Tessa Clark
Title:	Geologist	Title:	Geologist
Signature:	Jen Russell	Signature:	[illegible]
Date:	9/15/16	Date:	9/23/16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 8/18/16

Well ID: C9488	Well Name: NA	Location: 216-B-8 Crib & Tile Field
Project: 200DV-1 OU Characterization Ph.3		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	Core 12	100%		77.1-82.1: Sand(S) 100%: 65% Felsic, 35% Mafic, f-vc, predom c., dry, iron staining, 2.5Y5/2 grayish brn, no rxn w/ HCL, fining downward @ 81.0	Sonic Core
				79.2: 4 cm vf peb/vc sand bed	Core 12 B355D3
				80.6: 3 cm vf peb/vc sand bed	77.1-82.1
				80.9: 2-3 cm vf peb/vc sand bed	GM - 40 cpm
82.5	Core 13	100%		82.1-87.1: Sand(S) 100%: 70% Felsic, 30% Mafic, vf-c, predom med., dry, no rxn w/ HCL, 2.5Y5/3 light olive brn, SA, PS	Core 13 B355D5
				83.7-87.1: Interbedded rhythmites w/ vf peb	82.1-87.1
				84.7: Silt lamina 1mm thick	GM: 36/29 cpm
					PAM: Q cpm
					GM: 100 cpm w/ lid open - waste bucket
87.5	Core 14	100%		87.0-92.0 Sand(S) 100%: 70% Felsic, 30% Mafic, vf-c, predom. med., dry, no rxn w/ HCL, 2.5Y5/2 grayish brn, m-WS, fining downward @ 90.3	Core 14 B355D7
				88.3: silt lamina (not well defined) ~4 mm thick	87.0-92.0
				91.3: vf sand lamina 0.5 cm thick	GM: 42/37/48 cpm
					PAM: Q cpm
90					
				2 JR 8/18/16	
92.5	Core 15	100%		92.3-97.2 Sand(S) 100%:	Core 15 B355D9
				92.2-94.4: vf-f, predom. vf, 70% Felsic, 30% Mafic, 2.5Y6/3 light yellowish brn, dry, no rxn w/ HCL, WS	92.2-97.2
				93.4: 2mm thick silt lamina	Aliquot 92.8-94.4
				93.7: 2-3 mm thick silt lamina	
95				93.8-94.0: 3-4 cm thick coarse sand bed	Ludlum GM: 41 cpm through box (face of box)
				94.4-97.2: m-VC, predom VC, 60% Felsic qtz, feldspars, 40% Mafic, SA, mod sorted, dry, 2.5Y4/2 dk grayish brn, no rxn w/ HCL, iron staining	Ludlum GM: 39 cpm on side box w/ holes
				94.5: 2 cm silt bed	Ludlum GM: 33 cpm
97.5	Core 16	100%		96.0: Fining downward to f-m sand	on backside of box
				97.3-102.3: Sand(S) 100%: m-c, 60% Felsic, 40% Mafic, WS, SA, dry, 2.5Y4/2 dk grayish brn, no rxn w/ HCL, iron staining, massive	PAM: Q top of box
					Core 16 B355F1
					97.3-102.3

Reported By: Jen Russell		Reviewed By: Tessa Clark	
Title: Geologist		Title: Geologist	
Signature: Jen Russell	Date: 8/19/16	Signature: [illegible]	Date: 9/23/16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 9/16/16

Well ID: C9488	Well Name: NA	Location: 216-B-8 Crib & Tile Field
Project: 200 DV-1 OU Characterization Phase 3		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description (Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level)
100	Core 16	100%		97.3-102.3: Sand(S) 100%: m-c, 60% Felsic, 40% Mafic, WS, SA, dry, 2.5Y 4/2 dk grayish brn, no rxn w/HCl, iron staining, massive	Sonic Core, Core 16 B355F1 97.3 - 102.3
102.5	Core 17	100%		102.0-107.0 Sand(S): 100%, vf-c, predom med, WS, SA, 70% Felsic, 30% Mafic, dry, 2.5Y 4/2 dk grayish brn, no rxn w/HCl, iron staining, massive; 105.0: vf sand, very thin 1 cm bed; 105.5- 107.0: rhythmites, not well defined	Core 17 B355F3 102.0 - 107.0
105					
107.5	Core 18	100%		107.4-112.4: Sand(S): 100%, vf-c, predom med, mod. sorted, SA, 70% Felsic, 30% Mafic, dry 2.5Y 4/1 Gray, no rxn w/HCl, iron staining. 107.4-109.3: rhythmites, not well defined; 108.6: Dipping bed, 2 cm thick, vf-f sand, 30°; 109.3-112.4: massive	Core 18 B355F5 107.4 - 112.4
110					
112.5	Core 19	100%		112.3-117.3: Sand(S) 100%, f-vc, predom c., 60% Felsic, 40% Mafic, SA, WS, dry, 2.5Y 4/2 dk grayish brn, no rxn w/HCl, iron staining; 112.3-115.1: massive; 115.1 - dipping beds, 2 cm vf-f bed & 1 cm vf-f peb. bed (30°); 115.8-116.5: 18 cm med bed, vf-m; 116.5-117.3: Rhythmites	Core 19 B355F7 112.3 - 117.3
115					
117.5	Core 20	100%		117.3-122.3: Sand(S) 95% Sand, 5% Gravel; Gravel: vf-c pebbles 90% Mafic, 10% Felsic, SA; Sand: f-vc, 60% Felsic, 40% Mafic, SA; dry, 2.5Y 4/1 Dk gray, trace mica, iron staining; 118.3-122.3: Rhythmites (cont.)	Core 20 B355F9 117.3 - 122.3; <117.3-118.3 suspect Slough>

Reported By: Jen Russell		Reviewed By: Tessa Clark	
Title: Geologist		Title: Geologist	
Signature: Jen Russell	Date: 9/15/16	Signature: [illegible]	Date: 9/23/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 5 of 9
Date: 9/16/16

Well ID: C9488 | Well Name: NA | Location: 216-B-8 Crib & Tile Field

Project: 200 DV-1 OU Characterization Ph 3 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
120	Core 20	100%		117.3-122.3: Sand(S) 95% Sand, 5% Gravel; Gravel: vf-c pebbles, 90% Mafic, 10% Felsic, SA, Sand: f-vc, 60% Felsic, 40% Mafic, SA; dry, 2.5Y4/1 Dk gray, trace mica, iron staining	Sonic Core
				117.3-118.3 Suspect Slough	Core 20 B355F9 117.3-122.3
122.5				118.3-122.3 Rhythmites	
	Core 21			~~122.5~~ 120.8-121.0: Gravel bed, f-c pebbles	
				121.7-121.9: Gravel bed, f-c pebbles	Core 21 B355H1 122.1-127.1
125		100%		122.1-127.1: Sand(S) 100%, dry, 2.5Y5/2 grayish brn, 70% Felsic, 30% Mafic, SA, trace mica, iron staining, massive, vf-c, predom c., WS	
					Core 22 B355H3 127.2-132.2
127.5	Core 22			127.2-132.2: Sand (S) 100%, dry, 2.5Y5/2 grayish brn, 70% Felsic, 30% Mafic, SA, trace mica, iron staining, massive, vf-c, predom c, WS	
130		100%			
132.5	Core 23			132.1-137.1: Sand(S) 95% Sand, 5% Gravel, ~~2.5Y~~ Gravel: vf peb-1cm, 80% Mafic basalt, 20% Felsic quartzose, A-SA; Sand: m-vc, predom vc, 70% Felsic, 30% Mafic, SA; dry, trace mica, iron staining, no rxn w/ HCL, 2.5Y5/2 grayish brn, massive	Core 23 B355H5 132.1-137.1
135					
				137.3-142.3: Sand(S) 100%, decreased grain size, vf-c, predommed., trace mica, 75% Felsic, 25% Mafic, SA, m-WS, iron staining, 2.5Y6/2 light brownish gray, massive, no rxn w/ HCL	Core 24 B355H7 137.3-142.3
137.5	Core 24	100%			

Reported By: Jen Russell | Reviewed By: Tessa Clark

Title: Geologist | Title: Geologist

Signature: Jen Russell | Date: 9/16/16 | Signature: [illegible] | Date: 9/23/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 6 of 9
Date: 7/26/16

Well ID: C9488 | Well Name: NA | Location: 216-B-8 Crib & Tile Field

Project: 200DV-1OU Characterization Phase 3 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
140	Core 24	100%		137.3-142.3: Sand(S) 100%; decreased grain size, vf-c, predominantly medium, trace mica, 75% Felsic, 25% Mafic, SA, Mod-WS, iron staining, 2.5Y 6/2 light brownish gray, no rxn w/ HCL, massive	Sonic Core, Core 24 B355H7 137.3-142.3
142.5	Core 25	100%		142.2-147.2: Sand(S) 100%; 75% Felsic, 25% Mafic, SA, WS, trace mica, vf-c, predom. med., 2.5Y 6/2 light brownish gray, no rxn w/HCL, massive, fining downward @ 145.0 to vf-f sand	Core 25 B355H9 142.2-147.2
145					
147.5	Core 26	100%		147.3-152.3: Sand(S) 100%; 75% Felsic, 25% Mafic, ~~vf-f~~ 7/28/16, predom. med, SA, WS, trace mica, 2.5Y 6/2 light brnish gray, no rxn w/ HCL, massive, vf-f	Core 26 B355J1 147.3-152.3
150					
152.5	Core 27	100%		152.3-157.3: Sand(S): 100%, 70% Felsic, 30% Mafic, vf-c, predom c. 152.3-154.3, fining downward 154.3-157.3 - predom med, increased mica content, 2.5Y 6/2 light brnish gray, no rxn w/ HCL, massive	Core 27 B355J3 152.3-157.3
155					
157.5	Core 28	100%		157.1-161.8: Sand(S) 100%: 65% Felsic, 35% Mafic, trace mica, m-vc, predom. c., SA, WS, dry, 2.5Y 4/2 light brownish gray, no rxn w/ HCL, massive	Core 28 B355J5 157.1-162.1; Aliquot 159.6-161.6

Reported By: Jen Russell		Reviewed By: Tessa Clark	
Title: Geologist		Title: Geologist	
Signature: Jen Russell	Date: 9/16/16	Signature: [illegible]	Date: 9/23/16

A-6003-642 (03/03)

BOREHOLE LOG

C9488 JR 7/26/14

Page 7 of 9 JR 7/26/14

Date: 7/26/14

Well ID: C9507	Well Name: NA	Location: 216-B-8 JR 9/23/14 Crib & Tile Field	
Project: 200DV-1 OU Characterization Phase 3		Reference Measuring Point: Ground Surface	

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description (Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level)
160	Core 28	100%		157.1-161.8: Sand(S) 100%, 65% Felsic, 35% Mafic, trace mica, m-vc, predom. c, SA, WS, dry, 2.5Y 4/2 light brnish gray, no rxn w/ HCl, massive	Sonic Core Core 28 B355J5 157.1 - 162.1
162.5	Core 29	JR 9/23/14 100%		161.8-162.1: Silt (M) 90% Silt, 10% Clay, low plasticity, moist, 2.5Y 5/2 Grayish brn, no rxn w/ HCl 162.3-163.6: Silt (M) 95% Silt 5% Sand, vf sand, moist, non-plastic, no rxn w/ HCl, 2.5Y 5/2 grayish brn, iron staining @ 163.4-163.6 163.6-164.6: Gravelly Silt (gM): 70% Silt, 10% Sand, 20% Gravel; Gravel: f peb - 3 cm, SA-SR, predom. 0.5cm, 90% Mafic, 10% Felsic Sand: vf-c, predom med; moist, no rxn w/ HCl, 10YR 5/4 yellowish brn, PS	Core 29 B355J7 162.3 - 167.3
165					
167.5	Core 30			164.6 - 167.3: Sandy Gravel (sG): 70% Gravel, 30% Sand; Gravel: 30% Felsic, 70% Mafic basalt, SA-SR, vf peb - 3 cm, predom fine peb; Sand: 70% Felsic, 30% Mafic, SA, f-vc, predom vc; dry, no rxn w/ HCl, PS, 2.5Y 3/2 very dk grayish brn	Core 30 B355J9 167.3 - 172.3
170		100%		167.3 - 172.3: Gravelly Sand (gS): Gravel 10%, 90% Sand; Gravel: vf-f peb, 80% Mafic, 20% Felsic, SA-A; Sand: vf-vc, predom. c, 60% Felsic, 40% Mafic, SA; dry, no rxn w/ HCl, 2.5Y 5/2 grayish brn, rhythmites from ~168.0-168.9, fining downward, iron staining	
172.5	Core 31			172.3-177.3: Gravelly Sand (gS): Gravel 10%, 90% Sand; Gravel: vf-f peb, 90% Mafic, 10% Felsic, A-SA; Sand: 60% Felsic 40% Mafic, SA, vf-vc, predom c.; dry, no rxn w/ HCl, 2.5Y 5/2 grayish brn, f peb thin beds @ 173.7, 174.0, and 175.5	Core 31 B355K1 172.3 - 177.3
175		100%		175.4-182.1: Gravelly Sand (gS): 20% Gravel 80% Sand; Gravel: increase in gravel size - vf peb - 2 cm, SA-SR, 80% Felsic, Mafic, 20% Felsic; Sand: vf-vc, predom c, 70% Felsic, 30% Mafic; dry, no rxn w/ HCl, 2.5Y 6/2 light brnish gray, minor amt. iron staining	Core 32 B355K3 177.1 - 182.1 JR 9/19/14 JR 9/19/14
177.5	Core 32	100%		177.1 JR 9/19/14	

Reported By: Jen Russell		Reviewed By: Tessa Clark	
Title: Geologist		Title: Geologist	
Signature: Jen Russell	Date: 9/19/14	Signature:	Date: 9/23/16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 9/19/16

Well ID: C9488	Well Name: NA	Location: 216-B-8 Crib & Tile Field
Project: 200 DV-1 OU Characterization Phase 3		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
180	Core 32	100%		JR 9/19/16 ~~175~~ 177.1 – 182.1 Gravelly Sand (gS): 20% Gravel, 80% Sand; Gravel: increase in gravel size, vf peb – 2cm, predom f – c peb, SA-SR, 80% Mafic, 20% Felsic; Sand: vf – vc, predom c, 70% Felsic, 30% Mafic; dry, no rxn w/ HCL, 2.5Y 4/2 light brnish gray, minor iron staining	Sonic Core Core 32 B355K3 177.1 – 182.1
182.5	Core 33	100%		JR 9/19/16 182.3 – ~~187.3~~ 184.0: Gravelly Sand (gS): 20% Gravel, 80% Sand; Gravel: vf peb – 2cm, predom f – c peb, SA-SR, 60% Mafic, 40% Felsic; Sand: vf – vc, predom c, 70% Felsic, 30% Mafic; dry, no rxn w/ HCL, 2.5Y 4/2 light brnish gray, minor iron staining	Core 33 B355K5 182.3 – 187.3
185				184.0 – 187.3: JR 9/19/16 70% Gravel, 30% Sand: Sandy Gravel (sG): Gravel: vf peb – 3cm, A-R, predom. vf peb 40% Mafic, 60% Felsic; Sand: 70% Felsic, 30% Mafic, SA, m – vc, predom vc; dry, no rxn w/ HCL, 2.5Y 5/1 gray	
187.5	Core 34	100%		187.3 – 192.3: Gravelly Sand (gS): 10% Gravel, 90% Sand; Gravel: 0.5cm – 5cm predom 1cm, JR 9/21/16 60% Mafic (fine pebbles) 40% Felsic (larger cobbles), SA-R; Sand: vf – vc, predom. c, 60% Felsic, 40% Mafic; dry, PS, no rxn w/ HCL, 2.5Y 5/1 gray	Core 34 B355K7 187.3 – 192.3
190					
JR 9/21/16 192.5	Core 35	100%		192.0 – 197.0 Gravelly Sand (gS): 20% Gravel, 80% Sand; Gravel: vf peb – 1cm, predom vf peb., 70% Mafic, 30% Felsic; Sand: vf – vc, predom. c, 60% Felsic, 40% Mafic; dry, SA, PS, no rxn w/ HCL, 2.5Y 5/1 gray, upper 1 ft pulverized and/or slough.	Core 35 B355K9 192.0 – 197.0
195					
197.5	Optional 1	100%		197.3 – ~~202.3~~ – 202.3 JR 9/23/16: Gravelly Sand (gS): 25% Gravel, 75% Sand; Gravel: vf peb – 1cm, predom. vf pebbles JR 9/23/16, 80% Mafic, 20% Felsic, SA; Sand: vf – vc, predom. c, 60% Felsic, 40% Mafic, SA; Dry, PS no rxn w/ HCL, 2.5Y 5/1 gray, iron staining	Optional 1 B355M9 197.3 – 202.3

Reported By: Jen Russell		Reviewed By: Tessa Clark	
Title: Geologist		Title: Geologist	
Signature: Jen Russell	Date:	Signature: [illegible]	Date: 9/23/16

A-6003-642 (03/03)

JR 7/27/16

BOREHOLE LOG

C9488

Page ~~1~~ 9 of 9

Date: 7/27/16

Well ID: ~~C9507~~ | Well Name: NA | Location: 216-B-8 Crib & ~~The Tile Trench~~ Tile Field JR 7/27/16

Project: 200 DV-1 OU Characterization Ph. 3 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
200	opt. 1	100%		197.3-202.3: Gravelly Sand (gS): 25% Gravel, 75% Sand; Gravel: vf peb - 1cm, predom vf peb, 80% Mafic, 20% Felsic, SA; Sand: vf-vc, predom. c, 60% Felsic, 40% Mafic, SA; Dry, PS, no rxn w/ HCL, 2.5Y5/1 gray; iron staining	Sonic Core Optional 1 B355M9 197.3 - 202.3
202.5	Optional 2	100%		202.0-206.1 Sandy Gravel (SG): ~~60%~~ 50% JR 9/21/16 Gravel 50% Sand; Gravel: vf peb - 2cm, predom. f peb, 80% Mafic, 20% Felsic, SA; Sand: vf-vc, predom vc., 60% Felsic, 40% Mafic, SA; Dry, PS, no rxn w/ HCL, 2.5Y5/1 Gray 206.1-206.4: Sand (S) 100%: vf-f, 95% Felsic, 5% Mafic, mica, dry, 2.5Y7/2 light gray, no rxn w/ HCL 206.4-207.0: Silt (M) 90% Silt 10% ~~Clay~~ Clay JR 9/21/16; moist, low plasticity, 10YR5/4 Yellowish brn, wk rxn w/ HCL	Optional 2 B355N1 202.0 - 207.0
205					
207.5	Optional 3	100%		207.3-208.3: Silt (M): 95% Silt 5% vf sand; moist, 2.5Y5/3 light olive brn, non-plastic, platy structure, laminae in upper 0.2 ft (208.1-208.3) iron discoloration w/in laminae ~1cm thick - sharp contact 208.3-208.9: (sharp contact) vf Sand (S), 80% Felsic, 20% Mafic (sharp contact), no rxn w/ HCL, 208.9-212.3 Sandy Silt (SM): 75% Silt 25% Sand; moist, non-plastic, vf sand, 10YR5/2 grayish brn, platy structure from 210.1-210.5 w/ increased sand content (40% vf sand) no rxn w/ HCL	Optional 3 B355N3 207.3 - 212.3 Sharp contact Aliquot 209.8 - 211.8 2.5Y5/1 gray JR 9/23/16
210					
212.5	Optional 4	80%		~~212.1-217.4: 214.5: Silt (M): 100% Silt~~ JR 9/21/16 212.4-213.7: No recovery 213.7-214.5: Silt (M): 10% moist-wet, non-plastic, laminae & very thin bedding, wk rxn w/ HCL, 2.5Y6/3 Light yellowish brn, up to 2cm thick JR 9/23/16 214.5-217.4: Sandy Silt (SM): 65% Silt, 35% Sand; vf sand, moist-wet, wet at contact, 2.5Y4/2 dk grayish brn, trace mica, massive, non plastic.	Optional 4 212.4-217.4 B355N5
215					
217.5				Total Depth: 217.4	

Reported By: Jen Russell		Reviewed By: Tessa Clark	
Title: JR 9/21/16 Geologist		Title: Geologist	
Signature: Jen Russell	Date: 9/21/16	Signature: [illegible]	Date: 9/23/16

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 8/3/14

Well ID: C9499	Well Name: NA	Location: 216-T-6 Crib #1
Project: 200 DV-1 OU Characterization Phase 3		Reference Measure Point: Ground Surface

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
40				Sonic Core
			JR 9/29/14	
				RS = RadScreen
			*45.8-47.0: Sand(S) 95% Sand, 5% Gravel;	
42.5			Gravel: f peb - 2 cm cobbles, SA-SR, 80% Mafic, 20% Felsic, wk rxn w/ HCl on Cobbles; Sand: f-c, predom med., 80% Felsic, 20% Mafic, SA;	JR 9/27/14
			dry-moist, PS, no rxn w/ HCl, 2.5Y 5/2 grayish brn	
			43.0-44.0: No recovery	
			44.0-45.0: Silt(M) 90% Silt, 10% Clay, low plasticity,	JR 9/30/14 Core 1 B36DV1
45	Core 1		moist, slight odor, 2.5Y 3/1 v. dk gray, HCl rxn - wk	(RS - B36DV0) 43.0-47.0
			45.0-45.8: Silt grades to Sand and is deformed from drilling activity	
			heat & pressure	
	JR 9/27/14	JR 9/30/14	45.8-47.0: Sand(S) 95%, 5% Gravel; Gravel: * [See description above] *	
			47.0-48.2: Sand(S) 100%: 70% Felsic qtz, feldspar,	
47.5	Core 2		30% Mafic, f-c, predom med., SA, WS, moist, massive,	Core 2 B36DV3
			2.5Y 5/2 grayish brn, no rxn w/ HCl - sharp contact	47.0-49.5
			48.2-48.7: Silt(M) 95% Silt, 5% vf sand, moist - wet, 2.5Y 4/4	
			olive brn, non plastic, no rxn w/ HCl, graded contact	Aliquot
			48.7-49.5: Sand(S) 100%: 70% Felsic, 30% Mafic,	47.0-48.5
50	Core 3		f-m, pred. med., SA, WS, moist, 2.5Y 5/2 grayish brn,	
			no rxn w/ HCl, 0.5-1.5 cm cobbles 48.7-49.8 (Mafic - basalt)	
			49.6-52.1: Gravelly Sand (gS): 85% Sand, 15% Gravel;	Core 3 B36DV5
			85% Sand: vf-c, predom med, SA, 70% Felsic, 30% Mafic, Gravel:	49.6-52.1
			vf peb - med. peb, predom fine pebbles, SA-SR, 70%	
52.5			Mafic, 30% Felsic; dry, PS, no rxn w/ HCl, 2.5Y 6/1, Gray	
	Core 4		51.3: vf sand/silt bed, 3.5 cm thick, laminae	Core 4 B36DV7
			51.4-52.1: f sand	52.2-54.7
			52.2-54.7: Gravelly Sand (gS): 85% Sand, 15% Gravel;	
			85% Sand: vf-c, predom. med, 70% Felsic, 30% Mafic, SA,	
55			PS; Gravel: vf peb - 1 cm, predom fine peb, 60% Mafic, 40%	
	Core 5		Felsic; dry, no rxn w/ HCl, massive, 2.5Y 6/2 light brnish gray	Core 5 B36DV9
			~~54.5-57.0 Gravelly Sand (gS)~~: JR 9/27/14	54.5-57.0
	JR 10/10/14		54.5-55.6: ~~Gravelly Silt (gM)~~: JR 10/10/14 15% Gravel, 20%	Gravelly Sandy
			Sand, 65% Silt; Gravel: vf peb - 1 cm, predom f peb, SA, 80%	Silt
JR 10/10/14		JR 10/10/14	Mafic, 20% Felsic; Sand: vf-c, predom vf; dry, mod rxn w/ HCl, 2.5Y 7/2 light gray	

Reported By:

Jennifer Russell	Geologist	Jen Russell	9/27/14
Print Name	Title	Signature	Date

Reviewed By:

Print Name	Title	Signature	Date

For Office Use Only

OR Doc Type:	WMU Code(s):

A-6003-642 (REV 1)

BOREHOLE LOG (Cont.)

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Date: 9/27/16

Well ID: C9499 | Well Name: NA | Location: 216-T-6 Crib #1

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
57.5	Core 6		~~54.5-55.6: Gravelly Silt (gM): 15% Gravel, 20% Sand, 65% Silt; Gravel: vf peb-1cm, predom. f peb, SA, 80% Mafic, 20% Felsic; Sand: vf-c, predom vf, dry, mod rxn w/ HCl~~ JR 9/27/16, PS, 2.5Y 7/2 light gray	Sonic Core
			55.6-57.0: Gravelly Sand (gS): 25% Gravel, 75% Sand; Gravel: f peb-1.5cm, predom. f peb, SA-SR, 80% Felsic, 70% Mafic; Sand: vf-c, predom med., 30% Mafic, 70% Felsic; dry, trace mica, wk-no reaction w/HCl	Core 5 B360V9 54.5-57.0
60			57.4-62.4: Sand (S): 100%: Interbedded, stratified sand beds; Sand: vf-vc, trace mica, 80% Felsic, 20% Mafic; no rxn w/ HCl, dry, 2.5Y 5/2 Grayish brn	Core 6 B360W1 57.4-62.4
62.5	Core 7		57.8: Silt bed w/ laminae, 3.5cm thick	
			57.9-59.5: layer fining downward to v. thin laminae (of f sand) @ 59.2-60.4	
			59.5-60.4: layer fining downward to sharp contact where grainsize changes ~~(increases)~~ to JR 10/10/16	
			JR 9/27/16 60.4-61.0: vf-m sand	
65			61.0-61.3: vf-f sand	Core 7 B360W3
			61.3-62.4 - f-c sand	62.4-67.4
			62.4-67.4: Gravelly Sand (gS); 15% Gravel, 85% Sand; Gravel: vf peb-1cm, 70% Felsic, 30% Mafic, Sand: vf-vc, predom c, 60% Felsic, 40% Mafic; dry, no rxn w/HCl, 2.5Y 5/1 gray; interbedded rhythmites not well-defined	
67.5	Core 8		67.2-68.5: Gravelly sand (gS): 90% Sand, 10% Gravel; Gravel: 3mm-5mm, 90% Mafic, 10% Felsic, SA; Sand: f-c, predom. med, 35% Mafic, 65% Felsic, SA; 69.2 JR 8/3/16 dry, PS, no rxn w/HCl, 2.5Y 5/2 Grayish brn	Core 8 B360W5 67.2-72.2 Aliquot 69.0-70.5
			68.5-~~68.8~~: Sand 100% (S): 75% Felsic, 25% Mafic, vf-m, predom. f to 68.8, f-m to 69.2, no rxn w/HCl, 2.5Y 4/2 light grayish brn, laminated, dry, ms	
70			69.2-69.4: Silt bed (M): 95% Silt, 5% vf sand, 4cm thick w/vf laminae; moist, 2.5Y 5/4 light olive brn, no rxn w/HCl	
			69.4-72.2: Gravelly Sand w/ interbedded rhythmites (gS): 20% Gravel, 80% Sand; Gravel: vf peb-0.5cm, 90% Mafic, 10% Felsic, max 2cm cobble; Sand: 50% Felsic, 50% Mafic, 69.4-72.2 m-vc, 71.4-72.2 vf-m; moist, no rxn w/HCl, JR 8/3/16 rhythmites range from 2.5Y 4/1 - 2.5Y 5/4 dark gray to light olive brn, iron staining, PS, SA sand, SA-SR Gravel	
72.5	Core 9		72.1-77.1: Gravelly sand (gS): 15% Gravel, 85% Sand; Gravel: vf peb-2cm, predom fine peb, 65% Mafic, 35% Felsic, SA, Sand: vf-vc, predom c, 60% Felsic, 40% Mafic, trace mica; dry, no rxn w/HCl, 2.5Y 5/1 gray, massive	Core 9 B360W7 72.1-77.1
75				

Reported By:

Print Name	Title	Signature	Date
Jennifer Russell	Geologist	Jennifer Russell	9/27/16

A-6006-993 (REV 0)

BOREHOLE LOG (Cont.)

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Date: 8/3/16

Well ID: C9499 | Well Name: NA | Location: 216-T-6 Crib #1

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
77.5	Core 10		77.5-82.5 Gravelly Sand (gS): 10% Gravel, 90% Sand; Gravel: vf peb - 2cm, predom. 5mm, SR-SA, 80% Mafic, 20% Felsic; Sand: f-c, predom med., 40% Mafic, 60% Felsic, trace mica, SA-A; dry, 2.5Y 4/1 Gray, iron staining, no rxn w/HCL, mod sort.	Sonic Core Core 10 B360W9 77.5-82.5 Aliquot 80.0-81.5
80			- fines downward @ ~80.3' to 82.5' - massive	
82.5	Core 11		82.4-87.4: Gravelly Sand (gS): 25% Gravel, 75% Sand; Gravel: vf peb - 4cm, ~~predom~~ 8/29/16 predom. med. peb., 70% Mafic, 30% Felsic qtz & feldspars, A-SR; Sand: trace mica, f-vc, predom vc, 60% Felsic, 40% Mafic, SA; dry, wk rxn w/HCL, $CaCO_3$ nodules throughout - Strong rxn w/ HCL, A-SA, 2.5Y 5/1 gray, dipping f-m sand bed @ 85.0 (20°) - 3 cm thick, PS, massive	Core 11 B360X1 82.4-87.4
85				
87.5	Core 12		VR 8/3/16 90.8 87.2 - ~~92.2: 91.6~~: Gravelly Sand (gS): 15% Gravel, 85% Sand; Gravel: 0.5-1cm - vf peb, 90% Mafic, 10% Felsic, SR-SA; Sand: 60% Mafic 40% Felsic, m-vc, SA; moist, iron staining, 2.5Y 4/1 dark gray, stratified beds - gravel to f. sand (1cm - 3cm)	Core 12 B360X3 87.2-92.2 Aliquot 89.2-90.7
90			90.8-91.6: Sand 100% (S): f-c, 2.5Y 6/1 gray, trace mica, moist, iron staining, no structures - 90.2-90.5 Reddish discoloration 91.6 - ~~92.2~~ 91.8: Silt (M) ~~grading to Sandy Silt~~ VR 8/3/16 VR 8/3/16 95% Silt, 5% vf Sand, 2.5Y 4/3 olive brn, moist, no rxn w/HCL, laminae, moist 91.8-92.0: ~~Sandy (S) 100%~~ VR 8/3/16 Silt (sM) 25% Sand, 75% Silt; Sand: c-vc, 95% Mafic, 5% Felsic; 2.5Y 4/3 olive brn, moist, no rxn w/ HCL	
92.5	Core 13		92.0-92.2: Sand 100% (S): c-vc, moist, no rxn w/HCL, 2.5Y 4/2 dk grayish brn, 45% Felsic, 55% Mafic, SA, MS 92.1-97.1: Sand (S) 95% Sand, 5% Gravel; Gravel: vf peb - 1cm, predom 0.5 cm, 70% Mafic, 30% Felsic; Sand: vf-vc, predom med, 60% Felsic, 40% Mafic, trace mica; dry, iron staining, $CaCO_3$ nodules - strong rxn w/HCL, dipping rhythmites (~30°), no rxn w/HCL	Core 13 B360X5 92.1-97.1
95				

Reported By:

Print Name	Title	Signature	Date
Jennifer Russell	Geologist	Jennifer Russell	9/29/16

A-6006-993 (REV 0)

BOREHOLE LOG (Cont.)

Page 4 of 4

Date: 8/3/14

Well ID: C9499 | Well Name: NA | Location: 216-T-6 Crib #1

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
97.5	Core 14		97.0-98.0 Slough	Sonic Core
			98.0 - 102.0 Sand (S) 100%: Interbedded	
			Rhythmites and beds (up to 1cm thick), vf-vc,	Core 14 B360X7
			2.5Y 5/2 grayish brn - 2.5Y 4/1 dark gray, dry, individual beds	97 - 102.0
			45% Mafic 55% Felsic, no rxn w/ HCL, mod sort,	JR 10/10/16
100			SA, ~~silicates~~ JR 10/10/16 cementation from 100.6 - 101.0 (pink)	Aliquot
			$CaCO_3$ strong rxn w/ HCL w/in cementation	99.0 - 100.0
102.5	Core 15		102.1 - 105.1: Gravelly Sand (gS): 10% Gravel,	Optional 15 B360X9
			90% Sand; Gravel: vf peb - med peb, predom. fine peb,	102.1 - 105.1
			80% Mafic, 20% Felsic; Sand: vf - vc, predom med.,	
			60% Felsic, 40% Mafic, SA; dry, 2.5Y 5/2 grayish brn,	
			no rxn w/ HCL	
105			102.1 - 102.5: vf-med sand	
			102.5 - 102.9: m-vc sand and vf-f pebbles	
			102.9 - 103.1: layer of $CaCO_3$ nodules up to 2cm - strong rxn w/ HCL	
			103.1 - 103.9: f-m sand	
			103.9 - 104.2: layer of $CaCO_3$ nodules up to 1cm - strong rxn w/ HCL	
107.2			104.2 - 105.1: vf-f sand	
			Total Depth: 105.1 ft	
110				
112.5			JR 9/29/16 NOT USED	
115				

Reported By:

Print Name	Title	Signature	Date
Jennifer Russell	Geologist	Jennifer Russell	8/3/14

A-6006-993 (REV 0)

BOREHOLE LOG

Page 1 of 4
Date: 9/30/16

Well ID: C9506	Well Name: NA	Location: 216-T-18 Crib
Project: 200 DV-1 OU Characterization Phase 3		Reference Measure Point: Ground Surface

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
30			VR 9/30/16	Core-Sonic
32.5			33.3-34.0: Overdriven/Slough	Core 1 B36IT5 33.3-37.0
35	Core 1		34.0-37.0: Gravelly Sand (gS): 20% Gravel, 80% Sand; Gravel: 90% Mafic, 10% Felsic, vf peb-1.5cm, predom 0.5cm, SA; Sand: 70% Felsic qtz, 30% Mafic; vf-vc, predom med.; moist, PS, 2.5Y 4/2 dk grayish brn, iron staining, no rxn w/HCL, no structures	Aliquot 34.5-36.0
			37.0-37.3: Sand (S) 100%, vf-f, 80% Felsic, 20% Mafic, moist, 2.5Y 5/3 light olive brn, no rxn w/HCL, WS	
37.5	Core 2		37.3-37.5: Silt bed grading to sand (M) w/ fine pebbles in lower portion of bed; Silt 100%, non-plastic, v. wk rxn w/HCL, 2.5Y 5/4 light olive brn, moist, pebbles are mafic	Core 2 B36IT7 37.0-42.0
40			37.5-42.0: Gravelly Sand (gS) 90% Sand, 10% Gravel; Gravel: vf peb-med peb, predom f, 90% Mafic, 10% Felsic; Sand: vf-vc, interbedded layers from 37.5-40.0; massive 40.0-42.0; dry, no rxn w/HCL in coarse sand, wk rxn w/HCL in vf sand, PS, 2.5Y 5/4 light olive brn, SA.	
42.5	Core 3		42.1-47.1: Gravelly Sand (gS): 90% Sand, 10% Gravel; Gravel: vf-f pebbles, 90% Mafic, 10% Felsic; Sand: vf-vc, predom c., 60% Felsic, 40% Mafic, SA; dry, rhythmites throughout (not well defined), no rxn w/HCL, 2.5Y 5/2 grayish brn	Core 3 B36IT9 42.1-47.1
45				

Reported By:

Print Name	Title	Signature	Date
Jennifer Russell	Geologist	Jennifer Russell	9/29/16

Reviewed By:

Print Name	Title	Signature	Date
Tessa Clark	Geologist	[illegible]	10/10/16

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OR Doc Type:	WMU Code(s):

A-6003-642 (REV 1)

BOREHOLE LOG (Cont.)

Page 2 of 4

Date: 9/30/16

Well ID: C9506 | Well Name: NA | Location: 216-T-18 Crib

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
47.5	Core 4		47.0 - 52.0: Sand (S) 100%: vf-c, JR 9/29/16 fining downward, 70% Felsic quartz, 30% Mafic, dry, Iron staining, mica, no rxn w/ HCL, 2.5Y 6/2 light brnish gray, noticable grain size changes @ 49.2 and 50.4	Sonic Core Core 4 B361V1 47.0 - 52.0
50				
52.5	Core 5		52.0 - 54.5: Sand (S) 100%: vf-f, 70% Felsic, 30% Mafic, dry, iron staining, mica, 2.5Y 6/2 light brnish gray, WS, no rxn w/ HCL, vf sand laminae from 52.0 - 52.5 and 53.7 - 54.5	Core 5 B361V3 52.0 - 57.0
55			54.5 - 57.0: Gravelly Sand (gS) 15% Gravel, 85% Sand; Gravel: vf peb - 2.5 cm, predom fine peb; SA 90% Mafic, 10% Felsic; ~~mafic~~ JR 9/29/16; Sand: vf-c, predom. med., 70% Felsic, 30% Mafic; dry, mica, no rxn w/ HCL, 2.5Y 5/2 grayish brn, iron staining	
57.5	Core 6		57.2 - 60.3: Sand (S): 95% Sand, 5% Gravel; Gravel: vf peb - f peb, 90% Mafic, 10% Felsic, SA; Sand: vf-med, 80% Felsic, 20% Mafic, SA; dry, no rxn w/ HCL, 2.5Y 7/2 light gray, pebble layer @ 59.8 & 60.0 & faint rhythmites throughout	Core 6 B361V5 57.2 - 62.2
60			60.3 - 60.5: Silt (M): 100% dry, non-plastic, laminae w/ sand lens and v. fine pebble JR 9/29/16 2.5Y 6/3 light yellowish brown, no rxn w/ HCL, iron staining at contact below and above layer	
			60.5 - 62.0: Gravelly Sand (gS): Interbedded rhythmites 20% Gravel, 80% Sand; Gravel: vf peb - 2cm, predom. f peb, 90% Mafic, 10% Felsic; Sand: vf-vc, mica, 60% Felsic, 40% Mafic; dry, no rxn w/ HCL, 2.5Y 5/2 grayish brn, PS, SA	
			62.0 - 62.2: Sand (S): 100%, vf-f, dry, no rxn w/ HCL, 2.5Y 6/4 light yellowish brown, 70% Felsic, 30% Mafic	
62.5	Core 7		62.3 - 64.1: Gravelly Sand (gS): 15% Gravel, 85% Sand; Gravel: 90% Mafic, 10% Felsic, vf peb - 1cm, predom 0.5 cm, SR; Sand: f-c, predom. coarse, 40% Mafic, 60% Felsic, SA; dry, no rxn to HCL, 2.5Y 5/1 gray - graded contact, PS (Slough in upper 0.7)	Core 7 B361V7 62.3 - 67.3 Aliquot 64.0 - 66.0
65			64.1 - 66.1: Sand (S) 100%: vf-m, WS, 75% Felsic, 25% Mafic, trace mica, dry, no rxn to HCL, 2.5Y 7/1 light gray, graded contact, iron stain 25 JR 9/29/16 75 JR 9/29/16	
			66.1 - 67.3: Gravelly Sand (gS): 20% Gravel, 80% Sand; Gravel: vf peb - 2cm, 90% Mafic, 10% Felsic, SR; Sand: f-vc, predom. c, 40% Mafic, 60% Felsic; dry, no rxn, gray 2.5Y 5/1	

Reported By:

Jennifer Russell	Geologist	Jennifer Russell	9/30/16
Print Name	Title	Signature	Date

A-6006-993 (REV 0)

BOREHOLE LOG (Cont.)

Page 3 of 4

Date: 9/30/16

Well ID: C9506 | Well Name: NA | Location: 216-T-18 Crib

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
67.5	Core 8		67.1-68.0: Sand(S) 100% Sand, 5% Gravel; Gravel: vf-f pebbles, 90% Mafic, 10% Felsic, SA; Sand: vf-c, predom med, 80% Felsic, 20% Mafic, dry, iron staining, 2.5Y 5/1 Gray, no rxn w/ HCL.	Sonic Core Core 8 B361V9 67.1-72.1
70			68.0-68.4: Silt(M): 95% Silt, 5% Sand; vf sand, non-plastic, no rxn w/HCL, 2.5Y 6/3 light yellowish brn, dry.	
			68.4-70.1: Sand(S) 100%: vf-vc, no rxn w/HCL, 2.5Y 6/3 light yellowish brn, PS 70% Felsic, 30% Mafic, silt lamina @ 68.8, dipping beds/laminae in lower 0.7' (to 70.1)	
			70.1-72.1: Gravelly Sand(gS): 25% Gravel, 75% Sand; Gravel: f peb & CaCO3 nodules (strong rxn w/HCL) up to 1 cm, 80% Mafic, 20% Felsic; Sand: vf-vc, pred. vf, 70% Felsic, 30% Mafic, dry 2.5Y 6/2 grayish brn	
72.5	Core 9		72.4-72.7: Sand(S) 100% f-m, 85% Felsic, 15% Mafic, trace mica, dry, no rxn w/HCL, 2.5Y 5/1 gray, WS, SA, sharp contact	Core 9 B361W1 72.4-77.4
			72.7-73.3: Silt (M): 95% Silt, 5% vf sand, dry, 10% Mafic, 90% Felsic, iron staining, very thin laminae, increased sand content from 73.1-73.3 w/ minor rhythmites ~1 cm thick	Aliquot 73.9-75.4
75			73.3-73.9: Interbedded rhythmites, vc sand to silt, ~1 cm thick iron staining, w/ CaCO3 cementation (WK) - strong rxn w/ HCL, ~~(pink)~~ pink color	
			73.9-77.4: Sand(S) 95% Sand, 5% Gravel; Sand: f-vc, predom. c, trace mica, 35% Mafic, 65% Felsic; Gravel: vf peb - 2cm, 90% Mafic, 10% Felsic, SA/SR; dry, iron staining, PS, 2.5Y 5/2 grayish brn	
77.5			- 74.9-75.1: increased grain size & CaCO3 cementation (pink) strong rxn w/ HCL	
			75.6: - Layer of CaCO3 cementation - 1 cm thick - strong rxn w/ HCL (pink color)	
			75.6-76.5: decreased grain size (f-m)	
			76.5-77.4: Interbedded rhythmites, iron staining	
80	Core 10		77.2-82.2: Sand(S) 95% Sand, 5% Gravel; Gravel: f peb, 100% Mafic; Sand: vf-m, 80% Felsic, 20% Mafic, SA [78.4: CaCO3 layer, 1 cm thick, strong rxn w/ HCL] Dry, no rxn w/ HCL, 2.5Y 6/2 light brn gray, mod sort, mica	Core 10 B361W3 77.2-82.2
82.5	Core 11		82.4-87.4: Sand(S) 100%: f-c, predom. med, 40% Mafic, 60% Felsic, trace mica, mod sort - WS, SA, dry, 2.5Y 6/2 light ~~grayish brn~~, brownish gray, weak CaCO3 cementation throughout, mod-strong rxn w/ HCL	Core 11 B361W5 82.4-87.4 Aliquot 84.4-86.4
85			- mod cementation @ 84.1, ~5 cm thick - Interbedded rhythmites from 82.4 to 84.2 - increased cem. 85.7-86.1	

Reported By:

Print Name	Title	Signature	Date
Jennifer Russell	Geologist	Jennifer Russell	9/30/16

A-6006-993 (REV 0)

BOREHOLE LOG (Cont.)

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Date: 9/30/16

Well ID: C9506 | Well Name: NA | Location: 216-T-18 Crib

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
87.5	Core 12		87.0-87.4: Sandy Silt (sM) 25% Sand, 75% Silt, Sand: 70% Felsic, 30% Mafic M-C, SA, 2.5Y5/3 light olive brn, moist, strong rxn w/ HCL	Sonic Core
			87.2-91.3: Silt (M) 100% crosscut by intrusive clastic (Sand) dike; Silt: 100% dry, non-plastic, mod-strong rxn w/ HCL, 2.5Y5/2 grayish brown; Sand (clastic dike): vf-c, predom fine, 70% Felsic, 30% Mafic, mica, 2.5Y6/1 gray, dry, Sand matrix has strong rxn w/ HCL and $CaCO_3$ nodules throughout have strong rxn w/ HCL.	Core 12 B361W7 87.2-92.2
90				
92.5	Core 13		92.3-93.8: Silt (M) 100%; dry, non-plastic, 2.5Y6/3 light yellowish brn, wk-mod rxn w/ HCL - increasing with depth, platy structure.	Core 13 B361W9 92.3-97.3
			93.8-97.3: Caliche: 100% Cemented silt >5% pebbles (mafic) fine throughout; non-plastic, dry, 2.5Y8/1 white ~~grading~~ JR 9/30/16 to 2.5Y6/3 Light yellowish brn	
95			93.8-94.5: Moderate cementation, strong rxn w/ HCL, platy structure, white	
			94.5-95.5: decreased $CaCO_3$, platy structure, color change to light yellowish brn	
JR 9/30/16			95.5-97.3: grades to Sandy silt (sM) 70% Silt, 30% Sand	
			Silty Sand (mS) 15% Silt, 85% Sand	
97.5	Core 14		97.1-101.1: ~~Sandy Silt~~ Caliche (sM): ~~dry~~ JR 9/30/16, ~~25% Sand, 75% Silt~~ JR 9/30/16; Sand: vf-c, predom mf; JR 9/30/16 dry, mod cemented ($CaCO_3$), 10YR8/1 white - 10YR6/3 pale brown, strong rxn w/ HCL	Core 14 B361X1 97.1-101.1
			- reddish discoloration 100.1-101.0 iron staining?	Aliquot 98.0-100.0
100				
			Total Depth: 101.1A	
102.5			JR 9/30/16 NOT USED	
105				

Reported By:

Print Name	Title	Signature	Date
Jennifer Russell	Geologist	Jennifer Russell	9/30/16

A-6006-993 (REV 0)

BOREHOLE LOG

Page 1 of 7
Date: 9/20/16

Well ID: C9507 | Well Name: NA | Location: 216-T-19 Crib & Tile Field

Project: 200 DV-1 Characterization Phase 3 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
40					Sonic Core
				Cores 1-4 Not Collected	
42.5					
45				NOT USED	
47.5				JR 9/20/16	
50					
52.5					
55					
57.5	Core 5			57.3-59.8: Silty Sand: (mS) 75% Sand, 25% Silt; vf-med sand, 80% felsic, 20% Mafic, quartzose w/ feldspars, predom. medium sand, moist, mS, silt bed 58.8-59.1 w/ fine sand, no rxn w/ HCL, 2.5Y5/3 light olive brn	57.3-59.8 Core 5 B35411 (RS-B35410) GM: 40/45/34 cpm PAM: 0 cpm

Reported By: Jen Russell | Reviewed By: Tessa Clark (TC) 9-22-16

Title: Geologist | Title: Geologist

Signature: Jen Russell | Date: 9/20/16 | Signature: [signature] | Date: 9/22/16

A-6003-642 (03/03)

BOREHOLE LOG

JR 7/20/16 Page ~~1~~ 2 of 7
Date: 7/20/16

Well ID: C9507	Well Name: NA	Location: 216-T-19 Crib & Tile Field
Project: 200-DV-1 Characterization Ph. 3		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
60	Core 6	100%		59.7-62.2: Sand (S) 100%: 80% Felsic, 20% Mafic, vf-m, predom f, dry, SA, qtz, qtzite, mica, 2.5Y 6/2 light brnish gray, no rxn w/ HCL	Sonic Core Core 6 59.7-62.2
62.5	Core 7	100%		62.3 ~~-64.8~~ (static): -64.3: Sand (S) 100%: 80% felsic, 20% Mafic, vf-vc, predom f, 2.5Y 6/2 light brnish gray, no rxn w/ HCL, massive 64.3-64.8: Silt (M): 95% Silt, 5% vf sand, non-plastic, dry-moist, 2.5Y 5/3 light olive brn, no rxn w/ HCL	Core 7 62.3-64.8
65	Core 8	100%		~~64.5-67.0~~ JR 7/20/16: 65.5: Silty sand (mS): 70% Sand 30% Silt; Sand: f-c, 80% F, 20% Mafic, SR-SA; moist, 5/3 2.5Y light olive brown, wk rxn w/ HCL 65.5-67.0: Sand (S) 100%: 90% Felsic (Qtz) 10% Mafic, f-m, SR-SA, moist, 2.5Y 5/3 light olive brn, no rxn w/ HCL	Core 8 B35418 64.5-67.0 Aliquot Depth: 65.0-66.5'
67.5	Core 9	100%		67.2-69.7: Sand (S) 100% 80% Felsic 20% Mafic, f-vc, predom. f, mica, dry, 2.5Y 6/2 light brnish gray, no rxn w/ HCL, 2cm cobble, massive	Core 9 B35420 67.2-69.7
70	Optional 1	100%		~~69.7-72.0: Sand (S) 100%: 80% Felsic, 20% Mafic, vf-m, predom f, micaceous, moist, 2.5Y 6/2 light brnish gray, no rxn w/ HCL, minor amt. of iron staining; vf sand/silt beds @ 71.4 & 71.6~~ JR 8/25/16 69.4-69.6: fine pebbles (3 mm) ~~69.7~~ JR 8/29/16	Optional 1 B35409 69.7-72.0
72.5	Extra footage in core	VOAS 100%		68.8-69.3: Silt (M) 100%: non-plastic, moist, wk rxn w/ HCL, 2.5Y 5/3 light olive brn 69.3-69.5: Fine pebbles, 90% Mafic, 10% Felsic, 2-3mm, SA-SR, no rxn w/ HCL, 2.5Y 5/1 gray	extra footage in core
75	Core 10	100%		69.5-72.0: Sand (S) 100%: 80% Felsic, 20% Mafic, vf-m, predom f., micaceous, moist, 2.5Y 6/2 light brnish gray, no rxn w/ HCL, minor amt. of iron staining; vf sand/silt beds @ 71.4 & 71.6 72.6-75.1: Core sent for VOA sampling - not logged	Core 10 B35422 ~~72.6-77.6~~ JR 9/23/16 75.1-77.6
77.5	Core 11	100%		75.1-77.6: Sand (S) 100%: 80% Felsic, 20% Mafic, vf-m, predom f. micaceous, moist, 2.5Y 6/2 light brnish gray - 5/3 light olive brn, no rxn w/ HCL, iron staining 76.86 (not logged) 2cm silt/vf sand bed @ 76.1-76.6 Rhythmites (c-vc @ 76.2 (3cm)) JR 8/29/16	

Reported By: Jen Russell		Reviewed By: Tessa Clark JR 8/29/16	
Title: Geologist		Title: Geologist	
Signature: Jen Russell	Date: 8/29/16	Signature: [signature]	Date: 9/22/16

A-6003-642 (03/03)

JR 7/20/16

BOREHOLE LOG

Page ~~5~~ 3 of 7

Date: 7/21/16

Well ID: C9507	Well Name: NA	Location: 216-T-19 Crib & Tile Field
Project: 200 DV-1 OU Characterization Ph. 3		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCL	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	Core 11	100%		77.5-82.5: Sand(S) 100%: 80% Felsic, 20% Mafic, vf-m, predom f, mica, dry, 2.5Y 6/2 light brnish gray-2.5Y 5/3 light olive brn, no rxn w/HCL, iron staining, w/ interbedded, fine grained rhythmites (vf/silt)	Sonic Core Core 11 B35425 77.5-82.5
		Core 12		81.7: Silt bed w/ vf laminae, 2-3cm thick, no rxn w/ HCL 78.5: c-vc sand ~~bed~~ rhythmite ~1cm JR 8/29/16	
82.5				82.8 JR 8/29/16	Core 12 B35427
	Core 12	100%		82.0-87.0: Sandy gravel (SG): 40% Gravel, 60% Sand Gravel: f pebbles, SR-SA, 90% Mafic, 10% Felsic; Sand: c-vc, predom c, 80% Felsic, 20% Mafic; dry, $CaCO_3$ cementation throughout, strong rxn w/ HCL	82.0-87.0
85				82.8-87.0: Sand(S) 100% vf-vc, predom med., 70% Felsic, 30% Mafic 82.8-84.2: Massive, 5% gravel, 3mm-0.5cm, 50% F/50% M 84.2: 1.5cm silt bed 84.3-87.0: Interbedded f-vc sand rhythmites	
87.5	VOA Sample			87.4-89.9: Core collected for VOAs * No logging	Core 13 B35430 (89.9-92.4) 87.4-92.4
90	Core 13	100%		89.9-92.4: Sand(S) 100% 70% Felsic qtz, 30% Mafic basalt, Trace mica, vf-vc, SR-SA, dry, no rxn w/ HCL, interbedded 2.5Y 7/3 pale brn/2.5Y 6/3 light yellowish brn, iron staining - interbedded rhythmites up to ~~1.5cm~~ 3cm JR 7/21/16 - ~~laminations exhibited~~ cross bedding structure - vf sand - laminae JR 7/21/16 Coarse from 91.1-91.2 - vf 91.5-91.7	Aliquot 90.4-91.9
92.5				1-ft Push Cores from 92.1-97.7 TO PNNL * NOT LOGGED * Leachate Samples	
95	NOT LOGGED				
97.5	VOA sample			97.5-100.0: VOA Sample core - Core not logged.	Core 15 B35439 97.5-102.5 (100.0-102.5)

Reported By: Jen Russell		Reviewed By: Tessa Clark	
Title: Geologist		Title: Geologist	
Signature: Jen Russell	Date: 8/29/16	Signature: [illegible]	Date: 9/22/16

A-6003-642 (03/03)

JR 9/20/16 4

BOREHOLE LOG

Page ~~6~~ of 7

Date: 7/27/16

Well ID: C9507	Well Name: NA	Location: 216-T-19 Crib and Tile Field
Project: 200 DV-1 Characterization Phase 3		Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
100		VOA SAMPLE		100-102.5 Silt(M): 95% Silt 5% Sand;	Sonic Core.
	Core 15	100%		Sand: vf; moist, 2.5Y 4/2 light grayish brn no-wk rxn w/HCL. (wk rxn from 102.0-102.5)	Core 15 B35439 97.5-102.5
				- Platy structure noted from 100.0-101.0	Aliquot 100.5-102.0
102.5					
				1-A Cores from 102.4-107.4	
				NOT LOGGED > TOPNNL	- Leachate Samples
105	NOT LOGGED			107.3-108.9: Sandy Silt(sM) 60% Silt, 40% Sand; Sand: vf-med-vc, predom fine; dry, 10YR5/4 yellowish brn, strong rxn w/HCL, wk-mod cemented	
				108.9-112.3: Gravelly Sandy Silt (gsM): 20% Gravel, 30% Sand, 50% Silt; Gravel: vf peb-8cm cobble, 100% Mafic, SA-R; Sand: vf-f; dry, strong rxn w/HCL mod-strong cementation, PS:	
107.5				108.9-109.7: 10YR8/1 White, smaller gravel (1-3 cm)	Core 17 B35447
	Core 17			109.7-110.3: 10YR5/3 brown, ~~large~~ small cobbles (4cm-8cm) basalt 9/28/16 JR	107.3-112.3
				110.3-110.6: No cobbles, white cementation	
110		100%		110.6-112.3: 7.5YR5/4 brown 2-4 cm cobbles - basalt	
112.5				112.3-114.8: Core collected for VOAs * Not logged	Core 18 B35450 112.3-117.3 Aliquot 115.3-116.7 (114.8-117.8) core
115	Core 18	100%		114.8-~~117.3~~ 115.2: ~~two distinct~~ cemented silt	
				115.2-115.4: Silt(M): Silt beds (laminae) 1/2cm thick. Defined layers w/ platy structure Interbedded $CaCO_3$ between laminae	
				115.4 - 5 cm vf sand bed	
117.5				115.5 - 3mm silt laming	
	Core 19	100%		2cm vf sand bed	Core 19 B35452 117.4-122.4
				1 cm silt bed	
				115.6-115.7 - Cemented sandy silt strong rxn w/HCL 10YR8/2 very pale brn	

Reported By: Len Russell		Reviewed By: Tessa Clark	
Title: Geologist		Title: Geologist	
Signature: Len Russell	Date: 8/29/16	Signature:	Date: 9/22/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 5 of 7

Date: 7/21/16

Well ID: C9507 | Well Name: NA | Location: 216-T-19 Crib & Tile Field

Project: 200 DV-1 Characterization Phase 3 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
120	Core 19	100%		115.7-116.6: Silt: 95% Silt 5% Sand (M): Sand: 1mm, black, angular; Silt: Moist, 10YR 5/4 yellowish brn, no rxn w/ HCl, non-plastic	Sonic Core
				116.6-117.3: Sandy Gravel (sG): 75% Gravel, 25% Sand; Gravel: 1cm-6cm, 80% Mafic 20% Felsic (Quartzite), SR, predom. 3-4cm; Sand: c-vc, 80% Mafic, 20% Felsic, appears pulverized by drilling = white iron staining; moist, dk gray 10YR 4/1; no rxn w/ HCl	JR 9/23/16 ~~Core 18 112.3-117.3~~ B35450 Aliquot 115.3-116.7
122.5	Core 20	75%		117.4-122.4: Sandy Gravel (sG): 70% Gravel, 20% Sand, 10% Silt Gravel: 75% Mafic, 25% Felsic, vf peb-8cm, predom 6cm, SR-R Sand: vf-f; dry, PS, 2.5Y 5/6 light olive brn, no rxn w/ HCl, sand content increases @ ~119.0	Core 19 B35452 117.4-122.4
				122.5-125.0: Core taken for VOA sampling	Core 20 B35455 122.5-127.5
125				125.0-127.5: Sandy Gravel (sG): 70% Gravel, 20% Sand, 10% Silt; Gravel: 65% Felsic, 35% Mafic, 2cm-7cm, predom 6cm, SR; Sand: vf-vc, predom c, 70% Mafic, 30% Felsic (possibly stained); dry, silty to 126.2, PS, no rxn w/ HCl, 2.5Y 5/6 light olive brn-5/2 grayish brn	
127.5	Core 21	50%	No Recovery	127.4-129.9: No recovery	Core 21 B35457 127.4-132.4
130				129.9-132.4: Sandy Gravel Silty (msG): 60% Gravel, 20% Sand, 20% Silt; Gravel: 70% Mafic, 30% Felsic, SR-R, 1cm-8cm, predom 4cm; Sand: c-vc, 80% Felsic, 20% Mafic, SA; Dry, no rxn w/ HCl, 2.5Y 5/1 gray	
132.5	Core 22	40%	No Recovery	132.7-135.7: No recovery	Core 22 B35459 132.7-137.7
135				135.7-137.7: ~~Sandy~~ JR 9/23/16 Silty Sandy Gravel (msG): 60% Gravel, 20% Sand, 20% Silt; Gravel: 80% Mafic, 20% Felsic, SR-R, 1cm-8cm, predom 4cm; Sand: c-vc, 80% Felsic, 20% Mafic, SA; Dry, PS, no rxn w/ HCl, 2.5Y 4/2 dk grayish brn	
137.5	— TO PNNL			137.6-139.6: Core to PNNL Core 23	(Core 23 B35461 137.6-142.6 ~~TO PNNL~~ JR 9/23/16)

Reported By: Jen Russell | Reviewed By: Tessa Clark

Title: Geologist | Title: Geologist

Signature: Jen Russell | Date: 9/20/16 | Signature: [signature] | Date: 9/22/16

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JR 7/21/14 6

BOREHOLE LOG

Page ~~8~~ of 7
Date: 7/21/14

Well ID: C9507 | Well Name: NA | Location: 216-T-19 Crib & Tile Field

Project: 200DV1 OU Characterization Ph 3 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
140	Core 23	~~80%~~ JR 9/20/14		139.6-141.6 Sandy Gravel (SG): 75%G, 25%S; Gravel: f peb-5cm cobbles, 70% felsic w/ quartzite & granite, 30% Mafic basalt, SR-R, predom. 2-3cm; Sand: VC, 30% Felsic, 70% Mafic bas., SA; dry, 2.5Y 8/1 very dk gray, no rxn w/ HCL	Sonic Core Core 23 B35459
142.5		NO RECOVERY		141.6-142.6: No recovery	
				[Core 24 TO PNNL] 142.6-147.3	
145				No recovery - No cores collected 147.3 ~~142.5~~ - 157.7 JR 9/20/14	
147.5				JR 9/20/14	
150					
152.5					
155					
157.5	opt. 2			157.7-162.7: Sandy Gravel (SG): 60% Gravel, 30% Sand, 10% Silt; Gravel: f peb-4in + cobbles, pred. 3cm, 70% Felsic w/ qtzite, 30% Mafic, SR; Sand: vf-m, 80% felsic, 20% Mafic, dry-moist, no rxn w/ HCL, 2.5Y 8/1 - 4/1 white to dk gray	B354D1 Optional 2 ~~B354D1~~ JR 7/24/14 157.7-162.7 Aliquot 158.7-161.7

Reported By: Jen Russell | Reviewed By: Tessa Clark

Title: Geologist | Title: Geologist

Signature: Jen Russell | Date: 7/24/14 | Signature: [signature] | Date: 9/22/16

A-6003-642 (03/03)

JR 9/20/16 7

BOREHOLE LOG

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Date: 9/20/16

Well ID: C9507 | Well Name: NA | Location: 216-T-19 Crib & Tile Field

Project: 200DV-1 OU Characterization Phase 3 | Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description (Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level)
160	Optional 2			157.7-162.7 Sandy Gravel (sG): 60% Gravel, 30% Sand, 10% Silt; Gravel: f peb - 4in+ cobble, pred. 3cm, 70% Felsic w/ quartzite, 30% Mafic, SR, Sand: vf-m 80% felsic, 20% Mafic, dry-moist, no rxn w/HCl, 2.5Y 8/1-4/1 white to dk gray	Sonic Core, Core Optional 2 B354D1 157.7-162.7
162.5				1 ft of core used for Geotech analyses	Aliquot 158.7-161.7
				~~Total Depth 162.7~~ JR 9/28/16	
165				Total Depth is 243ft. Core only available to 162.7	
167.5					
170				JR 9/20/16	
172.5					
175					
177.5					

Reported By: Jen Russell | Reviewed By: Tessa Clark

Title: Geologist | Title: Geologist

Signature: Jen Russell | Date: 9/20/16 | Signature: [illegible] | Date: 9/22/16

A-6003-642 (03/03)

BOREHOLE LOG

Page 1 of 6
Date: 9/14/16

Well ID: C9514 | Well Name: NA | Location: 216-S-21 Crib
Project: 200 DV-1 OU Characterization Phase 3 | Reference Measure Point: Ground Surface

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
40			JR 10/19/16	Sonic Core RS = Rad Screen
42.5				
45	Core 1		44.1 – 46.6: Sandy Silt; Sand 40%, Silt 60% (SM) vf-f sand, moist, 2.5Y4/3 olive brn, non-plastic, platy structure, trace mica, no rxn w/ HCL, MS	Core 1 B36107 (RS - B36106) 44.1 – 46.6 Aliquot 44.6 – 45.6 GM: 51/42/53 cpm PAM: Q cpm
47.5	Core 2		47.4 – 49.9: Silty Sand (mS): 70% Sand, 30% Silt; Sand: vf-f, SA, 95% Felsic, 5% Mafic, predom vf; moist, no rxn w/ HCL, 2.5Y5/4 light olive brn, massive, WS, trace mica, iron staining	Core 2 B36109 47.4 – 49.9
50	Core 3	JR 10/19/16	49.6 – 52.1: Silty Sand (mS): 70% Sand, 30% Silt; Sand: vf-f, SA, 95% Felsic, 5% Mafic, predom vf; moist, no rxn w/ HCL, 2.5Y5/4 light olive brn, massive, WS, trace mica, iron staining	Core 3 B36111 49.6 – 52.1
52.5	Core 4		52.5 – 55.0: Sand (S): 90% Sand, 10% Silt; Sand: vf-f, 70% Felsic, 30% Mafic, SA; dry, WS, no rxn w/ HCL, trace mica, iron staining, massive, predom. f JR 10/19/16 2.5Y5/2 grayish brn	Core 4 B36113 52.5 – 55.0
55	Core 5		54.7 – 57.2: Sand (S): 100%, vf-f, predom f, massive, 70% Felsic, 30% Mafic, SA, dry, 2.5Y5/2 grayish brn, trace mica, iron staining, WS, no rxn w/ HCL	Core 5 B36115 54.7 – 57.2

Reported By:			
Jen Russell	Geologist	Jen Russell	9/21/16
Print Name	Title	Signature	Date

Reviewed By:			
Tessa Clark	Geologist	[signature]	10/25/16
Print Name	Title	Signature	Date

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OR Doc Type:	WMU Code(s):

A-6003-642 (REV 1)

BOREHOLE LOG (Cont.)

Page 2 of 6

Date: 10/19/16

Well ID: C9514 | Well Name: NA | Location: 216-S-21 Crib

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
57.5	Core 6		57.1 - 62.1: Sand (S) 100%: vf-f, 70% Felsic, 30% Mafic, trace mica, SA, WS, massive, dry, no rxn w/ HCL, 2.5Y 3/2 very dark grayish brown.	Sonic Core Core 6 B36117 57.1 - 62.1
60			— 62.6: JR 10/19/16	
62.5	Core 7		62.1 ~~62.4~~: Slough ~~62.4~~ JR 10/19/16 JR 10/19/16 62.6 - 67.1: ~~Sand (S)~~ Slightly silty sand (m) S: Sand 85%, Silt 15%; Sand: vf-f, predom vf, 90% Felsic, 10% Mafic, massive, trace mica; moist, 2.5Y 6/3 light yellowish brn, no rxn w/ HCL, WS.	Core 7 B36119 62.1 - 67.1
65				
67.5	Core 8		67.1 - 67.8: Silt (M): 90% Silt, 10% Sand, dry, strong rxn w/ HCL, vf sand, 2.5Y 5/3 light olive brn, platy structure, WS JR 10/19/16, non-plastic 67.8 - 70.2: Sand (S) 100%, vf-m, predom f, no rxn w/ HCL, 2.5Y 5/4 light olive brn, massive, silt bed @ 69.9 (1.5 cm) 90% Felsic, 10% Mafic, WS, SA JR 10/25/16	Core 8 B36121 67.1 - 72.1 Aliquot 67.8 - 69.5
70			70.2 - 70.4: Sandy Silt bed (sM): Sand: vf, 95% Felsic, 5% Mafic 60% Silt, 40% Sand; dry, no rxn w/ HCL, 2.5Y 7/3 pale brn 70.4 - 71.5: Silty sand (mS): 60% Sand, 40% Silt; Sand: vf-f, 70% Felsic, 30% Mafic; dry, 2.5Y 4/2 dark grayish brn to 70.9, 2.5Y 6/2 light brownish gray 70.9 - 71.5, no rxn w/ HCL, ~~WS~~ MS JR 10/25/16, massive	
72.5	Core 9		71.5 - 72.1: Sandy silt (sM): 60% Silt, 40% Sand; moist, mod rxn w/ HCL, 2.5Y 5/4 light olive brn, vf sand 72.0 - 74.7: Stratified Sand (S): 90% Sand, 10% Silt; dry to moist, no rxn w/ HCL, PS	Core 9 B36123 72.0 - 77.0
75			72.0 - 73.5: vf-c sand, vf grading to c @ ~ 73.0, 2.5Y 6/2 light brnish gray, 73.5 - 74.1: c grading to vf, 2.5Y 5/4 light olive brn 85% F, 15% M 30% Felsic, 70% Mafic, 70% Felsic, JR 10/19/16 74.1 - 74.4: m-c sand, trace mica, 30% Mafic, 70% Felsic, 2.5Y 6/2 light brn gray 74.4 - 74.7: vf, 2.5Y 5/3 light olive brn, 85% Felsic, 15% Mafic [DESCRIPTION CONT. ON PG. 3]	

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	10/19/16

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BOREHOLE LOG (Cont.)

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Date: 10/19/16

Well ID: C9514 | Well Name: NA | Location: 216-S-21 Crib

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
57.5				
60				
62.5			JR 10/19/16	
65				
67.5				
70				
72.5	Core 9		Core 9 (Cont.) JR 10/25/16 Slightly silty sand (m)S: 74.7-76.1: ~~Sandy Silt (SM)~~: Sharp contact, trace (3mm) wood bits noted above/at contact, 80% Sand, 20% Silt; Sand: vf; laminated in upper 0.3ft, 95% Felsic, 5% Mafic Silt layer ~2cm thick w/ lenticular bed of vf sand in center @ 74.8' (strong rxn w/HCL), strong rxn w/HCL, 2.5Y5/4 light olive brn, grades to silty sand @ 76.1	Core 9 B36123 72.0 - 77.0 by JR 10/25/16
75			76.1-77.0: Silty ~~Sand (m)S~~ Slightly JR 10/24/16: 80% Sand, 20% Silt; (m)S JR 10/24/16 Sand: vf-f, 95% Felsic, 5% Mafic, trace mica; 2.5Y6/2 light brnish gray, laminated silt lens @ 76.0 (nodule), no rxn w/HCL, dry	

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	10/19/16

A-6006-993 (REV 0)

BOREHOLE LOG (Cont.)

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Date: 10/19/16

Well ID: C9514 | Well Name: NA | Location: 216-S-21 Crib

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
77.5	Core 10		77.1-82.1: Sand(S): 90% Sand, 10% Silt; Interbedded vf - c sand beds, dry, no rxn w/ HCL, vf/f beds laminated, m-c sand beds 20% Mafic, 80% Felsic, 77.8: 4 mm silt lamina, 2.5Y5/6 light olive brn 80.2-82.1: vf sand/silt laminae	Sonic Core
80				Core 10 B36125 77.1-82.1
				Aliquot 78.3'-79.8'
82.5	Core 11		82.5-87.5: Sand(S): 100%; vf-c, dry, trace mica, 80% Felsic, 20% Mafic, no rxn w/ HCL, 2.5Y4/2 light brnish gray, PS, vf sand lamina @ 83.0, ~3mm thick 82.5-86.2: interbedded rhythmites	Core 11 B36127 82.5-87.5
85			86.2-87.5: massive sharp contact @ 83.0 betwn grain size (vf/c) JR 10/20/16	
87.5	Core 12		87.2-91.1: Sand(S) 100%: vf-c, dry, 80% Felsic, 20% Mafic, no rxn w/HCL 87.2-89.4: Massive, 2.5Y4/2 light brnish gray, WS, trace mica, m-c, predom c 89.4-91.1: rhythmites, laminae, vf, 2.5Y6/3 light yellowish brn, WS	
				Core 12 B36129 ~~87.5~~ JR 10/20/16 87.2-92.2
90			91.1-92.2: Sandy Silt (sM): 75% Silt, 25% Sand; sand: vf, 90% Felsic, 10% Mafic, SA; dry, no rxn w/ HCL, 2.5Y6/4 light yellowish brn, WS	
92.5	Core 13		92.2-93.5: Sand(S) ~~90% Sand 10% Gravel~~ JR 9/14/16 95% Sand 5% Gravel; Sand: m-c, 80% Felsic, 20% Mafic, SA, WS Gravel: 3 cm cobble, basalt, A; dry, trace mica, no rxn w/HCL, 2.5Y5/2 grayish brn	Core 13 B36131 92.2-97.2
95			93.5-94.1: Silt (M) 100%, moist, 2.5Y5/6 light olive brn, wk rxn w/ HCL, non-plastic 94.1-97.2: Sand(S): 95% Sand, 5% Silt; interbedded vf - med sand beds/rhythmites, no rxn w/HCL, 2.5Y6/4 light yellowish brn - 2.5Y5/4 light olive brn, Iron staining from 94.4-94.7, laminae from 95.8-97.2, 80% Felsic, 20% Mafic	Aliquot 93.7-95.7

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	10/20/16

A-6006-993 (REV 0)

BOREHOLE LOG (Cont.)

Page 5 of 6

Date: 10/20/16

Well ID: C9514 | Well Name: NA | Location: 216-S-21 Crib

Depth (ft)	Sample	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
97.5	Core 14		97.1 – 99.4: Sand (S) 100%: vf-vc, predom m-c, 65% Felsic, 35% Mafic, trace mica, SA rhythmites throughout, grades to gravelly Sand iron staining, 2.5Y 6/2 light brnish gray, dry, no rxn w/HCl	Sonic Core
				Core 14 B36133 97.1 – 102.1
100			99.4 – 102.1: Gravelly Sand (gS): Gravel 20%, 80% Sand; Gravel: vf peb – 4cm, SR-R, 50% Mafic, 50% Felsic, gravel size increases w/ depth, Felsic content increases w/ depth; Sand: vf-vc, 60% Felsic, 40% Mafic, SA; rhythmites → 99.4 – 101.2, massive from 101.2 to 102.1, dry, iron staining, mod rxn w/ HCl @ 101.2-102.1, no rxn w/HCl from 97.1 – 101.2, 2.5Y 5/2 grayish brn, PS, f-m sand from 100.3 – 100.9. 2.5Y 6/2 light grayish brn VR 10/26/16	
102.5	Core 15			Core 15 B36135 102.0 – 107.0
105			102.0 – 102.8: Gravelly Sand (gS): 75% ~~Gravel~~ sand, 25% ~~Sand~~ gravel, Gravel: f peb – 9cm, SR-R, 60% Felsic w/granite, 40% Mafic; Sand: f-c predom med., 70% Felsic, 30% Mafic, SA; dry, PS, no – wk rxn w/ HCL, 2.5Y 6/3 light yellowish brn VR 10/26/16	
			102.8 – 107.0: No recovery	
107.5	Core 16		107.2 – 112.2: Gravelly Sand (gS): 85% Sand, 15% Gravel; Gravel: vf peb – 3cm, 60% Felsic, 40% Mafic, pebbles predom. mafic, cobbles predom felsic; Sand: vf – c, predom c, 60% Felsic, 40% Mafic, trace mica, SA, no rxn w/HCl, 2.5Y 6/2 light brnish gray	Core 16 B36137 107.2 – 112.2 SR-R 10/20/16
110				
112.5	Core Opt. 17		112.2 – 114.8: Sand (S) 100%: vf-vc, predom. f-medium, trace mica, 70% Felsic, 30% Mafic, dry, no rxn w/HCl, coarse-grained layers 113.2 – 113.5, iron staining	Core Optional 17 112.2 – 117.2 B36139 Aliquot 114.8 – 115.8
115			114.8 – 115.9: Silty sand (mS): 60% Sand, 40% Silt, Interbedded sand & silt beds/laminae, Sand: vf-f, 80% Felsic, 20% Mafic, trace mica, moist, no rxn w/ HCl, 2.5Y 6/3 light yellowish brown, suspect charcoal fragments & iron staining @ contact (114.8) or wood bits	
			115.9 – 117.2: Silt (M): 100%, moist, 2.5Y 6/2 light brnish gray, wk rxn w/HCl, vf laminae (crossbedded), non-plastic	

Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	10/20/16

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BOREHOLE LOG (Cont.)

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Date: 10/20/16

Well ID: C9514 | Well Name: NA | Location: 216-S-21 Crib

Depth (ft)	Sample (JR 10/20/16)	Graphic Log	Sample Description: Sediment Classification, Grain Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Particle Size, Reaction to HCl, Other	Comments: Depth of Casing, Drilling Method, Sampling Method, Sampler Size, Water Level, Other
117.5	Core Optional 18		117.4-117.7: Silt (M) 100%, moist, 2.5Y 6/2 light brnish gray, wk rxn w/HCL, vf laminae (crossbedded)	Sonic Core
			117.7-120.9: Sand (S) 100%; vf-med, dry, 85% felsic, 15% Mafic, SA, WS, iron staining (JR 10/20/16) horizontal, rhythmites ~~thinning~~ JR 10/20/16 to 120.2, no rxn w/HCL linear	Core Optional 18 117.4 - 122.4
120			120.2-120.9: massive (gradational contact)	B36141
			120.9-122.4: Interbedded silt and sand layers	
			Sand: vf-f, 90% felsic, 10% Mafic, no rxn w/HCL, SA, 2.5Y 7/2 light gray, MS, 0.5-3cm thick	
			Silt: 2.5Y 5/3 light olive brn, strong rxn w/HCL, non plastic, 0.5-2cm thick, laminated; dry	
			rhythmites and/or graded ~~layers~~ JR 10/20/16 w/ thin sand layers, silt lenses 120.9-121.1	
122.5	Core Optional 19		122.0-124.3: Silt (M): moist, 2.5Y 5/3 light olive brn, vf laminae, no rxn w/HCL, 100% Silt, non-plastic	Core Optional 19 122.0 - 127.0
			124.3-125.3: Sandy silt (sM): 60% Silt, 40% Sand	B36143
			Sand: vf, 95% felsic, 5% Mafic, trace mica; dry, 2.5Y 5/3 light yellowish brn, laminae & very thin beds throughout,	Aliquot 123.5 - 125.0
125			platy structure	
			125.3-127.0: Silt (M): 70% Silt, 30% Clay, moist, low plasticity, wk-mod rxn w/HCL, 2.5Y 5/3 light olive brn	
127.5			Total Depth 127.0	
130			JR 10/20/16	
132.5				
135				

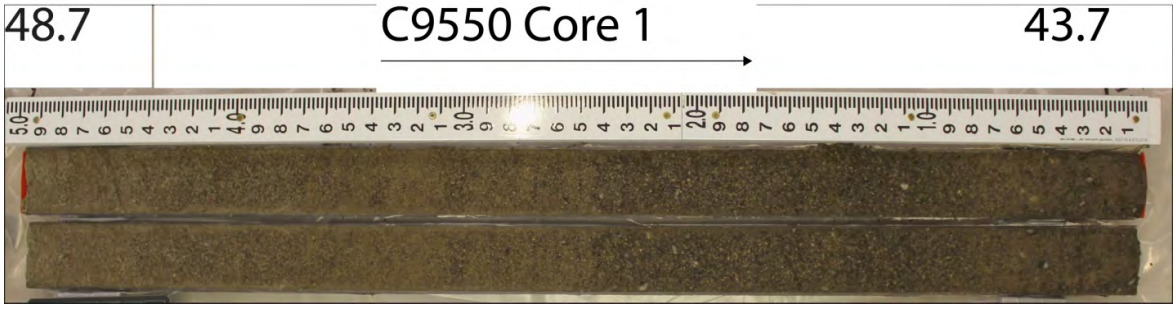
Reported By:

Print Name	Title	Signature	Date
Jen Russell	Geologist	Jen Russell	9/21/16

A-6006-993 (REV 0)

Appendix H

Core Photos for 200-DV-1 Operable Unit Boreholes


48.7
C9550 Core 1
43.7

52.9
C9550 Core 2
47.9

58.0
C9550 Core 3
53.0

63.0
C9550 Core 4
58.0

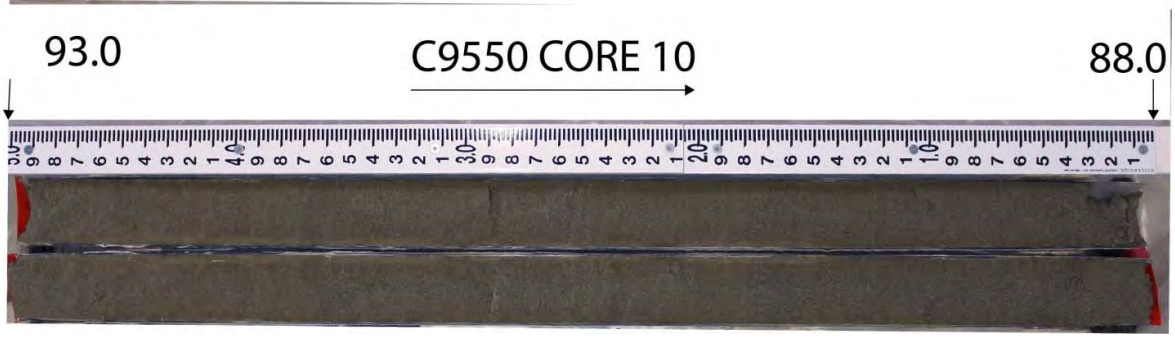
68.2
C9550 Core 5
63.2

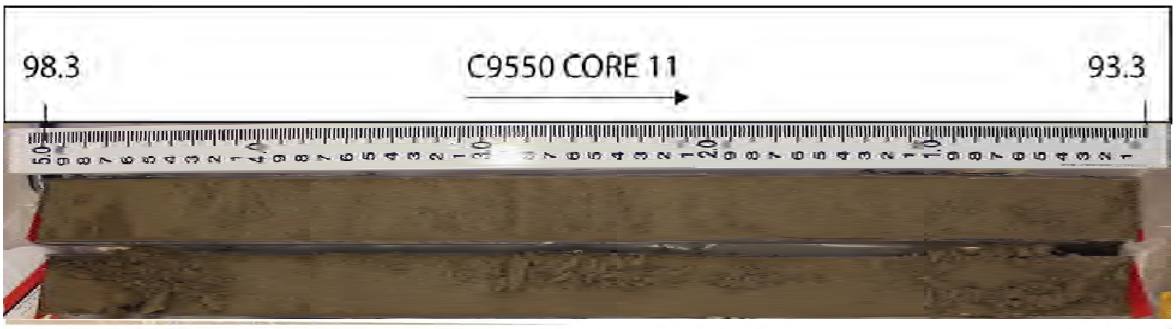
73.0
C9550 Core 6
68.0

78.1
C9550 Core 7
73.1

83.1
C9550 CORE 8
78.1

88.2
C9550 CORE 9
83.2


93.0
C9550 CORE 10
88.0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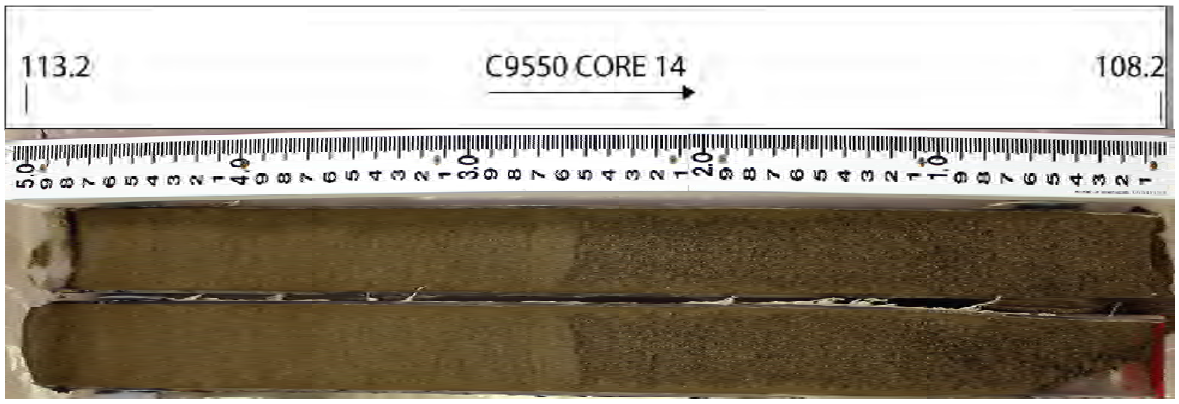
93.3

103.1
C9550 CORE 12
98.1

108.2
C9550 CORE 13
103.2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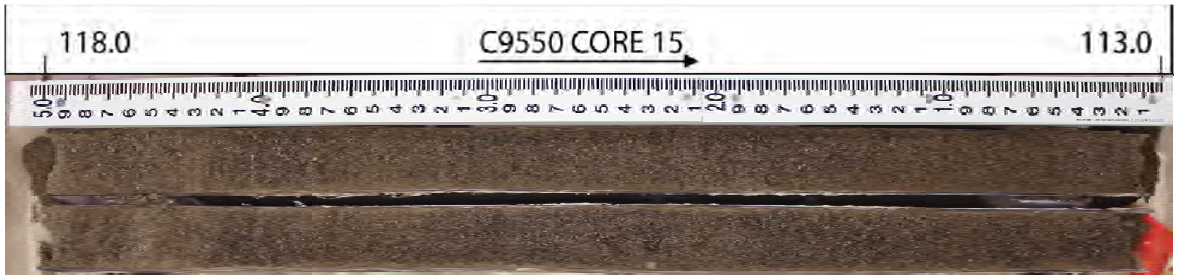
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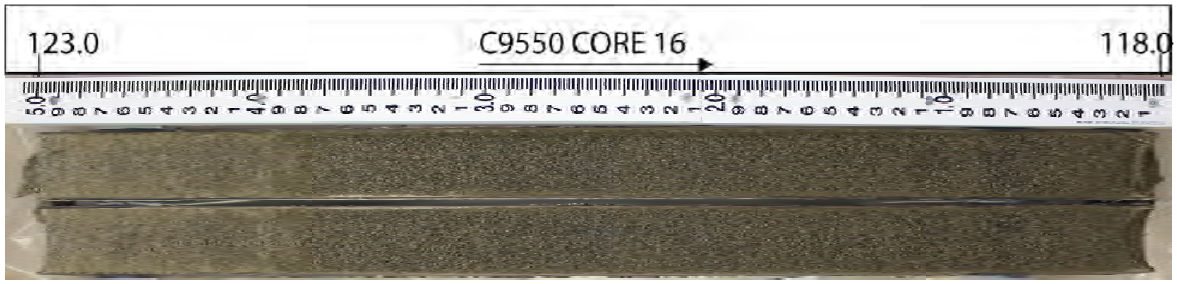
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C9550 CORE 17
123.1

133.0
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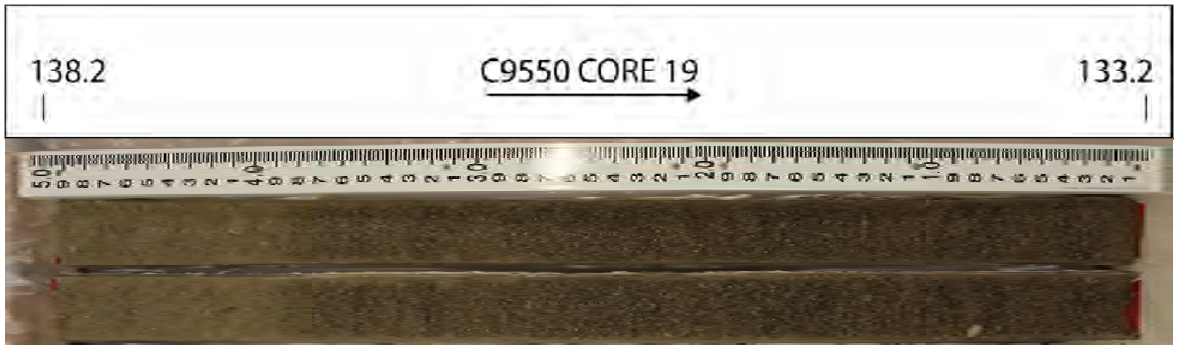
128.0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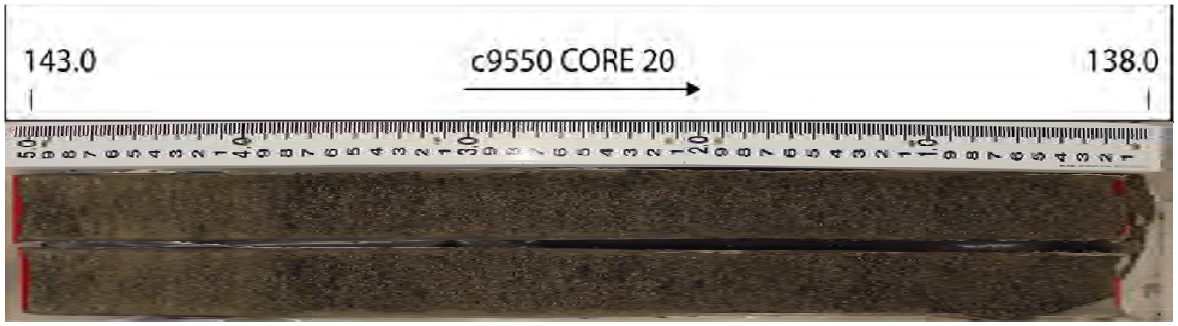
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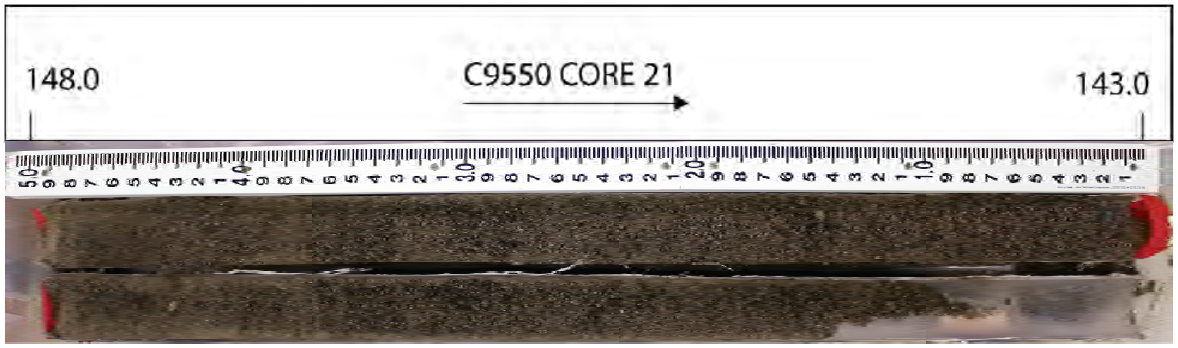
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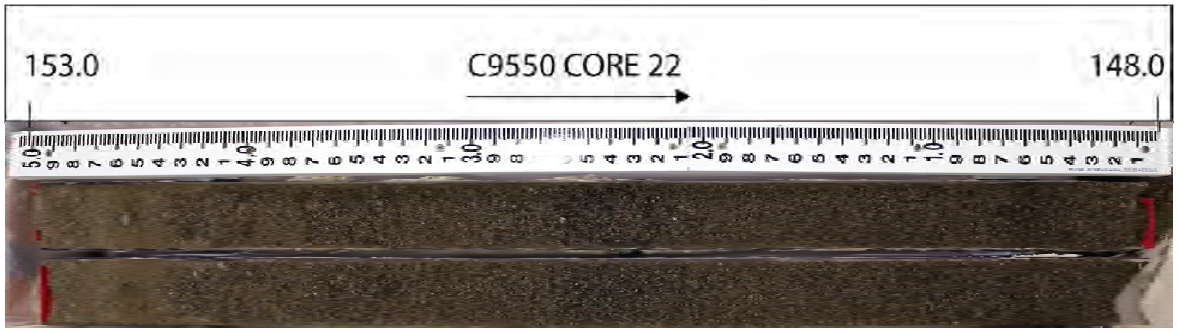
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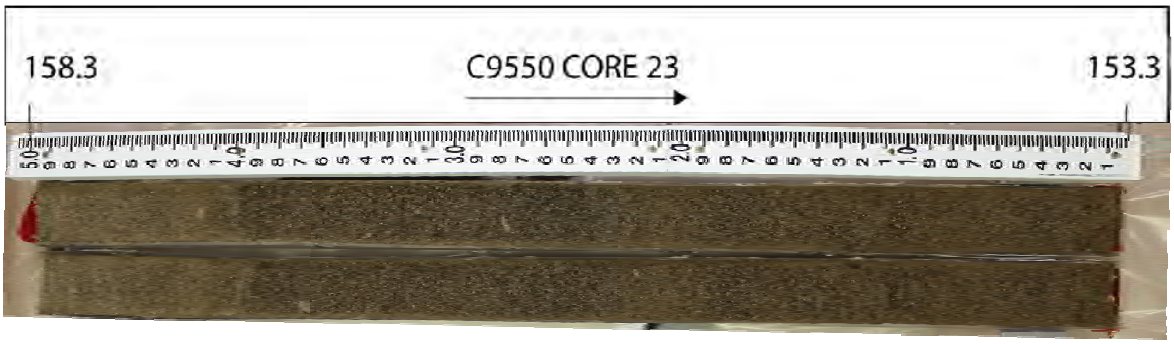
158.3
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153.3

163.0
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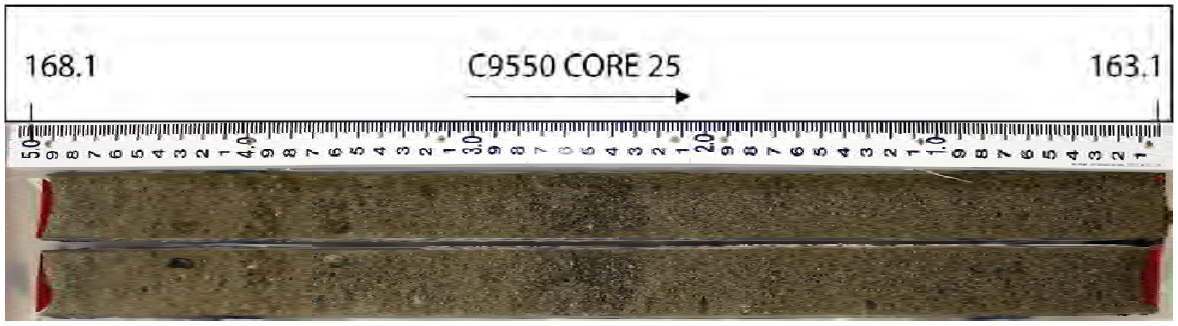
158.0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173.0
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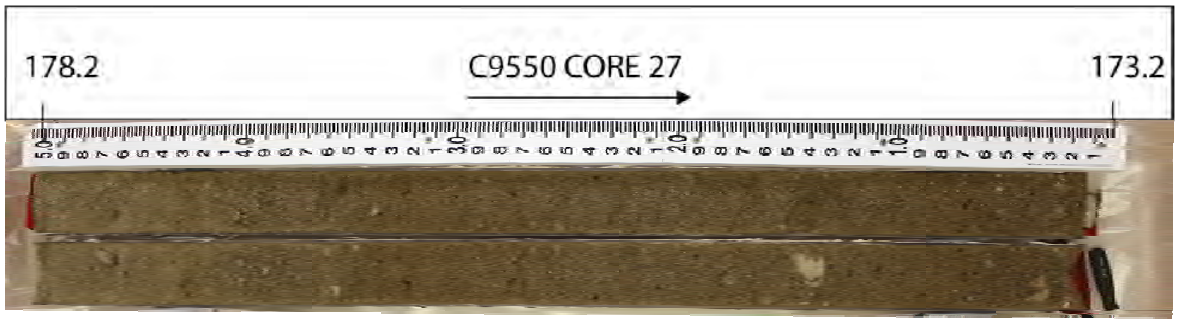
168.0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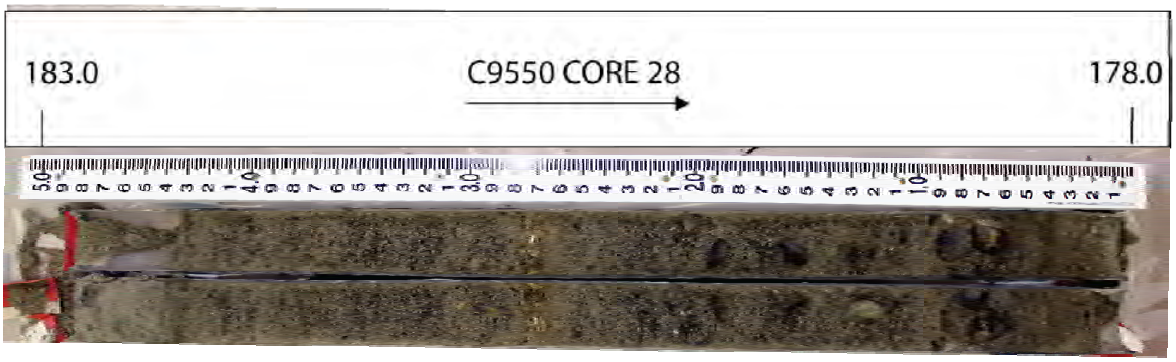
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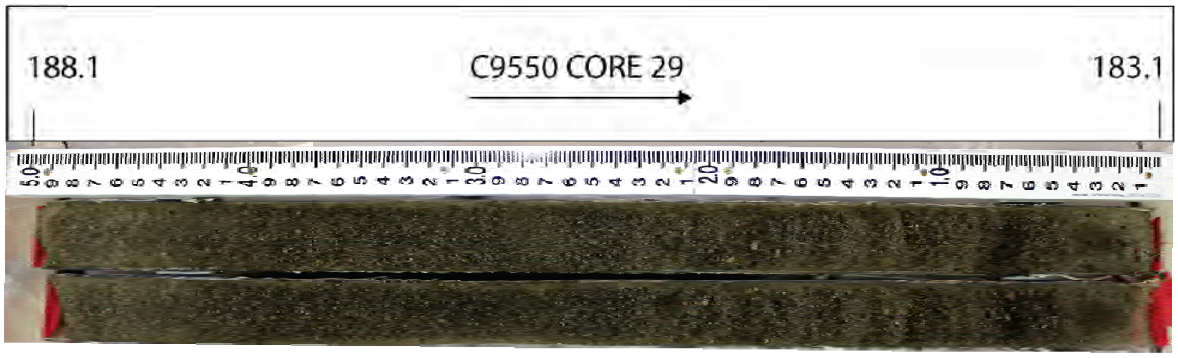
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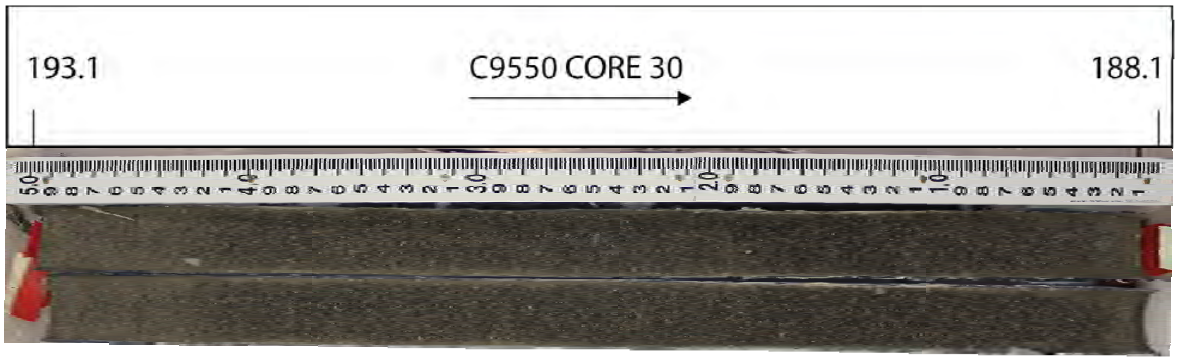
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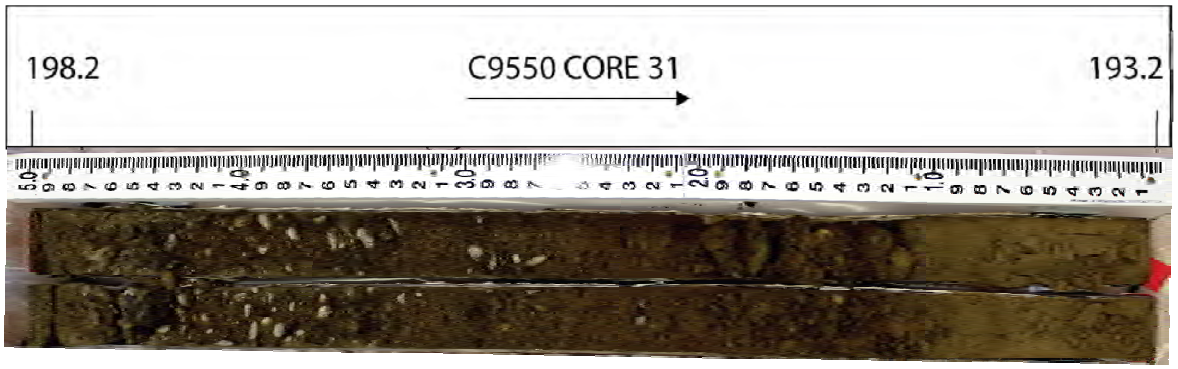
198.2
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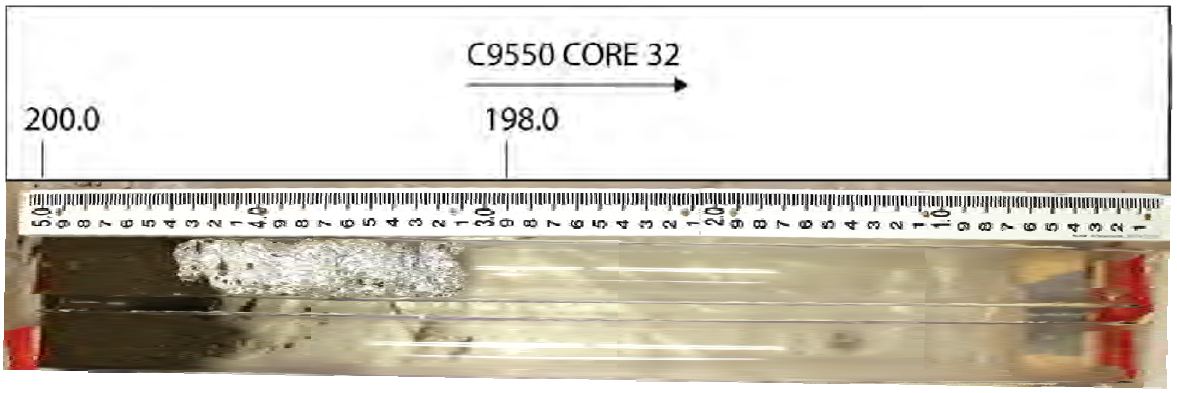
193.2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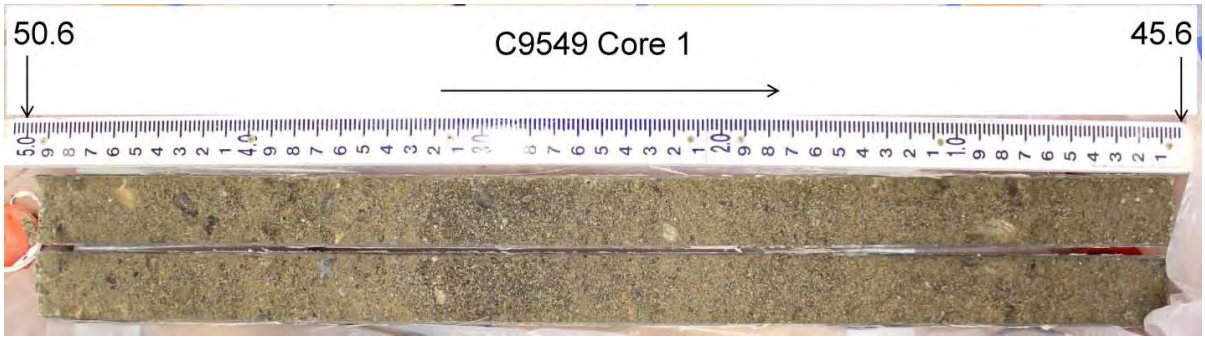
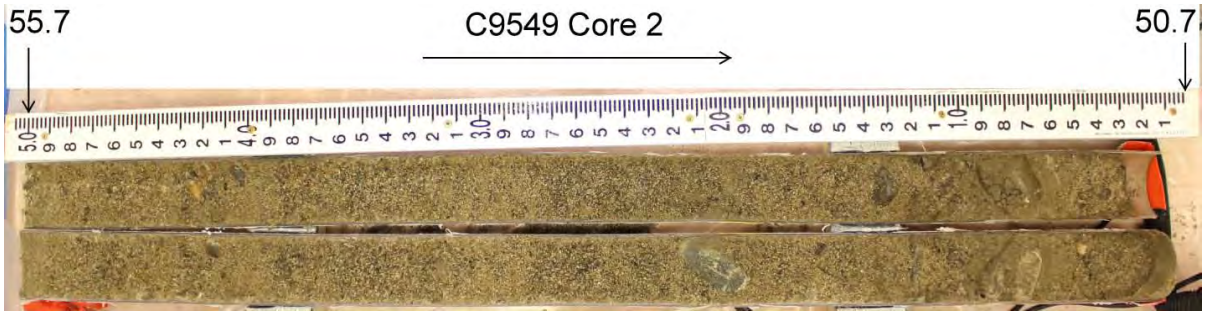
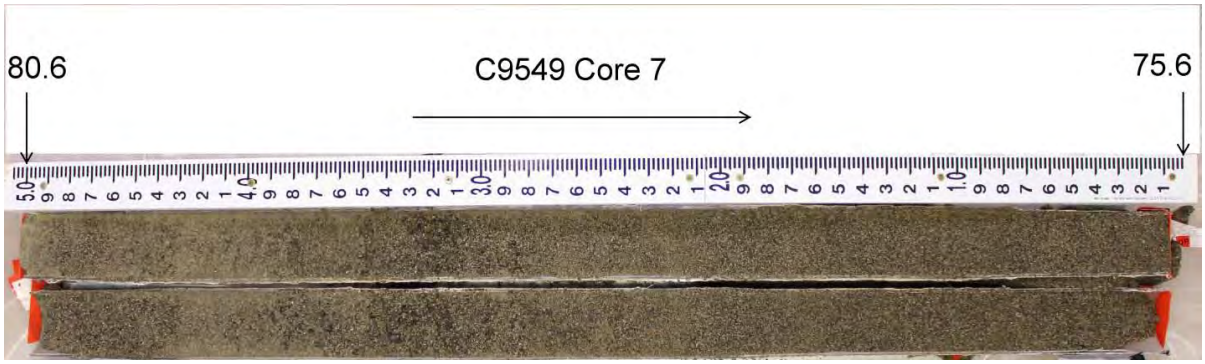

50.6
C9549 Core 1
45.6


55.7
C9549 Core 2
50.7


80.6
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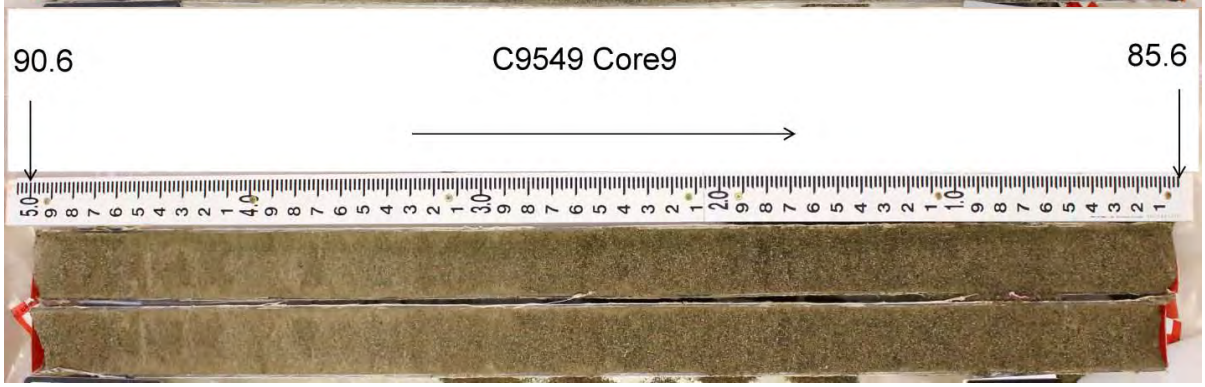
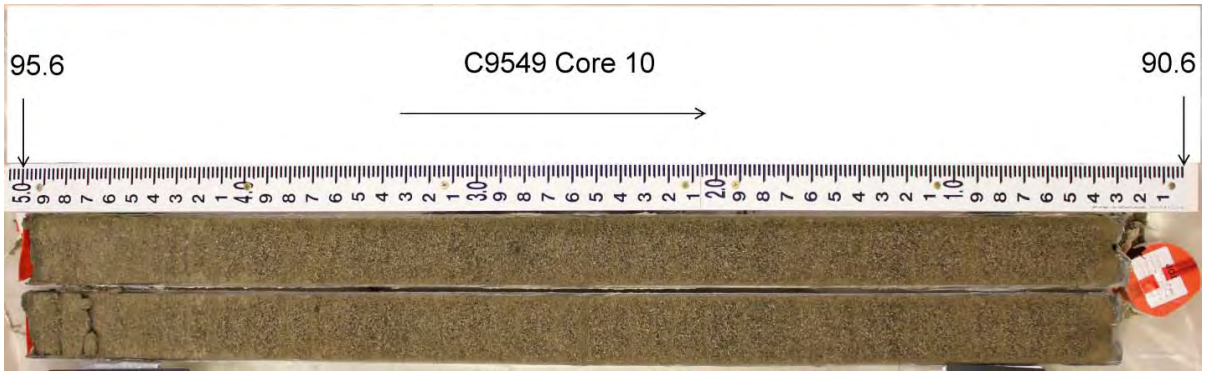
75.6

85.7
C9549 Core8
80.7


90.6
C9549 Core9
85.6


95.6
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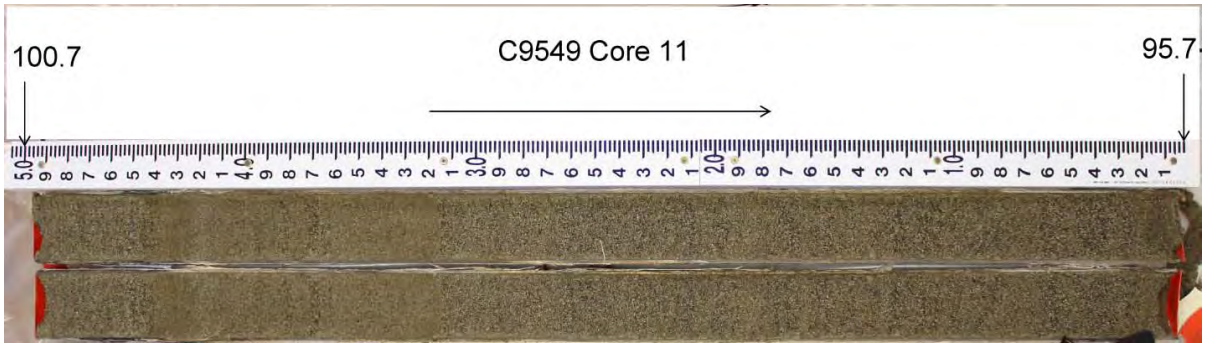
90.6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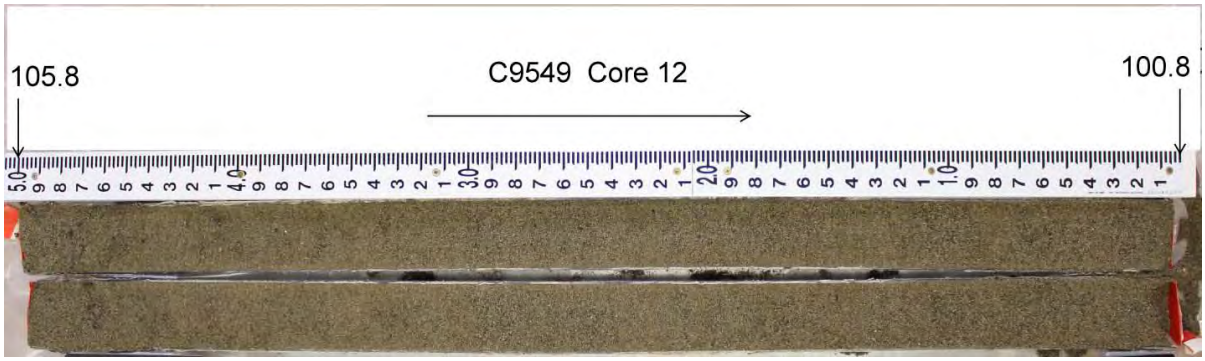
95.7


105.8
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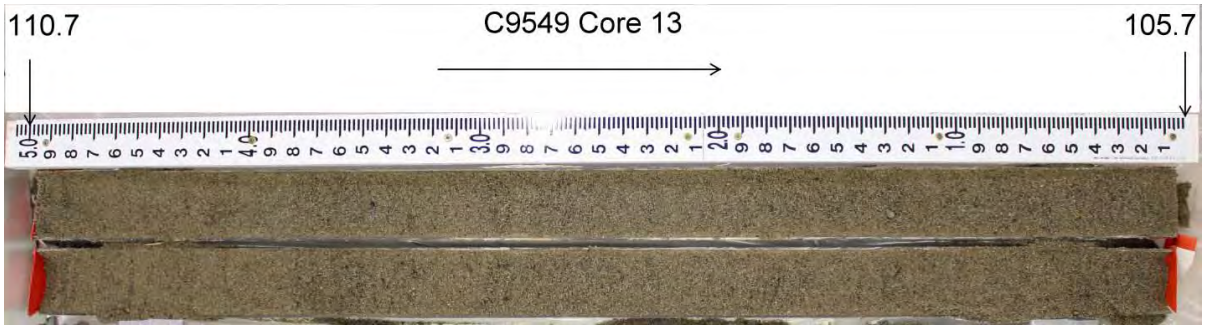
100.8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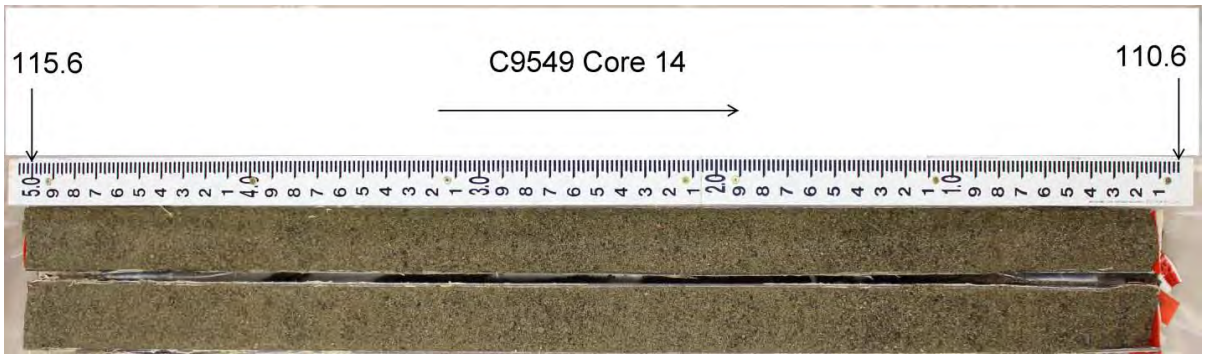
115.6
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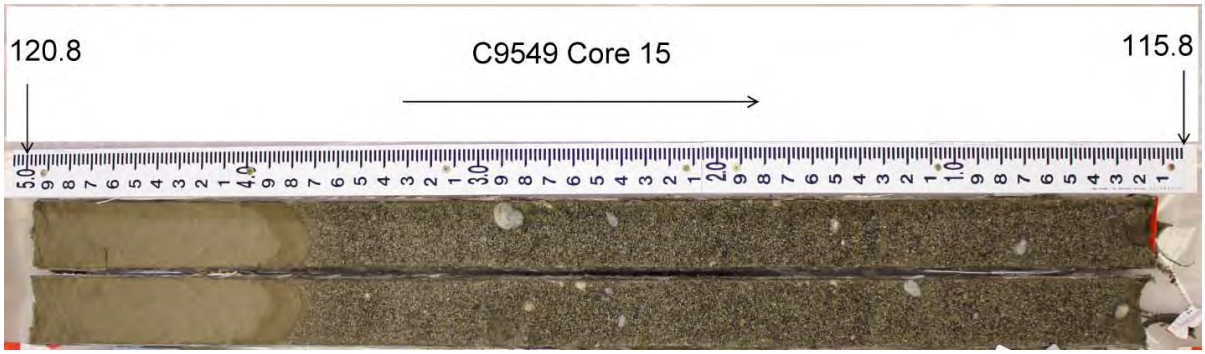
120.8
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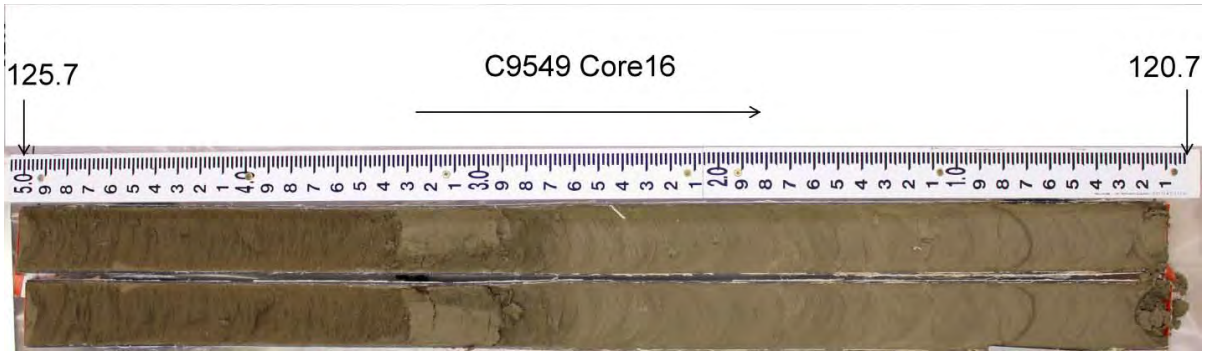
115.8


125.7
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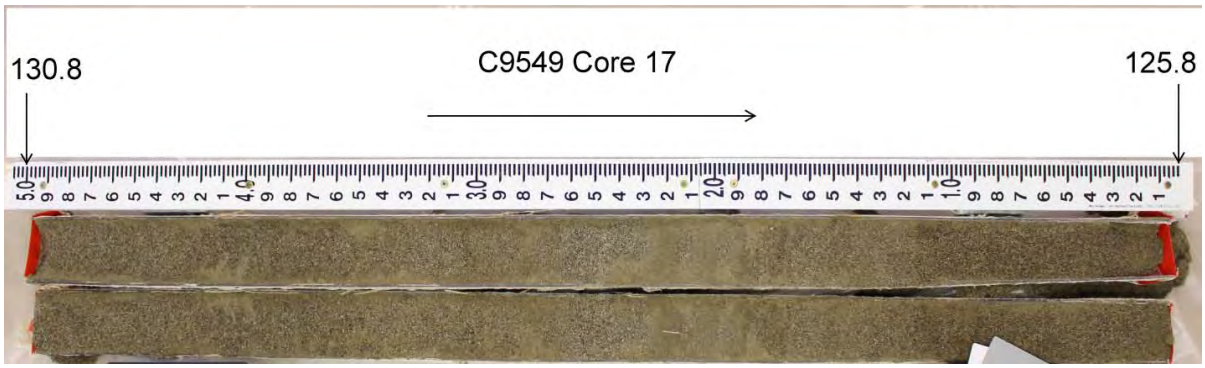
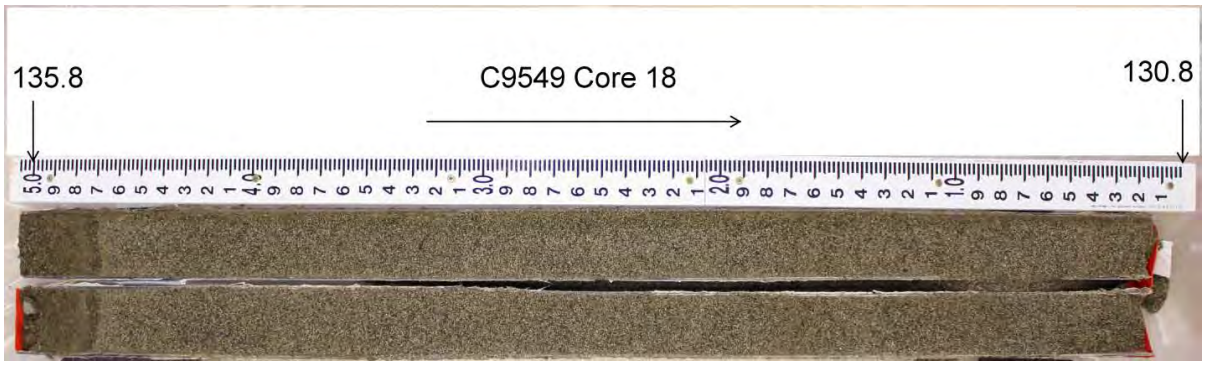
120.7


130.8
C9549 Core 17
125.8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130.8

140.7
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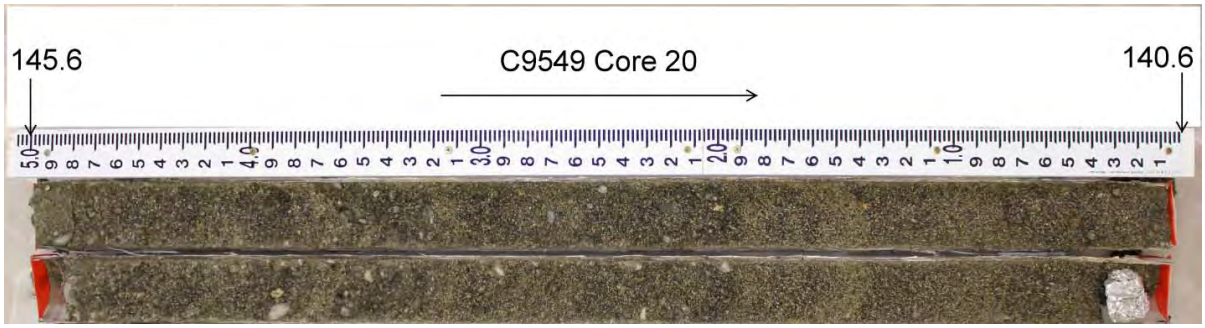
135.7


145.6
C9549 Core 20
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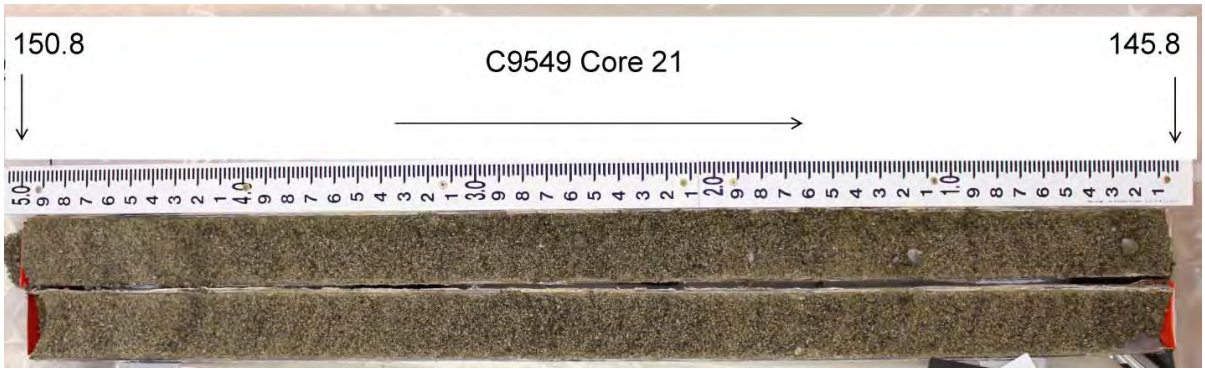
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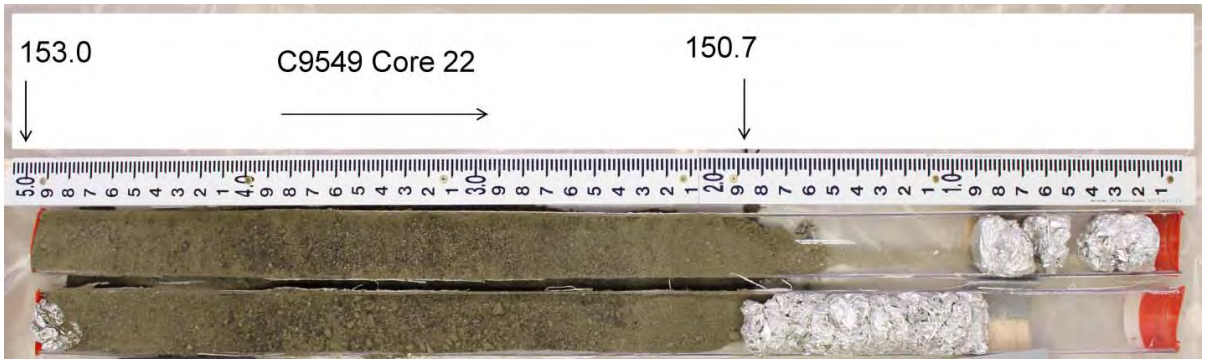
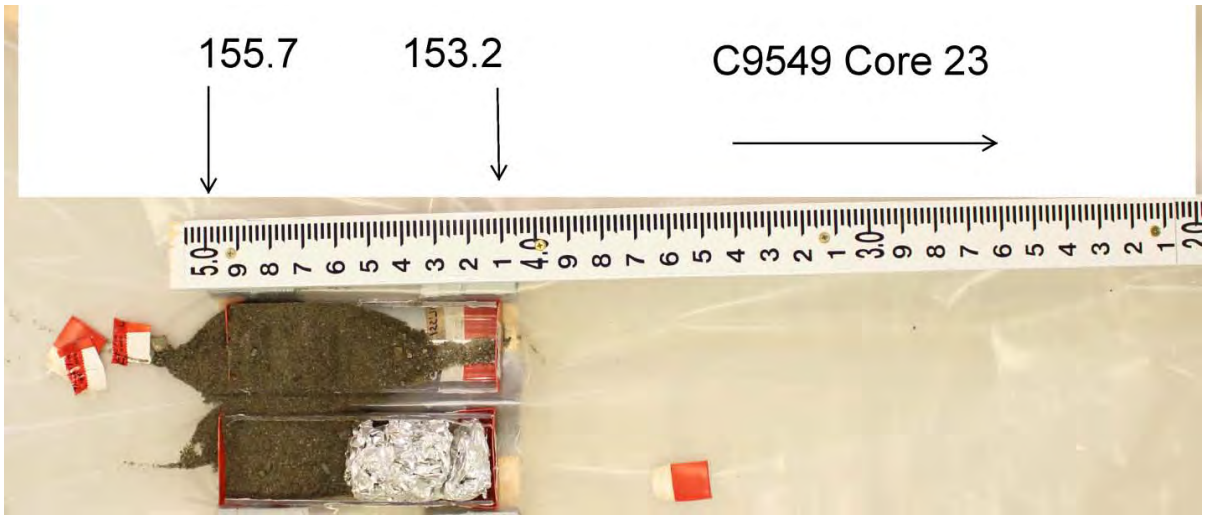
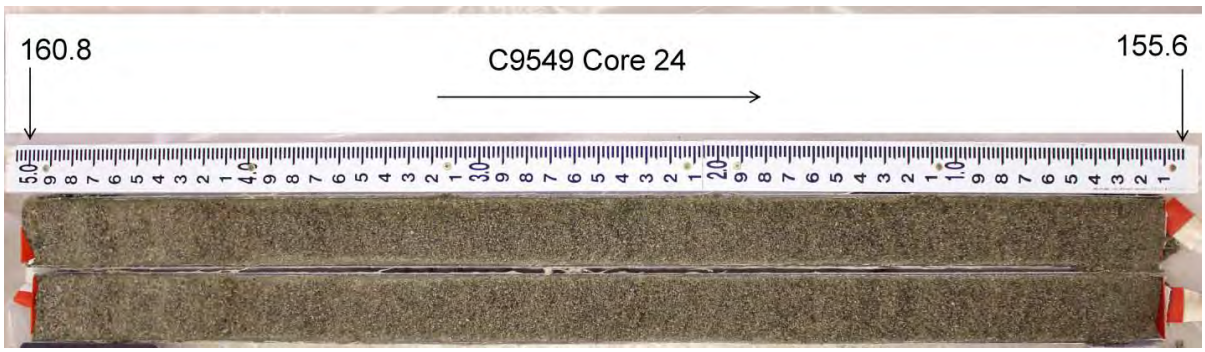
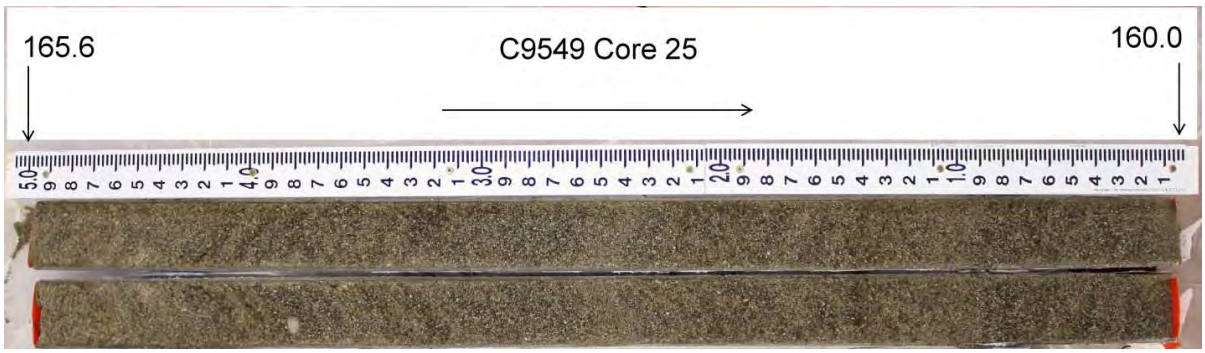
145.8


153.0
C9549 Core 22
150.7


155.7
153.2
C9549 Core 23


160.8
C9549 Core 24
155.6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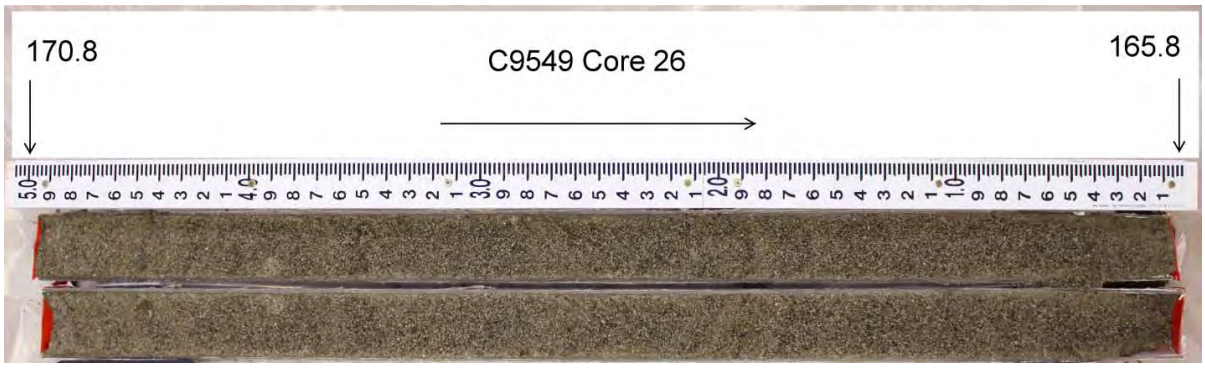
160.0


170.8
C9549 Core 26
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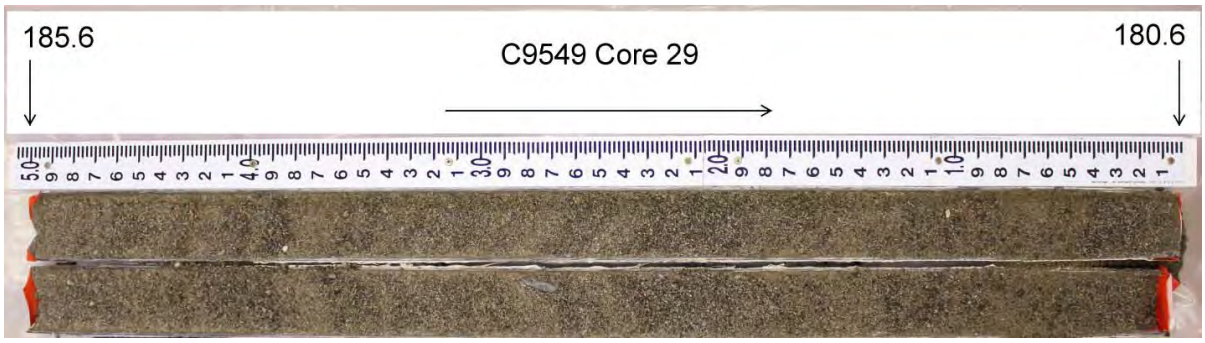
175.7
C9549 Core 27
170.7

180.8
C9549 Core 28
175.8


185.6
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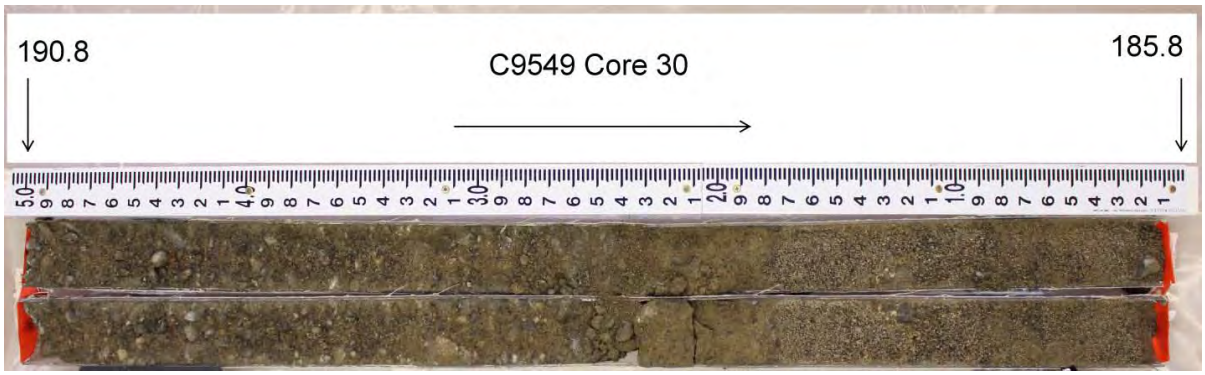
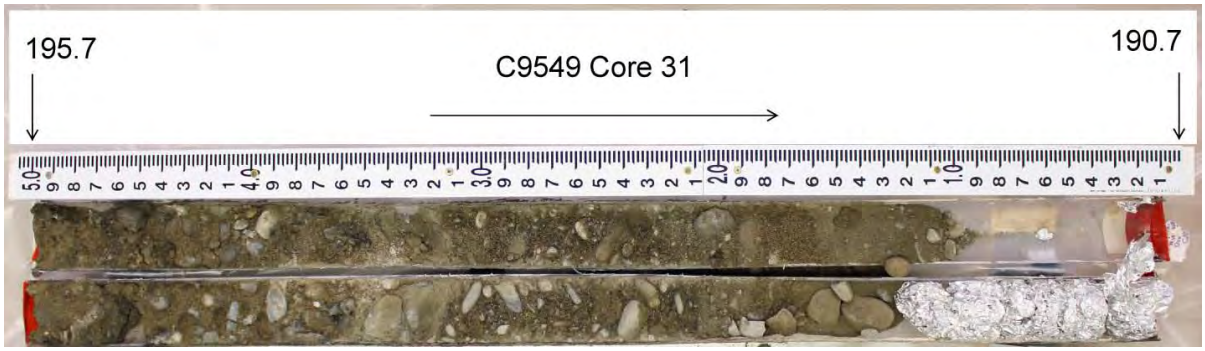
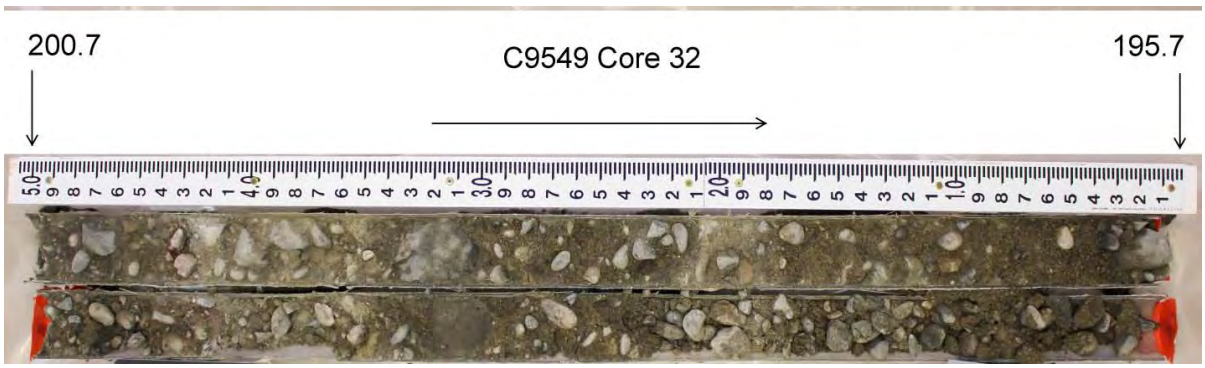
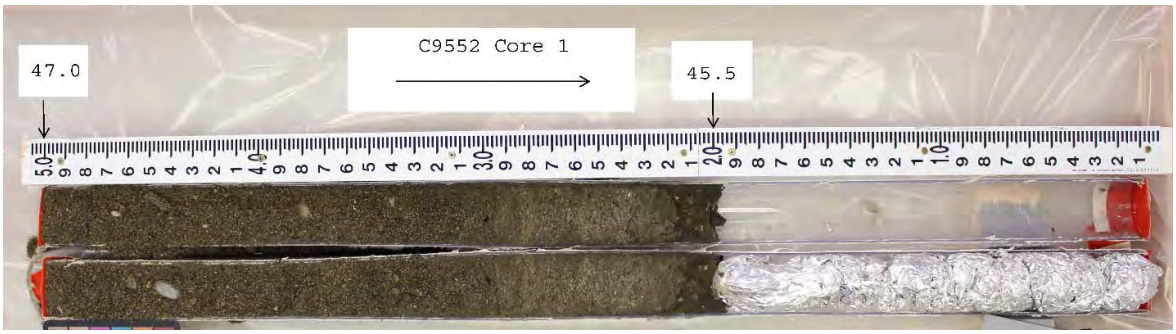
180.6


190.8
C9549 Core 30
185.8


195.7
C9549 Core 31
190.7


200.7
C9549 Core 32
195.7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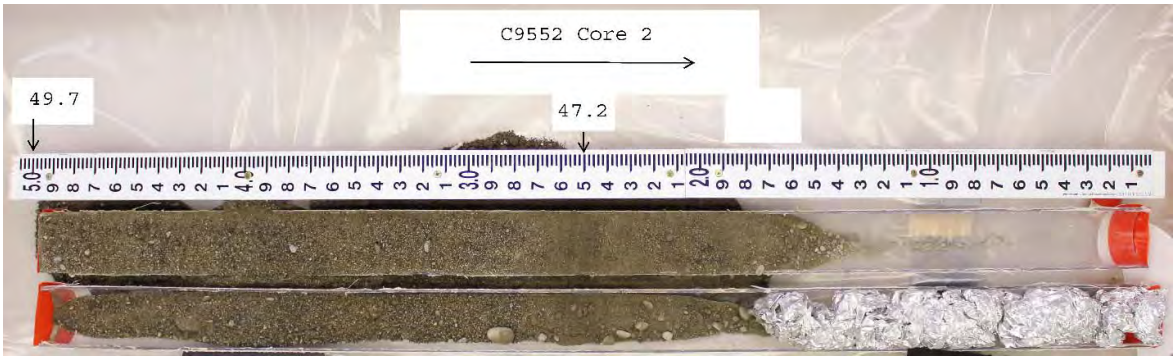
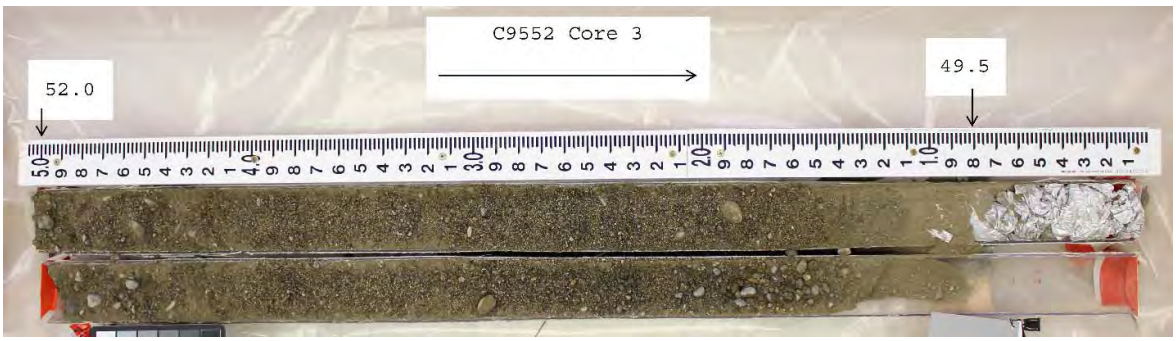
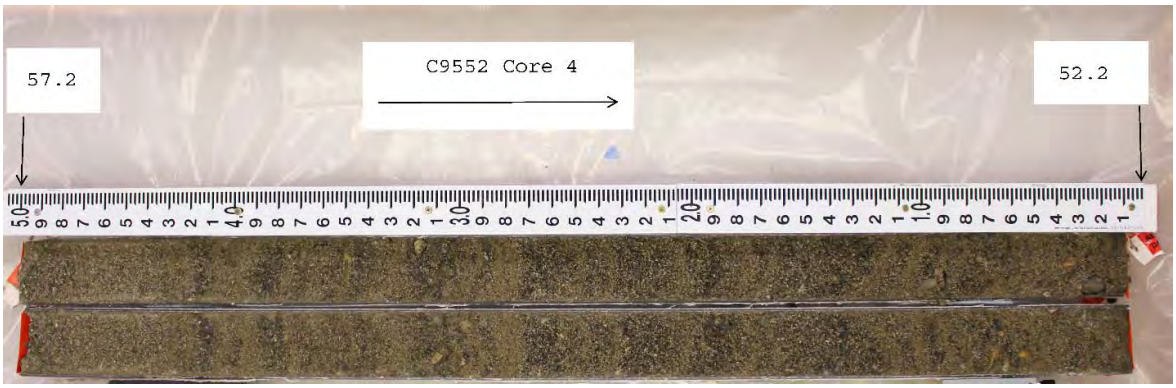
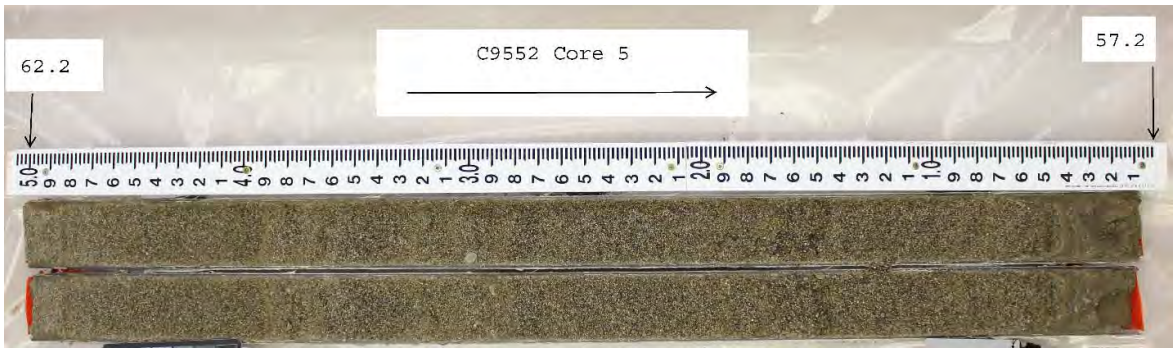
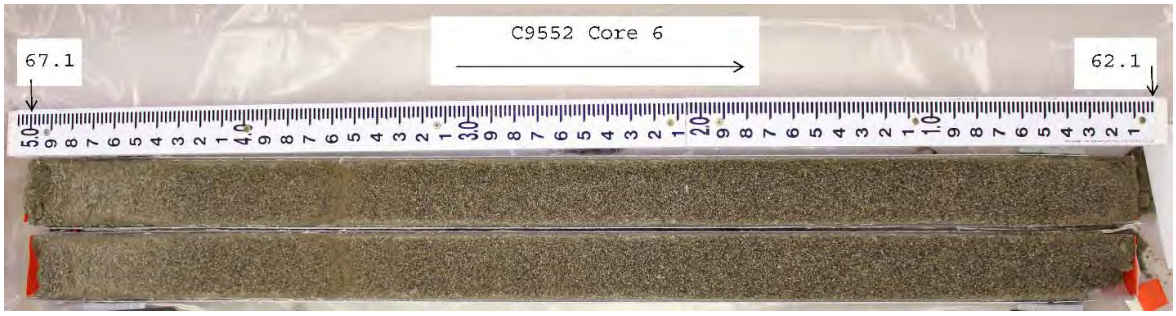
47.0
45.5

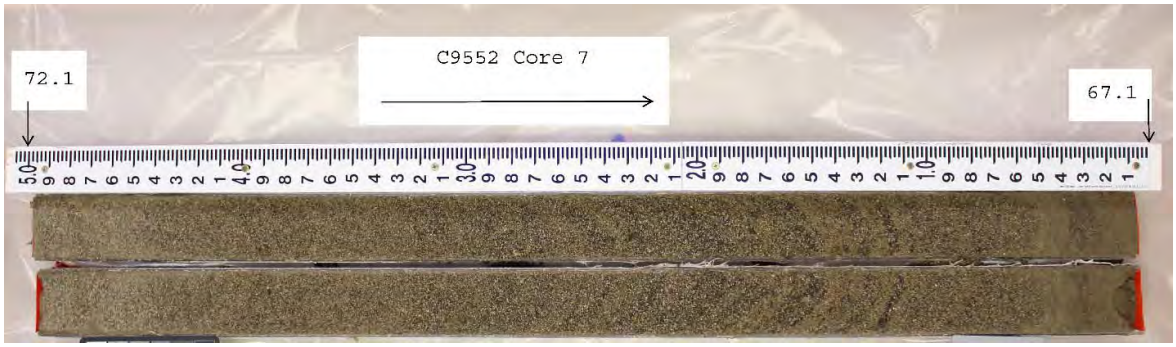

C9552 Core 2
49.7
47.2


C9552 Core 3
52.0
49.5


C9552 Core 4
57.2
52.2

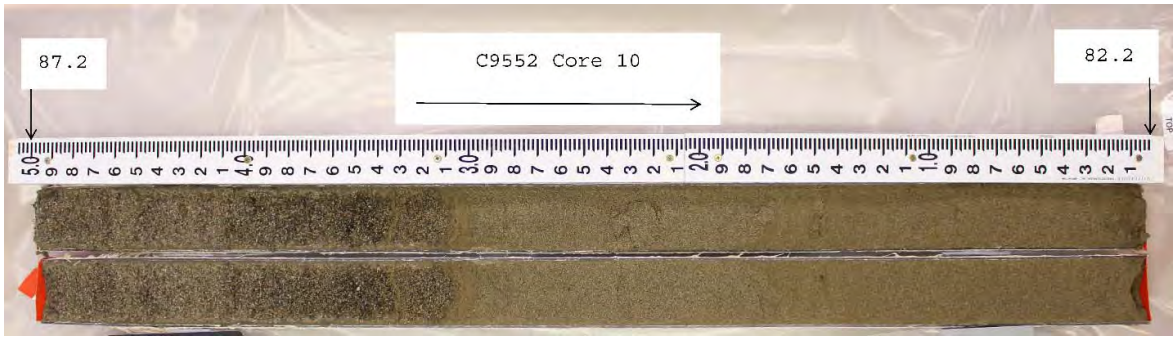

62.2
C9552 Core 5
57.2


67.1
C9552 Core 6
62.1


72.1
C9552 Core 7
67.1

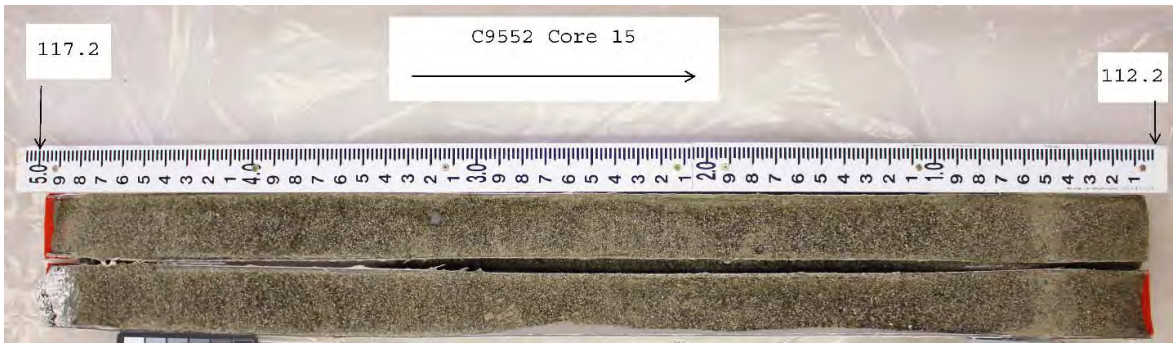
77.2
C9552 Core 8
72.2

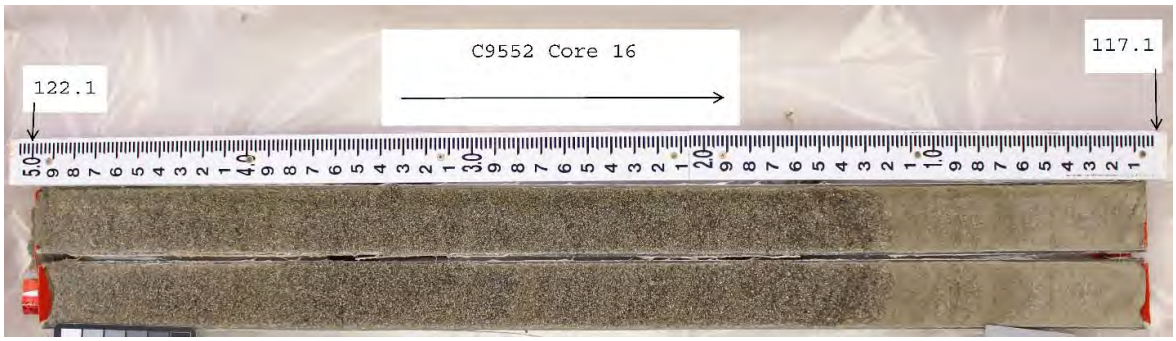
82.2
C9552 Core 9
77.2

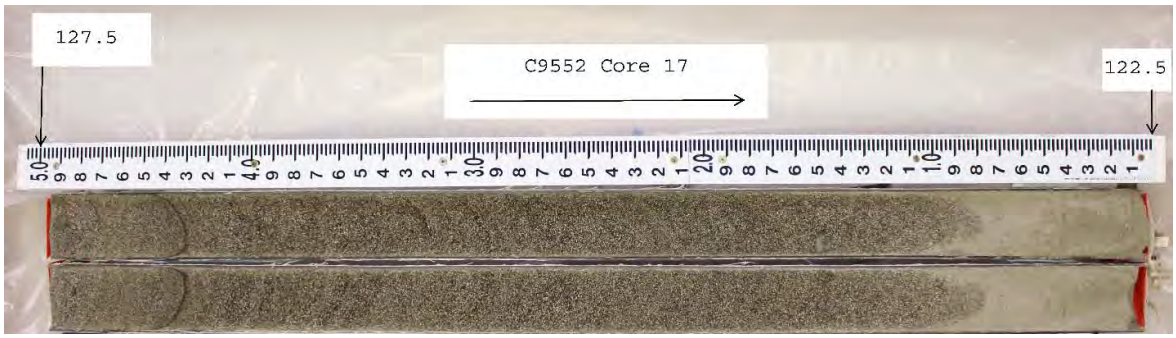

87.2
C9552 Core 10
82.2

92.1
C9552 Core 11
87.1

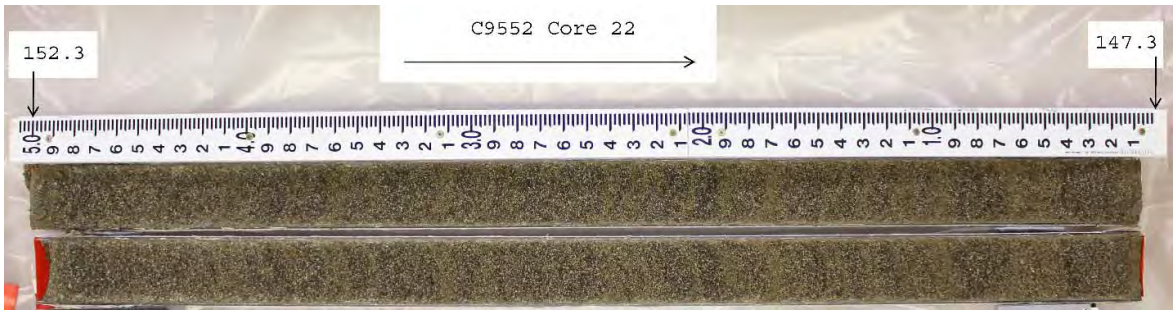
97.2
C9552 Core 12/Optional 1
92.2

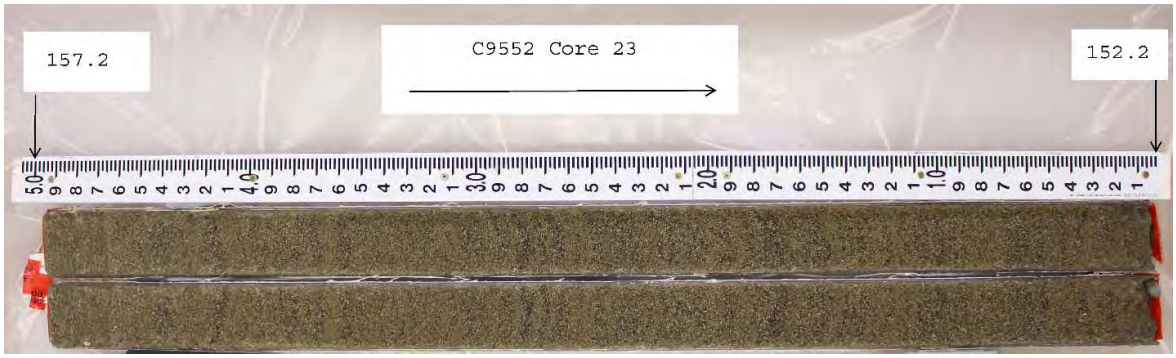

117.2
C9552 Core 15
112.2

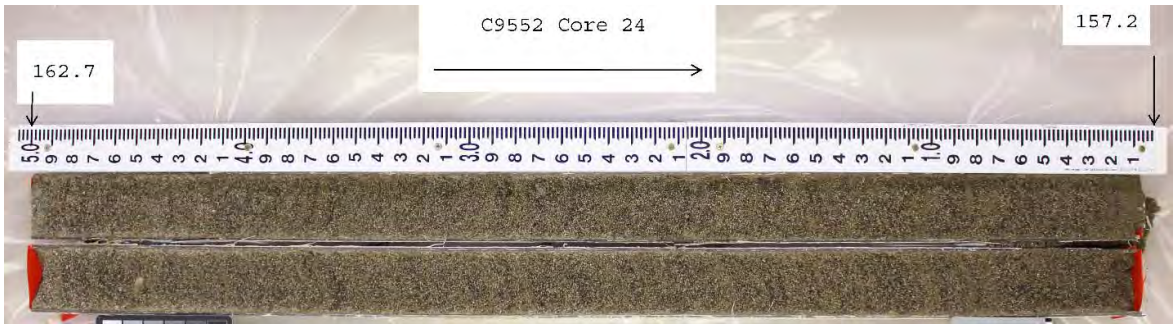

C9552 Core 16
122.1
117.1

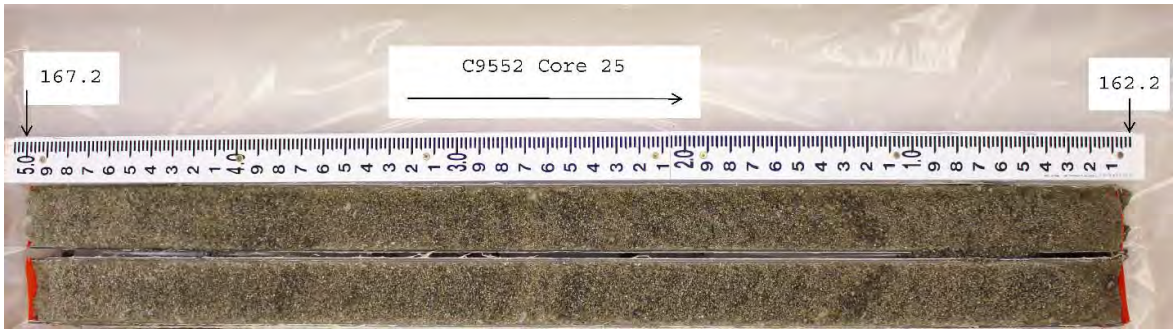

127.5
C9552 Core 17
122.5

147.3
C9552 Core 21
142.3


152.3
C9552 Core 22
147.3


157.2
C9552 Core 23
152.2


C9552 Core 24
157.2
162.7


167.2
C9552 Core 25
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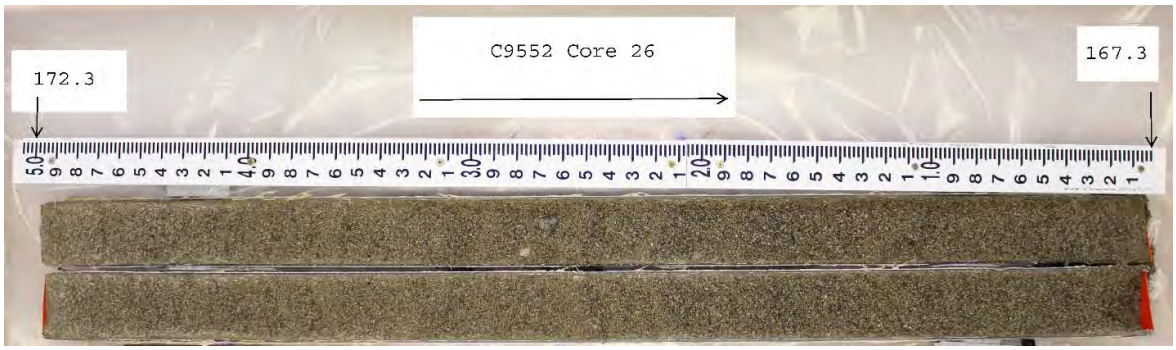
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167.3

C9552 Core 27
177.3
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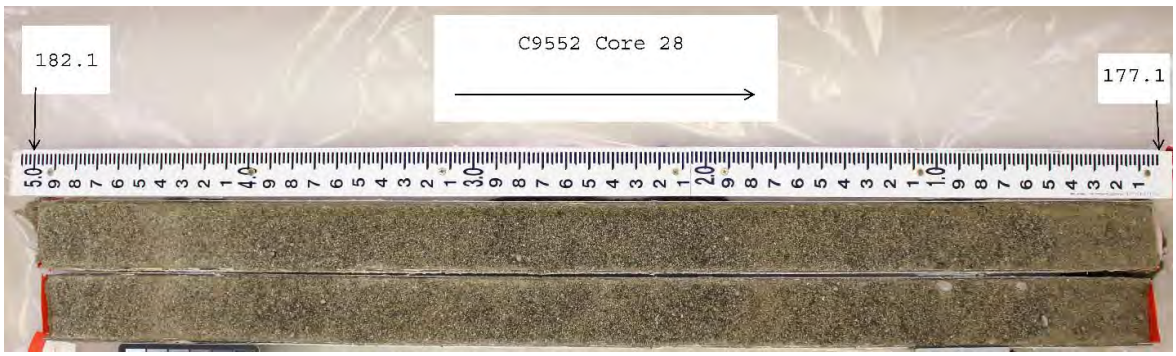
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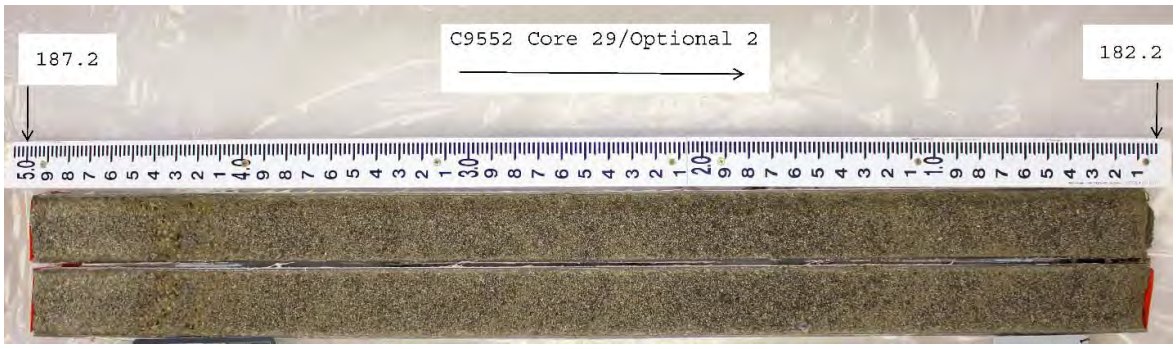
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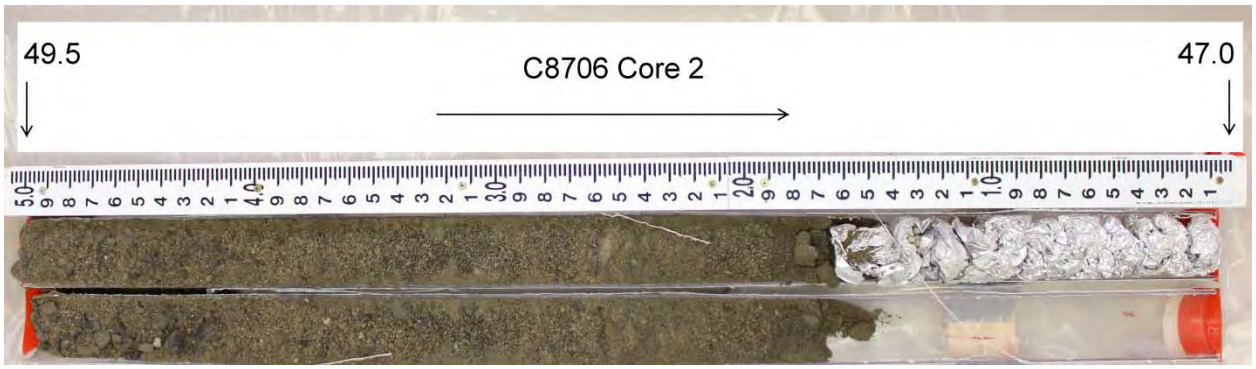
187.2
182.2

47.0
45.5
C8706 Core 1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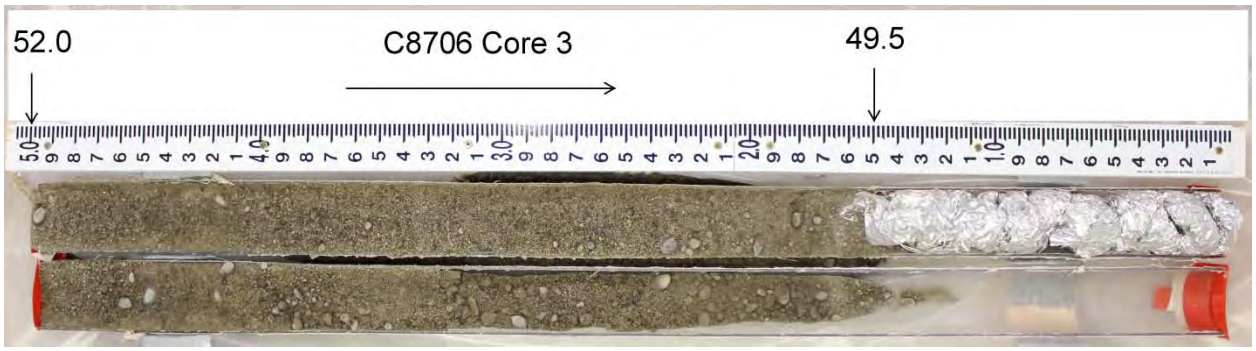
47.0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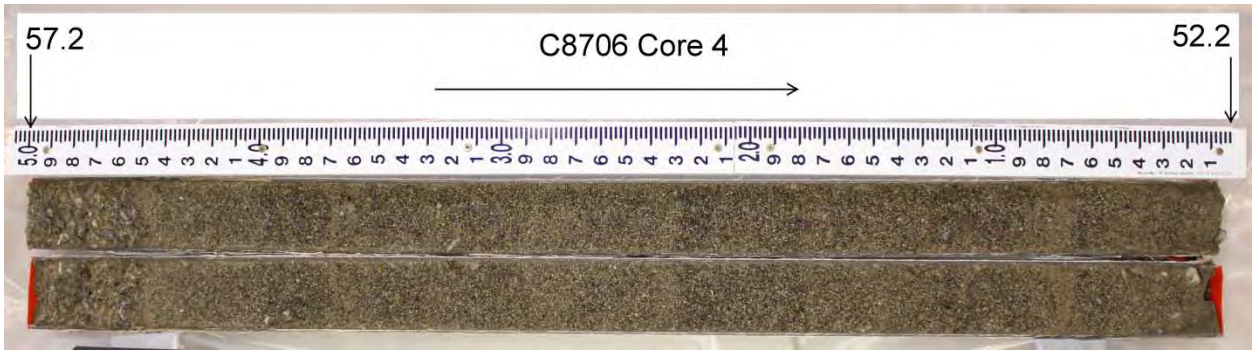
49.5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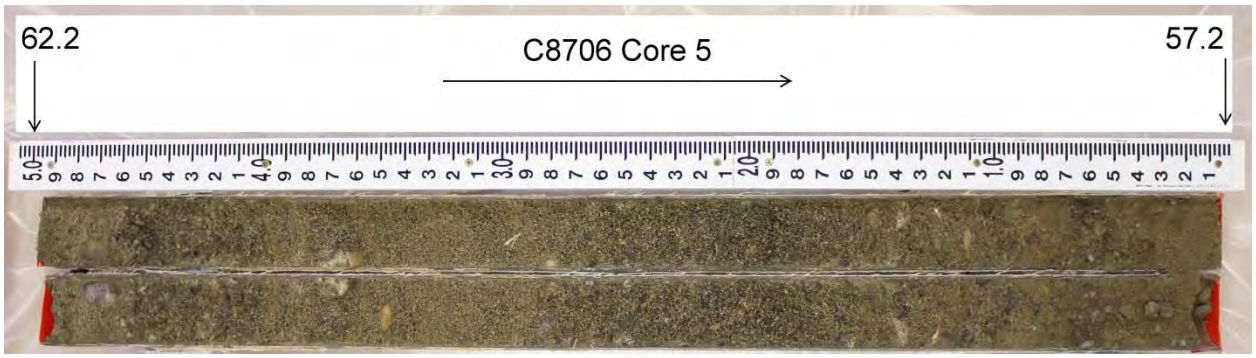
52.2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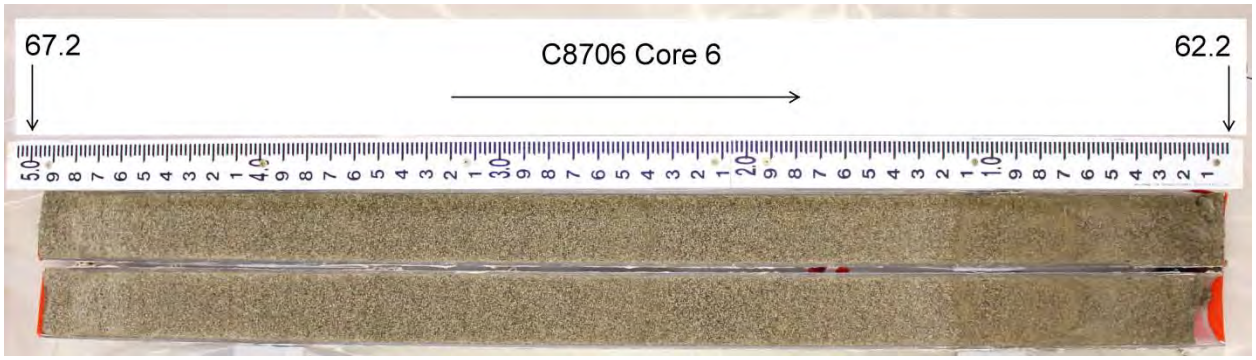
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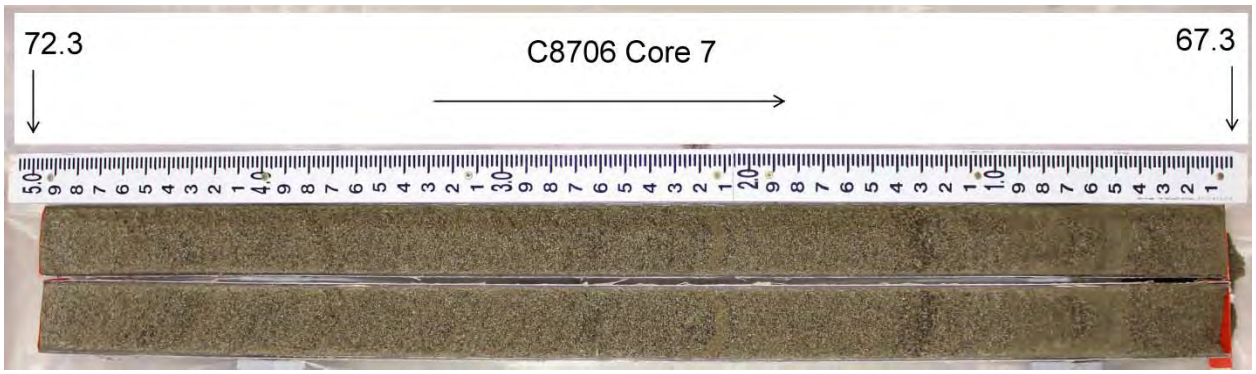
62.2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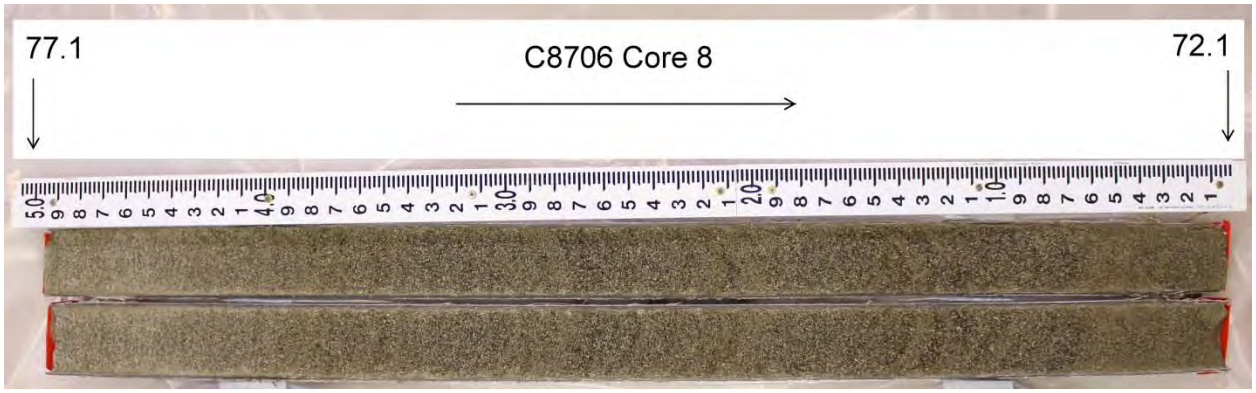
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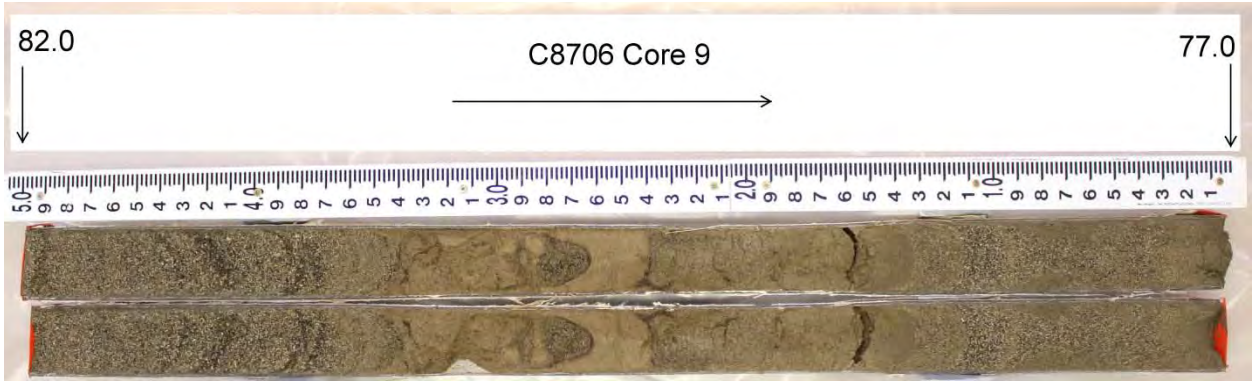
72.1


82.0
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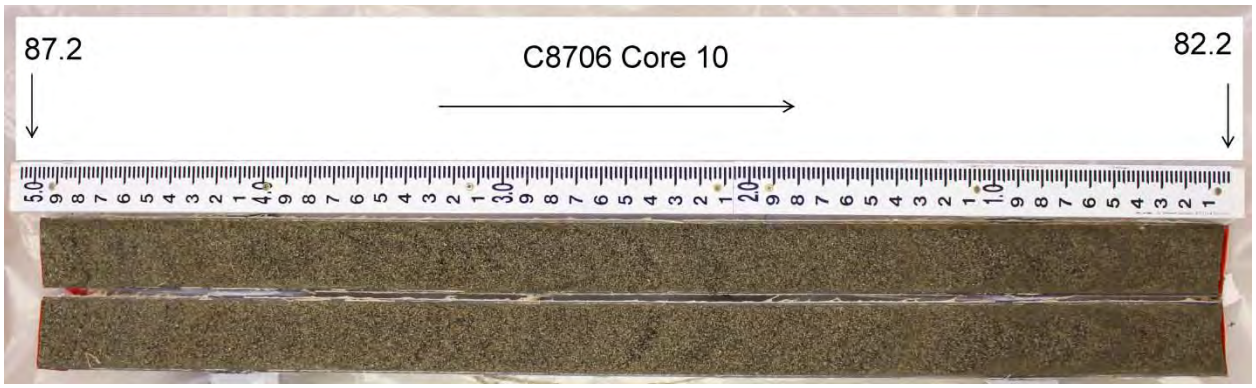
77.0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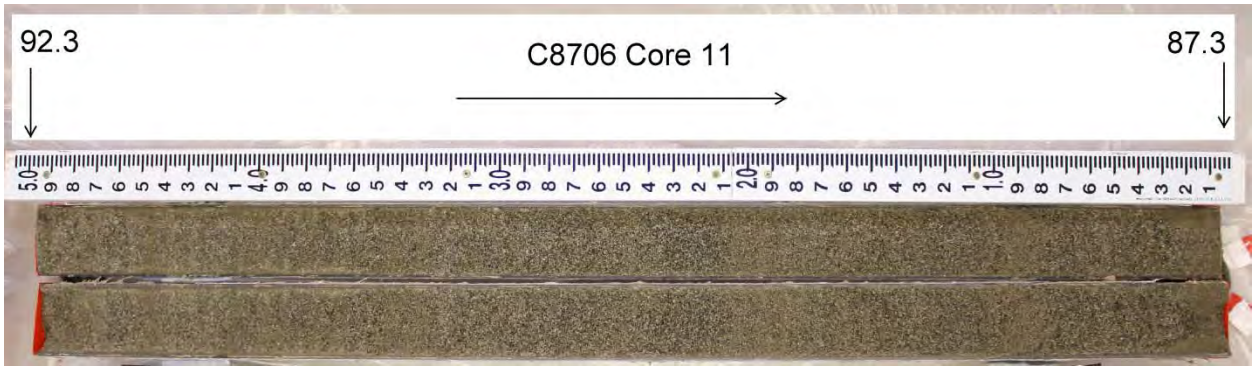
82.2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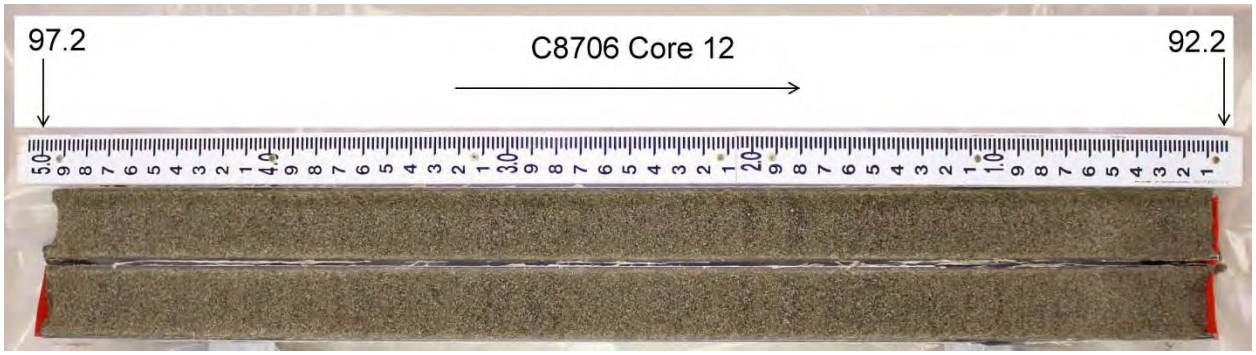
87.3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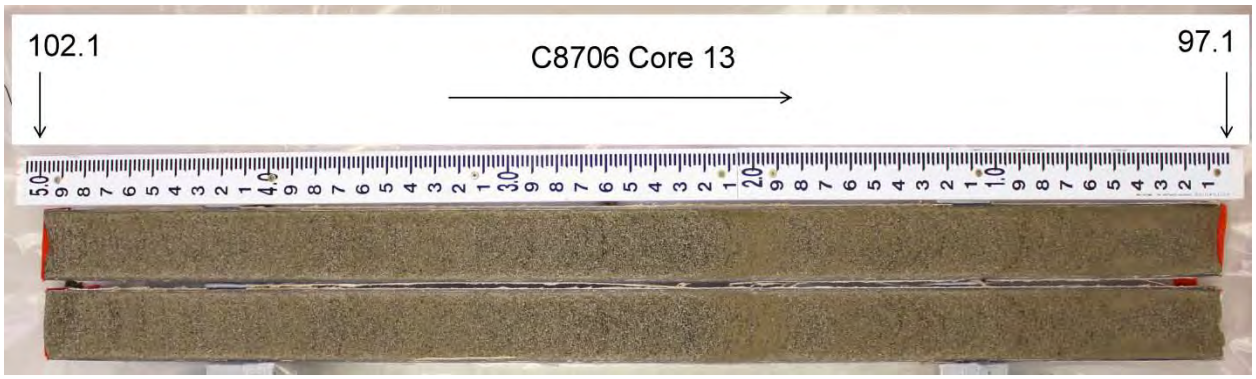
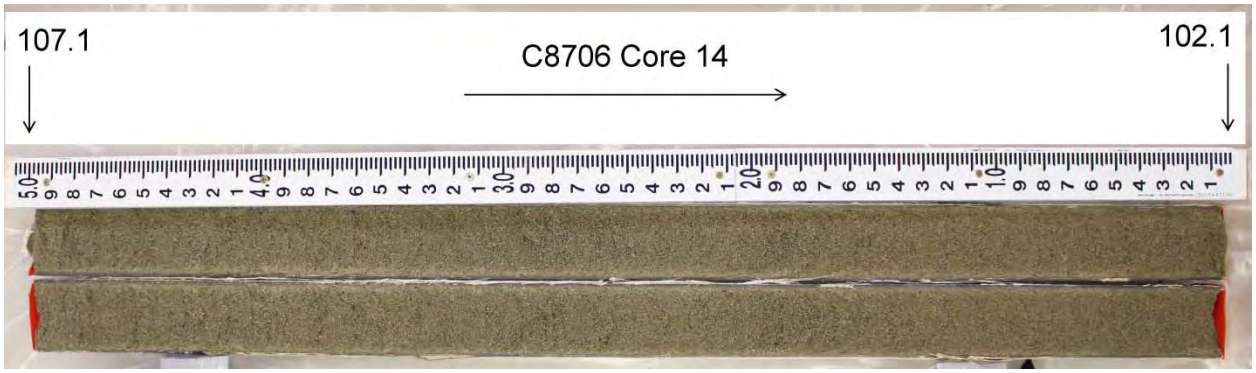

102.1
C8706 Core 13
97.1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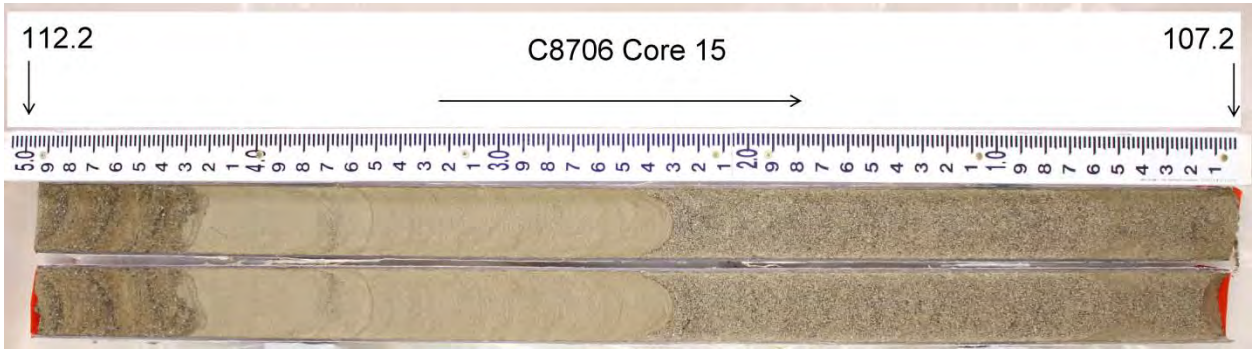
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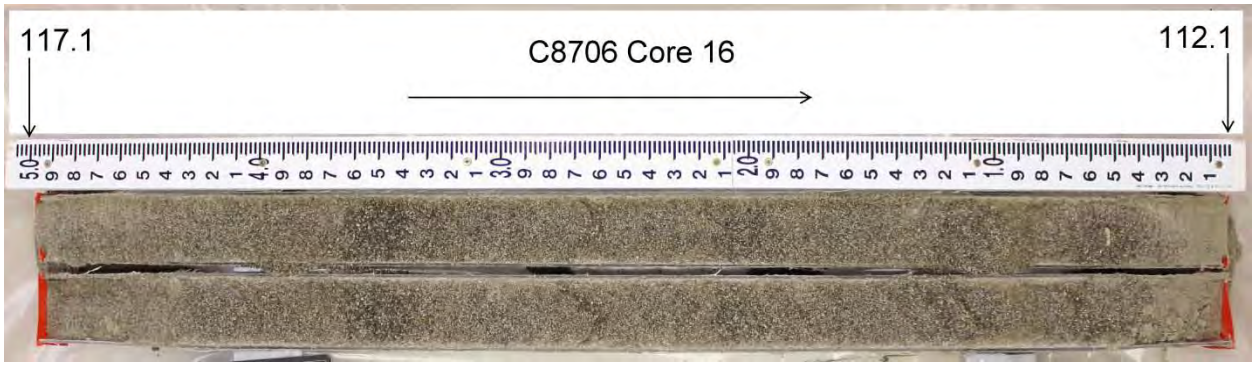
C8706 Core 15
107.2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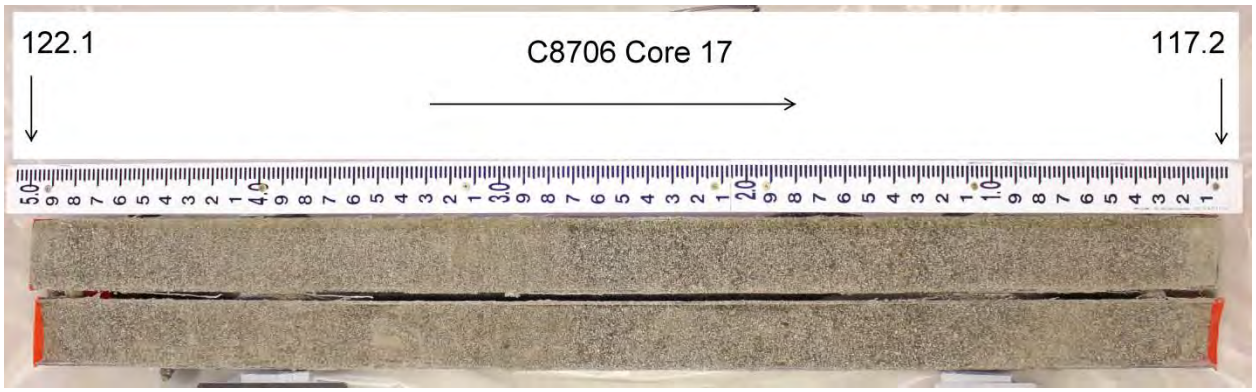
112.1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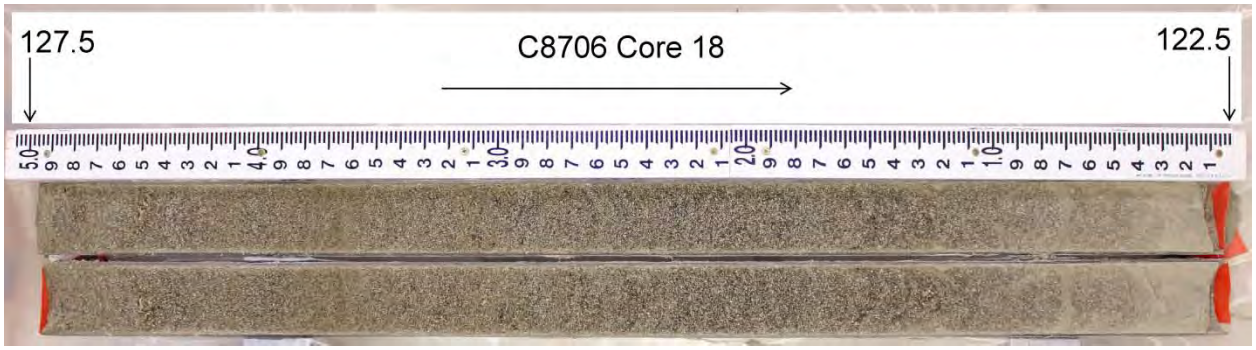
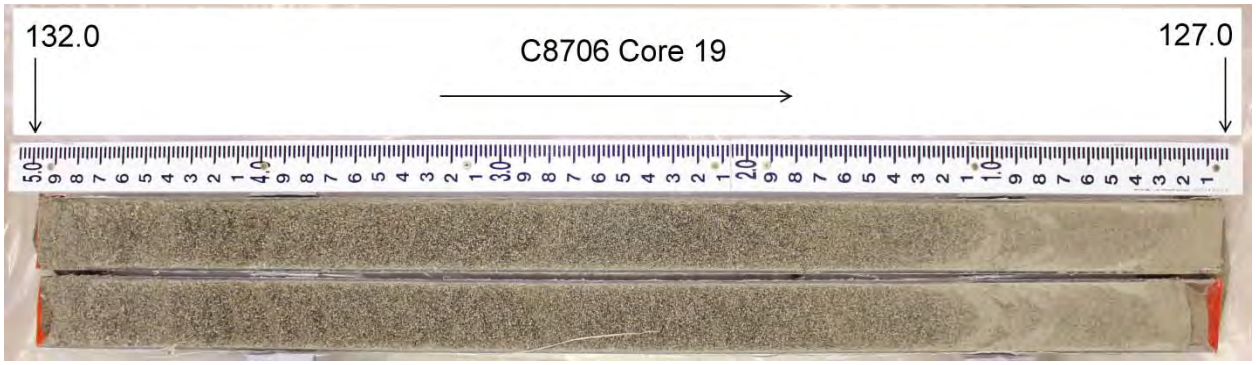
C8706 Core 17
117.2


127.5
C8706 Core 18
122.5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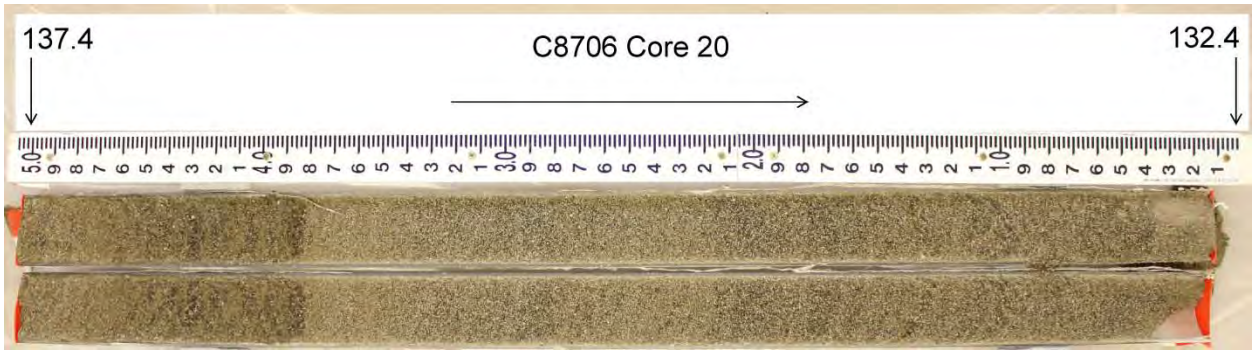
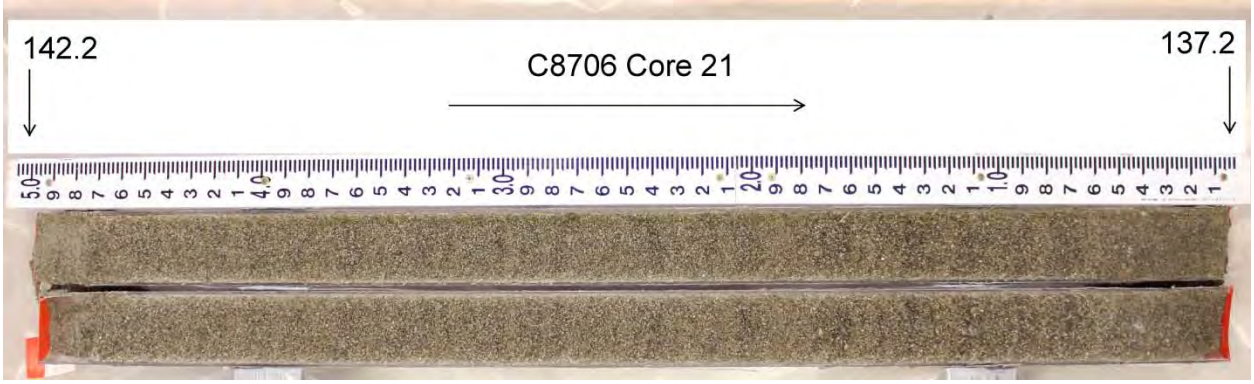
C8706 Core 19
127.0


137.4
C8706 Core 20
132.4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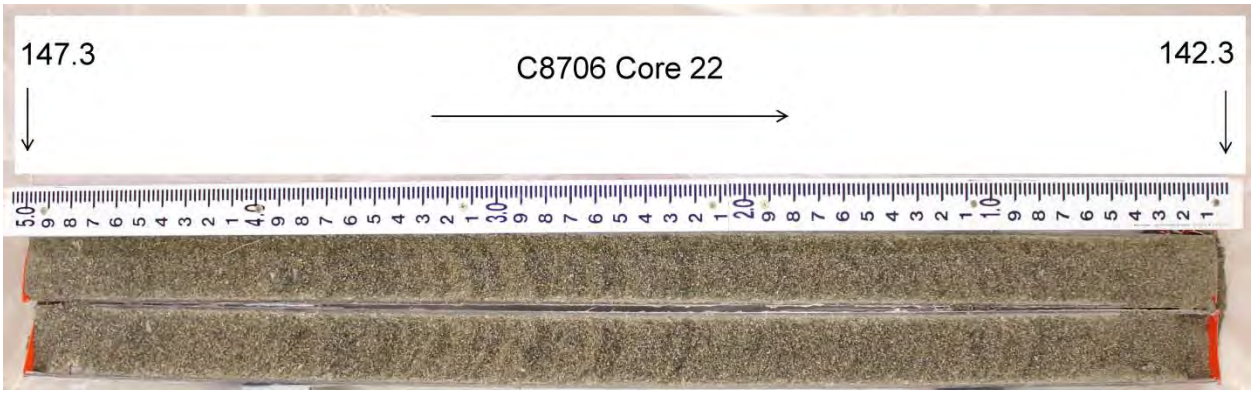
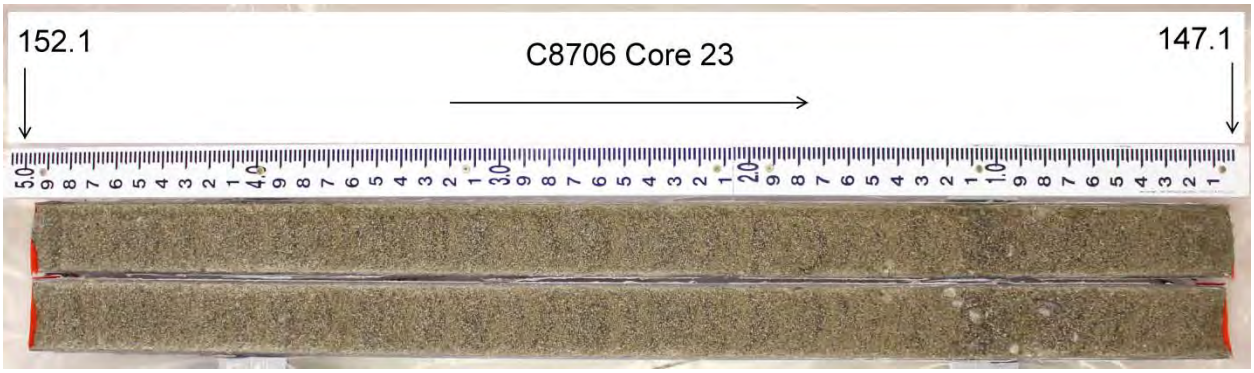
137.2


147.3
C8706 Core 22
142.3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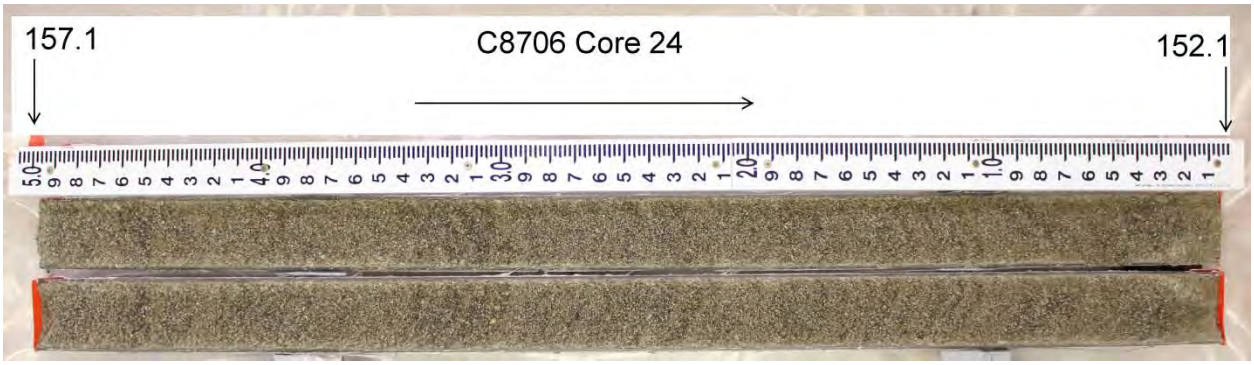
147.1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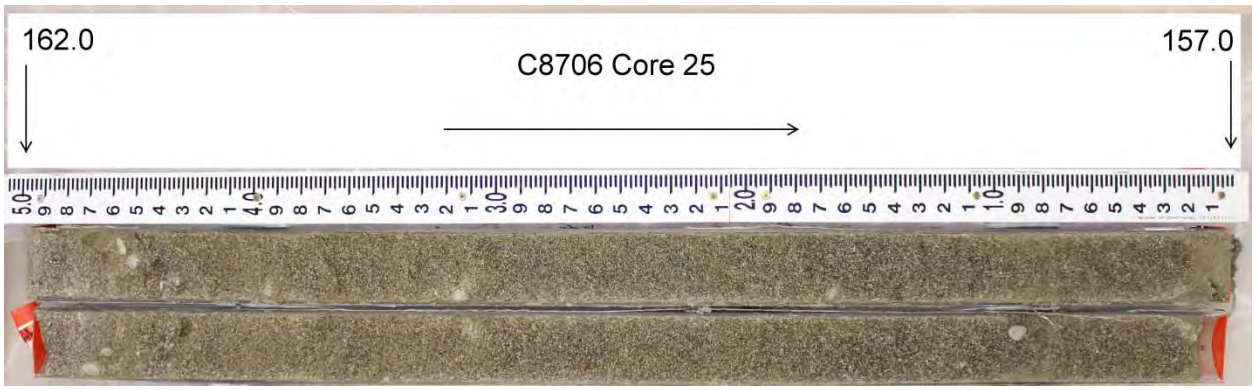
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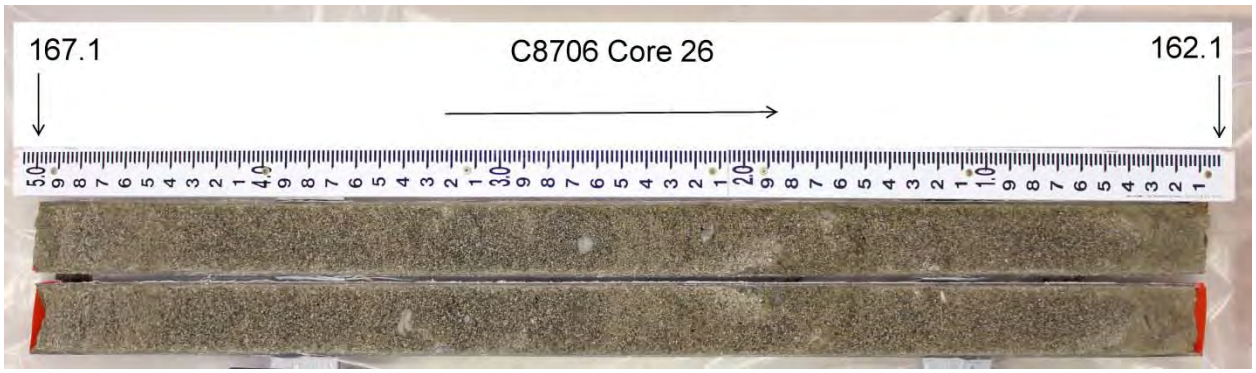
157.0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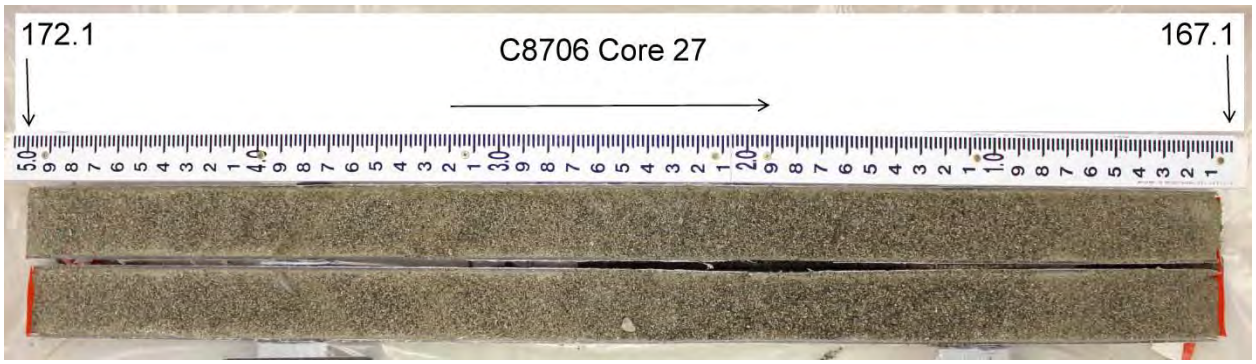
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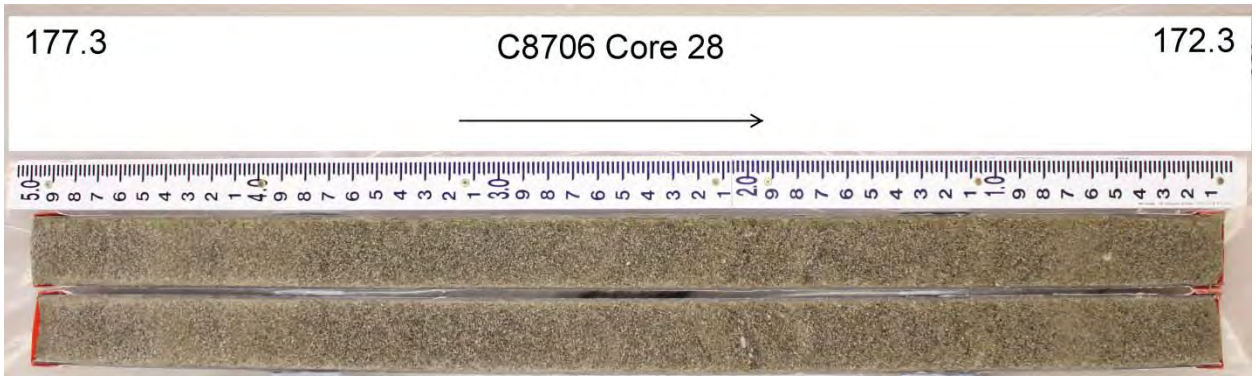
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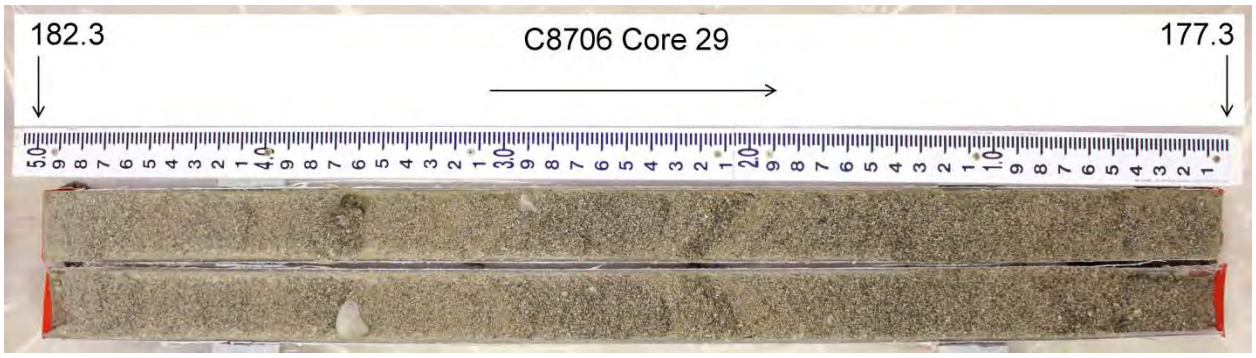
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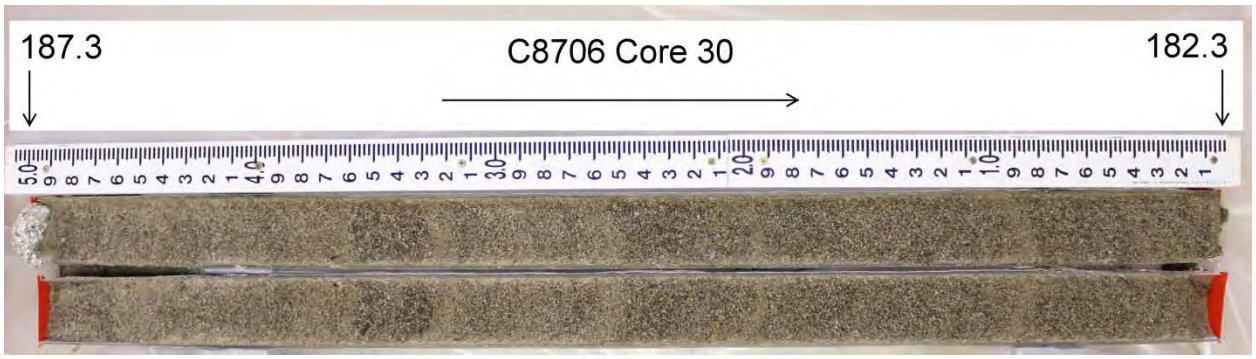
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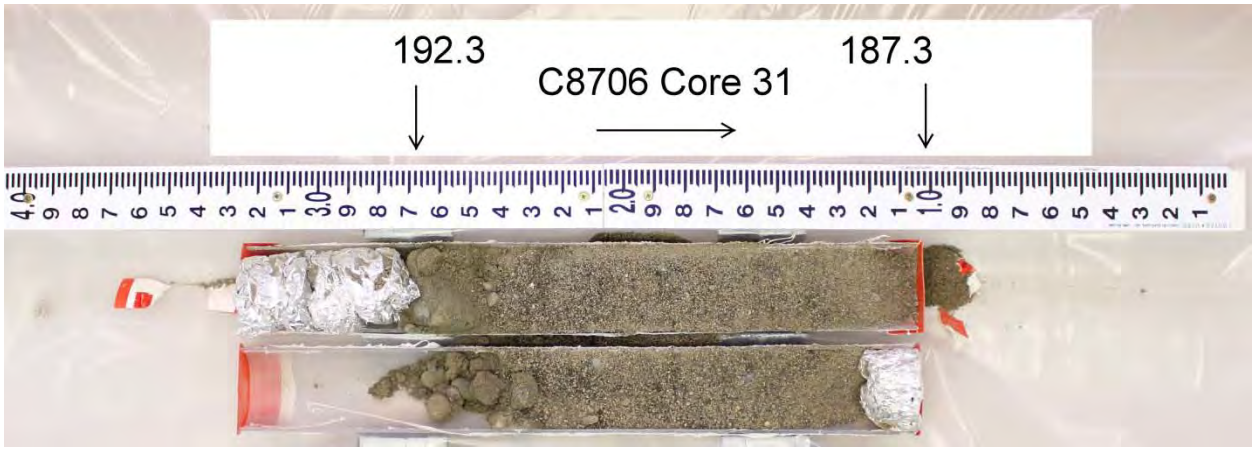
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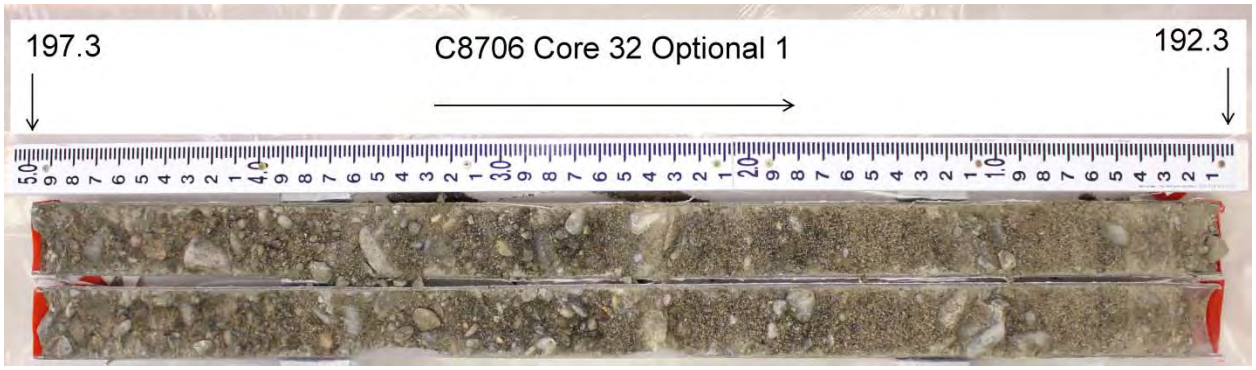
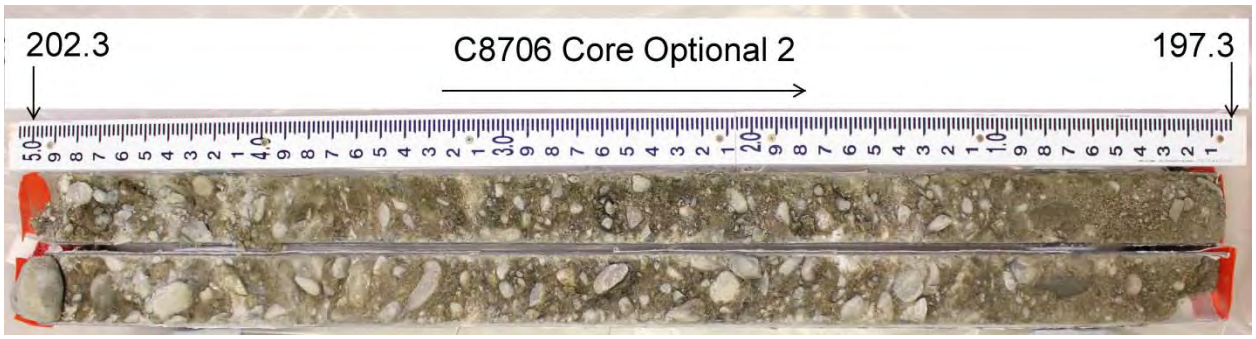
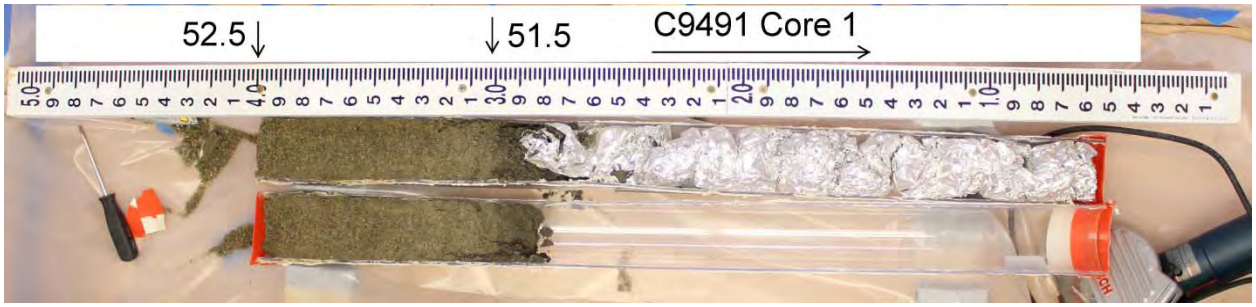
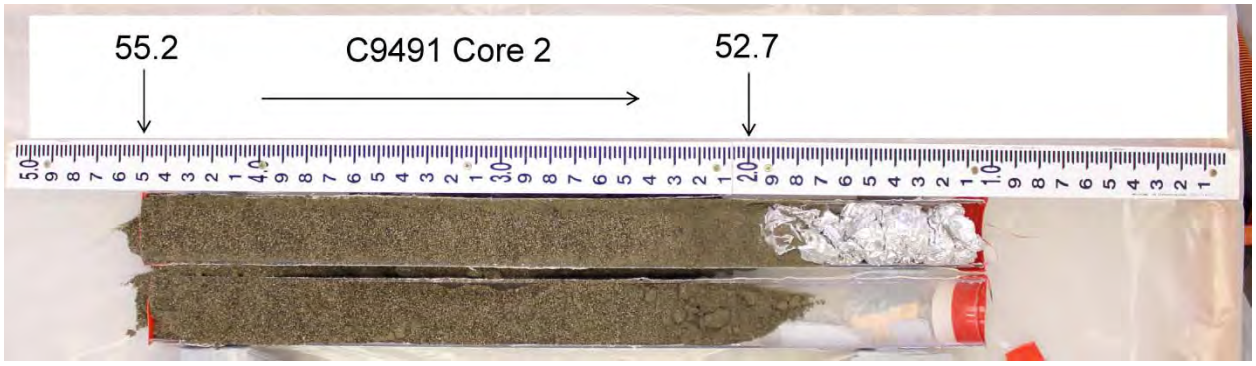
C8706 Core 31
187.3


197.3
C8706 Core 32 Optional 1
192.3


202.3
C8706 Core Optional 2
197.3


52.5
51.5
C9491 Core 1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C9491 Core 2
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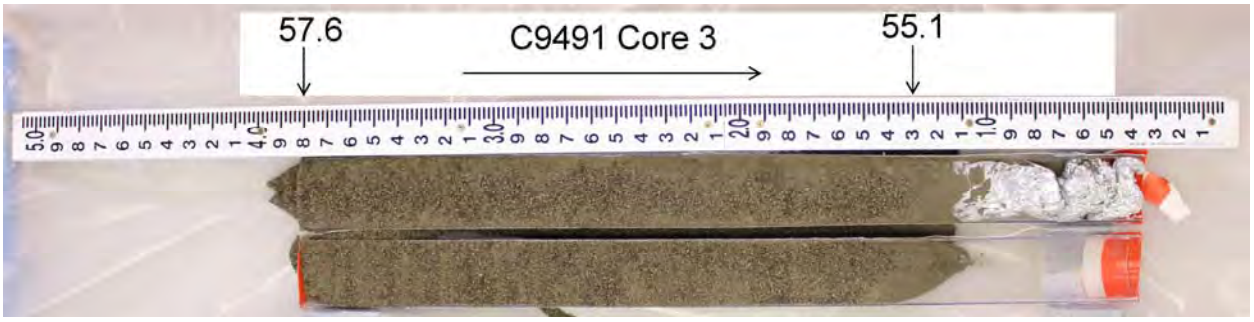
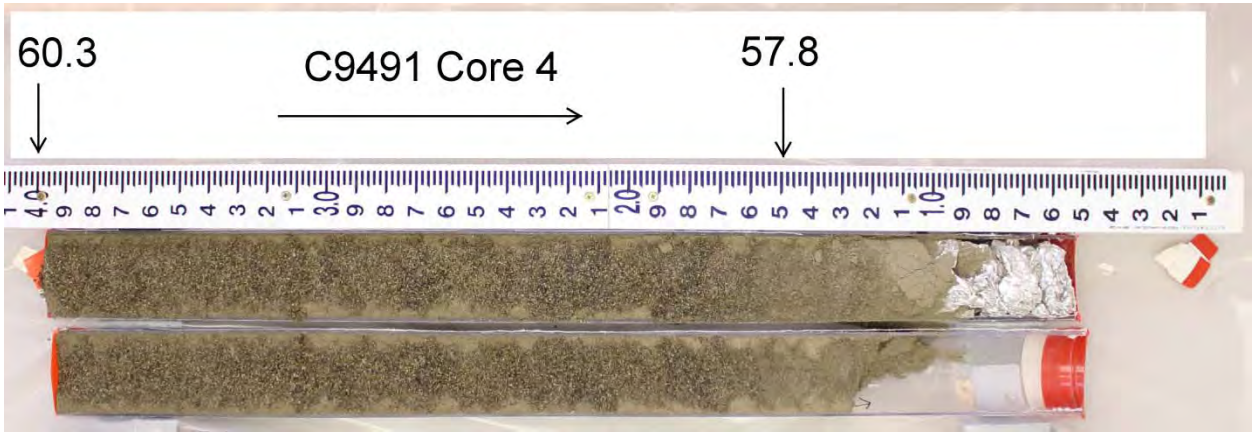

57.6
C9491 Core 3
55.1


60.3
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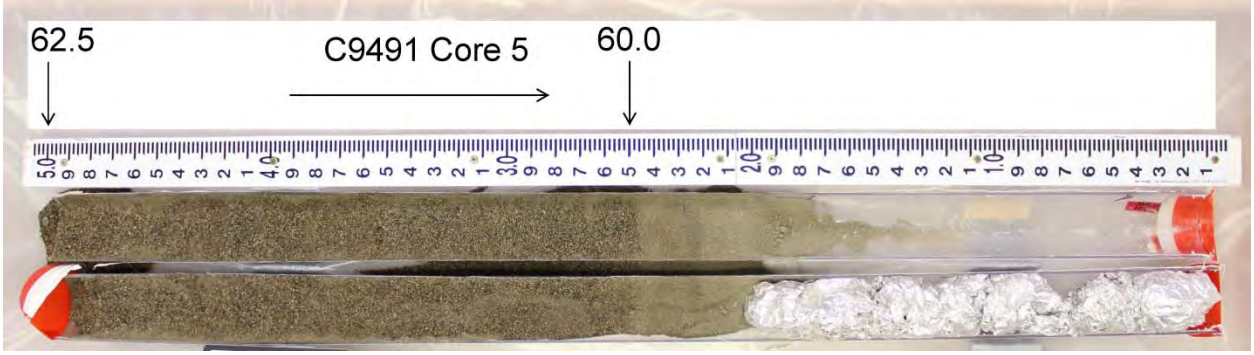
57.8


62.5
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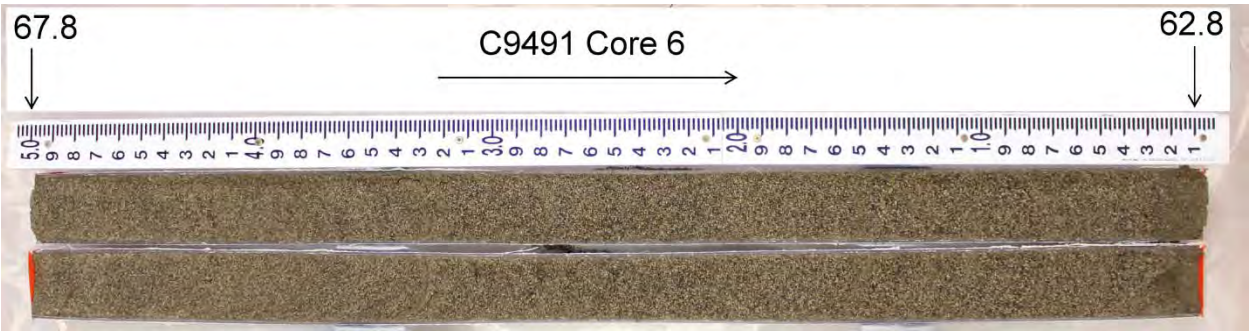
60.0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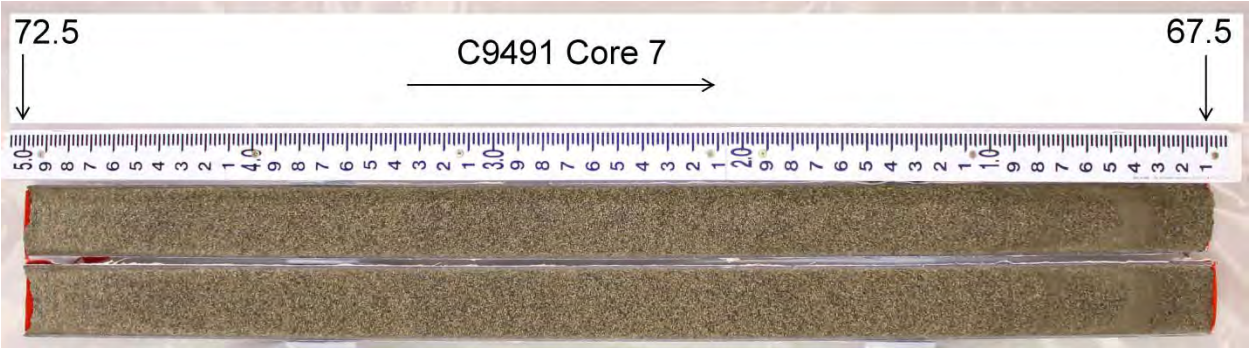
62.8


72.5
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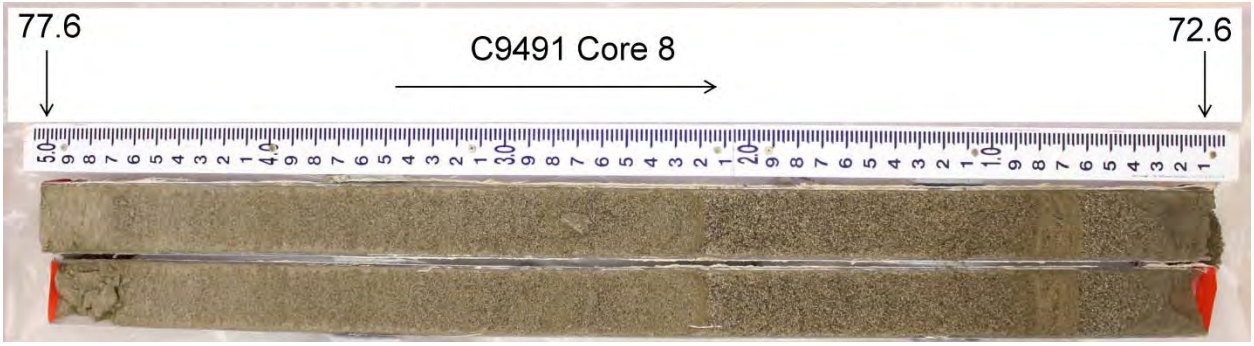
67.5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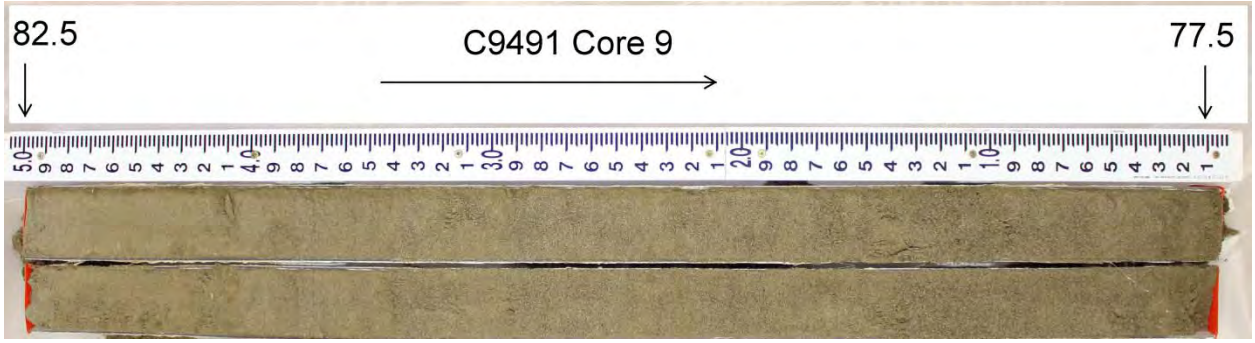
72.6


82.5
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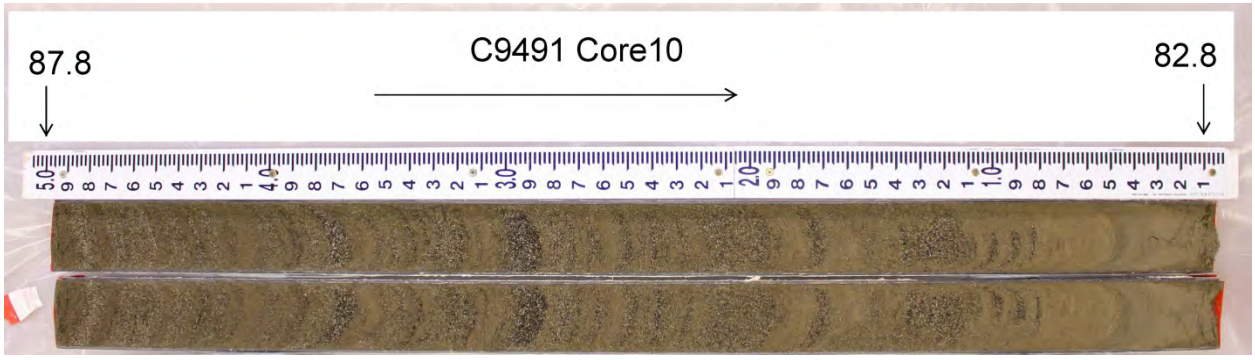
77.5


87.8
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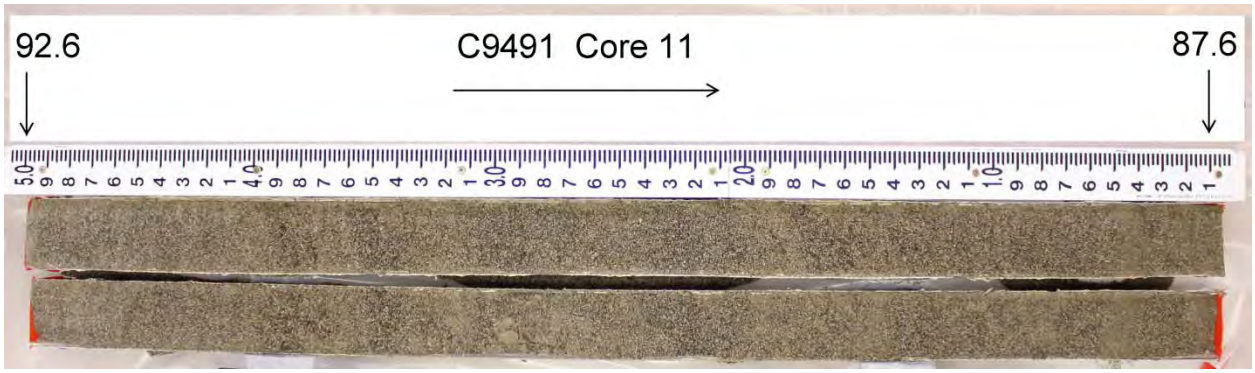
82.8


92.6
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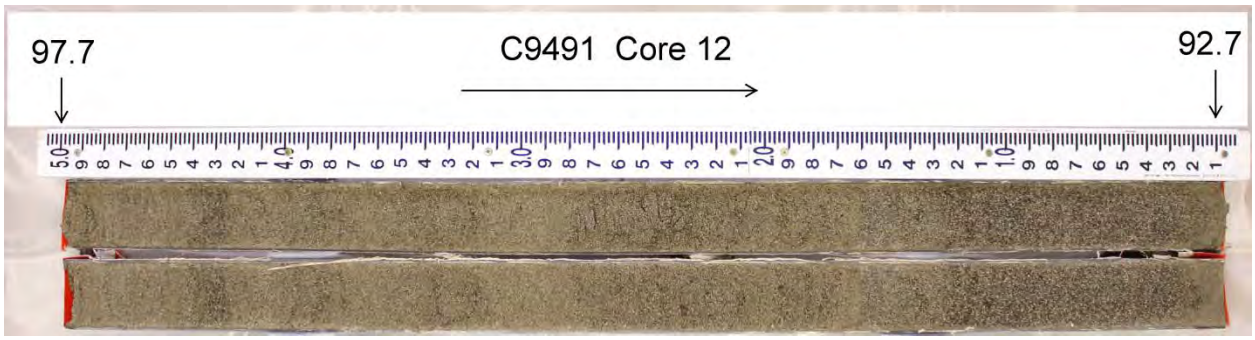
87.6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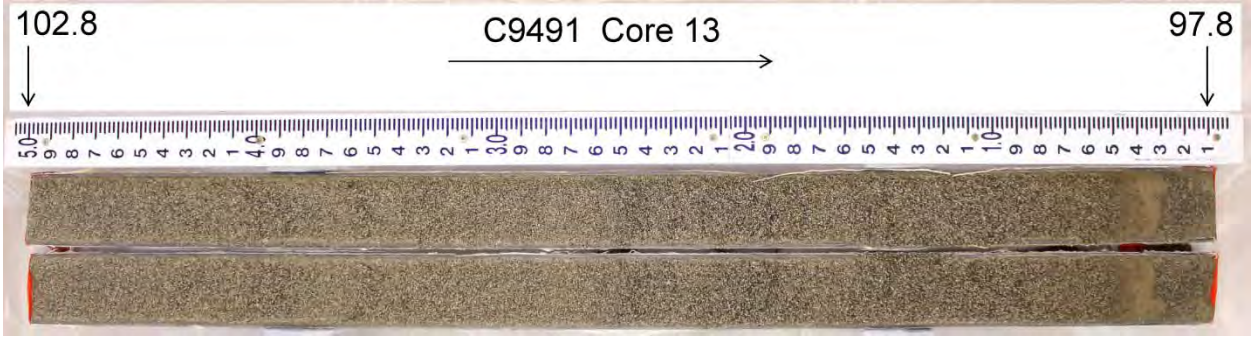
92.7


102.8
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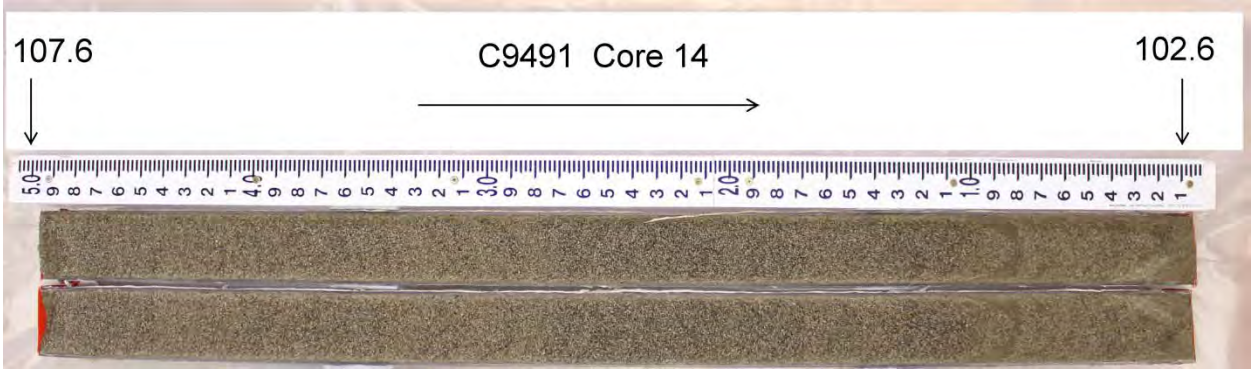
97.8


107.6
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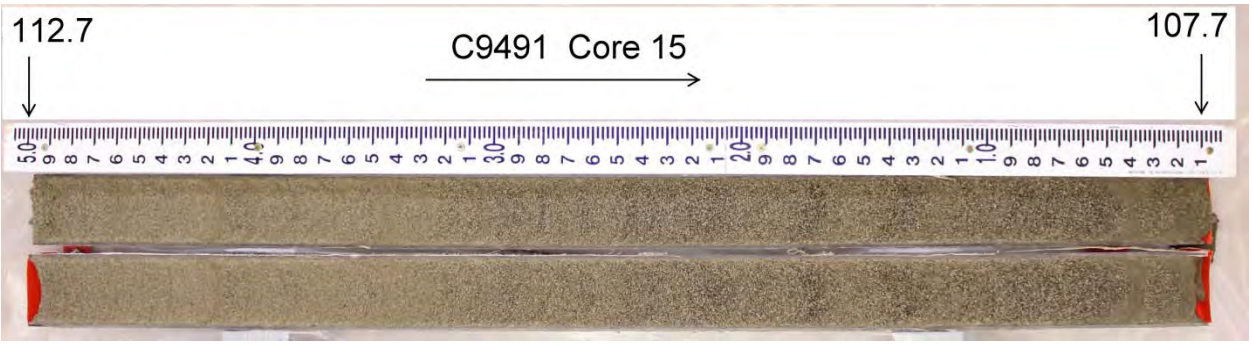
102.6


112.7
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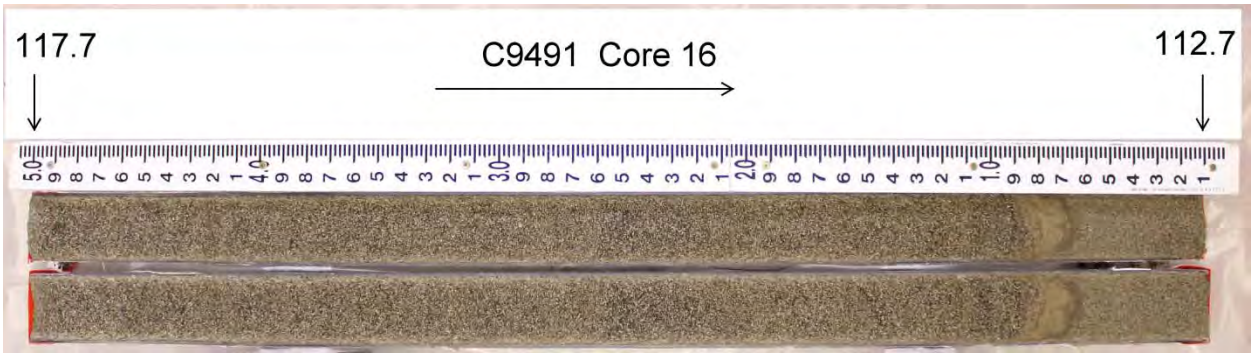
107.7


117.7
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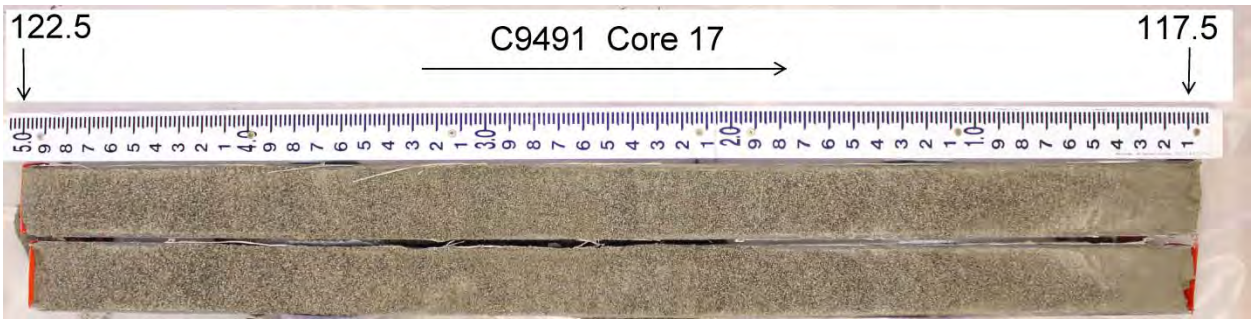
112.7


122.5
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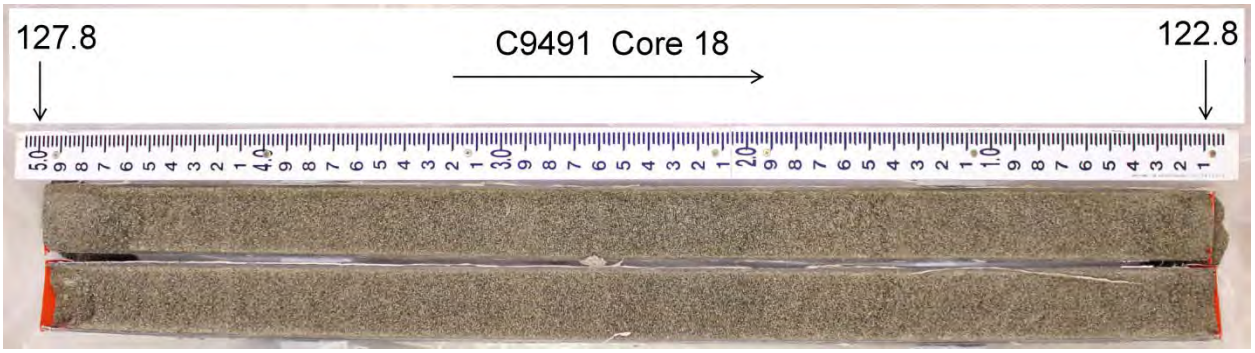
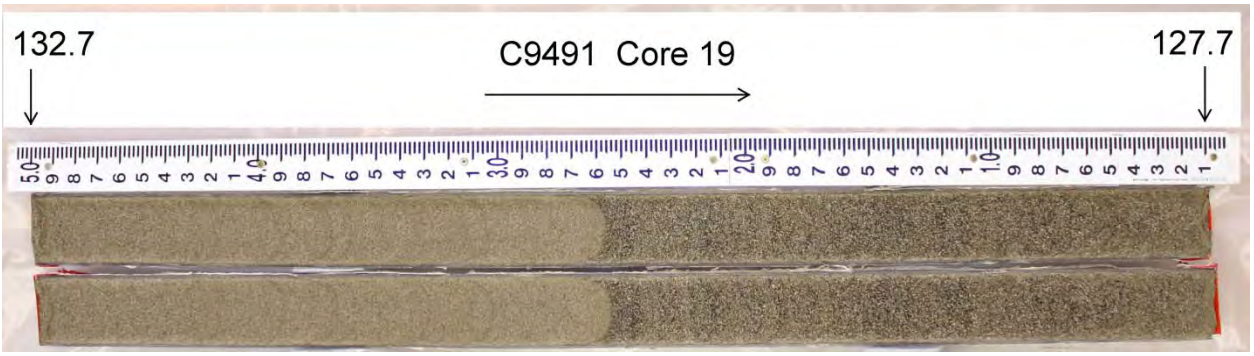
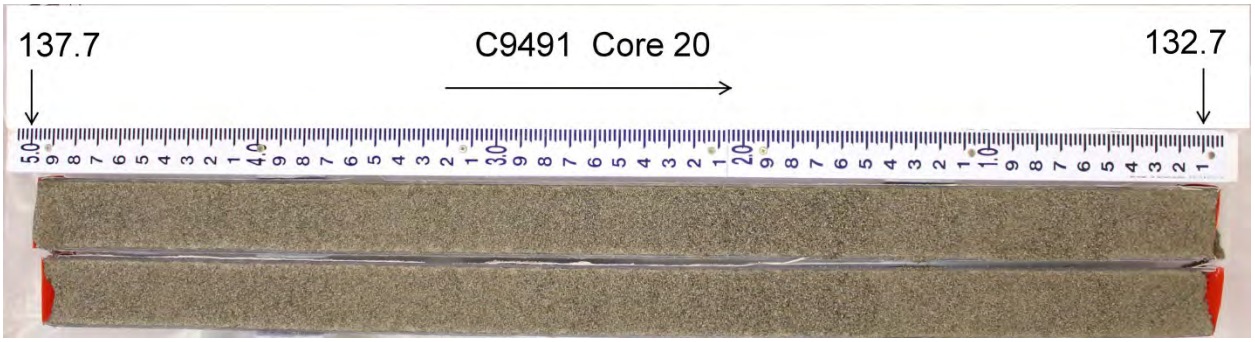
117.5


127.8
C9491 Core 18
122.8


132.7
C9491 Core 19
127.7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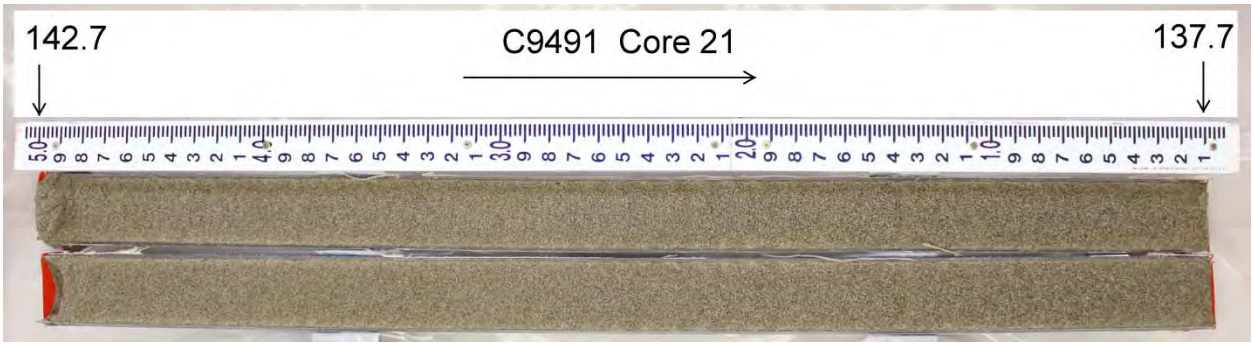
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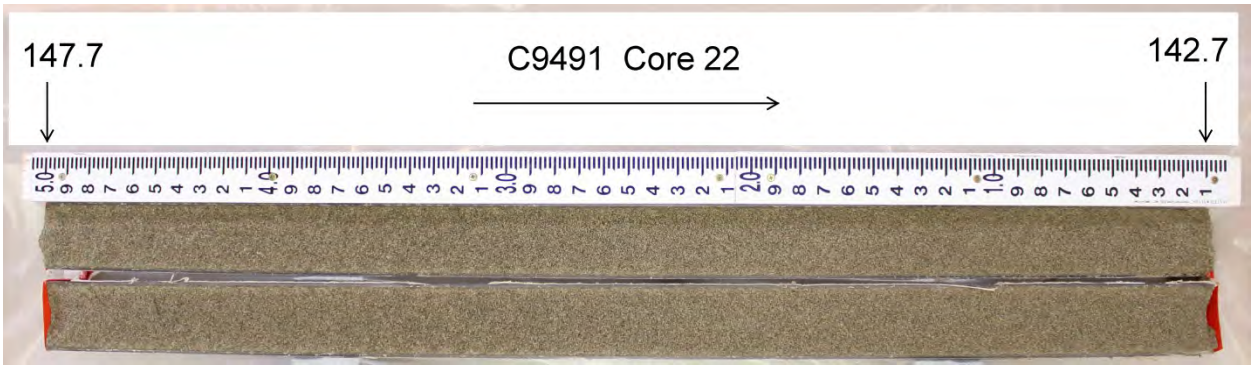
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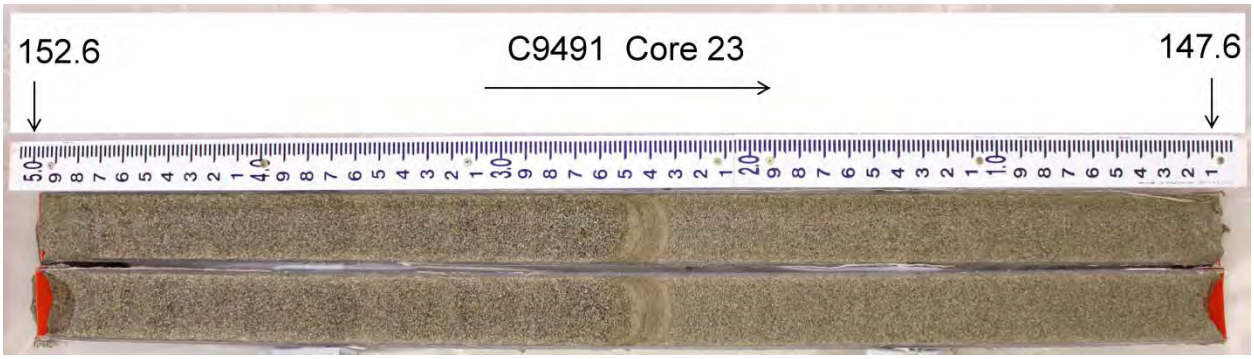
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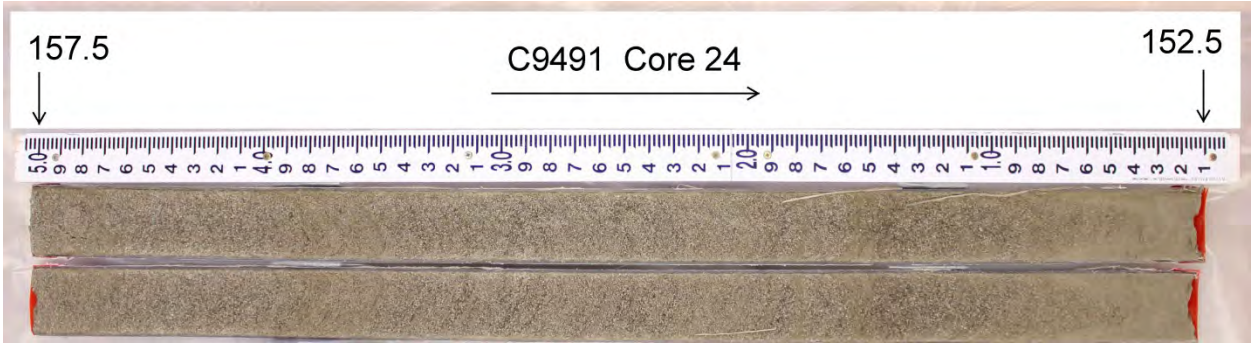
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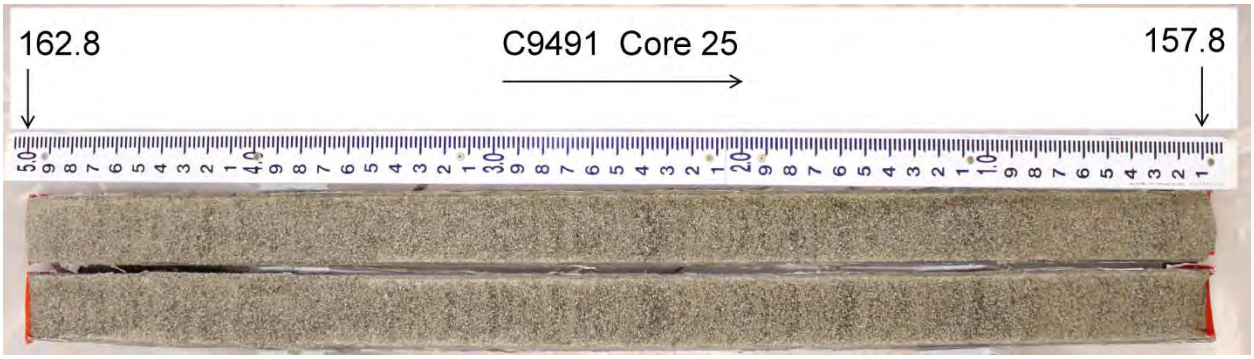
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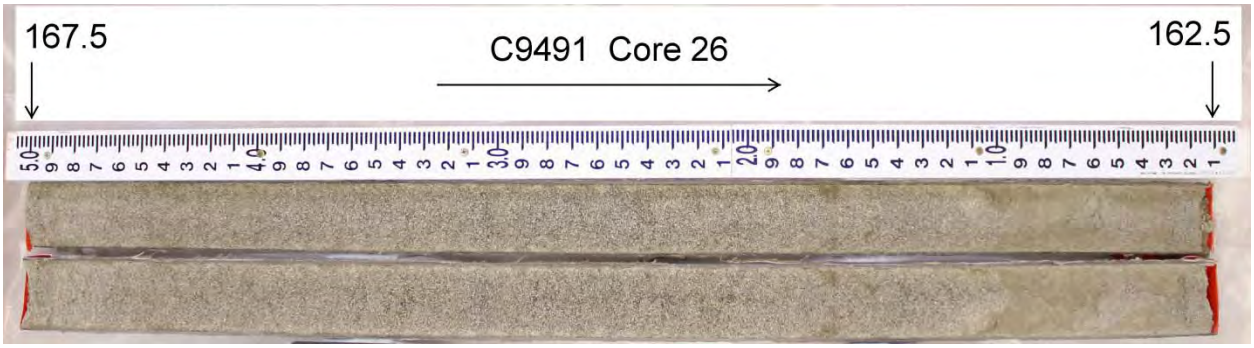
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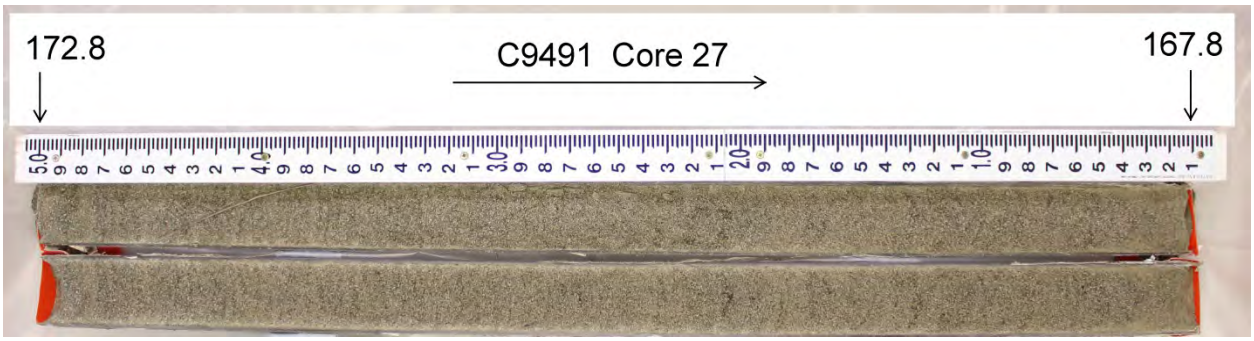
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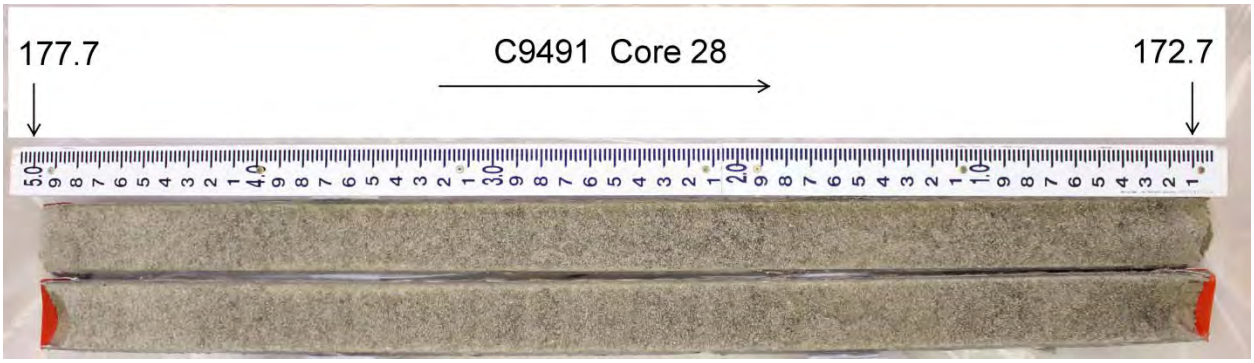
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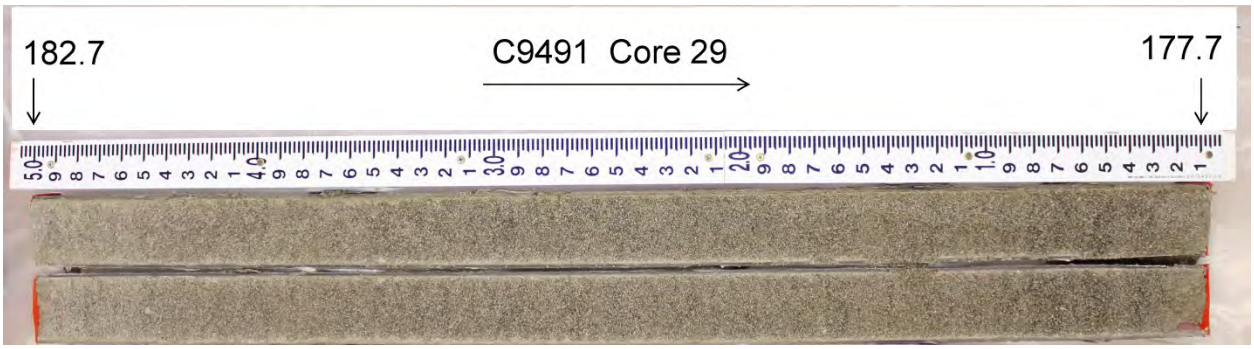
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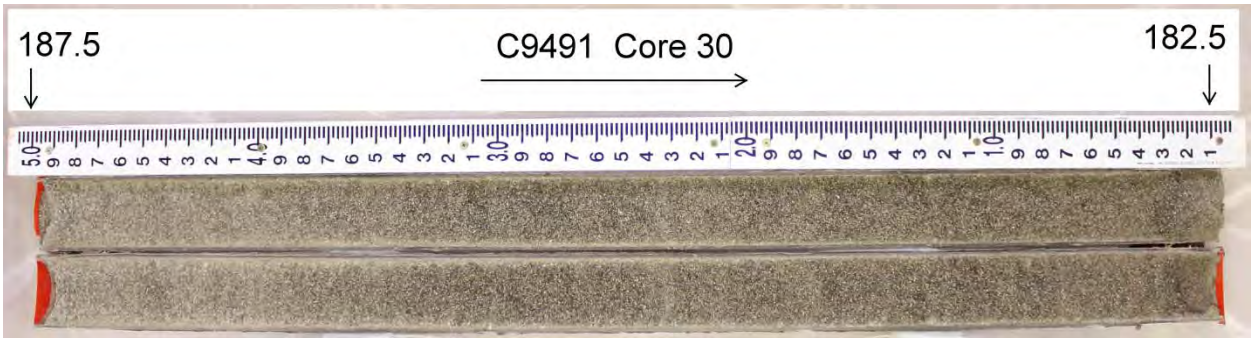
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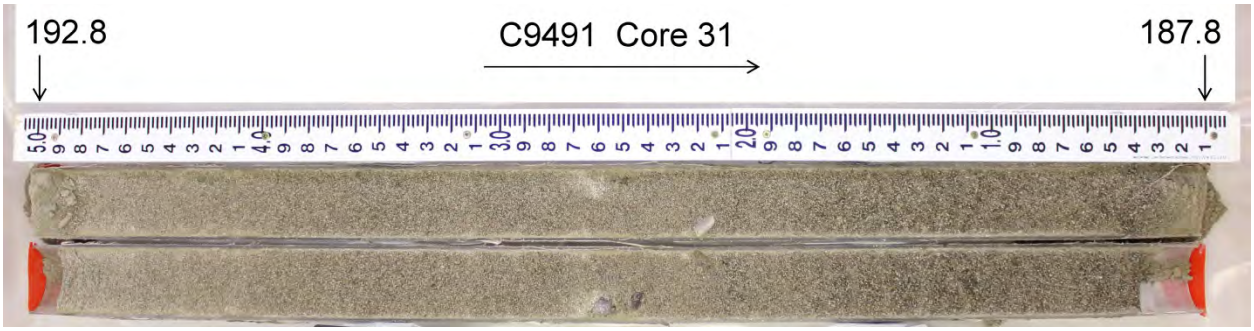
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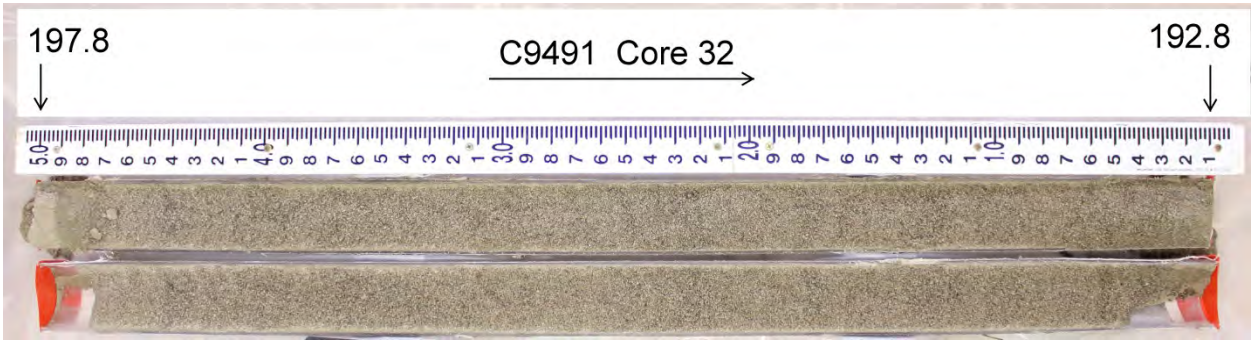
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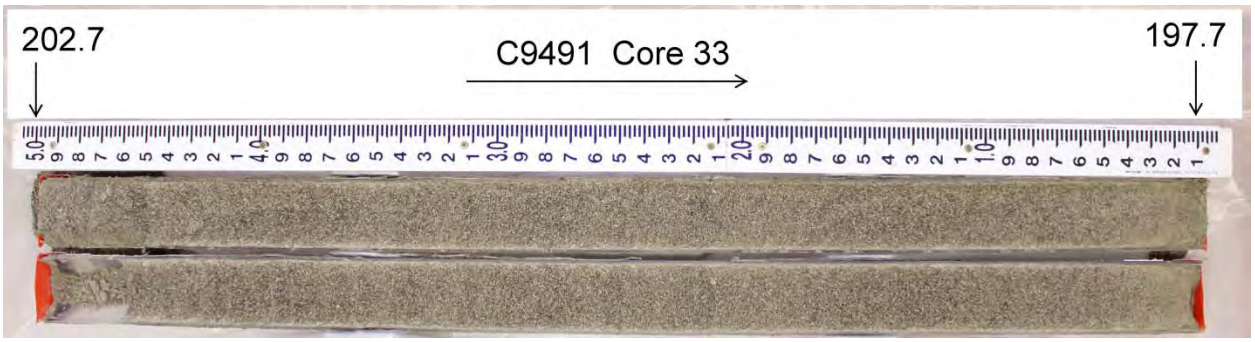
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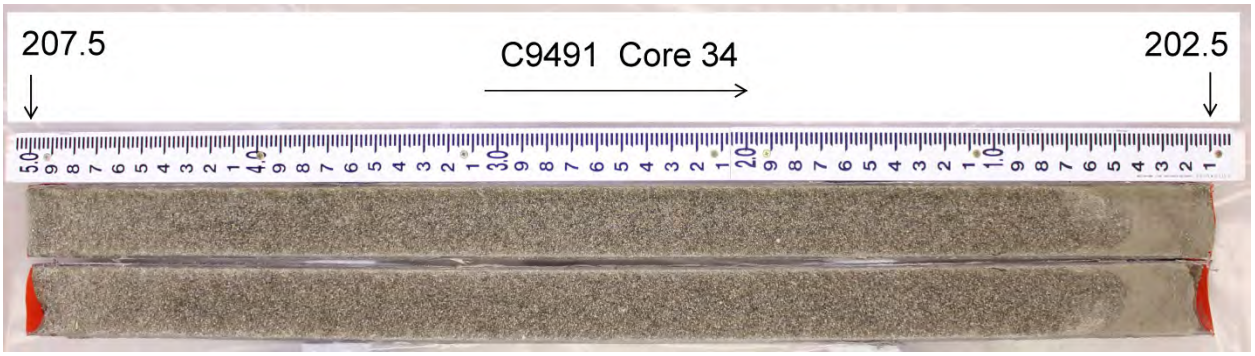
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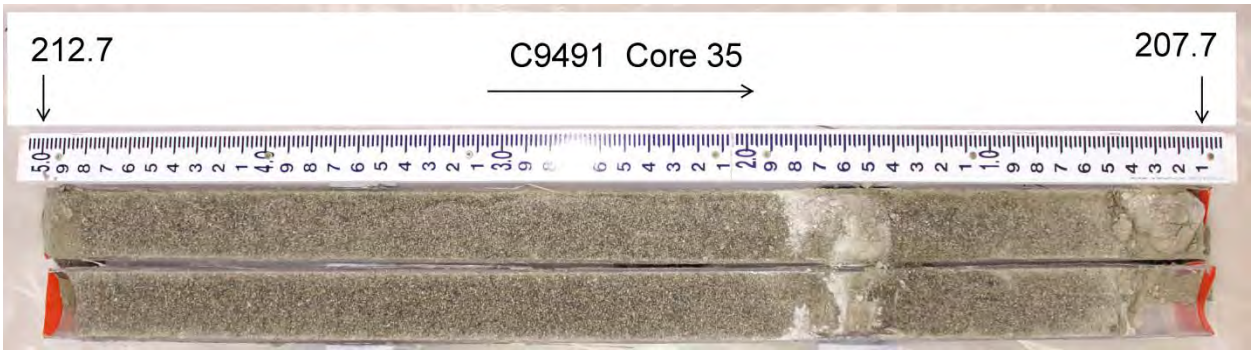
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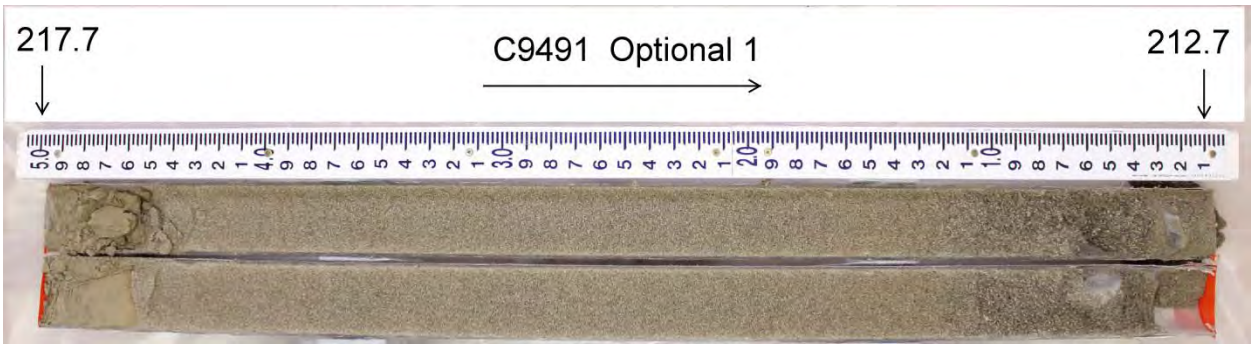
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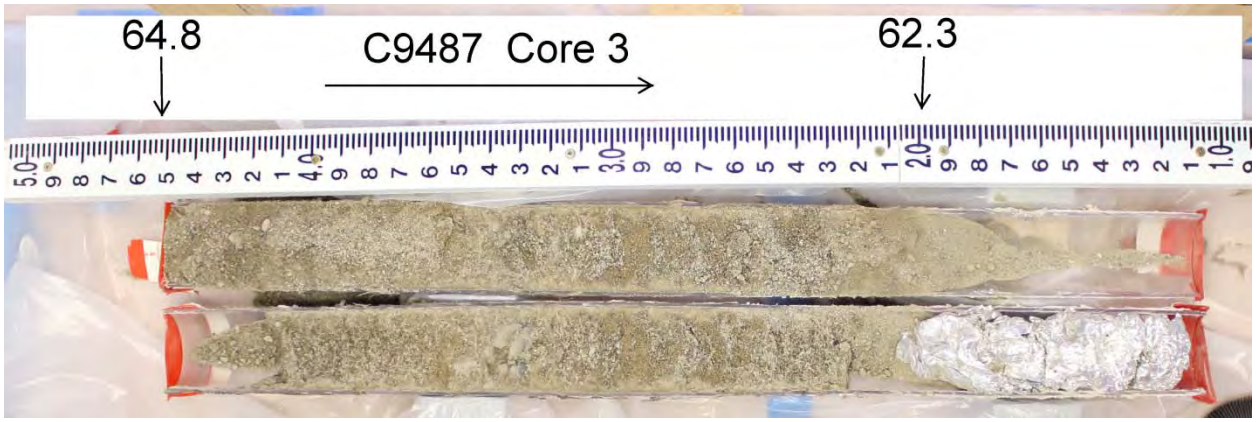
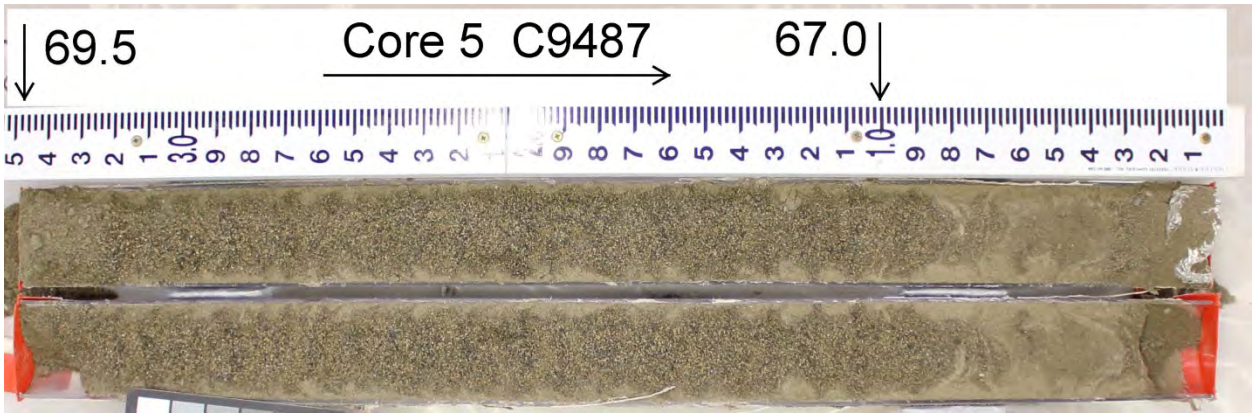
222.5
C9491 Optional 2
217.5

227.7
C9491 Optional 3
222.7


64.8
C9487 Core 3
62.3

67.0
Core 4 C9487
64.5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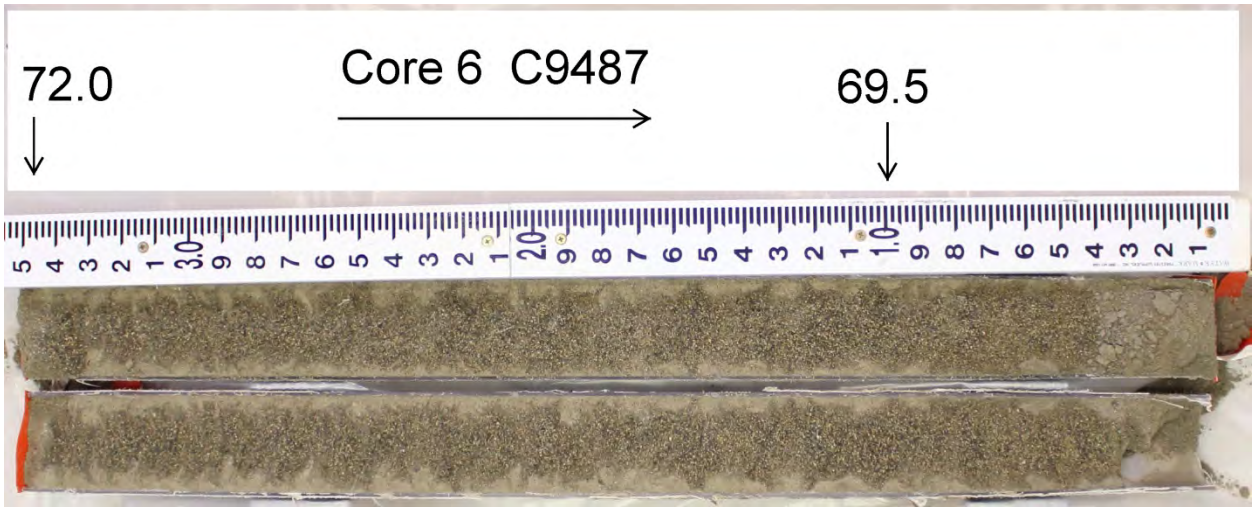
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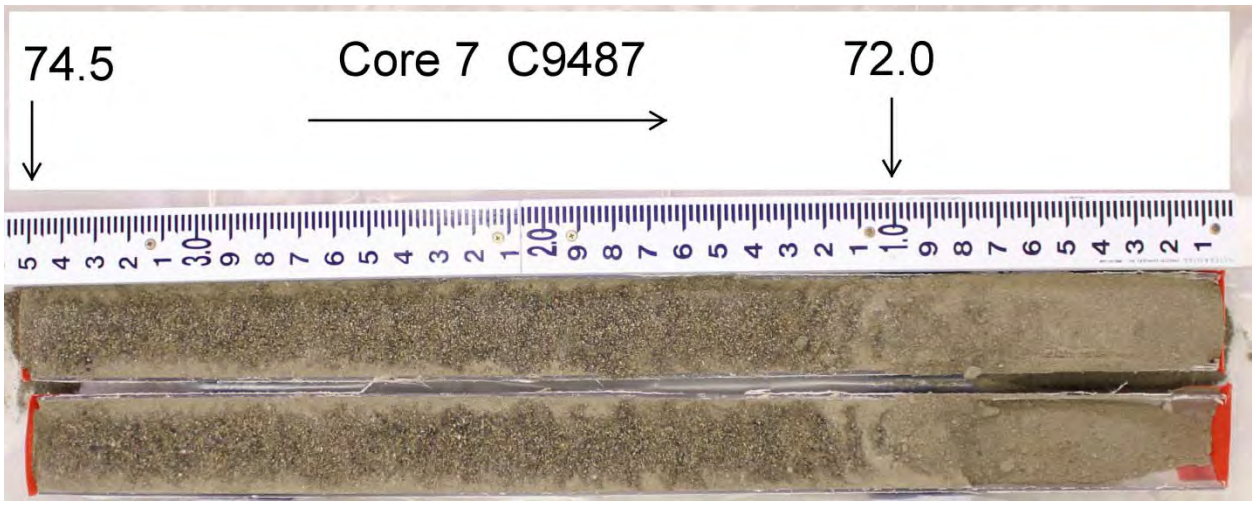
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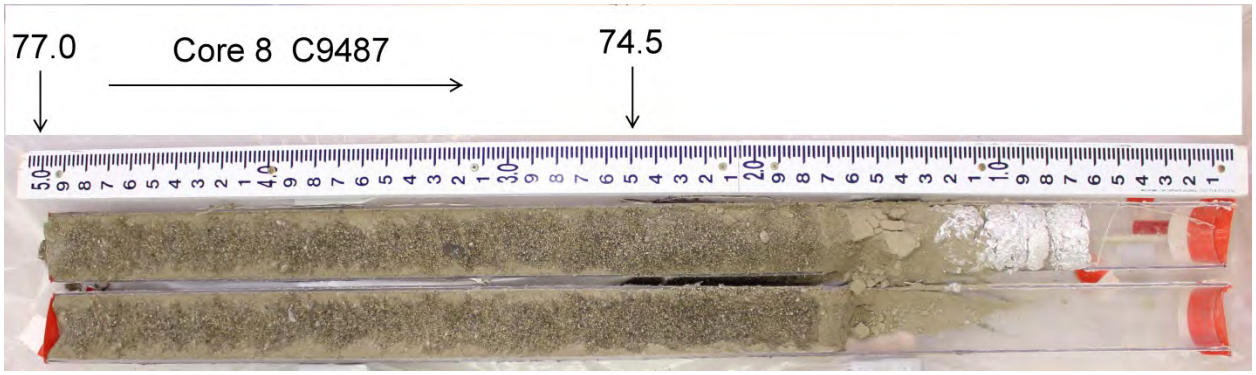
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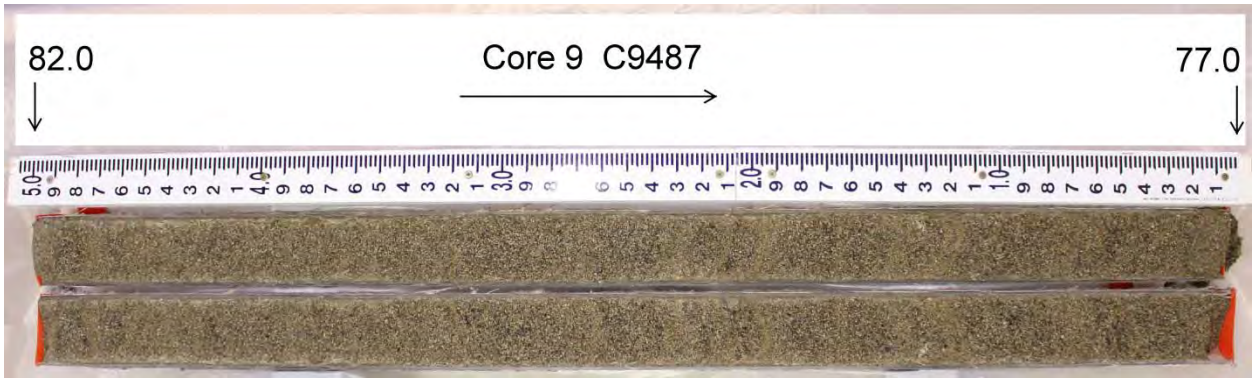
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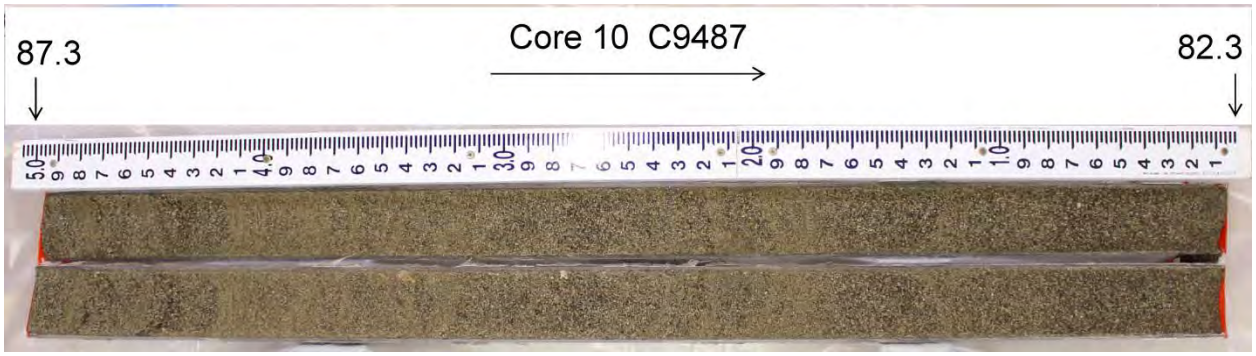
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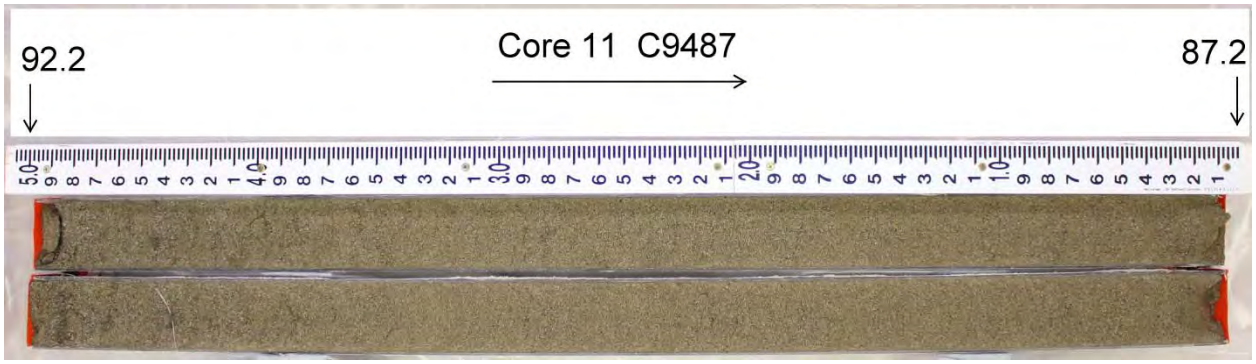
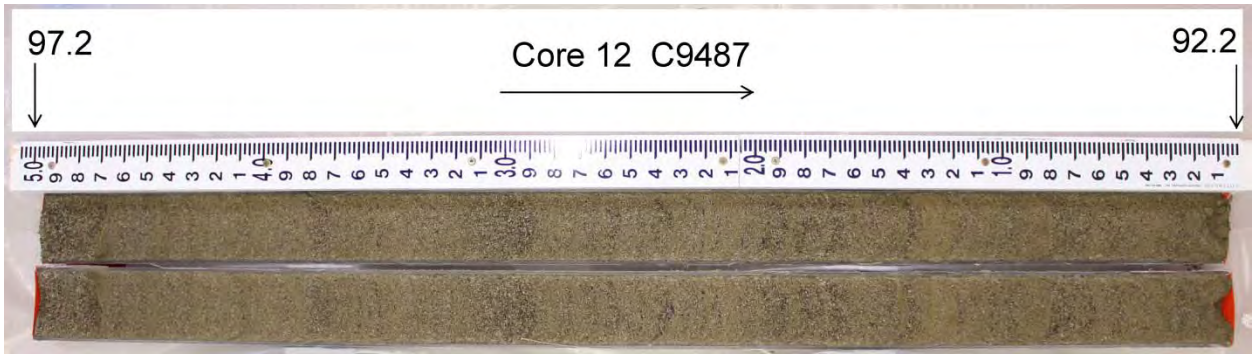
82.3


92.2
Core 11 C9487
87.2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Core 12 C9487
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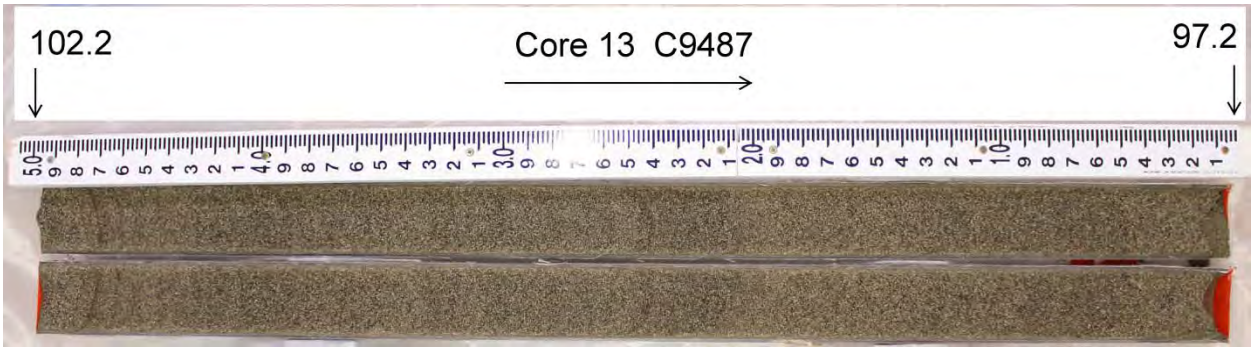
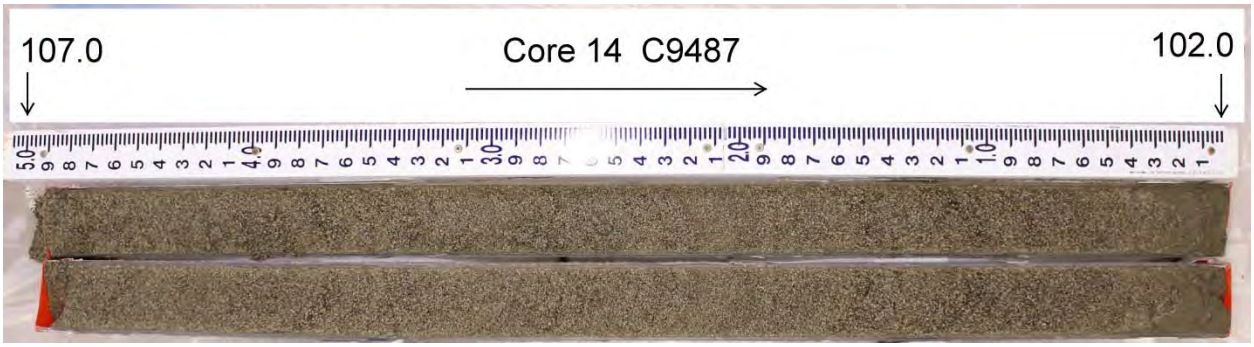

102.2
Core 13 C9487
97.2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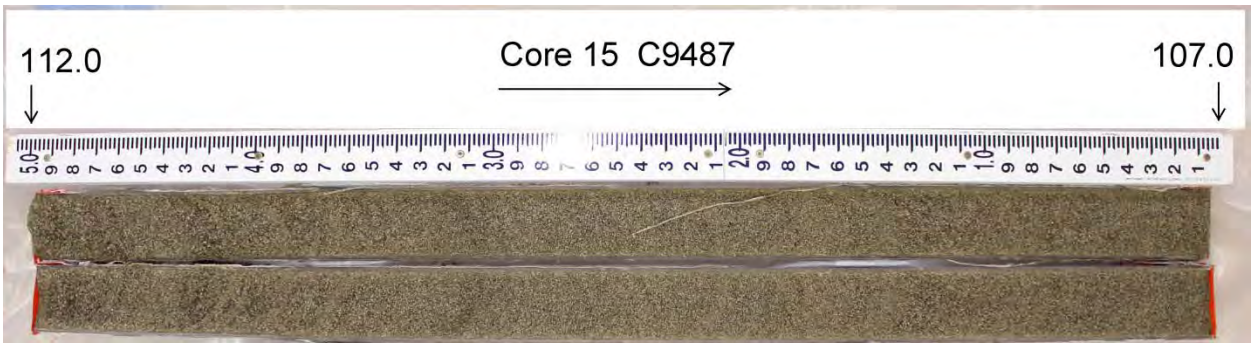
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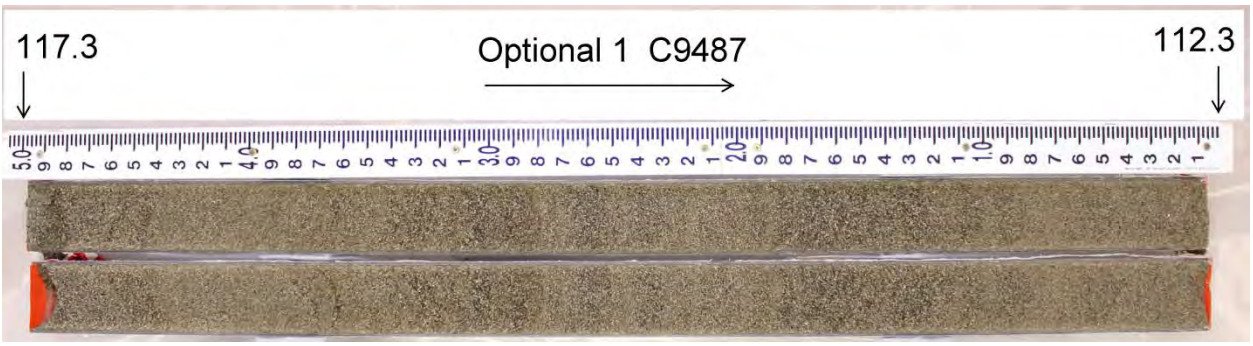
107.0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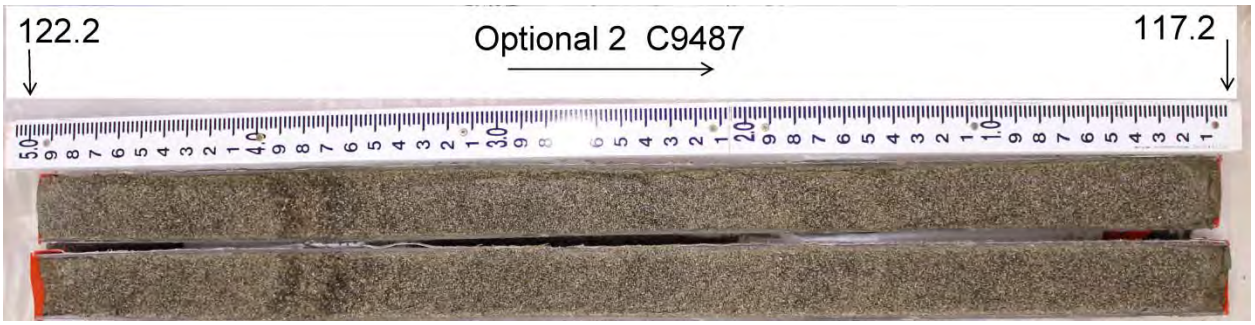
Optional 1 C9487
112.3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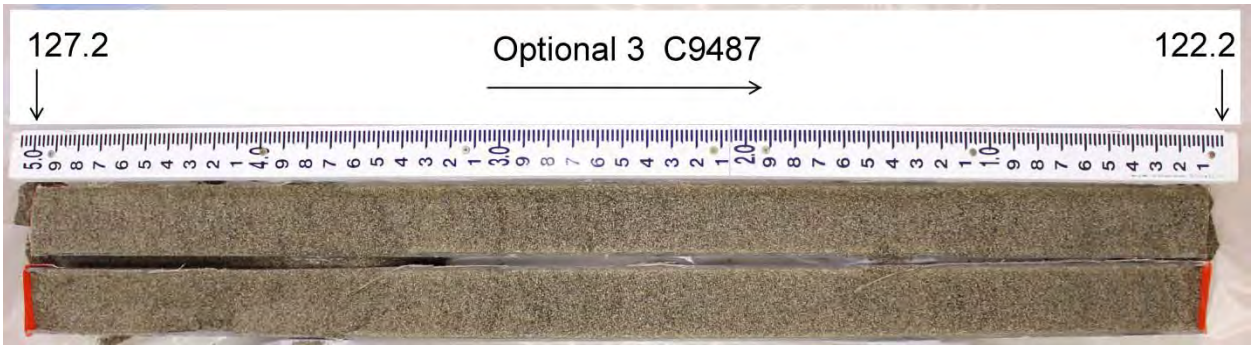
Optional 2 C9487
117.2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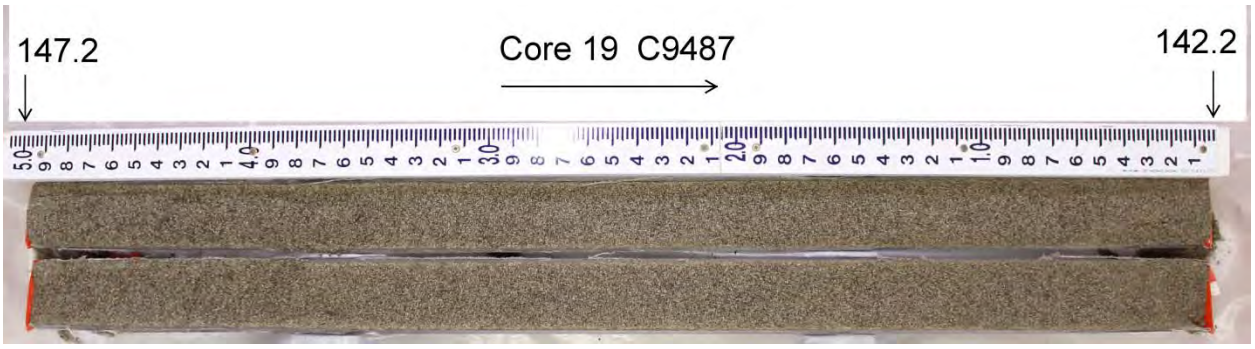
122.2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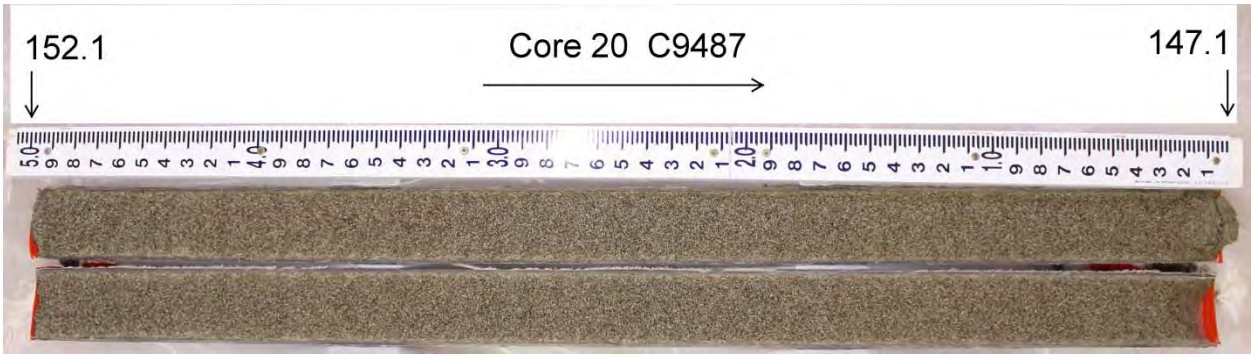
Core 19 C9487
142.2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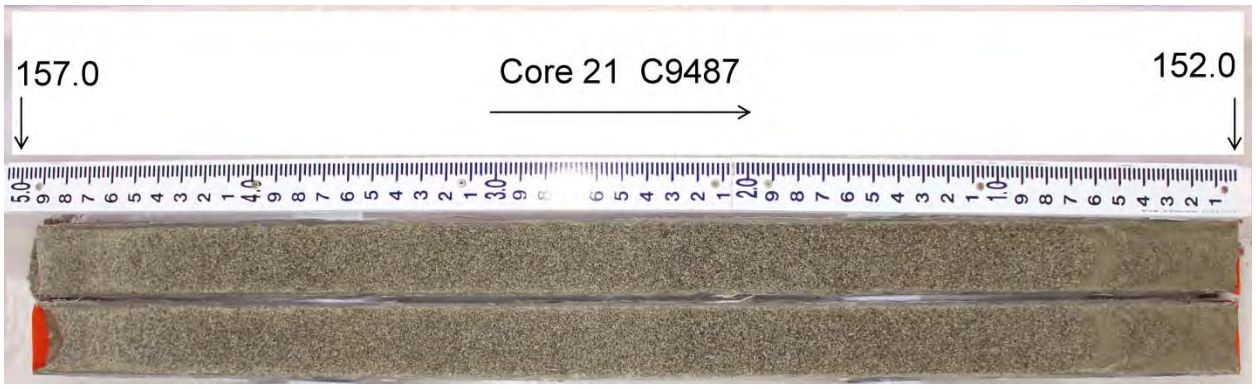
Core 20 C9487
147.1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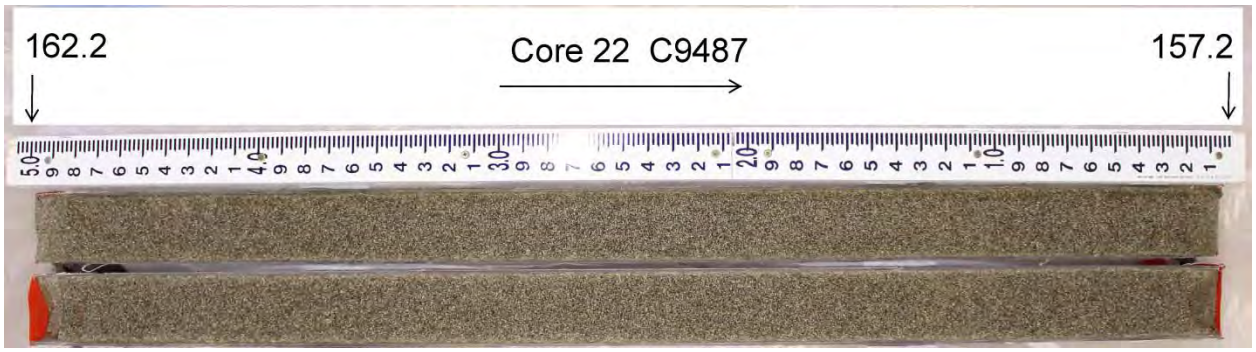
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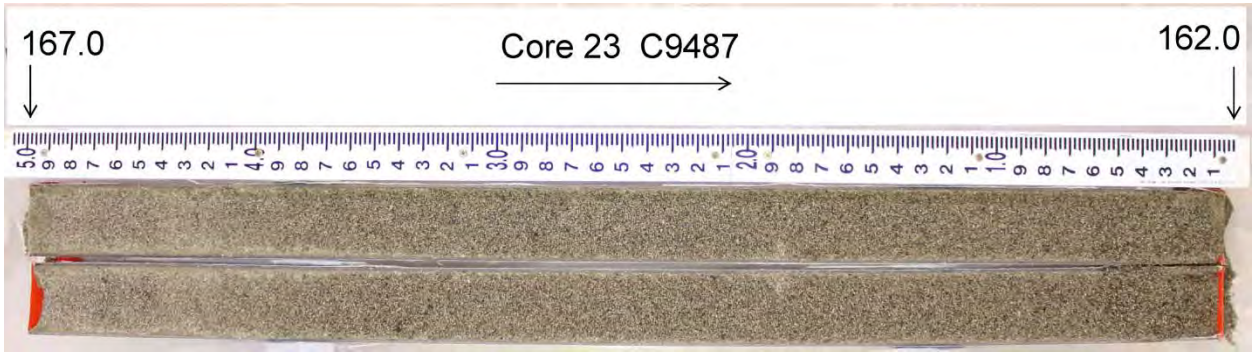
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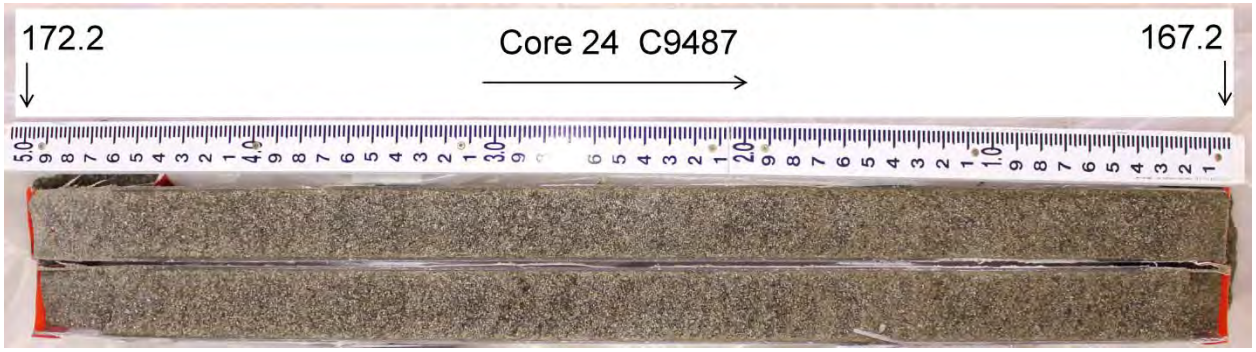
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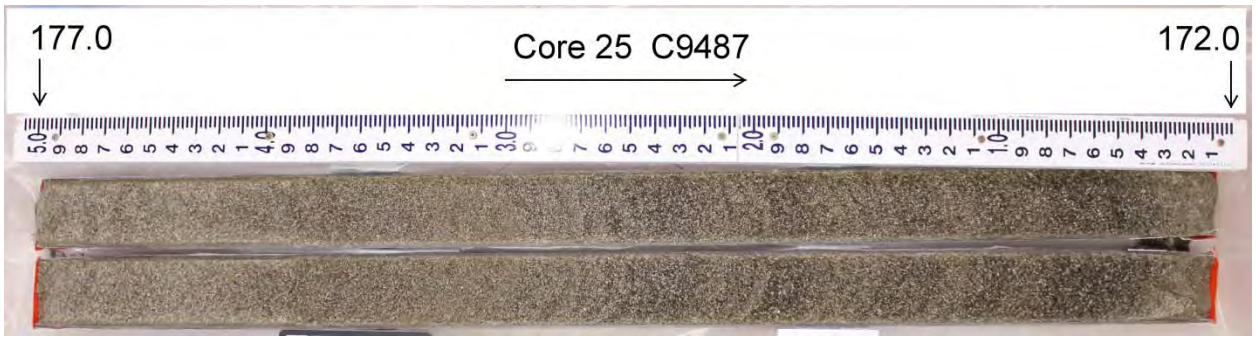
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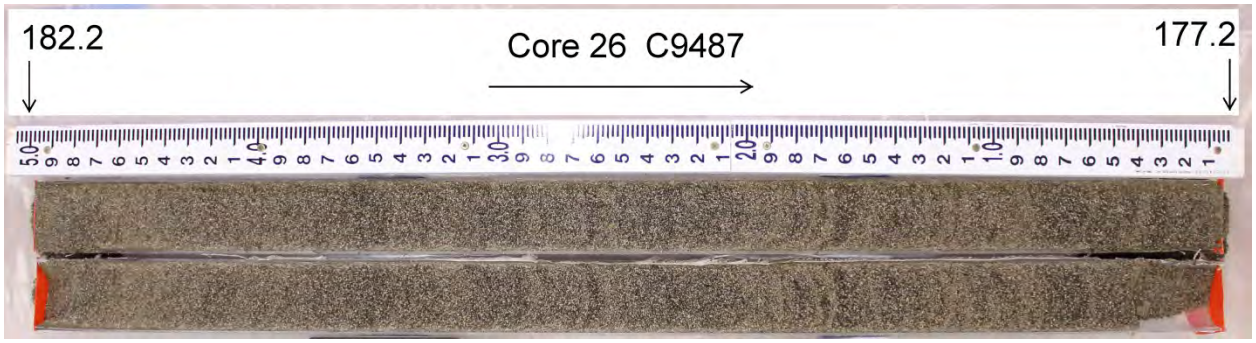
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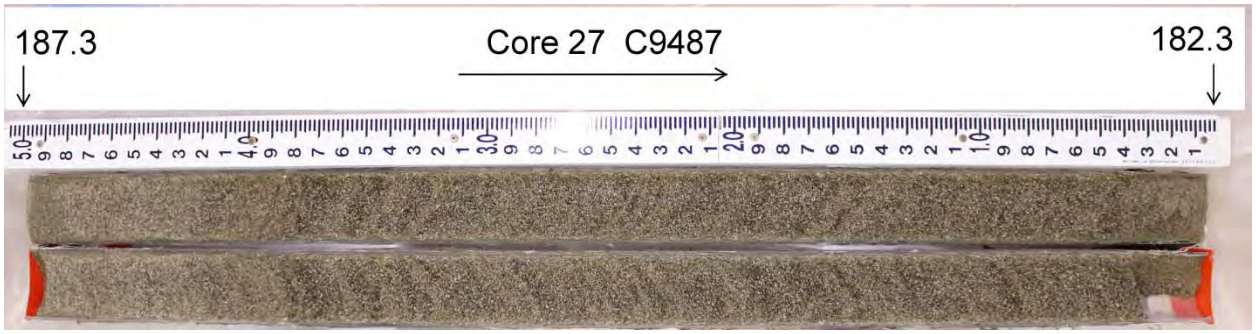
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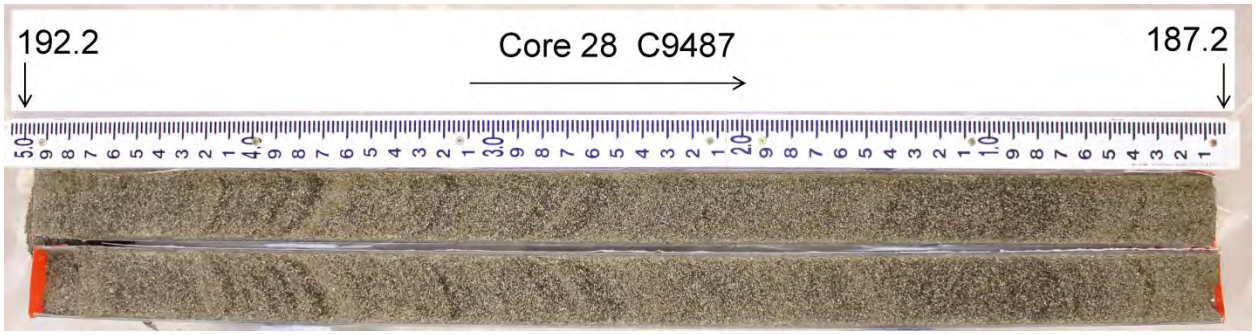
182.3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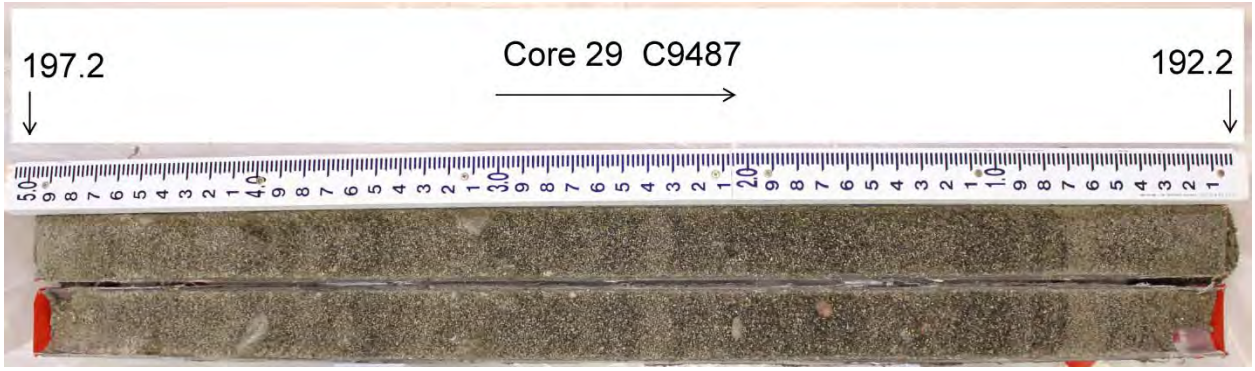
Core 28 C9487
187.2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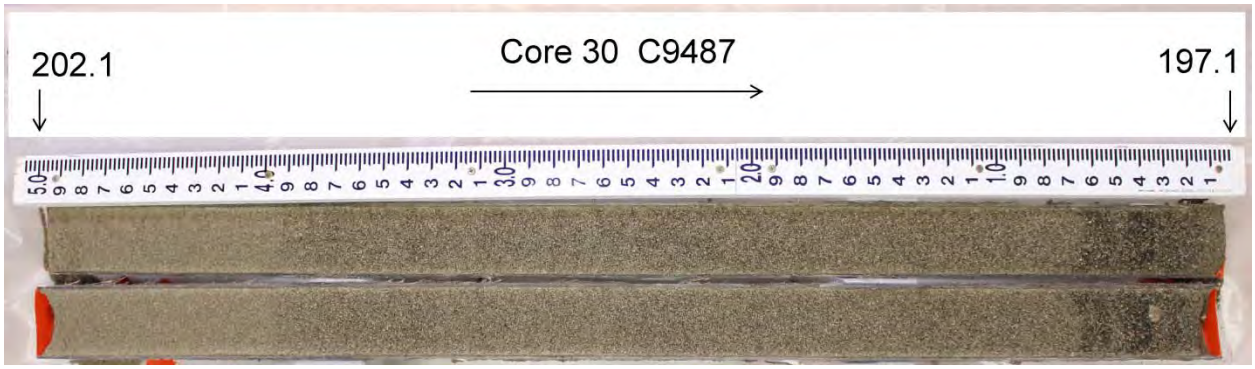
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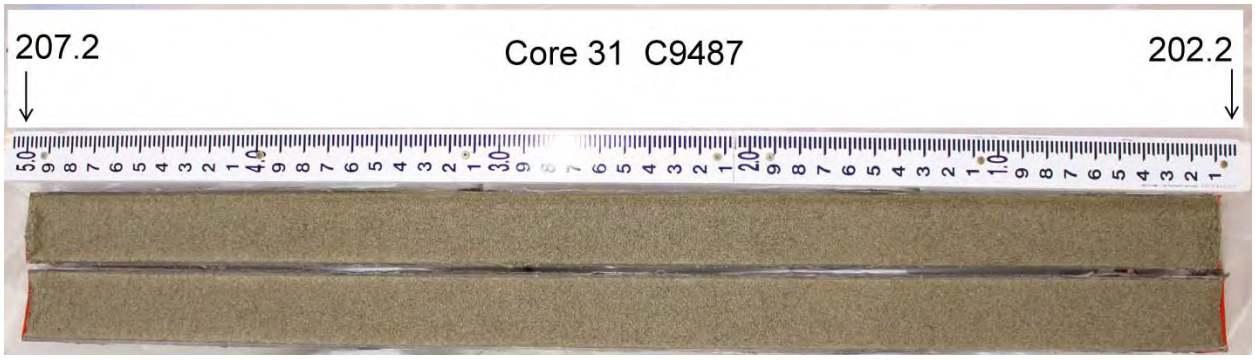
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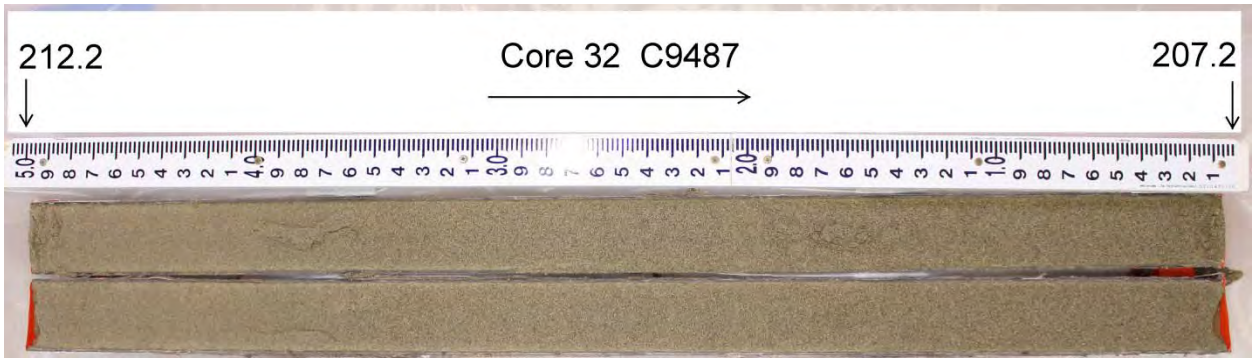
202.2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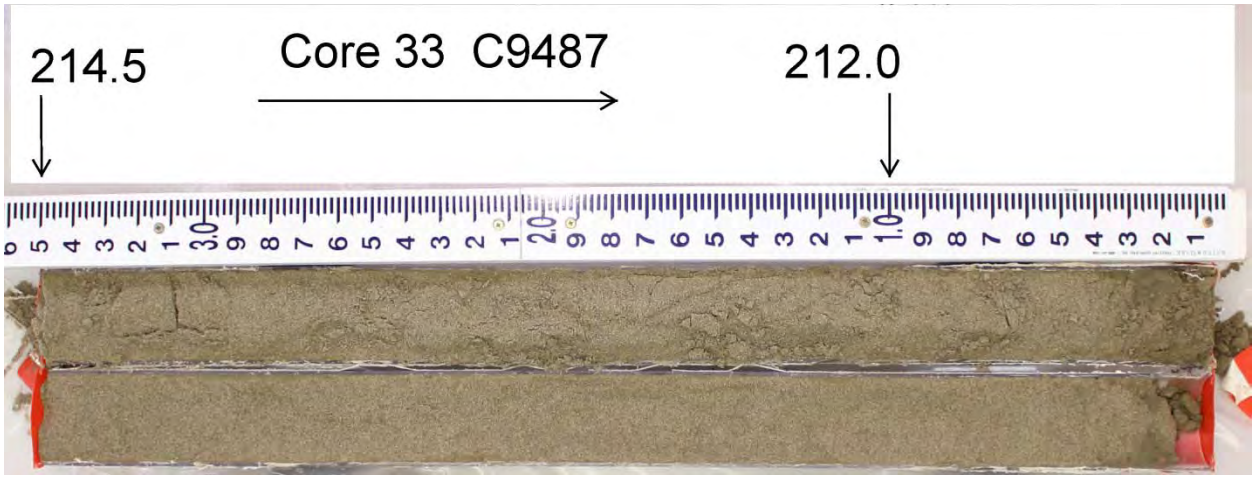
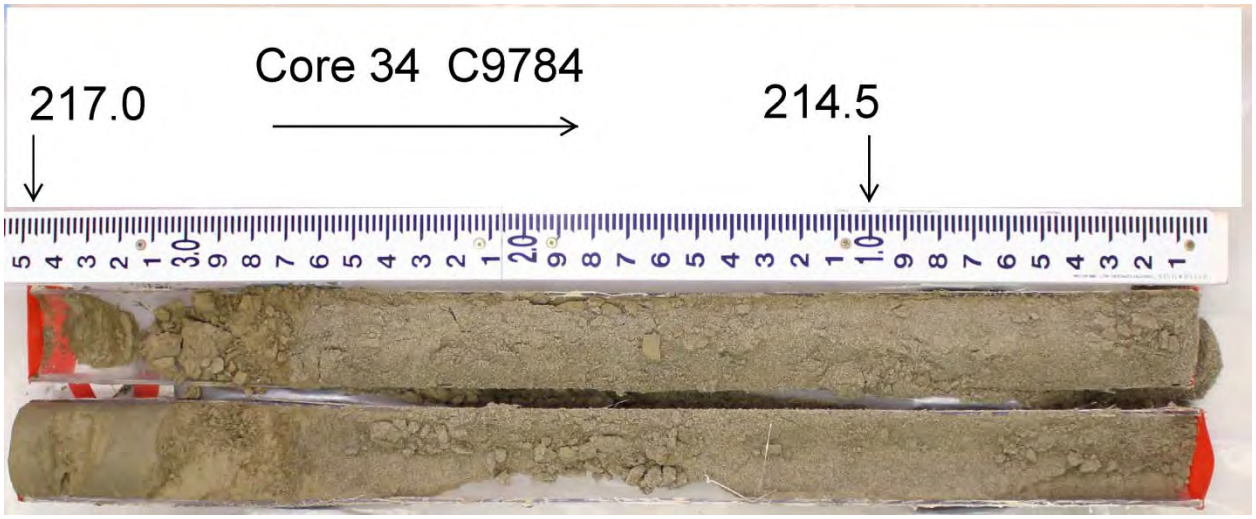

214.5
Core 33 C9487
212.0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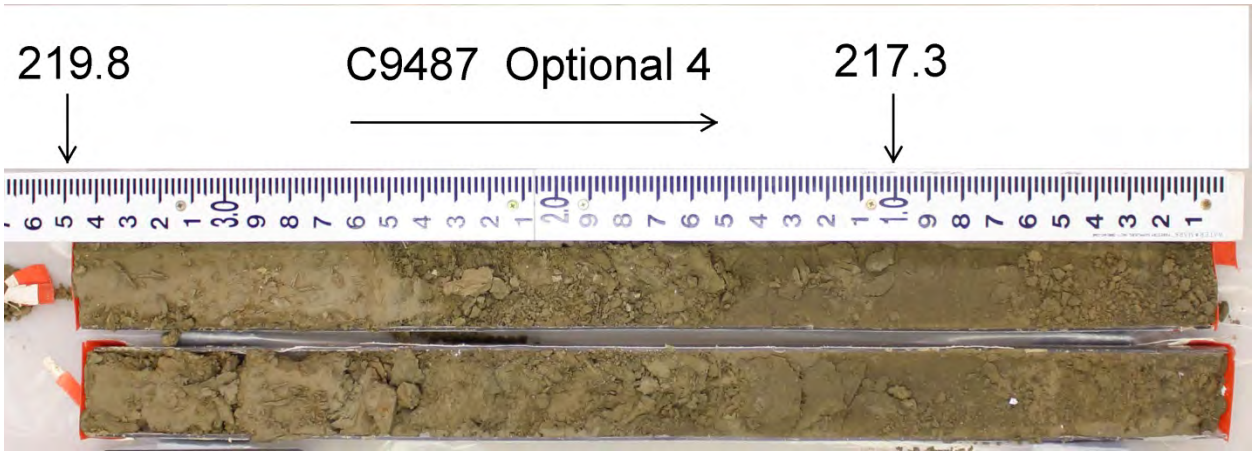
219.8
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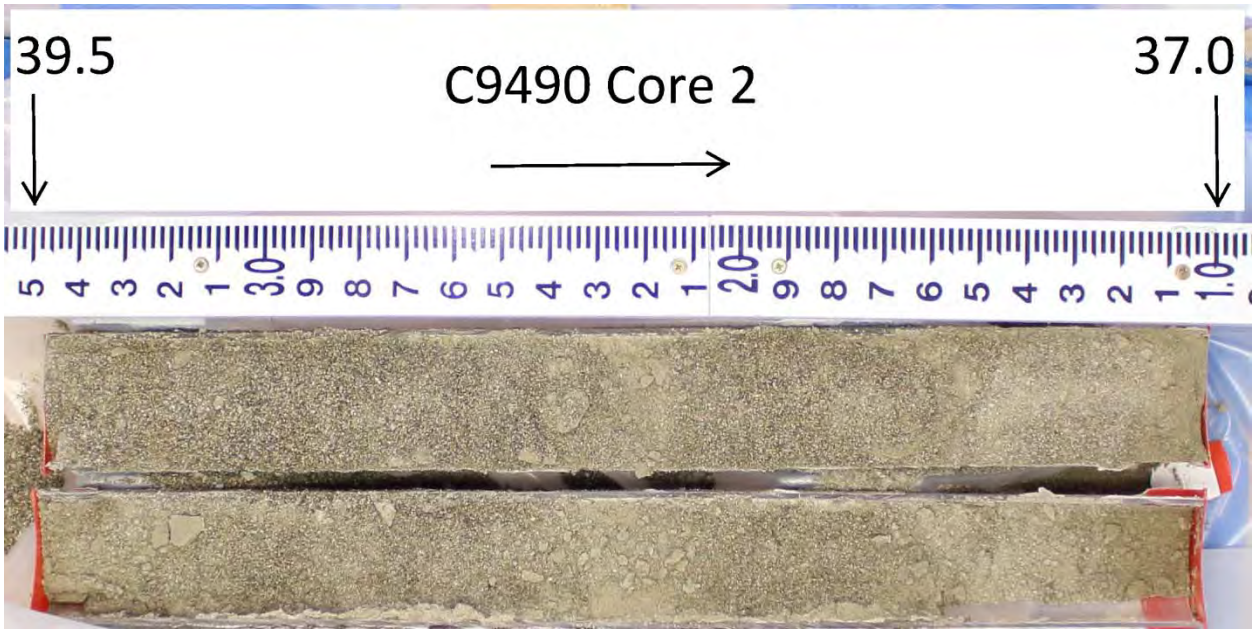
217.3

37.0
C9490 Core 1
34.5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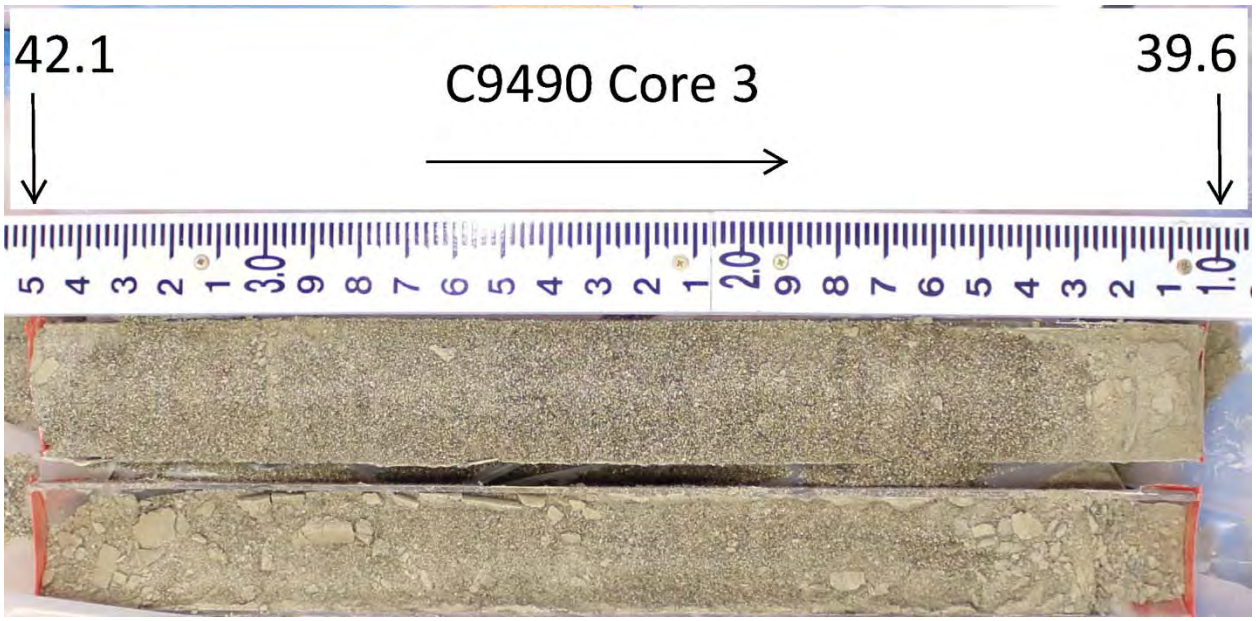
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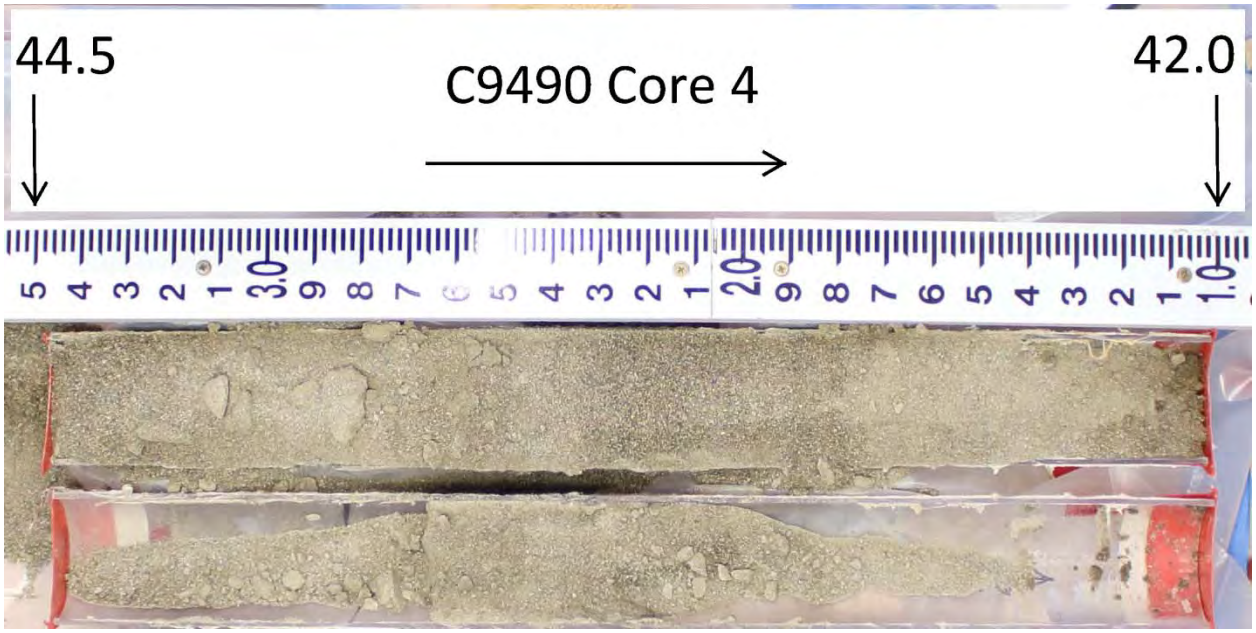
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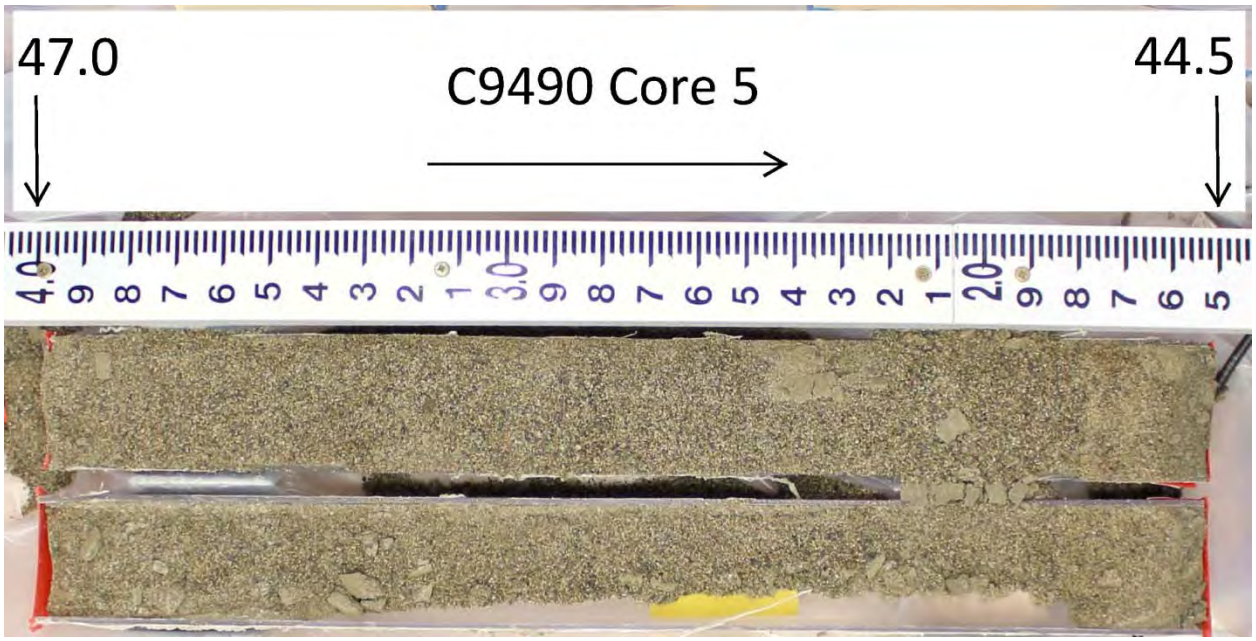
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C9490 Core 5
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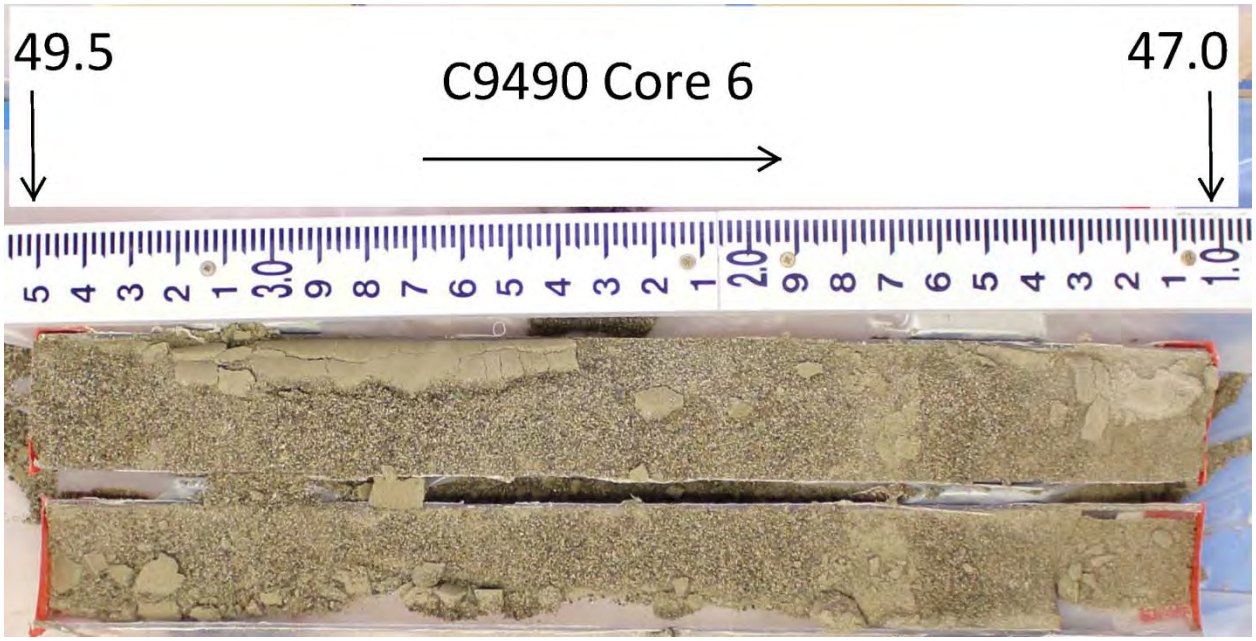
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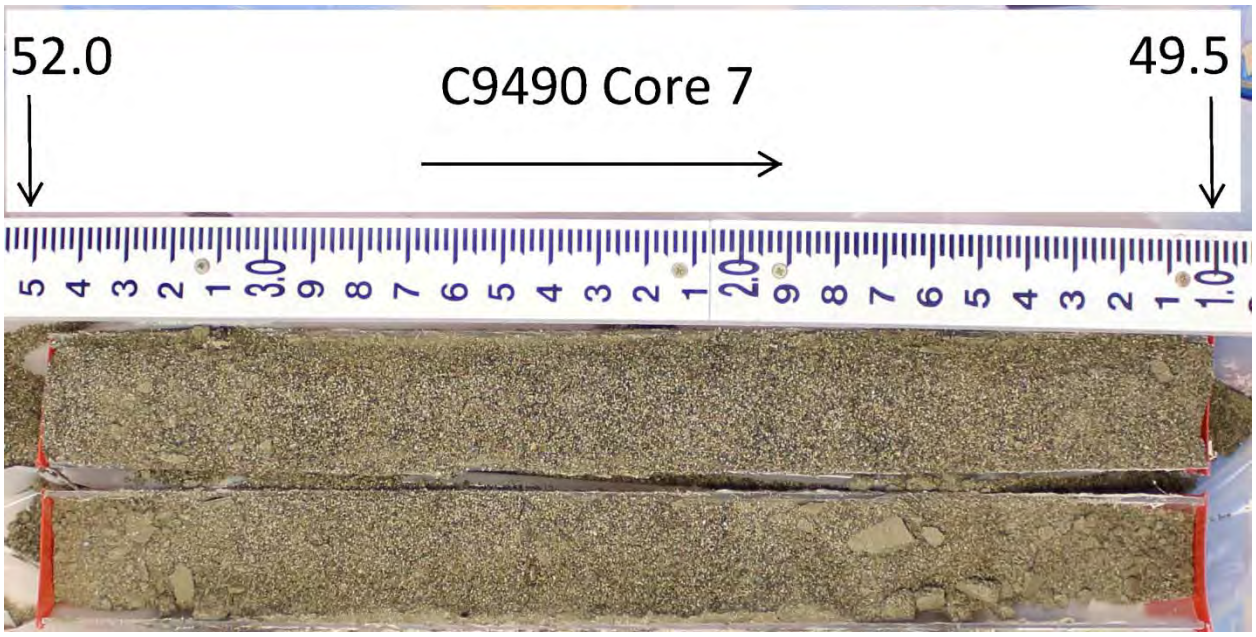
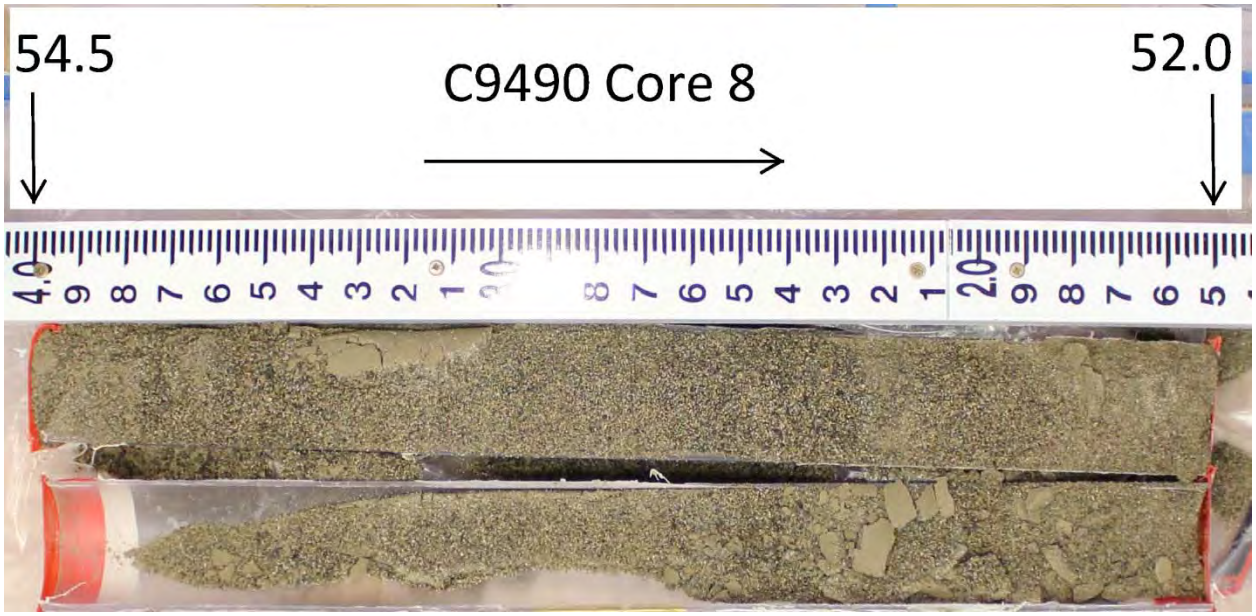
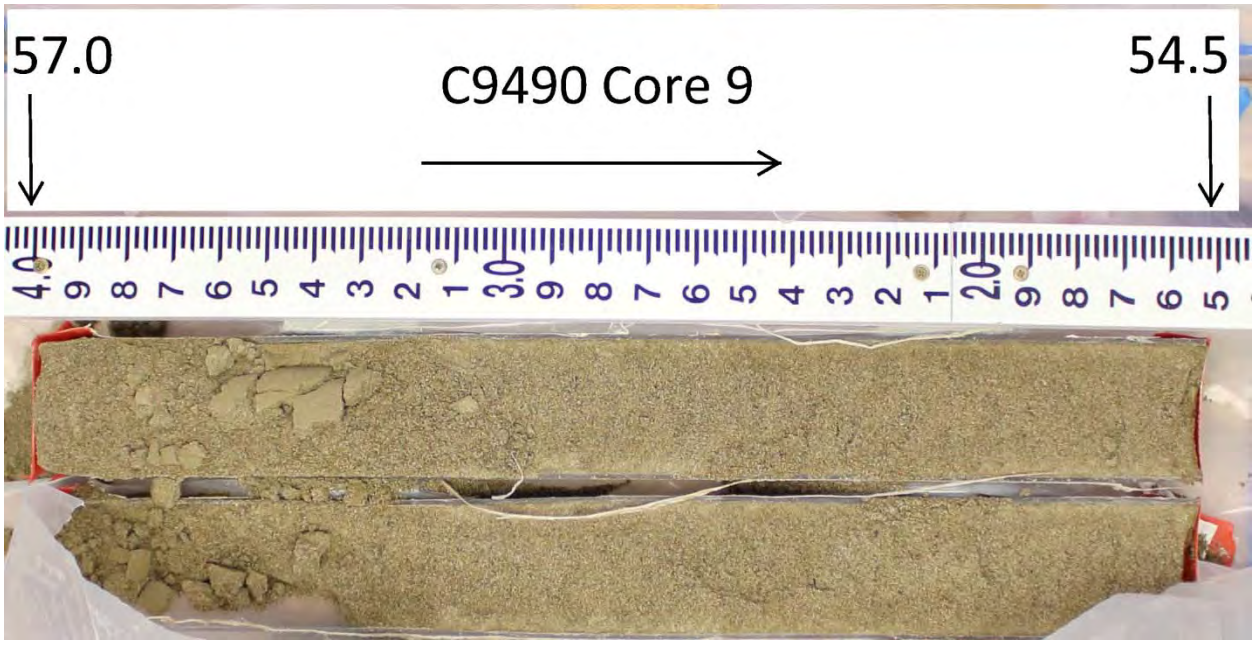
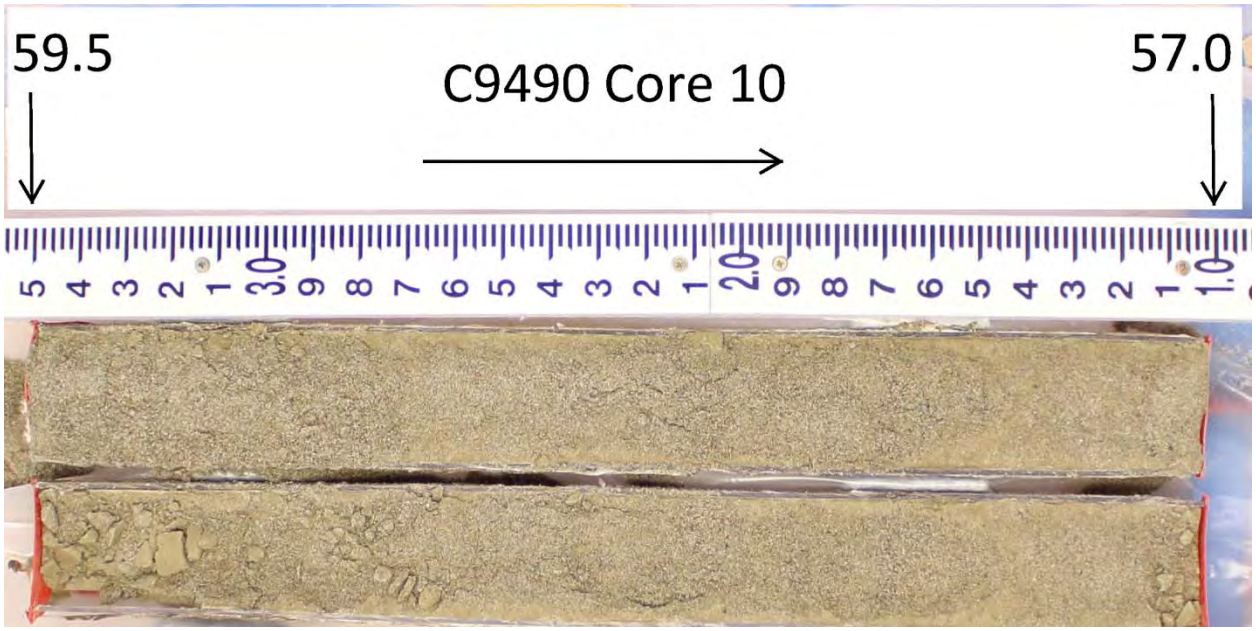
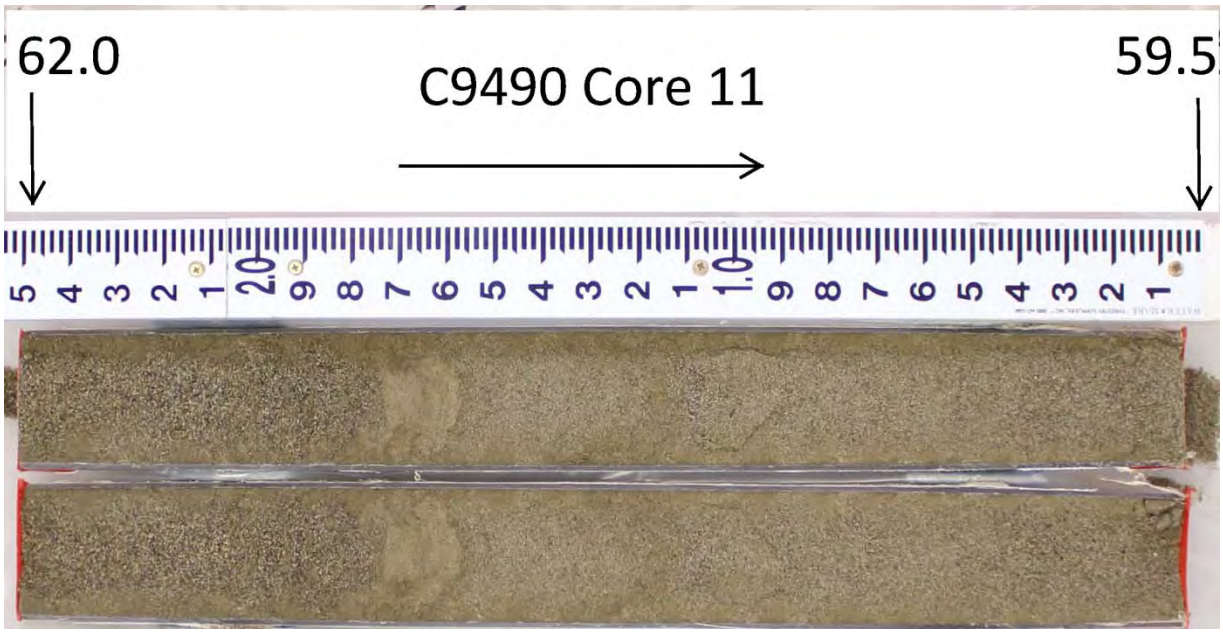
47.0

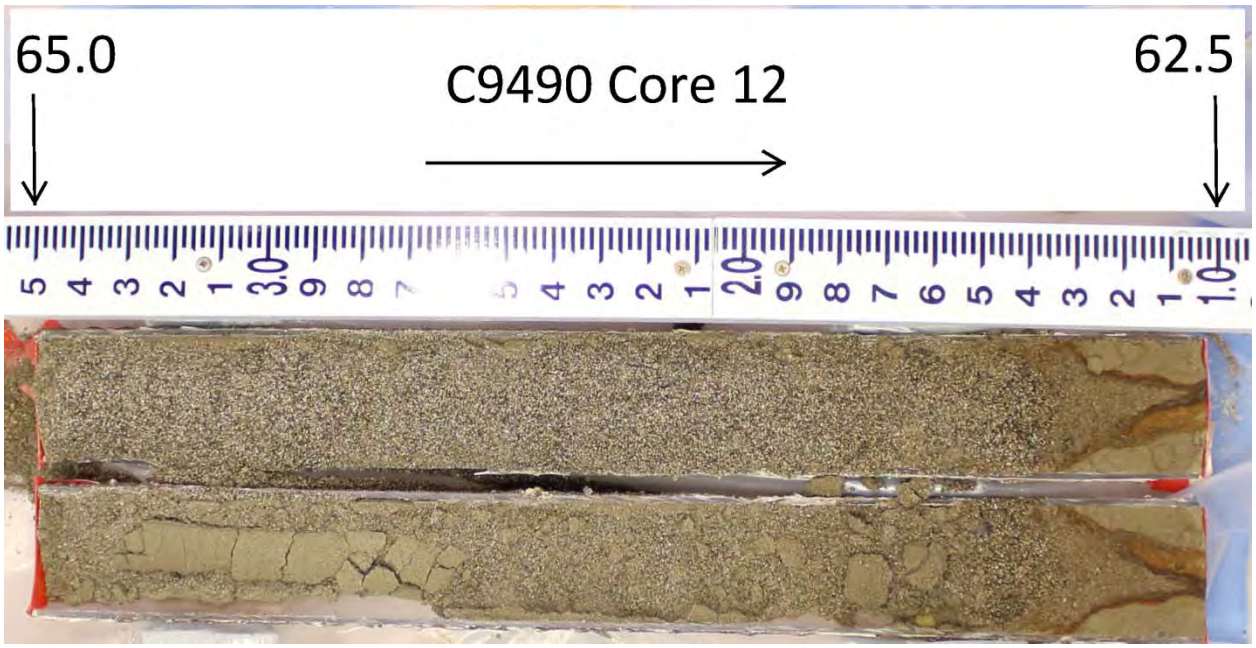

52.0
C9490 Core 7
49.5

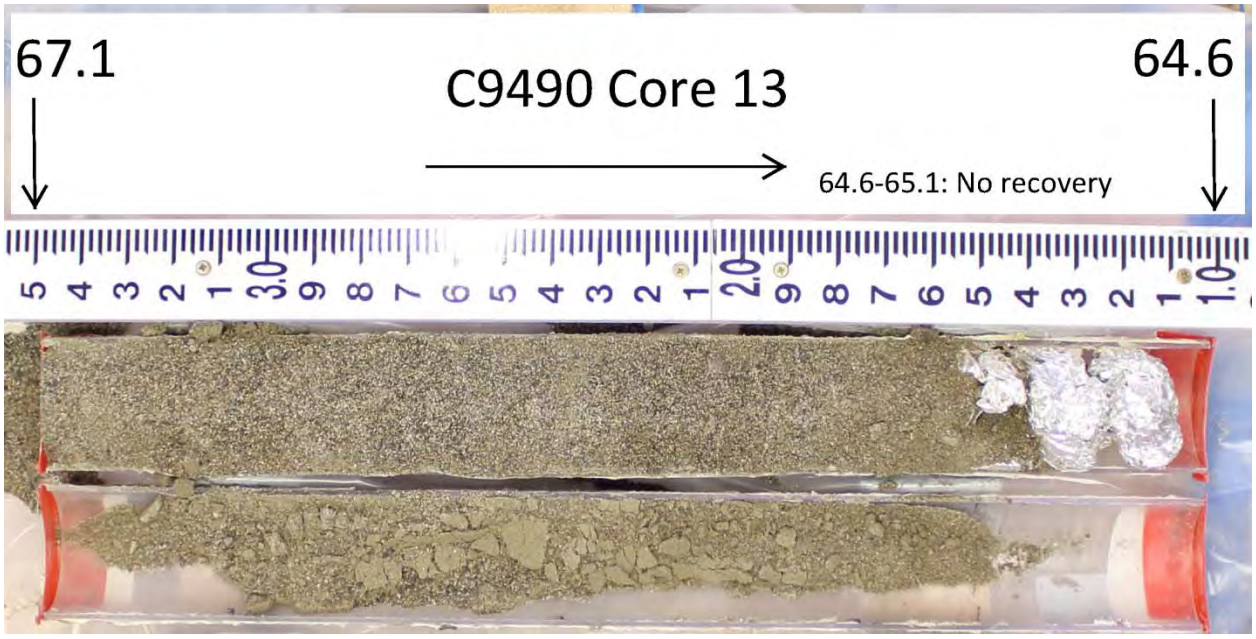

54.5
C9490 Core 8
52.0

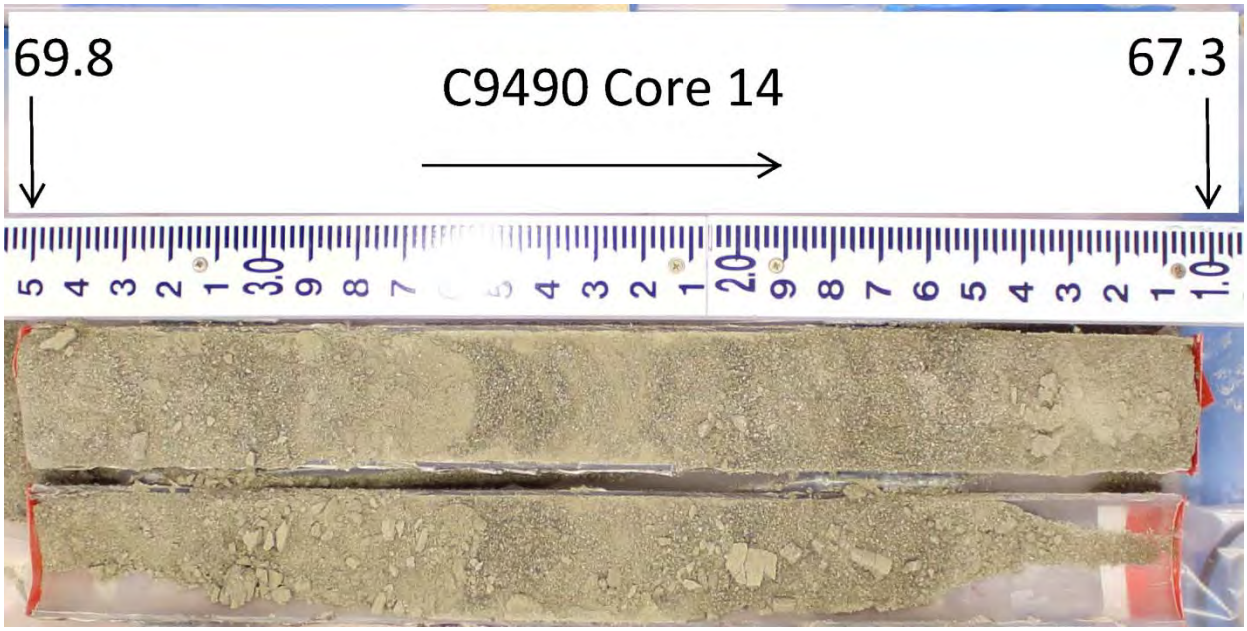

57.0
C9490 Core 9
54.5

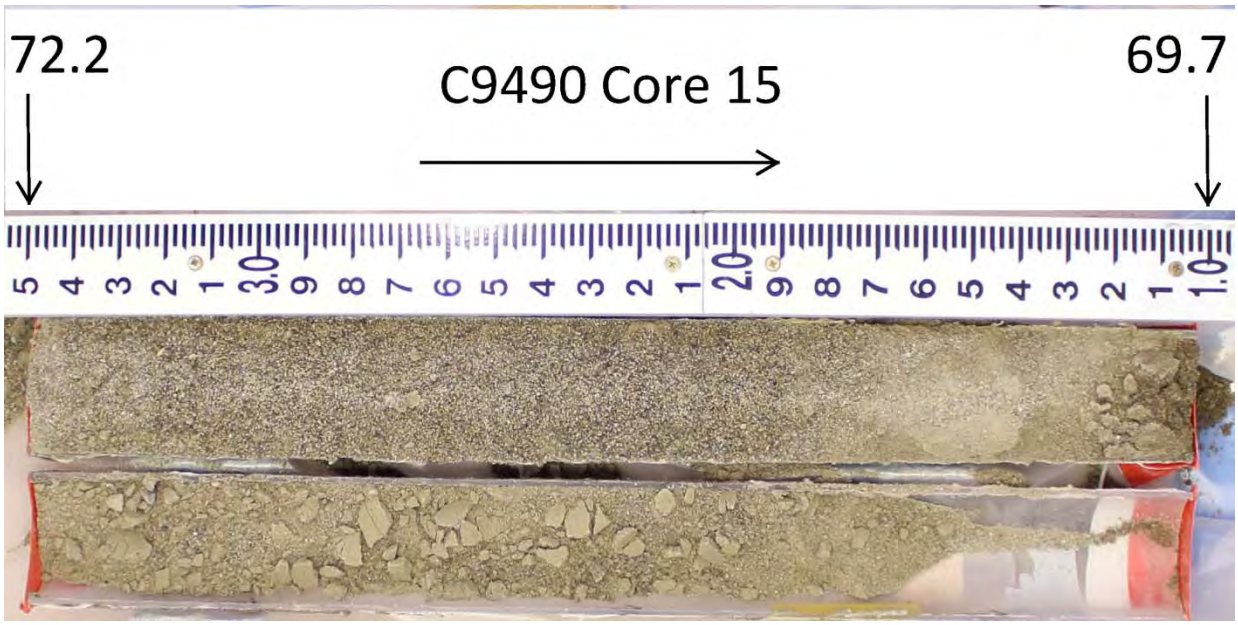

59.5
C9490 Core 10
57.0

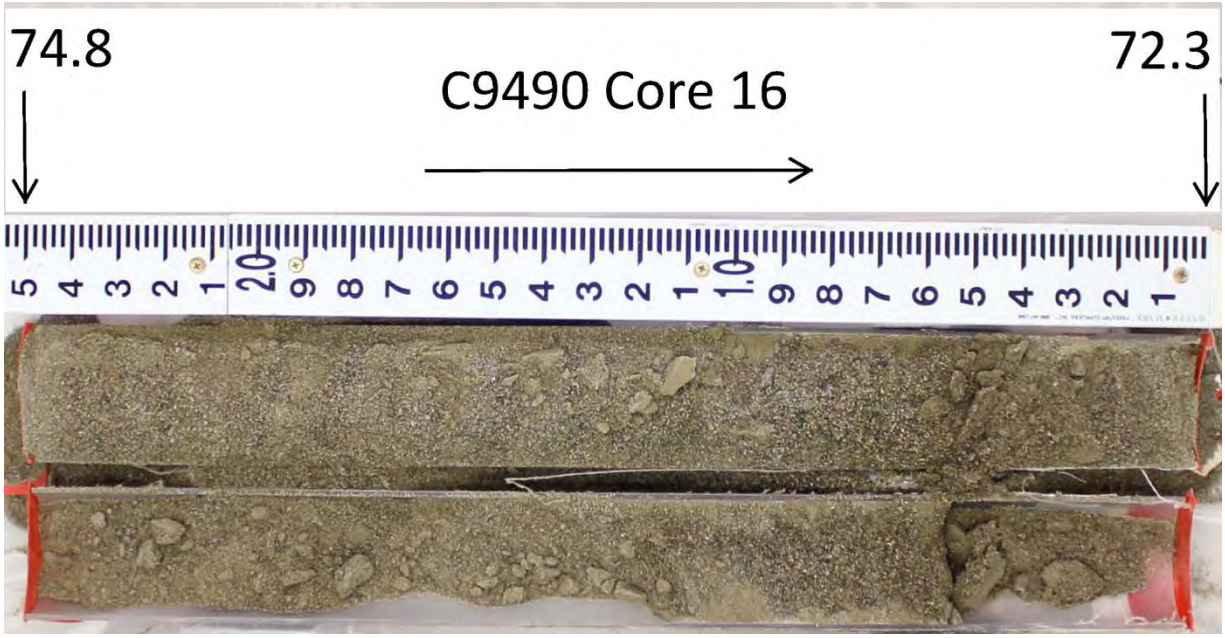

62.0
C9490 Core 11
59.5

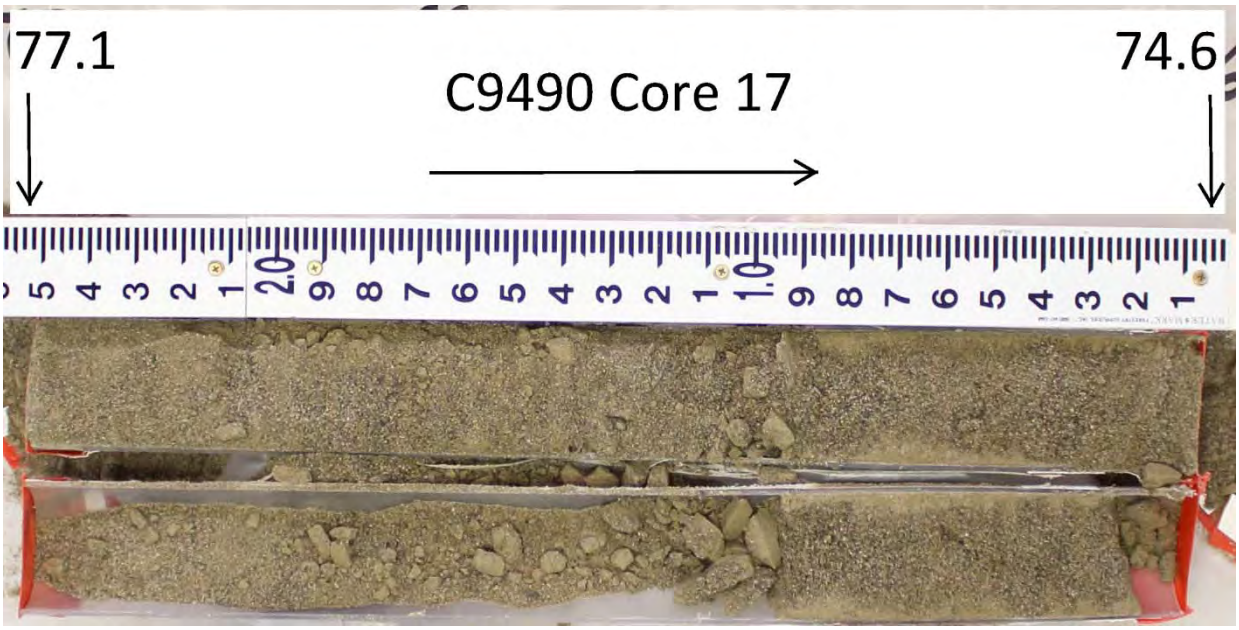

65.0
C9490 Core 12
62.5

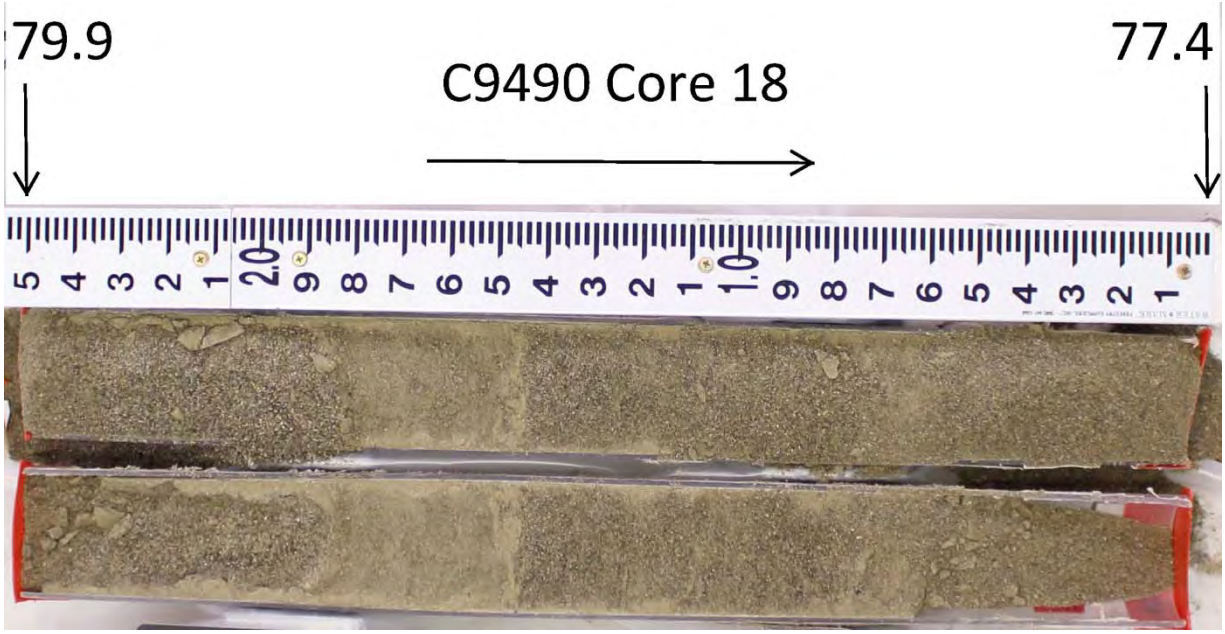

67.1
C9490 Core 13
64.6
64.6-65.1: No recovery

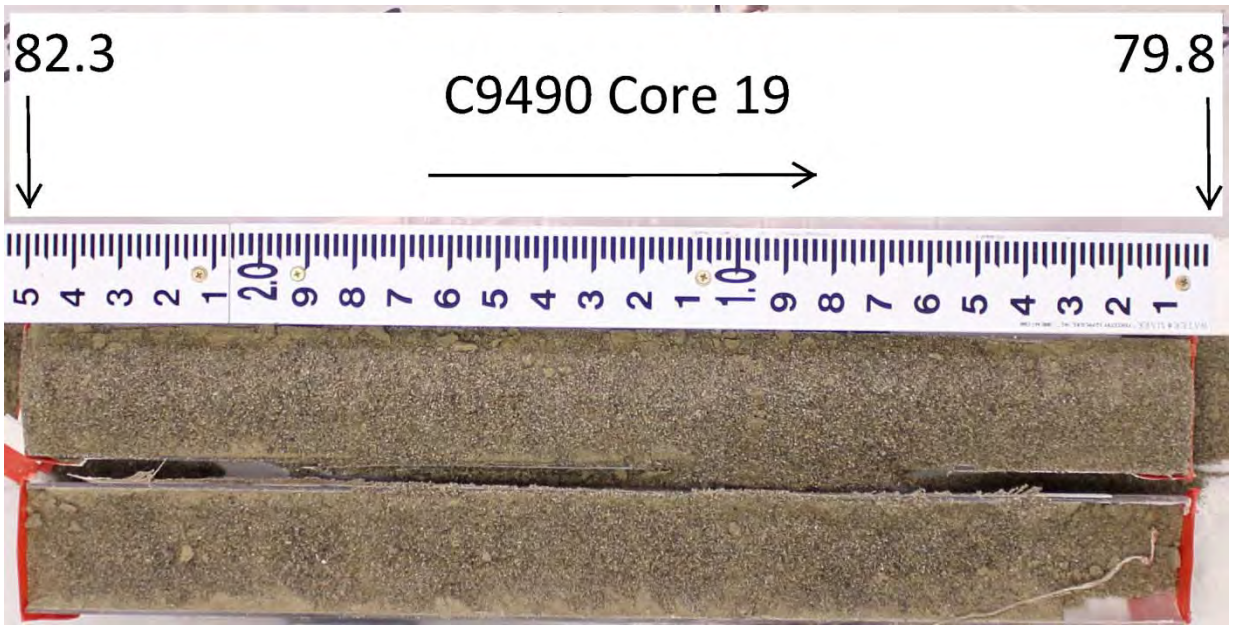

69.8
C9490 Core 14
67.3

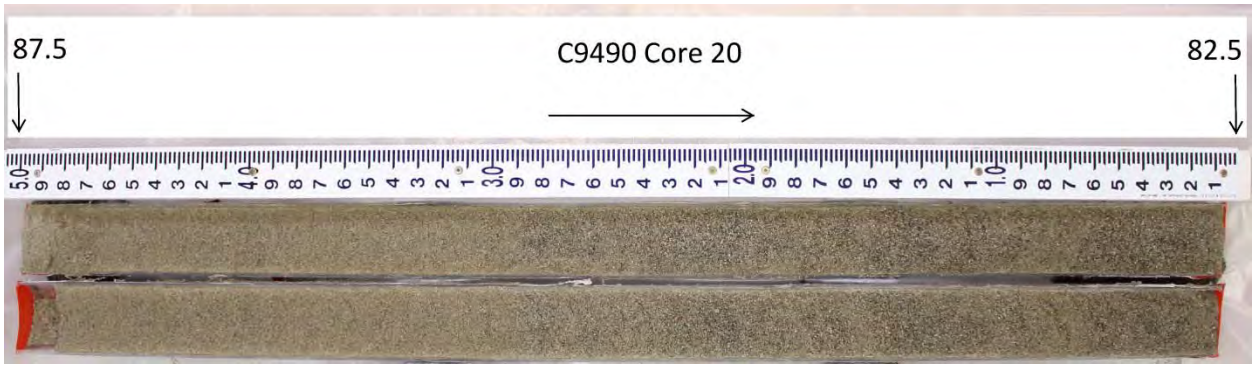

72.2
C9490 Core 15
69.7

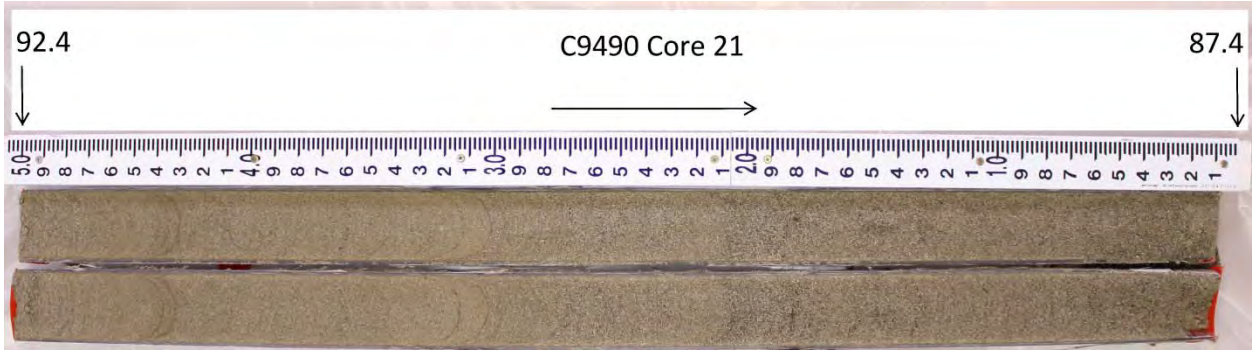

74.8
C9490 Core 16
72.3

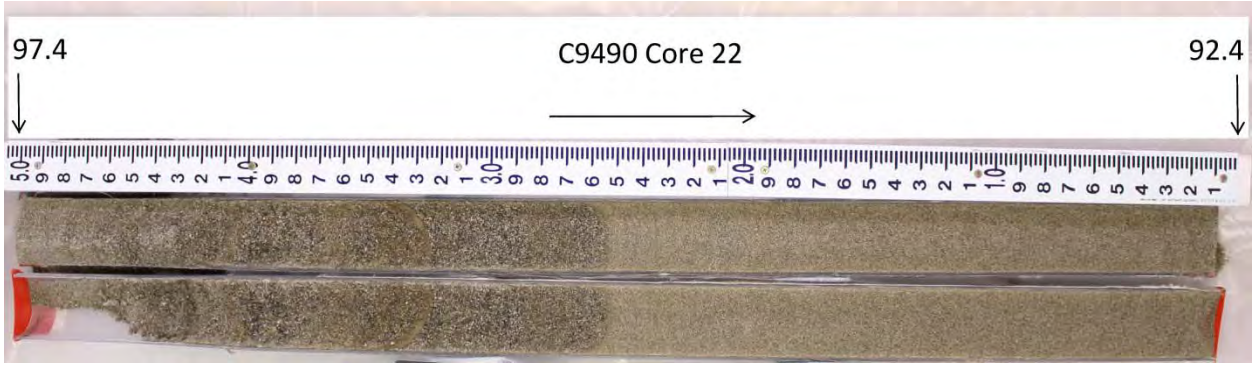

77.1
C9490 Core 17
74.6

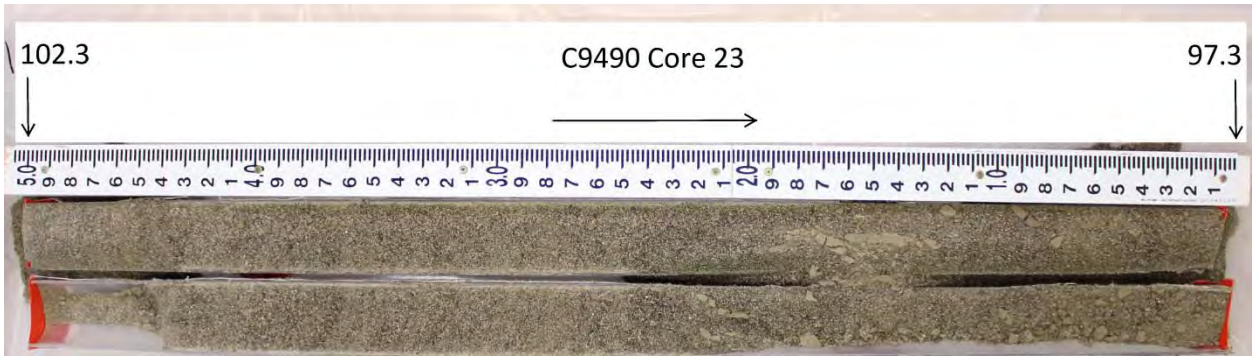

79.9
C9490 Core 18
77.4

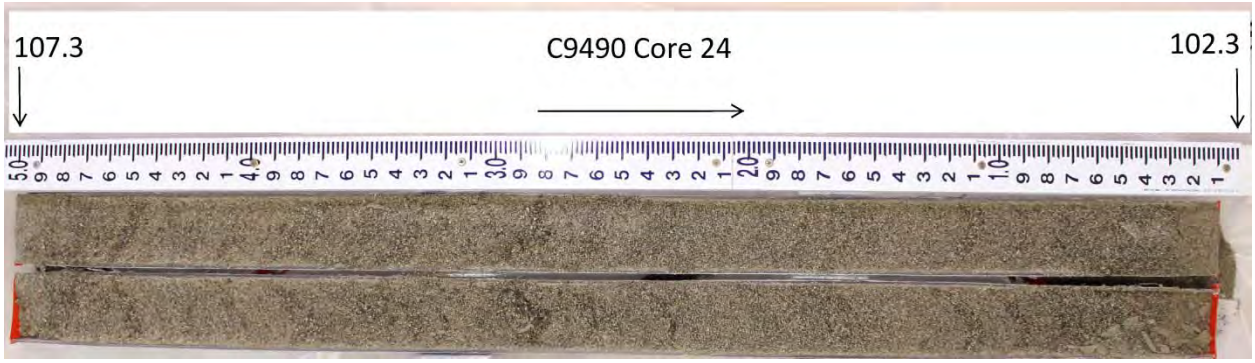

82.3
C9490 Core 19
79.8

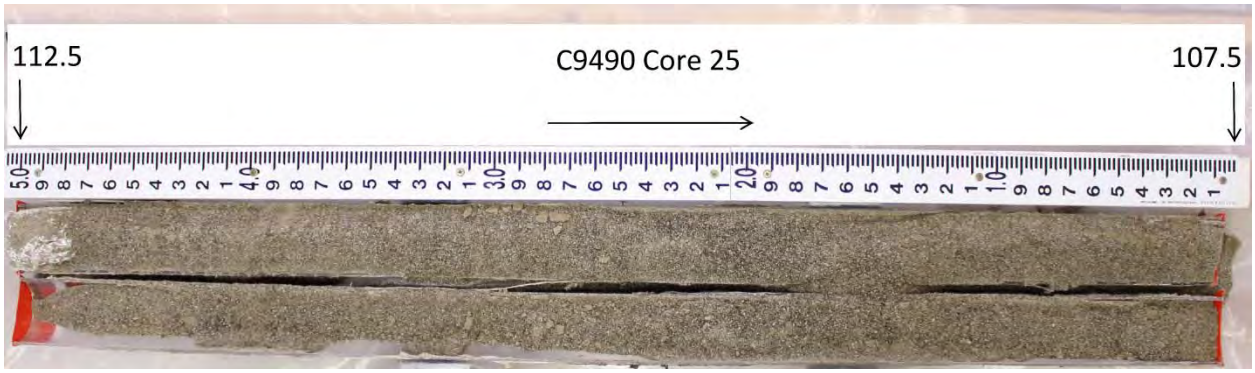

87.5
C9490 Core 20
82.5

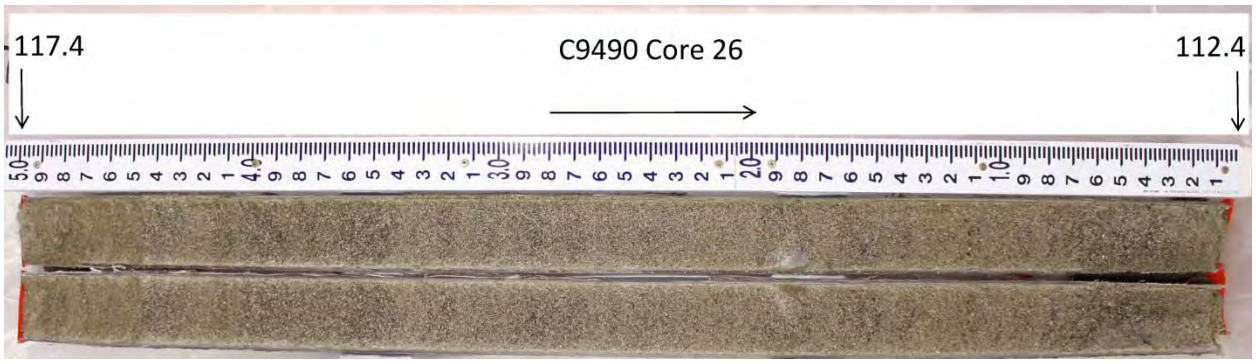

92.4
C9490 Core 21
87.4

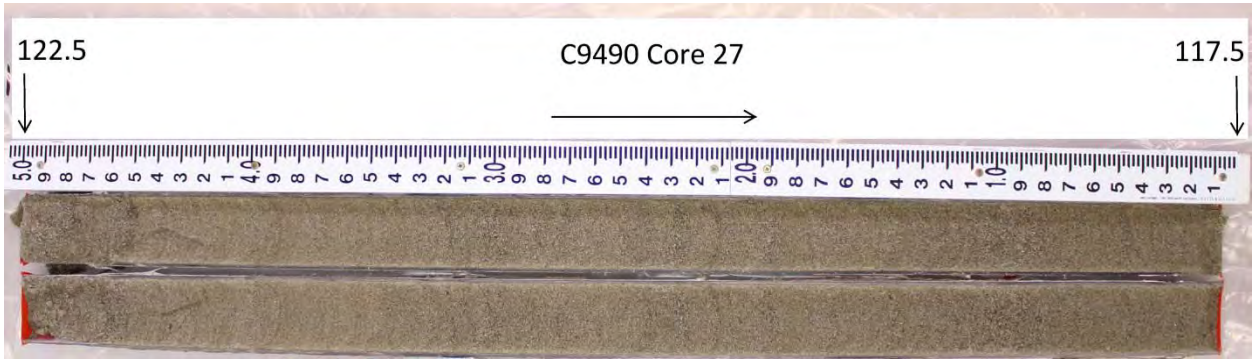

97.4
C9490 Core 22
92.4

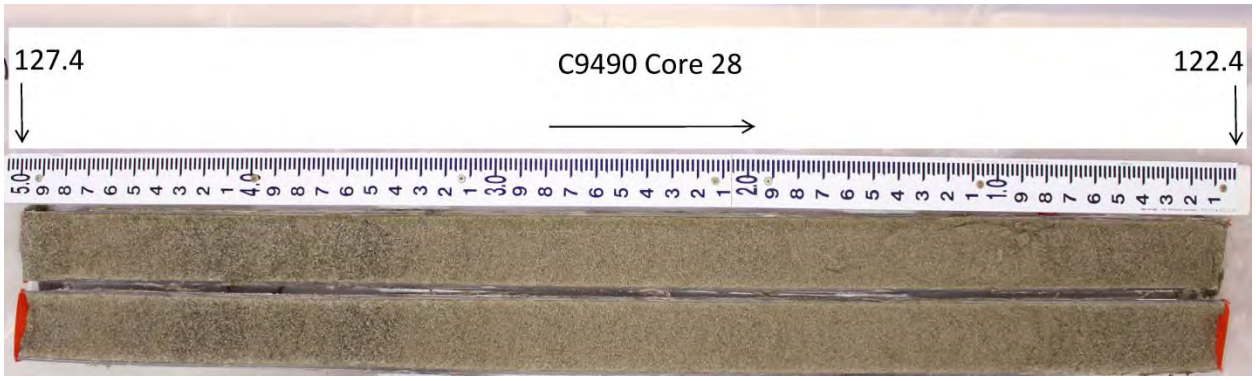

102.3
C9490 Core 23
97.3

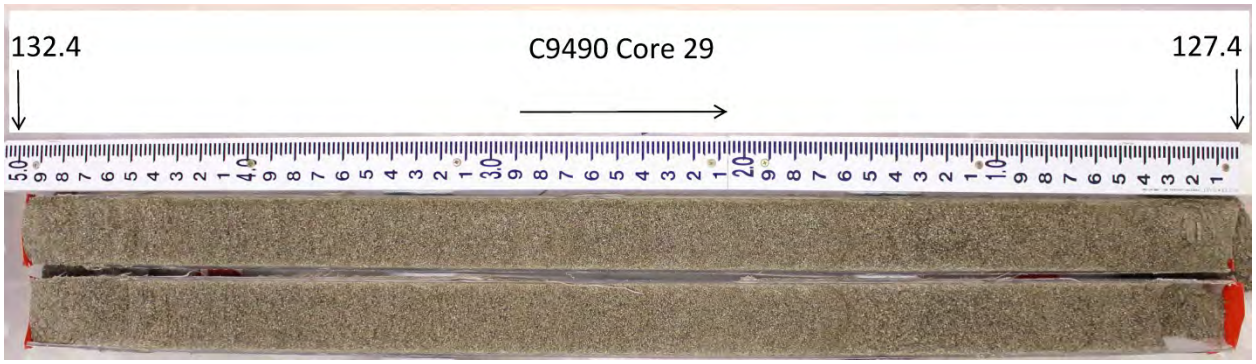

107.3
C9490 Core 24
102.3

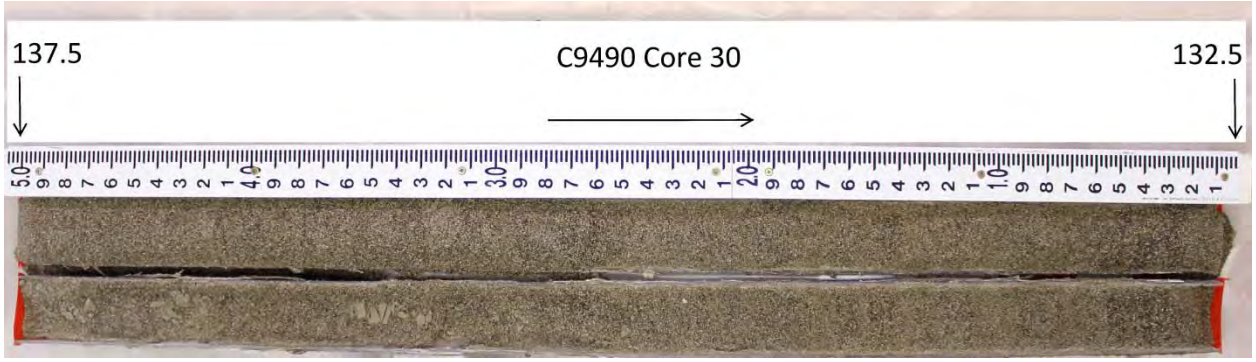

112.5
C9490 Core 25
107.5

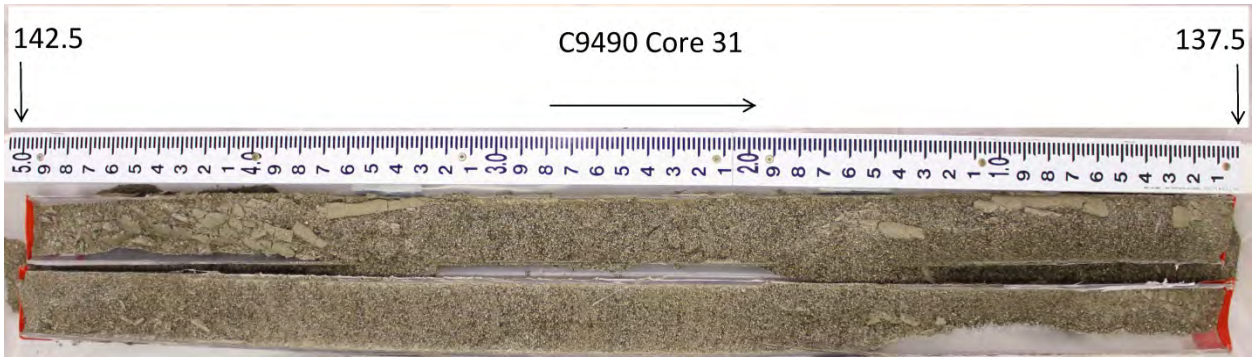

117.4
C9490 Core 26
112.4

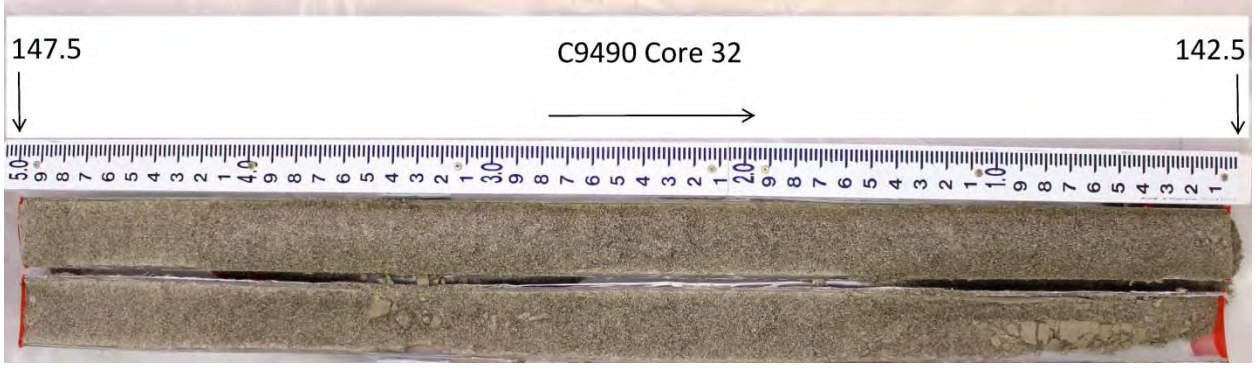

122.5
C9490 Core 27
117.5

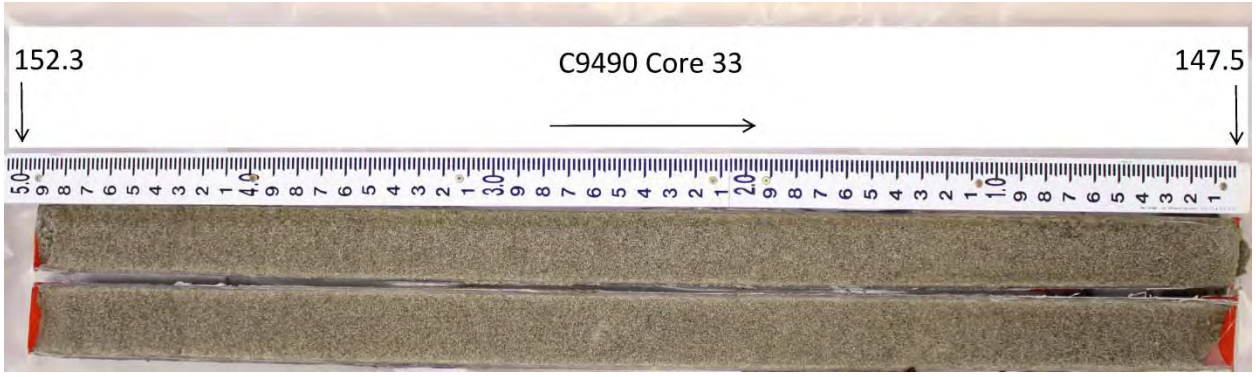

127.4
C9490 Core 28
122.4

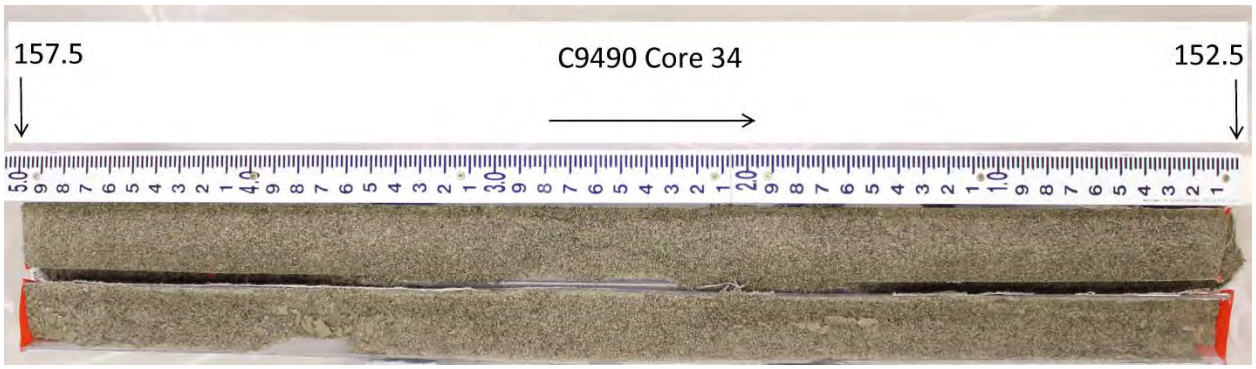

132.4
C9490 Core 29
127.4

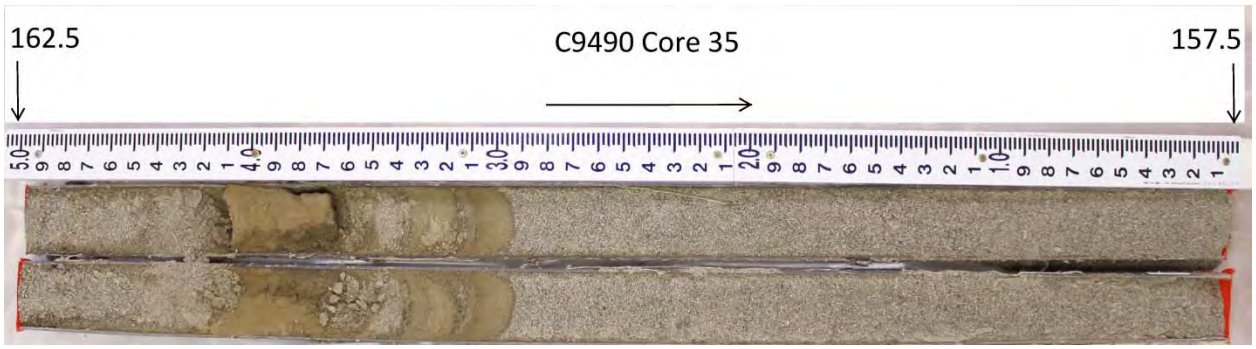

137.5
C9490 Core 30
132.5

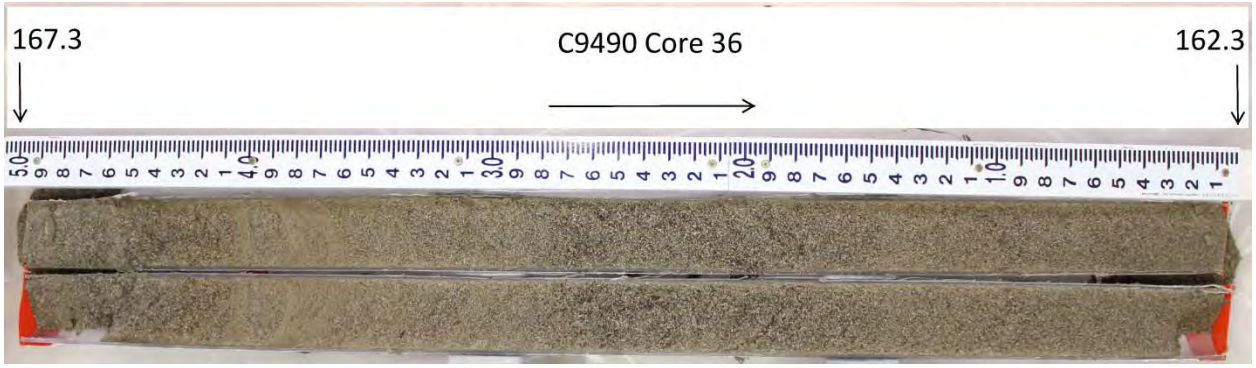

142.5
C9490 Core 31
137.5

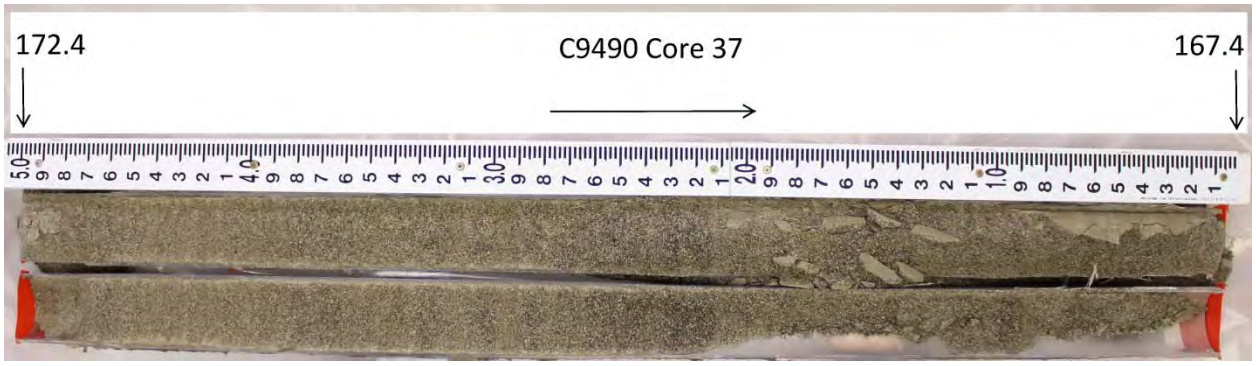

147.5
C9490 Core 32
142.5

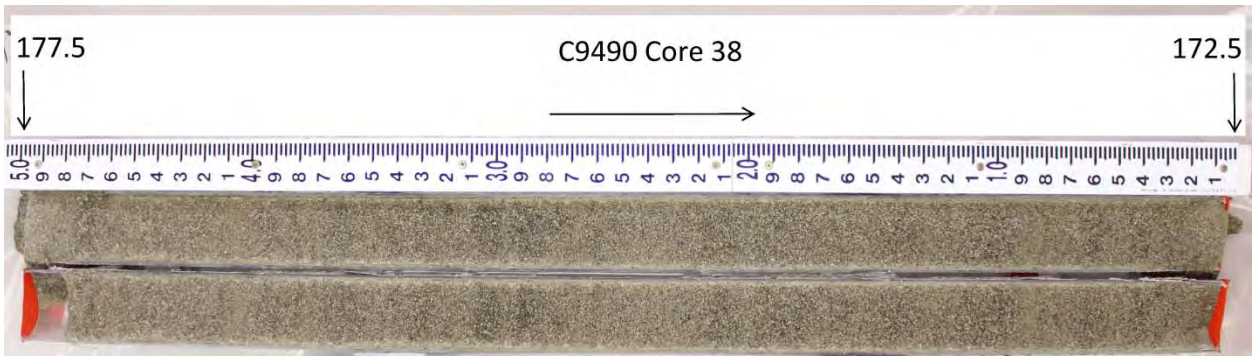

152.3
C9490 Core 33
147.5

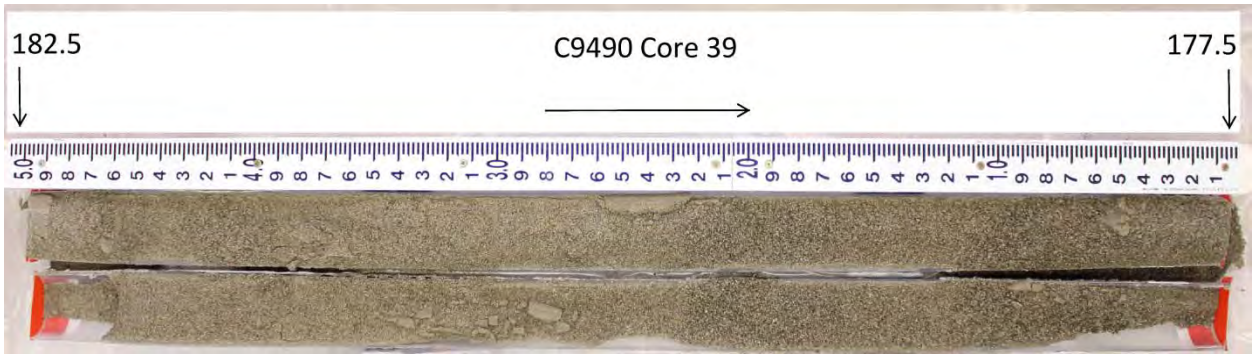

157.5
C9490 Core 34
152.5

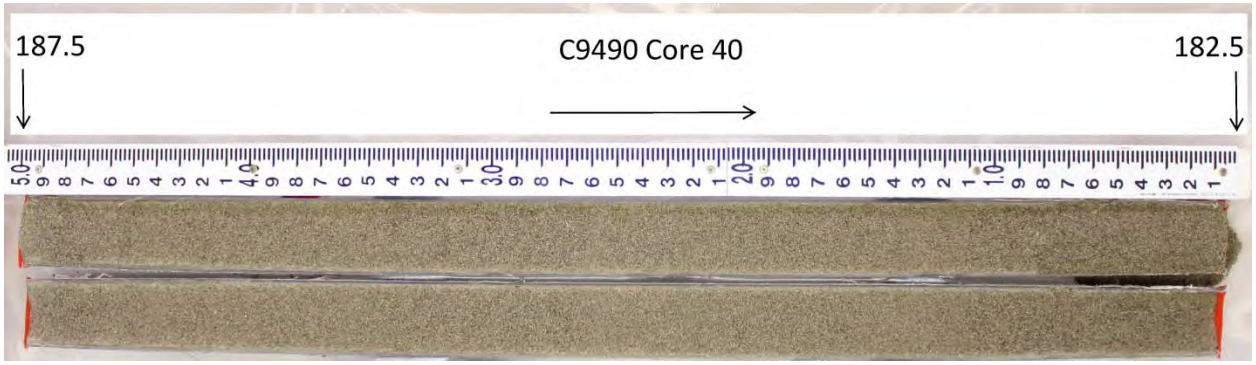

162.5
C9490 Core 35
157.5

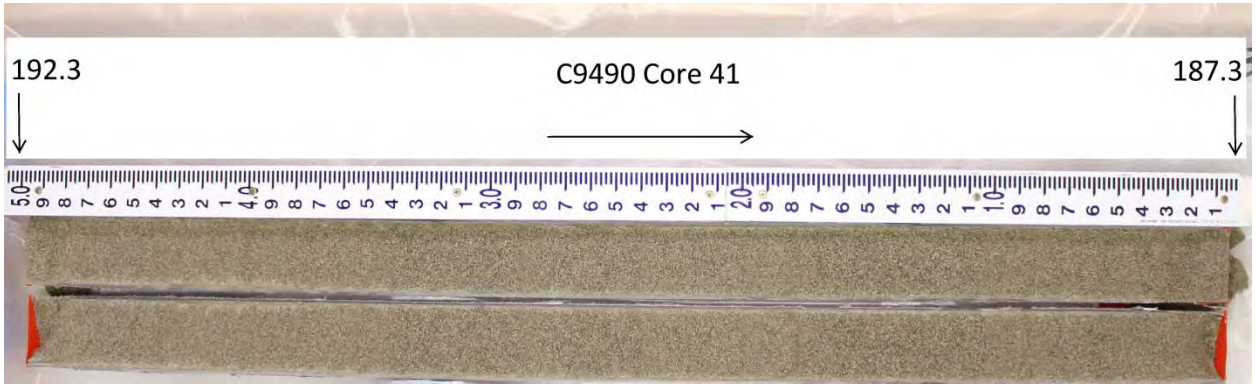

167.3
C9490 Core 36
162.3

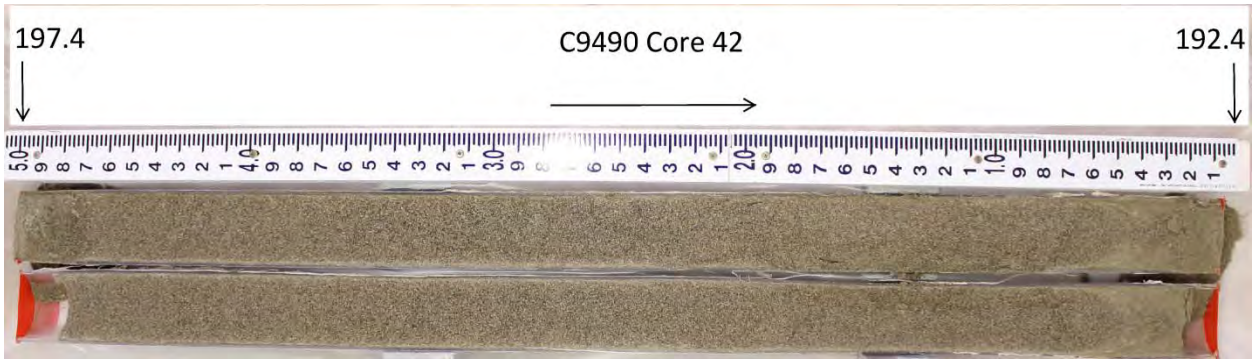

172.4
C9490 Core 37
167.4

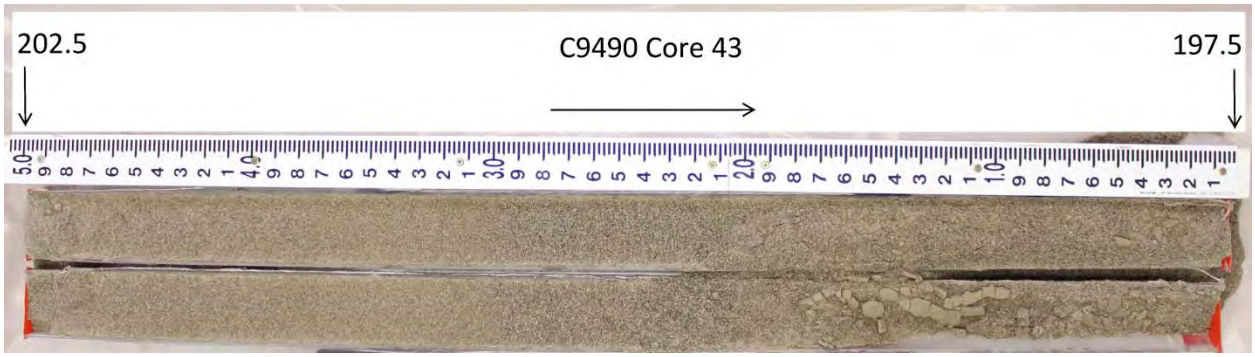

177.5
C9490 Core 38
172.5

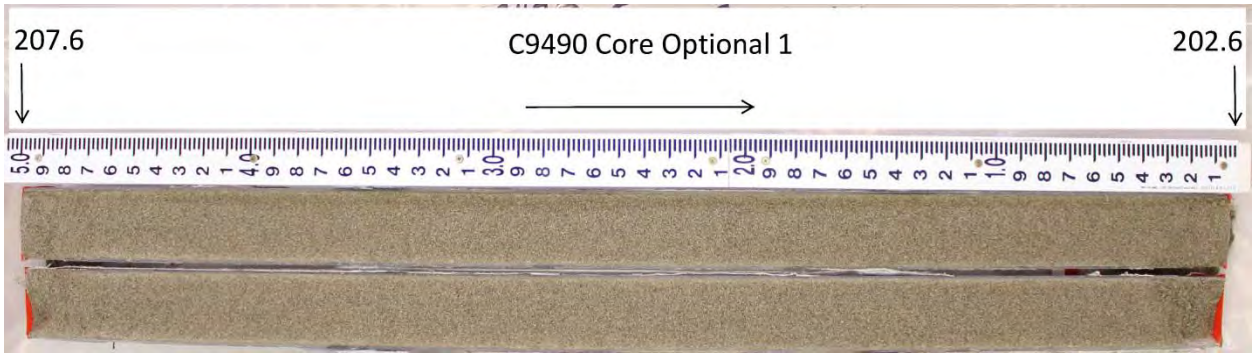

182.5
C9490 Core 39
177.5

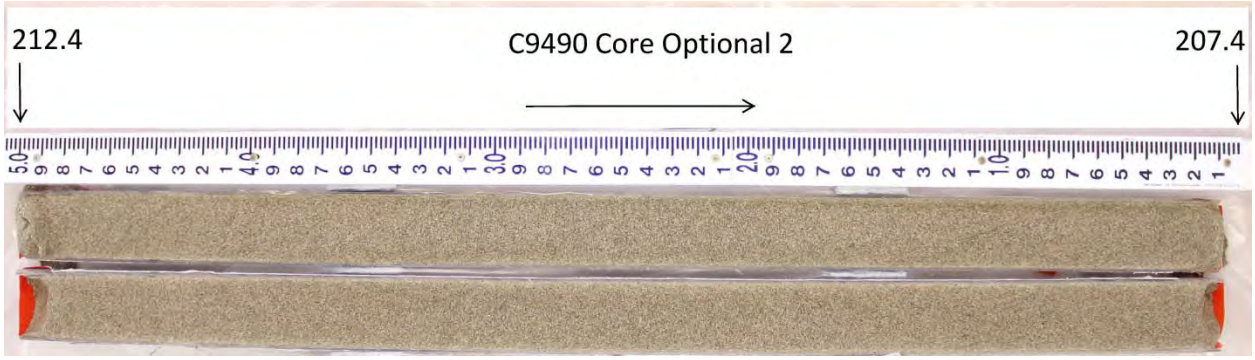

187.5
C9490 Core 40
182.5

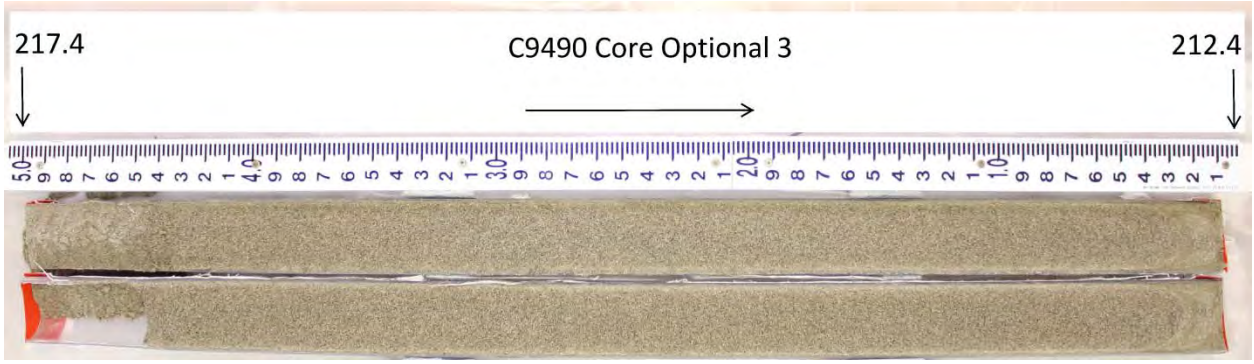

192.3
C9490 Core 41
187.3

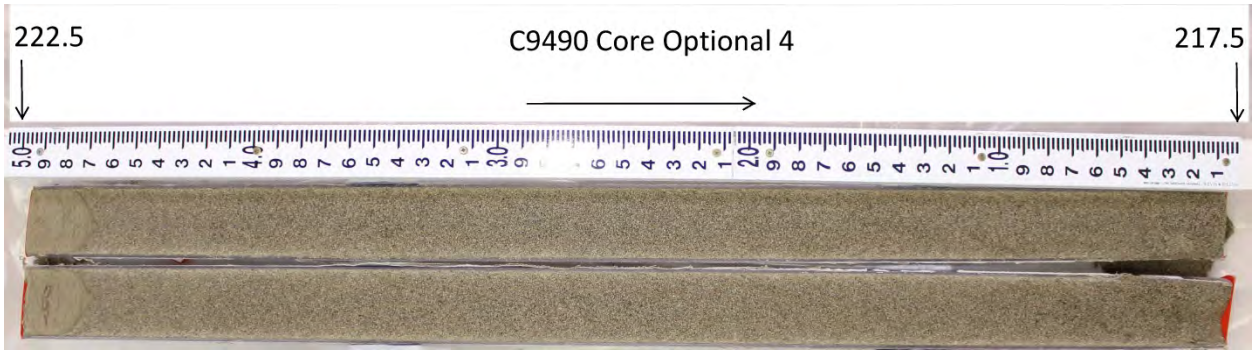

197.4
C9490 Core 42
192.4

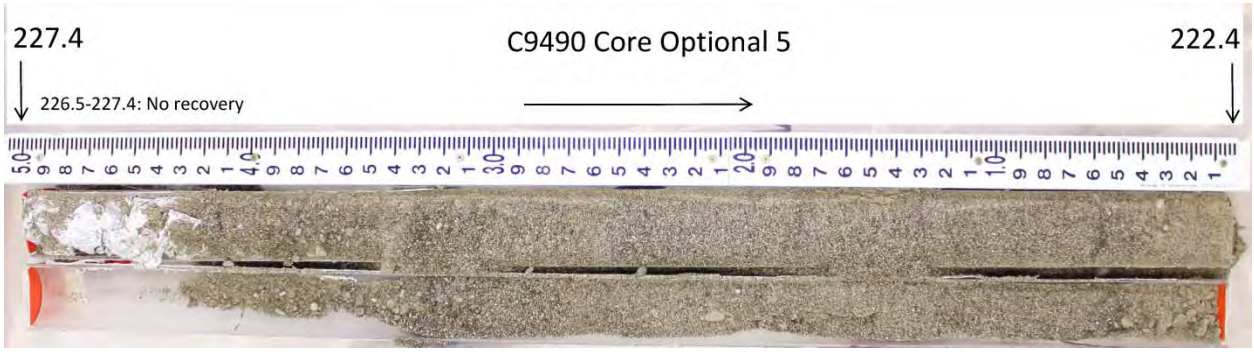

202.5
C9490 Core 43
197.5


207.6
C9490 Core Optional 1
202.6

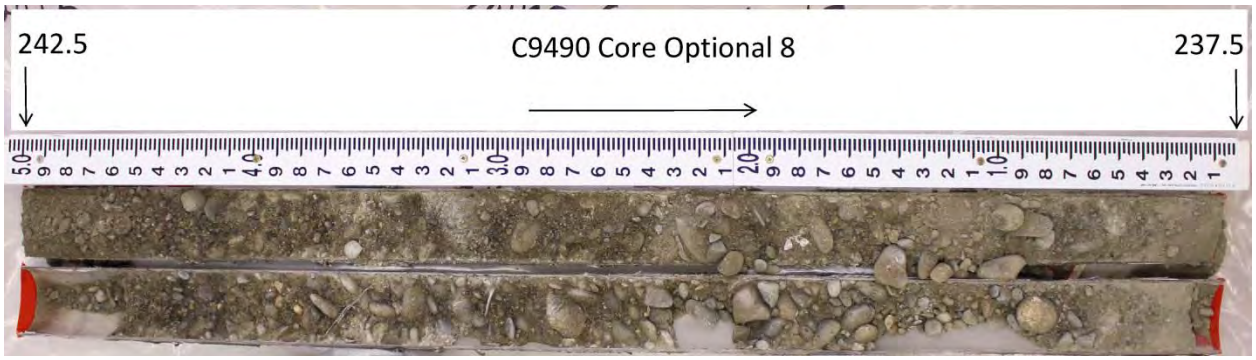

212.4
C9490 Core Optional 2
207.4

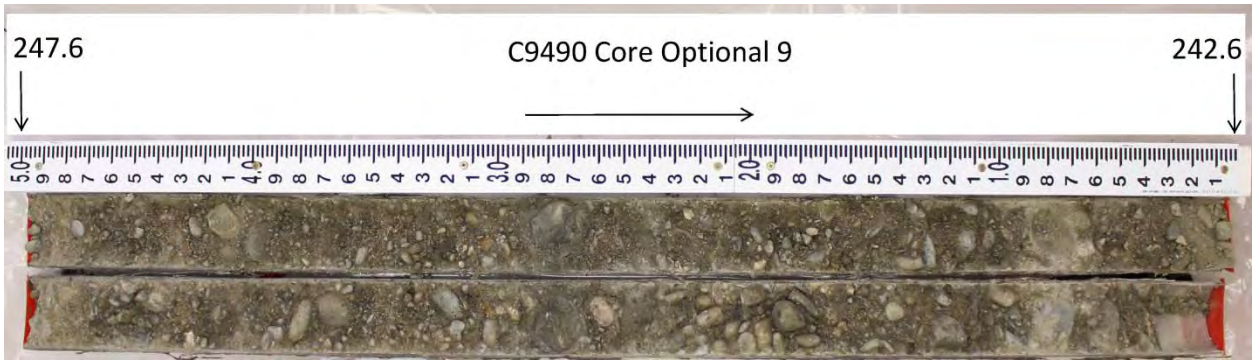


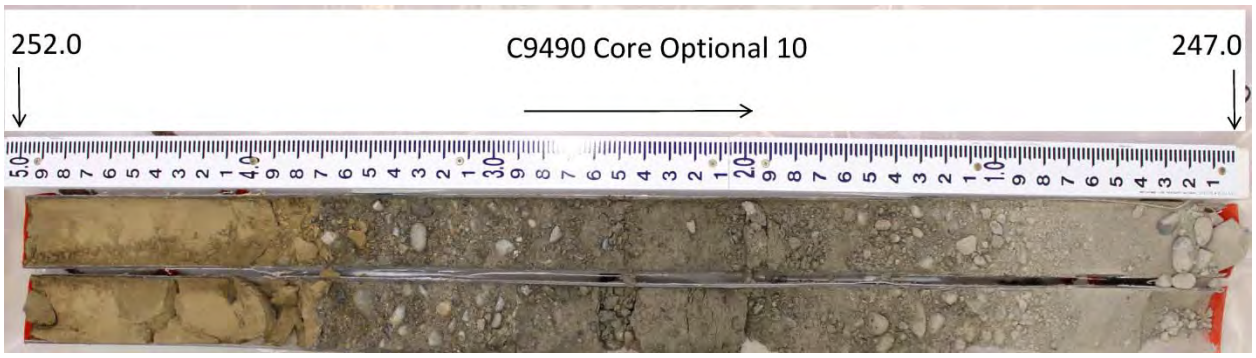


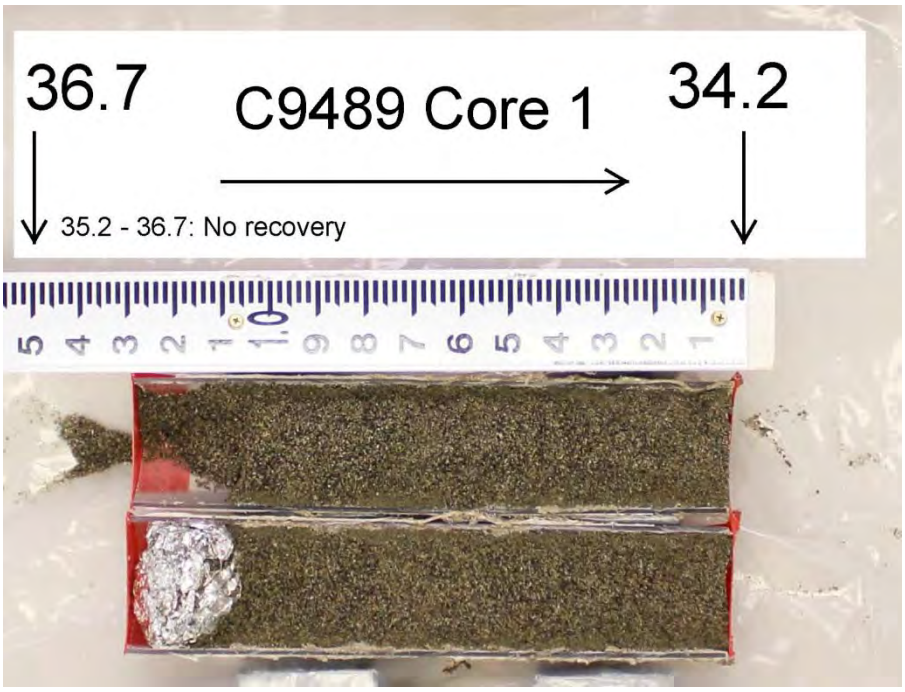


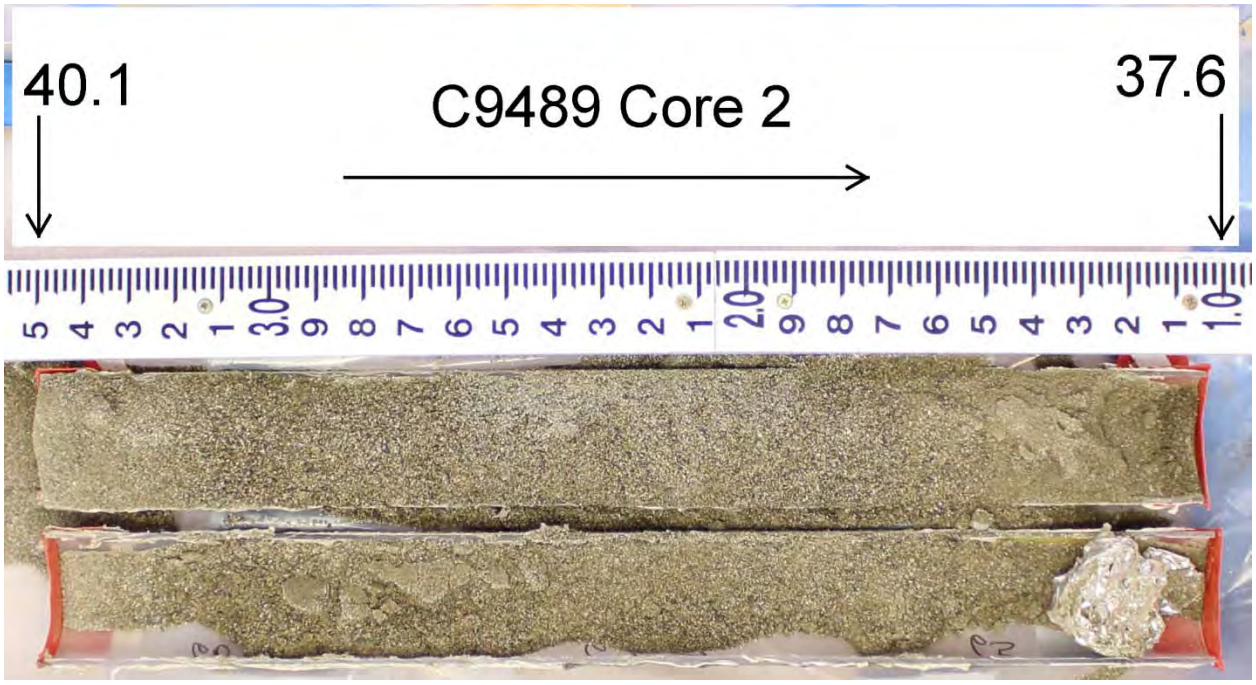
No Core Optional 7

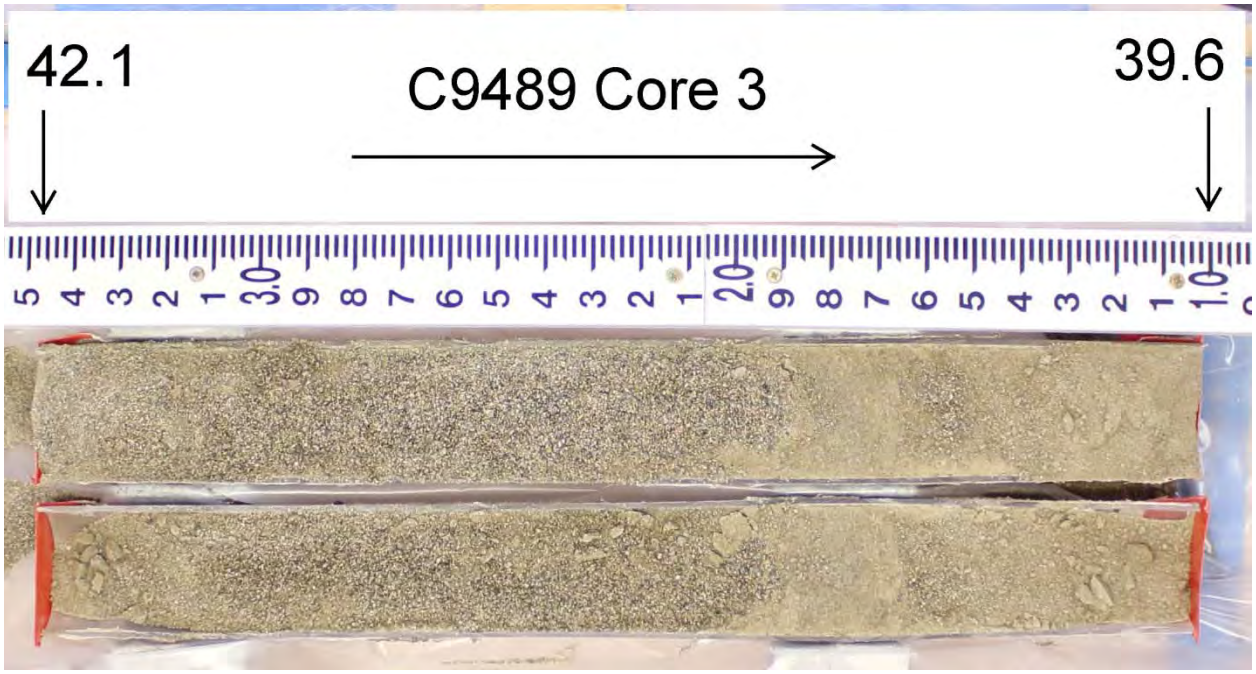

242.5
C9490 Core Optional 8
237.5

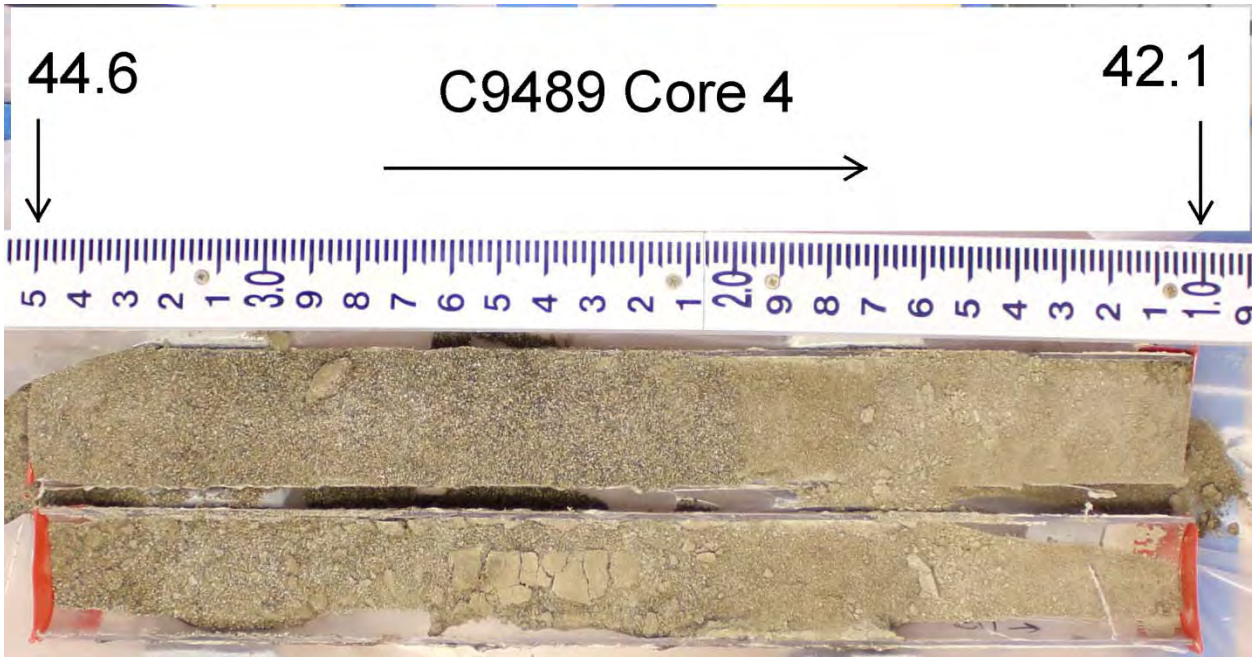

247.6
C9490 Core Optional 9
242.6

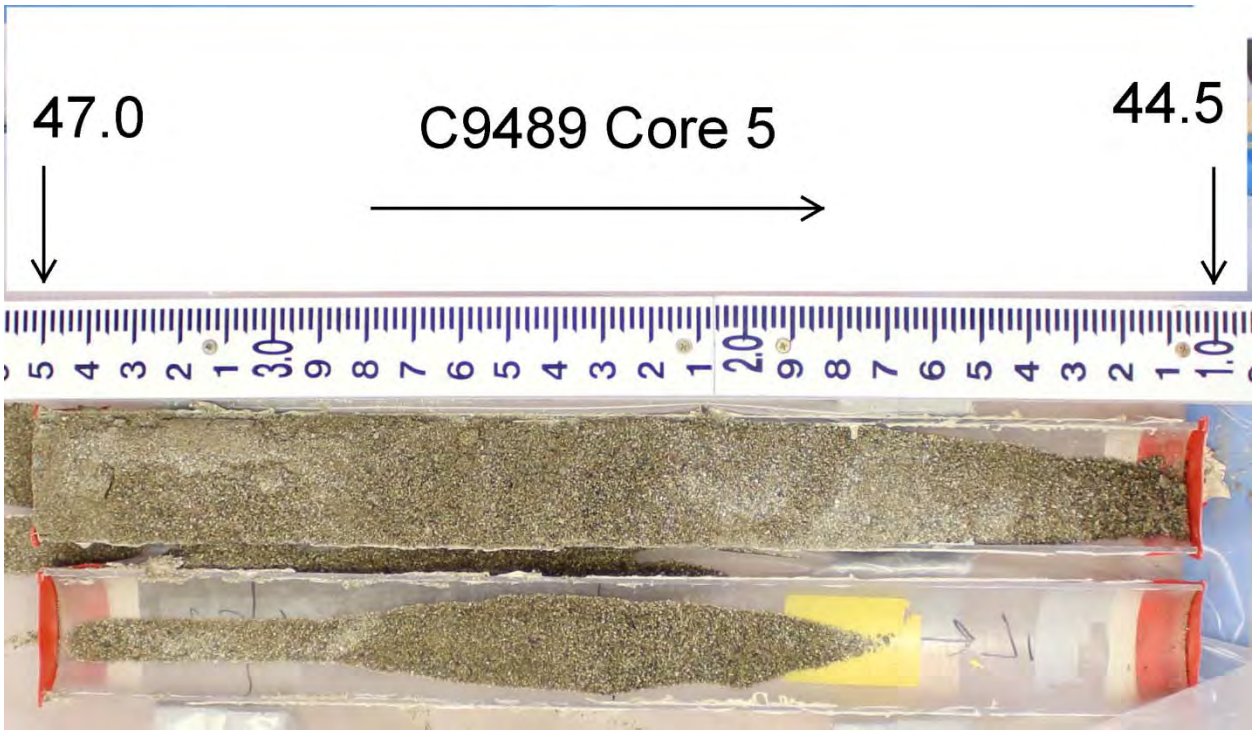

252.0
C9490 Core Optional 10
247.0

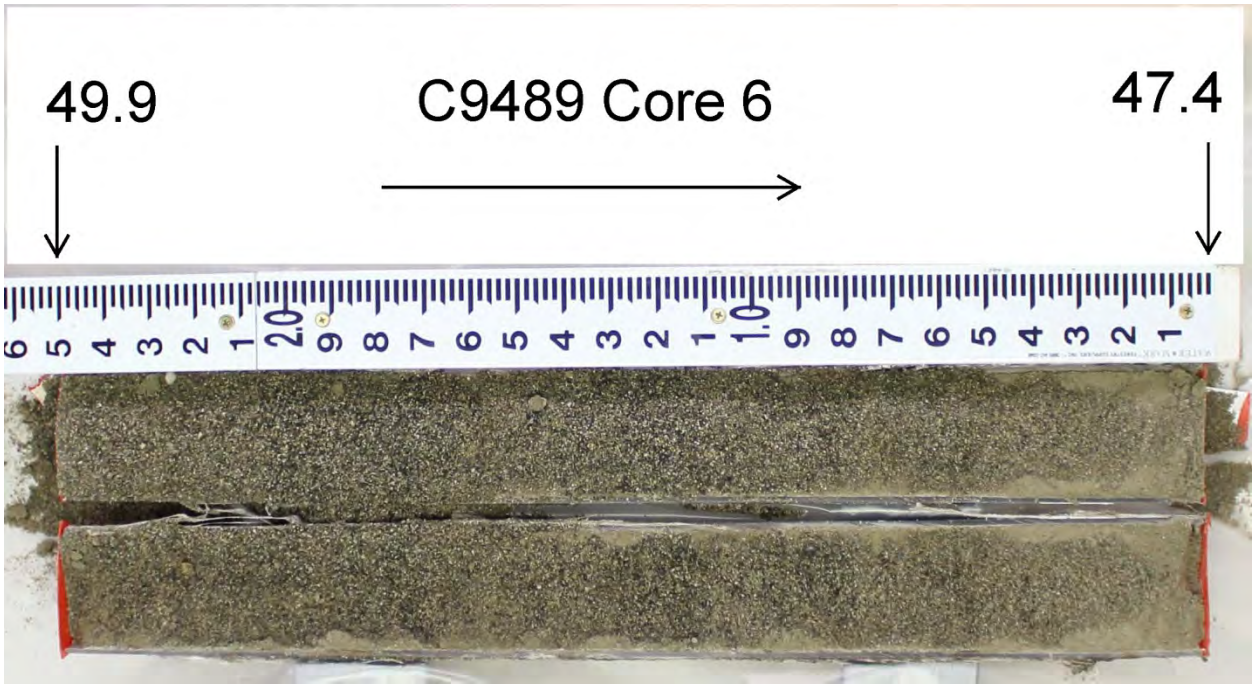

36.7
C9489 Core 1
34.2
35.2 - 36.7: No recovery


40.1
C9489 Core 2
37.6

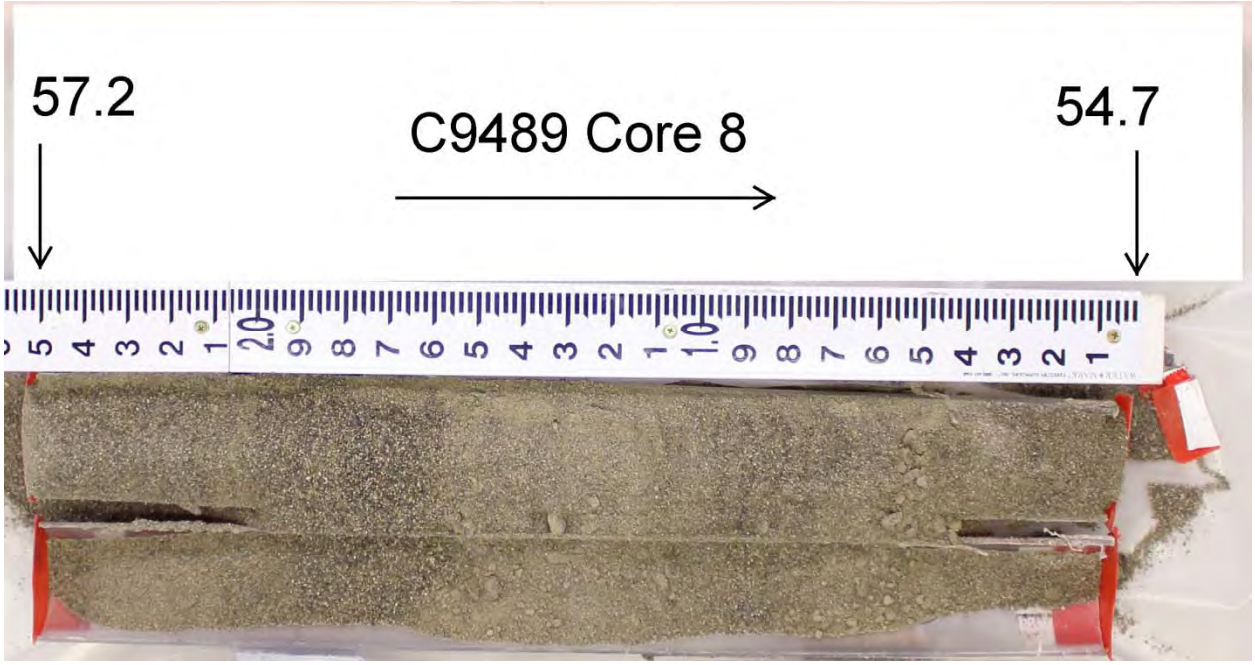

42.1
C9489 Core 3
39.6

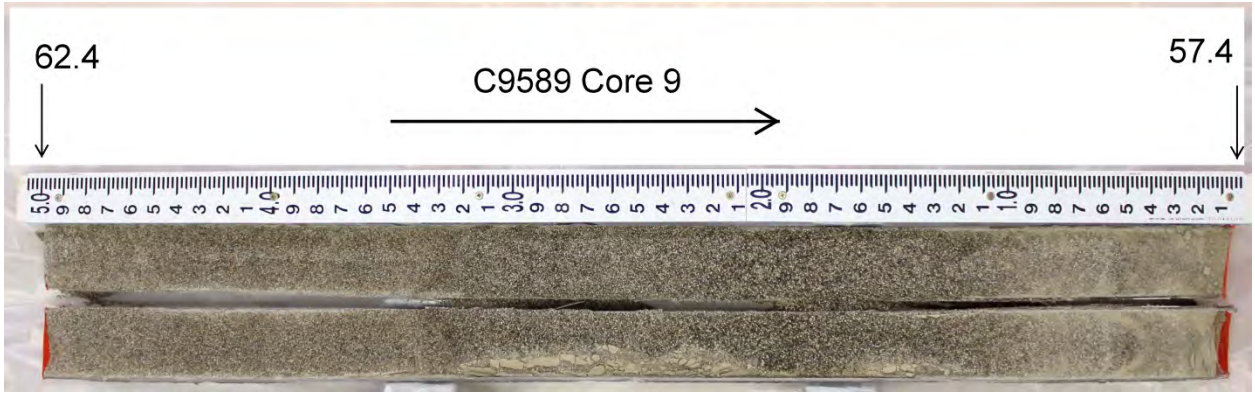

44.6
C9489 Core 4
42.1

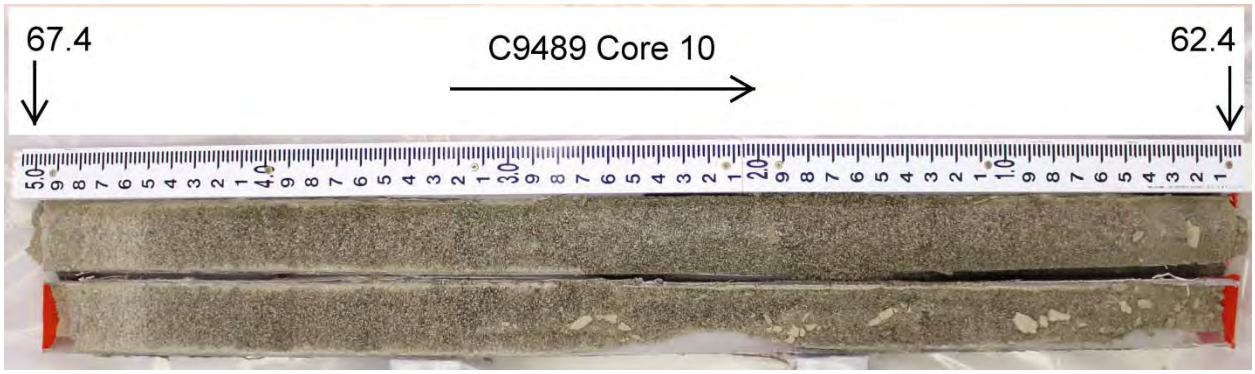


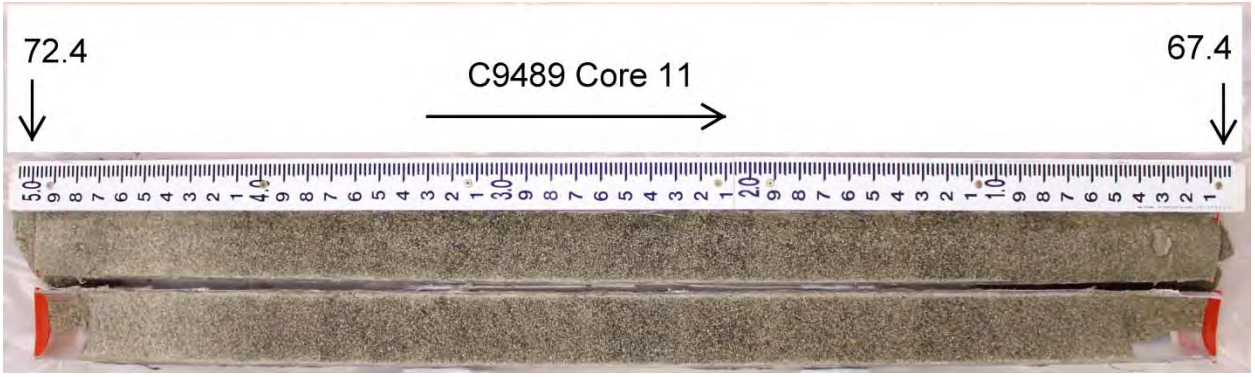


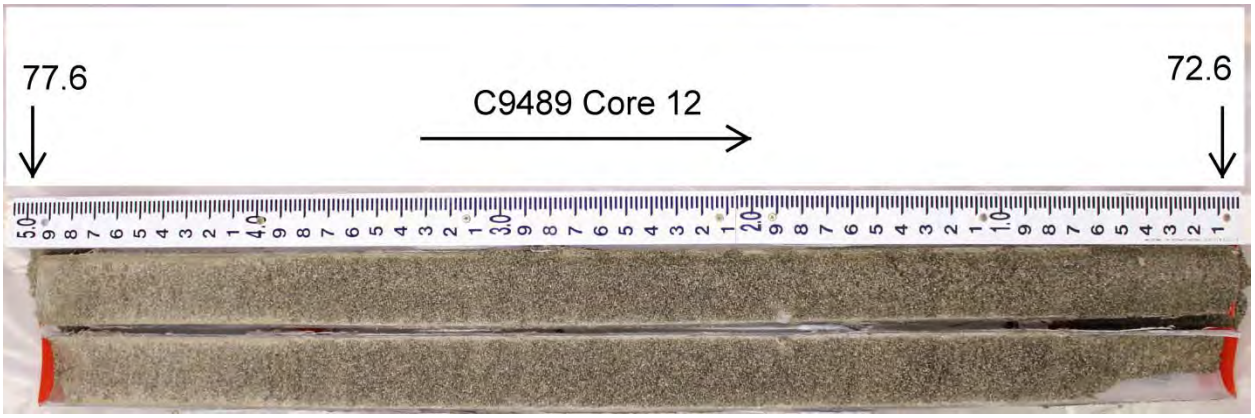
No Core 7

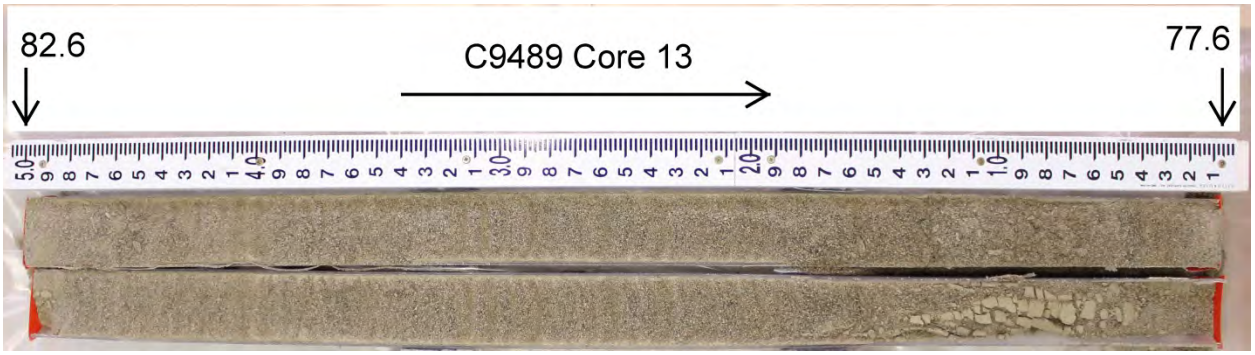

57.2
C9489 Core 8
54.7

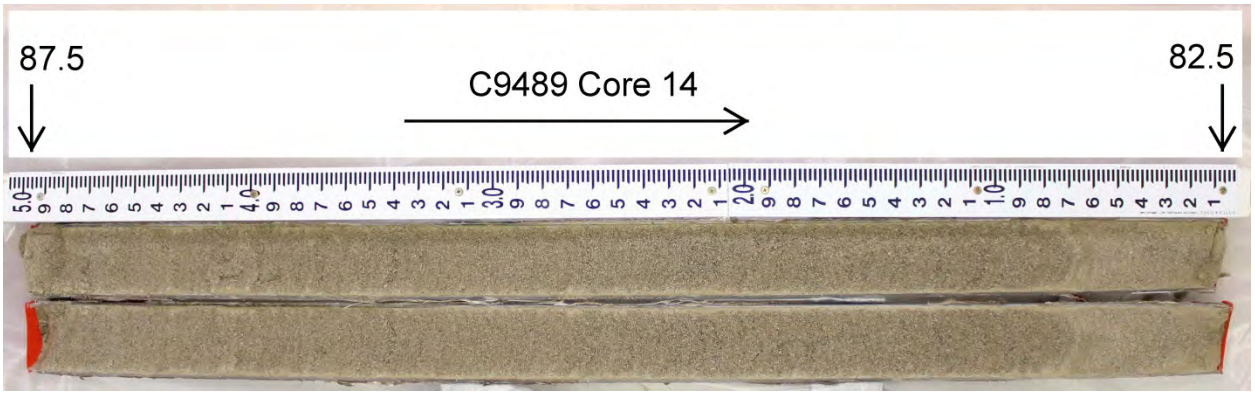

62.4
C9589 Core 9
57.4

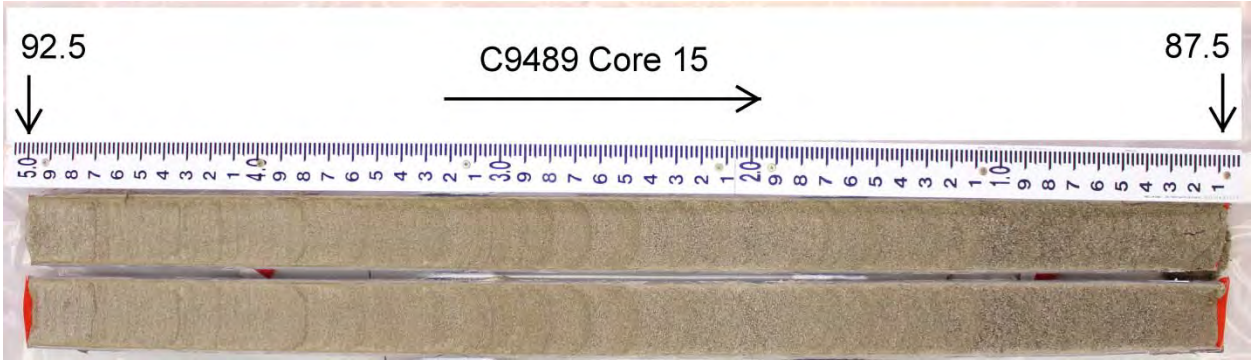

67.4
C9489 Core 10
62.4

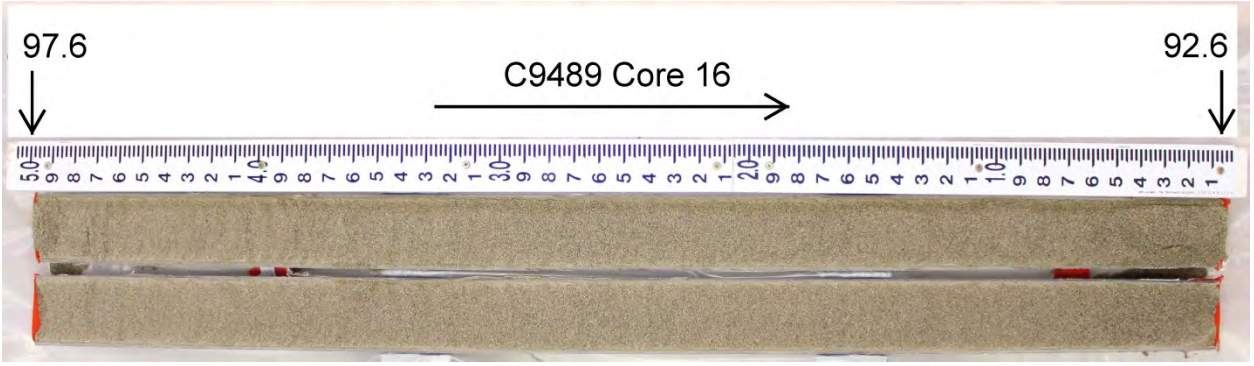

72.4
C9489 Core 11
67.4

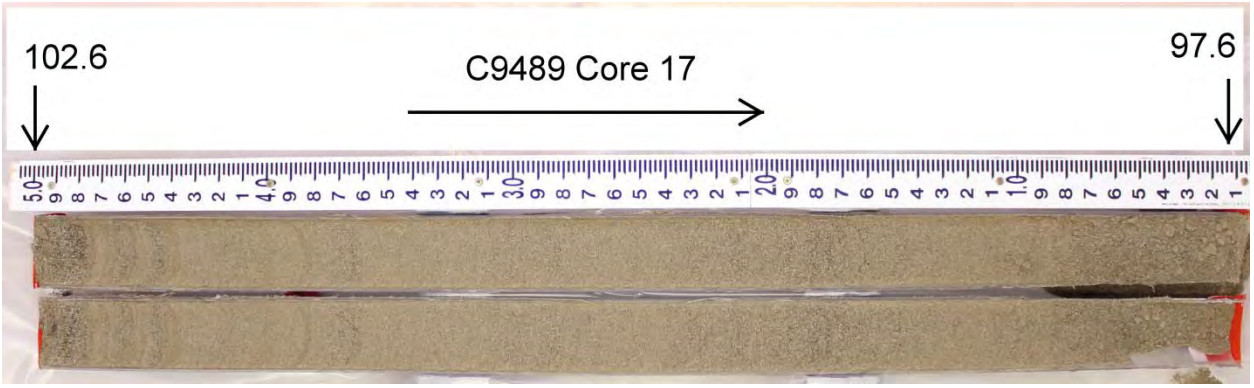

77.6
C9489 Core 12
72.6

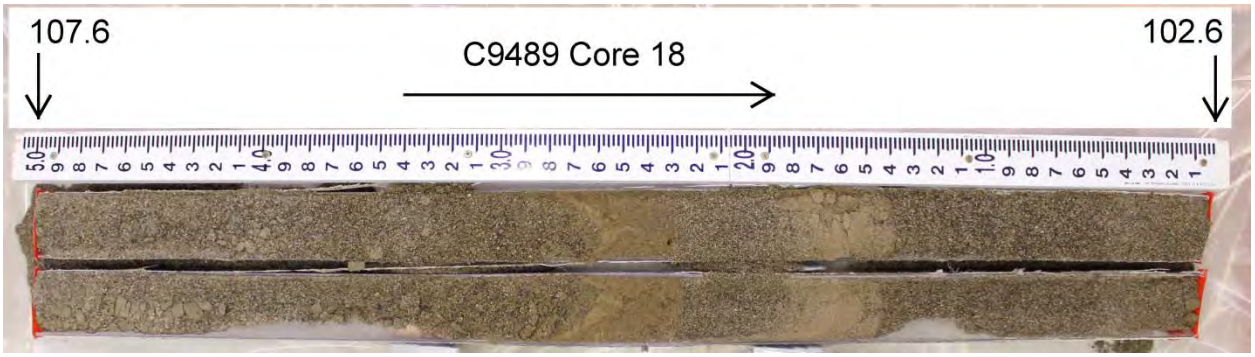

82.6
C9489 Core 13
77.6

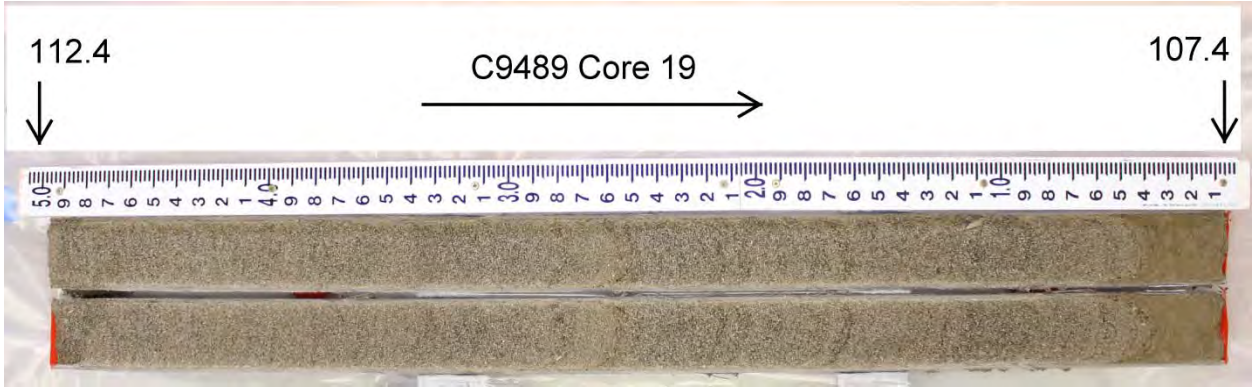

87.5
C9489 Core 14
82.5

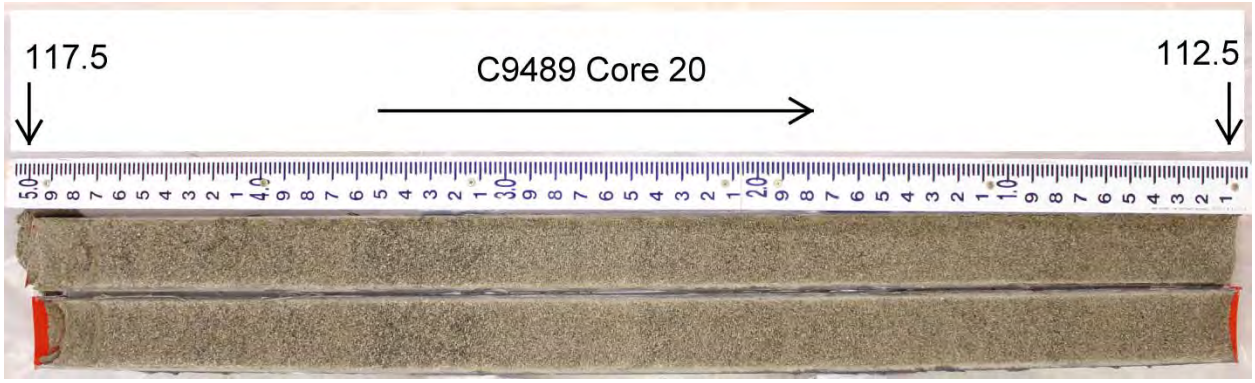

92.5
C9489 Core 15
87.5

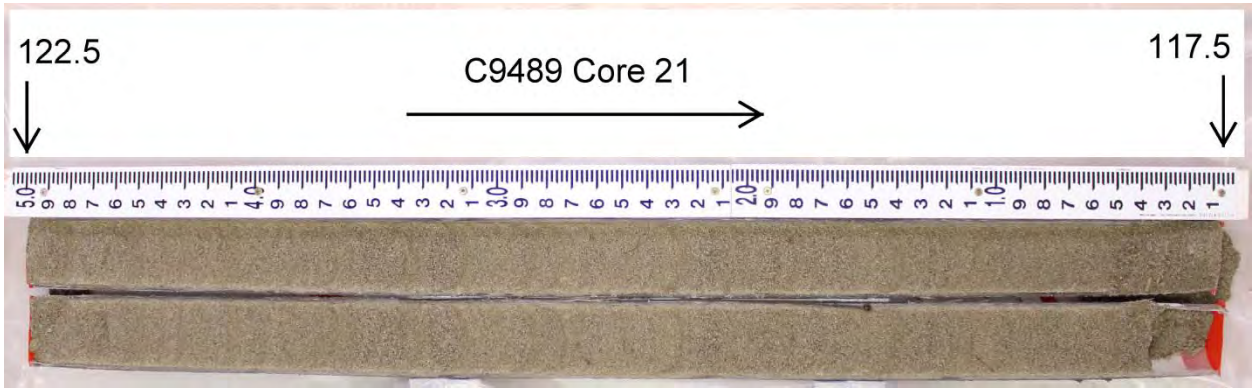

97.6
C9489 Core 16
92.6

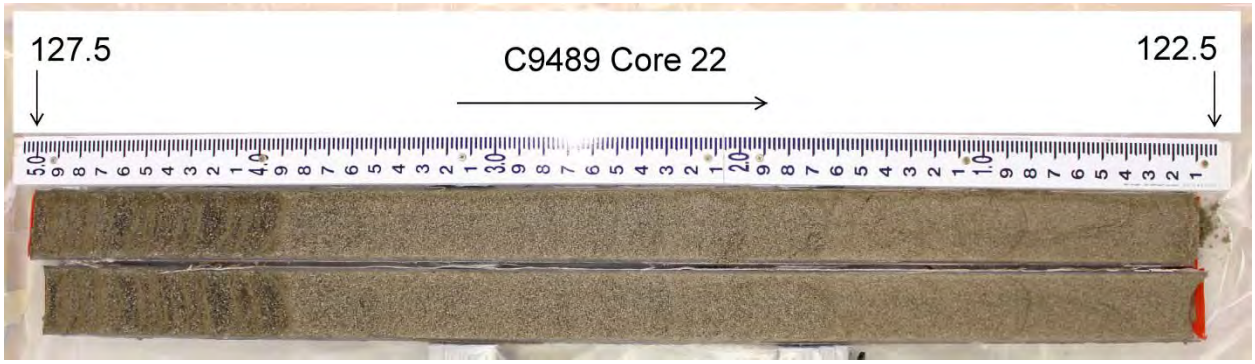

102.6
C9489 Core 17
97.6

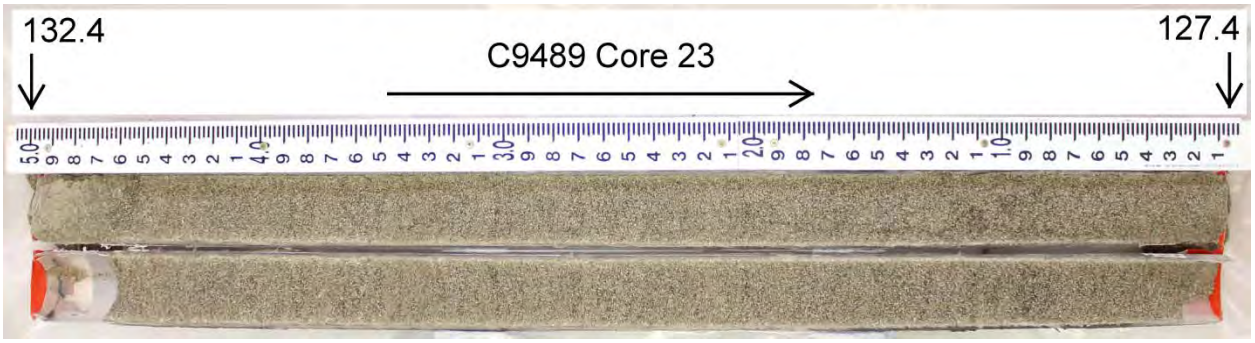

107.6
C9489 Core 18
102.6


112.4
C9489 Core 19
107.4

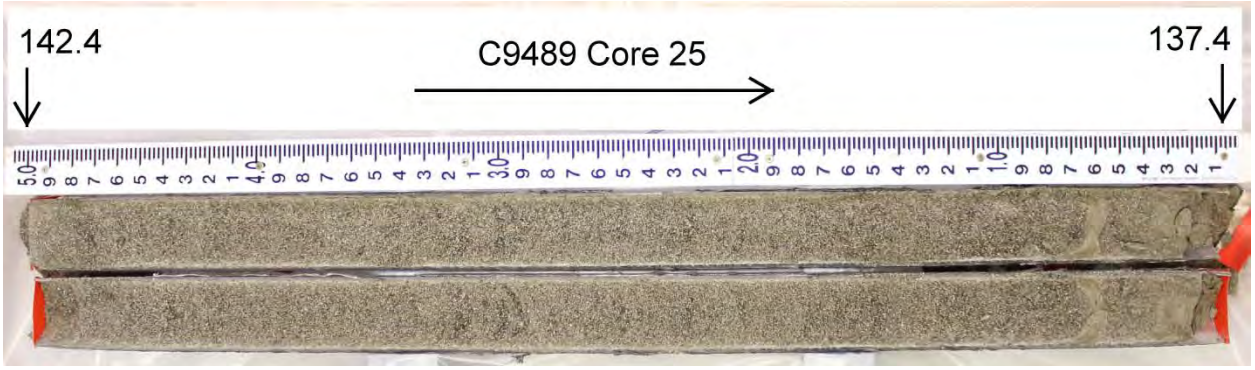

117.5
C9489 Core 20
112.5

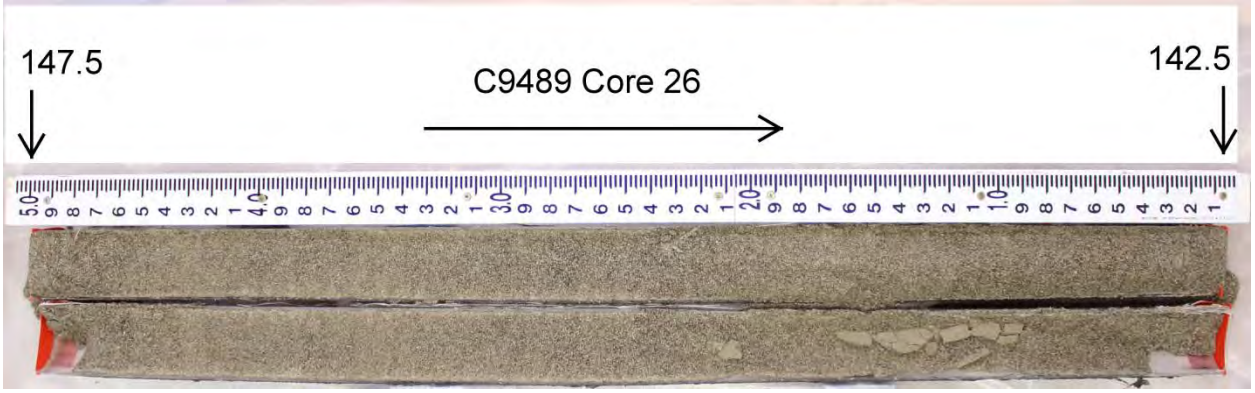

122.5
C9489 Core 21
117.5

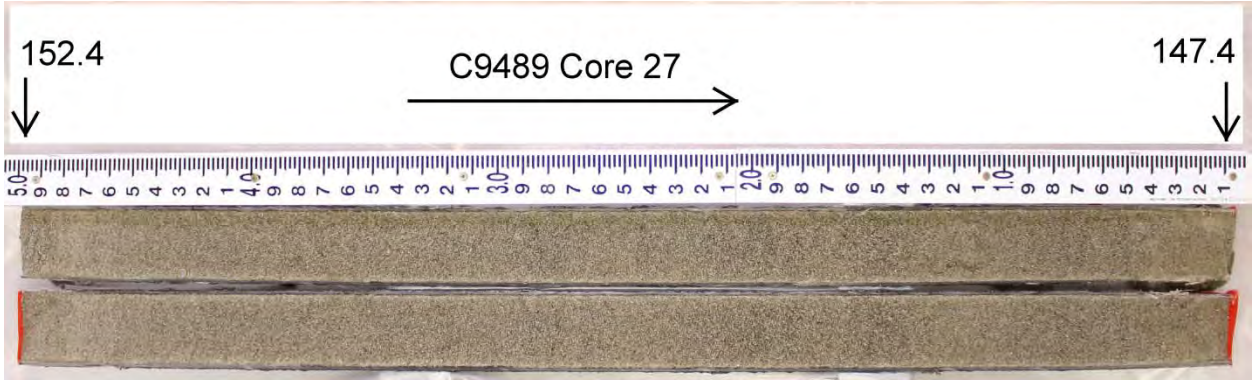

127.5
C9489 Core 22
122.5

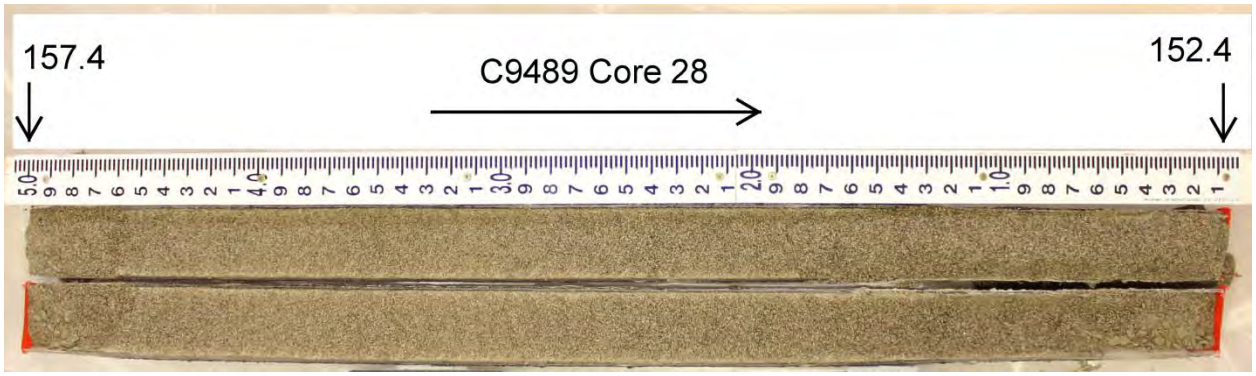

132.4
C9489 Core 23
127.4

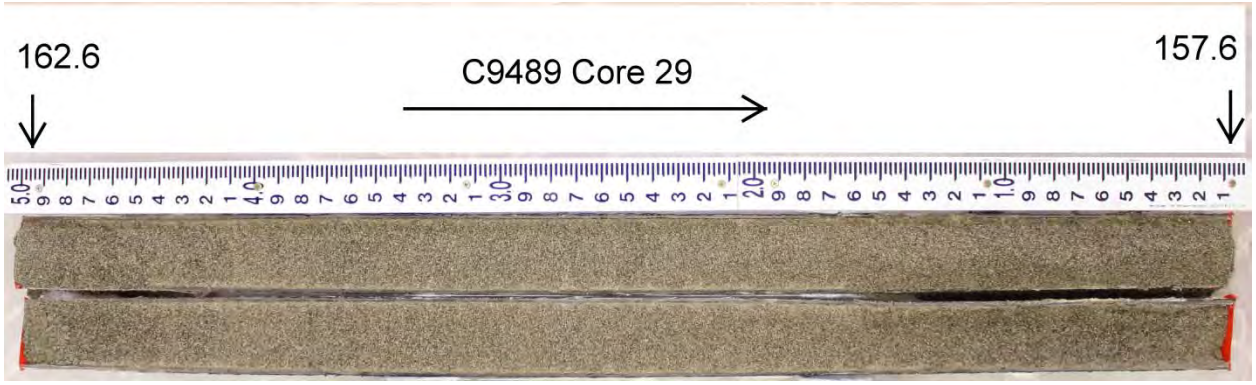
137.1
C9489 Core 24
132.1

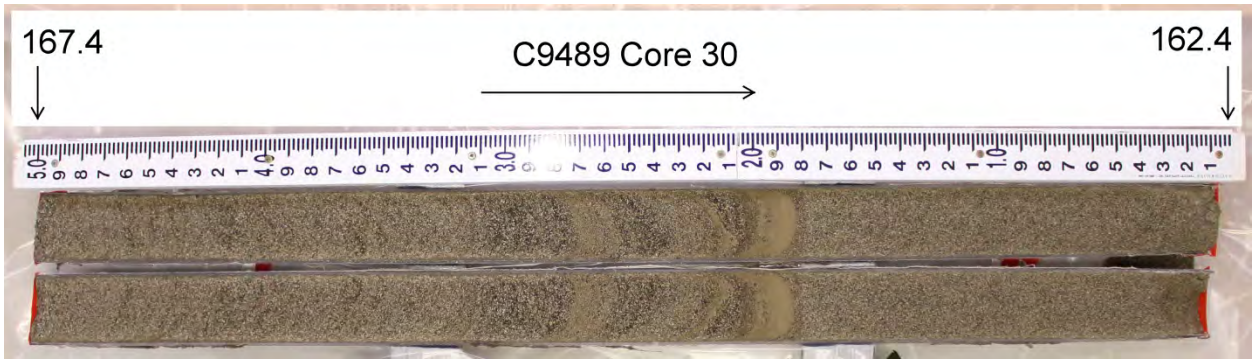

142.4
C9489 Core 25
137.4

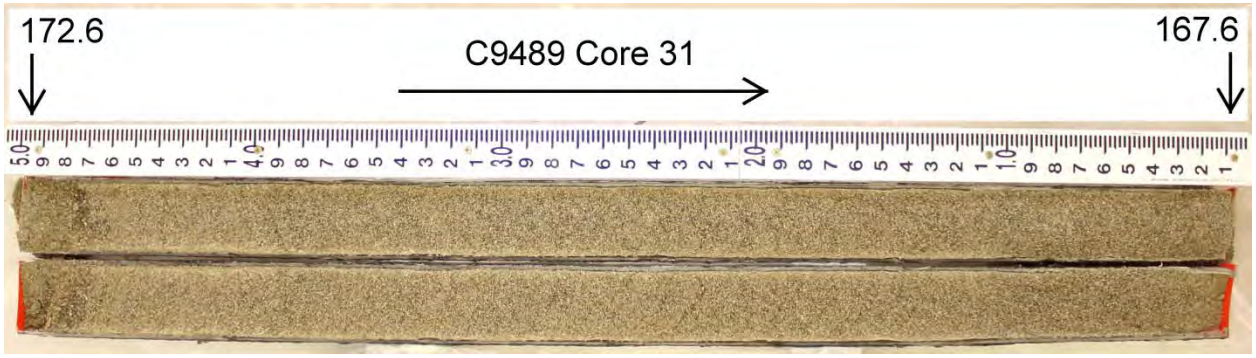

147.5
C9489 Core 26
142.5

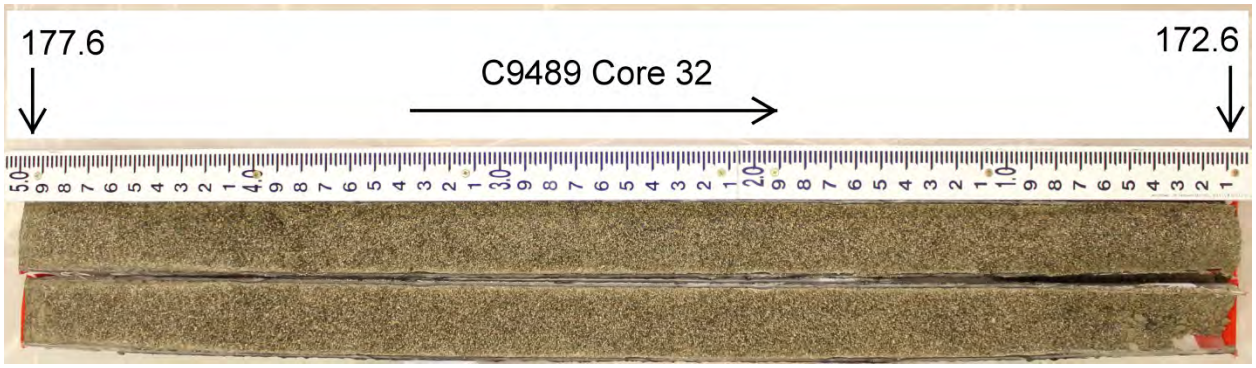

152.4
C9489 Core 27
147.4

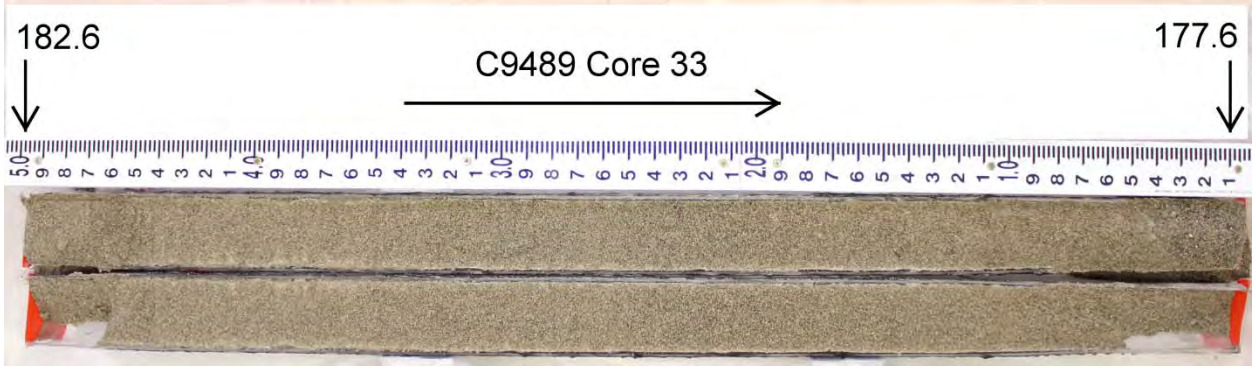

157.4
C9489 Core 28
152.4

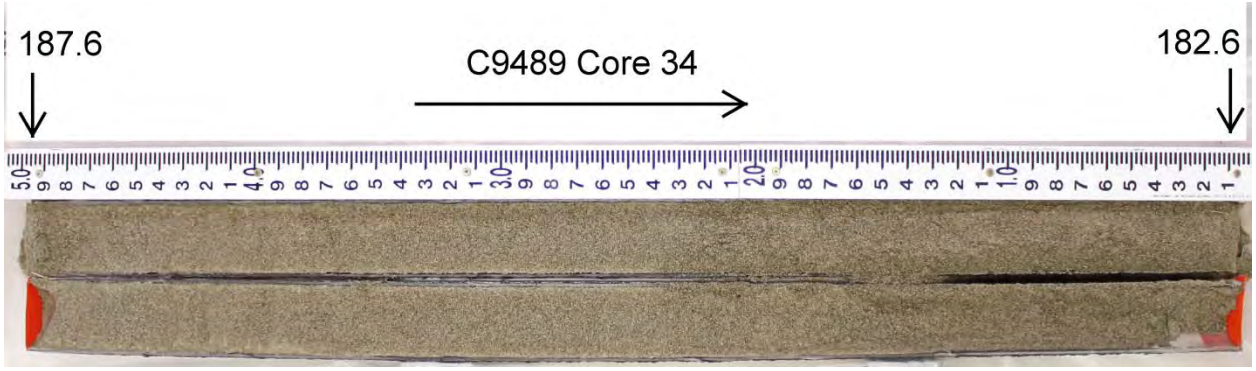

162.6
C9489 Core 29
157.6

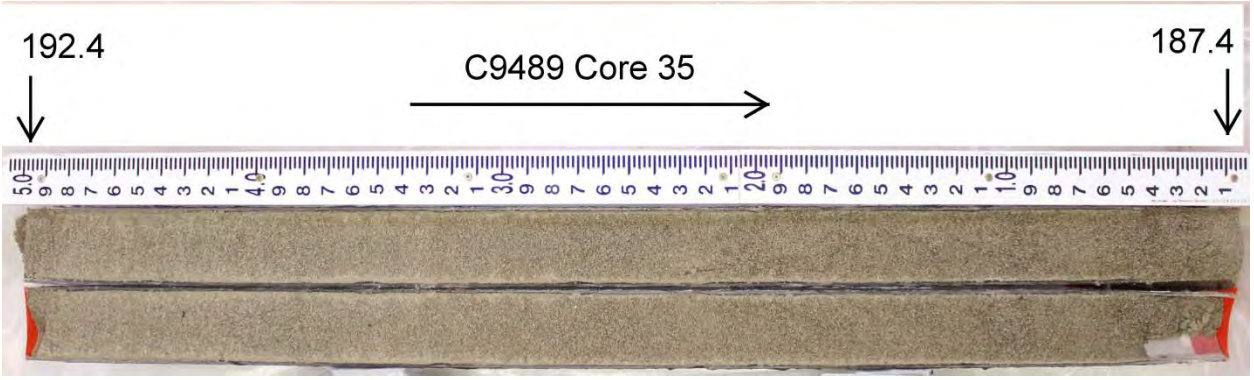

167.4
C9489 Core 30
162.4

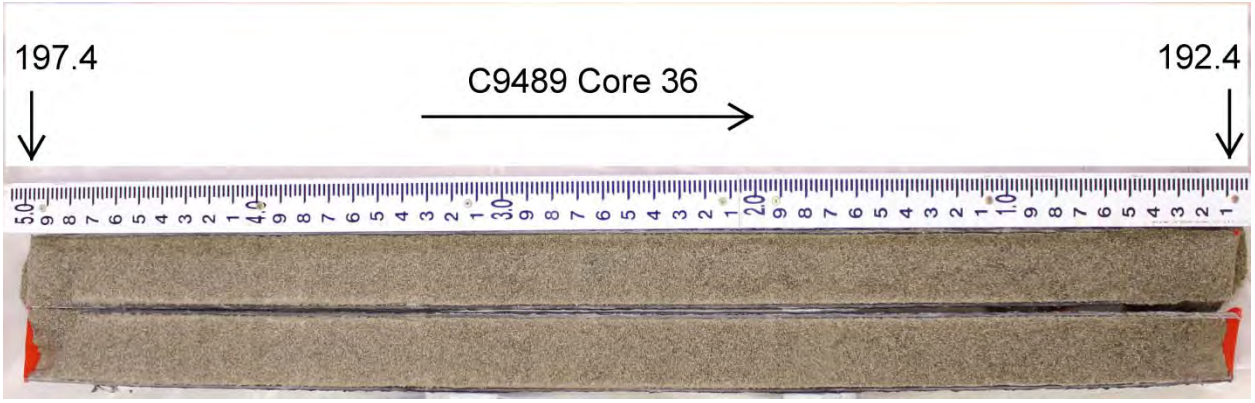

172.6
C9489 Core 31
167.6


177.6
C9489 Core 32
172.6


182.6
C9489 Core 33
177.6


187.6
C9489 Core 34
182.6


192.4
C9489 Core 35
187.4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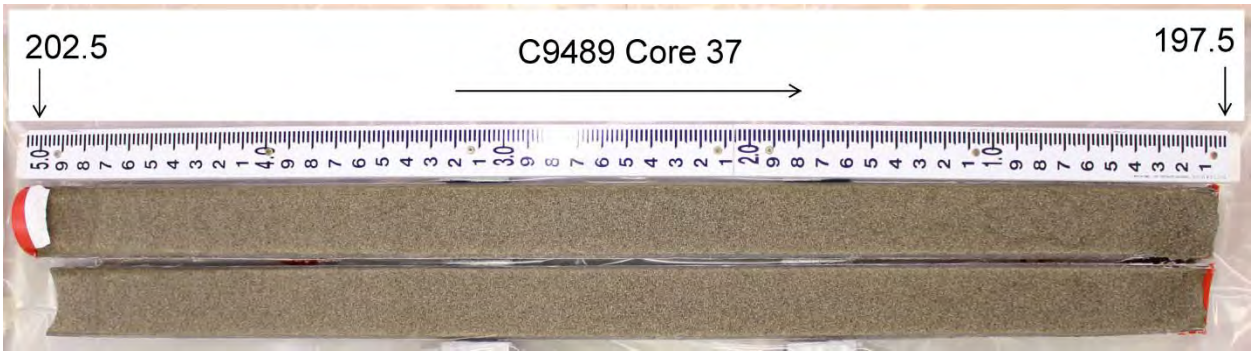
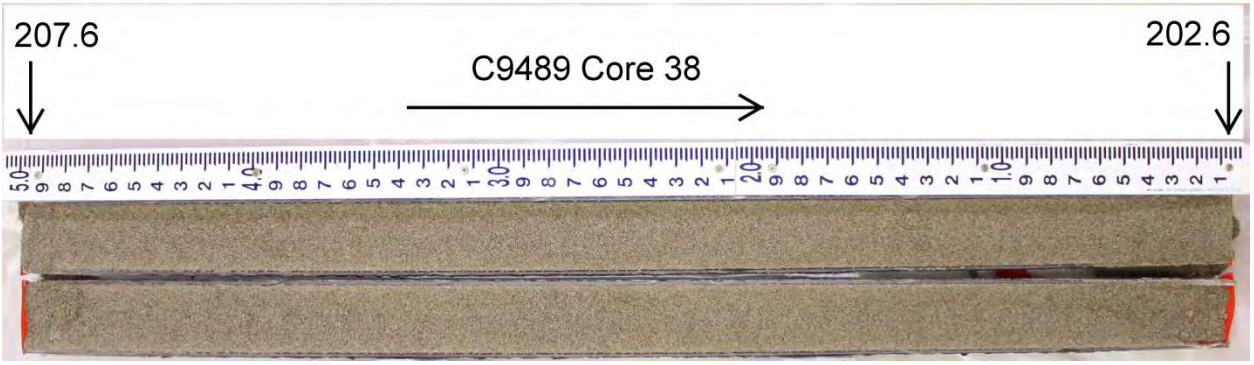
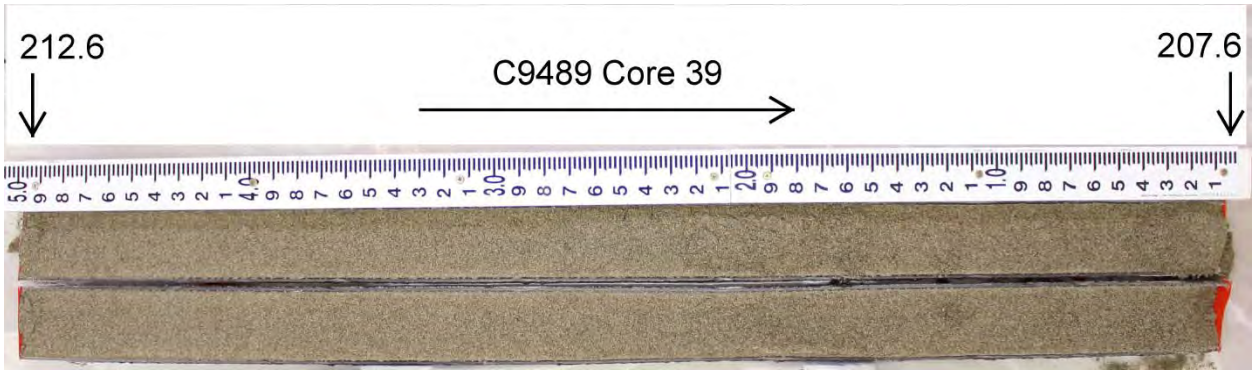
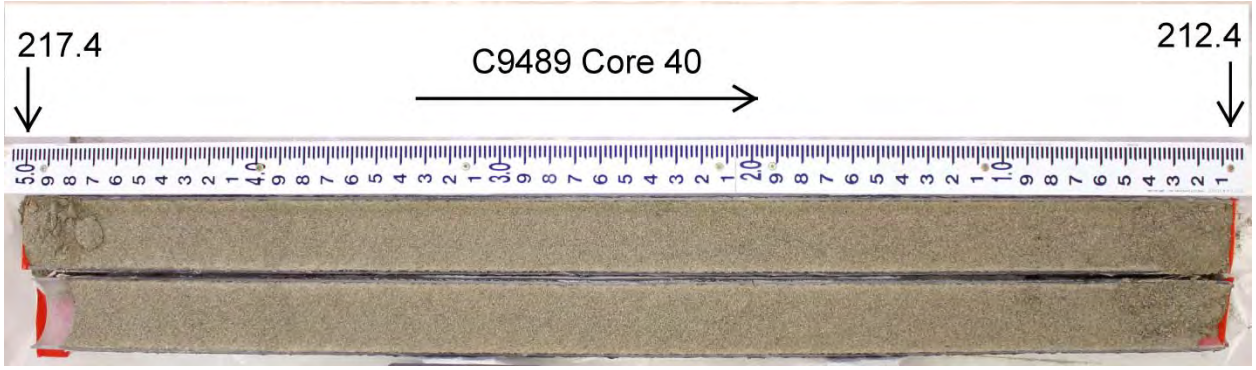
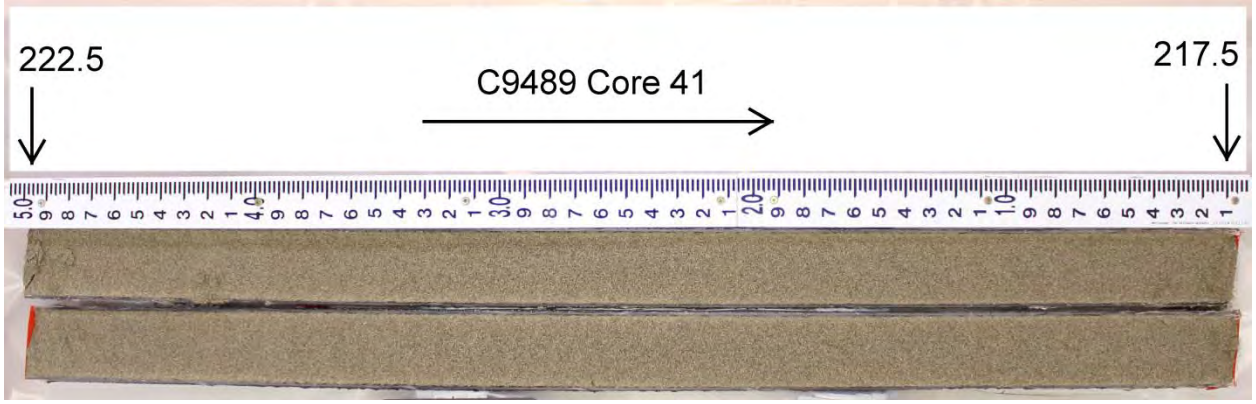
C9489 Core 36
192.4

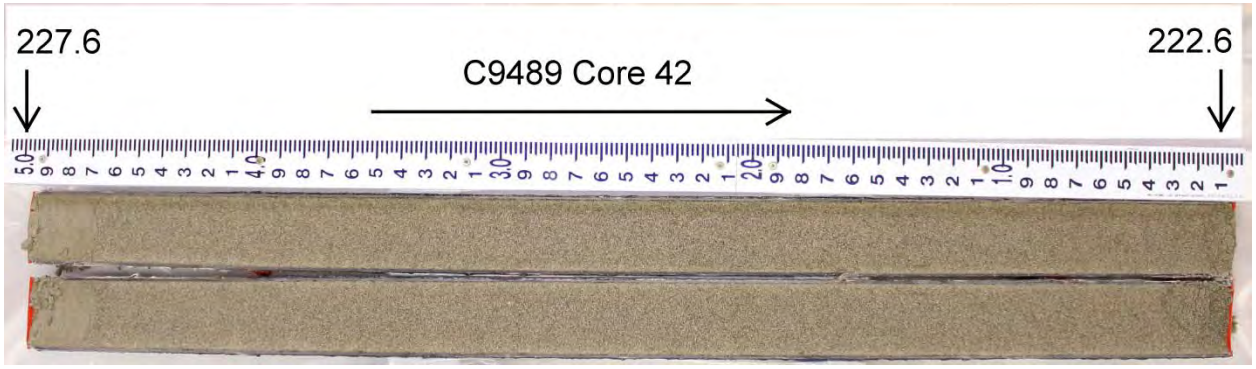

202.5
C9489 Core 37
197.5

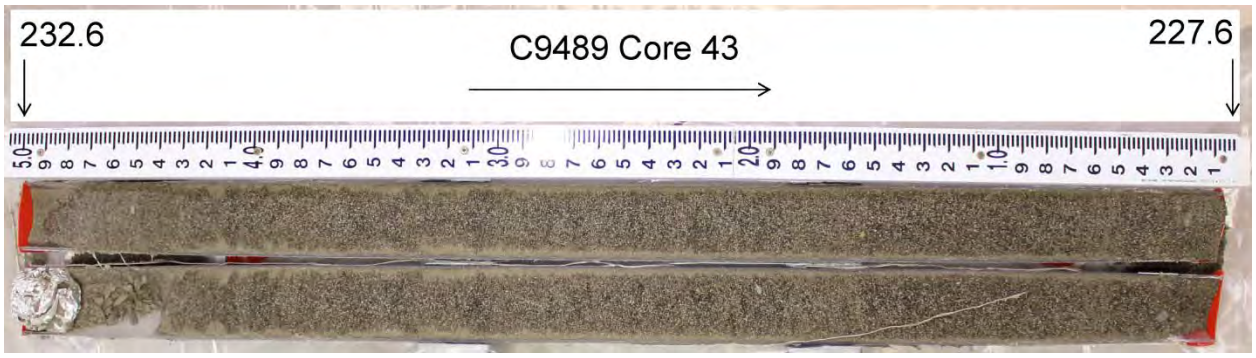

207.6
C9489 Core 38
202.6

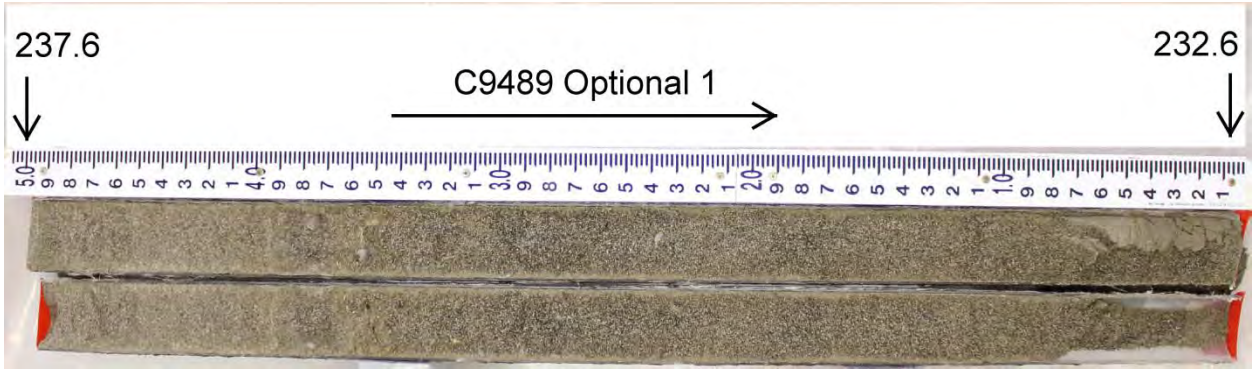

212.6
C9489 Core 39
207.6

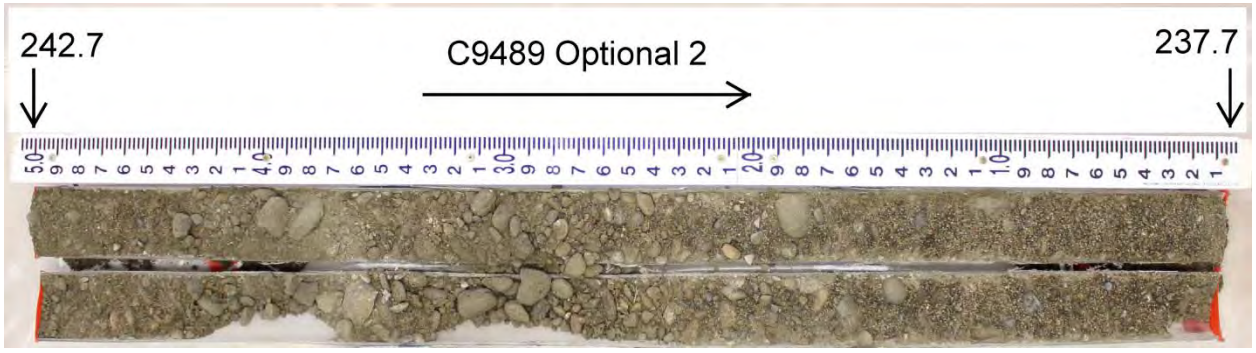

217.4
C9489 Core 40
212.4

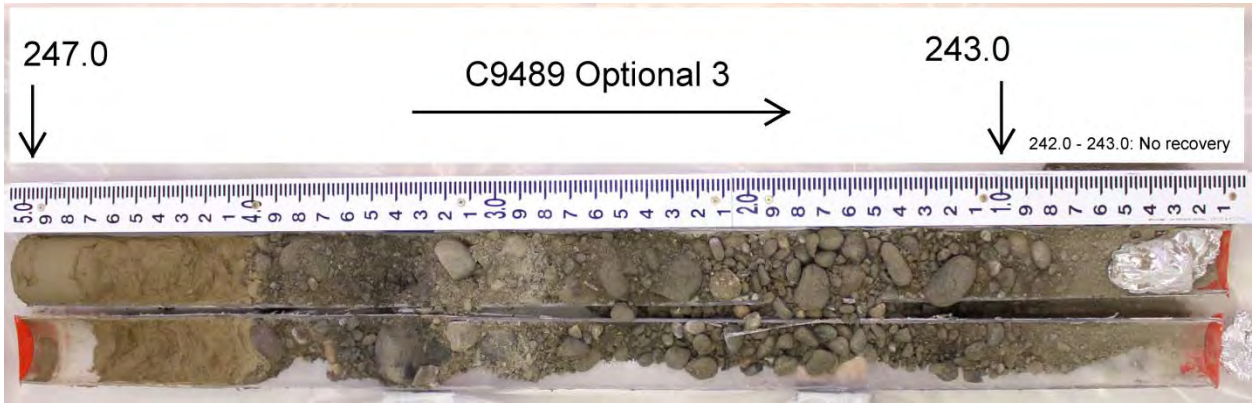

222.5
C9489 Core 41
217.5

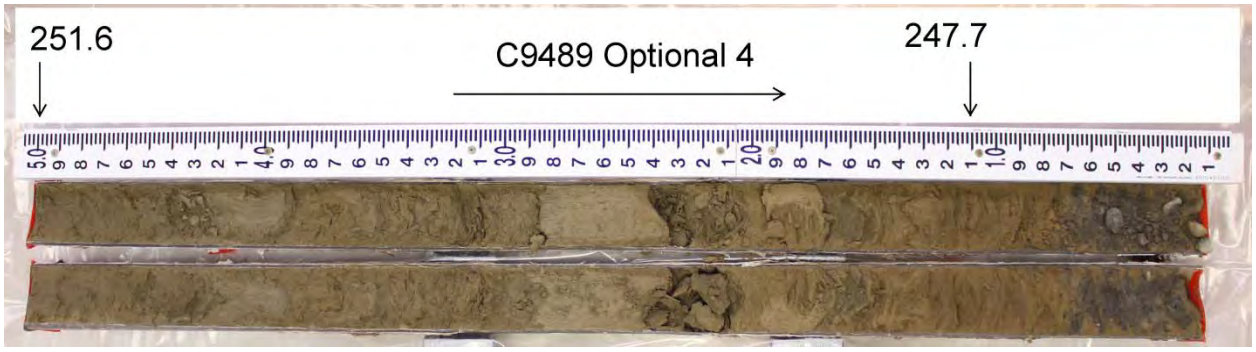

227.6
C9489 Core 42
222.6

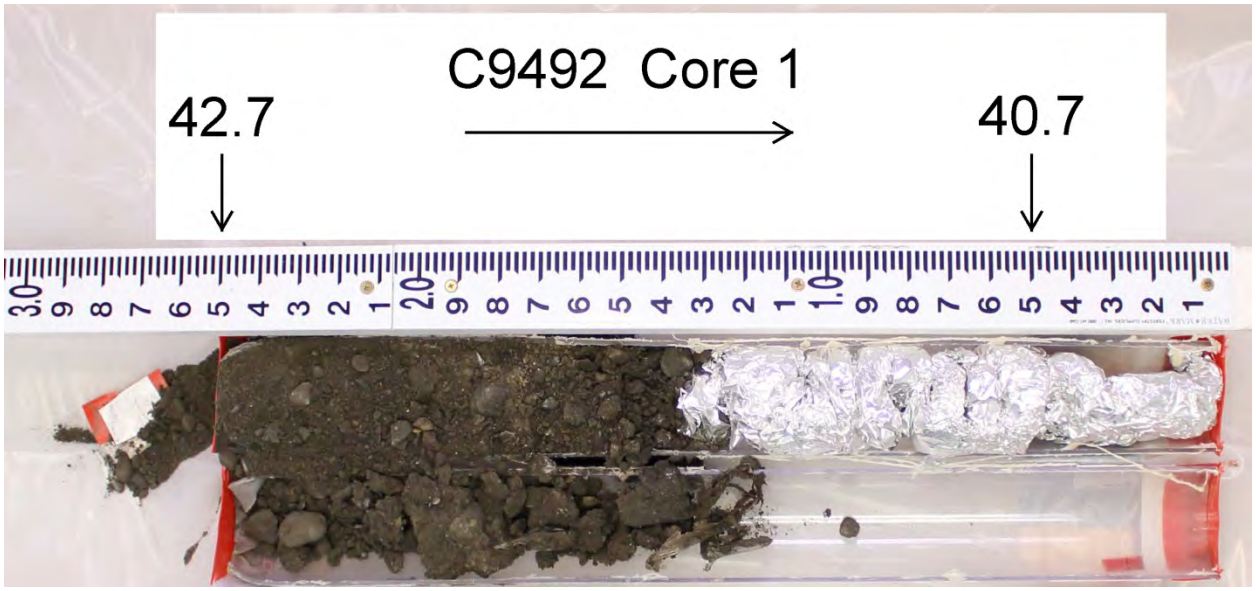

232.6
C9489 Core 43
227.6

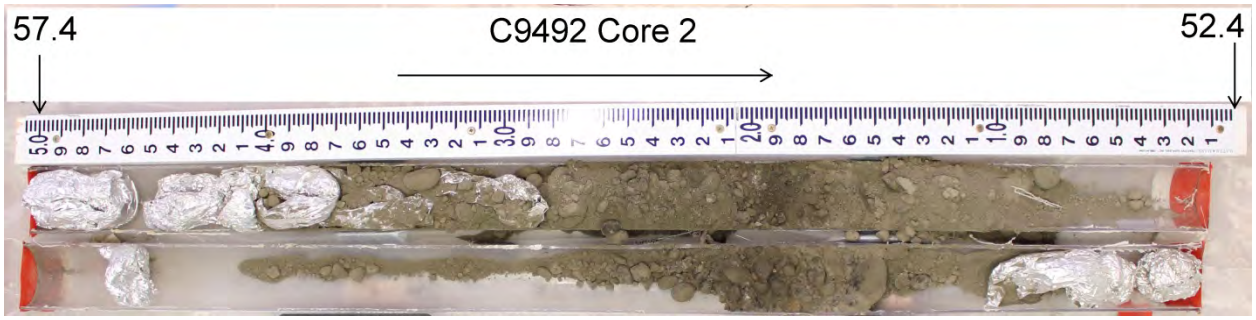

237.6
C9489 Optional 1
232.6

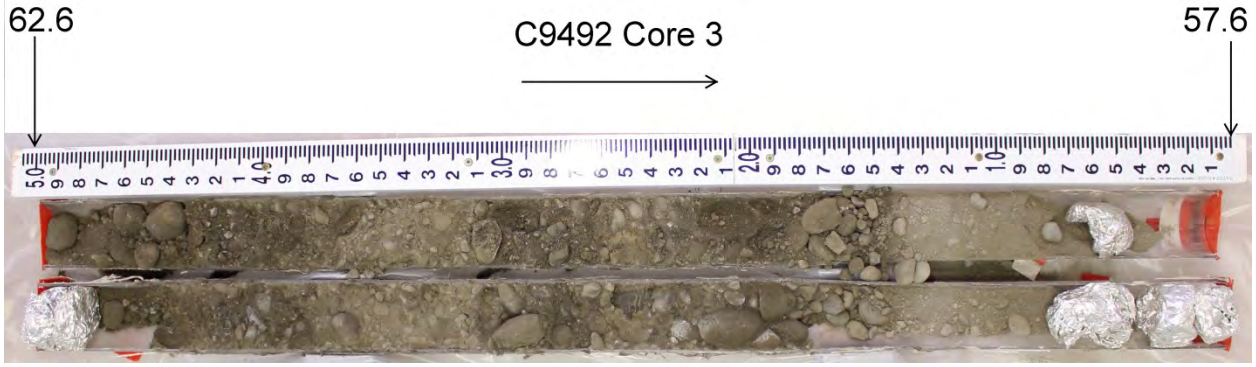

242.7
C9489 Optional 2
237.7

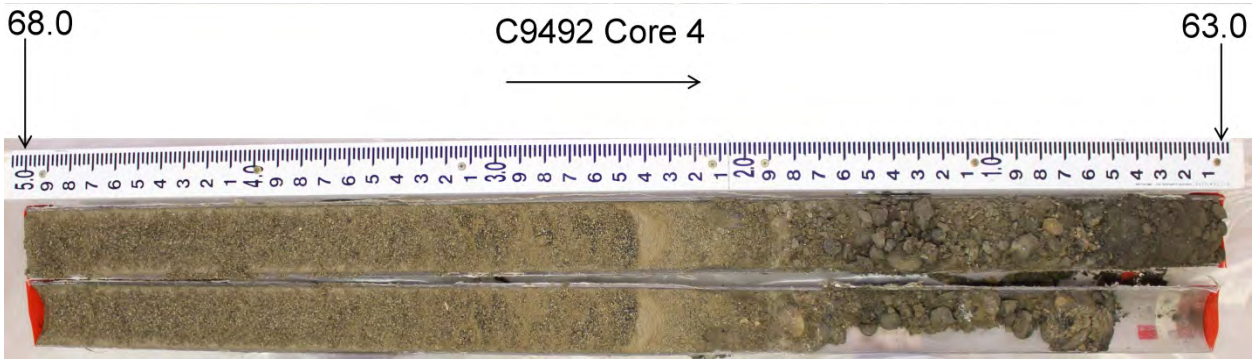

247.0
C9489 Optional 3
243.0
242.0 - 243.0: No recovery

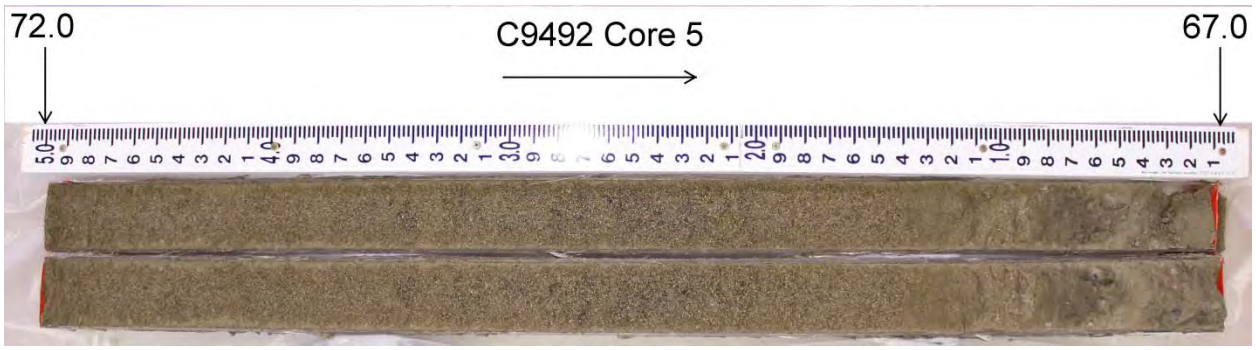

251.6
C9489 Optional 4
247.7

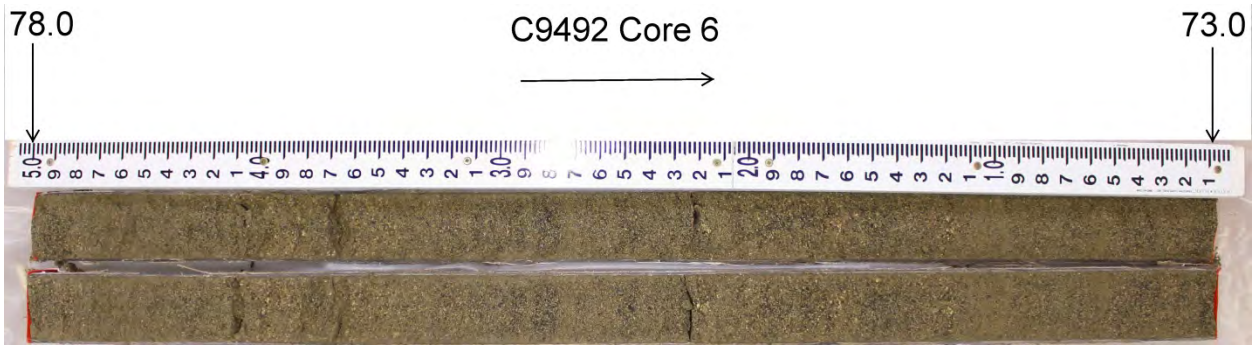

C9492 Core 1
42.7
40.7


57.4
C9492 Core 2
52.4

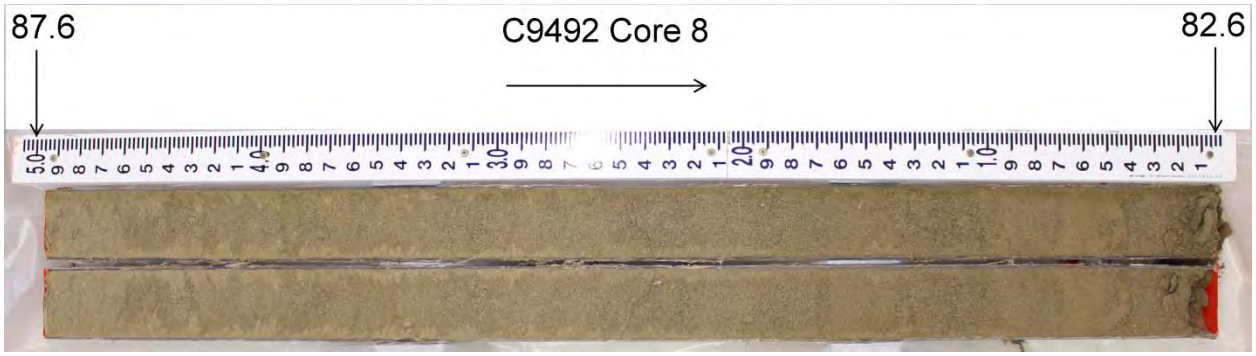

62.6
C9492 Core 3
57.6

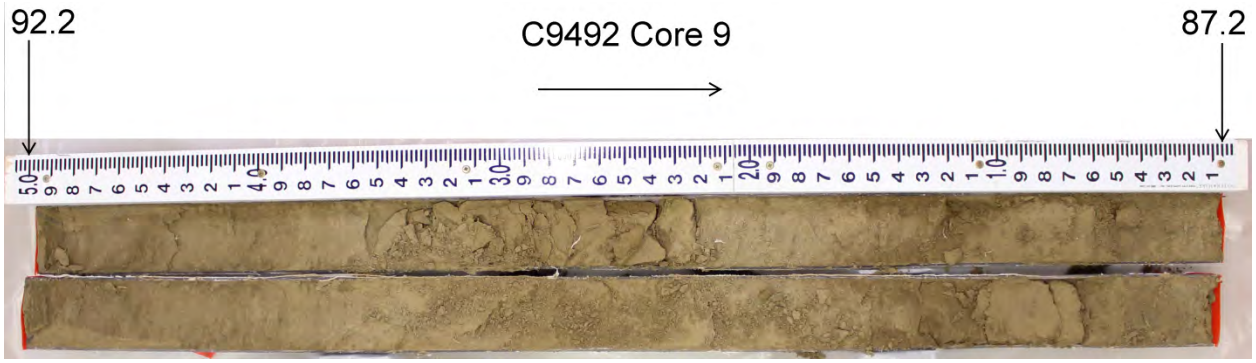

68.0
C9492 Core 4
63.0

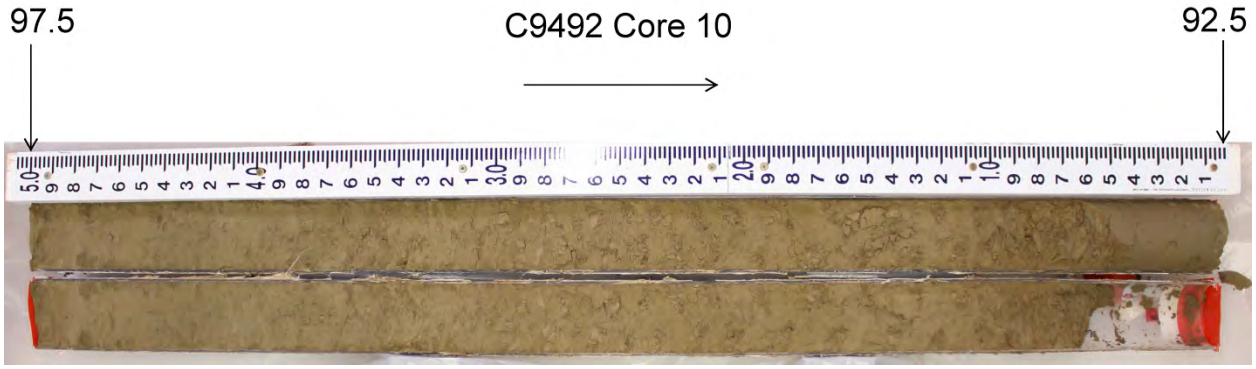

72.0
C9492 Core 5
67.0


78.0
C9492 Core 6
73.0

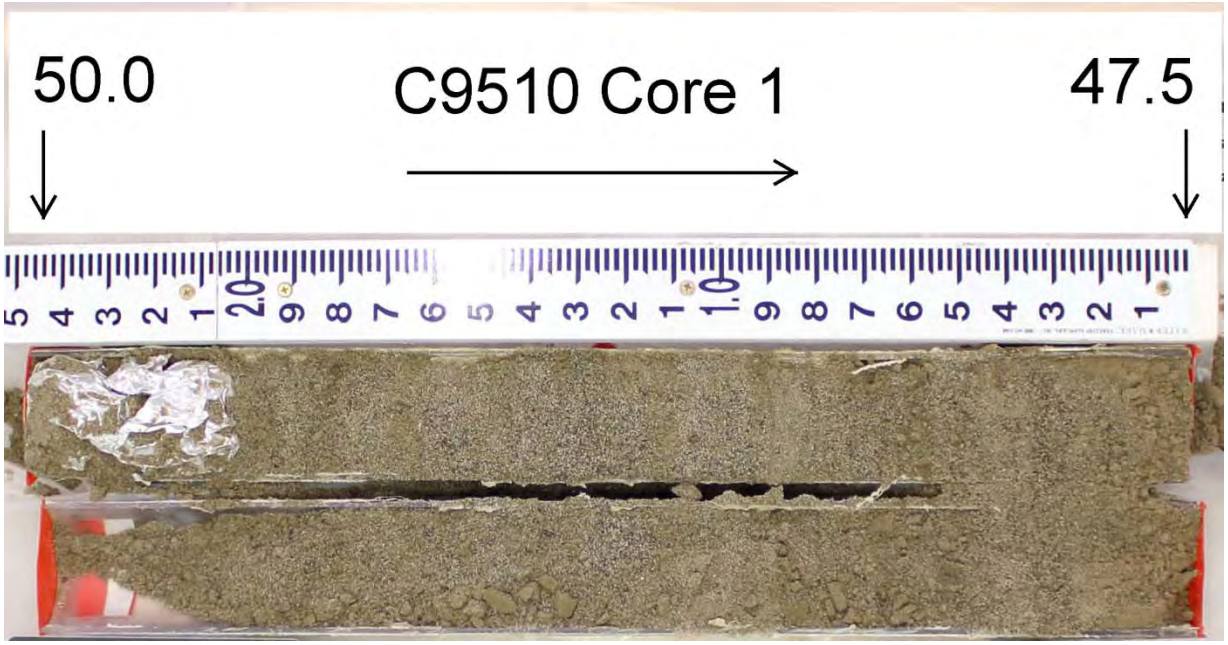
82.5
C9492 Core 7
77.5

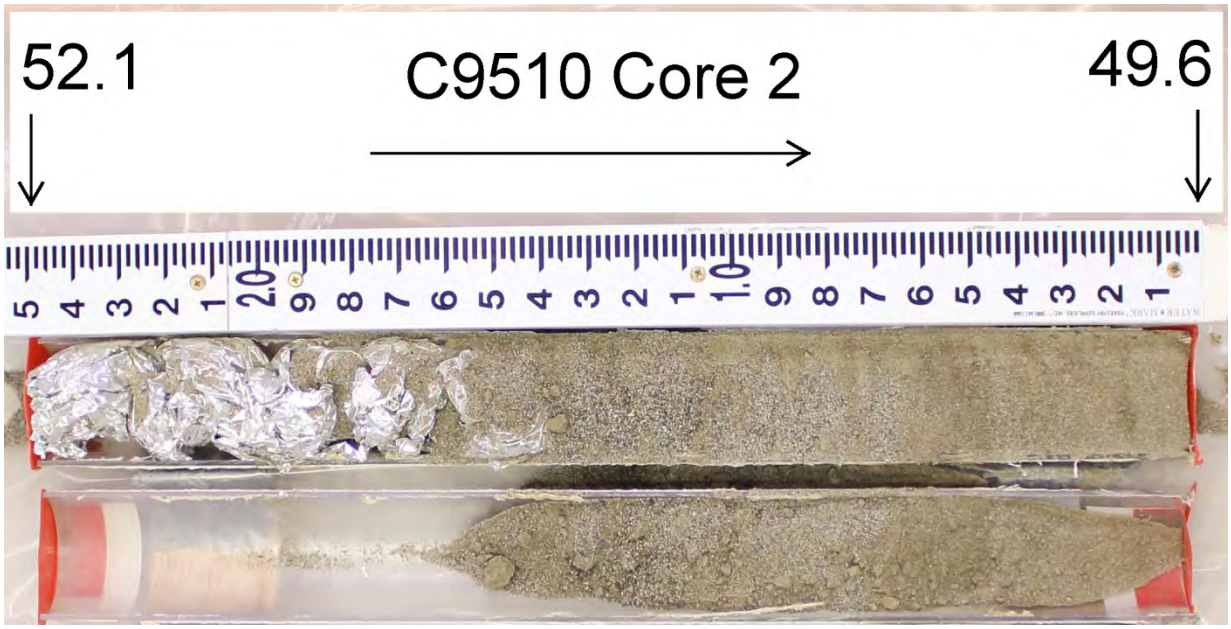

87.6
C9492 Core 8
82.6

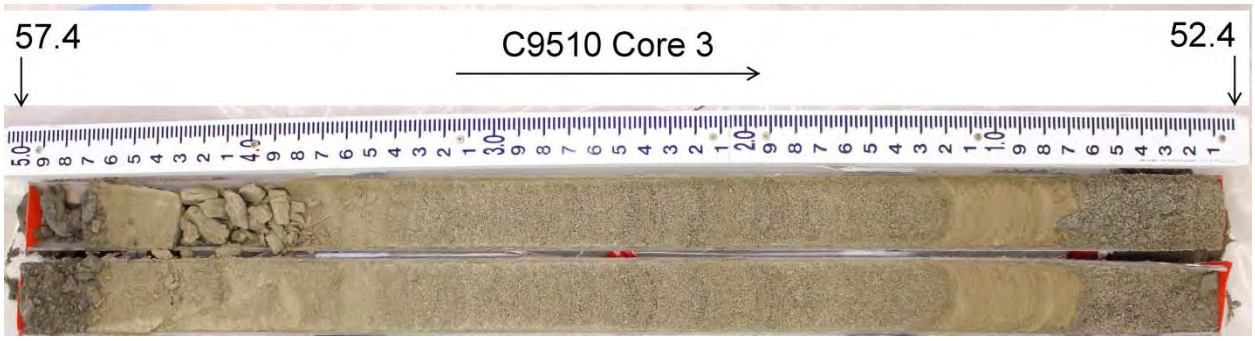

92.2
C9492 Core 9
87.2

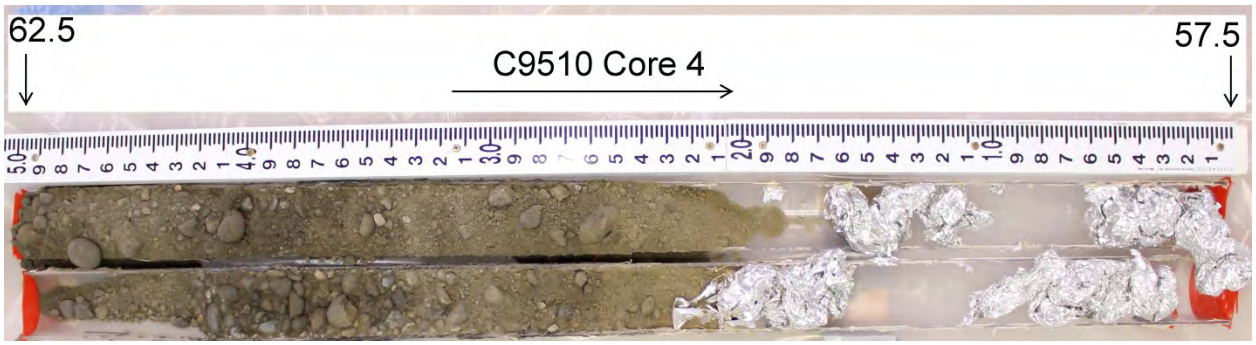

97.5
C9492 Core 10
92.5

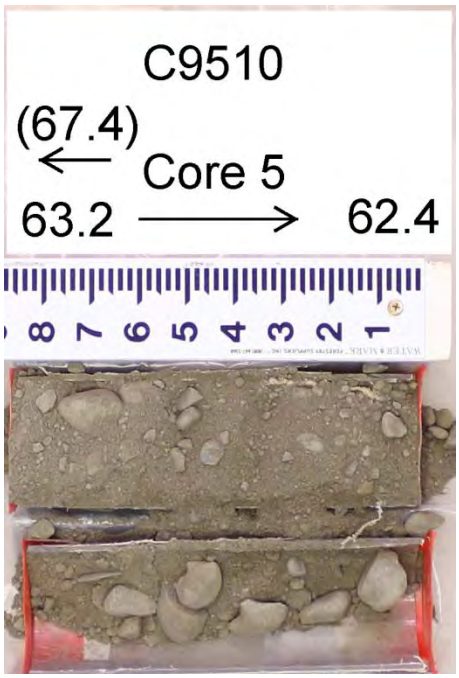
102.4
C9492 Core 11
97.4

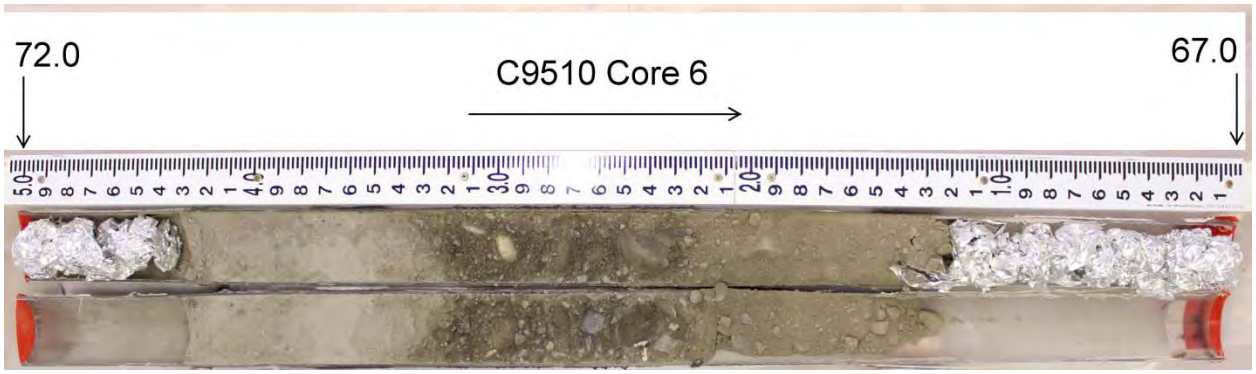

50.0
C9510 Core 1
47.5

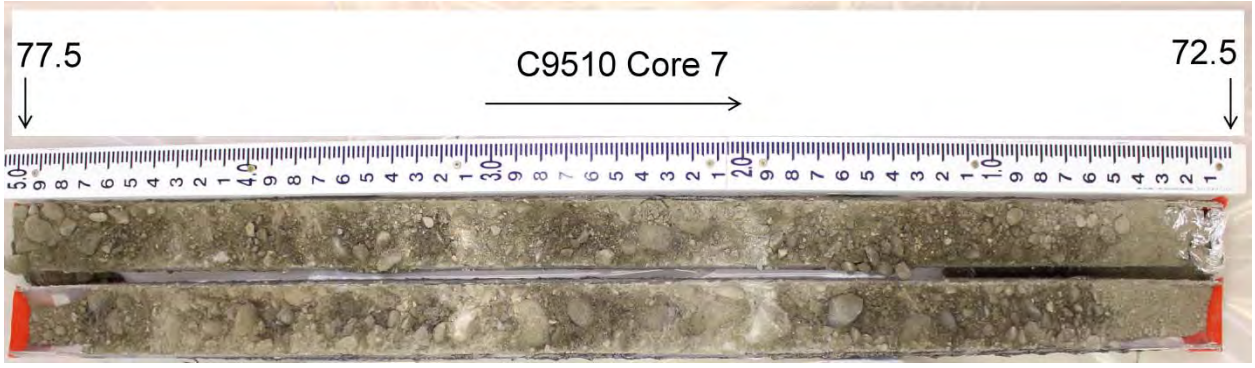

52.1
C9510 Core 2
49.6

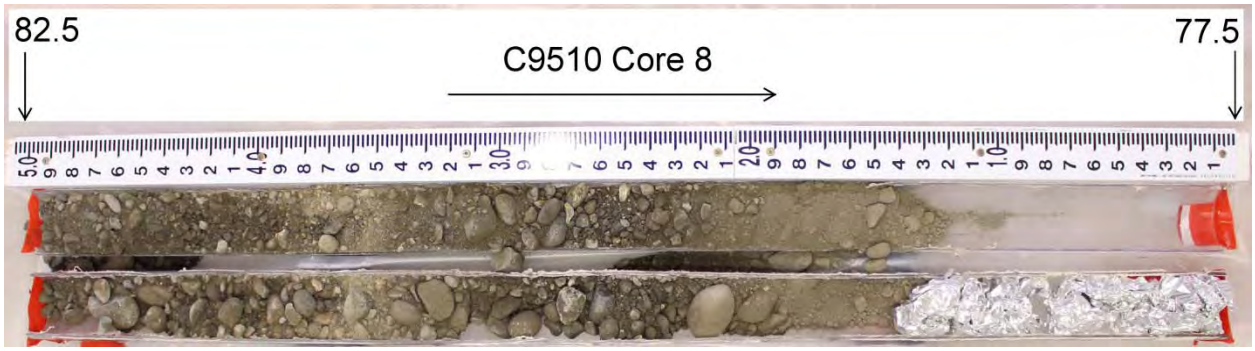

57.4
C9510 Core 3
52.4

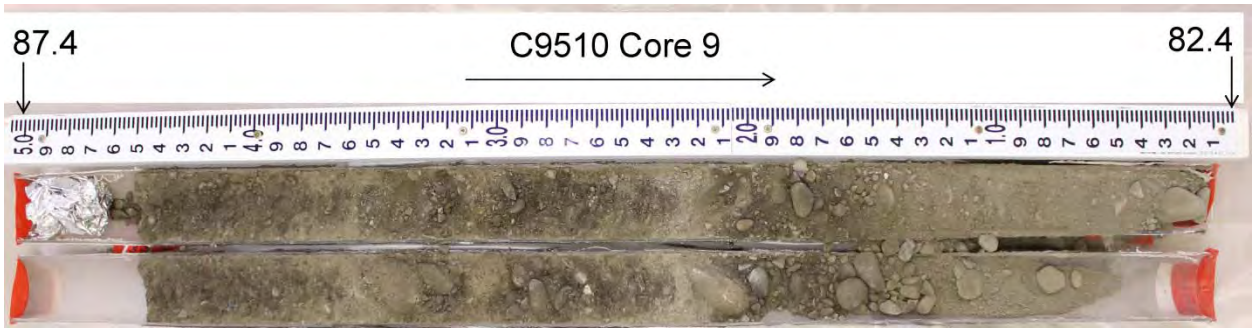

62.5
C9510 Core 4
57.5

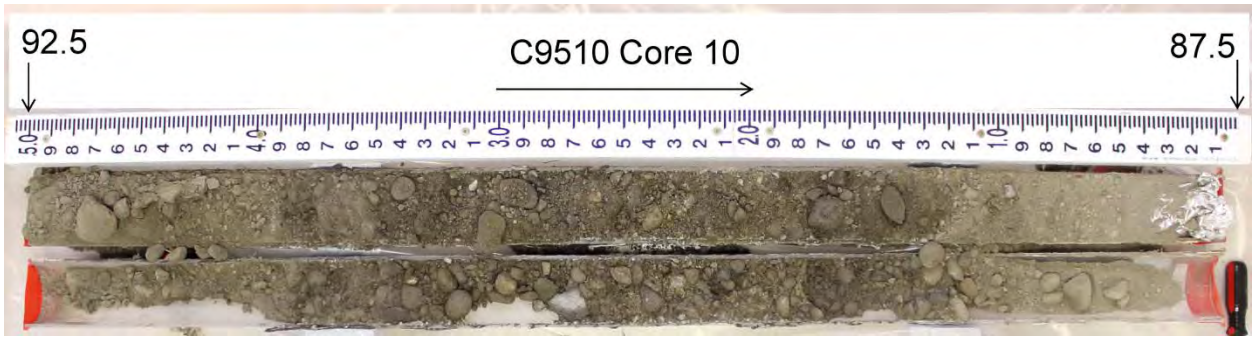

C9510
(67.4)
Core 5
63.2
62.4

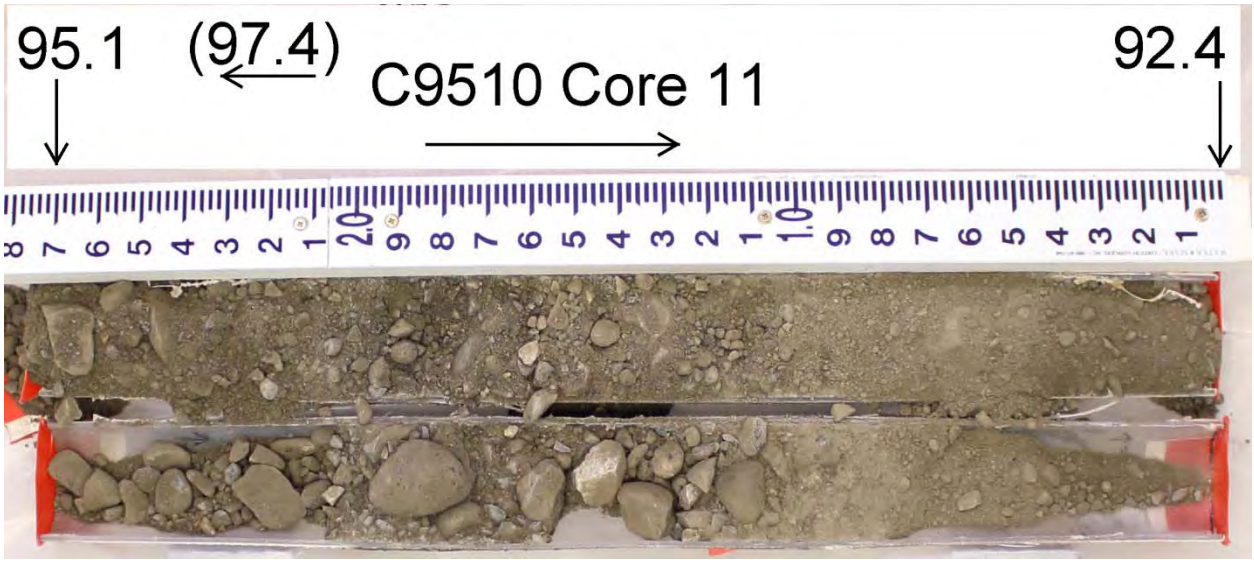

72.0
C9510 Core 6
67.0

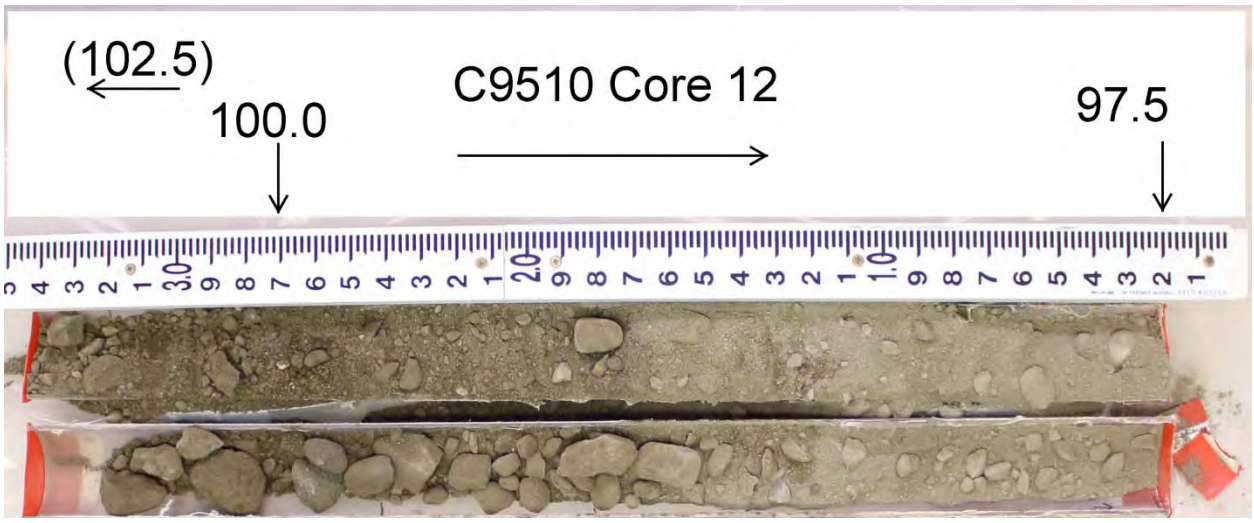

77.5
C9510 Core 7
72.5

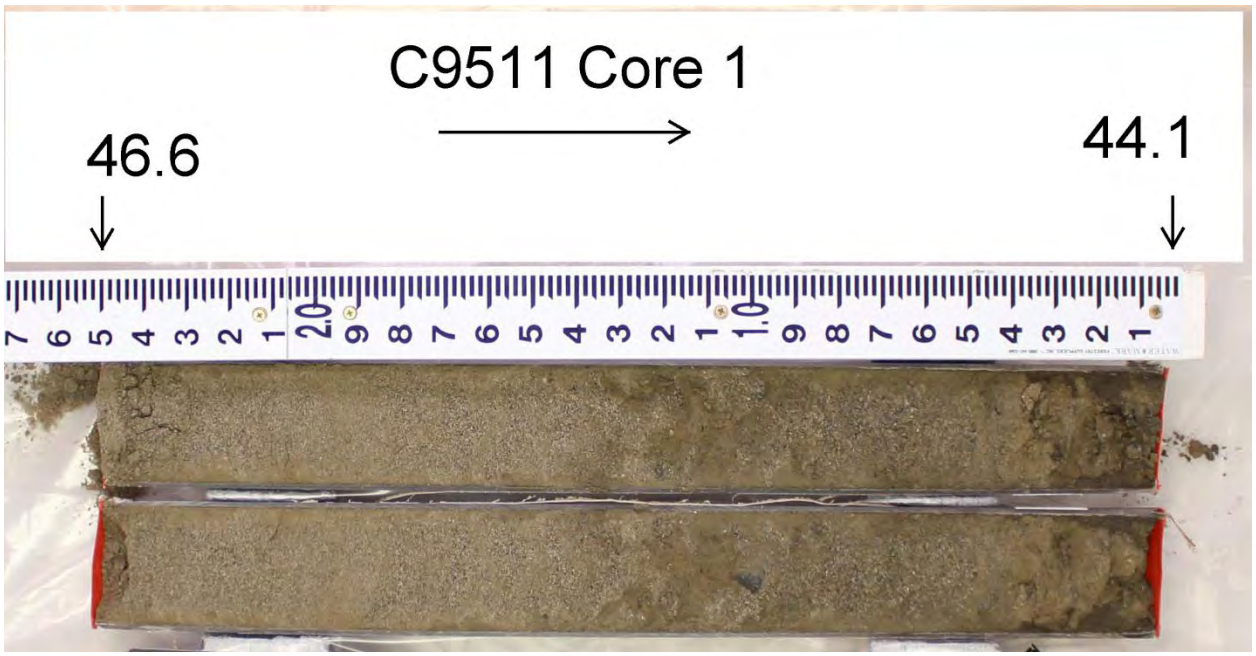

82.5
C9510 Core 8
77.5

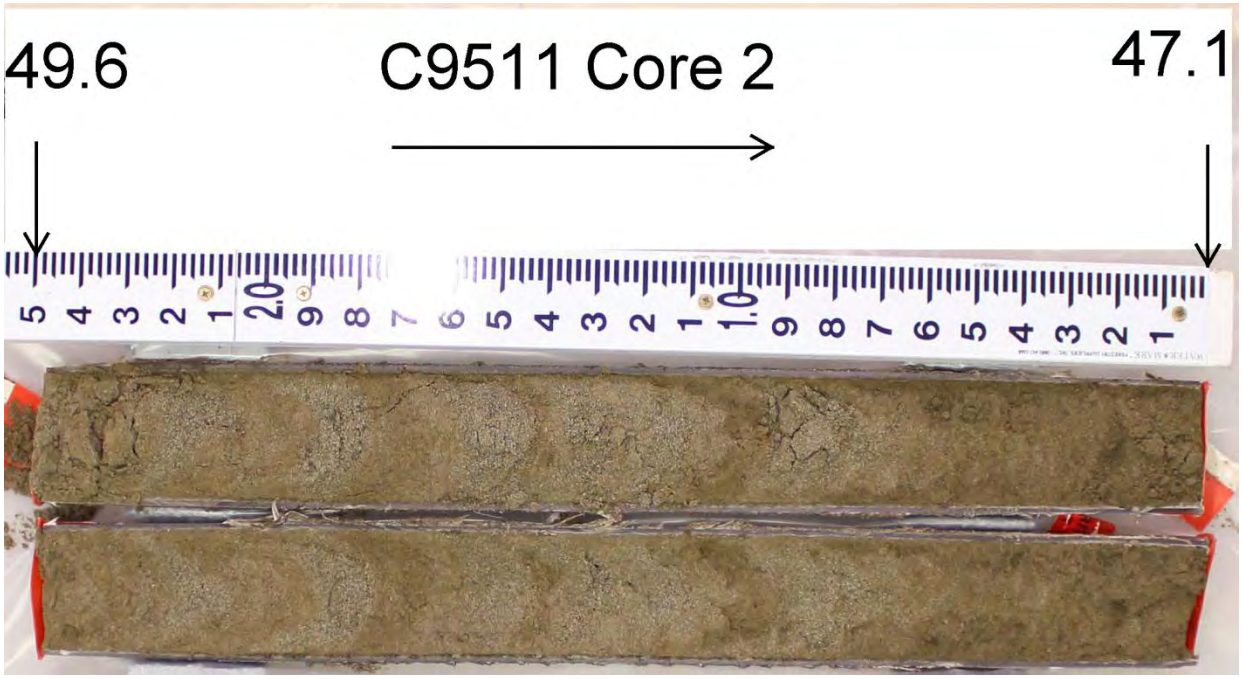

87.4
C9510 Core 9
82.4


92.5
C9510 Core 10
87.5


95.1
(97.4)
C9510 Core 11
92.4


(102.5)
100.0
C9510 Core 12
97.5


C9511 Core 1
46.6
44.1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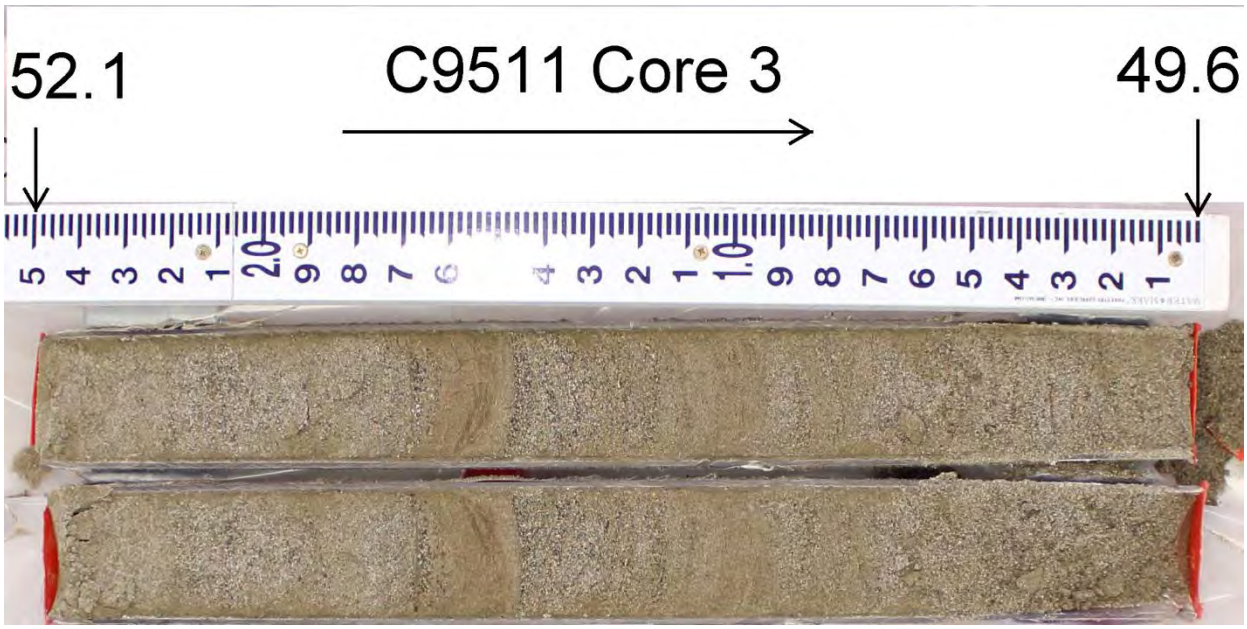
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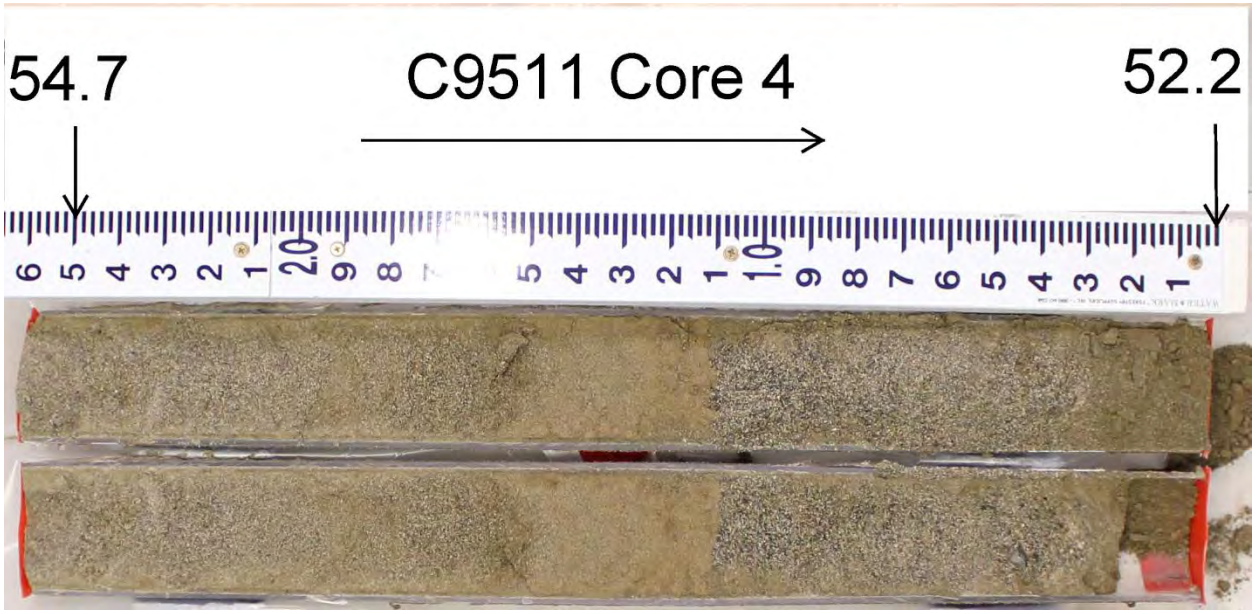
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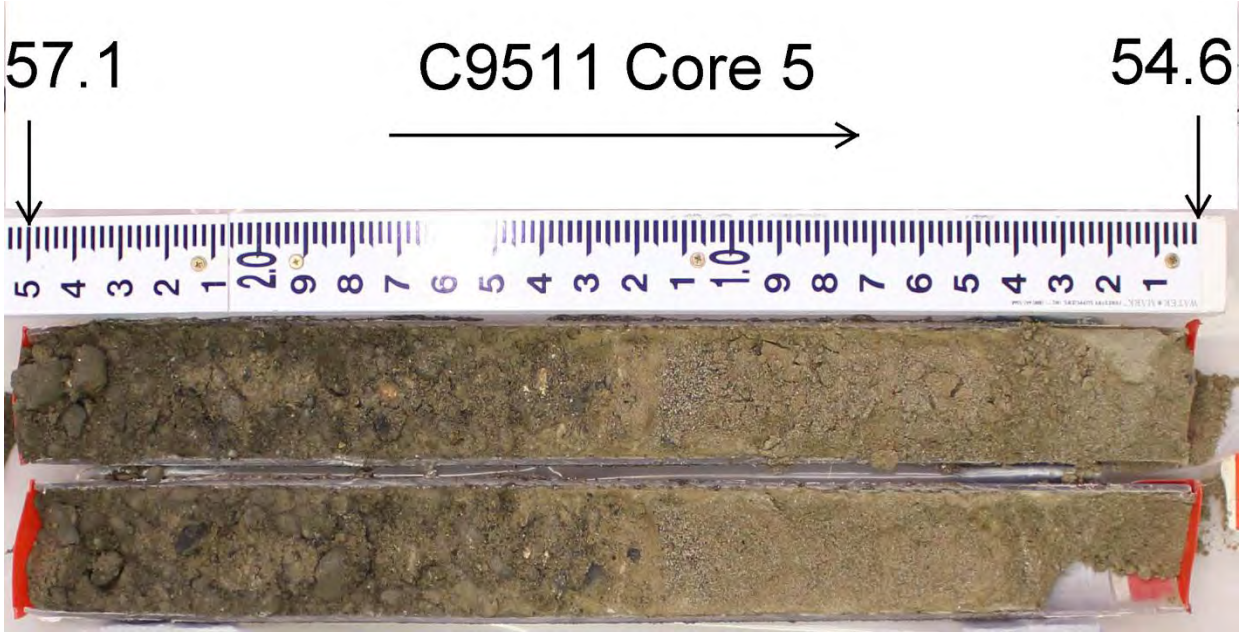
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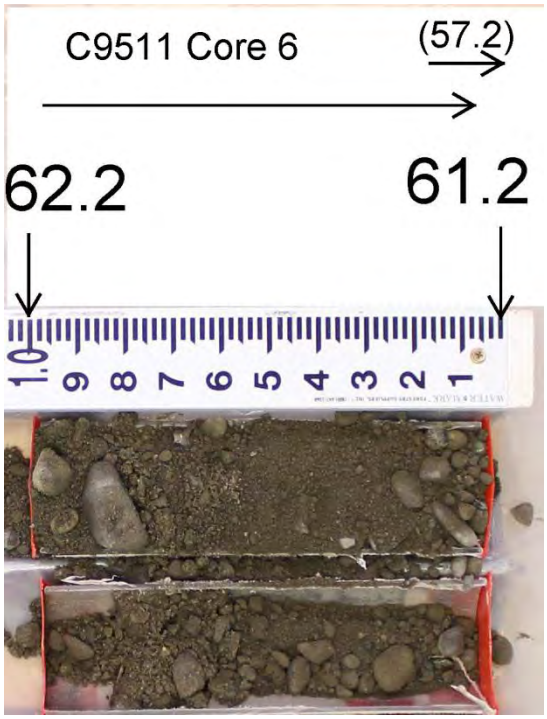
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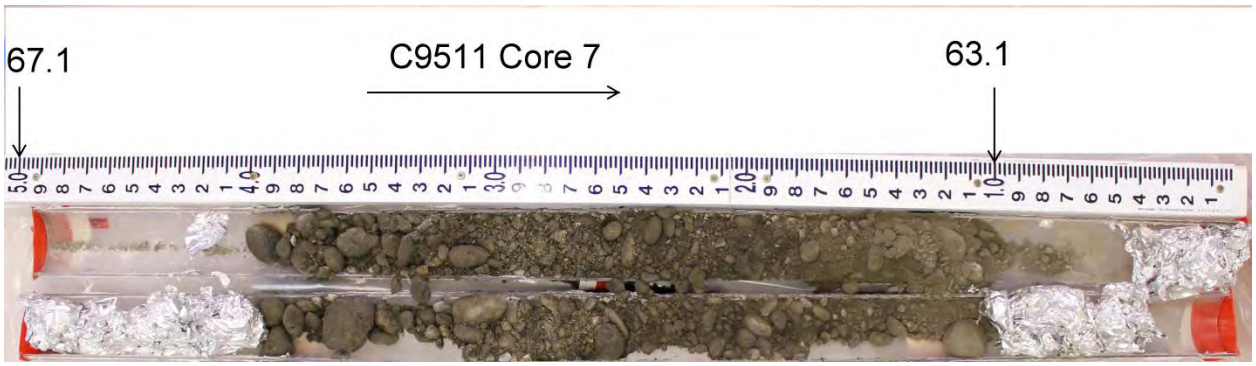
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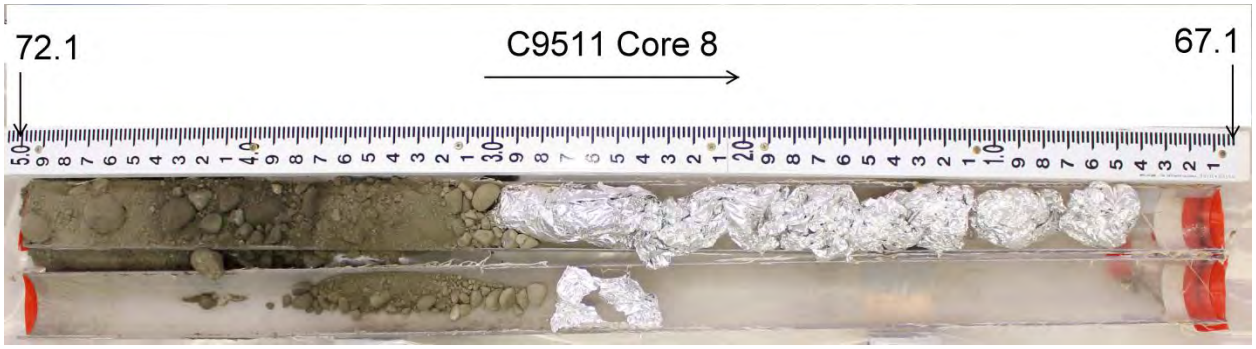
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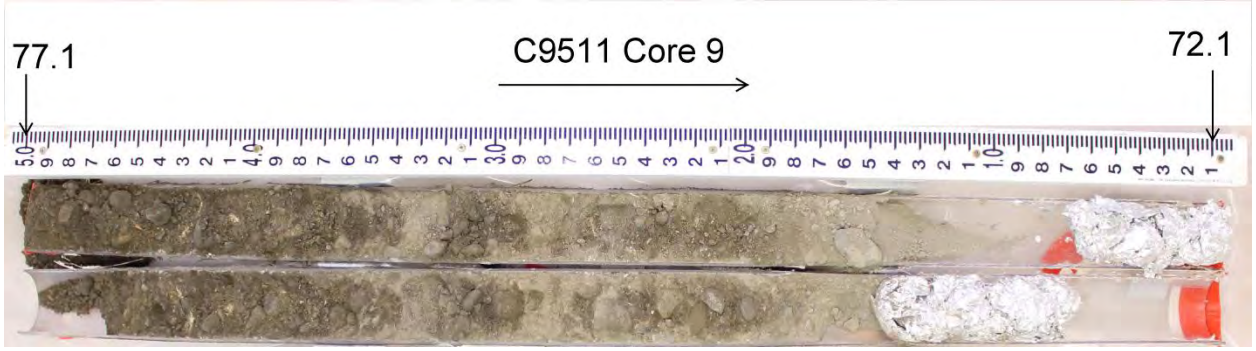
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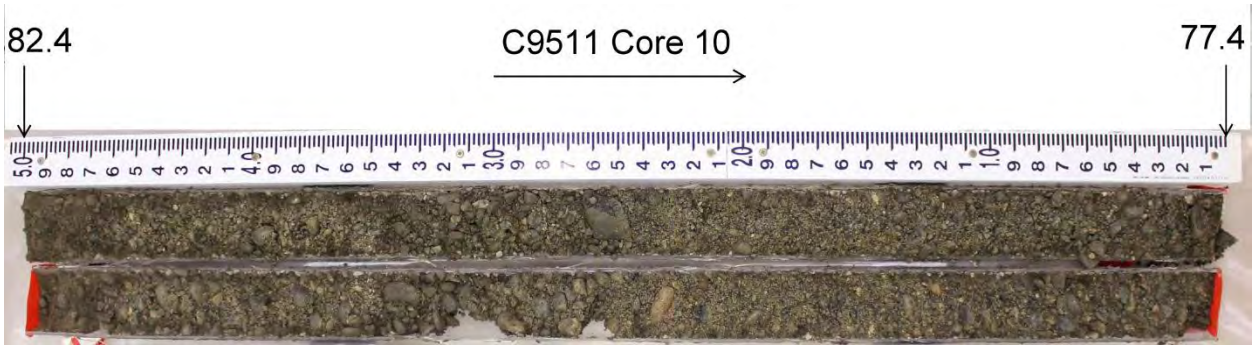
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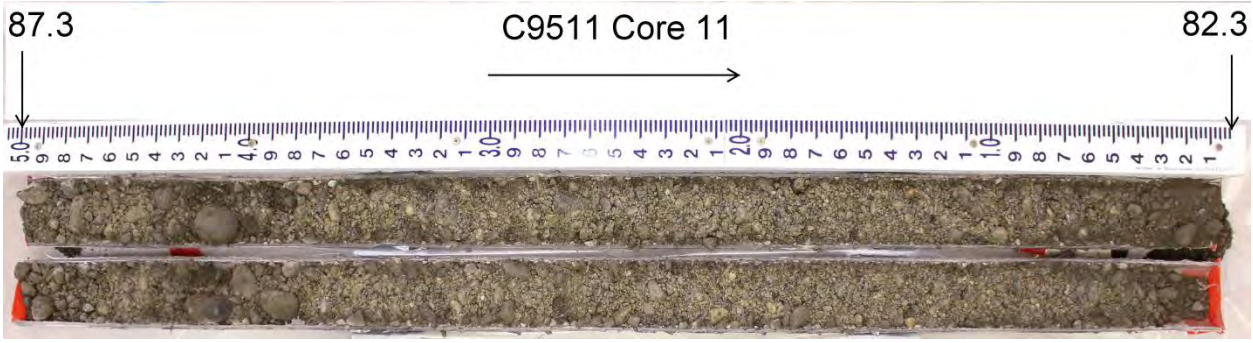
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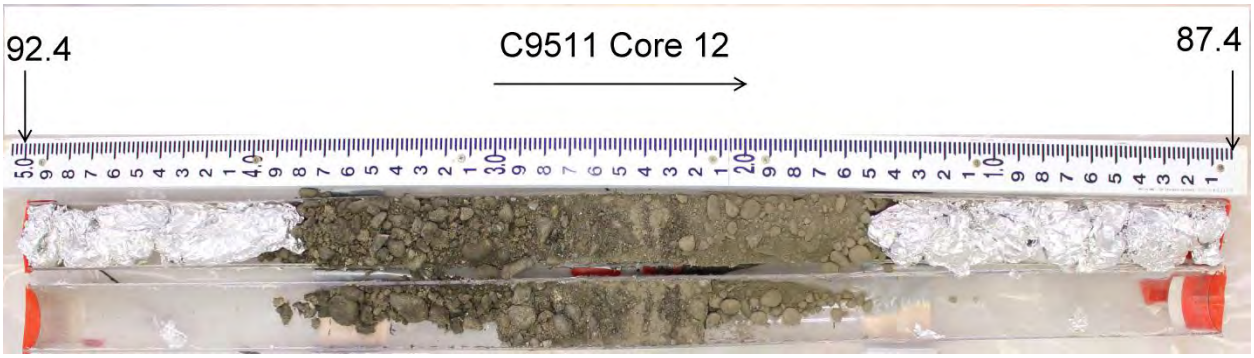
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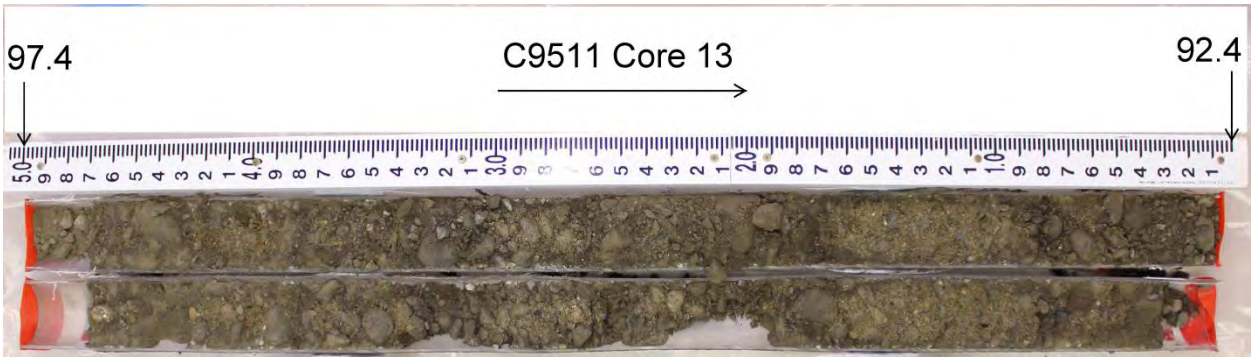
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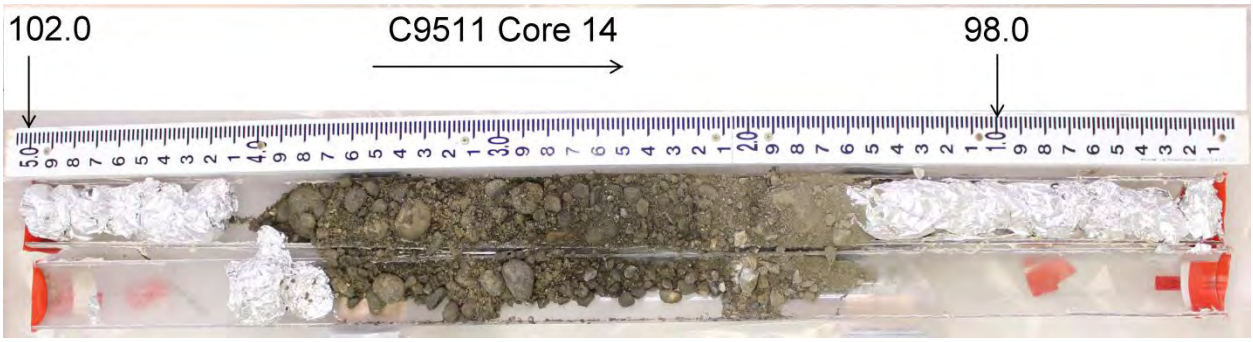
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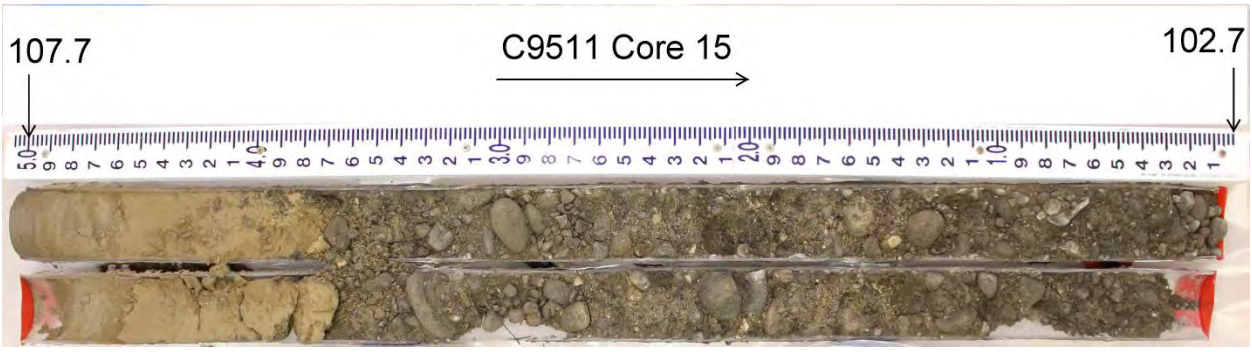
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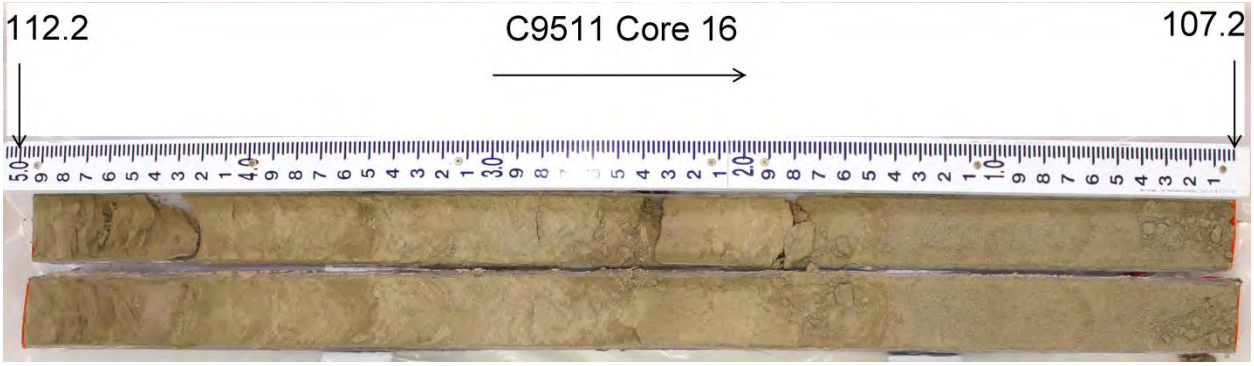
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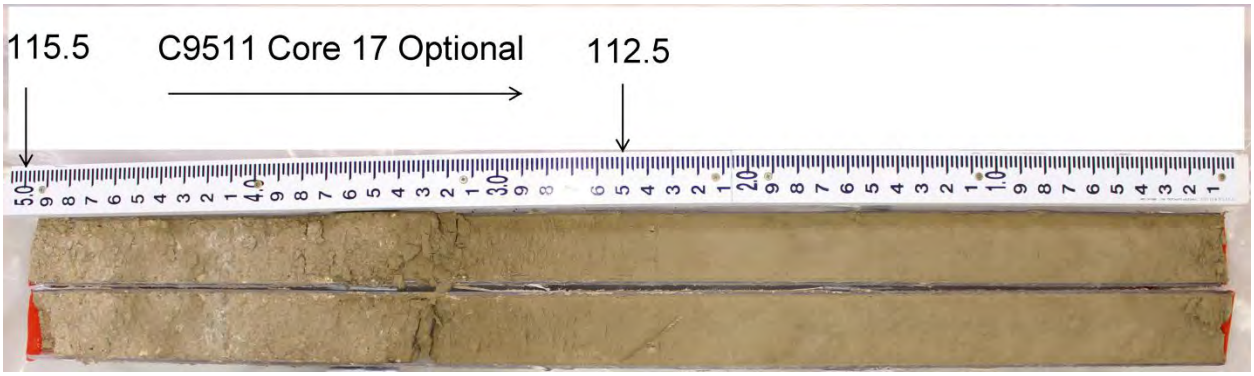
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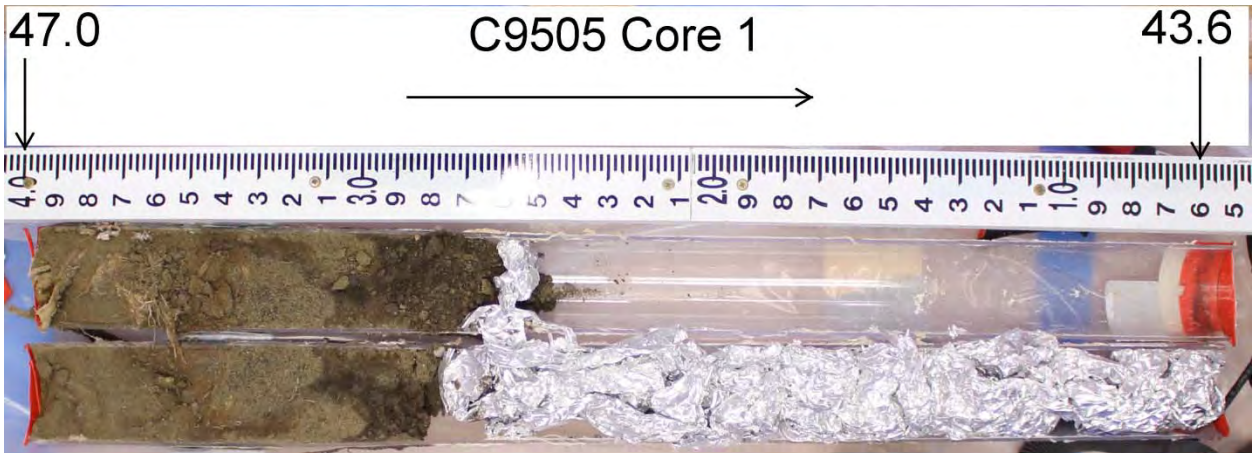
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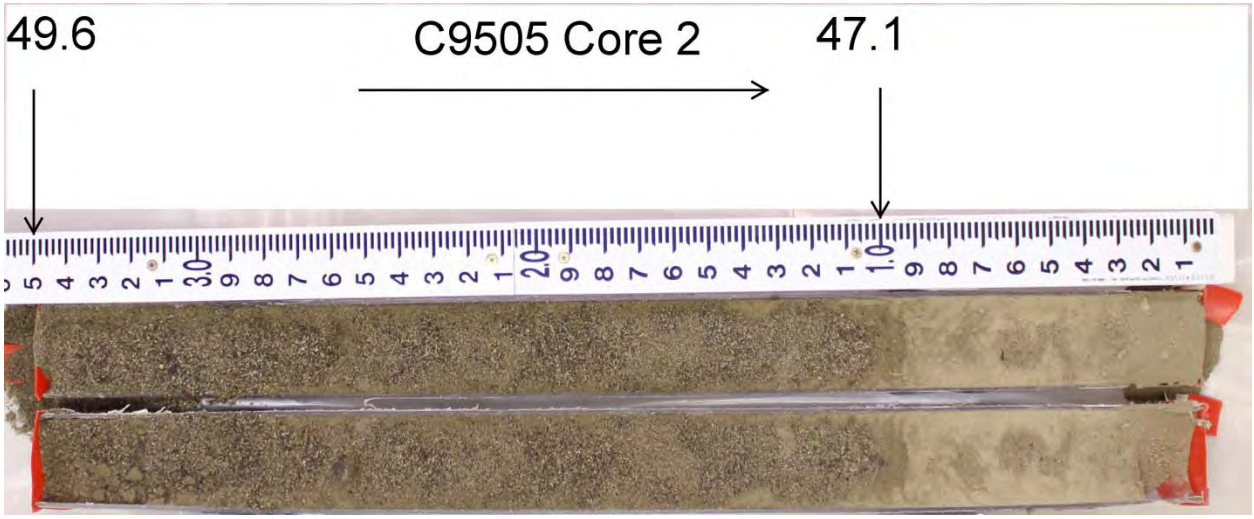
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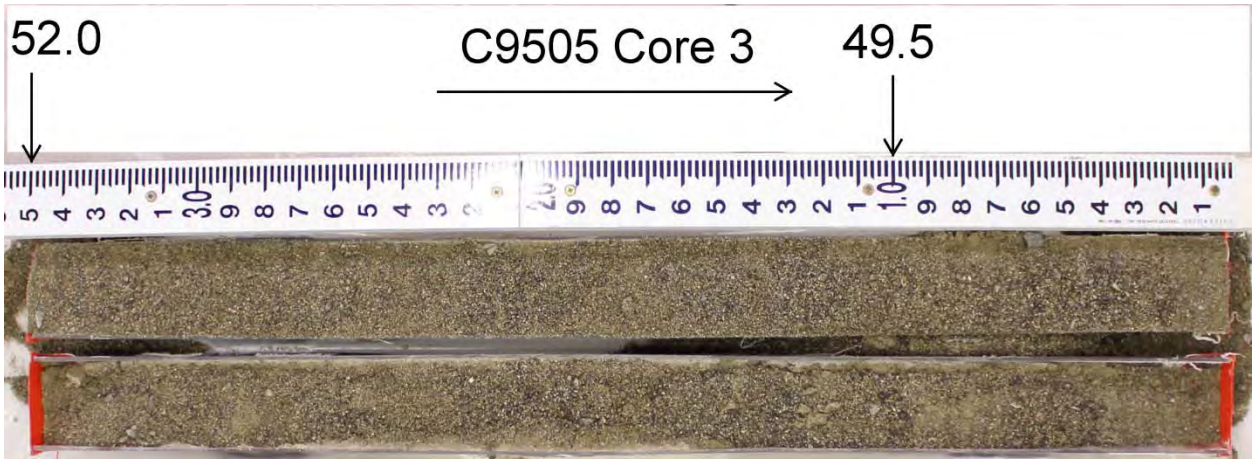
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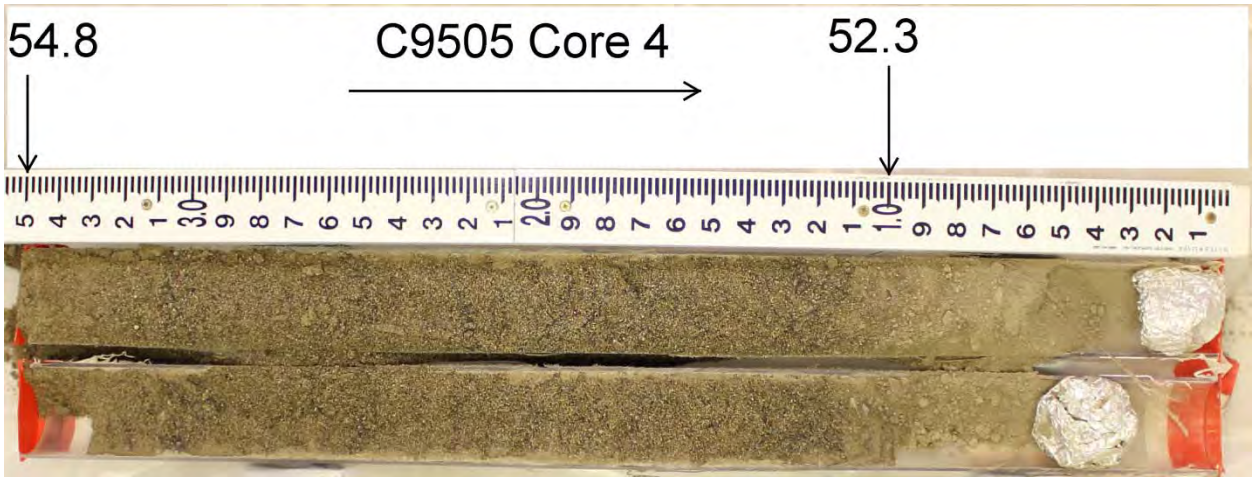
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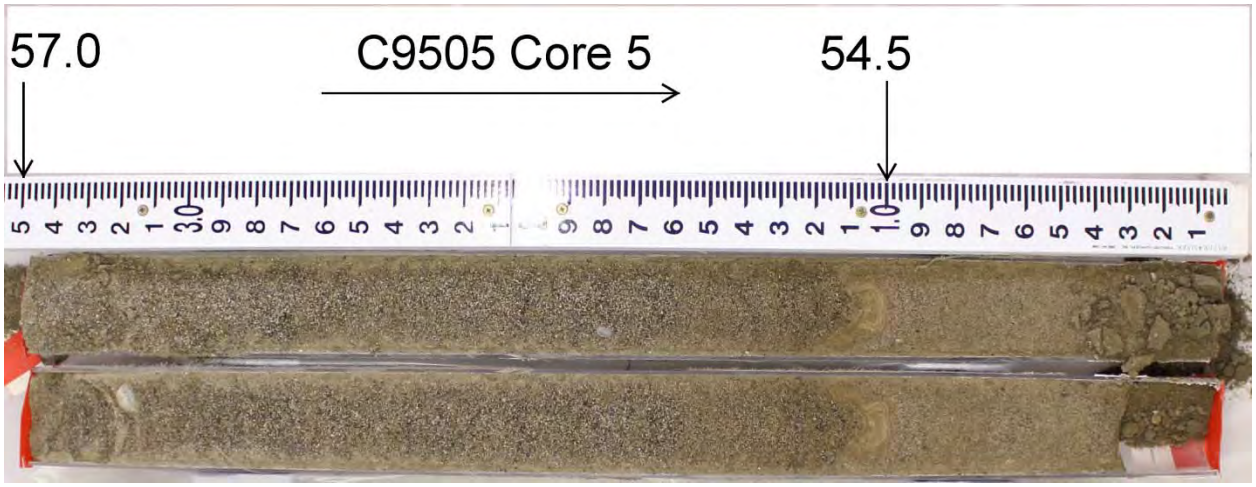
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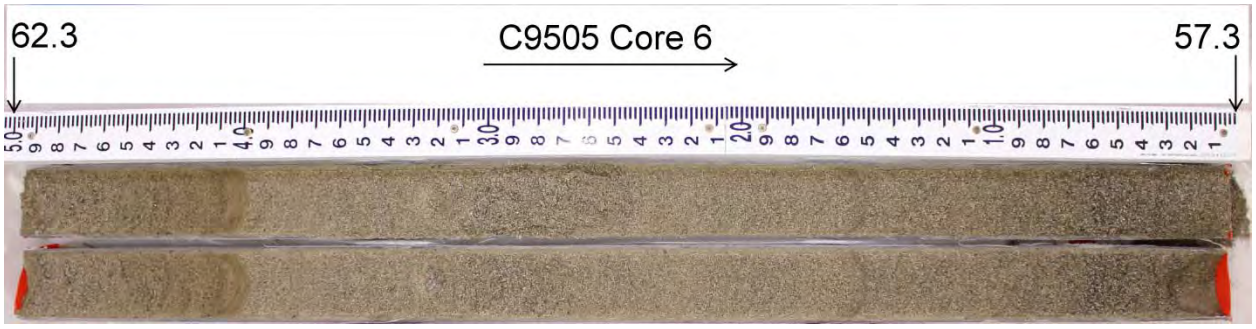
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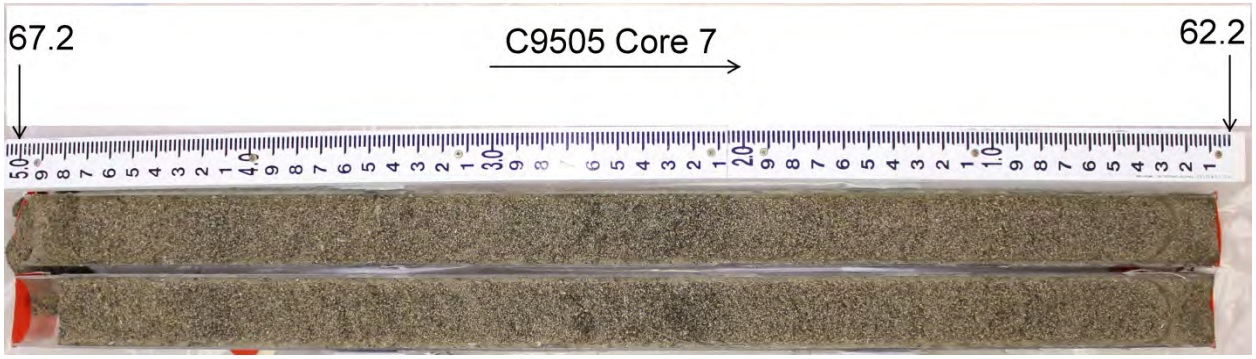
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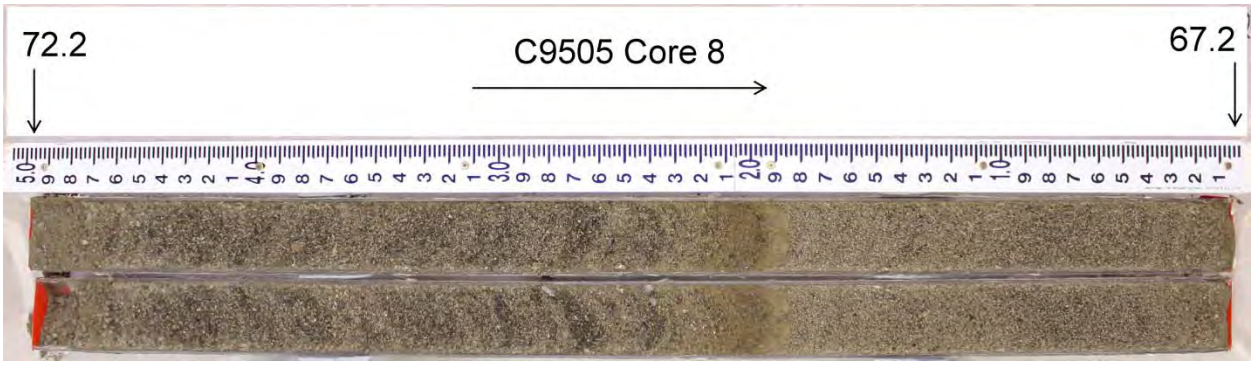
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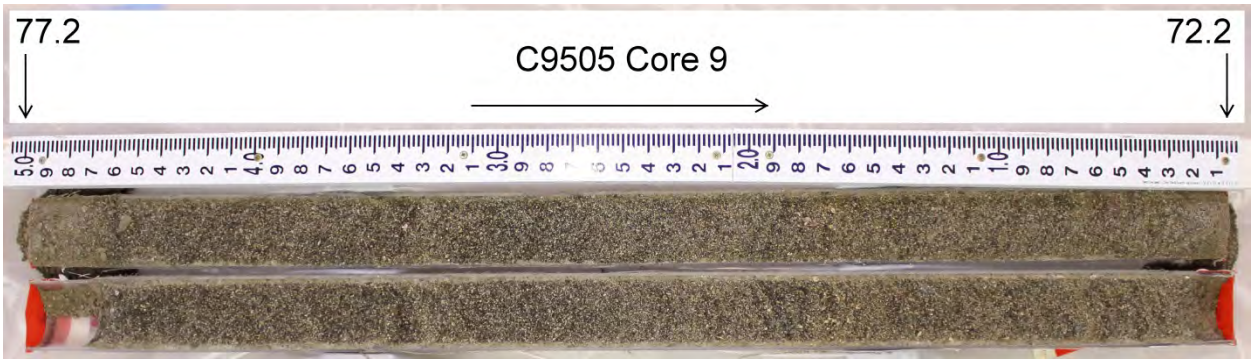
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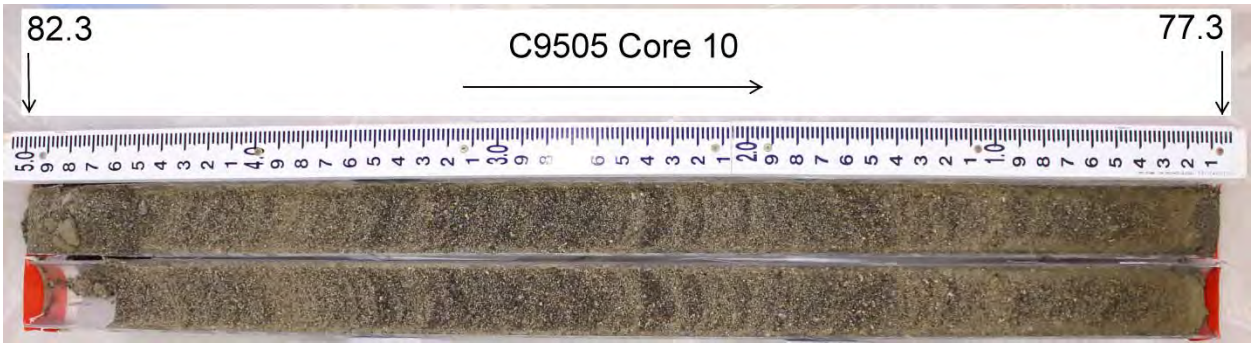
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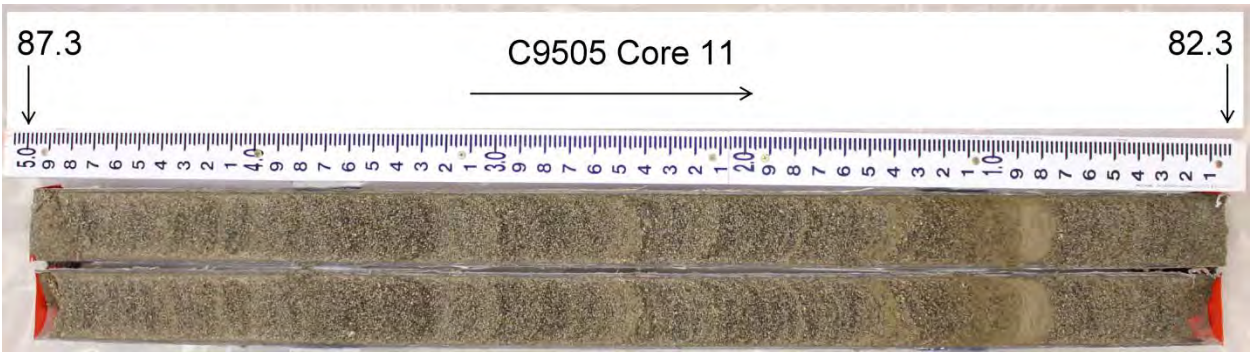
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92.4
C9505 Core 12
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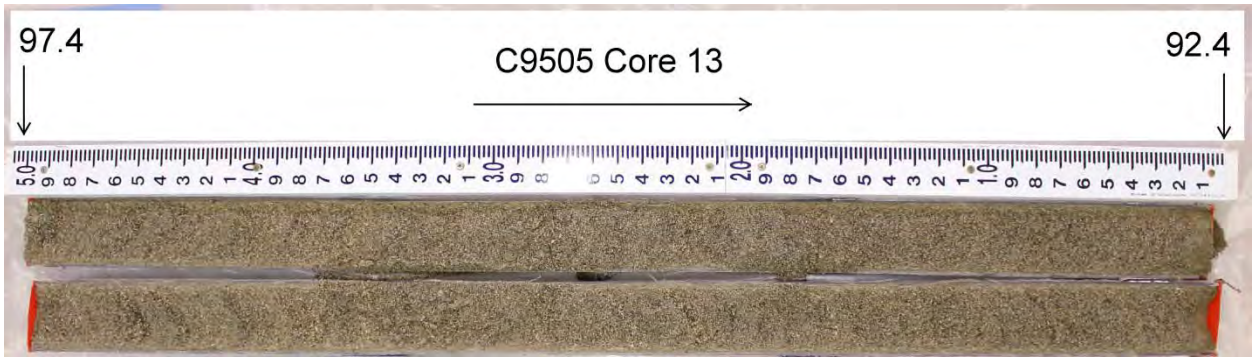
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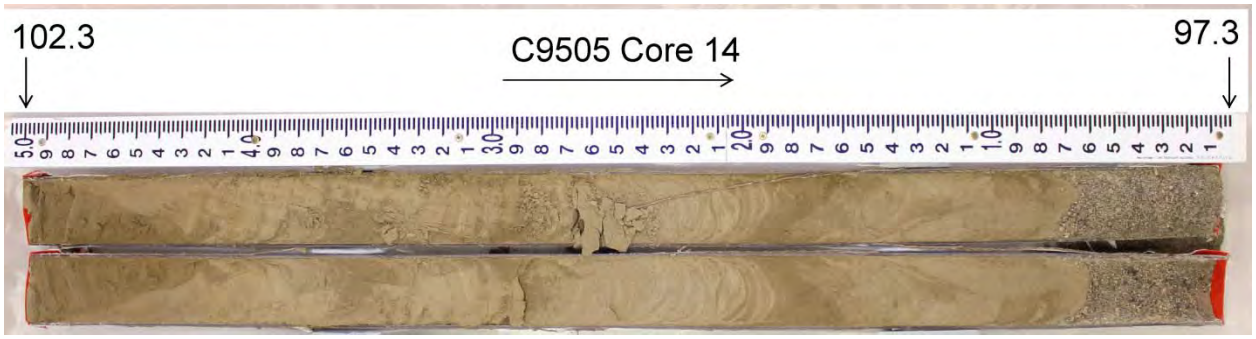
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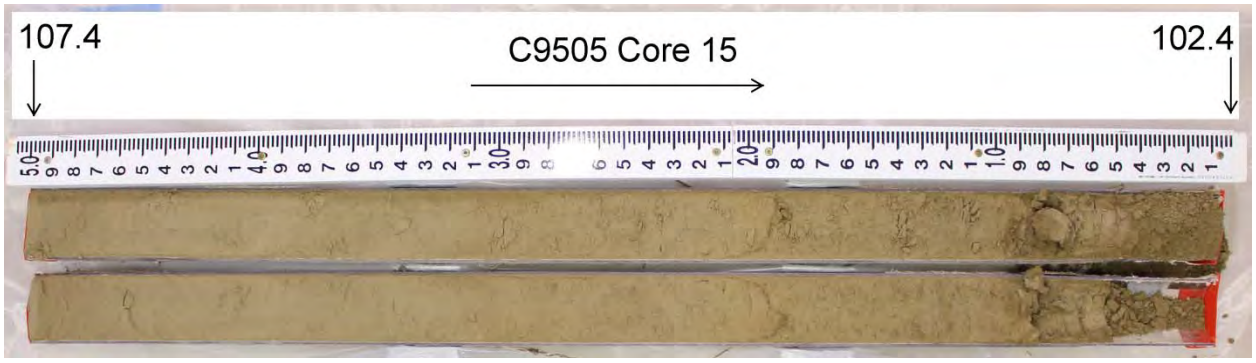
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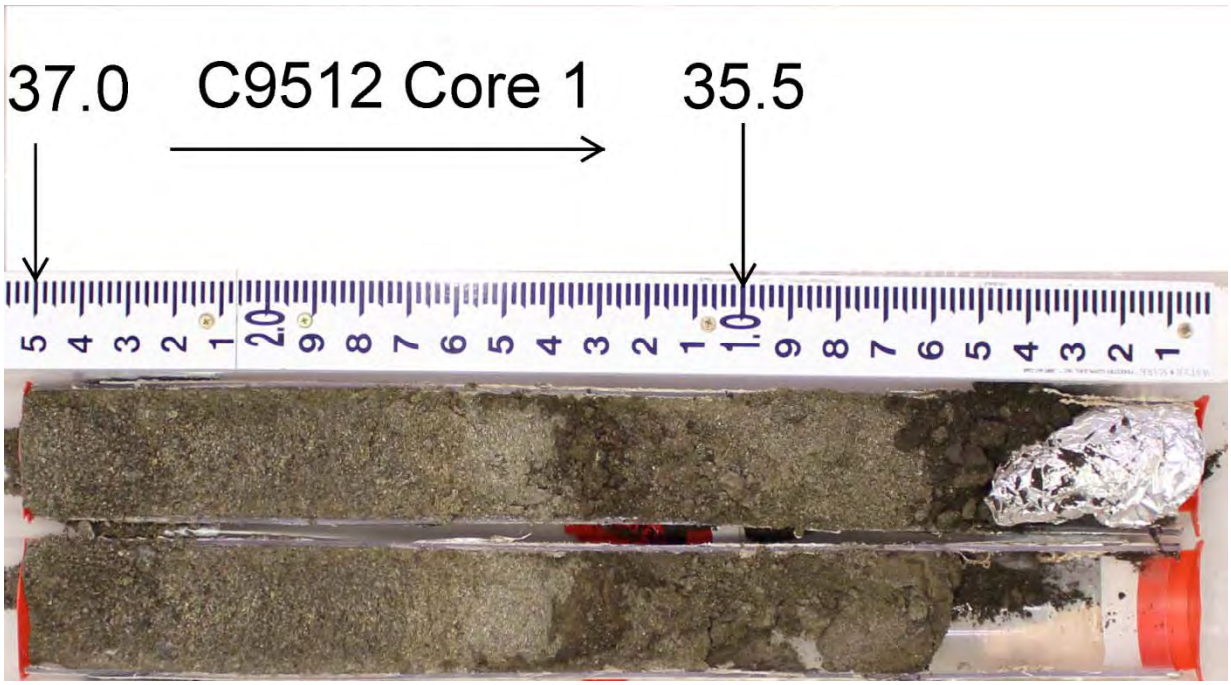
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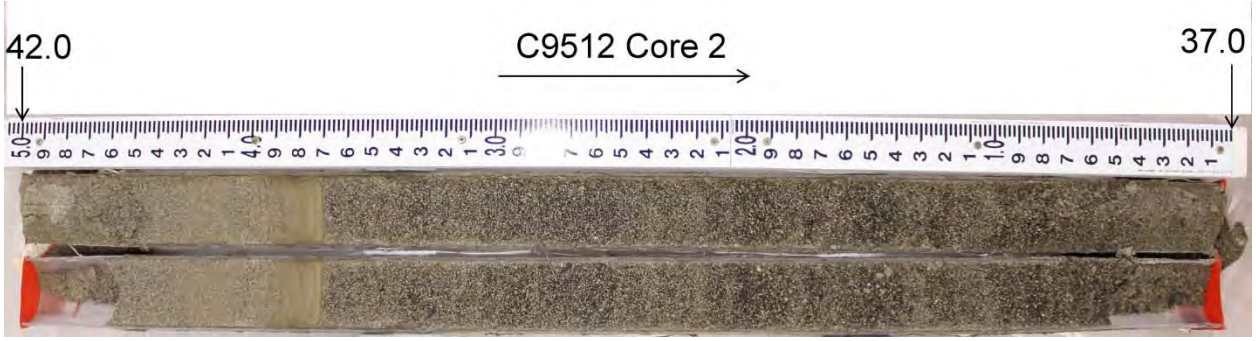
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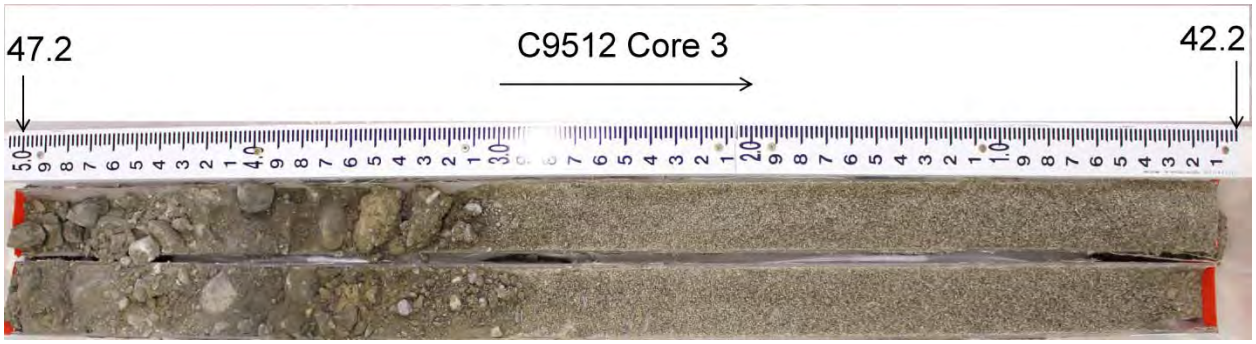
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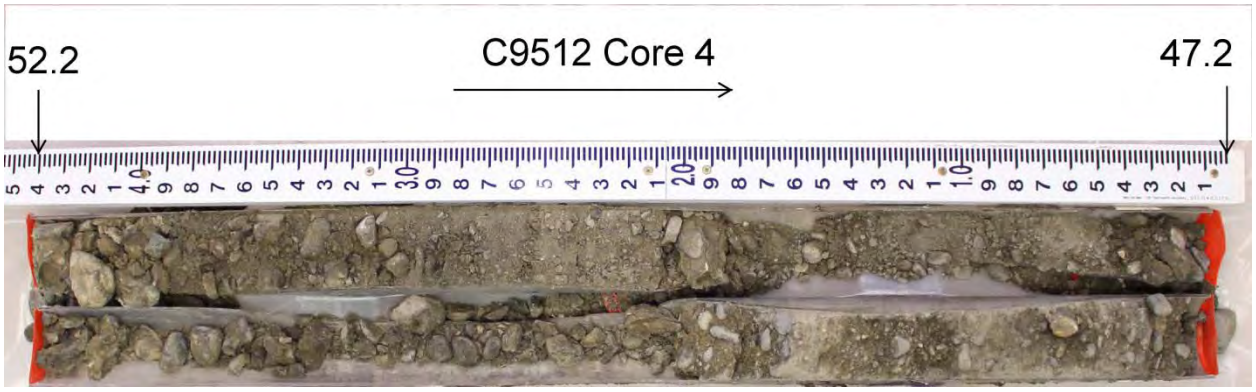
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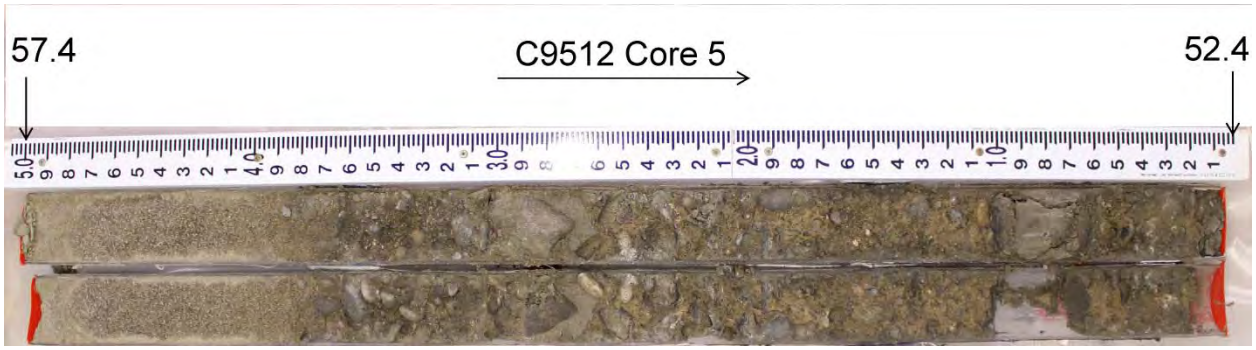
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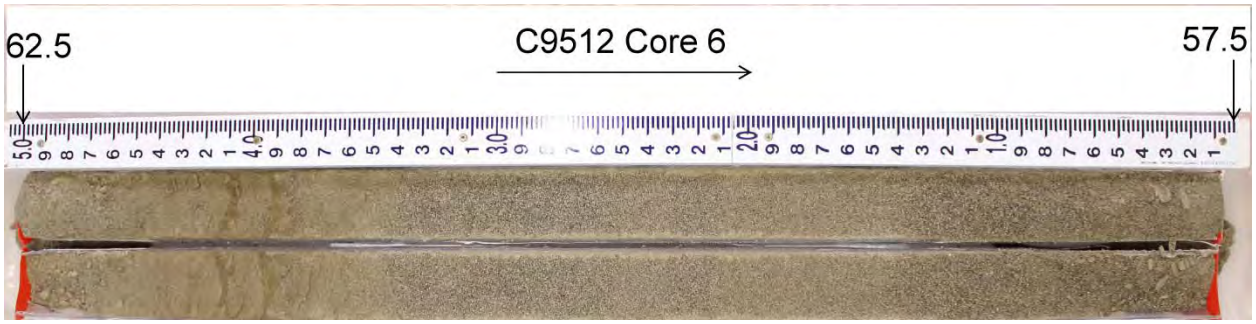
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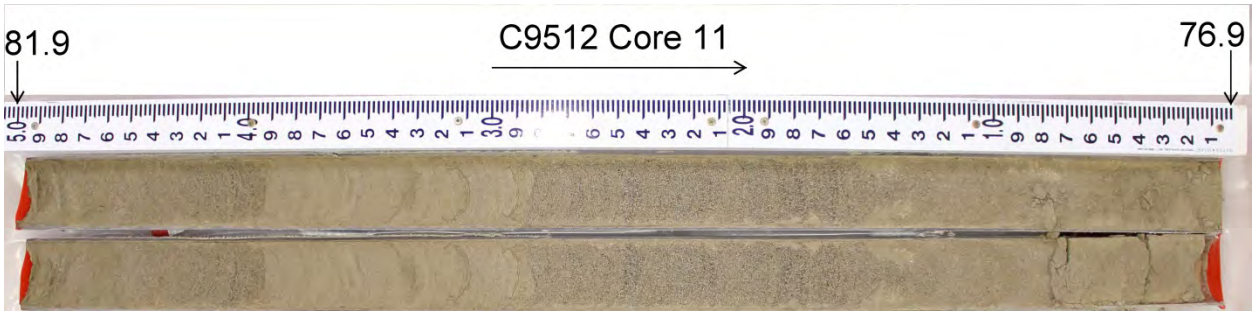
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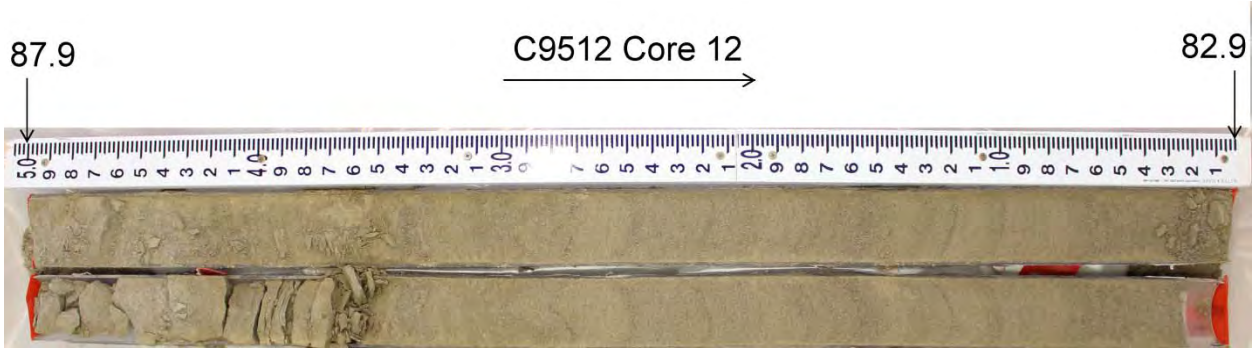
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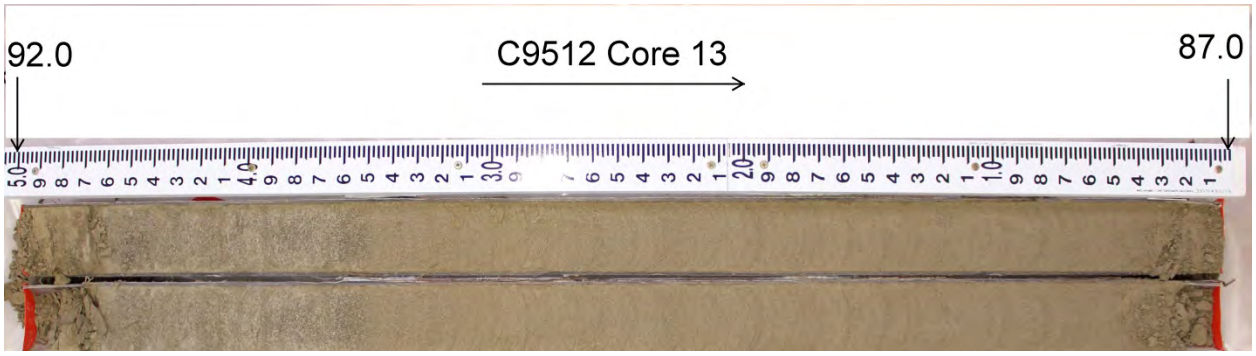
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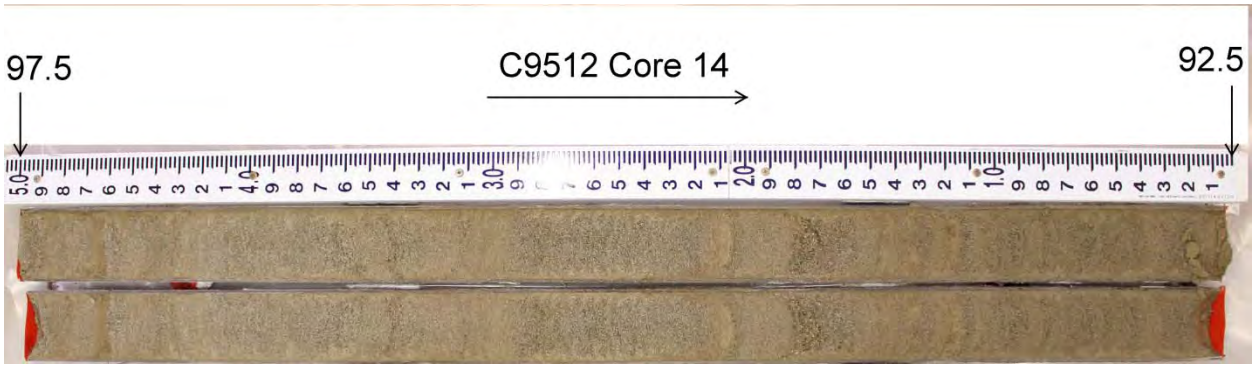
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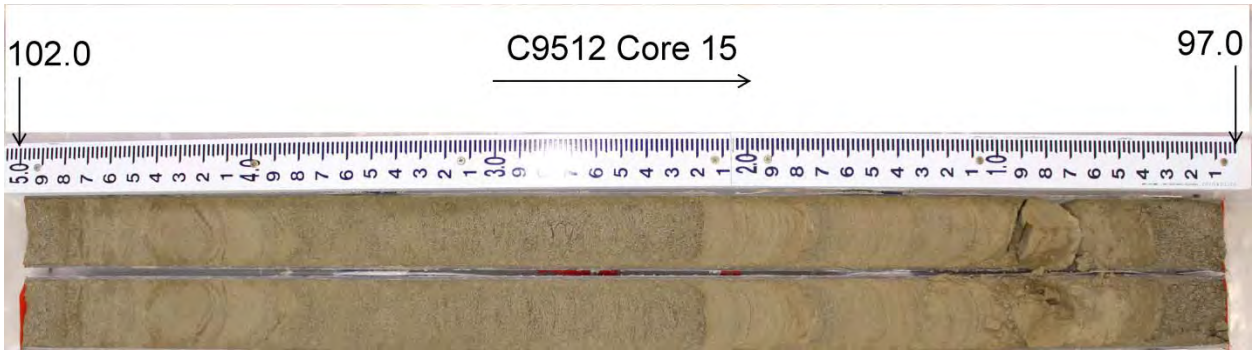
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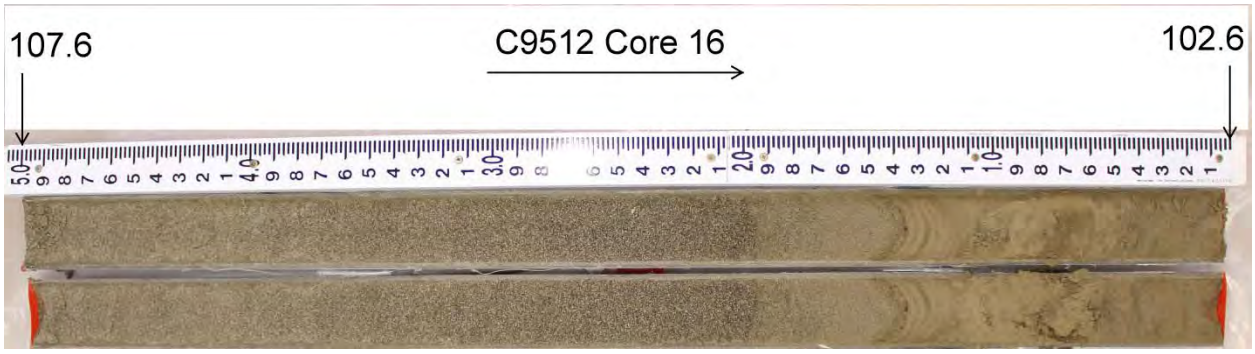
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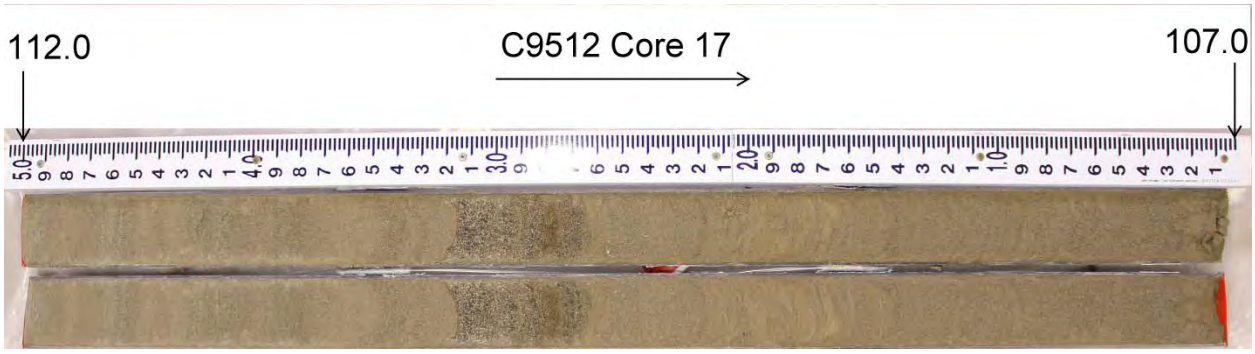
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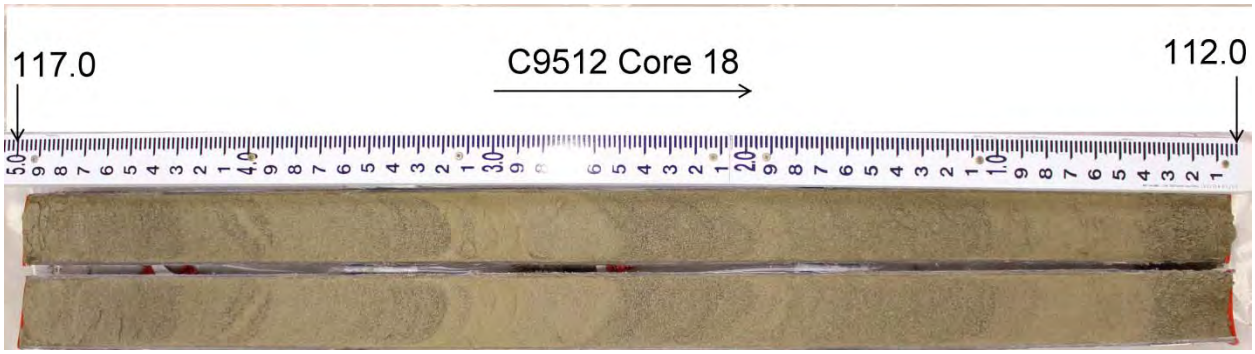
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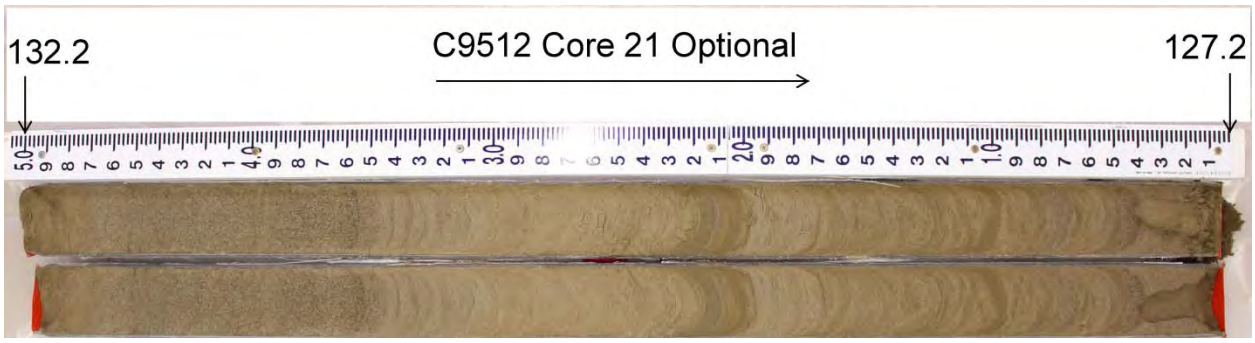
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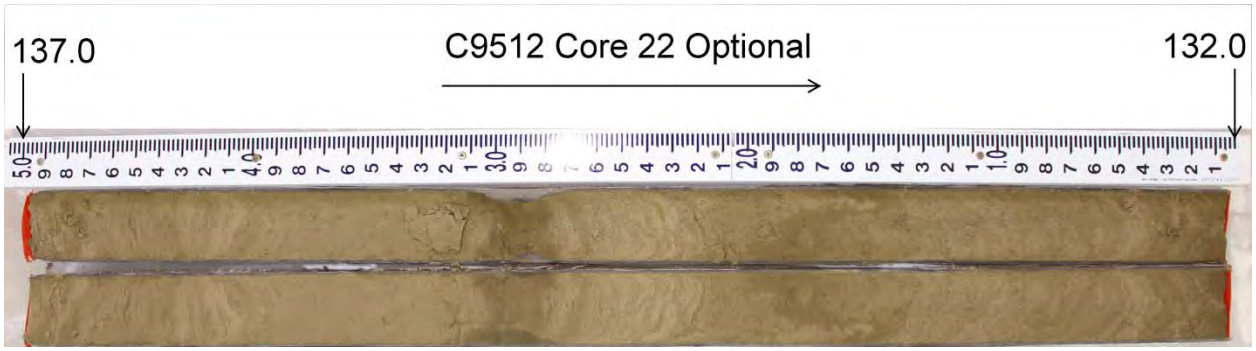
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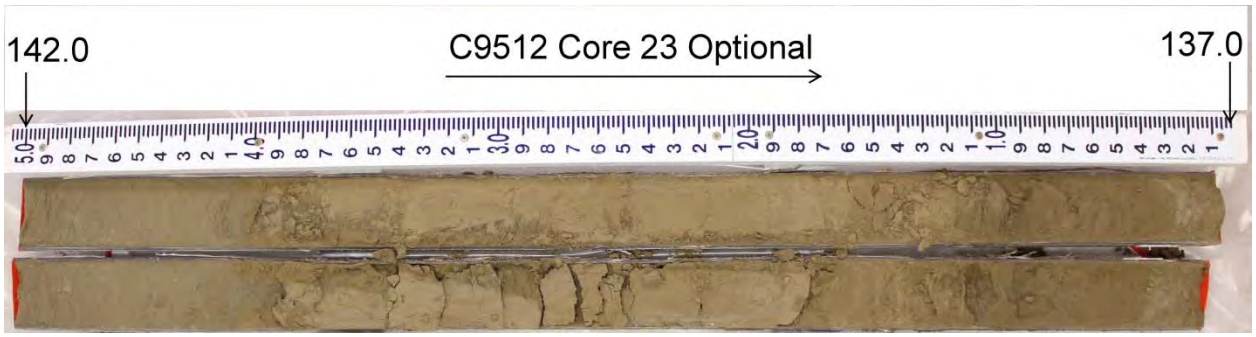
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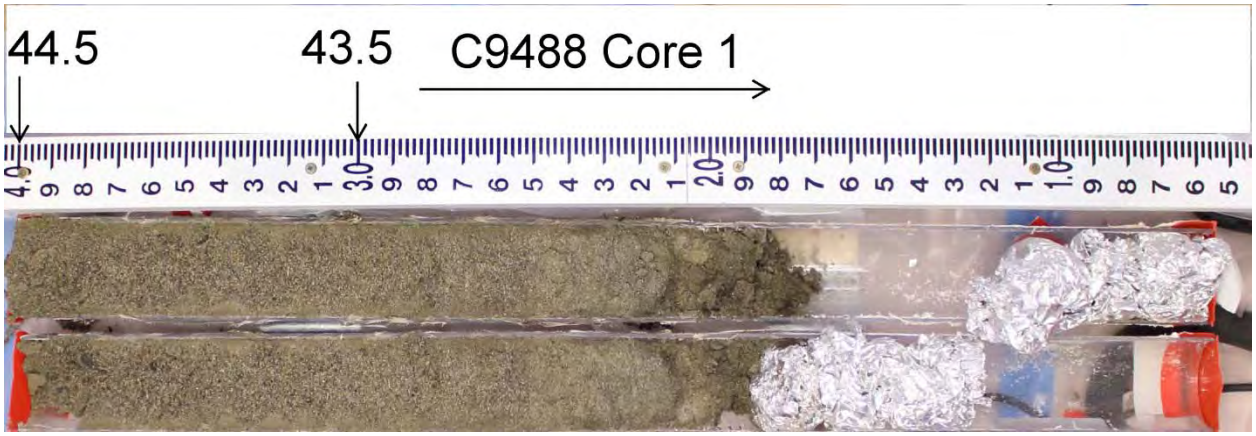
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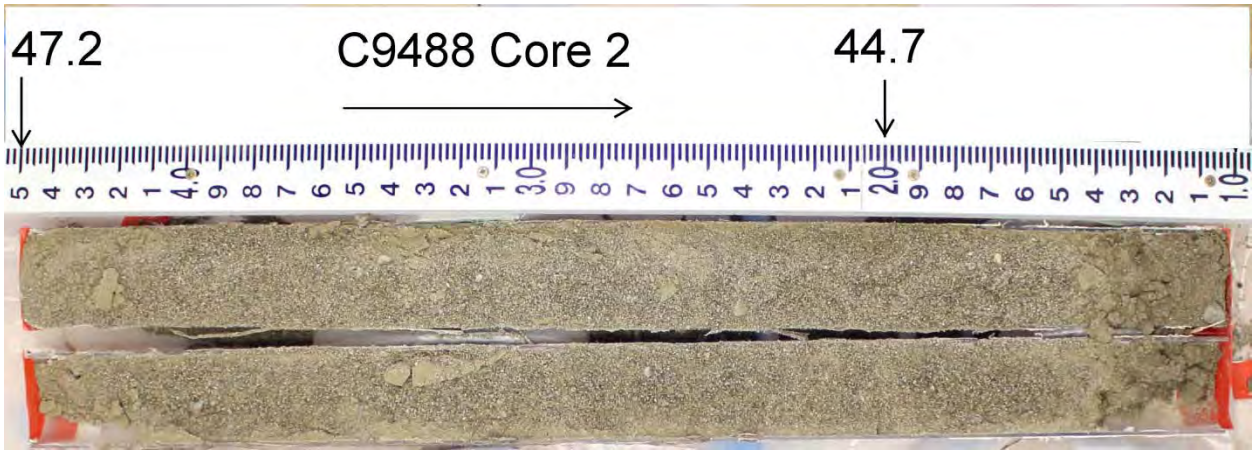
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C9488 Core 2
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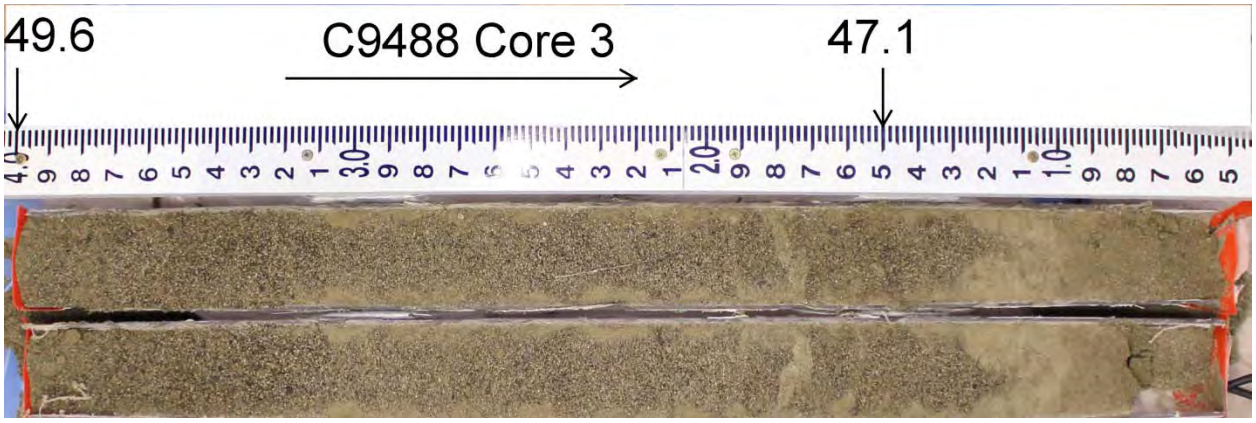
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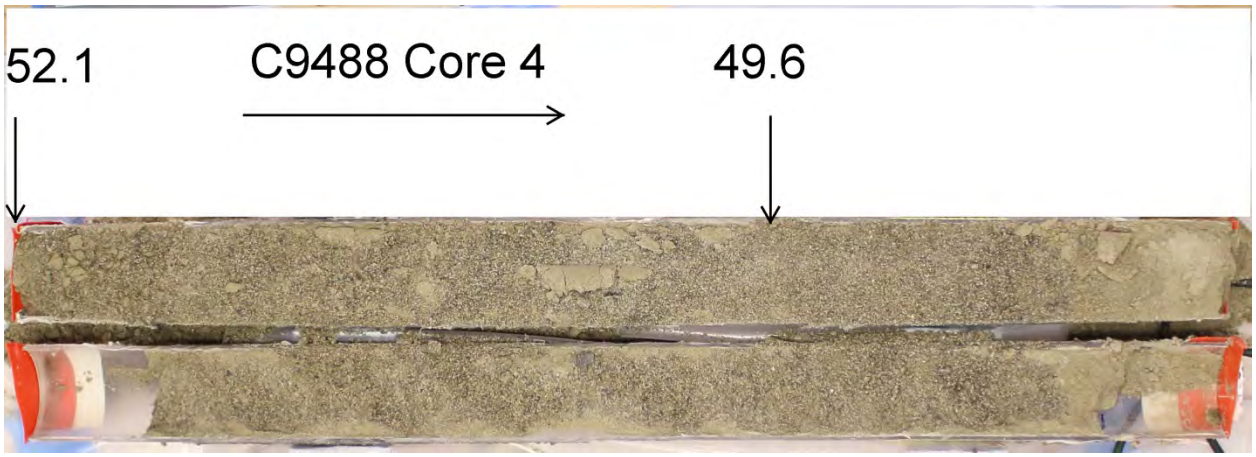
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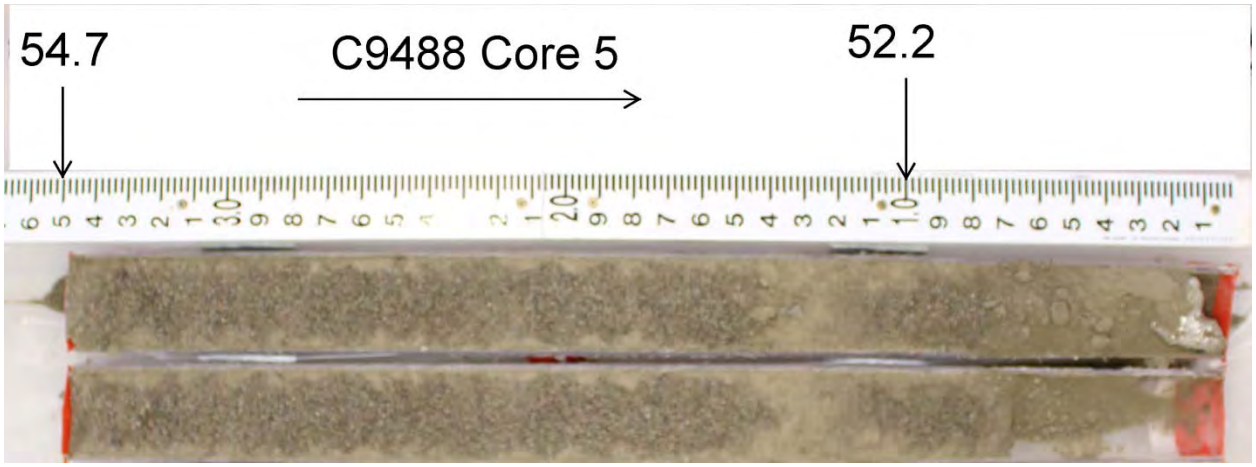
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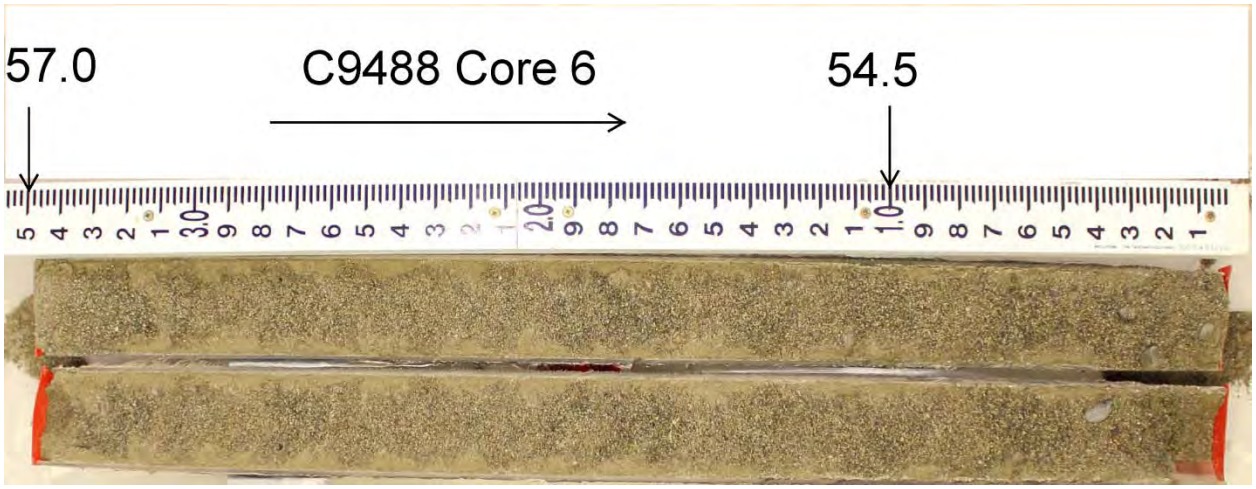
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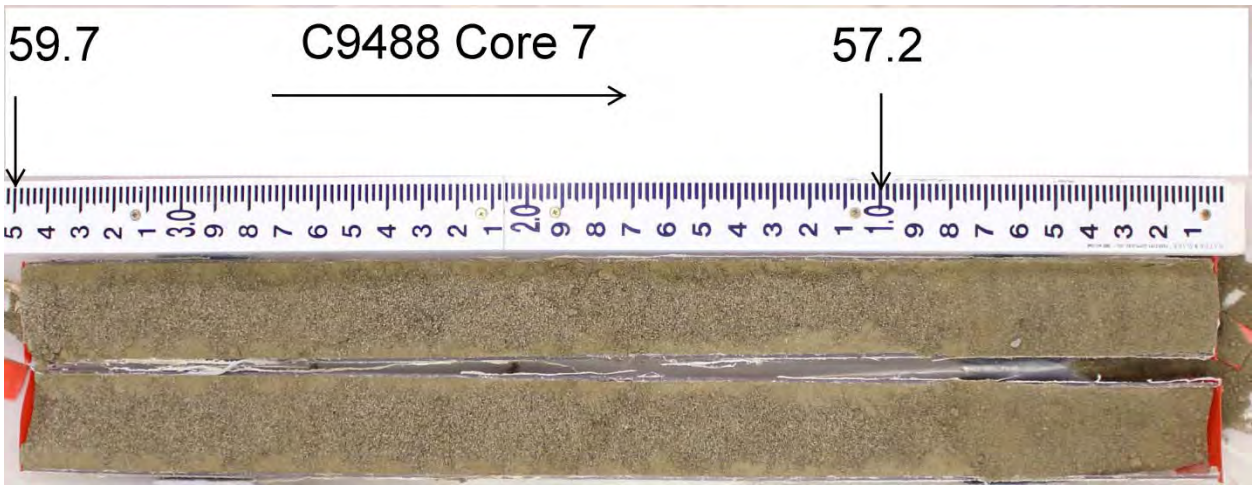
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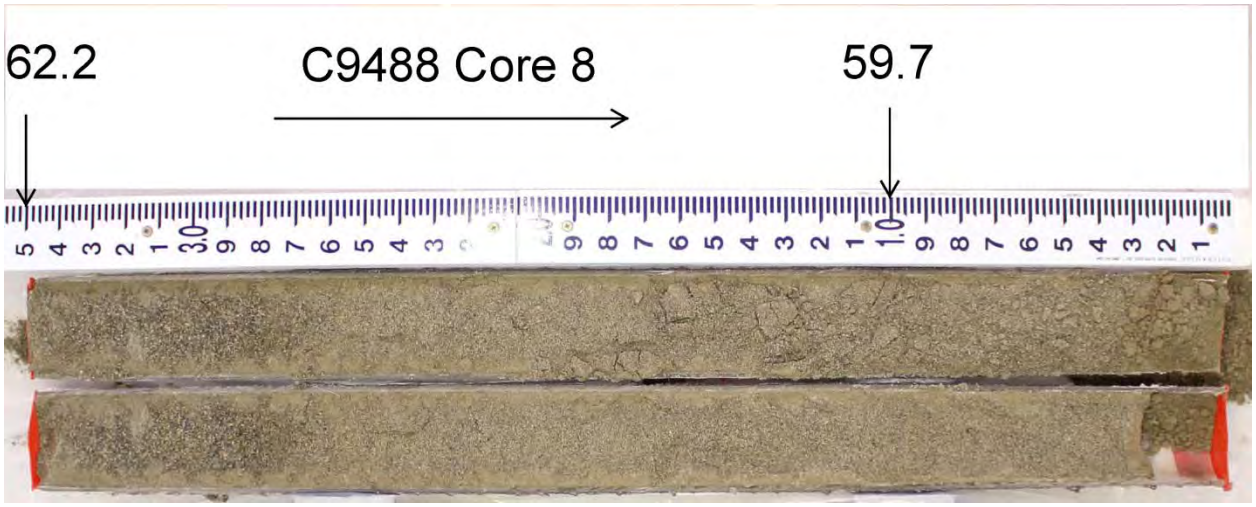
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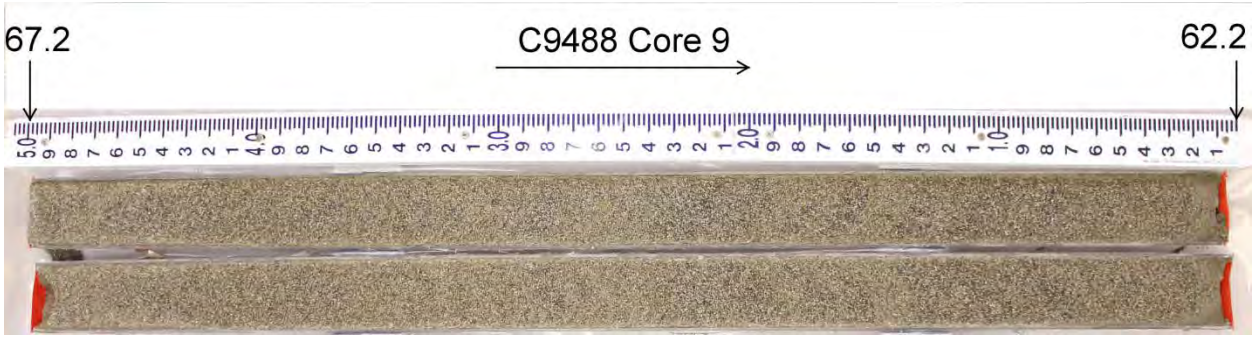
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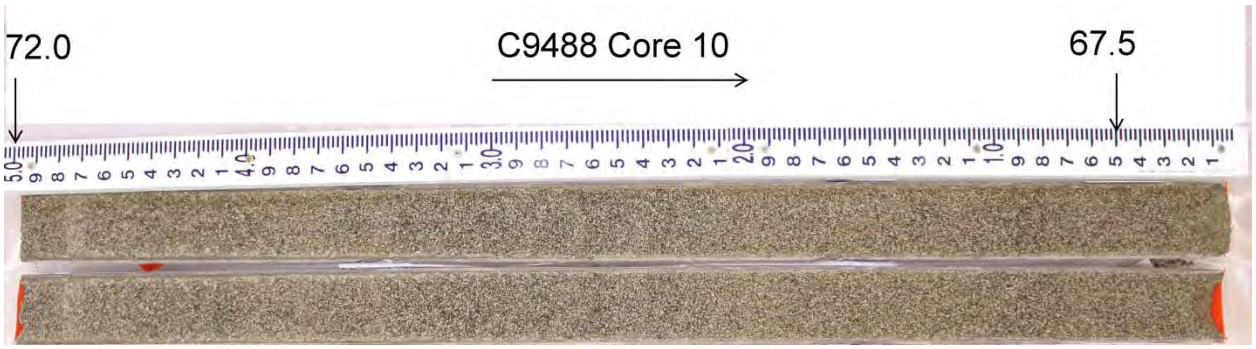
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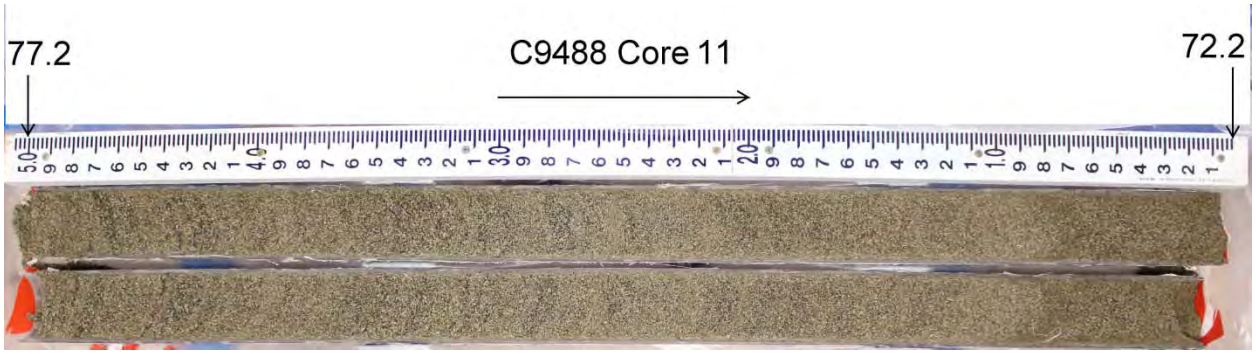
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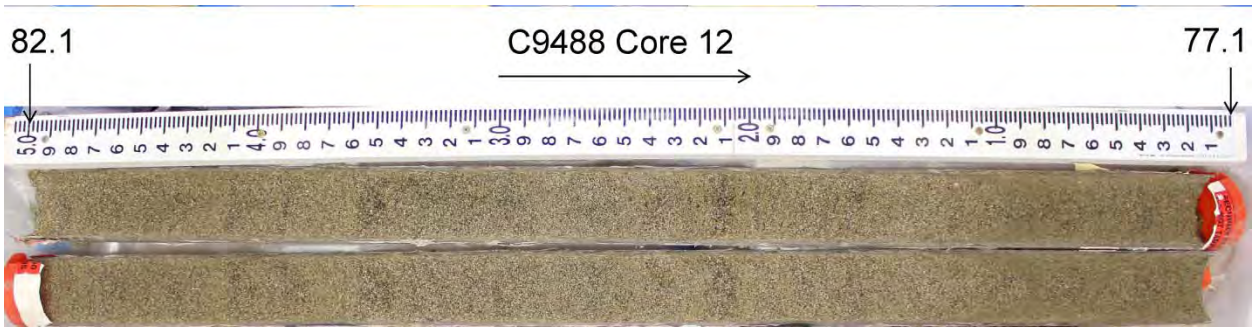
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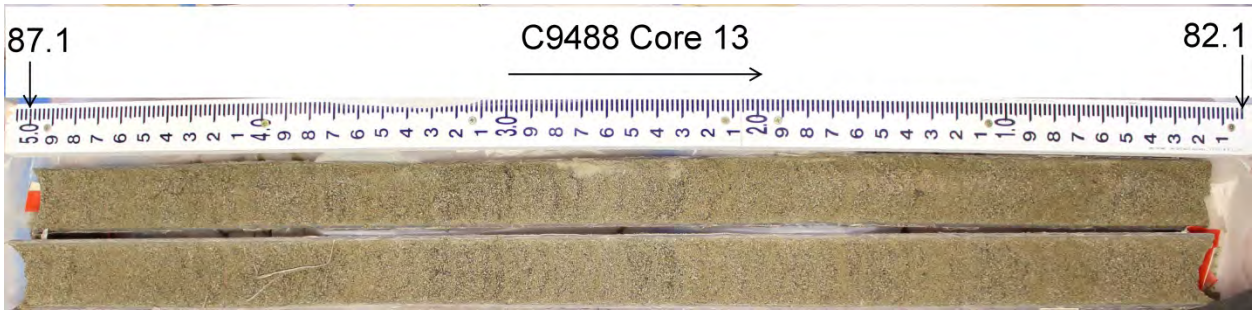
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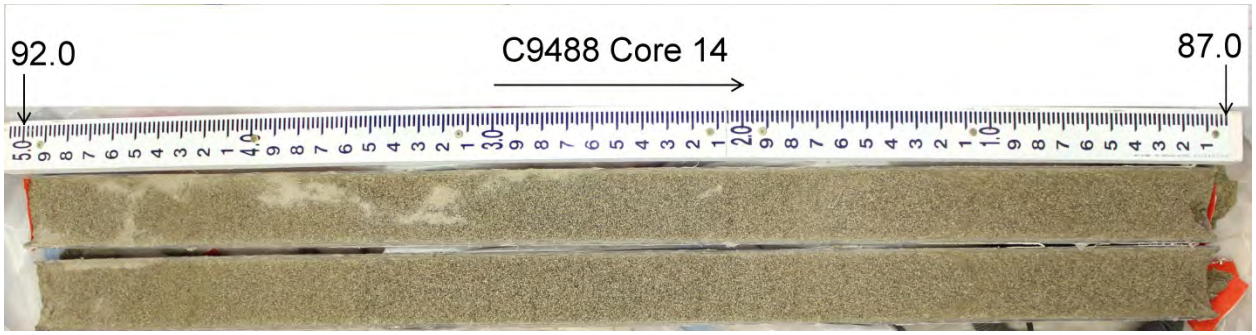
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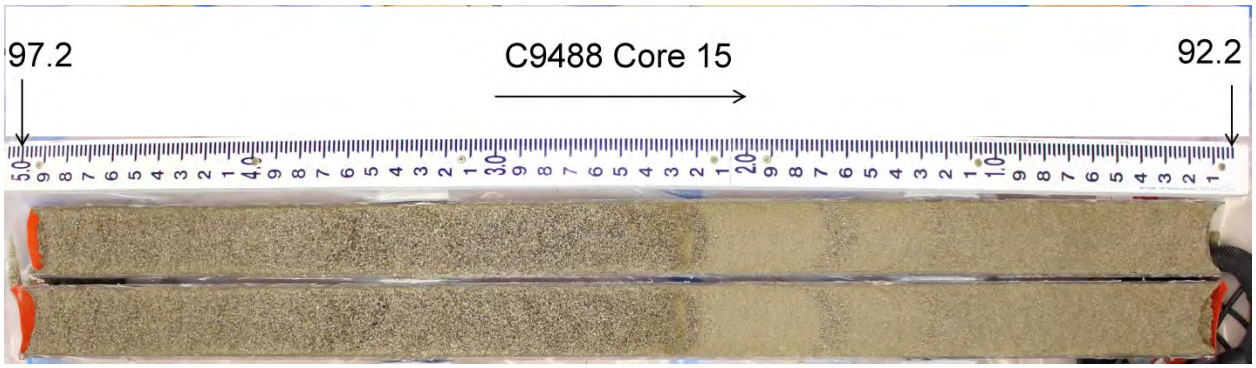
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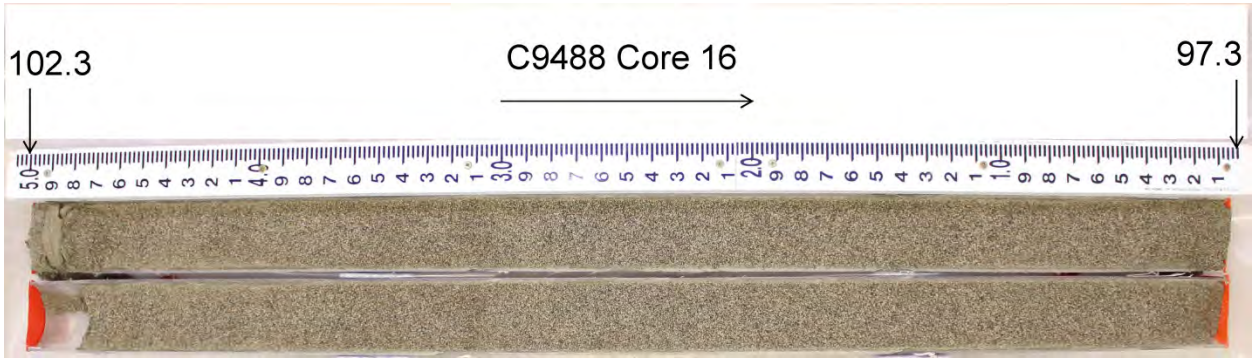
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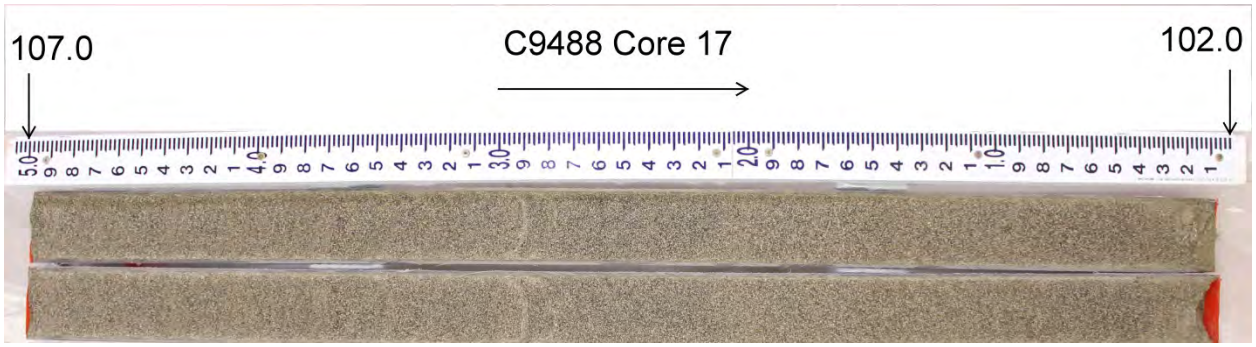
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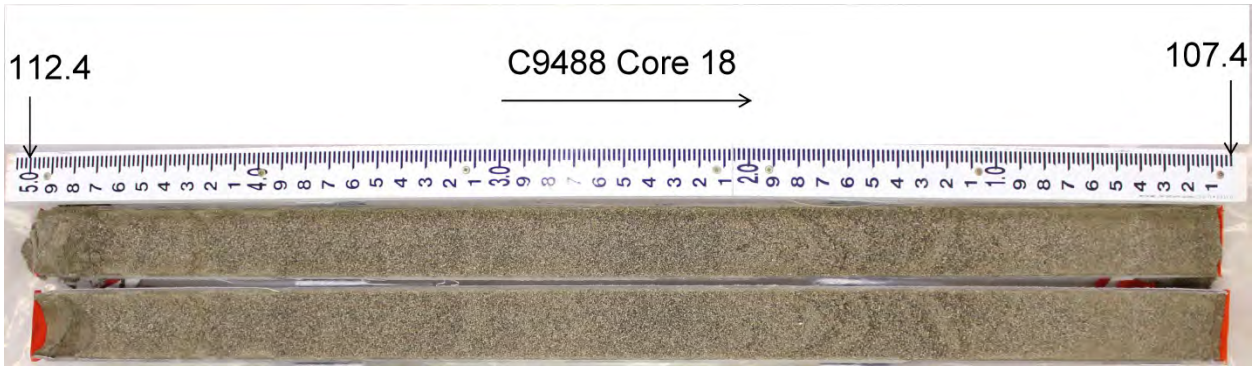
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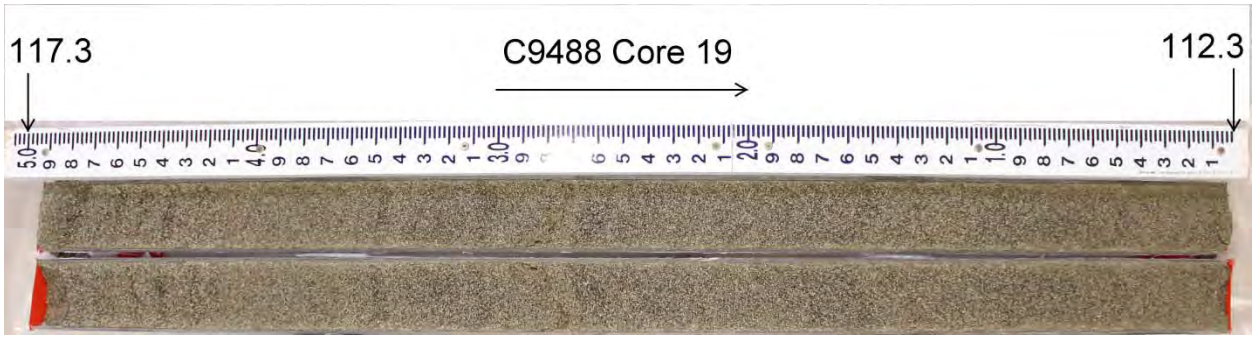
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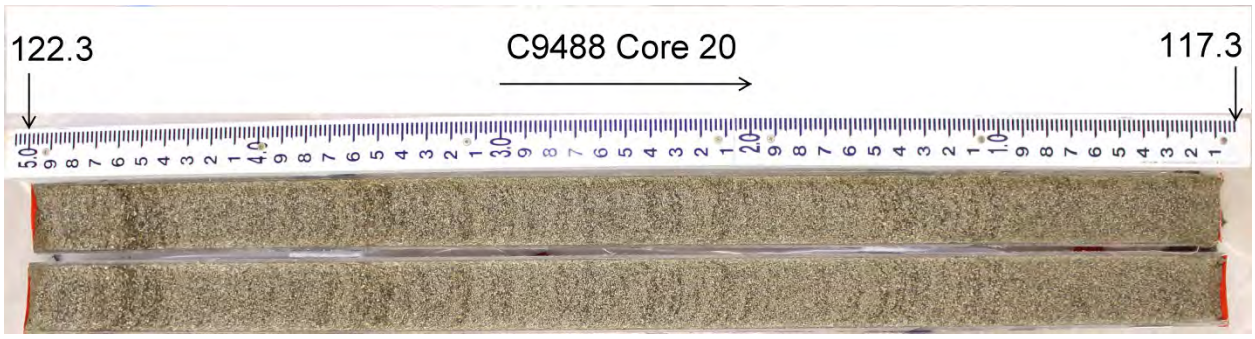
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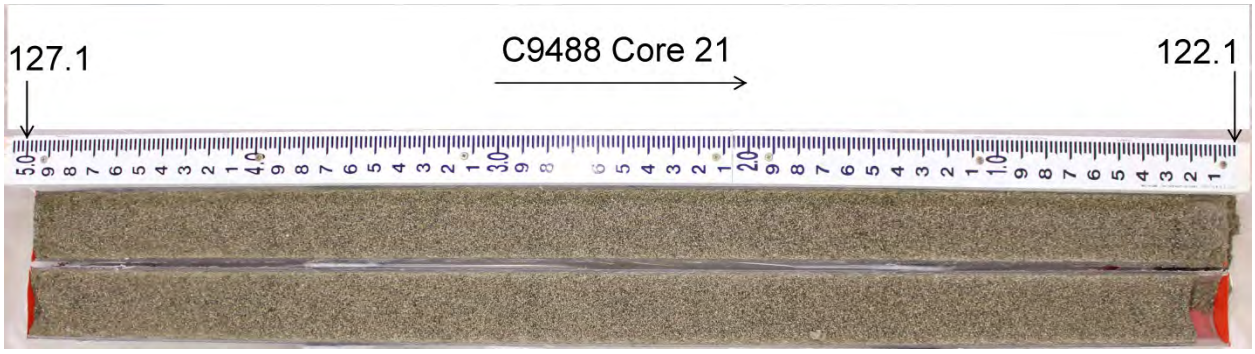
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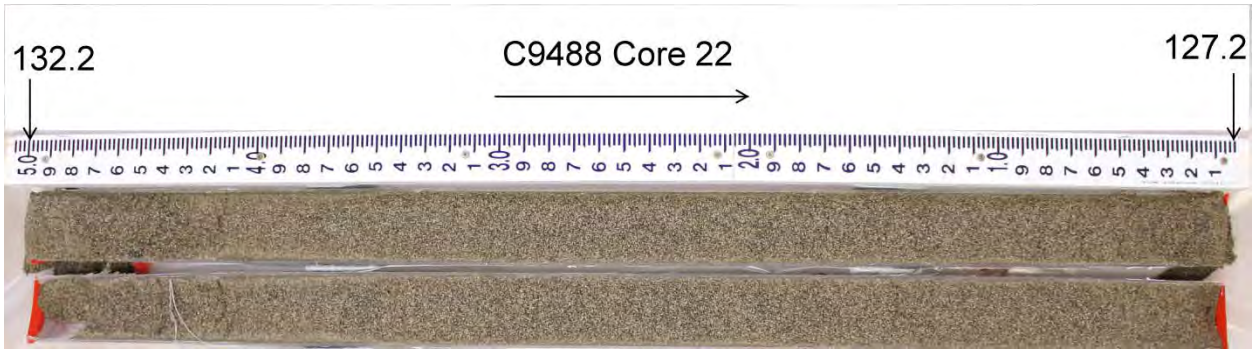
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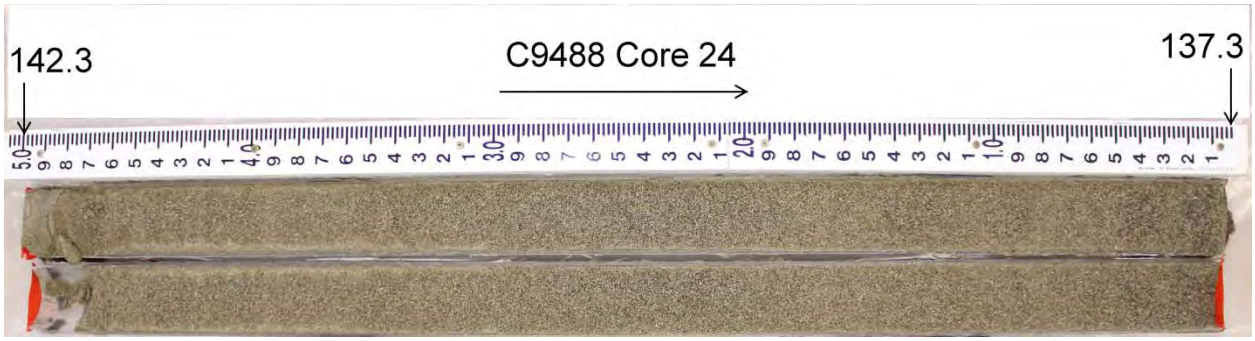
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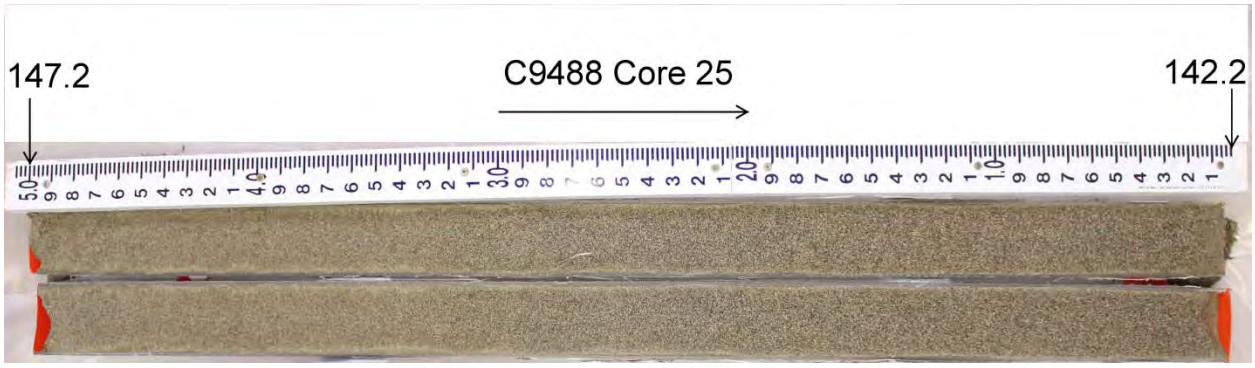
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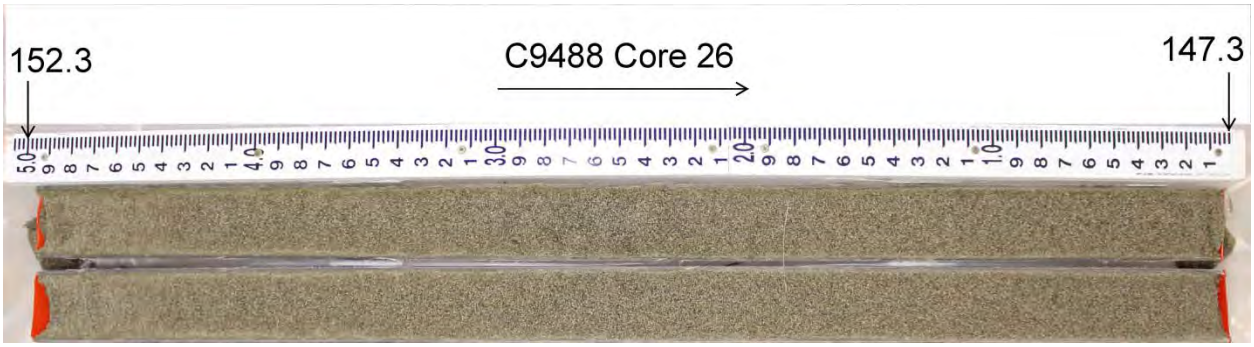
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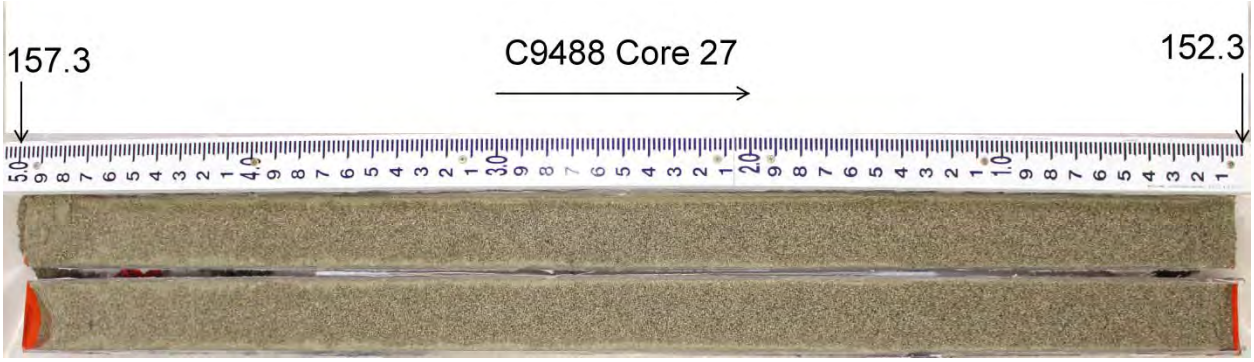
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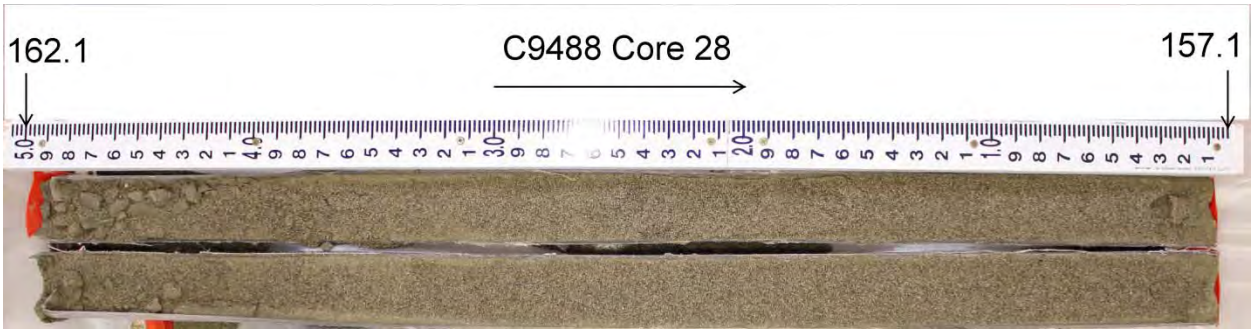
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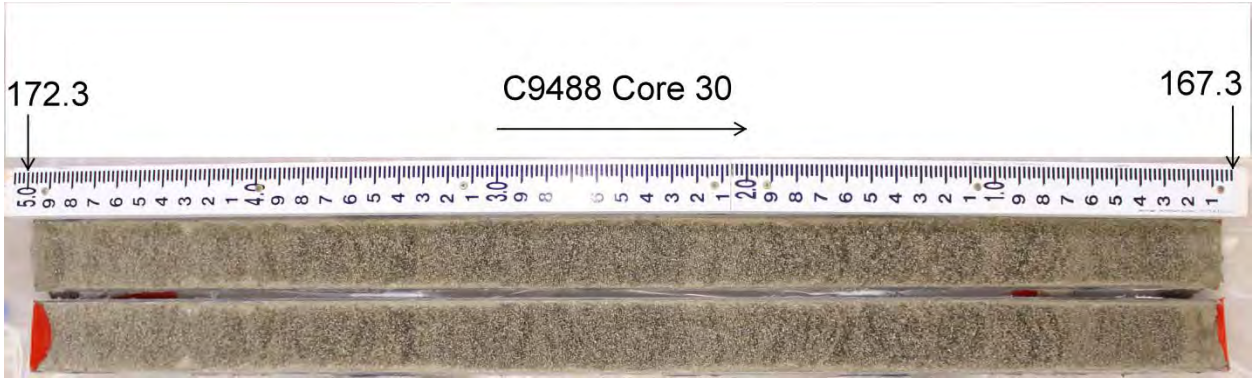
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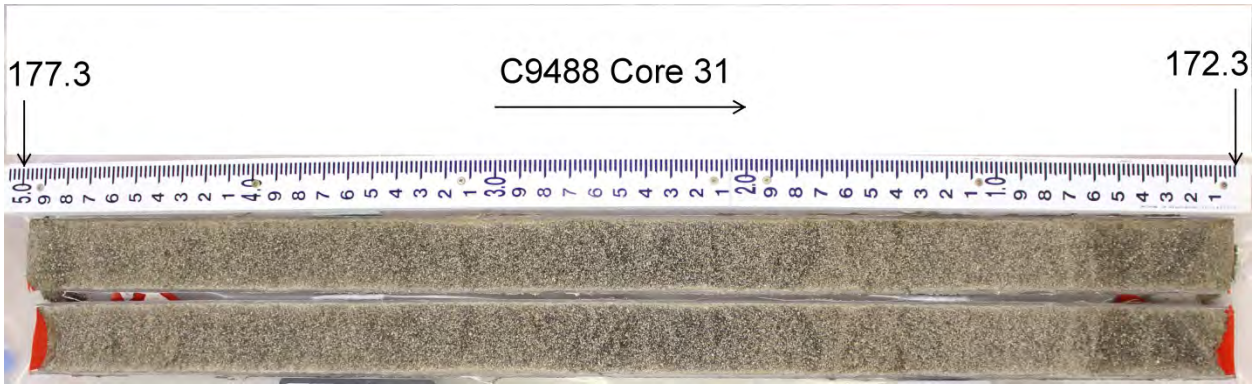
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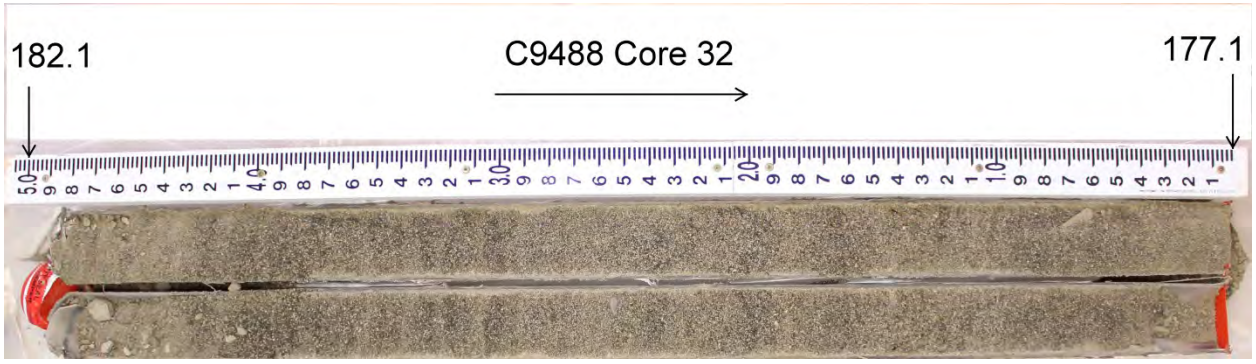
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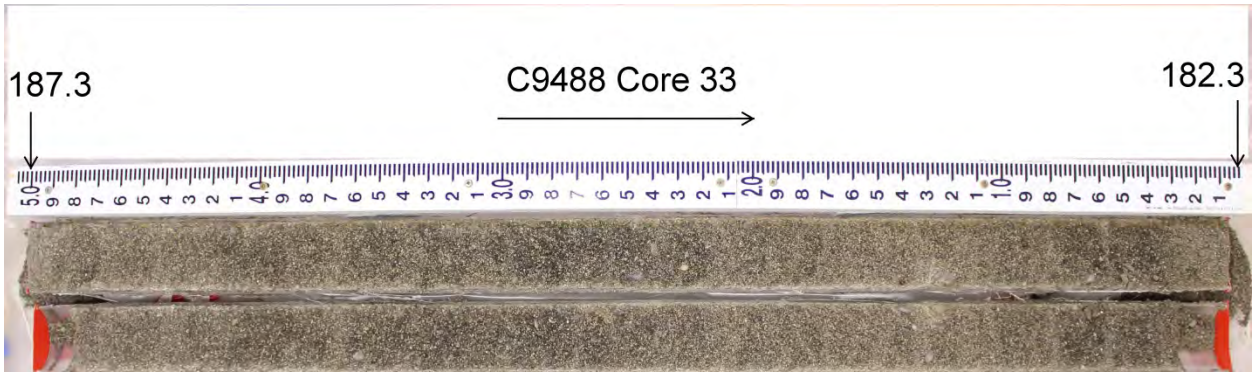
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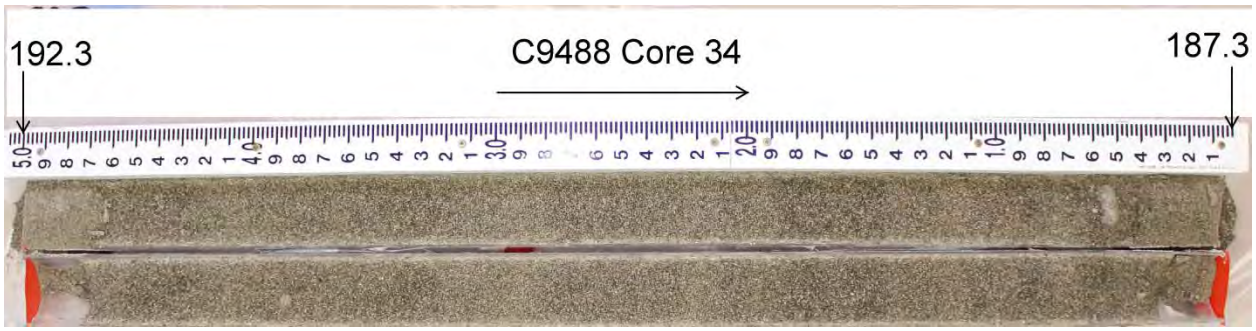
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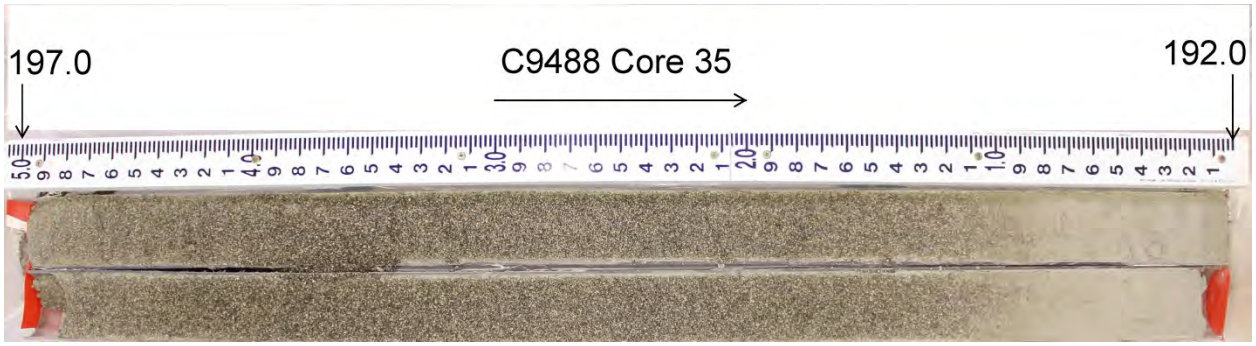
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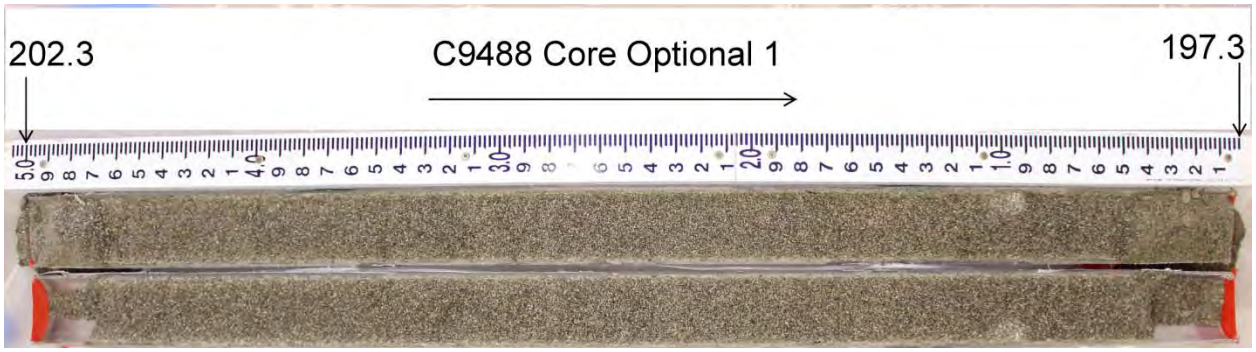
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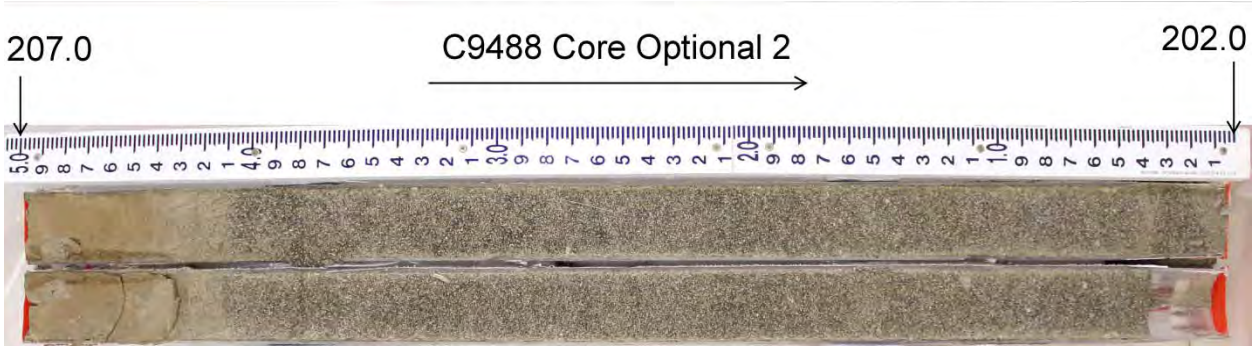
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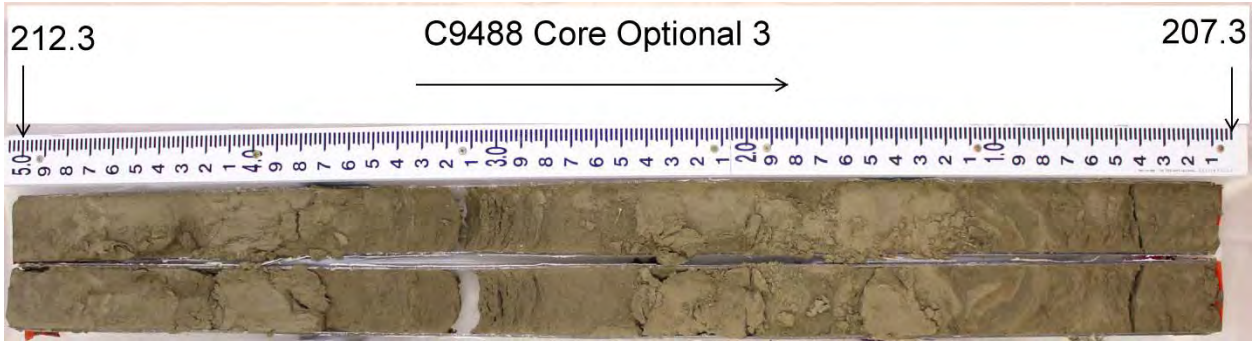
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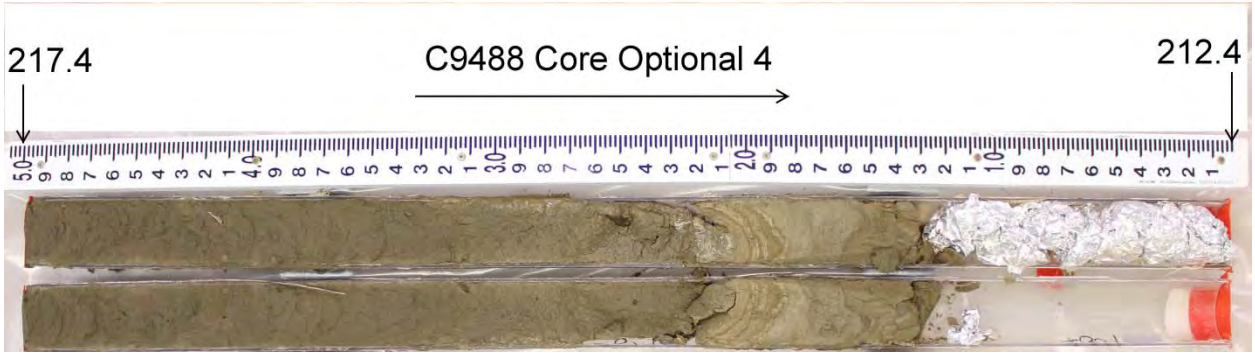
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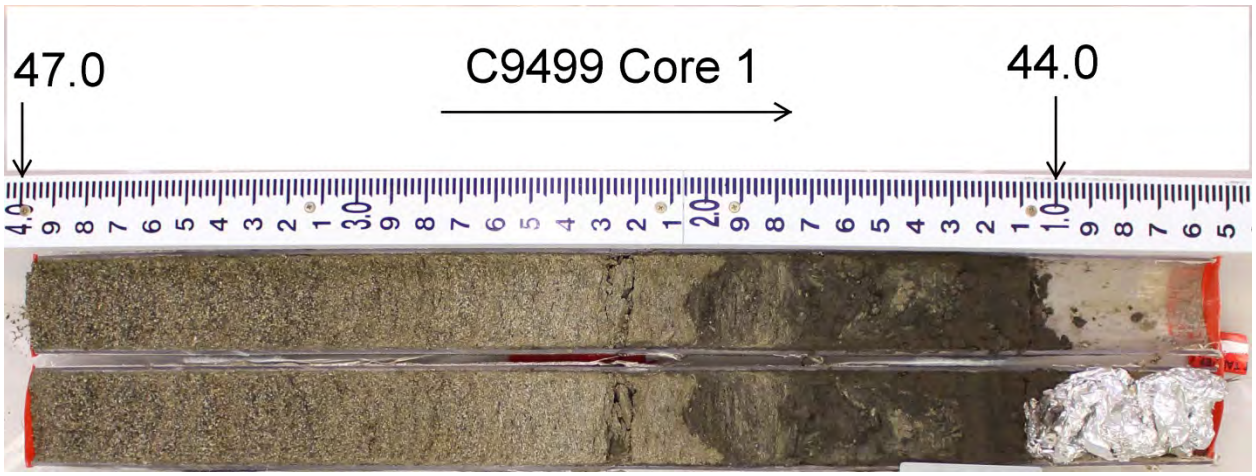
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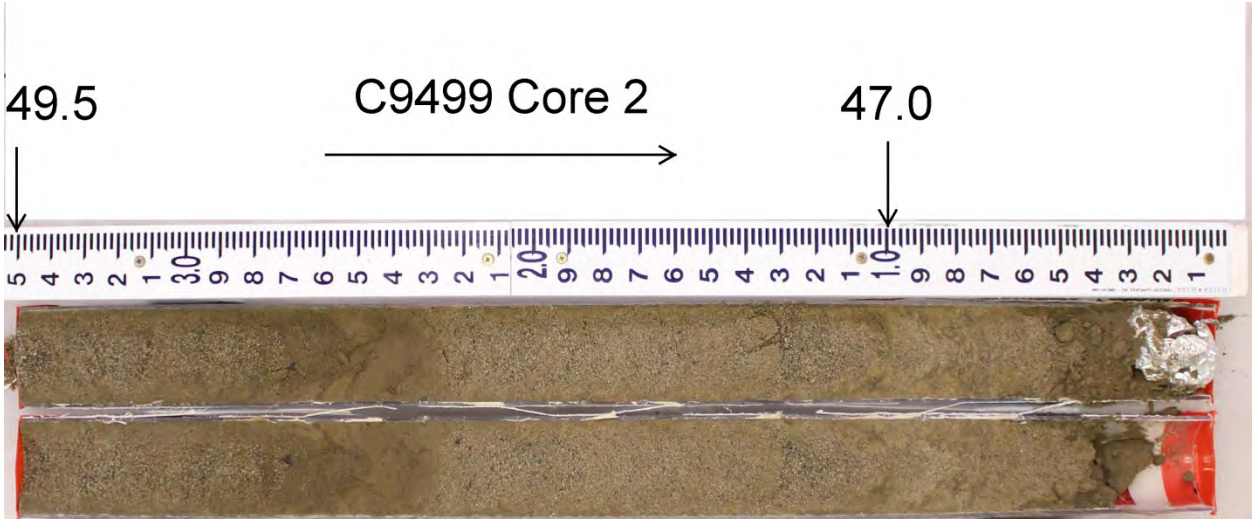
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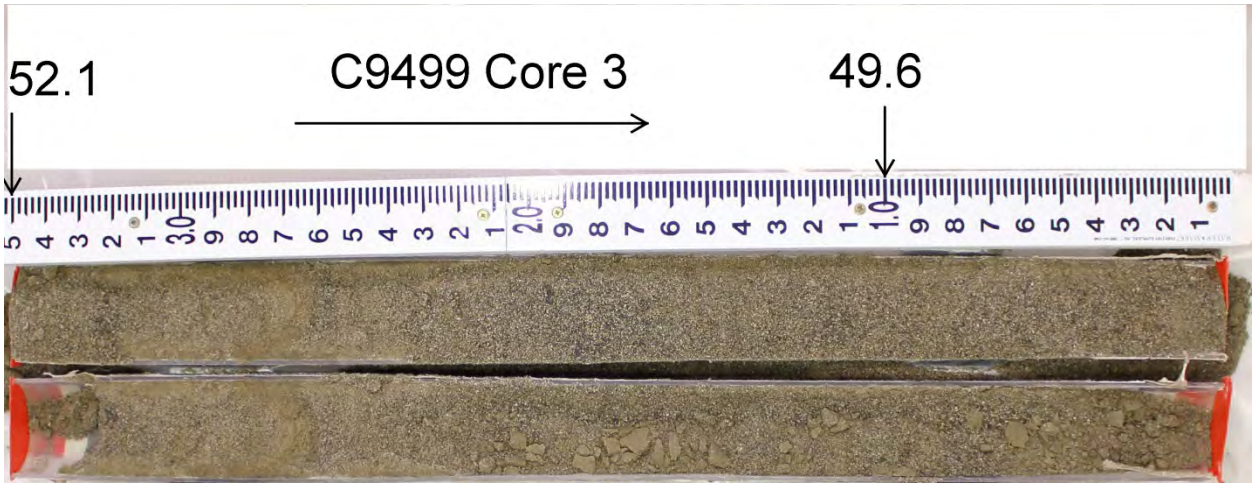
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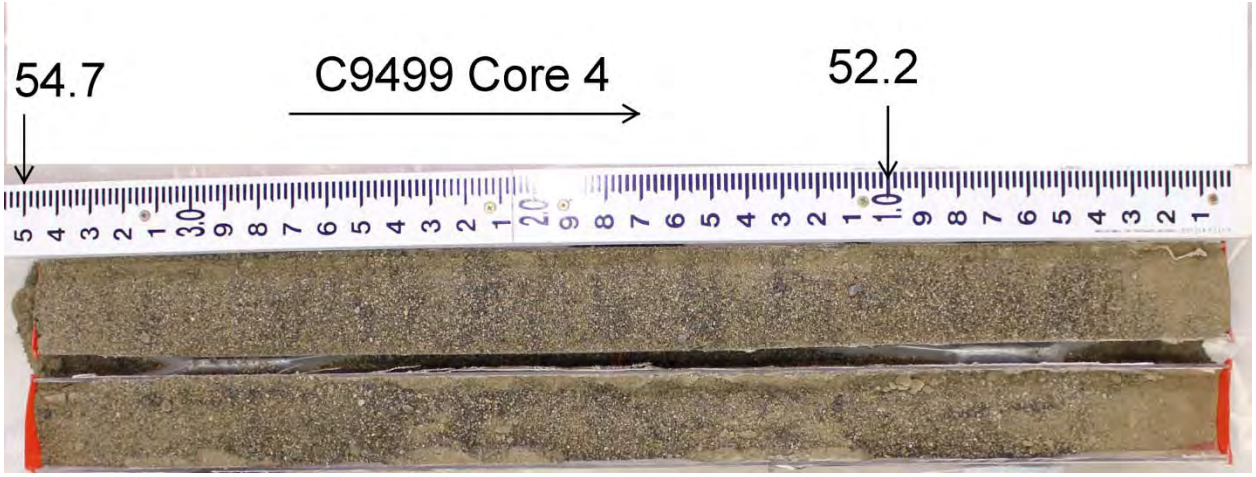
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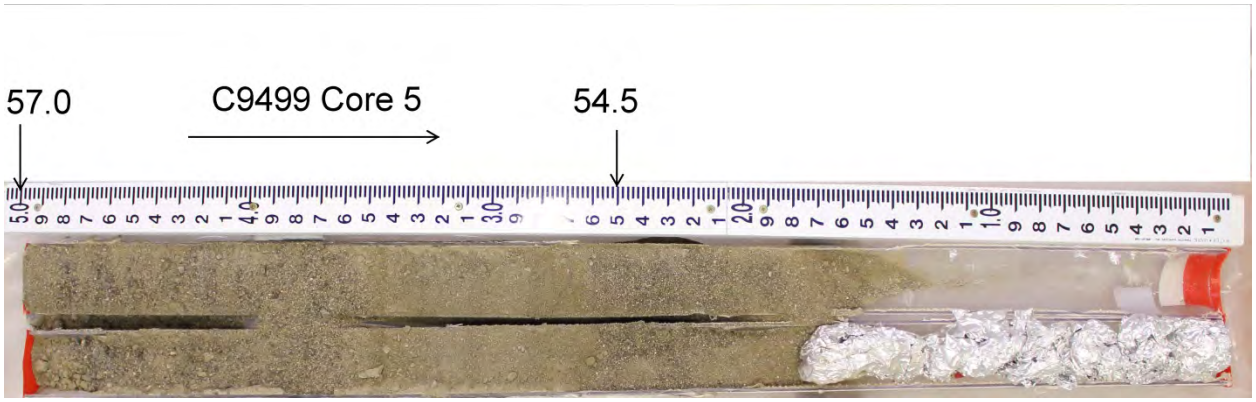
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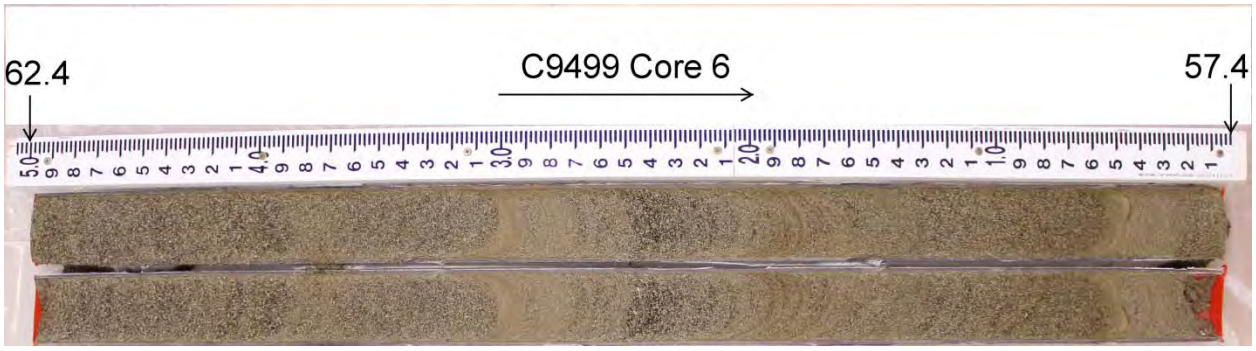
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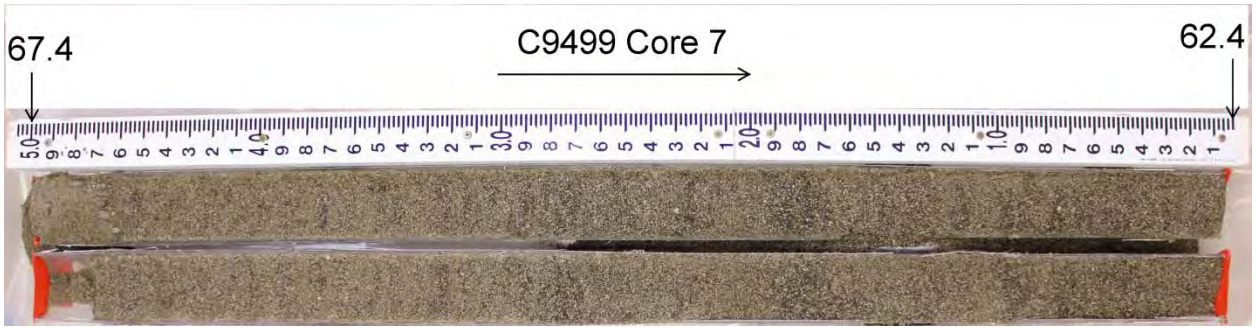
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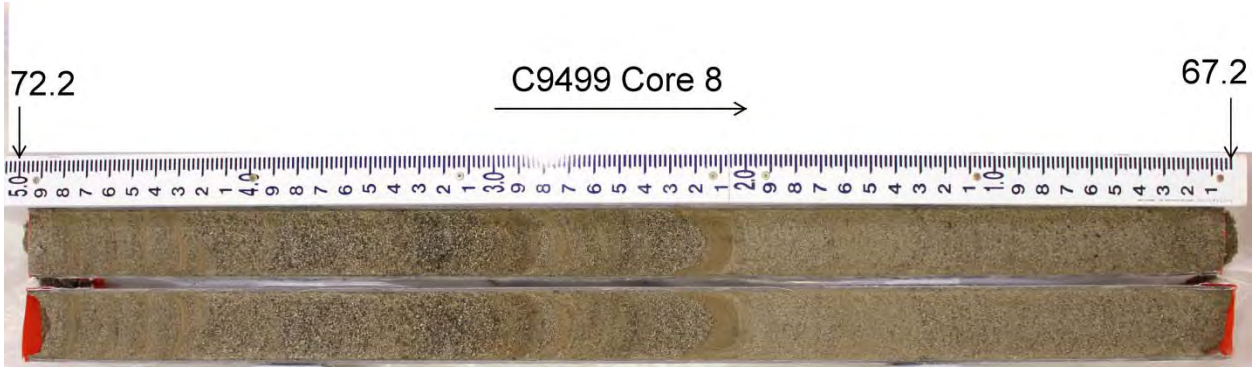
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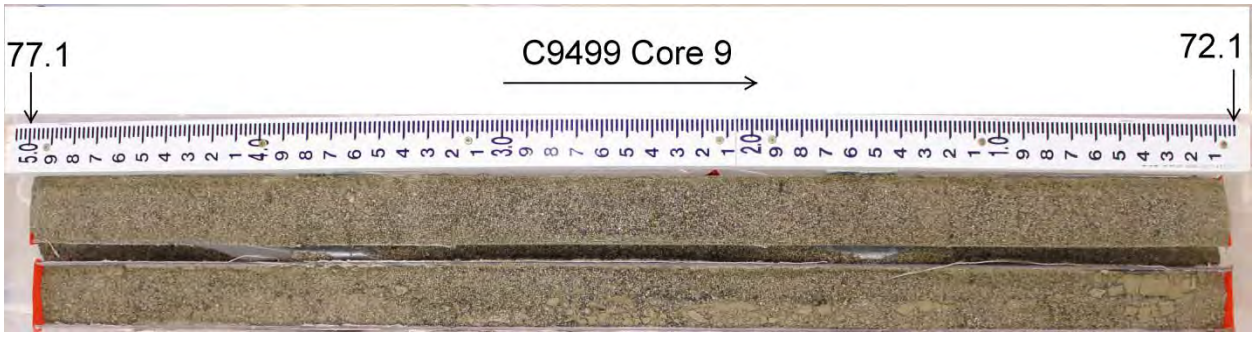
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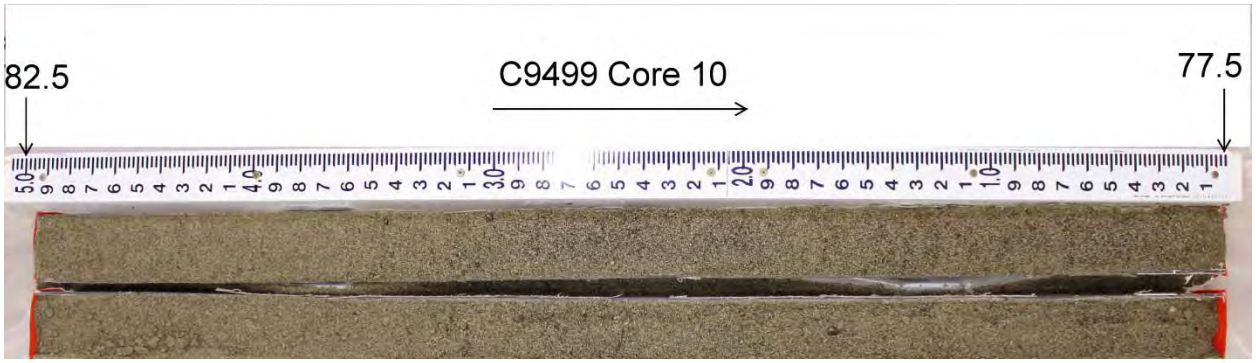
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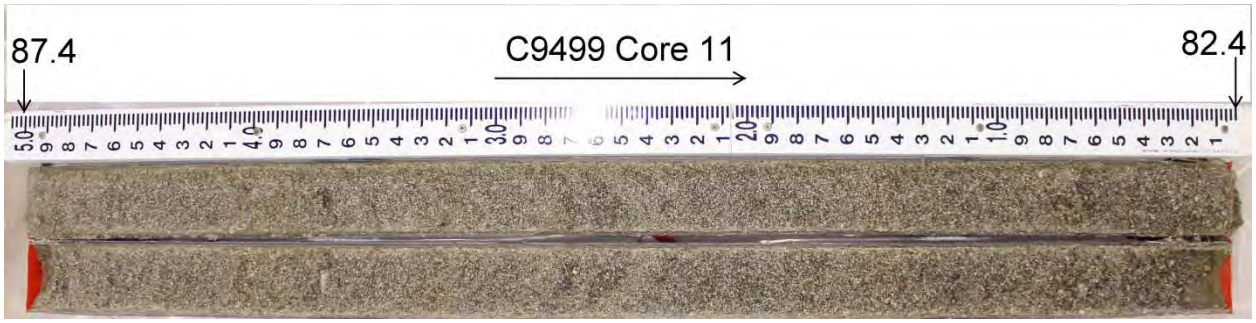
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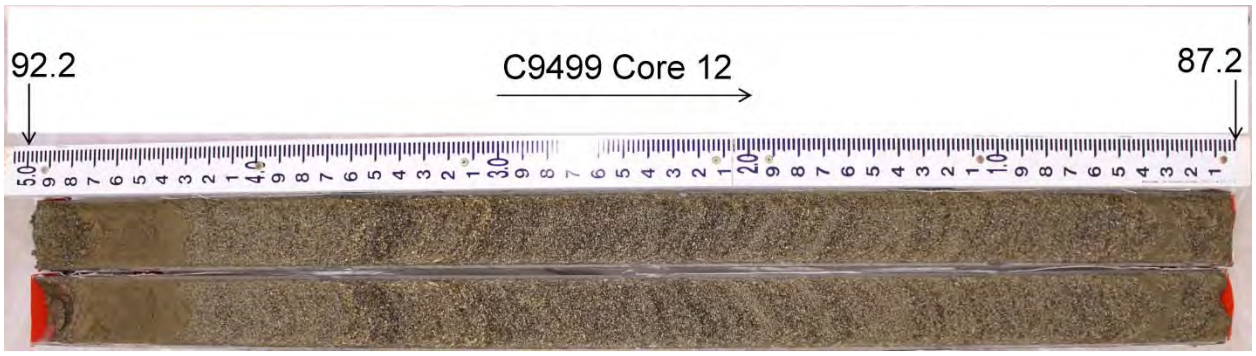
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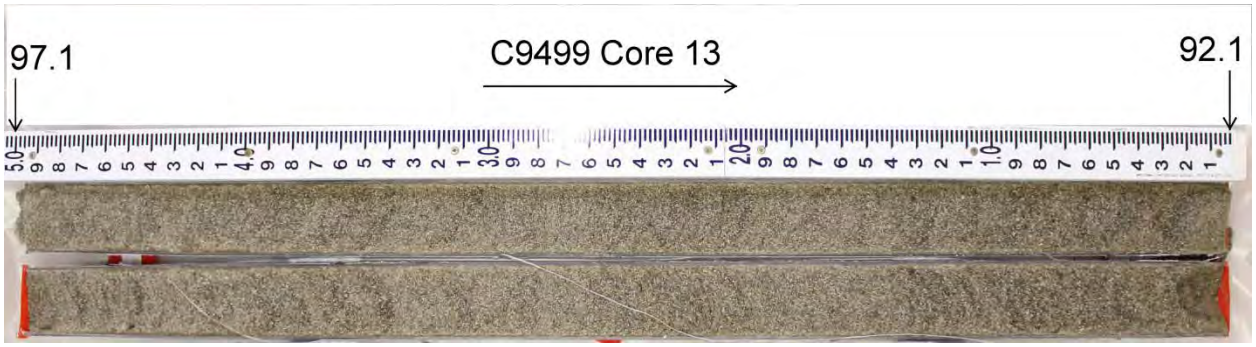
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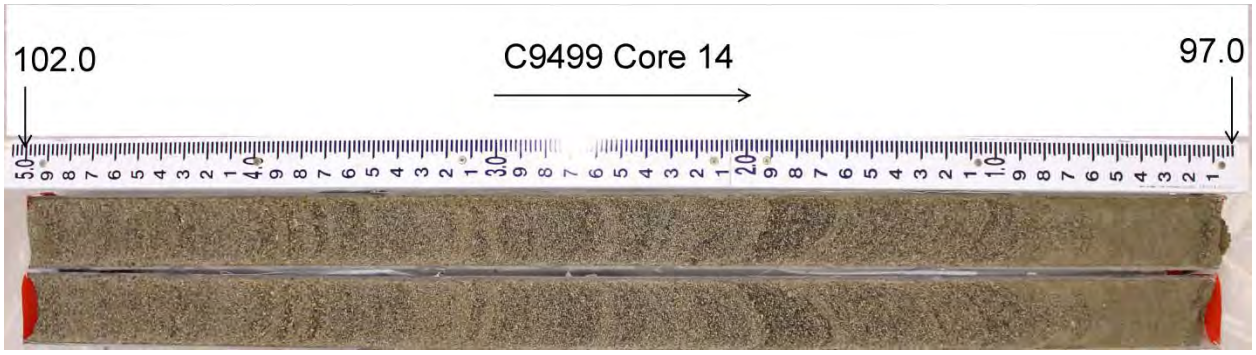
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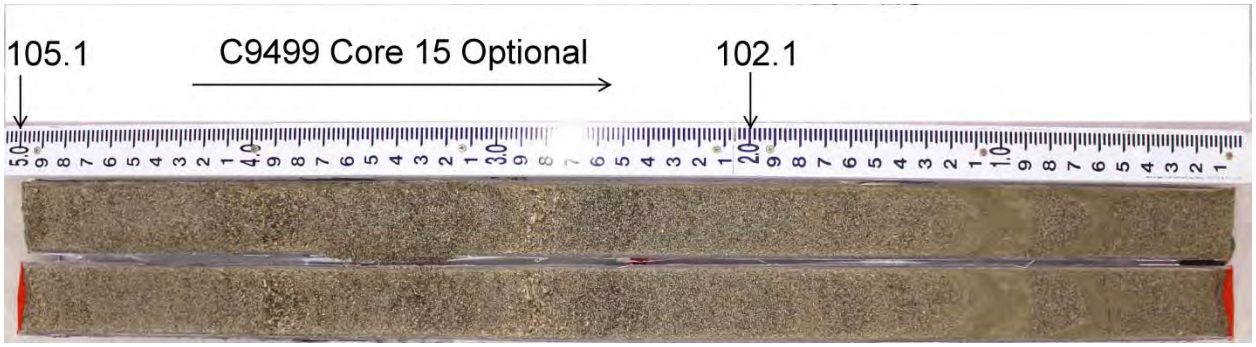
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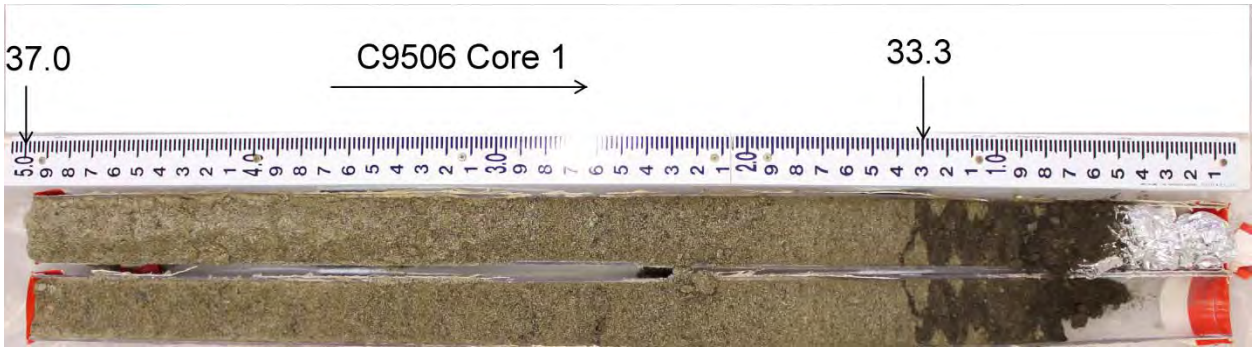
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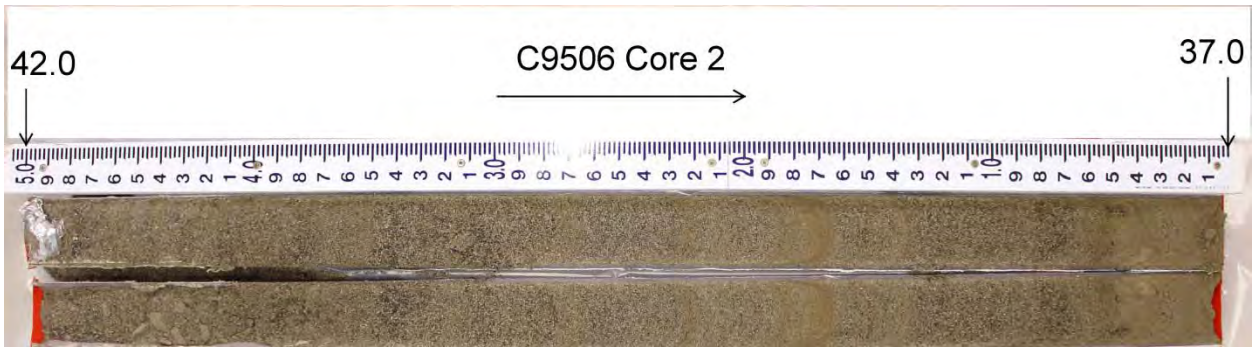
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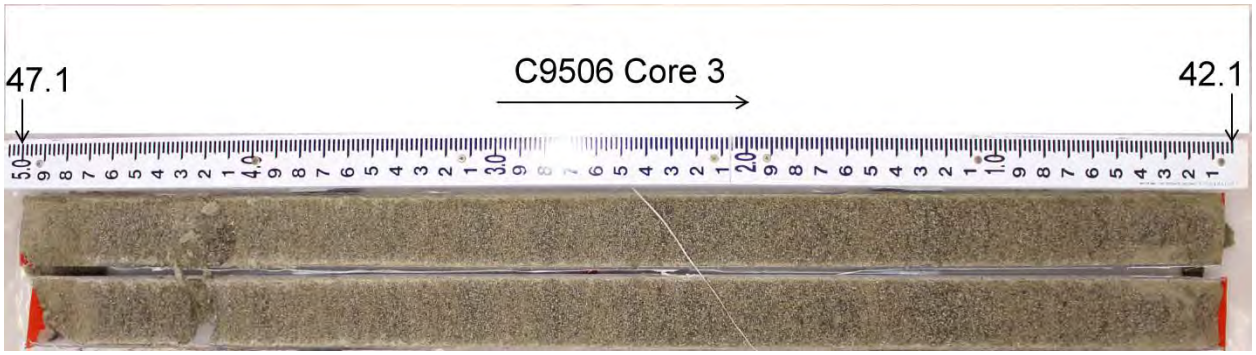
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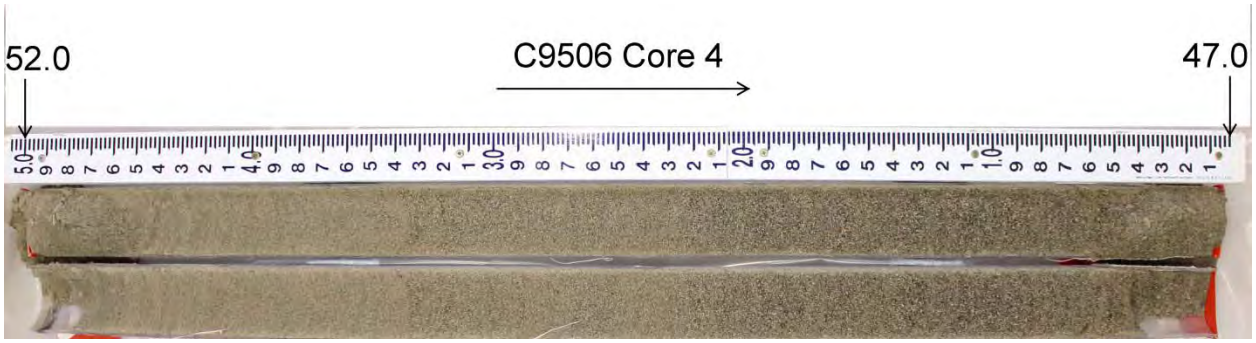
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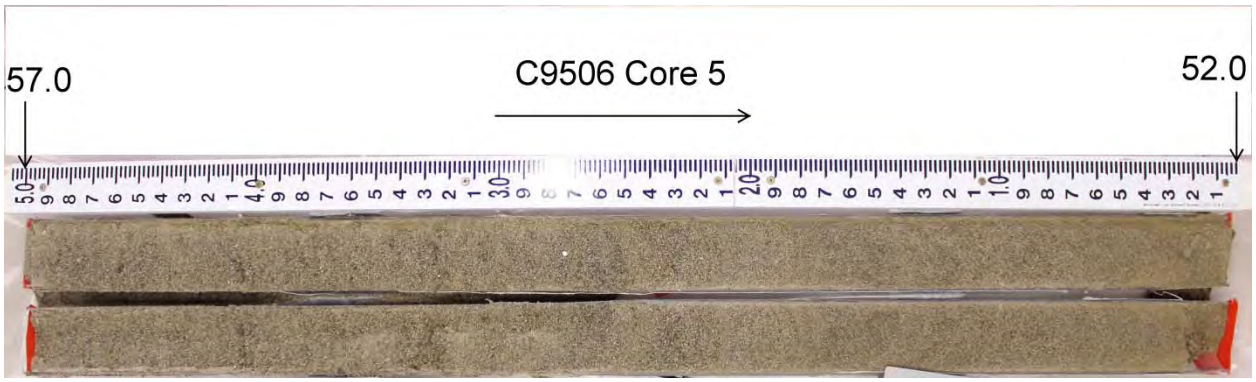
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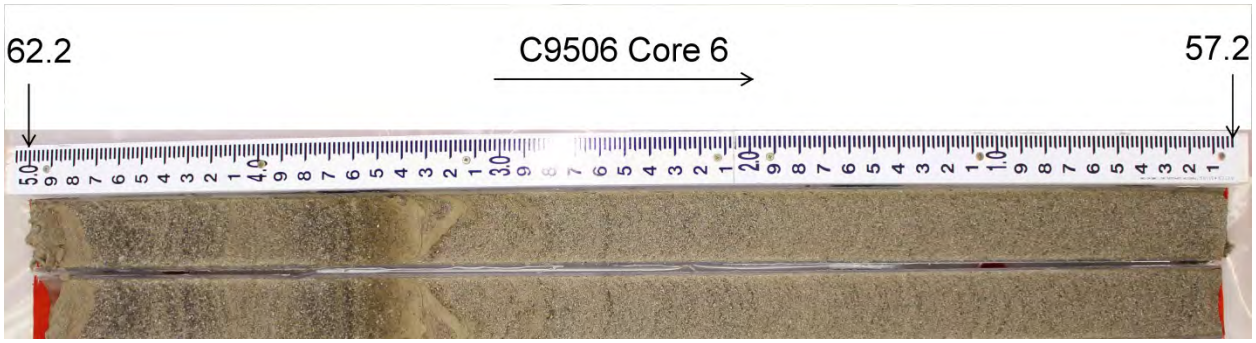
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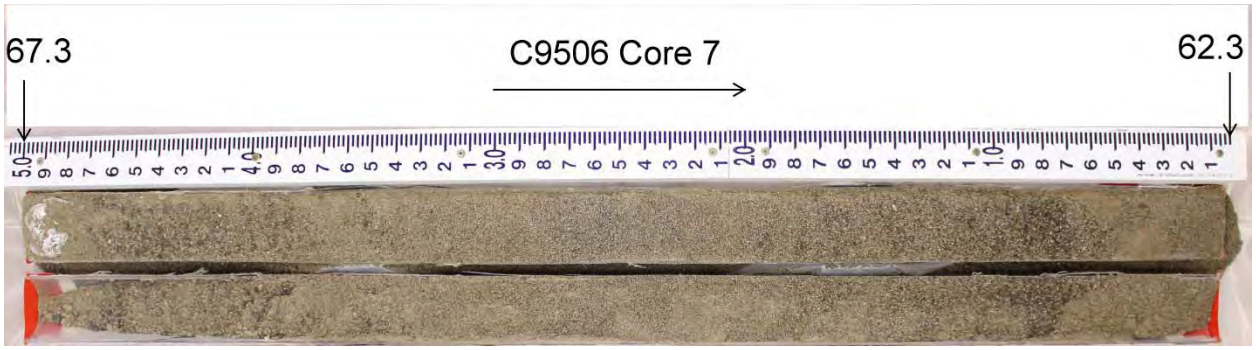
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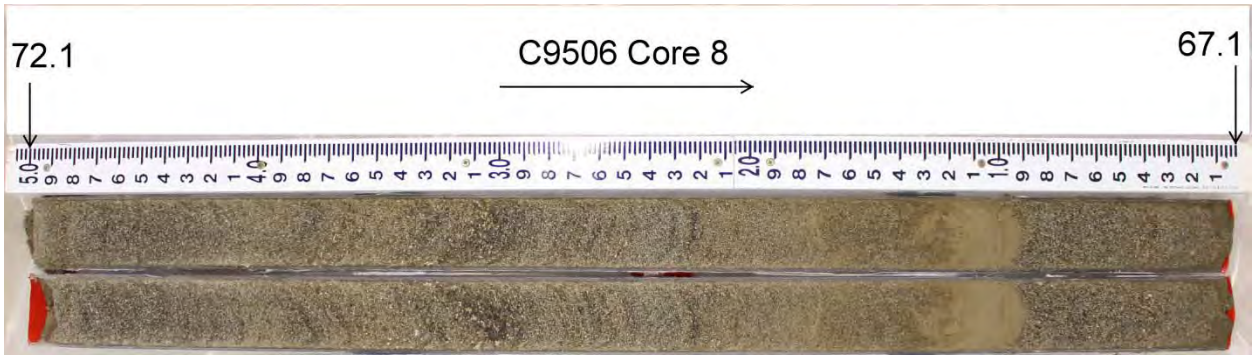
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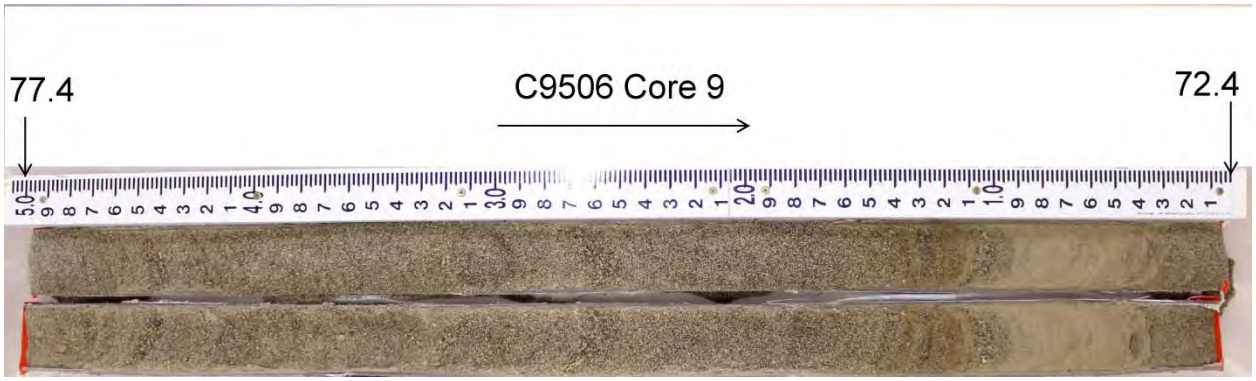
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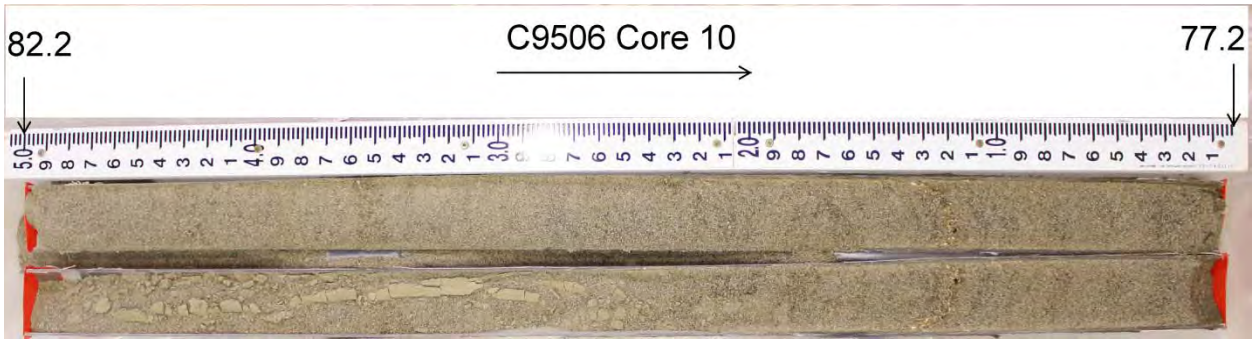
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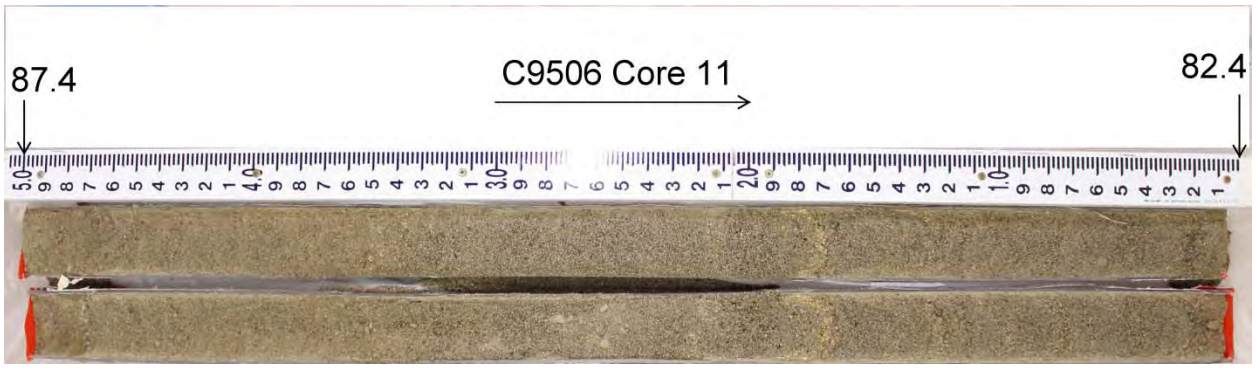
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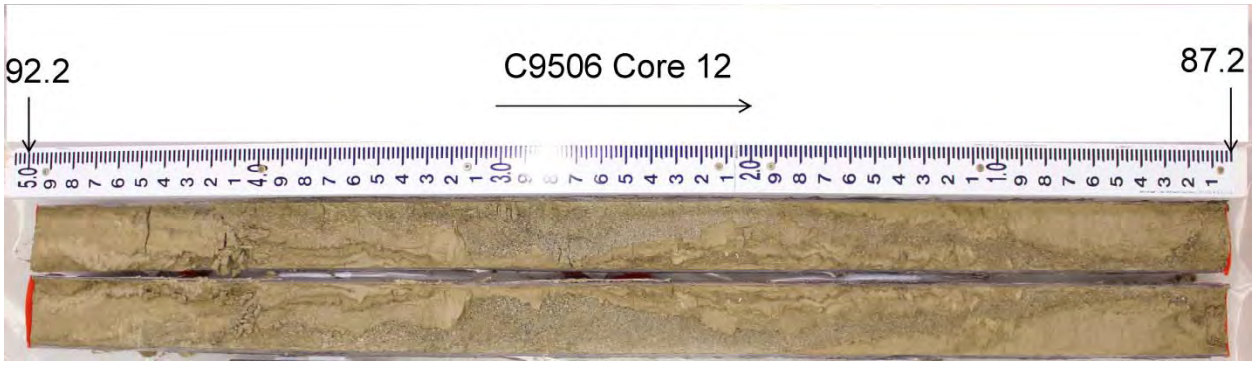
92.2
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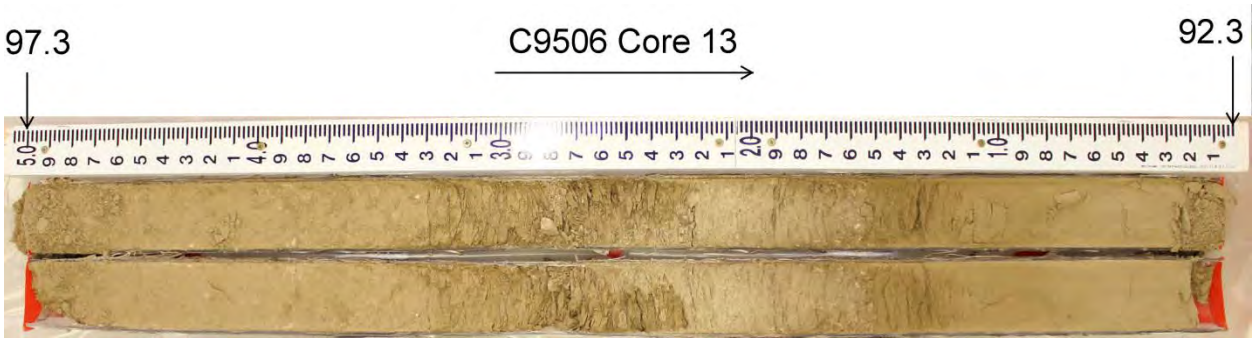
87.2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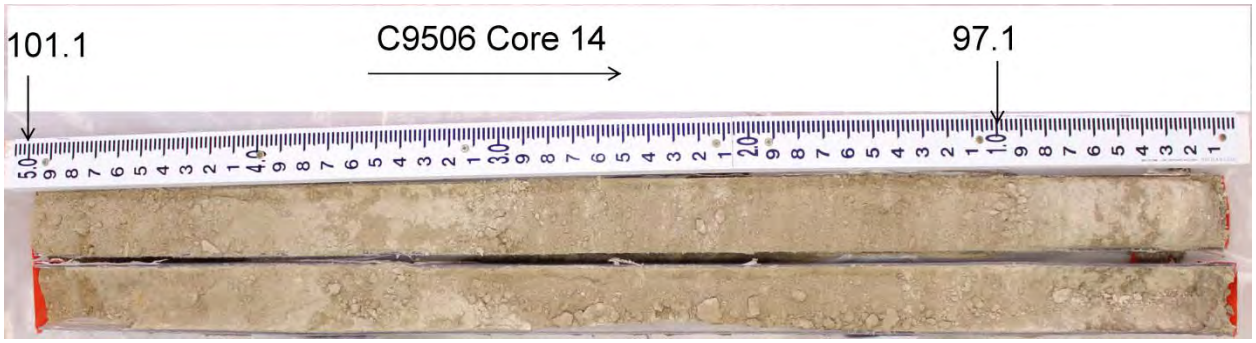
92.3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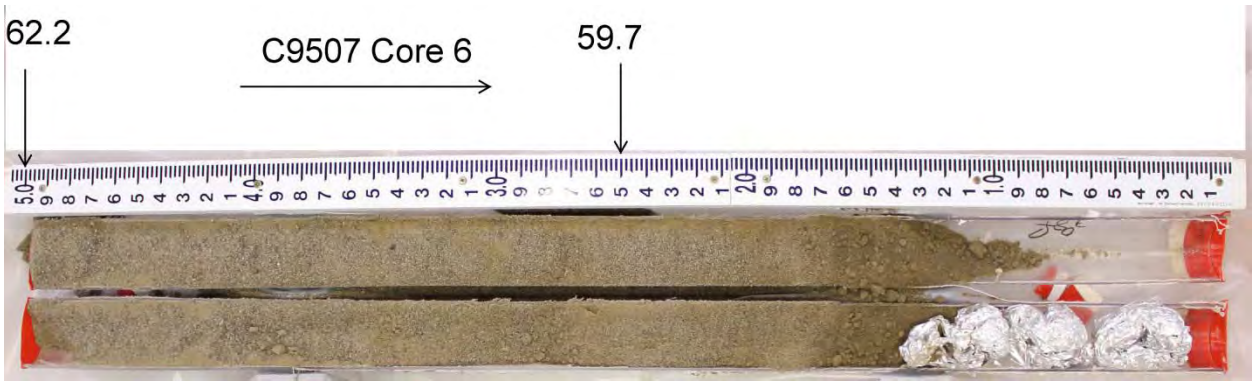
97.1

59.8
C9507 Core 5
57.3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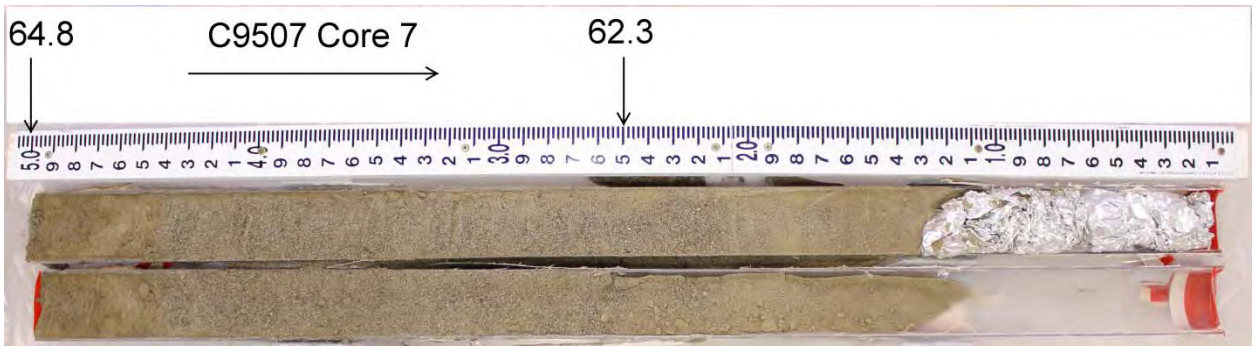
64.8
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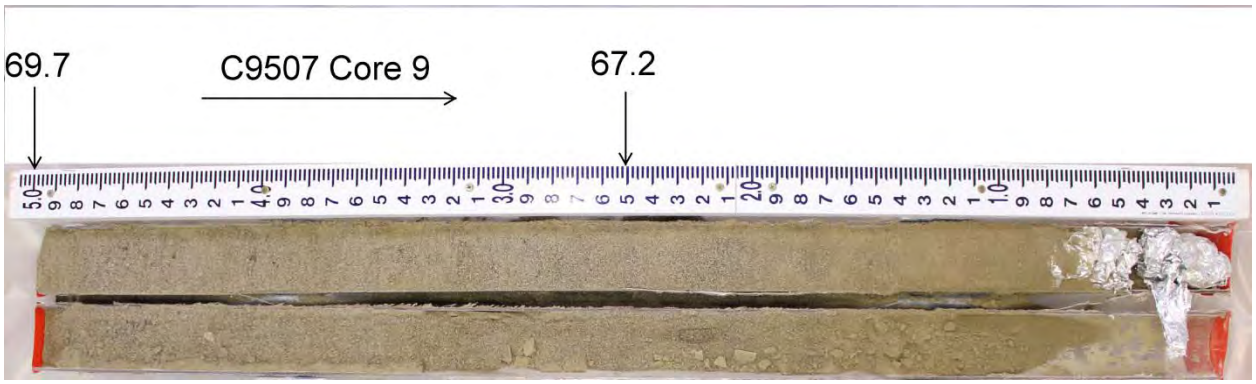
62.3

67.0
C9507 Core 8
64.5


69.7
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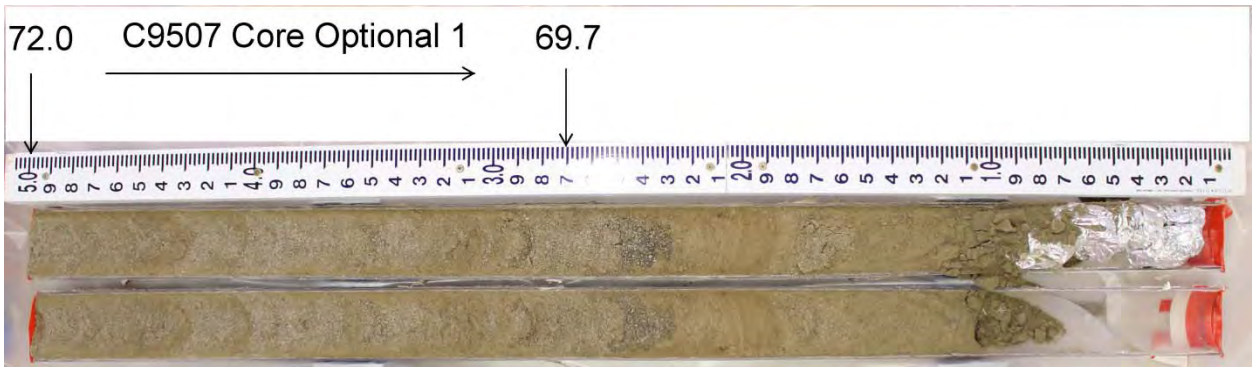
67.2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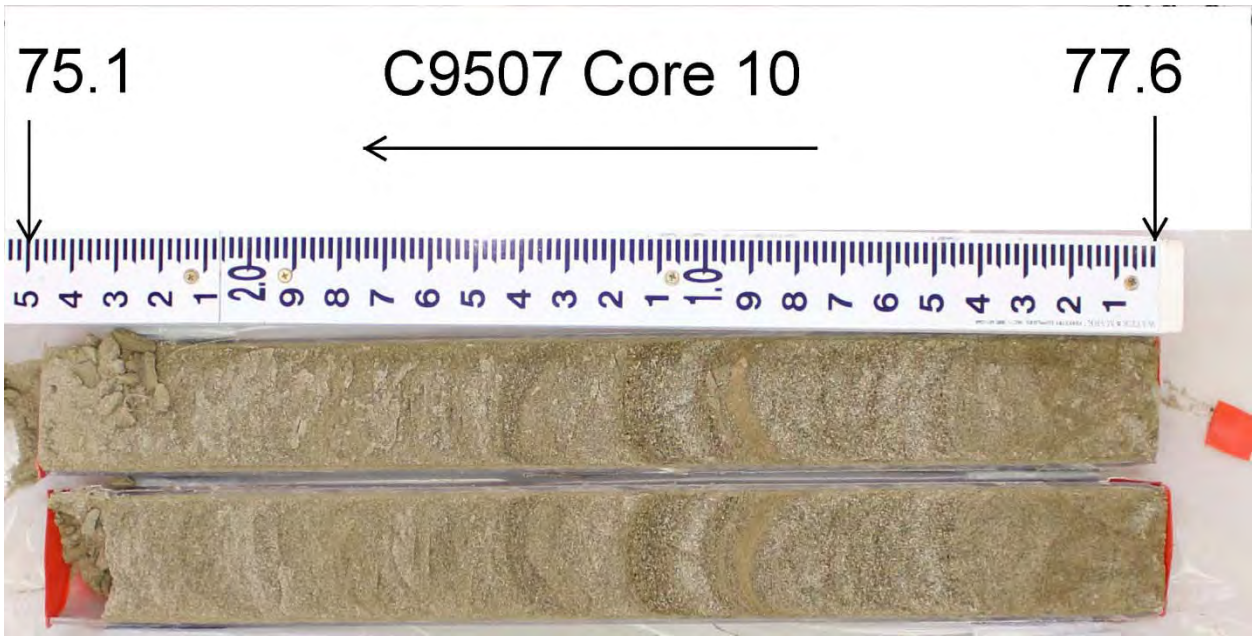
69.7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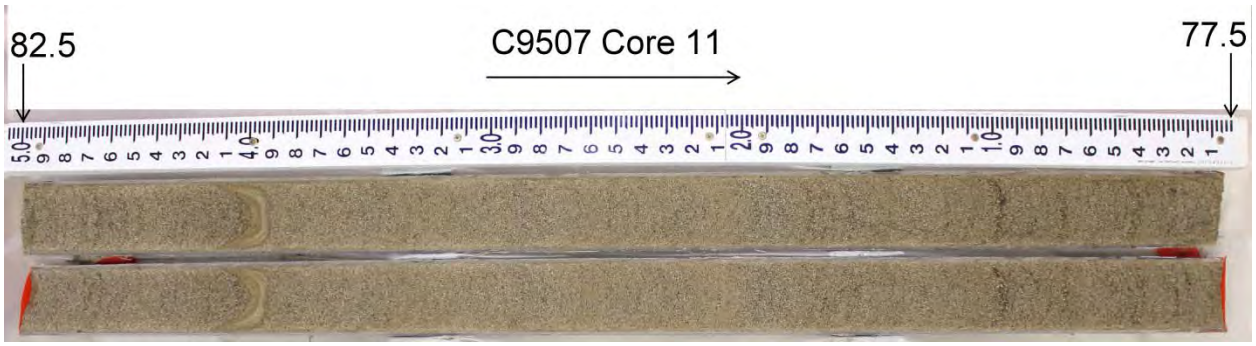
82.5
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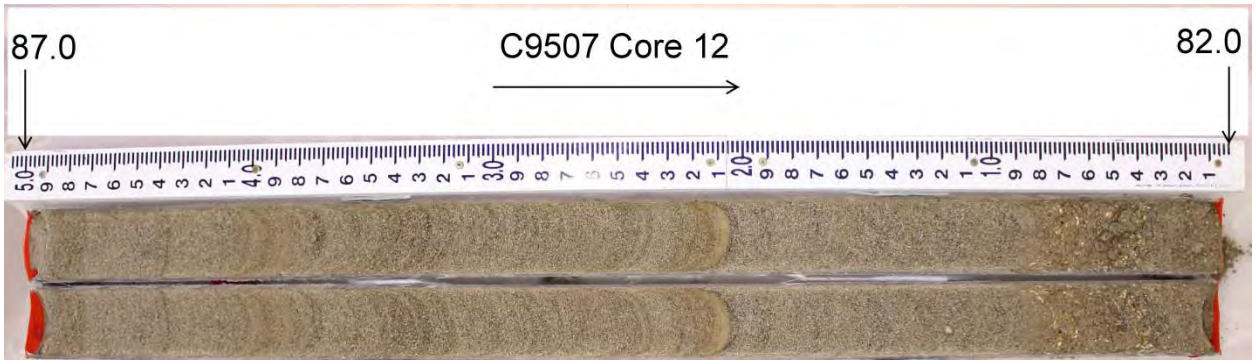
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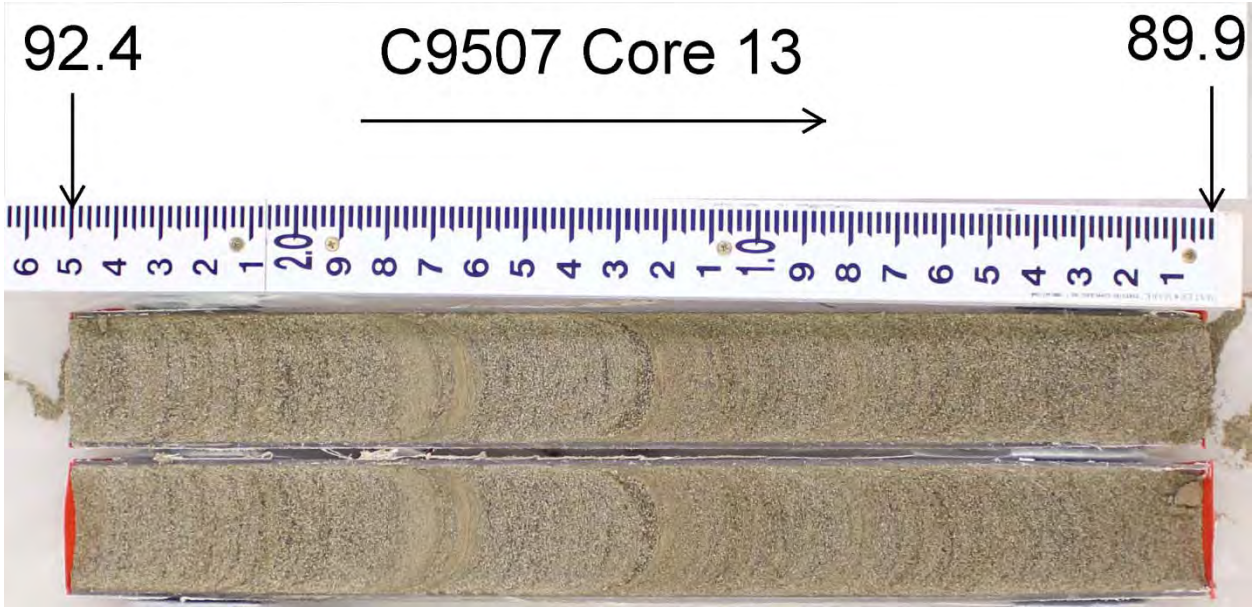
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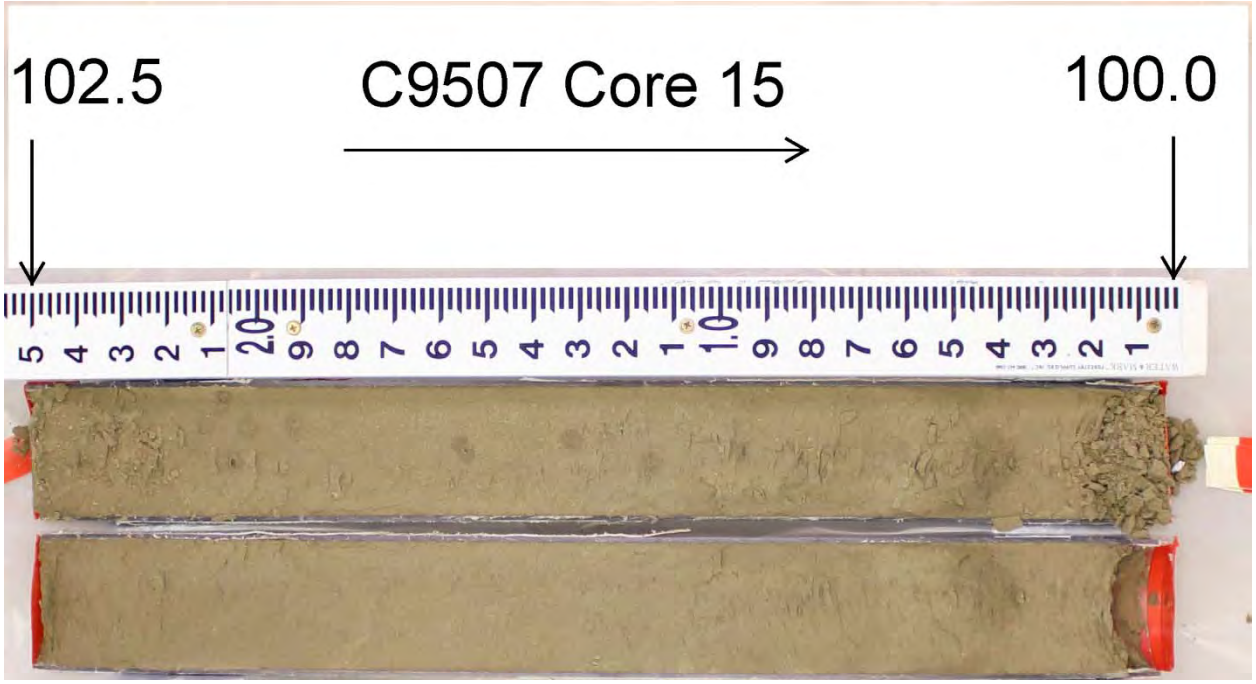
89.9


102.5
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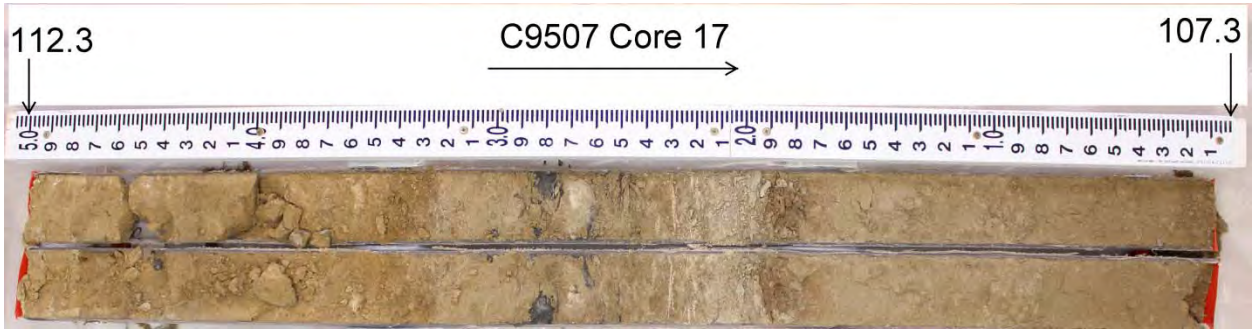
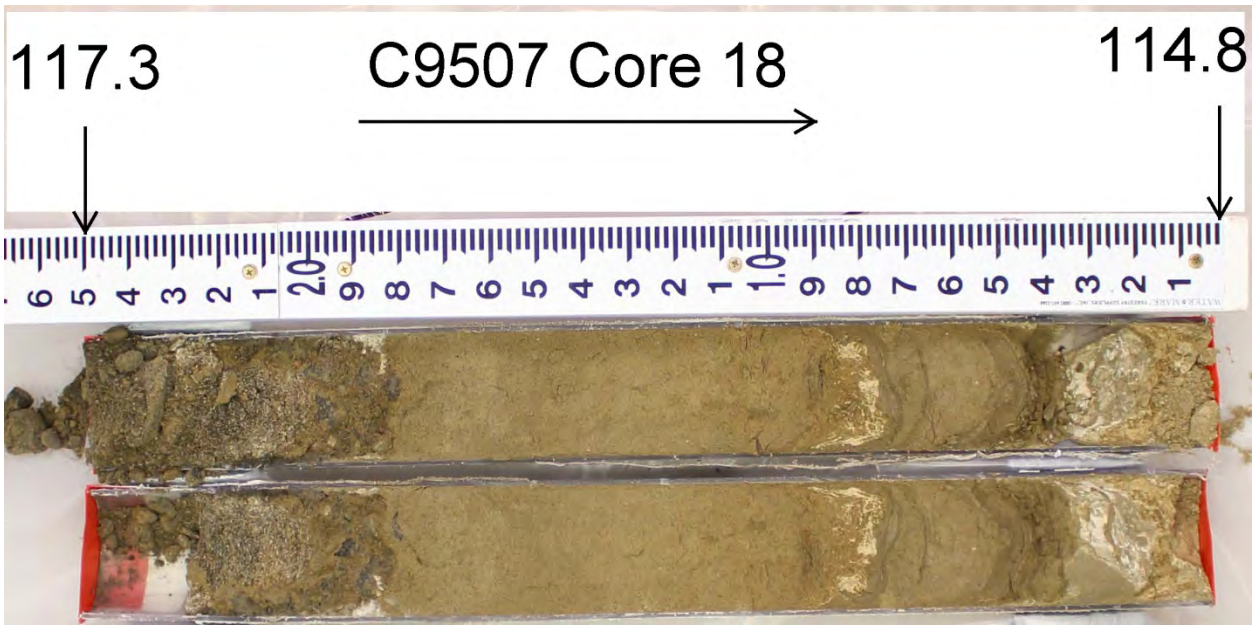

112.3
C9507 Core 17
107.3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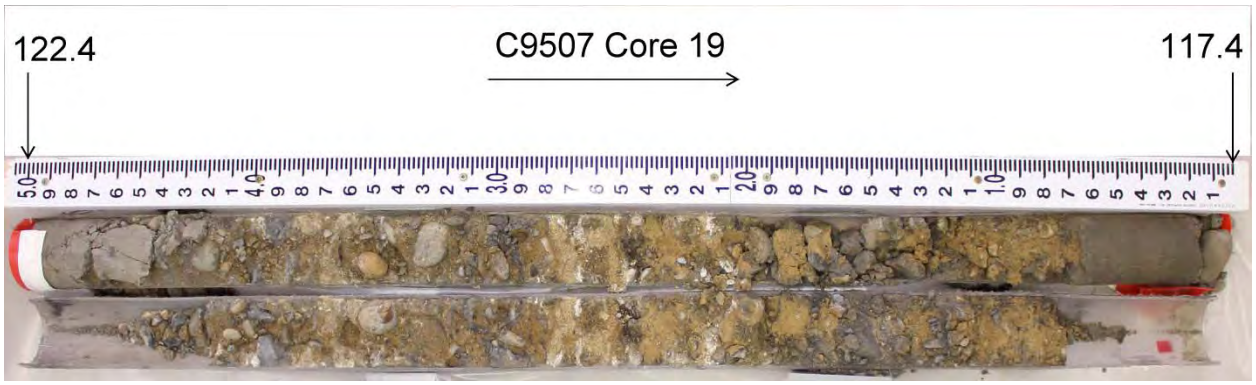
114.8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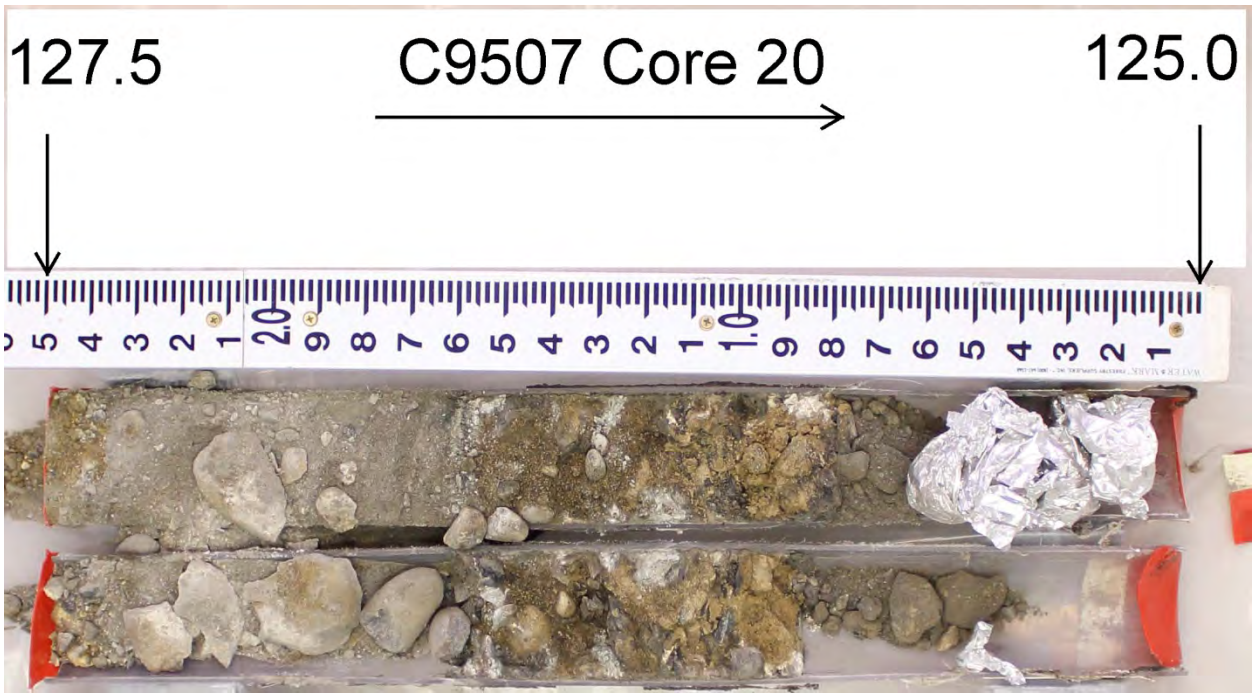
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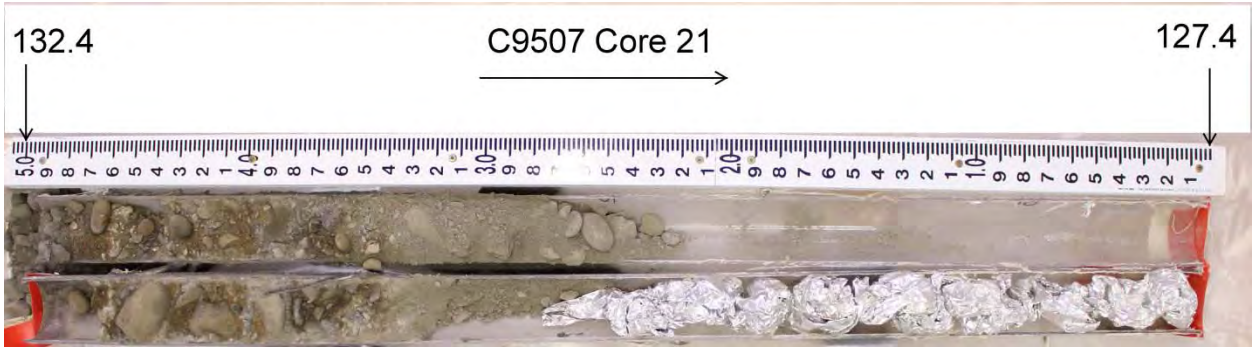
125.0


132.4
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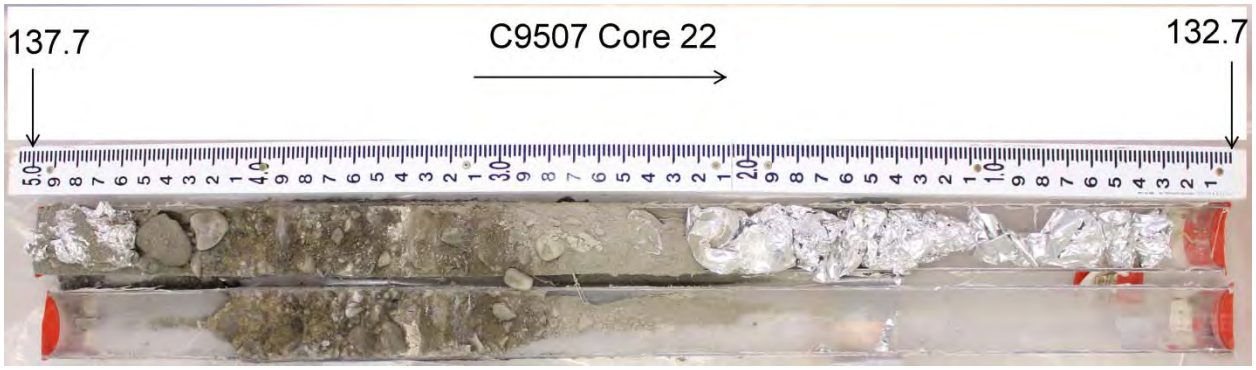
127.4


137.7
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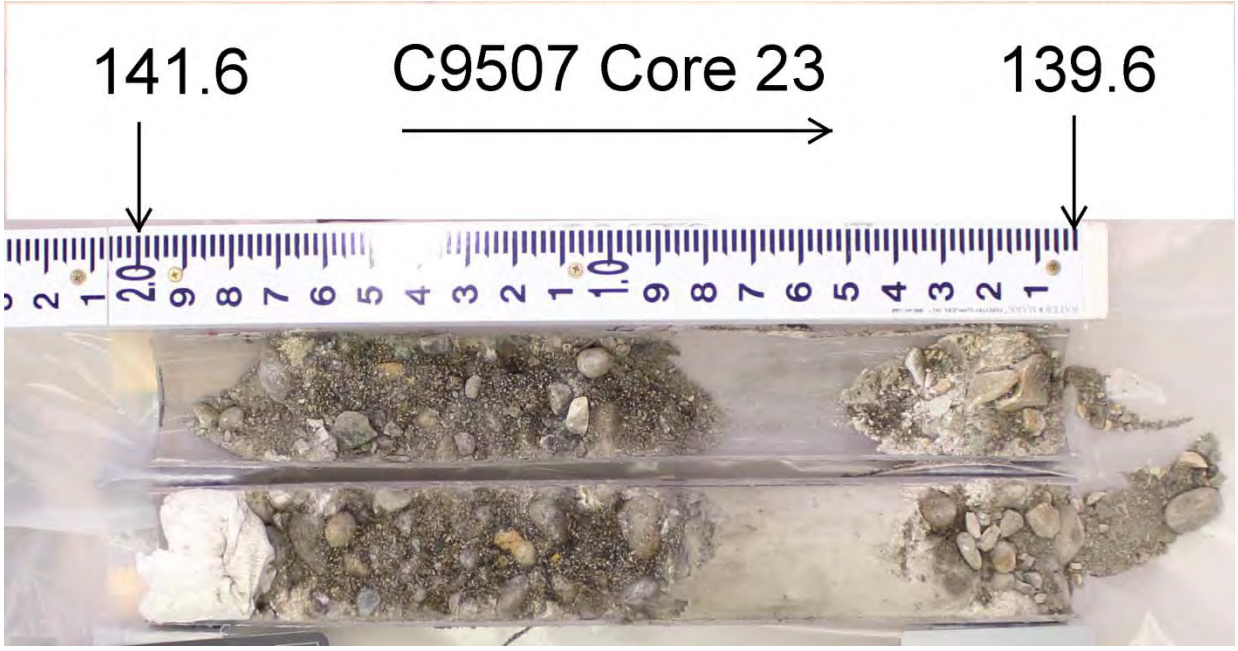
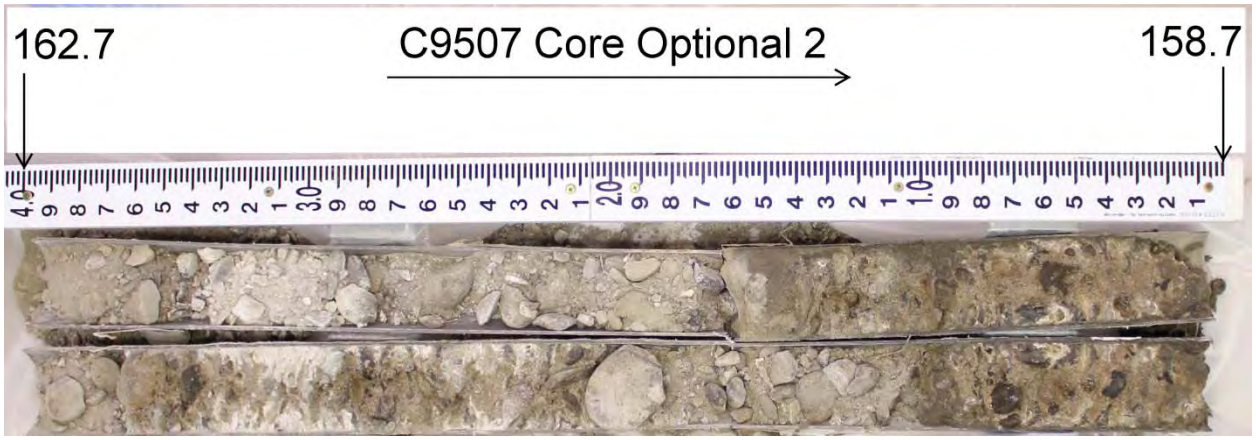
132.7


141.6
C9507 Core 23
139.6


162.7
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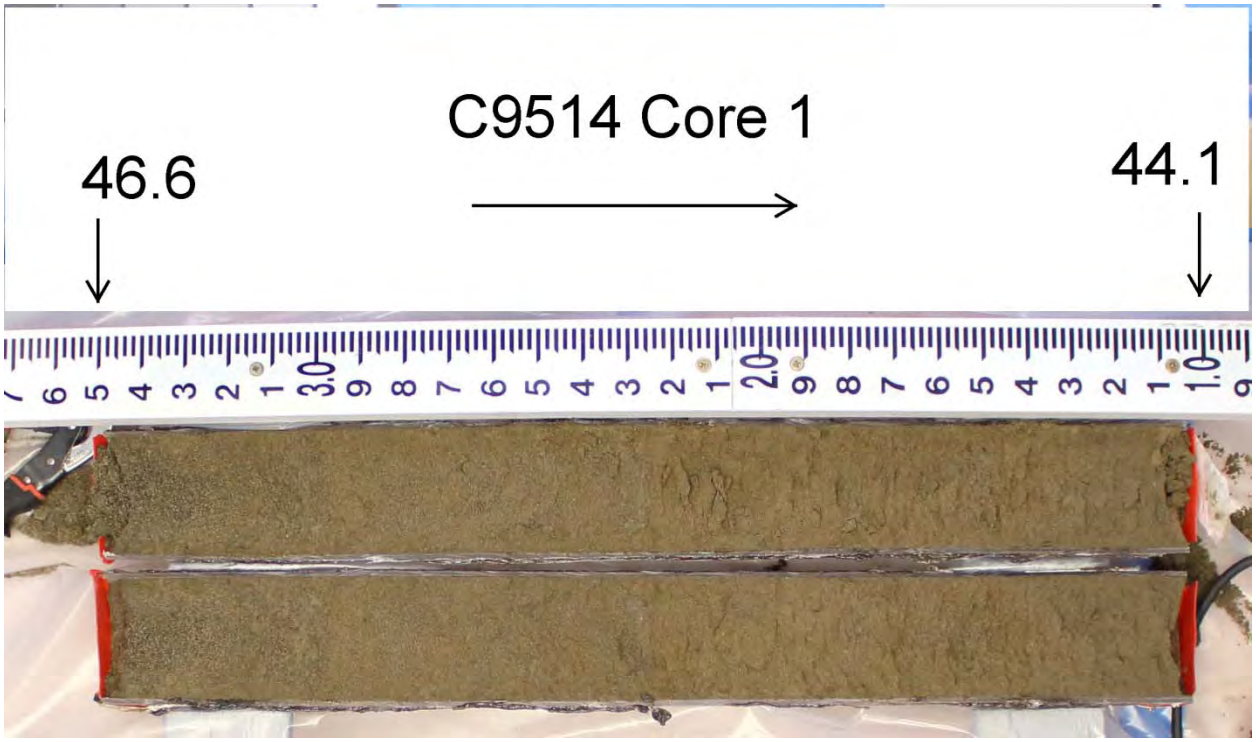
158.7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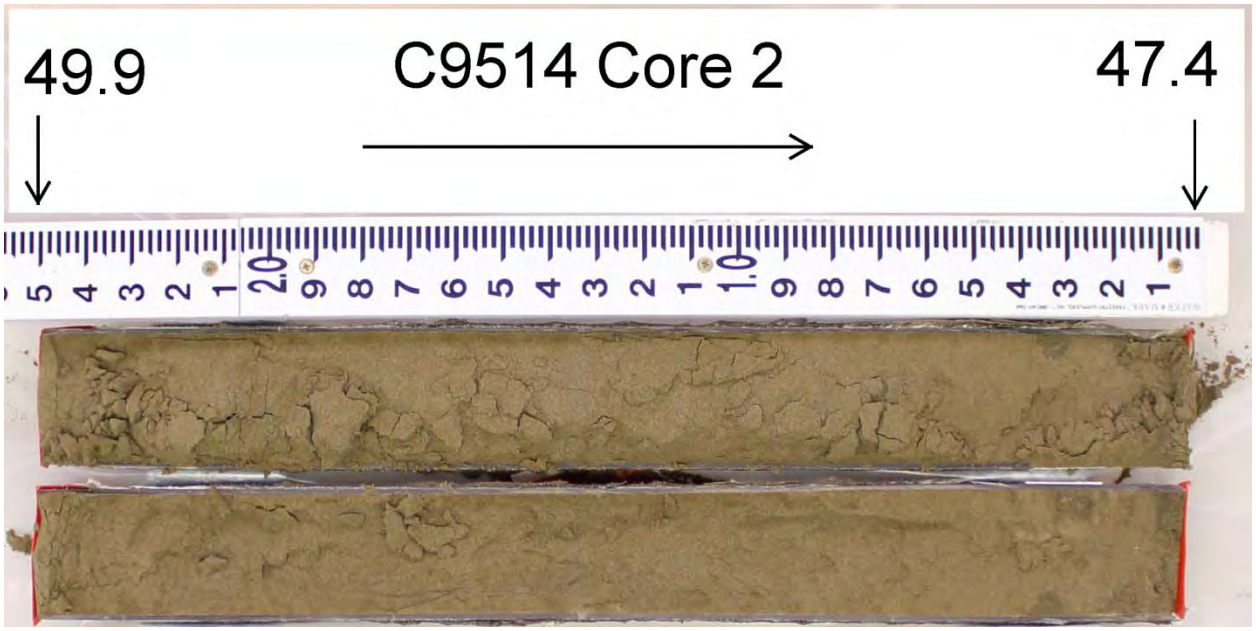
46.6
44.1


49.9
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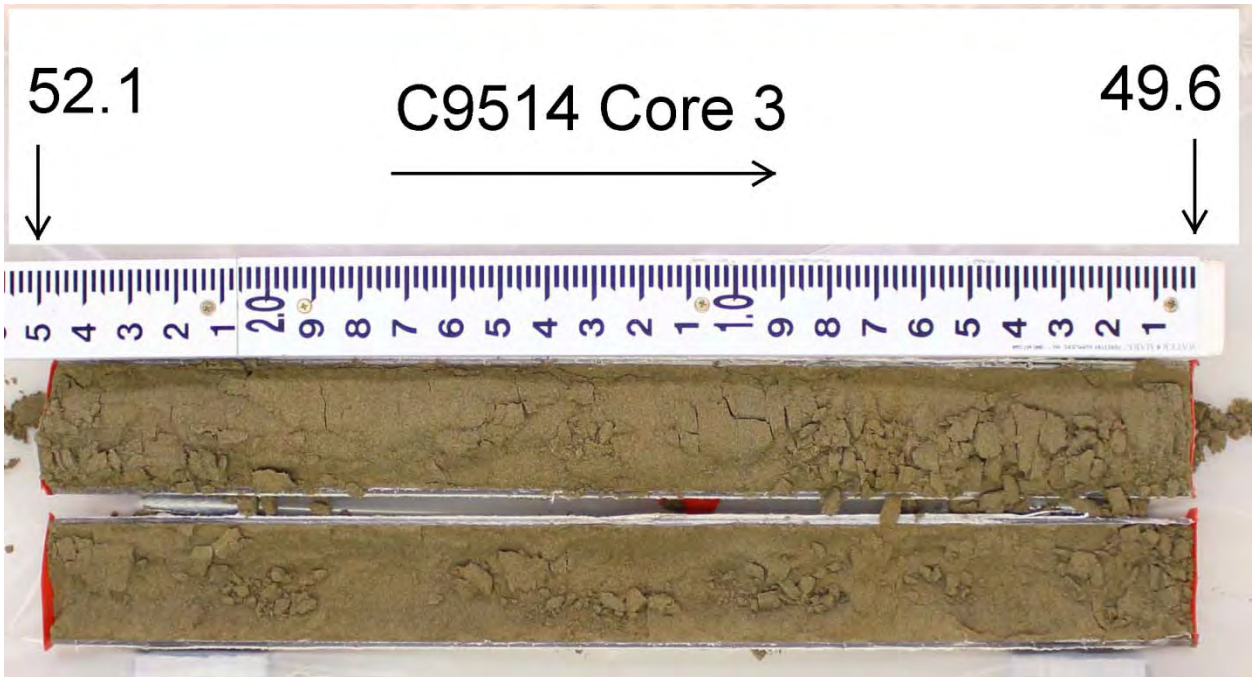
47.4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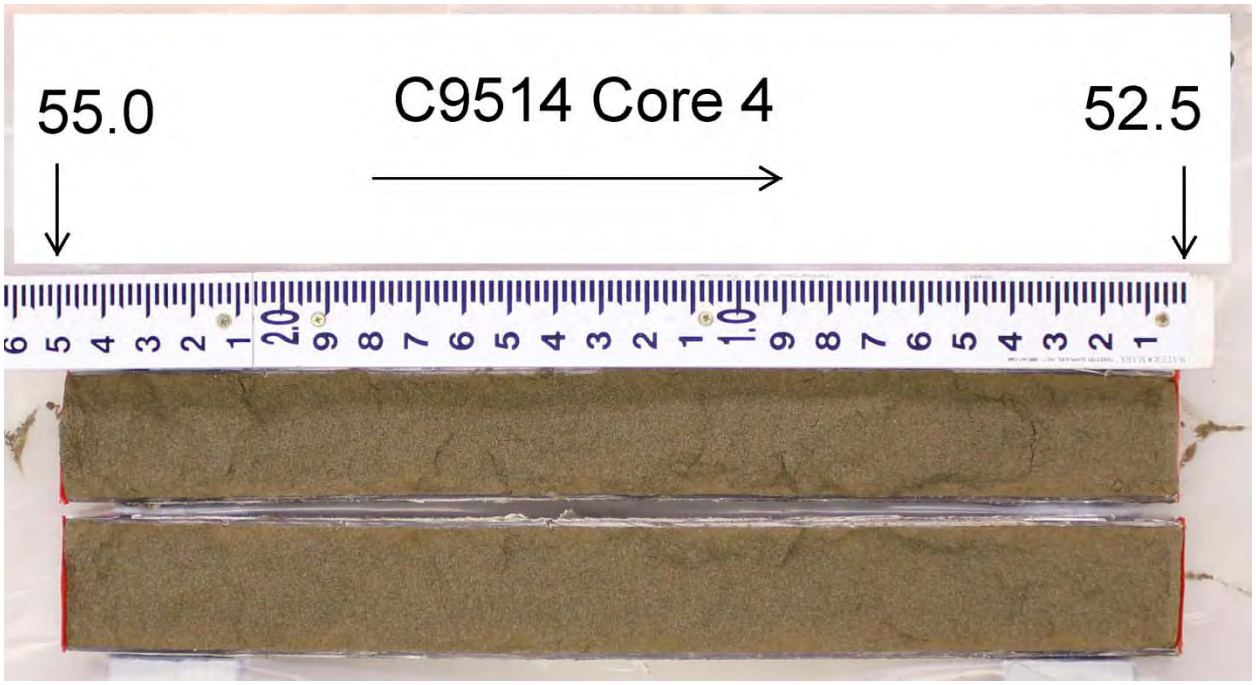
49.6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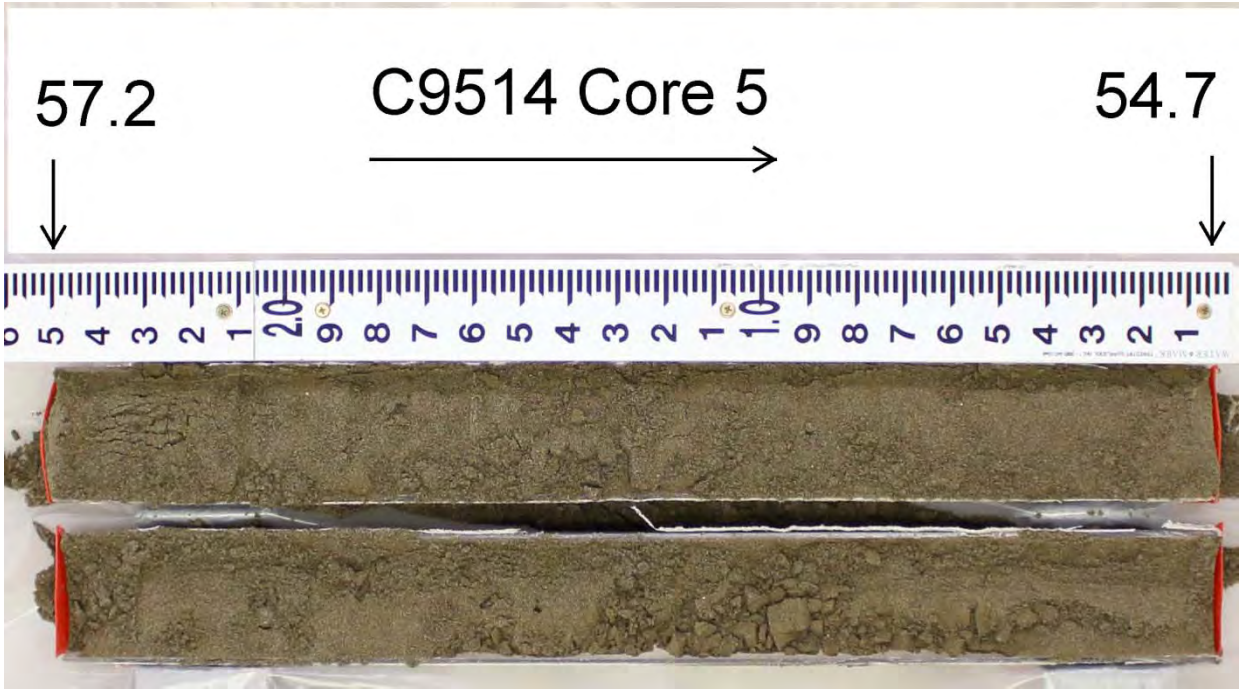
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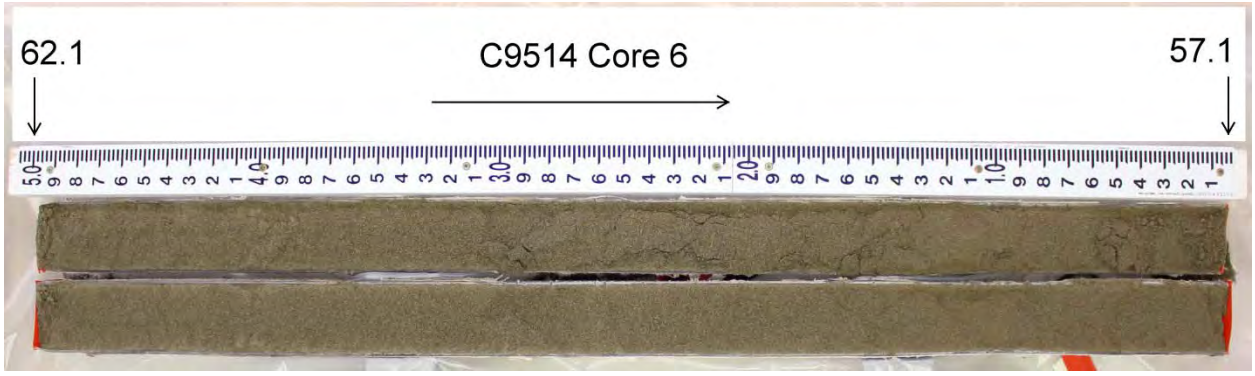
54.7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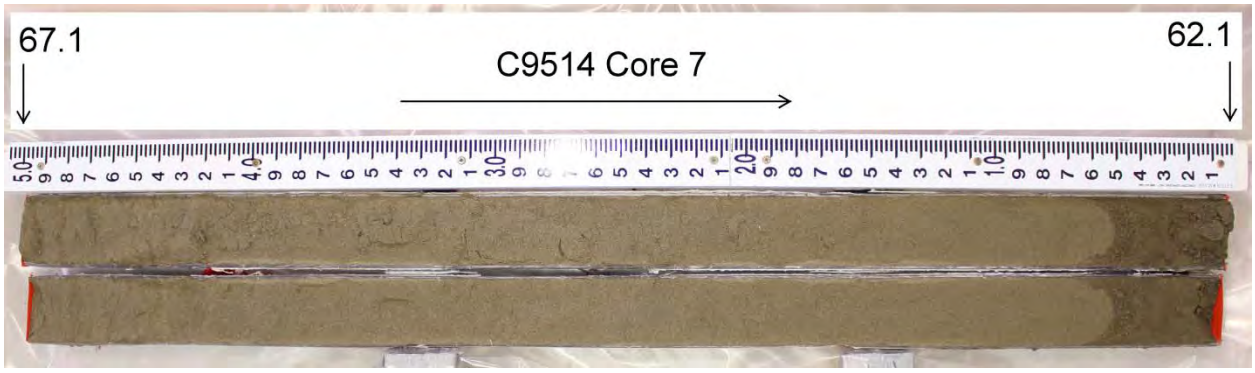
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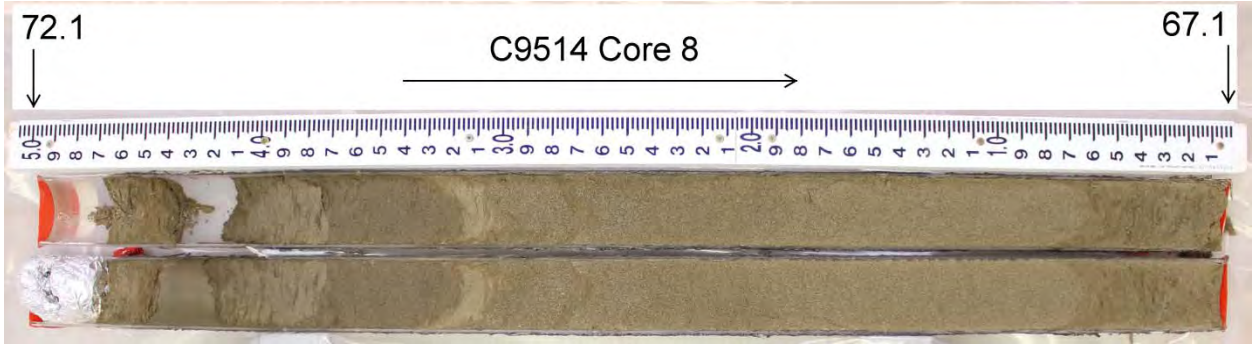
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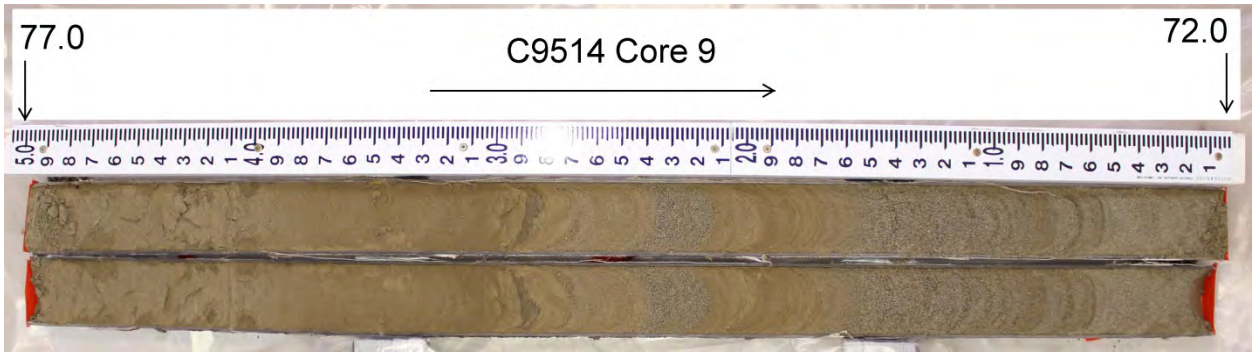
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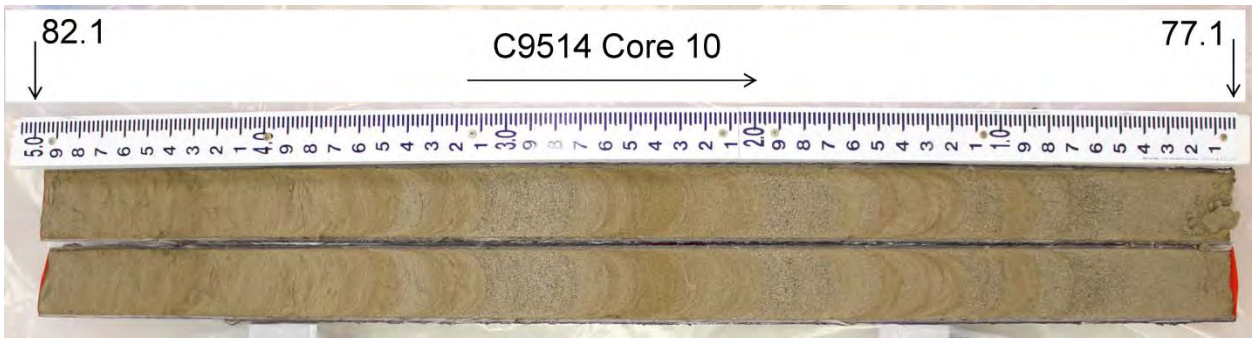
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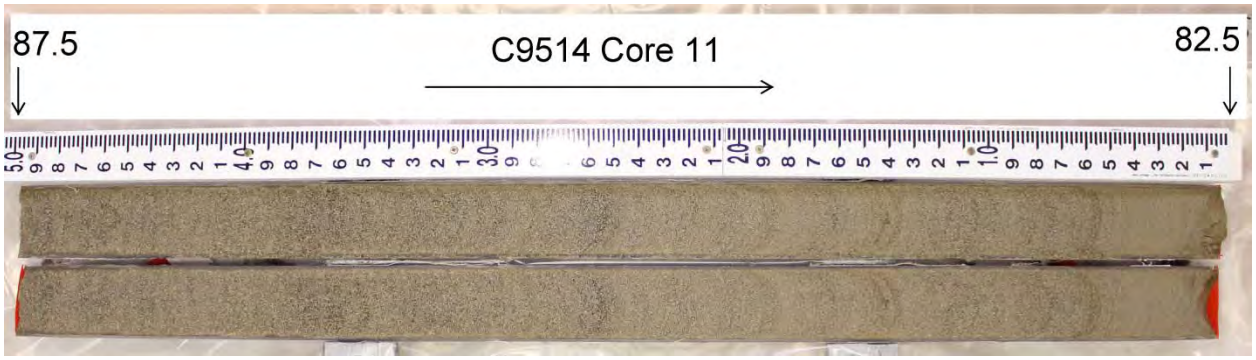
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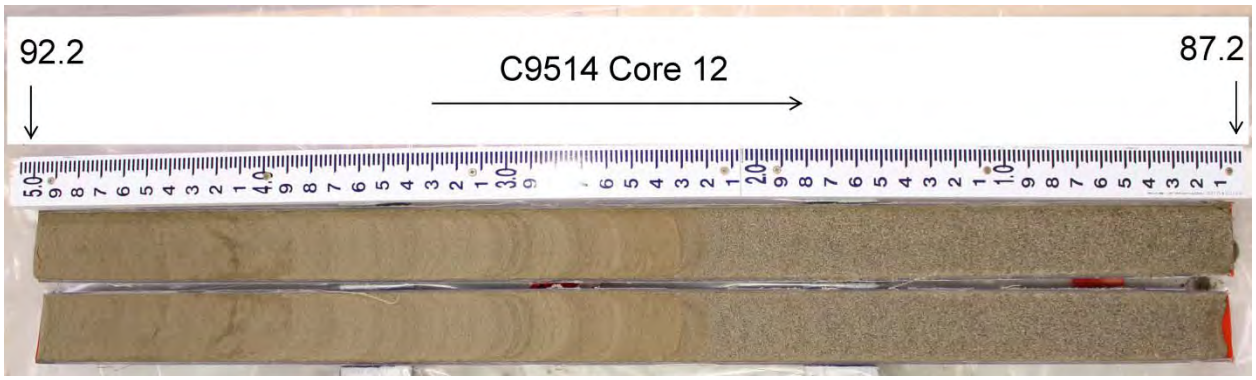
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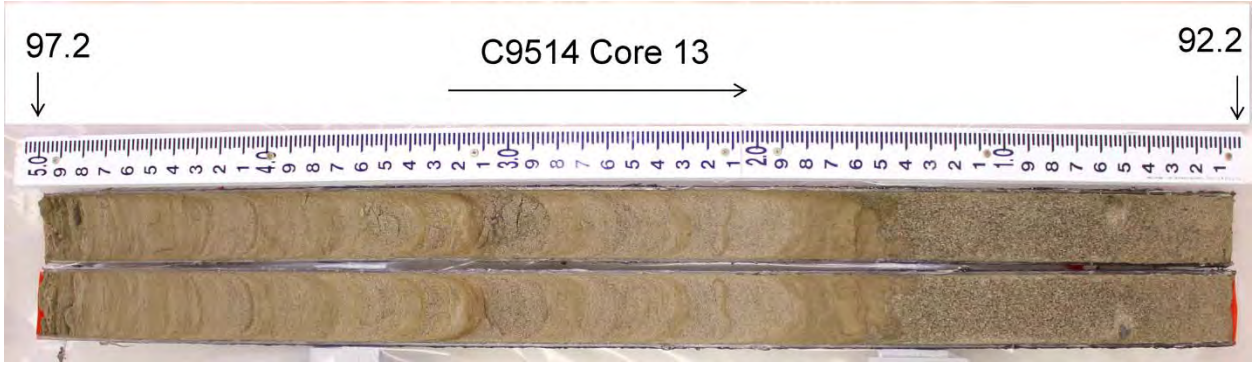
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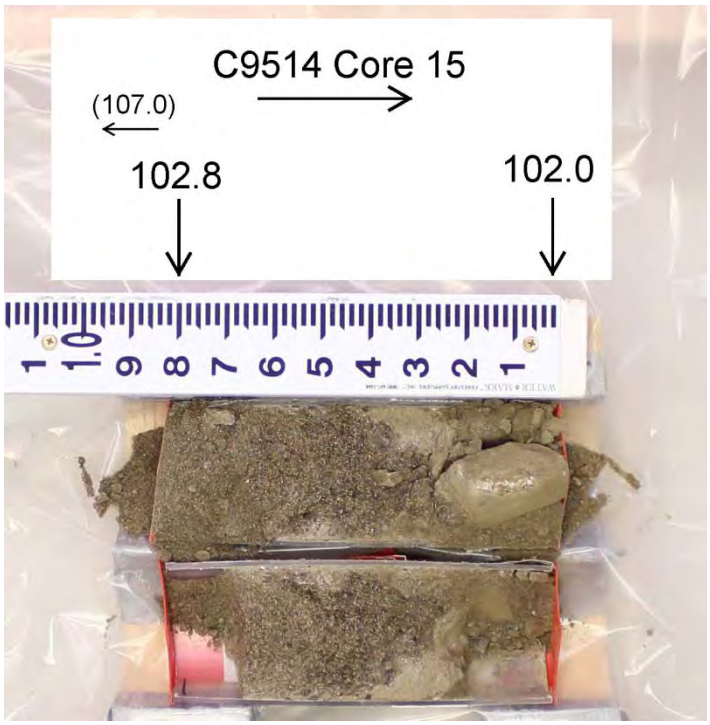
102.1
C9415 Core 14
97.1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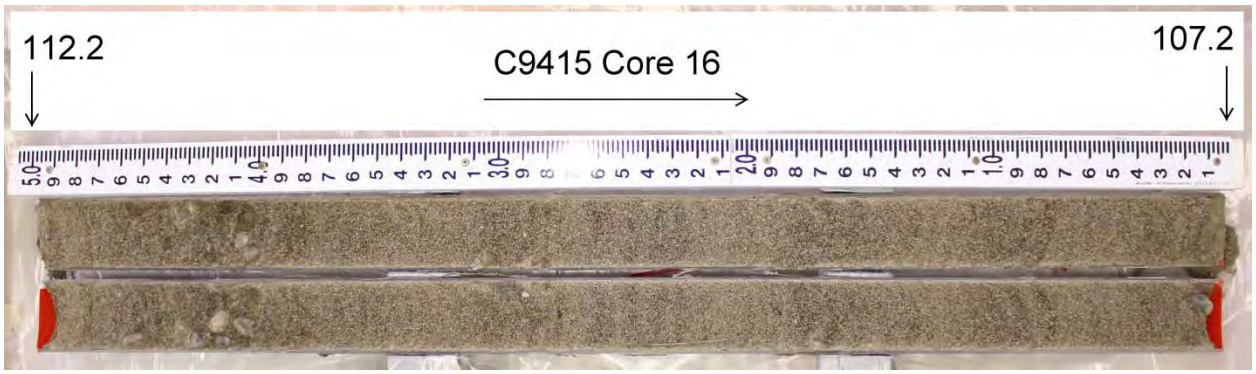
102.8
102.0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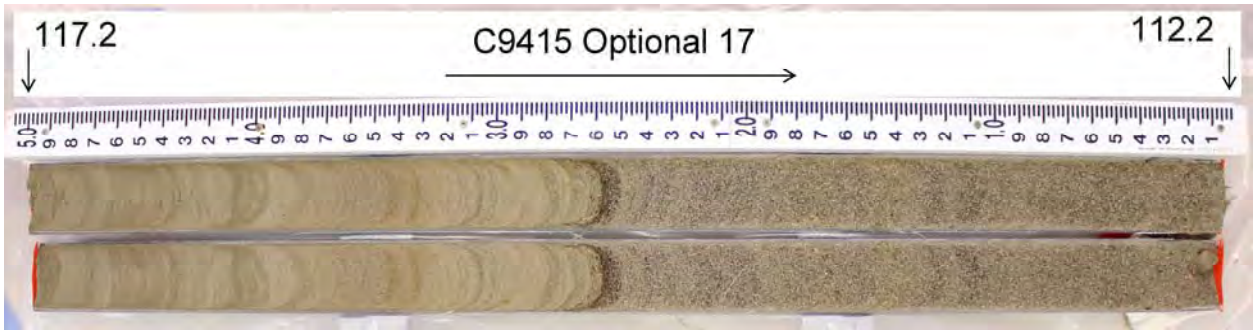
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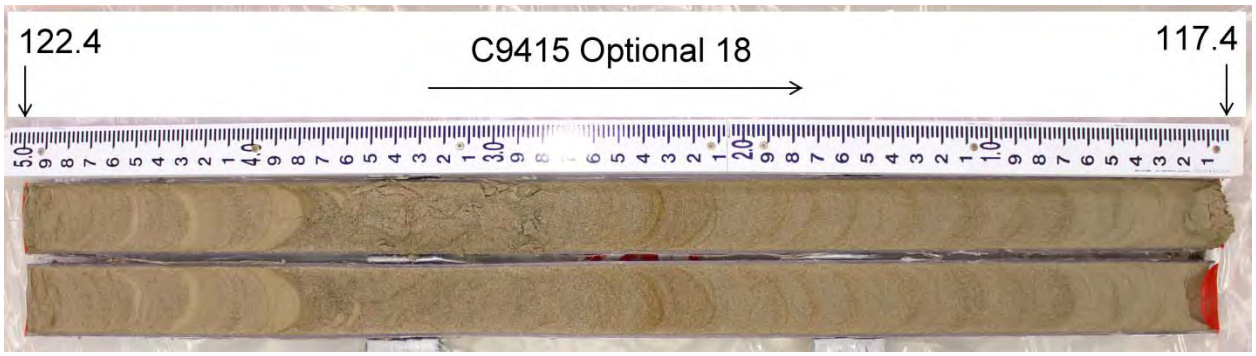
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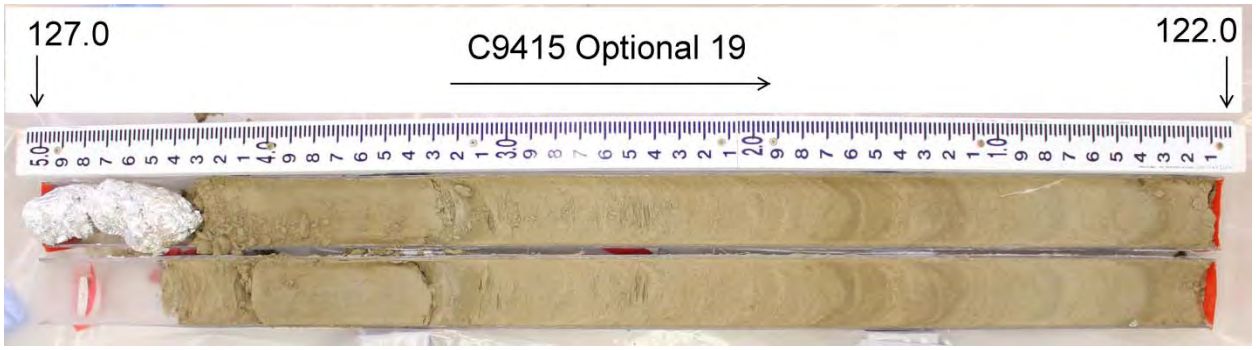
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C9415 Optional 19
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