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Status Report on Transfer of Physical and Hydraulic Properties Databases to the Hanford Environmental Information System - PNNL Remediation Decision Support Project, Task 1, Activity 6

ML Rockhold LA Middleton
K. J. Cantrell

June 2009

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Pacific Northwest National Laboratory
Richland, Washington 99352

Summary

The Remediation Decision Support (RDS) Project is managed by Pacific Northwest National Laboratory (PNNL) to support Hanford Site waste management and remedial action decisions by the U.S. Department of Energy and their contractors. The objective of Task 1, Activity 6 of the RDS project is to compile all available physical and hydraulic property data for sediments from the Hanford Site, to port these data into the Hanford Environmental Information System (HEIS), and to make the data web-accessible to anyone on the Hanford Local Area Network via the so-called Virtual Library. These physical and hydraulic property data are used to estimate parameters for analytical and numerical flow and transport models that are used for site risk assessments and evaluation of remedial action alternatives.

In past years efforts were made by RDS project staff to compile all available physical and hydraulic property data for Hanford sediments and to transfer these data into SoilVision®, a commercial geotechnical software package designed for storing, analyzing, and manipulating soils data. Although SoilVision® has proven to be useful, its access and use restrictions have been recognized as a limitation to the effective use of the physical and hydraulic property databases by the broader group of potential users involved in Hanford waste site issues. In order to make these data more widely available and useable, a decision was made to port them to HEIS and to make them web-accessible via a Virtual Library module.

In FY08 the original objectives of this activity on the RDS project were to: (1) ensure traceability and defensibility of all physical and hydraulic property data currently residing in the SoilVision® database maintained by PNNL, (2) transfer the physical and hydraulic property data from the Microsoft Access database files used by SoilVision® into HEIS, which is currently being maintained by CH2M-Hill Plateau Remediation Company (CHRPC), (3) develop a Virtual Library module for accessing these data from HEIS, and (4) write a User's Manual for the Virtual Library module. The intent of these activities is to make the available physical and hydraulic property data more readily accessible and useable by technical staff and operable unit managers involved in waste site assessments and remedial action decisions for Hanford.

In FY08 communications were established between PNNL and staff from Fluor-Hanford Co. (who formerly managed HEIS) to outline the design of a Virtual Library module that could be used to access the physical and hydraulic property data that are to be transferred into HEIS. Data dictionaries used by SoilVision® were also provided to Fluor-Hanford personnel who are now with CHPRC. During ongoing work to ensure traceability and defensibility of all physical and hydraulic property data that currently reside in the SoilVision® database, it was recognized that further work would be required in this effort before the data were actually ported into HEIS. Therefore work on the Virtual Library module development and an accompanying User's Guide was deferred until an unspecified later date.

In FY09 efforts have continued to verify the traceability and defensibility of the physical and hydraulic property datasets that are currently being maintained by PNNL. Although this is a work in progress, several of these datasets are now ready for transfer to CHRPC for inclusion in HEIS. The actual loading of data into HEIS is performed by CHPRC staff, so after the data are transferred from PNNL to CHPRC, it will be the responsibility of CHPRC to ensure that these data are loaded and made accessible. This document provides a status report on efforts to transfer physical and hydraulic property data from PNNL to CHPRC for incorporation into HEIS.

Acknowledgments

The Hanford Vadose Zone Physical and Hydraulic Properties Database development was initiated by George Last (PNNL) and Gene Freeman (formerly with PNNL) who compiled historical data sets generated by various site contractors into a series of Excel spreadsheets. This work was continued by Andy Ward (PNNL) and Jason Keller (formerly with PNNL) who were responsible for generating some of the more recent data, and for porting historic data as well as some of the more recent data into SoilVision®. Data entry into SoilVision® has been performed by various PNNL staff and summer students. Funding for this work was provided by the Remediation Decision Support activity within the Soil and Groundwater Remediation Project, currently managed by CH2M Hill Plateau Remediation Company (CHPRC).

Acronyms and Abbreviations

CHPRC	CH2M Hill Plateau Remediation Company
EDM	Environmental Data Management Group
HEIS	Hanford Environmental Information System
HWIS	Hanford Well Information System
VL	Virtual Library

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1.0 Introduction

Over the more than 60 years of Hanford Site operations significant efforts have been made to measure the physical properties of sediments underlying the Hanford Site, such as grain-size distributions, bulk and particle densities, and porosities. During the past 30 years or so that effort has grown to include the measurement of hydraulic properties, which include saturated hydraulic conductivities, relative permeabilities for different fluid phases, and pressure-saturation data. Much of this effort is driven by the need to accurately estimate contaminant transport in the subsurface for the purpose of remedial investigations and site assessments.

Physical and hydraulic properties are fundamental data for any type of quantitative analysis of contaminant transport and fate in the subsurface, including evaluation of risk associated with natural attenuation (no-action) or engineered remedial action alternatives at waste sites (e.g. biostimulation or In-Situ Redox Manipulation [ISRM] for chromium reduction, emplacement of surface infiltration barriers and soil dessication to minimize transport of technetium and other radionuclides, soil-vapor extraction for carbon tetrachloride removal, etc.). Therefore the Physical and Hydraulic Property Database and Interpretation activity of the RDS Project directly supports DOE's mission at the Hanford Site.

The efforts made to generate physical and hydraulic property data for Hanford sediments have resulted in the compilation of numerous data sets acquired by different contractors and individuals using different measurement methods, with data processing by different software, and with files stored in different locations. In order to more efficiently use the existing data, and to help reduce duplication of efforts, a process was initiated to compile into a single location the various Hanford sediment physical and hydraulic property datasets. A part of this effort is the transformation of the datasets into a form that allows the data to be presented and used in a consistent manner.

This document describes the current status of efforts to ensure traceability of these datasets and transfer of selected datasets to CHPRC for loading into HEIS. This data transfer will be performed with guidance from the CHPRC Environmental Data Management Group (EDM). After receiving the datasets from PNNL, loading of these data into HEIS will be the responsibility of the CHPRC EDM.

2.0 Physical and Hydraulic Properties Database

An overview of the database, its history of development, and a preliminary Virtual Library module development plan was presented by Rockhold (2008). The physical and hydraulic property data are currently managed, in part, using SoilVision® (http://www.soilvision.com/), a commercial geotechnical software package designed for storing and analyzing soils data. SoilVision® uses Microsoft Access database (*.mdb) files that allow for many different types of geotechnical data to be stored and cross-referenced, including physical (e.g. grain-size distribution data, bulk and particle density, porosity, etc.) and hydraulic properties (e.g. saturated hydraulic conductivity, water retention characteristics, relative permeability, etc.). These data and parameters derived from them are of great interest for vadose zone and groundwater modeling and risk assessment.

Physical and hydraulic property data have generally been collected on a site-by-site or project-by-project basis. Some of these data have been loaded into SoilVision®. Figure 2.1 lists some of the sites or projects that are currently represented in PNNL's SoilVision® database files. The sites represented include:

- the 300 Area (Schalla_1997_D.mdb),
- BC Cribs and Trenches (SVSoils_BCCrib_D.mdb),
- the ILAW site (SVSoils_ILAW_D.mdb),
- the Sisson & Lu Site (SVSoils_S&L_D.mdb),
- a clastic dike study site (SVSoils_VZTFFY03_D.mdb), and
- a compilation of data generated by the Westinghouse-Hanford Co. Geotechnical Engineering Lab (SVSoils_Freeman_D.mdb).

The data in Schalla_1997_D.mdb represent data reported by Schalla et al. (1988), collected more than 20 years ago, that were previously available only in hardcopy. These and other historical data were entered by hand into Excel spreadsheets and/or into SoilVision®. The datasets also include grain-size distribution data for over 30,000 sediment samples collected during well drilling at Hanford from the historical *ROCSAN*[1] database (SV_Rocsan_1997_D.mdb), which are already accessible via the Virtual Library.

[1] Inclusion of *ROCSAN* data into SoilVision® was made to facilitate estimation of grain-size distribution metrics, such as the median diameter, d_{50}, that can be used for estimating other properties (Guber et al. 2006). Since ROCSAN dataset is already available via the Virtual Library, these data and parameters derived from them will not be included in the database migration effort described herein.

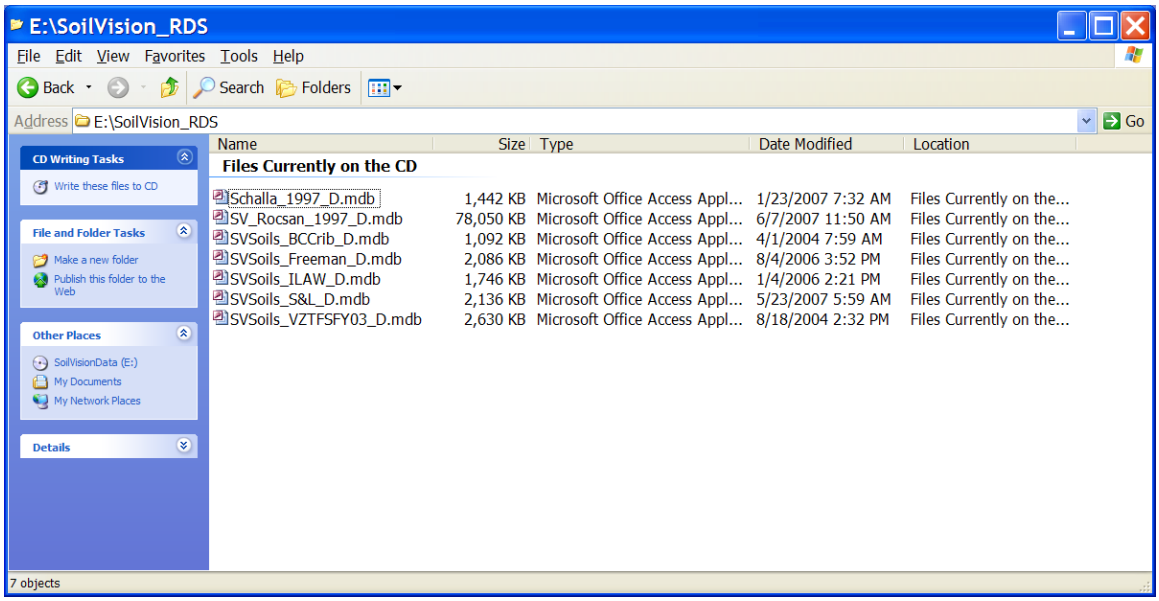

Figure 2.1. Hanford Site-Specific Soilvision® Databases

The database files shown in Figure 1 are currently static, but other similar database files are being actively developed on other projects for other sites at Hanford. These SoilVision® files and other data sets that are being stored in Excel spreadsheets are not under any formal configuration management at this time. Hence most of the physical and hydraulic property data would be considered informal. When these data or selected subsets are transferred into HEIS and made accessible via the Virtual Library (VL)[2], they will become "official" and will be placed under formal configuration management and control.

Data on physical and hydraulic properties for Hanford sediments are routinely generated on different projects in support of various research activities and site-specific remedial investigations. There is currently no concerted effort to gather these various datasets and to put them into a central repository. However, such an effort should be undertaken after the current physical and hydraulic property data have been transferred into HEIS and after a VL module has been developed that can be used to access these data. A long-term strategic plan for continued improvement and updating of the physical and hydraulic properties database and loading the data into HEIS will be presented in a later report.

[2] A Web-based graphical user interface that allows querying of HEIS databases, plotting, and data export.

3.0 Data Traceability

As noted by Rockhold (2008), during FY08 it was determined that some of the *.mdb files depicted in Figure 1 did not have sufficient so-called "metadata" associated with them to allow for cross-checking of data entries with published documents, laboratory record books, and/or to spreadsheets from which the data were originally transferred. Therefore a process was initiated in FY08 to identify and to obtain the original data sources and to compare selected subsets of data in the *.mdb files to the data in the original data sources in order to establish their traceability and to verify consistency (Rockhold and Middleton, 2009).

Another aspect of this and associated tasks on the RDS project involves making sure that so-called "best-estimate" hydraulic parameters (Last et al. 2009) that may be used for various site assessments are traceable to previously published work and/or to the original data files from which the parameters were produced so that they can be checked for consistency and reproducibility, and so that they can be regenerated if necessary. Last et al. (2009) provide a summary of physical and hydraulic parameters and partition coefficients (a.k.a. Kd values) that have been used in various Hanford site assessments, and recommendations for so-called best estimates of average or effective parameters.

As part of the effort to establish traceability of the raw data, the site, sample, and well IDs in the spreadsheet from which these best estimate parameters were derived were reviewed to identify the original data sources. In some cases, the parameters were traced to values reported in published documents or unpublished letter reports. In other cases, the original spreadsheets were found by contacting various people who were either responsible for the data generation, or who were involved in previous analyses of these data. Appendix A.1 shows a summary of these results to date. Note that the samples shown in Appendix A.1 represent just a small fraction of the data that are known to exist. For example, the lead author of this report has compiled a set of grain-size distribution data for over 400 samples from the Hanford 300 Area, most of which are not in the ROCSAN database. Extensive characterization studies have also been performed recently on intact core samples from both the 300 Area and the 100-N Area. These data are not yet represented in any readily accessible databases.

4.0 Data Transfer to HEIS

As noted by Rockhold and Middleton (2009), our intent is to initially transfer a smaller subset of the data that are currently in the SoilVision® database, and/or in various Excel spreadsheets containing data have been previously published or used for parameter estimation to the CHPRC EDM who will then be responsible for uploading these data into HEIS. Eventually these data should be made available via the VL, and PNNL will work with CHPRC to develop and test the VL module (Rockhold, 2008). The data transferred to HEIS will be expanded over time as traceability checks are continued and the data are verified against the original data sources. New physical and hydraulic property data will also be added as more high-quality, well-documented, and fully traceable data are generated on other projects.

Rockhold and Middleton (2009) summarized the minimum set of data requirements that must be specified for assigning HEIS sample numbers, which must be done prior to loading data into HEIS. Table 1 shows a condensed version of those data requirements, specific to soil samples. Many of the required field identifiers are also given in Table A.1, but under different names. Several of the required data fields are problematic, since most of these data sets are legacy. For example, the SAMP_DATE_TIME is a required sample identifier, but this information is not typically maintained with the physical and hydraulic property data files. However in most cases the SAMP_DATE_TIME can be estimated from well drill dates or well completion records.

Table 4.1. Data Fields Required for Assigning HEIS Numbers to Soil Samples

Sample Identification Field	Options
BIOTA_MEDIA	<null>
COLLECTION_PURPOSE	VP or S
FIELD_QC_TYPE	<null>
FILTERED_FLAG	<null>
MEDIA	SO
OWNER_ID	PNLWELL or CENTPLAT or TFVADZNP
SAMP_DATE_TIME	required
SAMP_FROM	not required
SAMP_INTERVAL_BOTTOM	required
SAMP_INTERVAL_TOP	required
SAMP_INTERVAL_UNITS	(m or ft)
SAMP_ITEM	not required
SAMP_MTHD	not required
SAMP_NUM	required
SAMP_SITE_ID	SAMP_SITE_ID or WELL_NAME but not both
TOTAL_COUNTS	<null>
WATER_PRESENT	<null>
WELL_NAME	SAMP_SITE_ID or WELL_NAME but not both
Options Key: VP = vertical profile; S = special study, SO = soil, PNLWELL = sample owned by PNNL; CENTPLAT = sample owned by Hanford central plateau remediation contactor; TFVADZNP = sample owned by tank farm vadose zone program	

Drill dates for the wells listed in Table A.1 were obtained from the Hanford Well Information System (HWIS). For several of the listed well numbers no information could be found in HWIS, which suggests that either the well ID was entered incorrectly, or the information for those

particular wells was never entered into HWIS. Efforts will be made in the coming months to resolve these uncertainties, and to complete the required data fields listed in Table 1 for as many of the samples listed in Table A.1 as possible.

The OWNER_ID is also not usually maintained with the data files, unless a published document can be found for the dataset. In some cases, the work may have been commissioned by TFVADZNP (Tank Farm Vadose Zone Program), for example, but the actual measurements may have been made by PNNL or the former Westinghouse Hanford Company Geotechnical Engineering Lab (WHC-GEL). In such cases, we recommend that the contractor that commissioned the work be listed as the owner. If the commissioning contractor can not be identified, then the contractor who performed the measurements will be listed as the owner. Efforts are currently underway to complete the sample identification data requirements listed in Table 1 for all samples given in Table A.1. Note that the SAMP_NUM field in Table 1 is auto-generated from HEIS for new data sets.

5.0 Discussion

Discussions were initiated in FY08 with Fluor-Hanford Co. staff on how the physical and hydraulic property data would be reformatted into HEIS-compatible tables. HEIS is now under the control of CHPRC. However, the staff that were responsible for HEIS data loading at Fluor-Hanford Co. are now with CHPRC and have the same job responsibilities. These staff have been contacted recently (June 2009) and requested to provide templates illustrating the desired formats for receiving grain-size distribution and hydraulic property (e.g. water retention) data. Although these data templates have not yet been received by PNNL, we do expect to receive them in the near future. Since grain size data already exist in HEIS, transfer of other grain size data into HEIS should simply be a matter of specifying the appropriate sample identification information to generate HEIS numbers (see Table 4.1), where needed, and then providing the data to CHPRC in a format that is compatible with the existing HEIS data tables.

For some of the other physical and hydraulic property data (e.g. water retention data) that we intend to transfer to CHPRC for inclusion in HEIS, tables for these data types may not currently exist in HEIS. Therefore some new table formats may need to be developed for HEIS. Although SoilVision® data models were transferred to Fluor-Hanford Co. staff in FY08, and the same staff are now responsible for HEIS at CHPRC, with the change in contractors these details will probably need to be revisited and resolved with the CHPRC EDM. A schedule for completion of data transfer activities cannot be realistically developed until concurrence with the CHPRC EDM has been obtained. We will continue to try to reach closure on these HEIS data transfer issues with the CHPRC EDM.

6.0 References

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Guber AK, YA Pachepsky, MTh Van Genuchten, WJ Rawls, J Simunek, D Jacques, TJ Nicholson, and RE Cady. 2006. "Field-Scale Water Flow Simulations Using Ensembles of Pedotransfer Functions for Soil Water Retention." *Vadose Zone J* 5:234-247.

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Appendix A

Identification information for Hanford sediment samples used to generate “best-estimate” values of physical and hydraulic parameters

Appendix A: Identification information for Hanford sediment samples used to generate "best-estimate" values of physical and hydraulic parameters

Table A.1. Site, Sample, and Well Identification Numbers, Depths, and Documentation Notes for Sediment Samples Used to Generate "Best-Estimate" Parameters Reported by Last et al. (2009)

Site ID	Well ID	Drill Date	Sample ID	Sample Depth – Bottom (?) (m)	Reference
100-BC-1	116-B-1	3/26/1992	2-2660	7.01	Lab note WHC-GEL
100-BC-1	116-B-1	3/26/1992	2-2661	8.38	Lab note WHC-GEL
100-BC-5	199-B2-12	5/28/1992	2-2662	2.93	Lab note WHC-GEL
100-BC-5	199-B2-12	5/28/1992	2-2664	24.84	Lab note WHC-GEL
100-BC-5	199-B4-9	5/28/1992	2-2665	9.60	Lab note WHC-GEL
100-BC-5	199-B4-9	5/28/1992	2-2666	21.49	Lab note WHC-GEL
100-BC-5	199-B4-9	5/28/1992	2-2667	23.93	Lab note WHC-GEL
100-BC-5	199-B4-9	5/28/1992	2-2668	27.13	Lab note WHC-GEL
100-BC-5	199-B9-2	6/15/1992	2-2669	12.80	Lab note WHC-GEL
100-BC-5	199-B9-2	6/15/1992	2-2670	24.08	Lab note WHC-GEL
100-BC-5	199-B9-2	6/15/1992	2-2671	28.04	Lab note WHC-GEL
100-BC-5	199-B9-2	6/15/1992	2-2672	35.05	Lab note WHC-GEL
100-FR-1	116-F-14	N/A	3-0682	6.80	Lab note WHC-GEL
100-FR-1	116-F-14	N/A	3-0684	4.72	Lab note WHC-GEL
100-FR-1	116-F-14	N/A	3-0685	5.36	Lab note WHC-GEL
100-FR-1	116-F-14	N/A	3-0687	7.32	Lab note WHC-GEL
100-HR-1	116-H-1	N/A	2-2673	4.18	Lab note WHC-GEL
100-HR-1	116-H-1	N/A	2-2674	6.55	Lab note WHC-GEL
100-HR-1	116-H-1	N/A	2-2675	7.77	Lab note WHC-GEL
100-HR-3-D	116-DR-1	N/A	2-1321	10.85	Lab note WHC-GEL
100-HR-3-D	116-DR-1	N/A	2-1322	11.92	Lab note WHC-GEL
100-HR-3-D	199-D5-14	3/27/1992	2-1306	10.36	Lab note WHC-GEL
100-HR-3-D	199-D5-14	3/27/1992	2-1307	19.05	Lab note WHC-GEL
100-HR-3-D	199-D5-14	3/27/1992	2-1308	30.78	Lab note WHC-GEL
100-HR-3-D	199-D5-17	3/18/1992	2-1310	11.43	Lab note WHC-GEL
100-HR-3-D	199-D5-17	3/18/1992	2-1311	20.57	Lab note WHC-GEL
100-HR-3-D	199-D5-17	3/18/1992	2-1312	30.18	Lab note WHC-GEL
100-HR-3-D	199-D5-17	3/18/1992	2-1313	31.85	Lab note WHC-GEL
100-HR-3-D	199-D8-53	2/6/1992	2-1319	21.01	Lab note WHC-GEL
100-HR-3-D	199-D8-54A	12/9/1991	2-1318	15.54	Lab note WHC-GEL
100-HR-3-D	199-D8-54B	2/10/1992	2-1314	9.30	Lab note WHC-GEL
100-HR-3-D	199-D8-54B	2/10/1992	2-1315	17.83	Lab note WHC-GEL
100-HR-3-D	199-D8-54B	2/10/1992	2-1316	18.75	Lab note WHC-GEL
100-HR-3-D	199-D8-54B	2/10/1992	2-1317	23.77	Lab note WHC-GEL

Site ID	Well ID	Drill Date	Sample ID	Sample Depth – Bottom (?) (m)	Reference
100-HR-3-D	199-D8-55	2/11/1992	2-1309	22.40	Lab note WHC-GEL
100-HR-3	199-H4-45	3/11/1992	2-1457	10.52	Lab note WHC-GEL
100-HR-3	199-H4-45	3/11/1992	2-1458	8.08	Lab note WHC-GEL
100-HR-3	199-H4-45	3/11/1992	2-1459	14.78	Lab note WHC-GEL
100-HR-3	199-H4-46	4/24/1992	2-1455	11.13	Lab note WHC-GEL
100-HR-3	199-H4-46	4/24/1992	2-1456	6.89	Lab note WHC-GEL
100-HR-3	199-H5-1A	4/17/1992	2-1460	5.64	Lab note WHC-GEL
100-HR-3	199-H5-1A	4/17/1992	2-1461	9.60	Lab note WHC-GEL
100-HR-3	199-H5-1A	4/17/1992	2-1462	15.70	Lab note WHC-GEL
100-HR-3	699-93-46	3/19/1992	2-2676	7.25	Lab note WHC-GEL
100-HR-3	699-93-46	3/19/1992	2-2677	10.36	Lab note WHC-GEL
100-HR-3	699-93-46	3/19/1992	2-2678	12.95	Lab note WHC-GEL
100-KR-1	116-KE-4A	10/30/1992	3-0567	1.83	Lab note WHC-GEL
100-KR-1	116-KE-4A	10/30/1992	3-0568	4.57	Lab note WHC-GEL
100-KR-1	116-KE-4A	10/30/1992	3-0569	6.10	Lab note WHC-GEL
100-KR-1	116-KE-4A	10/30/1992	3-0570	3.66	Lab note WHC-GEL
100-KR-4	199-K-33	8/10/1992	2-3059	5.27	Lab note WHC-GEL
100-KR-4	199-K-33	8/10/1992	2-3060	14.84	Lab note WHC-GEL
100-KR-4	199-K-33	8/10/1992	2-3061	17.83	Lab note WHC-GEL
100-KR-4	199-K-35	8/21/1992	2-3063	19.96	Lab note WHC-GEL
100-KR-4	199-K-35	8/21/1992	2-3064	27.22	Lab note WHC-GEL
100-KR-4	199-K-35	8/21/1992	2-3065	33.68	Lab note WHC-GEL
100-KR-4	199-K-37	8/4/1992	2-3066	8.84	Lab note WHC-GEL
100-KR-4	199-K-37	8/4/1992	2-3067	13.26	Lab note WHC-GEL
100-KR-4	199-K-37	8/4/1992	2-3068	14.78	Lab note WHC-GEL
100-KR-4	199-K-37	8/4/1992	2-3069	18.75	Lab note WHC-GEL
100-NR-2	199-N-80	10/1/1992	2-3055	7.92	Lab note WHC-GEL
100-NR-2	199-N-80	10/1/1992	2-3056	14.48	Lab note WHC-GEL
100-NR-2	199-N-80	10/1/1992	2-3057	16.46	Lab note WHC-GEL
100-NR-2	199-N-80	10/1/1992	2-3058	28.80	Lab note WHC-GEL
200-AP Tank	excavation		241-AP-1G	10.67	Smoot et al. (1989), WHC-EP-0332
200-AP Tank	excavation		241-AP-2	8.23	Smoot et al. (1989), WHC-EP-0332
200-AP Tank	excavation		241-AP-3	6.40	Smoot et al. (1989), WHC-EP-0332
200-AP Tank	excavation		241-AP-4G	3.05	Smoot et al. (1989), WHC-EP-0332
200-AP Tank	excavation		241-AP-5	2.13	Smoot et al. (1989), WHC-EP-0332
200-AP Tank	excavation		241-AP-6	0.00	Smoot et al. (1989), WHC-EP-0332
200-BP-1	216-B-43A	3/30/1992	2-2258	41.30	Lab notes WHC-GEL
200-BP-1	216-B-43A	3/30/1992	2-2289	51.36	Lab notes WHC-GEL
200-BP-1	216-B-43A	3/30/1992	2-2294	61.42	Lab notes WHC-GEL
200-BP-1	216-B-49A	1/10/1992	2-2244	26.52	Lab notes WHC-GEL
200-BP-1	216-B-49A	1/10/1992	2-2253	35.51	Lab notes WHC-GEL
200-BP-1	216-B-49A	1/10/1992	2-2261	48.62	Lab notes WHC-GEL

Site ID	Well ID	Drill Date	Sample ID	Sample Depth – Bottom (?) (m)	Reference
200-BP-1	216-B-49A	1/10/1992	2-2286	14.94	Lab notes WHC-GEL
200-BP-1	216-B-57A	10/25/1991	2-2271	60.50	Lab notes WHC-GEL
200-BP-1	216-B-57A	10/25/1991	2-2283	13.87	Lab notes WHC-GEL
200-BP-1	216-B-57A	10/25/1991	2-2297	65.38	Lab notes WHC-GEL
200-BP-1	216-B-61A	5/21/1991	1-1133	4.11	Lab notes WHC-GEL
200-BP-1	216-B-61A	5/21/1991	1-1134	5.82	Lab notes WHC-GEL
200-BP-1	216-B-61A	5/21/1991	1-1136	7.01	Lab notes WHC-GEL
200-BP-1	216-B-61A	5/21/1991	1-1137	8.84	Lab notes WHC-GEL
200-BP-1	299-E33-38	4/1/1991	1-0526	1.89	Lab notes WHC-GEL
200-BP-1	299-E33-38	4/1/1991	1-0527	15.06	Lab notes WHC-GEL
200-BP-1	299-E33-38	4/1/1991	1-0528	51.02	Lab notes WHC-GEL
200-BP-1	299-E33-38	4/1/1991	1-0529	62.30	Lab notes WHC-GEL
200-BP-1	299-E33-38	4/1/1991	1-0530	57.12	Lab notes WHC-GEL
200-BP-1	299-E33-38	4/1/1991	1-0531	57.91	Lab notes WHC-GEL
200-BP-1	299-E33-40	4/1/1991	1-0550	14.02	Lab notes WHC-GEL
200SX	299-W22-50	1/28/2000	B8814-060	18.29	Fayer et al. (2002), Letter report to CH2M Hill Hanford Group, dated April 5, 2002.
200SX	299-W22-50	1/28/2000	B8814-115	35.05	Fayer et al. (2002), Letter report to CH2M Hill Hanford Group, dated April 5, 2002.
200SX	299-W22-50	1/28/2000	B8814-130	39.77	Fayer et al. (2002), Letter report to CH2M Hill Hanford Group, dated April 5, 2002.
200SX	299-W22-50	1/28/2000	B8814-135	41.30	Fayer et al. (2002), Letter report to CH2M Hill Hanford Group, dated April 5, 2002.
200SX	299-W22-50	1/28/2000	B8814-141	42.98	Fayer et al. (2002), Letter report to CH2M Hill Hanford Group, dated April 5, 2002.
200SX	299-W22-50	1/28/2000	B8814-150	45.72	Fayer et al. (2002), Letter report to CH2M Hill Hanford Group, dated April 5, 2002.
200SX	299-W22-50	1/28/2000	B8814-160	48.77	Fayer et al. (2002), Letter report to CH2M Hill Hanford Group, dated April 5, 2002.
200SX	299-W22-50	1/28/2000	B8814-174	53.04	Fayer et al. (2002), Letter report to CH2M Hill Hanford Group, dated April 5, 2002.
200-UP-1	699-38-68A	6/21/1994	4-1111	56.69	Lab notes WHC-GEL
200-UP-1	699-38-68A	6/21/1994	4-1112	65.84	Lab notes WHC-GEL
200-UP-2	299-W19-95	9/2/1993	3-1707	10.00	Lab notes WHC-GEL
200-UP-2	299-W19-95	9/2/1993	3-1712	42.67	Lab notes WHC-GEL
200-UP-2	299-W19-95	9/2/1993	3-1713	46.02	Lab notes WHC-GEL
200-UP-2	299-W19-95	9/2/1993	3-1714	50.29	Lab notes WHC-GEL

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218-W-5	299-W07-02	9/30/1987	W7-2-219	66.80	Bjornstad (1991), PNL-7336
218-W-5	299-W07-02	9/30/1987	W7-2-65	19.80	Bjornstad (1991), PNL-7336
218-W-5	299-W07-02	9/30/1987	W7-2-94	28.60	Bjornstad (1991), PNL-7336
218-W-5	299-W10-13	9/25/1987	W10-13-45	13.70	Bjornstad (1991), PNL-7336
218-W-5	299-W10-13	9/25/1987	W10-13-80	24.40	Bjornstad (1991), PNL-7336
218-W-5	299-W7-9	4/11/1990	0-073	20.30	Bjornstad (1991), PNL-7336
218-W-5	299-W7-9	4/11/1990	0-082	24.50	Bjornstad (1991), PNL-7336
218-W-5	299-W7-9	4/11/1990	0-085	26.90	Bjornstad (1991), PNL-7336
218-W-5	299-W7-9	4/11/1990	0-101	31.80	Bjornstad (1991), PNL-7336
218-W-5	299-W7-9	4/11/1990	0-104	34.20	Bjornstad (1991), PNL-7336
218-W-5	299-W7-9	4/11/1990	5-0001	21.60	Bjornstad (1991), PNL-7336
218-W-5	299-W7-9	4/11/1990	5-0002	24.90	Bjornstad (1991), PNL-7336
218-W-5	299-W7-9	4/11/1990	5-0003	43.20	Bjornstad (1991), PNL-7336
218-W-5	299-W7-9	4/11/1990	5-0004	30.30	Bjornstad (1991), PNL-7336
218-W-5	299-W7-9	4/11/1990	5-0005	21.10	Bjornstad (1991), PNL-7336
218-W-5	299-W7-9	4/11/1990	5-0006	19.90	Bjornstad (1991), PNL-7336
218-W-5	299-W7-9	4/11/1990	5-0007	40.30	Bjornstad (1991), PNL-7336
241-T-106	299-W10-196	N/A	3-0210	3.10	Lab notes WHC-GEL
241-T-106	299-W10-196	N/A	3-0213	5.64	Lab notes WHC-GEL
241-T-106	299-W10-196	N/A	3-0279	1.83	Lab notes WHC-GEL
241-T-106	299-W10-196	N/A	3-0589	25.51	Lab notes WHC-GEL
241-T-106	299-W10-196	N/A	3-0667	42.21	Lab notes WHC-GEL
241-T-106	299-W10-196	N/A	3-0668	38.92	Lab notes WHC-GEL
241-T-106	299-W10-196	N/A	3-0682	46.06	Lab notes WHC-GEL
241-T-106	299-W10-196	N/A	3-0688	48.49	Lab notes WHC-GEL
241-T-106	299-W10-196	N/A	3-0689	52.18	Lab notes WHC-GEL
241-T-106	299-W10-196	N/A	3-0690	53.71	Lab notes WHC-GEL
C-018-H	299-W22-45	9/4/1992	2-2717	30.50	Lab notes WHC-GEL
C-018-H	299-W22-45	9/4/1992	2-2718	38.80	Lab notes WHC-GEL
C-018-H	299-W22-45	9/4/1992	2-2719	44.30	Lab notes WHC-GEL
C-018-H	699-48-77	5/4/1992	2-1169	8.08	Lab notes WHC-GEL

Site ID	Well ID	Drill Date	Sample ID	Sample Depth – Bottom (?) (m)	Reference
C-018-H	699-48-77	5/4/1992	2-1170	8.90	Lab notes WHC-GEL
C-018-H	699-48-77	5/4/1992	2-1176	12.98	Lab notes WHC-GEL
C-018-H	699-48-77	5/4/1992	2-1181	14.11	Lab notes WHC-GEL
C-018-H	699-48-77A	5/4/1992	2-1431	20.57	Lab notes WHC-GEL
C-018-H	699-48-77A	5/4/1992	2-1432	27.58	Lab notes WHC-GEL
C-018-H	699-48-77D	1/31/1994	4-0923	8.10	Lab notes WHC-GEL
C-018-H	699-48-77D	1/31/1994	4-0924	12.90	Lab notes WHC-GEL
ERDF	699-35-61A	N/A	4-1076	76.35	Lab notes WHC-GEL
ERDF	699-35-61A	N/A	4-1079	90.89	Lab notes WHC-GEL
ERDF	699-35-61A	N/A	4-1080	93.48	Lab notes WHC-GEL
ERDF	699-35-65A	N/A	4-0791	63.19	Lab notes WHC-GEL
ERDF	699-35-65A	N/A	4-0792	75.44	Lab notes WHC-GEL
ERDF	699-35-66B	N/A	4-0855	12.16	Lab notes WHC-GEL
ERDF	699-35-68A	N/A	4-0973	37.00	Lab notes WHC-GEL
ERDF	699-35-68A	N/A	4-0983	82.91	Lab notes WHC-GEL
ERDF	699-35-69A	N/A	4-0642	25.68	Lab notes WHC-GEL
ERDF	699-35-69A	N/A	4-0644	49.80	Lab notes WHC-GEL
ERDF	699-35-69A	N/A	4-1011	73.00	Lab notes WHC-GEL
ERDF	699-35-69A	N/A	4-1012	73.85	Lab notes WHC-GEL
ERDF	699-35-69A	N/A	4-1013	77.88	Lab notes WHC-GEL
ERDF	699-35-72B	well not found in HWIS	4-1056	61.72	Lab notes WHC-GEL
ERDF	699-35-72B	well not found in HWIS	4-1057	49.50	Lab notes WHC-GEL
ERDF	699-35-72B	well not found in HWIS	4-1058	64.74	Lab notes WHC-GEL
ERDF	699-36-63A	N/A	4-0637	74.86	Lab notes WHC-GEL
FLTF	Excavation		D02-10	6.10	Gee et al. (1989), PNL-6750
FLTF	Excavation		D02-16	6.10	Gee et al. (1989), PNL-6750
FLTF	Excavation		D04-04	6.10	Gee et al. (1989), PNL-6750
FLTF	Excavation		D04-10	6.10	Gee et al. (1989), PNL-6750
FLTF	Excavation		D05-03	6.10	Gee et al. (1989), PNL-6750
FLTF	Excavation		D07-04	6.10	Gee et al. (1989), PNL-6750
FLTF	Excavation		D08-15	6.10	Gee et al. (1989), PNL-6750
FLTF	Excavation		D09-01	6.10	Gee et al. (1989), PNL-6750
FLTF	Excavation		D09-02	6.10	Gee et al. (1989), PNL-6750
FLTF	Excavation		D09-05	6.10	Gee et al. (1989), PNL-6750
FLTF	Excavation		D10-04	6.10	Gee et al. (1989), PNL-6750
FLTF	Excavation		D11-06	6.10	Gee et al. (1989), PNL-6750
FLTF	Excavation		D11-08	6.10	Gee et al. (1989), PNL-6750
FLTF	Excavation		D12-14	6.10	Gee et al. (1989), PNL-6750

Site ID	Well ID	Drill Date	Sample ID	Sample Depth – Bottom (?) (m)	Reference
FLTF	Excavation		D13-08	6.10	Gee et al. (1989), PNL-6750
FLTF	Excavation		D14-04	6.10	Gee et al. (1989), PNL-6750
GROUT	299-E25-234	10/31/1987	110A	33.50	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	110B	33.50	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	117A	35.70	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	117B	35.70	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	126A	38.40	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	126B	38.40	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	133A	40.50	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	133B	40.50	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	19A	5.80	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	19B	5.80	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	25A	7.60	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	25B	7.60	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	25C	7.60	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	25D	7.60	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	29A	8.80	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	29B	8.80	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	37A	11.30	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	37B	11.30	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	46A	14.00	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	46B	14.00	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	54A	16.50	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	54B	16.50	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	5A	1.50	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	5B	1.50	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	69A	21.00	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	69B	21.00	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	83A	25.30	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	83B	25.30	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	99A	30.20	Rockhold et al. (1993), PNL-8813
GROUT	299-E25-234	10/31/1987	99B	30.20	Rockhold et al. (1993), PNL-8813
ILAW-1	299-E17-21	4/23/1998	B8500-07A	14.11	Khaleel (1999), HNF-4769. Rev 1
ILAW-1	299-E17-21	4/23/1998	B8500-10A	17.68	Khaleel (1999), HNF-4769. Rev 1
ILAW-1	299-E17-21	4/23/1998	B8500-12A	21.27	Khaleel (1999), HNF-4769. Rev 1
ILAW-1	299-E17-21	4/23/1998	B8500-14A	24.63	Khaleel (1999), HNF-4769. Rev 1
ILAW-1	299-E17-21	4/23/1998	B8500-15A	27.67	Khaleel (1999), HNF-4769. Rev 1
ILAW-1	299-E17-21	4/23/1998	B8500-16A	31.09	Khaleel (1999), HNF-4769. Rev 1

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ILAW-1	299-E17-21	4/23/1998	B8500-17A	33.92	Khaleel (1999), HNF-4769. Rev 1
ILAW-1	299-E17-21	4/23/1998	B8500-19A	37.37	Khaleel (1999), HNF-4769. Rev 1
ILAW-1	299-E17-21	4/23/1998	B8500-20A	39.96	Khaleel (1999), HNF-4769. Rev 1
ILAW-1	299-E17-21	4/23/1998	B8500-21A	43.22	Khaleel (1999), HNF-4769. Rev 1
ILAW-1	299-E17-21	4/23/1998	B8500-22A	46.85	Khaleel (1999), HNF-4769. Rev 1
ILAW-1	299-E17-21	4/23/1998	B8500-23A	49.38	Khaleel (1999), HNF-4769. Rev 1
ILAW-1	299-E17-21	4/23/1998	B8500-24A	55.44	Khaleel (1999), HNF-4769. Rev 1
ILAW-1	299-E17-21	4/23/1998	B8500-25A	58.19	Khaleel (1999), HNF-4769. Rev 1
ILAW-1	299-E17-21	4/23/1998	B8500-27A	61.11	Khaleel (1999), HNF-4769. Rev 1
ILAW-1	299-E17-21	4/23/1998	B8500-29A	64.19	Khaleel (1999), HNF-4769. Rev 1
ILAW-1	299-E17-21	4/23/1998	B8500-31A	67.33	Khaleel (1999), HNF-4769. Rev 1
ILAW-1	299-E17-21	4/23/1998	B8500-32A	69.31	Khaleel (1999), HNF-4769. Rev 1
ILAW-1	299-E17-21	4/23/1998	B8500-34A	72.30	Khaleel (1999), HNF-4769. Rev 1
ILAW-1	299-E17-21	4/23/1998	B8500-35A	73.36	Khaleel (1999), HNF-4769. Rev 1
ILAW-2	299-E24-21	3/28/2001	45	13.72	Khaleel (2004), RPP-20621, Rev 0.
ILAW-2	299-E24-21	3/28/2001	50	15.24	Khaleel (2004), RPP-20621, Rev 0.
ILAW-2	299-E24-21	3/28/2001	80	24.38	Khaleel (2004), RPP-20621, Rev 0.
ILAW-2	299-E24-21	3/28/2001	85	25.91	Khaleel (2004), RPP-20621, Rev 0.
ILAW-2	299-E24-21	3/28/2001	110	33.53	Khaleel (2004), RPP-20621, Rev 0.
ILAW-2	299-E24-21	3/28/2001	130	39.62	Khaleel (2004), RPP-20621, Rev 0.
ILAW-2	299-E24-21	3/28/2001	150	45.72	Khaleel (2004), RPP-20621, Rev 0.
ILAW-2	299-E24-21	3/28/2001	200	60.96	Khaleel (2004), RPP-20621, Rev 0.
ILAW-2	299-E24-21	3/28/2001	215	65.53	Khaleel (2004), RPP-20621, Rev 0.
ILAW-2	299-E24-21	3/28/2001	230	70.10	Khaleel (2004), RPP-20621, Rev 0.
ILAW-2	299-E24-21	3/28/2001	251	76.50	Khaleel (2004), RPP-20621, Rev 0.
ILAW-2	299-E24-21	3/28/2001	261	79.55	Khaleel (2004), RPP-20621, Rev 0.
Injection	299-E24-79	4/30/1980	2-1637	9.75	Lab notes WHC-GEL
Injection	299-E24-79	4/30/1980	2-1638	12.19	Lab notes WHC-GEL
Injection	299-E24-79	4/30/1980	2-1639	18.29	Lab notes WHC-GEL
Injection	299-E24-79	4/30/1980	2-2230	1.83	Lab notes WHC-GEL

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Injection	299-E24-79	4/30/1980	2-2231	3.05	Lab notes WHC-GEL
Injection	299-E24-79	4/30/1980	2-2232	4.88	Lab notes WHC-GEL
Injection	299-E24-79	4/30/1980	2-2233	7.92	Lab notes WHC-GEL
Injection	299-E24-79	4/30/1980	2-2234	10.97	Lab notes WHC-GEL
Injection	299-E24-92	4/30/1980	2-2225	9.75	Lab notes WHC-GEL
Injection	299-E24-92	4/30/1980	2-2226	15.24	Lab notes WHC-GEL
Injection	299-E24-92	4/30/1980	2-2227	18.29	Lab notes WHC-GEL
Injection	299-E24-95	4/30/1980	1-1417	1.83	Lab notes WHC-GEL
Injection	299-E24-95	4/30/1980	1-1418	3.05	Lab notes WHC-GEL
Injection	299-E24-95	4/30/1980	1-1419	4.88	Lab notes WHC-GEL
Injection	299-E24-95	4/30/1980	2-1636	4.88	Lab notes WHC-GEL
Injection	299-E24-95	4/30/1980	2-2228	15.24	Lab notes WHC-GEL
Injection	299-E24-95	4/30/1980	2-2229	18.29	Lab notes WHC-GEL
MW-10	699-36-58A	9/23/1985	45	13.72	Bergeron et al. (1987), PNWD-1127
MW-10	699-36-58A	9/23/1985	86	26.21	Bergeron et al. (1987), PNWD-1127
MW-10	699-36-58A	9/23/1985	105	32.00	Bergeron et al. (1987), PNWD-1127
MW-10	699-36-58A	9/23/1985	125	38.10	Bergeron et al. (1987), PNWD-1127
MW-10	699-36-58A	9/23/1985	165	50.29	Bergeron et al. (1987), PNWD-1127
MW-10	699-36-58A	9/23/1985	195	59.44	Bergeron et al. (1987), PNWD-1127
MW-10	699-36-58A	9/23/1985	205	62.48	Bergeron et al. (1987), PNWD-1127
MW-10	699-36-58A	9/23/1985	245	74.68	Bergeron et al. (1987), PNWD-1127
MW-10	699-36-58A	9/23/1985	265	80.77	Bergeron et al. (1987), PNWD-1127
MW-10	699-36-58A	9/23/1985	285	86.87	Bergeron et al. (1987), PNWD-1127
MW-10	699-36-58A	9/23/1985	300	91.44	Bergeron et al. (1987), PNWD-1127
MW-5	699-35-58	10/31/1985	50	15.24	Bergeron et al. (1987), PNWD-1127
MW-5	699-35-58	10/31/1985	70	21.34	Bergeron et al. (1987), PNWD-1127
MW-5	699-35-58	10/31/1985	90	27.43	Bergeron et al. (1987), PNWD-1127
MW-5	699-35-58	10/31/1985	130	39.62	Bergeron et al. (1987), PNWD-1127
MW-5	699-35-58	10/31/1985	170	51.82	Bergeron et al. (1987), PNWD-1127
MW-5	699-35-58	10/31/1985	190	57.91	Bergeron et al. (1987), PNWD-1127
MW-5	699-35-58	10/31/1985	210	64.01	Bergeron et al. (1987), PNWD-1127
MW-5	699-35-58	10/31/1985	230	70.10	Bergeron et al. (1987), PNWD-1127
MW-5	699-35-58	10/31/1985	270	82.30	Bergeron et al. (1987), PNWD-1127
MW-5	699-35-58	10/31/1985	300	91.44	Bergeron et al. (1987), PNWD-1127
MW-8	699-36-58B	9/27/1985	14.5	4.42	Bergeron et al. (1987), PNWD-1127
MW-8	699-36-58B	9/27/1985	145	44.20	Bergeron et al. (1987), PNWD-1127
MW-8	699-36-58B	9/27/1985	185	56.39	Bergeron et al. (1987), PNWD-1127
VOC	299-W15-216	5/14/1992	3-0654	35.60	Lab notes WHC-GEL
VOC	299-W15-216	5/14/1992	3-0655	36.88	Lab notes WHC-GEL
VOC	299-W15-216	5/14/1992	3-0656	39.01	Lab notes WHC-GEL
VOC	299-W15-	5/14/1992	3-0657	37.37	Lab notes WHC-GEL

Site ID	Well ID	Drill Date	Sample ID	Sample Depth – Bottom (?) (m)	Reference
	216				
VOC	299-W18-246	3/23/1992	3-0647	42.92	Lab notes WHC-GEL
VOC	299-W18-246	3/23/1992	3-0648	59.56	Lab notes WHC-GEL
VOC	299-W18-247	5/6/1992	3-0649	41.12	Lab notes WHC-GEL
VOC	299-W18-247	5/6/1992	3-0650	45.11	Lab notes WHC-GEL
VOC	299-W18-247	5/6/1992	3-0651	46.94	Lab notes WHC-GEL
VOC	299-W18-248	1/0/1900	3-0652	38.40	Lab notes WHC-GEL
VOC	299-W18-248	1/0/1900	3-0653	42.52	Lab notes WHC-GEL
VZTFS	299-E24-111	3/31/1980	1	5.79	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	2	5.94	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	3	6.10	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	4	6.25	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	5	6.40	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	6	6.55	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	7	6.71	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	8	6.86	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	9	7.77	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	10	7.92	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	11	8.08	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	12	8.53	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	13	8.69	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	14	8.84	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	15	9.14	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	16	9.30	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	17	9.45	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	18	9.75	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	19	9.91	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	20	10.06	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	21	10.21	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	22	10.36	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	23	10.52	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	24	10.97	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	25	11.13	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	26	11.28	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	27	11.43	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	28	11.43	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	29	11.13	Schaap et al. (2003), PNNL-14284

Site ID	Well ID	Drill Date	Sample ID	Sample Depth – Bottom (?) (m)	Reference
VZTFS	299-E24-111	3/31/1980	30	11.58	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	31	11.89	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	32	12.04	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	33	12.19	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	34	4.27	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	35	5.33	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	36	6.71	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	37	7.32	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	38	6.86	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	39	8.53	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	40	9.75	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	41	10.36	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	42	10.97	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	43	11.43	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	44	11.58	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	45	16.00	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	46	5.03	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	47	5.64	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	48	6.10	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	49	6.25	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	50	6.86	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	51	7.47	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	52	8.08	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	53	8.84	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	54	10.06	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	55	10.21	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	56	10.67	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	57	11.28	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	58	13.56	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	59	14.63	Schaap et al. (2003), PNNL-14284
VZTFS	299-E24-111	3/31/1980	60	16.92	Schaap et al. (2003), PNNL-14284
W-049-H	699-40-36	10/23/1992	3-0001	29.30	Lab notes WHC-GEL
W-049-H	699-40-36	10/23/1992	3-0003	65.80	Lab notes WHC-GEL
W-049-H	699-40-39	8/7/1989	2-3084	24.70	Lab notes WHC-GEL
W-049-H	699-41-35	10/5/1992	2-3085	31.50	Lab notes WHC-GEL
W-049-H	699-42-37	10/14/1992	2-2865	38.70	Lab notes WHC-GEL
W-049-H	699-42-37	10/14/1992	2-3088	4.60	Lab notes WHC-GEL
W-049-H	699-42-37	10/14/1992	2-3089	28.30	Lab notes WHC-GEL

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