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Calendar Year 2003 RCRA Groundwater Monitoring Well Summary Report

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management
Project Hanford Management Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

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P.O. Box 1000
Richland, Washington

Calendar Year 2003 RCRA Groundwater Monitoring Well Summary Report

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CH2M Hill Hanford Group, Inc.

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Summary Report

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ACRONYMS

bgs	below ground surface
CHG	CH2M Hill Hanford Group, Inc.
CY	calendar year
DTS	Duratek Technical Services
FH	Fluor Hanford, Inc.
ft	feet
gpm	gallons per minute
ID	inner diameter
IH	Industrial Hygiene
MDL	minimum detectable limit
NTU	Nephelometric Turbidity Unit
OD	outer diameter
OU	Operable Unit
PNNL	Pacific Northwest National Laboratory
ppm	parts per million
psi	pound per square inch
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
SGLS	Spectral Gamma Logging System
RCT	Radiological Control Technician
TD	total depth
WAC	<i>Washington Administrative Code</i>
WMA	waste management area

METRIC CONVERSION CHART

Into Metric Units		
<i>If You Know</i>	<i>Multiply By</i>	<i>To Get</i>
Length		
inches	25.4	millimeters
inches	2.54	Centimeters
feet	0.305	Meters
yards	0.914	Meters
miles	1.609	Kilometers
Area		
sq. inches	6.452	sq. centimeters
sq. feet	0.093	sq. meters
sq. yards	0.0836	sq. meters
sq. miles	2.6	sq. kilometers
Acres	0.405	Hectares
Mass (weight)		
Ounces	28.35	Grams
Pounds	0.454	Kilograms
Ton	0.907	metric ton
Volume		
Teaspoons	5	Milliliters
Tablespoons	15	Milliliters
fluid ounces	30	Milliliters
Cups	0.24	Liters
Pints	0.47	Liters
Quarts	0.95	Liters
Gallons	3.8	Liters
cubic feet	0.028	cubic meters
cubic yards	0.765	cubic meters
Temperature		
Fahrenheit	subtract 32, then multiply by 5/9	Celsius
Radioactivity		
Picocuries	37	Millibecquerel

Out of Metric Units		
<i>If You Know</i>	<i>Multiply By</i>	<i>To Get</i>
Length		
millimeters	0.039	inches
centimeters	0.394	inches
meters	3.281	feet
meters	1.094	yards
kilometers	0.621	miles
Area		
sq. centimeters	0.155	sq. inches
sq. meters	10.76	sq. feet
sq. meters	1.196	sq. yards
sq. kilometers	0.4	sq. miles
hectares	2.47	acres
Mass (weight)		
grams	0.035	ounces
kilograms	2.205	pounds
metric ton	1.102	ton
Volume		
milliliters	0.033	fluid ounces
liters	2.1	pints
liters	1.057	quarts
liters	0.264	gallons
cubic meters	35.315	cubic feet
cubic meters	1.308	cubic yards
Temperature		
Celsius	multiply by 9/5, then add 32	Fahrenheit
Radioactivity		
millibecquerel	0.027	picocuries

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1.0 INTRODUCTION

This report describes the calendar year (CY) 2003 field activities associated with the installation of two new groundwater monitoring wells in the A-AX Waste Management Area (WMA) and four groundwater monitoring wells in WMA C in the 200 East Area of the Hanford Nuclear Reservation. All six wells were installed by Fluor Hanford Inc. (FH) for CH2M Hill Hanford Group, Inc. (CHG) in support of Draft Hanford Facility Agreement and Consent Order (Tri-Party Agreement) M-24-00 milestones and *Resource Conservation and Recovery Act of 1976* (RCRA) groundwater monitoring requirements. Drilling data for the six wells are summarized in Table 1.

1.1 PURPOSE AND SCOPE

Based on local hydrographs and colloidal borescope measurements, it has been determined that the groundwater flow at WMA A-AX is to the southeast. The existing well network had been designed for groundwater flow to the southwest (PNNL-14187, 2002). Changes in the groundwater flow have created the need for additional wells to be installed in the vicinity of WMA A-AX. An upgradient and a downgradient location were selected and the boreholes were drilled and completed as groundwater monitoring wells. See Figure 1 for the WMA A-AX well location map.

Groundwater flow in WMA C is to the southwest based on in situ flow measurements, plume tracking, and water elevations that were corrected for borehole deviations from vertical. The existing monitoring network had been designed when groundwater flow had been due west (PNNL-14187, 2002). These changes in groundwater flow have created the need for additional wells to be installed in the vicinity of WMA C. The existing monitoring wells are cross-gradient to the southwesterly groundwater flow with the exception of one functioning downgradient well. Lack of adequate monitoring wells prompted three downgradient wells and one upgradient well to be placed in the vicinity of WMA C to ensure compliance with RCRA regulations. See Figure 2 for the WMA C well location map.

Descriptions of drilling, geophysical logging, sieve analyses, well construction information, well development, well deviation surveys and pump installations for the WMA A-AX wells are presented in Section 2.0. Section 3.0 describes similar activities for WMA C. Sections 4.0, 5.0, and 6.0 discuss waste management, civil survey, and well acceptance walkdown, respectively, for WMA A-AX and WMA C. Section 7.0 describes subsurface conditions encountered at WMAs A-AX and C, and Section 8.0 cites the references used. Well summary sheets and geologic borehole logs are included in Appendix A. Geophysical logging data are presented in Appendix B. Sieve analysis data are included in Appendix C. Well construction summary reports are listed in Appendix D. Appendix E contains well development data. Appendix F contains well deviation survey data. Pump installation data are in Appendix G.

All drilling activities were documented in accordance with CP-GPP-EE-02-14.0, Rev. 0, "Drilling, Maintaining, Remediation, and Decommissioning Resource Protection Wells, GeoProbe and Geotechnical Soil Borings." A geologic log was prepared for each well in

accordance with CP-GPP-EE-01-7.0, Rev. 0, "Geologic Logging". Drilling data in this report are presented in the English units in which they were measured.

Figure 2. WMA C Site Location Map.

Table 1. Drilling Summary of Boreholes and Wells Listed Chronologically Based on Drilling Start Date.

Well Name	Well ID	Operable Unit	Drilling Date		Northing (m)	Easting (m)	Ground Surface Elevation ^a (Brass Cap) (m)	Total Depth (ft bgs)
			Start	Finish				
299-E25-93	C4122	WMA A-AX	07/01/03	07/02/03	136022.09	575471.51	207.265	320
299-E24-22	C4123	WMA A-AX	07/10/03	07/11/03	136142.82	57262.68	209.553	330
299-E27-21	C4127	WMA C	07/21/03	07/21/03	136407.21	575145.03	204.995	318
299-E27-20	C4126 ^b	WMA C	07/28/03	07/31/03	136455.88	575067.36	205.447	278.5
299-E27-23	C4190 ^c	WMA C	08/05/03	08/05/03	136452.23	575069.46	205.661	318
299-E27-4	C4125	WMA C	08/12/03	08/14/03	136497.92	575032.02	204.685	311
299-E27-22	C4124	WMA C	08/21/03	09/05/03	136685.33	575185.10	192.604	268

NOTE:

Northing and easting coordinates are based on Washington State Plane Coordinates North American Datum of 1983 (NAD83[91]) rounded to 1 m.

^aNorth American Vertical Datum of 1988 (NAVD88) values rounded to 0.001 m.

^bRefusal at 278.5 ft bgs. Borehole decommissioned and new one drilled at C4190.

^cReplaced C4126 as groundwater monitoring well.

bgs = below ground surface

NS = survey data not available at this time.

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2.0 WASTE MANAGEMENT AREA A-AX

This section provides details of methods used to install two groundwater monitoring wells in the vicinity of WMA A-AX (See Figure 1). Drilling was performed in accordance with *Description of Work for Drilling RCRA Groundwater Monitoring Wells During Calendar Year 2003*, (PNNL-SA-38611, January 2003). Drilling data are presented in Table 1 and well summary information is located in Appendix A.

2.1 WELL 299-E25-93 (C4122)

This section contains a summary and description of drilling, geophysical logging, sieve analyses, well completion, well development, well deviation survey, and pump installation activities performed during the installation of well 299-E25-93 (C4122).

2.1.1 Drilling Summary

Well 299-E25-93 (C4122) was drilled using a dual wall percussion method (Becker Hammer) on July 1, 2003, advancing an outer 9-inch outside diameter (OD), and inner 6-inch inside diameter (ID) temporary casing. Groundwater was encountered approximately 278 ft below ground surface (bgs) on July 1, 2003. Archive samples (1-pint jars) were collected at five-foot intervals and delivered to Pacific Northwest National Laboratory (PNNL). Attempts to collect split-spoon samples (without liners) for grain size distribution analysis were made in the saturated zone; however, there was insufficient recovery for analysis so samples were collected directly from the cyclone (see Table 2). In the opinion of the well-site geologist, the saturated zone samples collected from the cyclone were representative of the formation. The borehole and temporary casing were advanced to a total depth of 320 ft bgs on July 2, 2003.

2.1.2 Geophysical Logging

Geophysical logging was performed by Stoller Company on July 7, 2003 using the Spectral Gamma Logging System (SGLS). A Gamma 2E probe was used to log the borehole and perform a repeat run. Cs^{137} , the only man-made radionuclide in this borehole, was detected near ground surface with maximum concentration of 4.9 pCi/g detected at 0-ft depth. Cs^{137} was also detected at a few sporadic locations throughout the borehole near its minimum detectable limit (MDL) of approximately 0.3 pCi/g. See Appendix B for geophysical logging data.

2.1.3 Sieve Analysis

Sieve analyses for well 299-E25-93 (C4122) were performed on July 7, 2003 using [®]Endecotts Octagon Digital Variable Amplitude Test Sieve Shaker Assembly according to manufacturer's instructions and "Particle Size Distribution of Soil-Wet Sieve Analysis", (CP-GPP-EE-05-1.21, Rev 0). See Table 2 for corresponding sample depths. Grain size distribution curves are plotted and summarized in Appendix C.

2.1.4 Well Completion

Well construction materials, filter pack installation, initial well development, and annular seal for well 299-E25-93 (C4122) are discussed in the following subsections. A well completion summary is provided in Table 3 and well construction summary sheets are presented in Appendix D.

2.1.4.1 Screen, Riser Casing, and Filter Pack. A 4-inch ID, thirty-five foot long, 20-slot (0.020-in) continuous v-wire wrap stainless steel screen, two-foot sump, and 10-20 mesh filter pack sand were pre-selected for this well based on data from nearby wells and anticipated formation characteristics. The bottom of the 4-inch ID sump was placed at 315.26 ft bgs. The bottom of the screen was set at 313.26 ft bgs and the top at 278.23 ft bgs. The top of the 4-inch ID riser casing was set 2 ft above ground surface. The borehole was backfilled with 10-20 mesh filter pack sand from 320 to 273.1 ft bgs (approximately 5 feet above top of screen).

2.1.4.2 Filter Pack Installation and Initial Well Development. The objectives when installing filter pack material are to introduce silica sand into annular space around the screen, settle filter pack to eliminate void spaces, and begin removal of fines and recondition the borehole walls from effects of drilling. A dual-flange surge block was used to develop and settle the filter pack material opposite the screen. Care was taken to maintain overlap between the filter sand and temporary casing so that formation material would not cave in against the well screen. Filter pack level was measured periodically with a weighted tape to monitor progress and ensure integrity of the completion. Bottom of the well was also checked for fill material to determine if any fine material was accumulating in the screen during surging. This material was removed as needed.

2.1.4.3 Annular Seal. An annular seal was constructed above the filter pack using 1/4-in bentonite pellets from 268.5 to 273.1 ft bgs, and granular bentonite from 10.5 to 268.5 ft bgs. A grout seal was placed from 10.5 ft to surface, and consisted of Portland cement mixed with no more than 5% bentonite by weight, in accordance with *Washington Administrative Code* (WAC) 173-160.

[®] Endecotts Octagon Digital Variable Amplitude Test Sieve Shaker Assembly is a copyright of Endecotts, LTD., London, England.

2.1.5 Final Well Development and Pumping Test

Final well development for 299-E-93 (C4122) was performed on August 14, 2003. A 5-HP Franklin electric submersible pump was used to pump at three depth intervals until turbidity was less than 5 Nephelometric Turbidity Units (NTU) and other water parameters had stabilized (temperature and conductivity). Water level drawdown during pumping was monitored using a 20 psi pressure transducer and was recorded with an In-Situ Hermit 3000 datalogger. During the first test, pump was operated with intake at the bottom of well screen at a flow rate of 25.5 gpm with a final turbidity of 1.26 NTU. Pump intake was raised to 10.8 feet above bottom of screen and pumping resumed until turbidity was again below 5 NTU. Flow rate for the second interval was 26 gpm with a final turbidity of 0.83 NTU. Pump intake was raised to 20.8 feet above bottom of screen and pumping resumed until turbidity was below 5 NTU. Flow rate for the third interval was 26 gpm with a final turbidity of 1.19 NTU. Each interval had negligible drawdown (< 0.2 ft); therefore, neither drawdown nor recovery curves are available. Final groundwater parameters are presented in Table 4 and well development data are in Appendix E.

2.1.6 Well Deviation Survey

Well deviation surveys were completed by Duratek Technical Services (DTS) on August 21, 2003. Maximum inclination was 0.9 degrees. Borehole bottom coordinates (relative to surface) are: North: 0.76 feet and East: 2.29 feet. Survey data are included in Appendix F.

2.1.7 Pump Installation

Pump installation was done on September 19, 2003. A 0.7-HP electric submersible pump (™ Grundfos RediFlo3) was set with the intake valve 283.1 ft bgs (286.1 ft below top of protective casing). Pump installation details are listed in Appendix G.

2.2 WELL 299-E24-22 (C4123)

This section contains a summary and description of drilling, geophysical logging, sieve analyses, well completion, well development, well deviation survey, and pump installation activities performed during the installation of well 299-E24-22 (C4123).

2.2.1 Drilling Summary

Well 299-E24-22 (C4123) was drilled using a dual wall percussion method (Becker Hammer) on July 10, 2003, advancing an outer 9-inch OD, and inner 6-inch ID temporary casing. Groundwater was encountered approximately 286 ft bgs on July 11, 2003. Archive samples (1-pint jars) were collected at five-foot intervals and delivered to PNNL. A split-spoon sample

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(without liners) for grain size distribution analysis was collected in the saturated zone from 286 to 288.5 ft bgs; however, the second sample for grain size distribution at 321 ft bgs was collected directly from the cyclone due to large cobbles encountered in the formation (see Table 2). In the opinion of the well-site geologist, the saturated zone sample collected from the cyclone was representative of the formation. The borehole and temporary casing were advanced to a total depth of 330 ft bgs on July 11, 2003.

2.2.2 Geophysical Logging

Geophysical logging was performed by Stoller Company on July 12, 14, and 15, 2003 using the Spectral Gamma Logging System (SGLS). A Gamma 2A probe was used to log the borehole and perform a repeat run. Cs^{137} , the only man-made radionuclide in this borehole, was detected at a few sporadic locations near the MDL of approximately 0.2 pCi/g. See Appendix B for geophysical logging data.

2.2.3 Sieve Analysis

Sieve analyses for well 299-E24-22 (C4123) were performed on July 14, 2003 using [®]Endecotts Octagon Digital Variable Amplitude Test Sieve Shaker Assembly according to manufacturer's instructions and "Particle Size Distribution of Soil-Wet Sieve Analysis", (CP-GPP-EE-05-1.21, Rev 0). See Table 2 for corresponding sample depths. Grain size distribution curves are plotted and summarized in Appendix C.

2.2.4 Well Completion

Well construction materials, filter pack installation, initial well development, and annular seal for well 299-E24-22 (C4123) are discussed in the following subsections. A summary of well completion is provided in Table 3 and well construction summary sheets are presented in Appendix D.

2.2.4.1 Screen, Riser Casing, and Filter Pack. A 4-inch ID, thirty-five foot 20-slot (0.020-in) continuous v-wire wrap stainless steel screen, two-foot sump, and 10-20 mesh filter pack sand were pre-selected for this well based on data from nearby wells and anticipated formation characteristics. The bottom of the 4-inch ID sump was placed at 323.68 ft bgs. The bottom of the screen was set at 321.26 ft bgs and the top at 286.21 ft bgs. The top of the 4-in ID riser casing was set 2 ft above ground surface. The borehole was backfilled with 10-20 mesh filter pack sand from 330 to 281.1 ft bgs (approximately 5 ft above the top of the screen).

2.2.4.2 Filter Pack Installation and Initial Well Development. The objectives when installing filter pack material are to introduce silica sand into annular space around the screen, settle filter pack to eliminate void spaces, and begin removal of fines and recondition the borehole walls from effects of drilling. A dual-flange surge block was used to develop and settle the filter pack material opposite the screen. Care was taken to maintain overlap between the filter sand and temporary casing so that formation material would not cave in against the well

screen. Filter pack level was measured periodically with a weighted tape to monitor progress and ensure integrity of the completion. Bottom of the well was also checked for fill material to determine if any fine material was accumulating in the screen during surging. This material was removed as needed.

2.2.4.3 Annular Seal. An annular seal was constructed above the filter pack using 1/4-in bentonite pellets from 276.1 to 281.1 ft bgs, and granular bentonite from 10 to 276.1 ft bgs. A grout seal was placed from 10 ft bgs to surface, and consisted of Portland cement mixed with no more than 5% bentonite by weight, in accordance with WAC 173-160.

2.2.5 Final Well Development and Pumping Test

Final well development for well 299-E24-22 (C4123) was performed on September 8, 2003. A 5-HP Franklin electric submersible pump was used at three depths intervals until turbidity was less than 5 NTU and other water parameters had stabilized (temperature and conductivity). Water level drawdown during pumping was monitored using a 20 psi pressure transducer and recorded with an In-Situ Hermit 3000 datalogger. During the first test, pump was operated with intake at the bottom of well screen at a flow rate of 22.5 gpm with a final turbidity of 2.31 NTU. Pump intake was raised to 10.3 feet above bottom of screen and pumping resumed until turbidity was again below 5 NTU. Flow rate for the second interval was 24 gpm with a final turbidity of 2.25 NTU. Pump intake was raised to 21.4 feet above bottom of screen and pumping resumed until turbidity was below 5 NTU. Flow rate for the third interval was 25 gpm with a final turbidity of 3.14 NTU. During the recovery test a problem developed with the datalogger and no data were recorded. Each interval had negligible drawdown (< 0.1 ft); therefore, neither drawdown nor recovery curves are available. Final groundwater parameters are presented in Table 4 and well development data are in Appendix E.

2.2.6 Well Deviation Survey

Well deviation surveys (Gyroscope) were completed by Duratek Technical Services (DTS) on August 22, 2003. Maximum inclination was 4.5 degrees. Borehole bottom coordinates (relative to surface) are: North: 5.85 feet and East: 10.65 feet. Survey data are included in Appendix F.

2.2.7 Pump Installation

Pump installation was performed on September 8, 2003. A 0.7-HP electric submersible pump (TMGrundfos RediFlo3) was set with the intake valve 292.9 ft bgs (295.9 ft below top of protective casing). Pump installation details are listed in Appendix F.

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3.0 WASTE MANAGEMENT AREA C

This section provides details of methods used to install four groundwater monitoring wells in the vicinity of WMA C (See Figure 2). Drilling was performed in accordance with *Description of Work for Drilling RCRA Groundwater Monitoring Wells During Calendar Year 2003*, (PNNL-SA-38611, January 2003). Drilling data are presented in Table 1 and well summary information is located in Appendix A.

3.1 WELL 299-E27-21 (C4127)

This section contains a summary and description of drilling, geophysical logging, sieve analyses, well completion, well development, well deviation survey, and pump installation activities performed during the installation of well 299-E27-21 (C4127).

3.1.1 Drilling Summary

Well 299-E27-21 (C4127) was drilled using a dual wall percussion method (Becker Hammer) on July 10, 2003, advancing an outer 9-inch OD, and inner 6-inch ID temporary casing. Groundwater was encountered approximately 276 ft bgs on July 21, 2003. Archive samples (1-pint jars) were collected at five-foot intervals and delivered to PNNL. Samples for grain size distribution analysis taken in the saturated zone from 277 to 280 ft bgs and 312 to 315 ft bgs were collected directly from the cyclone due to poor recovery rates from previous attempts at WMA A-AX (see Table 2). In the opinion of the well-site geologist, the saturated zone samples collected from the cyclone were representative of the formation. The borehole and temporary casing were advanced to a total depth of 318 ft bgs on July 21, 2003.

3.1.2 Geophysical Logging

Geophysical logging was performed by Stoller Company on July 21 and 22, 2003 using the SGLS. A Gamma 1E probe was used to log the borehole and perform a repeat run. Cs^{137} was detected at a few sporadic locations throughout the borehole near the MDL of approximately 0.2 pCi/g. See Appendix B for geophysical logging data.

3.1.3 Sieve Analysis

Sieve analyses for well 299-E27-21 (C4127) were performed on July 22, 2003 using [®]Endecotts Octagon Digital Variable Amplitude Test Sieve Shaker Assembly according to manufacturer's instructions and "Particle Size Distribution of Soil-Wet Sieve Analysis", CP-GPP-EE-05-1.21, Rev 0. See Table 2 for corresponding sample depths. Grain size distribution curves are plotted and summarized in Appendix C.

3.1.4 Well Completion

Well construction materials, filter pack installation and initial well development, and annular seal for well 299-E27-21 (C4127) are discussed in the following subsections. A summary of well completion is provided in Table 3 and well construction summary sheets are presented in Appendix D.

3.1.4.1 Screen, Riser Casing, and Filter Pack. A 4-inch ID thirty-five foot long, 20-slot (0.020 inch) continuous v-wire wrap stainless steel screen, two-foot sump, and 10-20 mesh filter pack sand were pre-selected for this well based on data from nearby wells and anticipated formation characteristics. The bottom of the 4-inch ID sump was placed at 308.83 ft bgs. The bottom of screen was set at 306.43 ft bgs and the top at 271.37 ft bgs. The top of the 4-inch ID stainless steel riser casing was set 2 ft above ground surface. The borehole was backfilled with 4-8 mesh filter pack sand from 318 to 314 ft bgs and 10-20 mesh filter pack sand from 314 to 265.5 ft bgs (approximately 5 feet above top of screen).

3.1.4.2 Filter Pack Installation and Initial Well Development. The objectives when installing filter pack material are to introduce silica sand into annular space around the screen, settle filter pack to eliminate void spaces, and begin removal of fines and recondition the borehole walls from effects of drilling. A dual-flange surge block was used to develop and settle the filter pack material opposite the screen. Care was taken to maintain overlap between the filter sand and temporary casing so that formation material would not cave in against the well screen. Filter pack level was measured periodically with a weighted tape to monitor progress and ensure integrity of the completion. Bottom of the well was also checked for fill material to determine if any fine material was accumulating in the screen during surging. This material was removed as needed.

3.1.4.3 Annular Seal. An annular seal was constructed above the filter pack using 1/4-in bentonite pellets from 260.4 to 265.5 ft bgs, and granular bentonite from 10.1 to 265.5 ft bgs. A grout seal was placed from 10.1 ft to surface, and consisted of Portland cement mixed with no more than 5% bentonite by weight, in accordance with *Washington Administrative Code* (WAC) 173-160.

3.1.5 Final Well Development and Pumping Test

Final well development was performed on August 28, 2003 using a 5-HP Franklin electric submersible pump. Well development was done at three depth intervals until turbidity was less than 5 NTU and other water parameters had stabilized (temperature and conductivity). Drawdown of the water level during pumping was to be monitored using a 20 psi pressure transducer and recorded with an In-Situ Hermit 3000 datalogger. However, there was a problem with either the transducer or the Hermit datalogger; therefore, the drawdown was measured with an E-tape. During the first test, pump was operated with intake 3.3 feet from the bottom of well screen at a flow rate of 23 gpm, and a final turbidity of 1.24 NTU. Pump intake was raised to 12.3 feet above bottom of screen and pumping resumed until turbidity was again below 5 NTU. Flow rate for the second interval was 23.5 gpm with a final turbidity of 1.64 NTU. Pump intake was raised to 24.4 feet above bottom of screen and pumping resumed until turbidity was below 5

NTU. Flow rate for the third interval was 21 gpm with a final turbidity of 1.83 NTU. Each interval had negligible drawdown (< 0.1 ft); therefore, neither drawdown nor recovery curves are available. Final groundwater parameters are presented in Table 4 and well development data are in Appendix E.

3.1.6 Well Deviation Survey

Well deviation surveys (Gyroscope) were completed by Duratek Technical Services (DTS) on September 10, 2003. Maximum inclination was 6.48 degrees. Borehole bottom coordinates (relative to surface) are: South: -5.76 feet and West: 20.93 feet. Survey data are included in Appendix F.

3.1.7 Pump Installation

Pump installation was performed on September 18, 2003. A 0.7-HP electric submersible pump (TMGrundfos RediFlo3) was set with the intake valve 278.1 ft bgs (281.1 ft below top of protective casing). Pump installation details are listed in Appendix G.

3.2 WELL 299-E27-20 (C4126)

This section contains a summary and description of drilling, sieve analysis, and well decommissioning activities of borehole 299-E27-20 (C4126).

3.2.1 Drilling Summary

Borehole 299-E27-20 (C4126) was drilled using a dual wall percussion method (Becker Hammer) on July 28, 2003, advancing an outer 9-inch OD, and inner 6-inch ID temporary casing. Groundwater was encountered approximately 273 ft bgs on July 29, 2003. Archive samples (1-pint jars) were collected at five-foot intervals and delivered to PNNL. Three archive samples (20, 25, and 30 ft bgs) were delivered to CHG to be analyzed for ammonia content; however, sample results were inconclusive. The sample for grain size distribution analysis taken in the saturated zone from 275 to 277 ft bgs was collected directly from the cyclone due to poor recovery rates from previous attempts at WMA A-AX (see Table 2). In the opinion of the well-site geologist, the saturated zone sample collected from the cyclone was representative of the formation. The borehole had refusal at a depth of 278.5 ft bgs (temporary casing 278.5 ft bgs) on July 28, 2003. Attempts to drill deeper on July 29 and 31, 2003 were unsuccessful. Decision was made on July 31, 2003 to decommission the existing borehole and to redrill a new one (299-E27-23/C4190), approximately 10 feet south of current location.

Borehole 299-E27-20 (C4126) was considered low risk for radiological contaminants and organic vapors, and required AM/PM checks from the Radiological Control Technician (RCT) and Industrial Hygiene Technician (IH). However, during a routine AM check by the IH tech, ammonia readings of 20 ppm were detected in the borehole, 7 ppm on the spoils pile, and 5 ppm in the breathing zone. The IH technician provided continuous monitoring to 270 ft bgs when

ammonia readings were less than detectable. From 20 to 260 ft bgs ammonia readings ranged from 3 ppm to 22 ppm inside the borehole.

Due to the presence of ammonia, the RCT returned to the site to provide continuous radiological coverage. The RCT surveyed spoils pile and detected elevated alpha and beta/gamma readings; although no readings reached an action level. Background readings on the sodium iodide meter that measures gamma were 2200 cpm; in the spoils pile between 50 to 60 feet, gamma readings were slightly less than 3000 cpm. These readings remained steady to 200 ft bgs, where gamma dropped to background levels. RCT coverage returned to AM/PM checks to TD.

3.2.2 Sieve Analysis

Sieve analysis for well 299-E27-20 (C4126) was performed on July 30, 2003 using [®]Endecotts Octagon Digital Variable Amplitude Test Sieve Shaker Assembly according to manufacturer's instructions and "Particle Size Distribution of Soil-Wet Sieve Analysis", CP-GPP-EE-05-1.21, Rev 0. See Table 2 for corresponding sample depths. Grain size distribution curves are plotted and summarized in Appendix C.

3.2.3 Well Decommission

Borehole 299-E27-20 (C4126) was decommissioned on August 8, 2003. A 10-20 mesh filter sand pack was placed from 278.5 to 262.8 ft bgs. Granular bentonite was placed 262.8 to 10.3 ft bgs. Quick-Crete Cement was placed from 10.3 ft bgs to ground surface. A well construction summary sheet is presented in Appendix D.

3.3 WELL 299-E27-23 (C4190)

This section contains a summary and description of drilling, geophysical logging, sieve analysis, well completion, well development, well deviation survey, and pump installation activities performed during the installation of well 299-E27-23 (C4190).

3.3.1 Drilling Summary

Well 299-E27-23 (C4190) was drilled to replace C4126, as discussed in the previous section, using a dual wall percussion method (Becker Hammer) on August 5, 2003, advancing an outer 9-inch OD, and inner 6-inch ID temporary casing. Groundwater was encountered approximately 273 ft bgs on August 5, 2003. Archive samples (1-pint jars) were not collected until 280 ft bgs due to proximity of decommissioned borehole C4126 and similarity of lithologies; archive samples were delivered to PNNL. A sample for grain size distribution analysis taken in the saturated zone from 310 to 312 ft bgs was collected directly from the cyclone due to poor recovery rates from previous attempts at WMA A-AX (see Table 2). In the opinion of the well-site geologist, the saturated zone sample collected from the cyclone was representative of the formation. The borehole and temporary casing were advanced to a total depth of 318 ft bgs on August 5, 2003.

3.3.2 Geophysical Logging

Geophysical logging was performed by Stoller Company on August 7 and 8, 2003 using the SGLS. A Gamma 1E probe was used to log the borehole and perform a repeat run. Cs^{137} , the only man-made radionuclide in this borehole, was detected near ground surface at the 2 foot depth and in the interval from 11 to 13 feet bgs at concentrations ranging from the MDL (0.3 pCi/g) to 0.6 pCi/g. Maximum concentration was measured at 12 feet bgs. Cs^{137} was also detected at log depths of 65, 130, and 218 feet with concentrations near the MDL.

Plots of the repeat logs demonstrate reasonable repeatability of the SGLS. The natural radionuclides at energy levels of 609, 1461, 1764, and 2614 keV are comparable between the repeat and original SGLS log runs. Cs^{137} encountered at 130 feet on the original log run did not repeat. See Appendix B for geophysical logging data.

3.3.3 Sieve Analysis

Sieve analysis for well 299-E27-23 (C4190) was performed on August 6, 2003 using [®]Endecotts Octagon Digital Variable Amplitude Test Sieve Shaker Assembly according to manufacturer's instructions and "Particle Size Distribution of Soil-Wet Sieve Analysis", CP-GPP-EE-05-1.21, Rev 0. See Table 2 for corresponding sample depths. Grain size distribution curves are plotted and summarized in Appendix C.

3.3.4 Well Completion

Well construction materials, filter pack installation and initial well development, and annular seal for well 299-E27-23 (C4190) are discussed in the following subsections. A summary of well completion is provided in Table 3 and well construction summary sheets are presented in Appendix D.

3.3.4.1 Screen, Riser Casing, and Filter Pack. A 4-inch ID thirty-five foot long, 20-slot (0.020-inch) continuous v-wire wrap stainless steel screen, two-foot sump, and 10-20 mesh filter pack sand were pre-selected for this well based on data from nearby wells and anticipated formation characteristics. The bottom of the 4-inch ID sump was placed at 310.97 ft bgs. The bottom of screen was set at 308.54 ft bgs and the top of the screen at 273.51 ft bgs. Top of the 4-inch ID stainless steel riser casing was set 1.8 ft above ground surface. The borehole was backfilled with 10-20 mesh filter pack sand from 318 to 267.8 ft bgs, approximately 5 ft above top of screen.

3.3.4.2 Filter Pack Installation and Initial Well Development. The objectives when installing filter pack material are to introduce silica sand into annular space around the screen, settle filter pack to eliminate void spaces, and begin removal of fines and recondition the borehole walls from effects of drilling. A dual-flange surge block was used to develop and settle the filter pack material opposite the screen. Care was taken to maintain overlap between the filter sand and temporary casing so that formation material would not cave in against the well screen. Filter pack level was measured periodically with a weighted tape to monitor progress and ensure

integrity of the completion. Bottom of the well was also checked for fill material to determine if any fine material was accumulating in the screen during surging. This material was removed as needed.

3.3.4.3 Annular Seal. An annular seal was constructed above the filter pack using 1/4-in bentonite pellets from 263 to 267.8 ft bgs, and granular bentonite from 9.9 to 267.8 ft bgs. A grout seal was placed from 9.9 ft to surface, and consisted of Portland cement mixed with no more than 5% bentonite by weight, in accordance with *Washington Administrative Code* (WAC) 173-160.

3.3.5 Final Well Development and Pumping Test

Final well development was performed on September 2, 2003 using a 5-HP Franklin electric submersible pump. Well development was done at three depth intervals until turbidity was less than 5 NTU and other water parameters had stabilized (temperature and conductivity). Drawdown of the water level during pumping was monitored using a 20 psi pressure transducer and was recorded with an In-Situ Hermit 3000 datalogger. During the first test, pump was operated with intake 1.1 feet from the bottom of well screen at a flow rate of 24.5 gpm, and a final turbidity of 3.93 NTU. Pump intake was raised to 13.1 feet above bottom of screen and pumping resumed until turbidity was again below 5 NTU. Flow rate for the second interval was 26 gpm with a final turbidity of 0.74 NTU. Pump intake was raised to 23.1 feet above bottom of screen and pumping resumed until turbidity was below 5 NTU. Flow rate for the third interval was 6 gpm with a final turbidity of 3.00 NTU. The datalogger stopped working during the third test and no data were recorded. Each interval had negligible drawdown (< 0.2 ft); therefore neither drawdown nor recovery curves are available. Final groundwater parameters are presented in Table 4 and well development data are in Appendix E.

3.3.6 Well Deviation Survey

Well deviation surveys were completed by Duratek Technical Services (DTS) on August 25, 2003. Maximum inclination was 3.64 degrees. Borehole bottom coordinates (relative to surface) are: North: 0.46 feet and East: 8.29 feet. Survey data are included in Appendix F.

3.3.7 Pump Installation

Pump installation was performed on September 18, 2003. A 0.7-HP electric submersible pump (TMGrundfos RediFlo3) was set with the intake valve 278.1 ft bgs (281.1 ft below top of protective casing). Pump installation details are listed in Appendix G.

3.4 WELL 299-E27-4 (C4125)

This section contains a summary and description of drilling, geophysical logging, sieve analysis, well completion, well development, well deviation survey, and pump installation activities performed during the installation of well 299-E27-4 (C4125).

3.4.1 Drilling Summary

Well 299-E27-4 (C4125) was considered medium radiological risk from 0 to 30 ft bgs; therefore continuous Radiological Control Technician (RCT) and Industrial Hygiene Technician (IH) coverage were required. From 30 ft to TD, the borehole was considered low risk; RCT and IH coverage was A.M./P.M. checks only. Drilling began on August 12, 2003 using a hollow stem auger inside a 10-inch ID carbon steel temporary casing from ground surface to 30 ft bgs. No radiological contamination was detected above background levels. From 30 ft to TD, the borehole was drilled using a dual wall percussion method (Becker Hammer) advancing an outer 9-inch OD, and inner 6-inch ID temporary casing. Groundwater was encountered approximately 270.6 ft bgs on August 14, 2003. Archive samples (1-pint jars) were collected at five-foot intervals and delivered to PNNL. Samples for grain size distribution analysis taken in the saturated zone from 270 to 271 ft bgs and 301 to 303 ft bgs were collected directly from the cyclone due to poor recovery rates from previous attempts at WMA A-AX (see Table 2). In the opinion of the well-site geologist, the saturated zone samples collected from the cyclone were representative of the formation. The borehole and temporary casing were advanced to a total depth of 311 ft bgs on August 14, 2003.

3.4.2 Geophysical Logging

Geophysical logging was performed by Stoller Company on August 15 and 16, 2003 using the SGLS. A Gamma 1E probe was used to log the borehole and perform a repeat run. Cs^{137} , the only man-made radionuclide in this borehole, was detected at a few sporadic locations near the MDL of approximately 0.2 pCi/g.

3.4.3 Sieve Analysis

Sieve analyses for well 299-E27-4 (C4125) were performed on August 14, 2003 using ©Endecotts Octagon Digital Variable Amplitude Test Sieve Shaker Assembly according to manufacturer's instructions and "Particle Size Distribution of Soil-Wet Sieve Analysis", CP-GPP-EE-05-1.21, Rev 0. See Table 2 for corresponding sample depths. Grain size distribution curves are plotted and summarized in Appendix B.

3.4.4 Well Completion

Well construction materials, filter pack installation and initial well development, and annular seal for well 299-E27-4 (C4125) are discussed in the following subsections. During well completion the driller had trouble tagging bottom, and a stainless steel weight and 240 ft of measuring tape broke off in the annulus of the borehole. The permanent casing was removed and the borehole was redrilled to a depth of 309 ft bgs. Although the measuring tape was retrieved, the stainless steel weight was not and it remains approximately 309 ft bgs. A summary of well completion is provided in Table 3 and well construction summary sheets are presented in Appendix D.

3.4.4.1 Screen, Riser Casing, and Filter Pack. A 4-inch ID thirty-five foot long, 20-slot (0.020-inch) continuous v-wire wrap stainless steel screen, two-foot sump, and 10-20 mesh filter pack sand were pre-selected for this well based on data from nearby wells and anticipated formation characteristics. The bottom of the 4-inch ID sump was placed at 307.76 ft bgs. The bottom of the screen was set at 305.33 ft bgs and the top at 270.32 ft bgs. The top of the 4-inch ID stainless steel riser casing was set 1.9 ft above ground surface. The borehole was backfilled with 10-20 mesh filter pack sand from 309 to 264.4 ft bgs (approximately 6 feet above top of screen).

3.4.4.2 Filter Pack Installation and Initial Well Development. The objectives when installing filter pack material are to introduce silica sand into annular space around the screen, settle filter pack to eliminate void spaces, and begin removal of fines and recondition the borehole walls from effects of drilling. A dual-flange surge block was used to develop and settle the filter pack material opposite the screen. Care was taken to maintain overlap between the filter sand and temporary casing so that formation material would not cave in against the well screen. Filter pack level was measured periodically with a weighted tape to monitor progress and ensure integrity of the completion. Bottom of the well was also checked for fill material to determine if any fine material was accumulating in the screen during surging. This material was removed as needed.

3.4.4.3 Annular Seal. An annular seal was constructed above the filter pack using 1/4-in bentonite pellets from 259 to 264.4 ft bgs, and granular bentonite from 9.9 to 264.4 ft bgs. A grout seal was placed from 9.9 ft to surface, and consisted of Portland cement mixed with no more than 5% bentonite by weight, in accordance with *Washington Administrative Code* (WAC) 173-160.

3.4.5 Final Well Development and Pumping Test

Final well development was performed on September 11 and September 12, 2003 using a 5-HP Franklin electric submersible pump. Well development was done at three depth intervals until turbidity was less than 5 NTU and other water parameters had stabilized (temperature and conductivity). Drawdown of the water level during pumping was to be monitored using a 20 psi pressure transducer and recorded with an In-Situ Hermit 3000 datalogger. However, there was a problem with the Hermit datalogger; therefore, the drawdown was measured with an E-tape during the bottom and middle interval. The datalogger operated normally during the third test. During the first test, pump was operated with intake 4.65 feet from the bottom of well screen with a flow rate of 27 gpm, and a final turbidity of 3.20 NTU. Pump intake was raised to 13.65 feet above bottom of screen and pumping resumed until turbidity was again below 5 NTU. Flow rate for the second interval was 26 gpm with a final turbidity of 0.74 NTU. Pump intake was raised to 25.75 feet above bottom of screen and pumping resumed until turbidity was below 5 NTU. Flow rate for the third interval was 28 gpm with a final turbidity of 1.16 NTU. Each interval had negligible drawdown (< 0.1 ft); therefore, neither drawdown nor recovery curves are available. Final groundwater parameters are presented in Table 4 and well development data are in Appendix E.

3.4.6 Well Deviation Survey

Well deviation surveys were completed by Duratek Technical Services (DTS) on August 22, 2003. Maximum inclination was 10.12 degrees. Borehole bottom coordinates (relative to surface) are: South: -21.93 feet and East: 9.37 feet. Survey data are included in Appendix F.

3.4.7 Pump Installation

Pump installation was performed on September 19, 2003. A 0.7-HP electric submersible pump (TMGrundfos RediFlo3) was set with the intake valve 278.1 ft bgs (281.1 ft below top of protective casing). Pump installation details are listed in Appendix G.

3.5 WELL 299-E27-22 (C4124)

This section contains a summary and description of drilling, geophysical logging, sieve analysis, well completion, well development, well deviation survey, and pump installation activities performed during the installation of well 299-E27-22 (C4124).

3.5.1 Drilling Summary

Well 299-E27-22 (C4124) was drilled using a dual wall percussion method (Becker Hammer) on July 10, 2003, advancing an outer 9-inch OD, and inner 6-inch ID temporary casing. Groundwater was encountered approximately 231 ft bgs on September 3, 2003. Archive samples (1-pint jars) were collected at five-foot intervals and delivered to PNNL. Continuous split spoon samples with Lexan Liners were collected from 19.0 to 111.5 ft bgs, and were then collected every 5 feet to 231.5 ft bgs when groundwater was encountered. At this point, slug tests were performed by PNNL at varying intervals from groundwater to TD. Results are discussed in Spane 2003. See Table 5 for sample depths. Samples for grain size distribution analysis taken in the saturated zone from 233 to 235 ft bgs and 268 ft bgs were collected directly from the cyclone due to poor recovery rates from previous attempts at WMA A-AX (see Table 2). In the opinion of the well-site geologist, the saturated zone samples collected from the cyclone were representative of the formation. The borehole and temporary casing were advanced to a total depth of 268 ft bgs on September 5, 2003 where basalt was encountered.

3.5.2 Geophysical Logging

Geophysical logging was performed by Stoller Company on September 8, 2003 using the SGLS. A Gamma 1E probe was used to log the borehole and perform a repeat run. Cs¹³⁷, the only man-made radionuclide in this borehole, was detected at a few sporadic locations near the MDL of approximately 0.3 pCi/g. See Appendix B for geophysical logging data.

3.5.3 Sieve Analysis

Sieve analyses for well 299-E27-22 (C4124) were performed on September 5, 2003 using ©Endecotts Octagon Digital Variable Amplitude Test Sieve Shaker Assembly according to manufacturer's instructions and "Particle Size Distribution of Soil-Wet Sieve Analysis", CP-GPP-EE-05-1.21, Rev 0. See Table 2 for corresponding sample depths. Grain size distribution curves are plotted and summarized in Appendix C.

3.5.4 Well Completion

Well construction materials, filter pack installation and initial well development, and annular seal for well 299-E27-22 (C4124) are discussed in the following subsections. During well completion, a ¼ inch OD rod was used to aid in tagging the bottom of the borehole. While the rod was being removed from the annulus, one of the joints came loose, and 170 feet of rod remain in the borehole (from 40 to 217 ft bgs). The rod is above the water table. Nonconformance Report WMP-GPP-03NCR-010 was issued to document resolution of the condition. The well was accepted-as-is because the problem will have no affect on water samples and Ecology concurred that the well's annular seal is adequate. A summary of well completion is provided in Table 3 and well construction summary sheets are presented in Appendix D.

3.5.4.1 Screen, Riser Casing, and Filter Pack. A 4-inch ID forty foot long, 20-slot (0.020 inch) continuous v-wire wrap stainless steel screen, 0.08 foot endcap, and 10-20 mesh filter pack sand were chosen for this well based on anticipated formation characteristics. The bottom of the 4-inch ID endcap was placed on top of the basalt at 268.1 ft bgs. The bottom of the screen was set at 268.02 ft bgs and the top at 228.05 ft bgs. The top of the 4-inch ID stainless steel riser casing was set 2.2 ft above ground surface. The borehole was backfilled with 10-20 mesh filter pack sand from 268.0 to 225.8 ft bgs. A small amount of 4-8 mesh sand was used to complete the filter pack from 225.8 to 222.5 ft bgs. Filter sand pack is approximately 5 feet above top of screen.

3.5.4.2 Filter Pack Installation and Initial Well Development. The objectives when installing filter pack material are to introduce silica sand into annular space around the screen, settle filter pack to eliminate void spaces, and begin removal of fines and recondition the borehole walls from effects of drilling. A dual-flange surge block was used to develop and settle the filter pack material opposite the screen. Care was taken to maintain overlap between the filter sand and temporary casing so that formation material would not cave in against the well screen. Filter pack level was measured periodically with a weighted tape to monitor progress and ensure integrity of the completion. Bottom of the well was also checked for fill material to determine if any fine material was accumulating in the screen during surging. This material was removed as needed.

3.5.4.3 Annular Seal. An annular seal was constructed above the filter pack using 1/4-in bentonite pellets from 217.2 to 222.5 ft bgs, and granular bentonite from 10 to 217.2 ft bgs. A grout seal was placed from 10 ft to surface, and consisted of Portland cement mixed with no more than 5% bentonite by weight, in accordance with *Washington Administrative Code* (WAC) 173-160.

3.5.5 Final Well Development and Pumping Test

Final well development was performed on September 12, 2003 using a 5-HP Franklin electric submersible pump. Well development was done at three depth intervals until turbidity was less than 5 NTU and other water parameters had stabilized (temperature and conductivity). Drawdown of the water level during pumping was monitored using a 20 psi pressure transducer and was recorded with an In-Situ Hermit 3000 datalogger. During the first test, pump was operated with intake 6.8 feet from the bottom of well screen at a flow rate of 25 gpm, and a final turbidity of 1.08 NTU. Pump intake was raised to 15.8 feet above bottom of screen and pumping resumed until turbidity was again below 5 NTU. Flow rate for the second interval was 24 gpm with a final turbidity of 0.97 NTU. Pump intake was raised to 28 feet above bottom of screen and pumping resumed until turbidity was below 5 NTU. Flow rate for the third interval was 23 gpm with a final turbidity of 2.31 NTU. Drawdown for the first interval was 0.27 ft, the second was 0.39 ft, and the third was 0.44 ft; however, drawdown was negligible and neither drawdown nor recovery curves are available. Final groundwater parameters are presented in Table 4 and well development data are in Appendix E.

3.5.6 Well Deviation Survey

Well deviation surveys were completed by Duratek Technical Services (DTS) on September 11, 2003. Maximum inclination was 8.4 degrees. Borehole bottom coordinates (relative to surface) are: South: 15.24 feet and West: 1.99 feet. Survey data are included in Appendix F.

3.5.7 Pump Installation

Pump installation was performed on September 18, 2003. A 0.5-HP electric submersible pump (TMGrundfos RediFlo2) was set with the intake valve 237.96 ft bgs (240.96 ft below top of protective casing). Pump installation details are listed in Appendix G.

**Table 2. Sampling Summary of Boreholes and Wells Listed
Chronologically Based on Drilling Start Date.**

Well Name	Well ID	Operable Unit	Drilling Method and Intervals (ft bgs)	Radiological Risk Intervals (ft bgs)	Depth Interval for Grain Size Analysis (ft bgs)
299-E25-93	C4122	WMA A-AX	BH 0-320	LR 0-TD	280-282.5 315-317.5
299-E24-22	C4123	WMA A-AX	BH 0-330	LR 0-TD	286-288.5 321
299-E27-21	C4127	WMA C	BH 0-318	LR 0-TD	277-280 312-315
299-E27-20	C4126 ^a	WMA C	BH 0-278.5	LR 0-TD	275-277
299-E27-23	C4190	WMA C	BH 0-318	LR 0-TD	310-312
299-E27-4	C4125	WMA C	HS 0-30 BH 30-311	MR 0-30 LR 30-TD	270-271 301-303
299-E27-22	C4124	WMA C	BH 0-268	LR 0-268	233-235 268

^aC4126 was decommissioned due to refusal met at 278.6 feet bgs. C4190 was drilled to replace C4126 as groundwater monitoring well.

BH = Becker Hammer

HS = hollow stem auger

LR = low risk

MR = medium risk

TD = total drilled depth

Table 3. Well and Borehole Completion Summary (Chronologically Based on Drilling Start Date).

Well Name	Well ID	Operable Unit (OU)	Water Level (ft bgs)	Screen ^a					Sandpack ^b Interval (ft bgs)	Seal ^c (ft bgs)	Grout ^d Depth (ft bgs)	Riser		Pump ^e Intake Depth ^f (ft bwt)
				Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Screen Length (ft)	Sump (ft)	Material				Top (ft)	Material	
Wells														
299-E25-93	C4122	WMA A-AX	278.04	278.23	313.26	35.03	2.40	ss304	273.1-320.0	BC 10.5-268.5 BP 268.5-273.1	0-10.5	+2.0	ss304	4.8
299-E24-22	C4123	WMA A-AX	286.02	286.21	321.26	35.05	2.42	ss304	281.1-330.0	BC 10.0-276.1 BP 276.1-281.1	0-10.0	+2.0	ss304	7.0
299-E27-21	C4127	WMA C	271.38	271.37	306.43	35.06	2.40	ss304	265.5-314.0 314.0-318.0 ^g	BC 10.1-260.4 BP 260.4-265.5	0-10.1	+2.0	ss304	6.7
299-E27-20	C4126 ^h	WMA C	273.15	N/A	N/A	N/A	N/A	N/A	262.8-278.5	BC 10.3-262.8	0-10.3	N/A	N/A	N/A
299-E27-23	C4190	WMA C	273.10	273.51	308.54	35.03	2.43	ss304	267.8-318.0	BC 9.9-263.0 BP 263.0-267.8	0-9.9	+1.8	ss304	4.7
299-E27-4	C4125	WMA C	270.65	270.32	305.33	35.01	2.43	ss304	264.4-309.0	BC 9.9-259.0 BP 259.0-264.4	0-9.9	+1.9	ss304	6.9
299-E27-22	C4124	WMA C	230.46	228.05	268.02	39.97	0.08	ss304	222.5-225.8 ^f 225.8-268.0	BC 10.0-217.2 BP 217.2-222.5	0-10.0	+2.2	ss304	6.4

^aScreen slot size is 0.02 in.^bSandpack is Colorado silica sand (10-20 mesh)^cBentonite seal consisted of 0.25-in. BP and BC.^dGrout consisted of portland cement with <5% by weight Quik-gel bentonite powder.^eRedi-Flo2 and Redi-Flo3 pumps are made by Grundfos Pumps Corporation, Clovis, California.^fPump intake depth is determined from groundwater readings taken on day pump was installed and total length of tremmie pipe and distance to pump intake. Groundwater readings recorded on pump installation form may vary slightly from those listed in column 4 of this table.^gSandpack is Colorado silica sand (4-8 mesh).^hBorehole C4126 hit refusal at 278.5 ft bgs and was decommissioned. C4190 was drilled to replace C4126.

BC = bentonite crumbles

bgs = below ground surface

BP = bentonite pellets

bwt = below water table

N/A = not applicable

OU = operable unit

ss = stainless steel

WMA = waste management area

Table 4. Well Development Data (Chronologically Based on Drilling Start Date).

Well Name	Well ID	Static Water Level (ft)(bgs)	Development Date	Development Pumping Duration (minutes)	Final Turbidity (NTU)	Final Conductivity (µS/cm)	Final Temp. (°C)	Final Flow Rate (gpm)	Final Drawdown (ft)	Total Gallons Pumped
299-E25-93	C4122	278.04	08/14/03	59 64 53	1.26 0.83 1.19	564 550 555	20.4 21.6 20.6	25.5 26.0 26.0	0.156 0 0.036	1504.5 1664 1378
299-E24-22	C4123	286.02	09/08/3	80 63 31	2.31 2.25 3.14	519 366 370	18.2 18.4 18.5	22.5 24.0 25.0	0.021 0.027 0.015	1800 1512 775
299-E27-21	C4127	271.38	08/28/03	63 48 62	1.24 1.64 1.83	376 363 353	20.0 20.2 20.7	23.0 23.5 21.0	0 0 0	1449 1128 1302
299-E27-23	C4190	273.10	09/02/03	57 30 78	3.93 0.74 3.00	409 -- 381	20.2 -- 22.1	24.5 26.0 6.0	0.138 0.01 0.63	1396.5 780 468
299-E27-4	C4125	270.65	09/11/03	70 50	3.20 0.74	516 452	19.5 20.1	27.0 26.0	0 0	1840 1300
299-E27-23	C4124	230.46	09/12/03	70	1.16	403	18.4	28.0	0.066	1960
			09/12/03	60 43 43	1.08 0.97 2.31	504 490 476	20.7 20.3 20.2	25.0 24.0 23.0	0.27 0.387 0.444	1500 1032 989

bgs= below ground surface
 ft= feet
 gpm= gallon per minute
 NTU= Nephelometric Turbidity Units
 µs/cm= micro seimen per centimeter
 °C= degree Centigrade

Table 5. Slug Test and Groundwater Sample Data.

299-E27-23				
C4124				
Date	Depth	Test	Sample Collected	Purpose
09/03/03	239.5-242.5	Slug	Groundwater	Field Screening
09/04/03	246.5-249	Slug	Groundwater	Field Screening
09/04/03	252-254	Slug	Groundwater	Field Screening
09/05/03	260	N/A	Groundwater	Laboratory analysis
09/05/03	268	N/A	Groundwater	Laboratory analysis
09/05/03	267-268	Slug	Groundwater	Field Screening

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4.0 WASTE MANAGEMENT

Waste generated from WMA A-AX and C wells were managed in accordance with BHI-EE-10, *Waste Management Plan, Site-Specific Waste Management Instruction (SSWMI) Well Decommissioning, Maintenance, and Sampling* (WMI-GWCERCLA001, Rev 2). Additionally, waste generated from the WMA A-AX wells (C4122 and C4123) were managed in accordance with *Site Specific Waste Management Instruction RCRA Well Drilling, 200-East/West Area* (Gould, 2002). Waste generated from the WMA C wells (C4124, C4125, C4126, C4127, and C4190) were managed according to *Data Quality Objective Summary Report for Waste Disposition - Cy2003 Waste Management Area C RCRA Wells* (CP-16001, Rev. 0).

4.1 VADOSE ZONE CUTTINGS

Vadose zone cuttings from WMA A-AX wells (C4122 and C4123) were low risk and were placed on plastic sheeting near the point of generation until released back into the ground based on field surveys by RCT's. Drill cuttings were surveyed in accordance with *Hanford Site Solid Waste Acceptance Criteria*, (HNF-EP-0063). All waste generated from WMA A-AX drilling was handled as CERCLA waste in accordance with DOE/RL-97-01. Vadose zone cuttings from WMA C wells (C4124, C4126, C4127, and C4190) were low risk and were placed on plastic sheeting near the point of generation until released back into the ground based on field surveys by RCT's. Well C4125 was medium risk from ground surface to 30 feet bgs, and spoils were containerized in 55-gallon drums lined with a 10-mil plastic liner and stored for final disposition. All waste generated from WMA C drilling was managed as RCRA waste in accordance with the *Waste Control Plan for the 200-BP-5 Operable Unit* (DOE/RL-2003-30). Vadose zone cuttings were returned to the environment prior to the final well acceptance walkdown.

4.2 SATURATED ZONE CUTTINGS

Drill cuttings removed below the water table in all seven boreholes were containerized in 55-gallon drums lined with a 10-mil plastic liner and stored for final disposition. Waste codes (F001-F005) were applied to groundwater contacted waste at WMA C wells (C4124-C4127 and C4190) based on "*Application of Listed Waste Codes to Secondary Solid Wastes Related to Well Construction, Maintenance, and Sampling*" (CCN 081034).

4.3 PURGEWATER

Purgewater generated during slurry sampling and well development activities was containerized and transferred to a regulated purgewater truck and handled in accordance with "Purge Water Handling", CP-GPP-FE-01-10.2 and *Strategy for Handling and Disposing of Purgewater at the Hanford Site, Washington* (DOE/RL 1990).

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5.0 CIVIL SURVEY

Civil survey of well locations and elevation surveys for the WMA A-AX and C was performed by Fluor Federal Services Survey Department on October 31, 2003. Coordinate datum for the surveys were Washington State Plane Coordinates (south zone) North American Datum of 1983 and vertical datum will be North American Vertical Datum of 1988. All results are reported in metric units with vertical accuracy of ± 0.001 m and horizontal accuracy of ± 0.01 m. Surveying was performed in accordance with the requirements of CP-GPP-EE-01-1.6, "*Survey Requirements and Techniques.*"

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6.0 WELL ACCEPTANCE

WMA A-AX and C groundwater monitoring wells were transferred from Layne Christensen and accepted by Fluor Hanford at the conclusion of the project. Site acceptance walkdowns for the WMA A-AX and C wells were performed on September 29, 2003, and included representatives from Layne Christensen, Fluor Hanford, Inc., Pacific Northwest National Laboratory, and CH2M Hill Hanford Group, Inc.

Quality Assurance Surveillance was performed during the drilling and construction phase in July and during the final acceptance walkdown on Sept 29, 2003. Aspects of well drilling such as waste handling, drill rig decontamination, driller qualification, selection of well construction materials, surface protection features, sampling pumps, well identification and site clean-up were observed. The surveillance was satisfactory.

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7.0 SUBSURFACE DESCRIPTION

7.1 WMA A-AX GEOLOGY/HYDROGEOLOGY

Generalized stratigraphy in the WMA A-AX in the 200-East Area of the Hanford Site includes the sand dominated Hanford formation consisting primarily of sand, with pebble-cobble gravel interbeds, the basal Ringold formation consisting of moderately cemented sandy gravel, and the Columbia River Basalt Group. Surficial sediments are mainly eolian deposits consisting of reworked Hanford sands and silts.

7.1.1 Well 299-E25-93 (C4122)

At this location, the Hanford Formation was overlain by backfill material (0 to 2 ft bgs) and a thin veneer of non-basaltic, fine to medium grained eolian sand (2 to 11 ft bgs) with a strong reaction to 10% dilute hydrochloric acid. The sand dominated facies of the Hanford formation extended from 11 to 266 ft bgs, with occasional gravelly sand interbeds. Basaltic sand was unconsolidated and poorly sorted with very fine to very coarse grains. Traces of pea-sized basaltic gravel were observed throughout. Very fine to medium grained sand interbeds were observed at 88, 145 to 150, 155 to 160, and 165 to 170 ft bgs. These interbeds had a lower basalt content (<30%), were micaceous, and were more consolidated. Gravelly sand interbeds (20 to 25, 35 to 45, 106 to 115, and 215 to 220 ft bgs) consisted of medium to well-sorted, pea-sized basaltic gravel and very fine to very coarse grained basaltic sand. Trace amounts of silt (<5%) were observed in the sand and gravelly sand interbeds. No reaction to 10% hydrochloric acid was observed. The gravel dominated facies of the Hanford formation was encountered between 266 and 317 ft bgs. Gravel was initially moderately sorted, ranging from pea-sized to medium size pebbles and grading to poorly sorted gravel with cobbles. Basalt content was similar to the sand dominated facies. Silty sandy gravel, possibly of the Ringold Formation, was encountered between 317 to 320 ft bgs. Gravel was poorly sorted with an increase in cobble size, a decrease in basalt content, moderate cementation, and extensive iron oxide staining. Sand, although very fine to very coarse grained and poorly sorted, also had a decrease in basalt content (<25%) and was very micaceous. No reaction to 10% dilute hydrochloric acid was observed. Silt content was higher ($\geq 10\%$) in this interval than had been noted previously. Total drilled depth (TD) was 320 ft bgs.

Geologic borehole logs are included in Appendix A.

7.1.2 Well 299-E24-22 (C4123)

At this location, the Hanford formation was overlain by backfill material (0 to 2 ft bgs) and a thin veneer of very well sorted, very fine to medium grained, non-basaltic eolian sand (2 to 10 ft bgs) with a strong reaction to 10% dilute hydrochloric acid. The sand dominated facies of the Hanford formation extended from 10 to 300 ft bgs with occasional gravelly sand interbeds. Basaltic sand was unconsolidated and poorly sorted with very fine to very coarse grains;

however, there were sporadic well sorted, medium to coarse grained sand layers. Traces of pea-sized basaltic gravel were observed throughout. Gravelly sand layers were encountered between 15 to 25, 175 to 180, 220 to 225, 281 to 285, and 290 to 300 ft bgs, and consisted of medium to well-sorted, pea-sized basaltic gravel and very fine to very coarse grained basaltic sand. Trace amounts of silt (<5%) were observed in the sand and gravelly sand interbeds. Between 270 and 272 ft bgs a lens of silt/clay was encountered that was very compact, had moderate plasticity, laminar bedding, iron oxide staining, and did not react to 10% dilute hydrochloric acid. At 272 ft bgs, Hanford formation was again unconsolidated sand. There was no reaction to 10% hydrochloric acid. At 300 ft bgs, the gravel dominated facies of the Hanford formation was encountered. Very poorly sorted sandy gravel (300 to 310 ft bgs) was encountered. Gravel ranged from pea-sized to medium cobbles and sand was poorly sorted with very fine to very coarse grains. Gravel contained somewhat lower basalt content than previously observed; however, the basalt content in the sand was comparable to the sand dominated facies of the Hanford formation. From 310 to 330 ft bgs, a silty sandy gravel layer was observed. Basaltic gravel ranged from pea-sized to medium cobbles, sand was moderately sorted with very fine to medium grains, micaceous, and exhibited iron oxide staining. There was no visible cementation, and no reaction to 10% dilute hydrochloric acid. Total drilled depth (TD) was 330 ft bgs.

Geologic borehole logs are included in Appendix A.

7.2 WMA C GEOLOGY/HYDROGEOLOGY

Generalized stratigraphy at WMA C in the 200-East Area of Hanford Site consists of the sand dominated Hanford formation with occasional pebble-cobble gravel interbeds, and possibly the Ringold formation overlying the Columbia River Basalt Group. Surficial sediments are mainly eolian deposits consisting of reworked Hanford sands and silts.

7.2.1 Well 299-E27-21 (C4127)

At this location, the Hanford formation was overlain by backfill material (0 to 1 ft bgs). The sand dominated facies of the Hanford formation extended from 1 to 285 ft bgs with occasional gravelly sand, silty sandy gravel, and silty sand interbeds. Basaltic sand was unconsolidated and poorly sorted with very fine to very coarse grains; however, there were sporadic well sorted, medium to coarse grained sand layers. Traces of pea-sized basaltic gravel were observed throughout. Gravelly sand layers were observed between 20 to 25, 40 to 65, 160 to 170, and 275 to 285 ft bgs. Gravel was generally moderate to well-sorted, pea-size to small pebbles and had a high basalt content; except for the interbed between 275 to 285 ft bgs, where the gravel was very poorly sorted and ranged from pea-size to medium cobbles. Basaltic sand was very fine to very coarse grained. Silt content varied between 5 to 10% in the sand and gravelly sand interbeds. Silty sandy gravel layers were observed between 185 to 200, 225 to 235, and 240 to 275 ft bgs; and were characterized by well sorted, pea size basaltic gravel, and very fine to very coarse grained basaltic sand. From 225 to 235, silt nodules with iron oxide staining were observed. Silty sand interbeds were encountered between 200 to 225 and 235 to 240 ft bgs. Sand in these layers ranged from moderate to poorly sorted, and very fine to very coarse grained. Basalt content was lower than previously noted. There was no reaction to 10% dilute hydrochloric acid. At 285 ft

bgs, the gravel dominated facies of the Hanford formation was encountered. Sandy gravel (285 to 318 ft bgs) was characterized by pea size to medium pebbles that graded to very poorly sorted gravel with depth. Basalt content also decreased with depth. Sand consisted of very fine to very coarse grains with basalt content comparable to the sand dominated facies of the Hanford formation. There was no visible cementation, and no reaction to 10% dilute hydrochloric acid. Total drilled depth (TD) was 318 ft bgs.

Geologic borehole logs are included in Appendix A.

7.2.2 Well 299-E27-20 (C4126)

At this location, the Hanford formation was overlain by backfill material (0 to 1 ft bgs) and a thin veneer of very well sorted, very fine to medium grained, micaceous, non-basaltic eolian sand (1 to 5 ft bgs) and no reaction to 10% dilute hydrochloric acid. The sand dominated facies of the Hanford formation extended from 5 to 240 ft bgs and was interspersed with sand and gravelly sand units, and occasional silty sandy gravel and silty sand layers. From 5 to 20 ft bgs there was a moderate to strong reaction to 10% dilute hydrochloric acid. Basaltic sand was unconsolidated and poorly sorted with very fine to very coarse grains; however, there were sporadic non-basaltic, micaceous, very well sorted, very fine to medium grained sand interbeds; and also layers grading to moderately sorted, medium to very coarse grained basaltic sand. Traces of pea-sized basaltic gravel were observed throughout. Gravelly sand interbeds were encountered between 5 to 13, 16 to 20, 85 to 90, and 95 to 110 ft bgs, and consisted of medium to well-sorted, pea-sized basaltic gravel and very fine to very coarse grained basaltic sand. Trace amounts of silt (<5%) were observed in the sand and gravelly sand interbeds. A silty sandy gravel layer (160 to 175 ft bgs) consisted of basaltic, pea size to small pebbles, moderately sorted sand with medium to very coarse grains and an increase in silt content. A silty sand layer (175 to 220 ft bgs) consisted of silt and an unconsolidated, poorly sorted, very fine to very coarse grained basaltic sand with a trace of mica. There was no reaction to 10% dilute hydrochloric acid after 20 ft bgs. At 240 ft bgs, the gravel dominated facies of the Hanford formation was observed. A sandy gravel layer (240 to 278.5 ft bgs) was encountered and consisted of moderate to well-sorted gravel ranging from pea size to small pebbles and unconsolidated, poorly sorted basaltic sand to 255 ft bgs. From 255 to 278.5 ft bgs gravel was poorly sorted ranging from pea size to medium cobbles and poorly sorted basaltic sand. Gravel contained somewhat lower basalt content than previously observed; however, the basalt content in the sand was comparable to the sand dominated facies of the Hanford formation. There was no visible cementation, and no reaction to 10% dilute hydrochloric acid was observed. Refusal was at 278.5 ft bgs.

Geologic borehole logs are included in Appendix A.

7.2.3 Well 299-E27-23 (C4190)

At this location, the Hanford Formation was overlain by backfill material (0 to 1.5 ft bgs) and a thin veneer of very well sorted, very fine to medium grained, non-basaltic eolian sand (1.5 to 10 ft bgs) with a strong reaction to 10% dilute hydrochloric acid. The sand dominated facies of the Hanford formation extended from 10 to 245 ft bgs with gravelly sand interbeds and

occasional sandy gravel, silty sand, or silty sandy gravel layers. Basaltic sand was unconsolidated and poorly sorted with very fine to very coarse grains; however, there were sporadic well sorted, fine to medium grained sand interbeds. Traces of basaltic gravel were observed throughout. The gravelly sand interbeds were encountered between 10 to 12, 15 to 20, 103 to 107, and 226 to 230 ft bgs. Basaltic gravel sorting ranged from well to poorly sorted and consisted of pea size to medium cobbles. Sand was basaltic, unconsolidated, and poorly sorted with very fine to very coarse grains. Trace amounts of silt (<5%) were observed in the sand and gravelly sand interbeds. An unconsolidated sandy gravel layer (12 to 15 ft bgs) consisted of a poorly sorted basaltic sand and gravel with a trace of silt. The gravel ranged from small pebbles to medium cobbles and the sand was very fine to very coarse grained. A silty sand layer (160 to 200 ft bgs) consisted of poorly sorted, fine to very coarse grained, basaltic sand with a higher silt fraction. No reaction to 10% dilute hydrochloric acid was observed. At 245 ft bgs, the gravel dominated facies of the Hanford formation was encountered. A silty sandy gravel layer (245 to 255 ft bgs) consisted of basaltic gravel ranging from pea size to small pebbles, poorly sorted basaltic sand with very fine to very coarse grains, and silt. A basaltic gravel layer (255 to 260 ft bgs) consisted of small pebbles to medium cobbles interspersed with poorly sorted basaltic sand. A sandy gravel layer (260 to 318 ft bgs) was similar to the gravel layer; however there was an increase in the poorly sorted basaltic sand. There was no visible cementation, and no reaction to 10% dilute hydrochloric acid was observed. Total drilled depth (TD) was 318 ft bgs.

Geologic borehole logs are included in Appendix A.

7.2.4 Well 299-E27-4 (C4125)

At this location, the Hanford formation was overlain by backfill material (0 to 2 ft bgs) and a thin veneer of very well sorted, very fine to medium grained, non-basaltic eolian sand (2 to 20 ft bgs) with a strong reaction to 10% dilute hydrochloric acid. The sand dominated facies of the Hanford formation extended from 20 to 245 ft bgs with occasional sandy gravel, gravelly sand, and silty sand interbeds. Basaltic sand was unconsolidated with very fine to very coarse grains; however, there were sporadic sand layers that graded to moderately sorted, medium to coarse grains. Traces of pea-sized basaltic gravel were observed throughout. A sandy gravel layer (20 to 22 ft bgs) consisted of poorly sorted gravel ranging in size from small pebbles to small cobbles, and a non-basaltic, well sorted, very fine to fine grained sand. A sandy gravel layer (190 to 200 ft bgs) consisted of basaltic, well sorted pea size gravel and moderately sorted medium to very coarse grained basaltic sand. Gravelly sand layers were encountered between 45 to 50, 80 to 110 and 240 to 245 ft bgs, and consisted of well sorted, pea size to small pebble basaltic gravel, and very fine to very coarse grained basaltic sand. Trace amounts of silt (<5%) were observed in the sand, sandy gravel, and gravelly sand interbeds. A silty sand layer (225 to 235 ft bgs) consisted of moderately sorted very fine to coarse grained basaltic sand and silt. No reaction to 10% dilute hydrochloric acid was observed. At 245 ft bgs, the gravel dominated facies of the Hanford formation was encountered. A sandy gravel layer (245 to 255 ft bgs) consisted of well sorted basaltic pebbles and poorly sorted very fine to very coarse grained basaltic sand with a trace of silt. A gravel layer (255 to 272 ft bgs) consisted of pea size to medium pebbles with a lower fraction of sand. A sandy gravel layer (272 to 311 ft bgs) was moderately sorted with gradational changes in gravel size to 311 ft bgs. Basaltic sand continued

to be poorly sorted with very fine to very coarse grains. There was no visible cementation, and no reaction to 10% dilute hydrochloric acid was observed. Total drilled depth (TD) was 311 ft bgs.

Geologic borehole logs are included in Appendix A.

7.2.5 Well 299-E27-22 (C4124)

At this location, the Hanford Formation was overlain by backfill material (0 to 1 ft bgs) and a thin veneer of very well sorted, very fine to medium grained, non-basaltic eolian sand layer (1 to 5 ft bgs) with no reaction to 10% dilute hydrochloric acid. The sand dominated facies of the Hanford formation extended from 5 to 192 ft bgs; however, lithology in this borehole contained significantly more silt and gravel than the other boreholes surrounding WMA C. Basaltic sand was unconsolidated with very fine to very coarse grains; however, there were sporadic, non-basaltic, well sorted, very fine to fine grained sand interbeds. Traces of basaltic gravel were observed throughout. A gravelly sand layer (5 to 10 ft bgs) consisted of moderately sorted basaltic gravel and poorly sorted, very fine to very coarse grained basaltic sand. Sandy gravel layers were encountered between 29 to 36, 50 to 54, 56 to 60, and 157 to 165 ft bgs. The gravel was basaltic poorly sorted and varied from pea size to medium cobbles. Basaltic sand was poorly sorted with very fine to very coarse grains. Silty sandy gravel layers were encountered between 60 to 72, 153 to 157, and 185 to 188 ft bgs. The gravel and sand were similar to the sandy gravel layers; however, the silt content had increased significantly. Silty gravelly sand/gravelly silty sand interbeds were encountered between 72 to 81.5 and 145 to 153 ft bgs. Gravel was moderately sorted, basaltic, and ranged from pea size to small pebbles. Sand was poorly sorted, basaltic, and consisted of very fine to very coarse grains. Silt content was higher in these layers. Silty sand layers were encountered between 89 to 98, 105 to 112, 116 to 122, 138 to 145, and 188 to 192 ft bgs. Sand was less basaltic than had been previously noted, was moderate to poorly sorted, and ranged from fine to very coarse grains. Increased silt content was noted. No reaction to 10% dilute hydrochloric acid was observed. At 192 ft bgs, the gravel dominated facies of the Hanford formation was encountered. Sandy gravel layers (192 to 215 and 233 to 268 ft bgs) graded from well sorted to poorly sorted gravel with depth. Basaltic sand was poorly sorted with very fine to very coarse grains. A gravelly sand layer (215 to 219 ft bgs) was similar to sandy gravel except for a decrease in gravel. Silty sandy gravel layers (219 to 222 and 227 to 233) were similar to the sandy gravel; however, there was a significant increase in silt content. A thin layer of poorly sorted basaltic sand was encountered between 222 to 227 ft bgs. There was no visible cementation, and no reaction to 10% dilute hydrochloric acid was observed. Basalt was encountered at 268 ft bgs and was characterized by iron oxide staining, vesicular surface, fractures, and peacock iridescence. Total drilled depth (TD) was 268 ft bgs.

Geologic borehole logs are included in Appendix A.

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8.0 REFERENCES

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- Resource Conservation and Recovery Act of 1976*, 42 U.S.C. 103, et seq., as amended.

Spane, 2003 *Slug Test Characterization Results for Multi-Test/Depth Intervals Conducted during the drilling of WMA-C Well 299-E27-22*(C4124 Letter Report, F.A. Spane to J.V. Borghese, 10/8/2003)

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

WMI-GWCERCLA001, Rev. 0, *Site-Specific Waste Management Instruction (SSWMI) Well Decommissioning, Maintenance, and Sampling*, Bechtel Hanford, Inc., Richland, Washington.

WMP-GPP-03NCR-010, Rev. 0, *Nonconformance Report*, Fluor Hanford, Richland, Washington.

APPENDIX A
WELL SUMMARY REPORTS
BOREHOLE LOGS

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WELL SUMMARY SHEET		Start Date: 07/01/03		Page 1 of 2	
		Finish Date: 07/09/03			
Well ID: C4122		Well Name: 299-E25-93			
Location: East of 241-A Tank Farm		Project: C403 RCRA Drilling			
Prepared By: Charlene Martinez		Date: 07/15/03		Reviewed By: L.D. Walker	
Signature: <i>Charlene Martinez</i>		Signature: <i>L.D. Walker</i>		Date: 8/11/03	
CONSTRUCTION DATA		GEOLOGIC/HYDROLOGIC DATA			
Description	Diagram	Depth in Feet	Graphic Log	Lithologic Description	
Dual-wall temporary casing used. 9" ID. Inner casing 7 1/8"		0		0'-2' Backfill material	
				2'-11' SAND(S)	
				Hanford Formation @ 11' bgs.	
Protective casing set (6" ID) + 1.1' above permanent casing				11'-20' SAND(S)	
				20'-25' Gravelly SAND(qs)	
4" ID SS 304 sched 10 casing: 12.00' → 278.23'		40		25'-35' SAND(S)	
				35'-45' Gravelly SAND(qs)	
				45'-106' SAND(S)	
Portland Cement Grout: 0' → 10.5'		80			
Granular Bentonite: 10.5' → 268.5'			106'-115' Gravelly SAND(qs)		
			115'-215' SAND(S)		
1/4" Bentonite Pellets: 268.5' → 273.1'		120			
		160			
		200			
All temporary casing removed from ground.					
All depths are in feet below ground surface.			215'-220' gravelly SAND(qs)		
			220'-266' SAND(S)		

WELL SUMMARY SHEET		Start Date: 07/01/03		Page 2 of 2	
Finish Date: 07/09/03					
Well ID: C 4122		Well Name: 299-625-93			
Location: East of 241-A Tank Farm		Project: CY03 RCRA drilling			
Prepared By: Charlene Martinez		Date: 07/15/03		Reviewed By: L.D. Walker	
Signature: Charlene Martinez		Signature: L.D. Walker		Date: 8/11/03	
CONSTRUCTION DATA		GEOLOGIC/HYDROLOGIC DATA			
Description	Diagram	Depth in Feet	Graphic Log	Lithologic Description	
10-20 mesh silica sand:		240			
273.1' → 320.0'					
4" ID SS 304 schedule 10 well screen:					
278.23' → 313.26'					
4" ID SS 304 schedule 10 sumplendcap		280			
313.26' → 315.26'					
		320		Ringold formation @ 317' bgs	
				317-320' silty sandy GRAVEL (m66)	
				TD @ 320' bgs.	
				static water ⇒ 278.04' bgs (07/15/03)	
All temporary casing removed from ground.					
All depths are in feet below ground surface.					

BOREHOLE LOG						Page 1 of 2
						Date: 07/01/03
Well ID: C4122		Well Name: 299-E25-93		Location: East of 241-A Tank Farm		
Project: C403 RCRA Drilling				Reference Measuring Point: Ground Surface		
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments	
	Type No.	Blows Recovery			Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	BH 9'00	N/A		0'-2' Backfill material. Crushed basaltic gravel.	Becker Hammer using dual wall casing 9' old	
5	Grab BH			2'-11' Sand (S) 100% v. well sorted R, fn-med. Trace mica. non basaltic 10 YR 5/3, brown (moist). Strong rxn HCl.	Collect 5' archive sample	
10	Grab BH			11'-20' Sand (S) 95% sand, 5% silt. v. poorly sorted, SR-SA, vfn-vce. grained 85% basalt, 15% qtz/other 10 YR 3/2, very dark grayish brown (moist) mod. rxn HCl.	Collect 10' archive sample	
15	Grab BH			20'-25' gravelly SAND (gs) 15% gravel, 85% sand, 5% silt. Gravel, mod sorted, R, basaltic. Sand, v. poorly sorted. vfn-vce, SR-SA, 90% basalt 10% qtz/other. No rxn HCl. 10 YR 3/2 v. dark grayish brown (moist)	Collect 15' archive sample	
20	Grab BH			25'-35' SAND (S) 100% v. poorly sorted, f-vce grained, SR-SA, 45% basalt, 55% qtz/other. 10 YR 4/2, dark grayish brown (moist) micaceous. No rxn HCl.	Collect 20' archive sample	
25	Grab BH			35'-45' gravelly SAND (gs) 10% gravel, 85% sand, 5% silt. Gravel, well sorted mps ~ 1", R, basaltic. Sand, poorly sorted, SR-SA, vfn-vce grained, 90% basalt, 10% qtz/other. 10 YR 3/2, v. dark grayish brown (moist). No rxn HCl.	Collect 25' archive sample	
30	Grab BH			45'-106' SAND (S) 100% v. poorly sorted, vfn-vce, SR-SA, 90% basalt, 10% qtz/other. 10 YR 3/2, v. dark grayish brown (moist). No rxn HCl.	Collect 30' archive sample	
35	Grab BH					

Reported By: Charlene Martinez		Reviewed By: L.D. Walker	
Title: Geologist		Title: Geologist	
Signature: Charlene Martinez	Date: 07/01/03	Signature: L.D. Walker	Date: 10/1/03

BOREHOLE LOG					Page 2 of 8
					Date: 07/01/03
Well ID: C4122		Well Name: 299-E-25-93		Location: East of 241-A Tank Farm	
Project: C403 RCRA Drilling				Reference Measuring Point: Ground surface	
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments
	Type No.	Blows Recovery			
40	BH BH 94	n/A		@ 45' 45% basalt, 55% qtz/other (still sand) 10YR 4/3 (brown, moist)	Becker Hammer using dual wall casing, 4" ID
				micaceous, SR-SP, poorly sorted. no rxn HCl.	collect 40' archive
45	BH 94				collect 45' archive
50	BH 94				collect 50' archive
55	BH 94				collect 55' archive
					A.M. BCT ok, < 2.5% background
60	BH 94				collect 60' archive
65	BH 94				@ 70' sand grading to med-sorted SR-R, micaceous, med coarse grained
					collect 65' archive
70	BH 94				
75	BH 94			@ 75' sand 95% qtz, gravel < 5% trace silt. Gravel, basaltic, well sorted, mps ~ 0.5". Sand, poorly sorted, SR-SP, vfn-ucce, 55% qtz/other, 45% basalt, 10YR 4/3, brown no rxn HCl	collect 75' archive
Reported By: charlene martinez				Reviewed By: L.D. Walker	
Title: Geologist				Title: Geologist	
Signature: charlene martinez		Date: 07/01/03		Signature: L.D. Walker	
				Date: 10/1/03	

A-6003-842 (03/03)

BOREHOLE LOG					Page 3 of 8	
					Date: 07/01/03	
Well ID: C4123		Well Name: 209-E25-93		Location: East of 241-A Tank Farm		
Project: C403 RCRA drilling			Reference Measuring Point: Ground Surface			
Depth (Ft.)	Sample Type No.	Blows Recovery	Graphic Log	Sample Description	Comments	
				Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level	
80	Grab BH 9"	N/A		@ 80' sand, well sorted, (vfn-med grained) SE-S, 45% basalt, 55% qtz/other. No rxn HCl, micaceous.	Becker Hammer using dual well casing, 9" ID. Collect 80' archive	
85	Grab BH 9"				Collect 85' archive	
90	Grab BH 9"				@ 90' trace of pea-sized, & basaltic gravel. Still sand. Sand, poorly sorted, vfn-v-coarse, SE-S, 45-55% basalt, 50% qtz/other. 10YR 7/3 brown, moist. No rxn HCl	Collect 90' archive
95	Grab BH 9"				Collect 95' archive	
100	Grab BH 9"				@ 100' sand grading to med-sorted. Sand, m-v-coarse grained, no gravel. Basalt increasing to 60%. 10YR 3/3, dark brown, moist	Collect 100' archive
105	Grab BH 9"				@ 105' trace well sorted gravel @ 105' basaltic. Sand, poorly sorted, SE-S, vfn-v-coarse, 40% basalt, 40% qtz/other. 10YR 3/3, dark brown, moist	Collect 105' archive
110	Grab BH 9"				106'-115' gravelly SAND (g.s) 20% gravel, 80% sand. Gravel, R, well-sorted, mps ~ 0.5", Basaltic. Sand, SE-S, poorly sorted, vfn-v-coarse. Basalt - 60%, qtz/other 40%.	Collect 110' archive
115	Grab BH 9"				10YR 3/2, v. dark grayish brown (moist). No rxn HCl	Collect 115' archive

Reported By: <u>Charlene Martinez</u>		Reviewed By: <u>L.D. Walker</u>	
Title: <u>Geologist</u>		Title: <u>Geologist</u>	
Signature: <u>Charlene Martinez</u>	Date: <u>07/01/03</u>	Signature: <u>L.D. Walker</u>	Date: <u>10/1/03</u>

BOREHOLE LOG					Page 4 of 8
					Date: 07/01/03
Well ID: C 4122		Well Name: 299-225-93		Location: East of 241-A Tank Farm	
Project: C403 RCRA drilling				Reference Measuring Point: Ground Surface	
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments
	Type No.	Blows Recovery			
120	BH 9"	N/A		45'-215' sand (S) 100% poorly sorted, SR-SA, vfn-vco grained 60-65% basalt, 30-35% qtz/other, 10YR 3/2 v. dark grayish brown (moist) micaceous. no rxn HCl.	Becker Hammer using dual wall casing 9" OD. Collect 120' archive
125	Grab BH 9"				Collect 125' archive
130	Grab BH 9"				Collect 130' archive
135	Grab BH 9"			@ 135' trace basaltic gravel (5%)	Collect 135' archive
140	Grab BH 9"			@ 140' sand grading to med-well sorted, med-vco grained.	Collect 140' archive
145	Grab BH 9"			@ 145' sand, v. well sorted, SR-R, vfn-med grained, basalt 30%, qtz/other 70%, micaceous 10YR 4/4 dark yellowish brown (moist) no rxn HCl (145'-150')	Collect 145' archive
150	Grab BH 9"			@ 150' back to basaltic, poorly sorted sand as described above. (150'-155')	Collect 150' archive
155	Grab BH 9"			@ 155' Another layer of vfn-med grained, well sorted sand as described @ 145'. (155'-160')	Collect 155' archive

Reported By: Charlene Martinez		Reviewed By: L.O. Walker	
Title: Geologist		Title: Geologist	
Signature: Charlene Martinez	Date: 07/01/03	Signature: L.O. Walker	Date: 10/1/03

BOREHOLE LOG						Page 5 of 8
						Date: 07/01/03
Well ID: C4122		Well Name: 299-E25-93		Location: East of 241-A tank farm		
Project: C403 RCRA drilling				Reference Measuring Point: Ground surface		
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments	
	Type No.	Blows Recovery				
160	Grab BH 9"	N/A		@ 160' sand, vfn-vcse grained, 100% basalt, 40% qtz/other poorly sorted, SR-SA, 10YR 4/3 dark grayish brown (moist) no rxn HCl. (160'-165')	Becker Hammer using dual wall casing 9" OD collect 160' archive	
165	Grab BH 9"			@ 165' sand, vfn-med grained, well-sorted, SR-R, 70% qtz/other, 30% basalt. 10YR 4/4 dark yellowish brown (moist) no rxn HCl. (165'-170')	Collect 165' archive	
170	Grab BH 9"			@ 170' basaltic (60%) vfn-vcse grained poorly sorted, SR-SA sand, 10YR 4/3 dark grayish brown (moist) no rxn HCl.	Collect 170' archive	
175	Grab BH 9"				Collect 175' archive	
180	Grab BH 9"				Collect 180' archive	
185	Grab BH 9"				Collect 185' archive	
190	Grab BH 9"				Collect 190' archive	
195	Grab BH 9"				Collect 195' archive	
195	Grab BH 9"				@ 195' sand, not as coarse, silt increase ~ to 5% basaltic, SR-SA	collect 195' archive
195	Grab BH 9"					

Reported By: Charlene Martinez		Reviewed By: L.D. Walker	
Title: Geologist		Title: Geologist	
Signature: Charlene Martinez	Date: 07/01/03	Signature: L.D. Walker	Date: 10/1/03

BOREHOLE LOG

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Date: 07/01/03

Well ID: C4122

Well Name: 299-E25-93

Location: East of 241-A Tank Farm

Project: C403 RCRA Drilling

Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample		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
	Type No.	Blows Recovery			
200	Grab BH 9"	N/A		@ 200' sand (95%) silt (5%) sand, med-vege, med-well sorted, SR-SA, 40% basalt, 40% qtz/other, micaceous 10YR 4/3, brown, moist no rxn HCl.	Becker Hammer using dual wall casing 9" OD collect 200' archive
205	Grab BH 9"				Collect 205' archive Am I H ck organics < detect.
210	Grab BH 9"				Collect 210' archive
215	Grab BH 9"			215-220' gravelly SAND (95%) 10% gravel, 85% sand, 5% silt. Gravel, R-SR, well sorted, predominately pea-size gravel, med. < 0.5", basaltic sand, v. poorly sorted, SR-SA, vfn-vege grained, 40% basalt, 40% qtz/other. Trace mica. 10YR 4/3 brown (moist) no rxn HCl.	Collect 215' archive
220	Grab BH 9"				Collect 220' archive
225	Grab BH 9"			220-225' SAND (95%) 95% sand, 5% silt, trace fine gravel. Sand, v. poorly sorted, SR-SA, vfn-vege grained, 40% basalt, 40% qtz/other. 10YR 4/3 brown (moist) no rxn HCl.	Collect 225' archive
230	Grab BH 9"				Collect 230' archive
235	Grab BH 9"				Collect 235' archive

Reported By: Charlene Martinez

Reviewed By: L.D. Walker

Title: Geologist

Title: Geologist

Signature: Charlene Martinez

Date: 07/01/03

Signature: L.D. Walker

Date: 10/1/03

A-6003-642 (03/03)

BOREHOLE LOG					Page 7 of 8	
					Date: 07/01/03	
Well ID: C4122		Well Name: 299-625-93		Location: East of 241-A Tank Farm		
Project: C403 RCRA drilling				Reference Measuring Point: Ground Surface		
Depth (Ft.)	Sample Type No.	Blows Recovery	Graphic Log	Sample Description	Comments	
240	Grab BH 9"	N/A		240' Sand, trace gravel, trace silt. sand v. poorly sorted, rfn-vest grained, SR-SA, 60-65% basals, 20-35% quartz, other, 10YR 4/3 brown (moist) No rxn HCl.	Becker Hammer using dual wall casing 9" O.D. collect 240' archive	
245	Grab BH 9"				Collect 245' archive	
250	Grab BH 9"				Collect 250' archive	
255	Grab BH 9"				Collect 255' archive	
260	Grab BH 9"				260'-317' sandy GRAVEL (SG) 45% gravel, 50% sand, 5% silt. Gravel, med sorted, pea-sized to med pebbles, SA-R, sand, poorly sorted, SR-SA, med-vest grained, 10YR 5/3 brown (moist) No rxn HCl.	Collect 260' archive cont. RCT coverage between 260'-280' bgs 2.8X @ background
265	Grab BH 9"				Collect 265' archive	
270	Grab BH 9"				Collect 270' archive	
275	Grab BH 9"				Collect 275' archive	
					Tagged g.w. @ 278.04' bgs (07/15/03) organics < detect.	
					EOS @ 280' bgs (07/16/03) Start @ 280' bgs (07/22/03)	
Reported By: Charles Martinez				Reviewed By: L.D. Walker		
Title: Geologist				Title: Geologist		
Signature: Charles Martinez		Date: 07/01/03		Signature: L.D. Walker		
				Date: 10/1/03		

BOREHOLE LOG					Page 8 of 8
					Date: 07/01/03
Well ID: C4122		Well Name: 299-625-93		Location: East of 241-A Tank Farm	
Project: C403 RCRA Drilling				Reference Measuring Point: Ground surface	
Depth (Ft.)	Sample		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
	Type No.	Blows Recovery			
280	BH 9" Grab 35# 1	n/A 200 blows 0% rec			Rock Hammer using dual wall casing. 9" OD. Collect 280' archive. 35# 1 280-282.5' bgs.
285	BH 9" Grab BH 9"	n/A			no recovery. Collect 285' archive. Am GCT etc. 1.2.20 background.
290	Grab BH 9"				Collect 290' archive.
295	Grab BH 9"				Collect 295' archive.
300	Grab BH 9"				Collect 300' archive.
305	Grab BH 9"				Collect 305' archive. Am IH etc. organics < detect.
310	Grab BH 9"				Collect 310' archive.
315	Grab 35# 2	200 blows 15% rec			312-320' Silty sandy GRAVEL (msG) 100% gravel, 30% sand, 10% silt. Gravel, poorly sorted, SA-R, 20% basalt, 80% qtz/other. Sand, poorly sorted, SR-SA, vfn-ucse, 25% basalt, 75% qtz/other. moderate cementation, Fe oxide staining, micaceous. Sample - wet.
320	Grab BH 9"				Collect 315' archive. Ringold ftn @ 317' bgs. Collect 320' archive. TD @ 320' bgs.
320	Grab BH 9"				
320	Grab BH 9"				
Reported By: Charlene Martinez				Reviewed By: L.D. Walker	
Title: Geologist				Title: Geologist	
Signature: Charlene Martinez		Date: 07/09/03		Signature: L.D. Walker	
				Date: 10/1/03	

A-6003-642 (03/03)

WELL SUMMARY SHEET		Start Date: 07/10/03		Page 1 of 2	
		Finish Date: 07/17/03			
Well ID: C 4123		Well Name: 299-E24-22			
Location: West of 241-AY Tank Farm		Project: C403 RCRA drilling			
Prepared By: Charlene Martinez		Date: 08/06/03		Reviewed By: L.D. Walker	
Signature: <i>Charlene Martinez</i>		Signature: <i>L.D. Walker</i>		Date: 8/11/03	
CONSTRUCTION DATA		GEOLOGIC/HYDROLOGIC DATA			
Description	Diagram	Depth in Feet	Graphic Log	Lithologic Description	
9" OD dual wall temporary carbon steel casing		0		0-2' Backfill material (crushed gravel)	
6" ID protective casing set + 1.0' above permanent		2		2-15' SAND (s)	
4" ID SS 304 sched 10 riser: +2.00' → 286.21'		15		15-25' gravelly SAND (gs)	
Portland cement grout: 0' → 10.0'		25		25-175' SAND (s)	
Granular bentonite: 10.0' → 276.1'		40			
		80			
		120			
		160			
		200			
All temporary casing removed from ground:					
All depths are in feet below ground surface.					
				175-180' gravelly SAND (gs)	
				180-220' SAND (s)	
				220-225' gravelly SAND (gs)	
				225-270' SAND (s)	

WELL SUMMARY SHEET		Start Date: 07/01/03	Page 2 of 2
		Finish Date: 07/17/03	
Well ID: C4123		Well Name: 299-E24-22	
Location: west of 241-AY Tank Farm		Project: C403 RCRA drilling	
Prepared By: Charles Martinez	Date: 08/06/03	Reviewed By: L.D. Walker	Date: 8/11/03
Signature: Charles Martinez		Signature: L.D. Walker	
CONSTRUCTION DATA		GEOLOGIC/HYDROLOGIC DATA	
Description	Diagram	Depth in Feet	Lithologic Description
1/4" bentonite pellets: 276.1' → 281.1'		240	
10-20 mesh silica sand: 281.1' → 320'			270'-272' SILT/clay (m)
0.020" slot conc. wire-wrap well screen (SS 304 sched. 10) 286.21' → 321.26'		280	272'-281' SAND (s) 281'-285' gravelly SAND (gs) 285'-290' SAND (s) 290'-300' gravelly SAND (gs) 300'-310' sandy GRAVEL (sg) 310'-320' silty sandy GRAVEL (msG)
SS 304 sched. 10 sump casing endcap: 321.26' → 323.68'		320	
		340	TD = 330' bgs static water → 286.03' bgs (07/17/03)
All temporary casing removed from ground.			
All depths are in feet below ground surface			

BOREHOLE LOG						Page 1 of 9
						Date: 07/10/03
Well ID: C4123		Well Name: 299-E24-22		Location: West of 241-A Tank Farm		
Project: C403 RCRA Drilling				Reference Measuring Point: Ground surface		
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments	
	Type No.	Blows Recovery				
0	BH 9"	N/A		0-2' Backfill material. Crushed gravel	Dual well casing	
				2-15' SAND (S) 100% v. well sorted, vfn-med grained, SE-R	9" O.D. 7" I.D. Becker Hammer drilling	
5	Grab BH 9"			10YR 3/3, dark brown, moist, strong rxn HCl. Non-basaltic.	Aeolian sand 2-10' collect 5' archive	
				@ 10-15' sand basaltic. (65%)	Hanford fmtn @ 10' logs	
				35% gtz/other. Poorly sorted, SE-SA vfn-v. coarse grained. Trace mica.		
10	Grab BH 9"			10YR 3/2 v. dark grayish brown (moist) Strong rxn HCl.	Collect 10' archive.	
				15-25' gravelly SAND (S) 15% gravel, 80% sand, 5% silt. Gravel med-sorted, SA-R, basaltic. Sand poorly sorted, SE-SA, vfn-v. coarse grained, 80% basaltic, 20% sand	Collect 15' archive.	
15	Grab BH 9"			2.5YR 3/1 v. dark gray (moist) mp ~ 1"		
				25-175' Sand (S) 5% gravel, 95% sand, trace silt. Gravel, basaltic, med-sorted, SE-R Sand. 40% basaltic, 60% gtz/other, poorly sorted, SE-SA	Collect 20' archive.	
20	Grab BH 9"			10YR 4/2 dark grayish brown (moist) no rxn HCl.	Collect 25' archive.	
				@ 30' basalt content increasing to ~ 70%.		
				@ 35' sand grading to well-sorted med-v. coarse grained. Basaltic, 45% gtz/other 55% v. micaceous. SE-SA		
25	Grab BH 9"			10YR 5/2 grayish brown (moist) no rxn HCl.	Collect 30' archive.	
30	Grab BH 9"					
35	Grab BH 9"				Collect 35' archive.	

Reported By: Charlene Martinez	Reviewed By: L.D. Walker
Title: Geologist	Title: Geologist
Signature: Charlene Martinez	Signature: [Signature]
Date: 07/10/03	Date: 10/1/03

A-6003-642 (03/03)

BOREHOLE LOG					Page 2 of 9
					Date: 07/10/03
Well ID: C4123		Well Name: 299-E24-22		Location: west of 241-A Tank Farm N.W. of 241-A Tank Farm	
Project: C403 BCRA drilling				Reference Measuring Point: Ground surface	
Depth (Ft.)	Sample		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
	Type No.	Blows Recovery			
40	Grab BH 9"	11A		@ 40' sand grading to vfn-vss	Becker Hammer rig using 9" OD dual wall casing. Collect 40' archive.
	Grab BH 9"			grained, 20% basalt, 30% gravel	
	Grab BH 9"			other, poorly sorted, ss-sa.	
	Grab BH 9"			moist	
45	Grab BH 9"				Collect 45' archive.
	Grab BH 9"				
	Grab BH 9"				
50	Grab BH 9"				Collect 50' archive.
	Grab BH 9"				
	Grab BH 9"				
55	Grab BH 9"			sand is increasing in basalt content (~80%) moist @ 55'	Collect 55' archive.
	Grab BH 9"				
60	Grab BH 9"				Collect 60' archive.
	Grab BH 9"				
65	Grab BH 9"				Collect 65' archive.
	Grab BH 9"				
70	Grab BH 9"				Collect 70' archive.
	Grab BH 9"				
75	Grab BH 9"				Collect 75' archive.
	Grab BH 9"				

Reported By: Charlene Martinez		Reviewed By: L.D. Walker	
Title: Geologist		Title: Geologist	
Signature: Charlene Martinez	Date: 07/10/03	Signature: L.D. Walker	Date: 10/1/03

BOREHOLE LOG						Page 3 of 9
Well ID: C4123		Well Name: 299-E-24-22		Location: West of 241-A Tank Farm N.W. of 241-A Tank Farm		
Project: C403 BCR				Reference Measuring Point: Ground Surface		
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments	
	Type No.	Blows Recovery				
80	Grab BH9"	N/A		@ 80' traces of well sorted SR-R gravel, basaltic mps ~ 0.5'. Sand continues to be 80% basalt, 20% poorly sorted as before. moist	Becker Hammer using 90" dual wall casing Collect 80' archive	
85	Grab BH9"				Collect 85' archive	
90	Grab BH9"				Collect 90' archive	
95	Grab BH9"				Collect 95' archive	
100	Grab BH9"			@ 100' gravel increasing to 5%. Basaltic, well sorted mps < 1". SR-R sand, basaltic, vfn-ucse, SR-SA	Collect 100' archive	
105	Grab BH9"				Collect 105' archive	
110	Grab BH9"			@ 110' sand, med-ucse grained, well-sorted, SR-SA, 45% basalt, 55% qtz/other. Trace mica. 7.5 YR 5/3 brown (moist) No rxn HCl.	Collect 110' archive IH ok. Organics < detect.	
115	Grab BH9"			@ 115' sand grading back to 100% basalt, 40% qtz/other, SR-SA, poorly sorted, vfn-ucse grain 7.5 YR 4/2 brown, moist. No rxn HCl.	Collect 115' archive.	

Reported By: Charlene Martinez	Reviewed By: L.D. Walker
Title: Geologist	Title: Geologist
Signature: Charlene Martinez	Signature: L.D. Walker
Date: 07/15/03	Date: 10/1/03

BOREHOLE LOG					Page 4 of 9
					Date: 07/10/03
Well ID: C4123		Well Name: 299-E24-22		Location: west of 241-MY Tank farm	
Project: C403 ECR drilling			Reference Measuring Point: Ground Surface		
Depth (Ft.)	Sample Type No.	Blows Recovery	Graphic Log	Sample Description	Comments
				Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
120	BH 9" Grab BH 9"	N/A		@ 120' same desc. as 115'	Becker Hammer using 9" O.D. dual wall casing Collect 120' archive
125	Grab BH 9"			@ 125' trace of well sorted, pea-size basaltic gravel, SE-R (LS 1/2)	Collect 125' archive
130	Grab BH 9"				Collect 130' archive
135	Grab BH 9"			@ 135' trace of pea-size basaltic gravel	Collect 135' archive
140	Grab BH 9"			@ 140' sand grading to well-sorted, med. coarse grained, SE-SA, 40% basalt, 60% g&cl other, 10YR 5/3 brown, moist. No rxn HCl. Trace pea-sized gravel.	Collect 140' archive
145	Grab BH 9"			@ 145' Increase in pea-size basaltic gravel (LS 1/2)	Collect 145' archive
150	Grab BH 9"				Collect 150' archive
155	Grab BH 9"				Collect 155' archive

Reported By: Charlene Martinez		Reviewed By: L.D. Walker	
Title: Geologist		Title: Geologist	
Signature: Charlene Martinez	Date: 07/10/03	Signature: L.D. Walker	Date: 10/1/03

BOREHOLE LOG					Page <u>5</u> of <u>9</u>
					Date: <u>07/10/03</u>
Well ID: <u>C4123</u>		Well Name: <u>299-E24-22</u>		Location: <u>West of 241-A Tank Farm</u>	
Project: <u>C403 RCEA drilling</u>				Reference Measuring Point: <u>Ground Surface</u>	
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments
	Type No.	Blows Recovery			
160	Grab BH 9"	N/A		@ 160' sand grading to well-sorted, SP-SA med-vese grain. Trace mica. 40% basalt, 60% qtz/other.	Becker Hammer using 9" OD dual-wall casing. Collect 160' archive.
165	Grab BH 9"				Collect 165' archive.
170	Grab BH 9"			@ 170' sand grading to poorly sorted, 65% basalt, 35% qtz/other, SR-SA vfn-vese grain.	Collect 170' archive.
175	Grab BH 9"			175'-180' gravelly SAND (gs) 10% gravel, 90% sand. Gravel, well-sorted, SR-E basaltic, mps 61". Sand, v poorly sorted, SR-SA, 65% basalt, 35% qtz/other, vfn-vese grain. 7.5 YR 4/2 brown (moist) no rxn HCl.	Collect 175' archive.
180	Grab BH 9"			180'-220' SAND(S) 100% v poorly sorted, vfn-vese grained, SR-SA, 20% basalt, 30% qtz/other 7.5 YR 4/1 dark gray (moist), no rxn HCl.	Collect 180' archive.
185	Grab BH 9"				Collect 185' archive.
190	Grab BH 9"			@ 185' basalt content decreasing to ~60% qtz/other increasing to 40% sand grading to med-well sorted, SR-SA, med-vese grained.	Collect 190' archive.
195	Grab BH 9"			@ 195' traces of pea-sized gravel, basaltic, sand as above.	Collect 195' archive.

Reported By: <u>Charlene Martinez</u>		Reviewed By: <u>L.D. Walker</u>	
Title: <u>Geologist</u>		Title: <u>Geologist</u>	
Signature: <u>Charlene Martinez</u>	Date: <u>07/10/03</u>	Signature: <u>L.D. Walker</u>	Date: <u>10/1/03</u>

BOREHOLE LOG						Page 6 of 9
						Date: 07/10/03
Well ID: C4622		Well Name: 299-824-22		Location: west of 241-A Tank farm		
Project: C403 RCMA drilling				Reference Measuring Point: Ground Surface		
Depth (Ft.)	Sample Type No.	Blows Recovery	Graphic Log	Sample Description	Comments	
				Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Depth of Casing, Drilling Method Method of Driving Sampling Tool Sampler Size, Water Level	
200	BH 9" Grab BH 9"	N/A		@ 200' sand grading to poorly sorted, SR-SA, vfn-vcoe grained. 40% basalt, 40% qtz/other. Trace gravel. Trace mica.	Becker hammer using 9" OD dual-wall casing. Collect 200' archive RCT ck. @ 215' @ background	
205	BH 9" Grab BH 9"			@ 205' sand grading to med-well sorted med-vcoe grained. Trace gravel. Basalt content 40%, qtz/other 40%.	Collect 205' archive	
210	BH 9" Grab BH 9"				Collect 210' archive	
215	BH 9" Grab BH 9"			@ 215' sand grading to poorly sorted vfn-vcoe grained. Trace gravel	Collect 215' archive	
220	BH 9" Grab BH 9"			220'-225' gravelly SAND(s) 15% gravel, 85% sand. Gravel poorly sorted SR-A, pea-size to med pebbles. 35% qtz/other, 65% basalt. mps ~ 15". Sand, SR-SA, poorly sorted 100% basalt, 40% qtz/other, vfn-vcoe grained.	Collect 220' archive	
225	BH 9" Grab BH 9"			2.5 Y 3/13 v. dark grayish brown, moist. no rxn HCl. Trace mica.	Collect 225' archive	
230	BH 9" Grab BH 9"			225'-230' SAND(s) 100% SR-SA. med-well sorted, med-vcoe grained. Trace mica. 55% basalt, 45% qtz/other. 2.5 Y 4/13 olive brown, moist. no rxn HCl.	Collect 230' archive	
235	BH 9" Grab BH 9"				Collect 235' archive	

Reported By: <u>charlene martinez</u>	Reviewed By: <u>L.D. Walker</u>
Title: <u>Geologist</u>	Title: <u>Geologist</u>
Signature: <u>charlene martinez</u>	Signature: <u>L.D. Walker</u>
Date: <u>07/10/03</u>	Date: <u>10/1/03</u>

BOREHOLE LOG						Page <u>7</u> of <u>9</u>
						Date: <u>07/10/03</u>
Well ID: <u>C4122</u>		Well Name: <u>299-B24-22</u>		Location: <u>West of 241-MY Tank Farm</u>		
Project: <u>C403 RCRA drilling</u>				Reference Measuring Point: <u>Ground Surface</u>		
Depth (Ft.)	Sample	Blows Recovery	Graphic Log	Sample Description	Comments	
	Type No.			Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level	
240	BH 9" Grab BH 9"	N/A		@ 240' same as previous description (275')	Becker Hammer using 9" OD dual wall casing collect 240' archive	
245	Grab BH 9"				collect 245' archive	
250	Grab BH 9"				collect 250' archive	
255	Grab BH 9"				collect 255' archive	
260	Grab BH 9"				collect 260' archive End of shift @ 260' hrs (07/10/03)	
265	Grab BH 9"			@ 265' sand grading to poorly sorted, w/fin- med. grain. basaltic. Trace of well-sorted, SR-R gravel (< 5%) pebbles to sm pebbles. Basaltic	collect 265' archive	
270	Grab BH 9"			Clay 270' - 272' SILT (m) 100% a very compact matrix, med. plasticity. Laminar bedding. Traces of Fe oxide staining. Clay 104 511 greenish gray (moist) outer color. Inner color 2.5Y 5/4 light olive brown (moist). Also 2.5Y 5/6 light olive brown (moist). Weak to no rxn HCl.	collect 270' archive	
275	Grab BH 9"				collect 275' archive	

Reported By: <u>Charlene Martinez</u>		Reviewed By: <u>L.D. Walker</u>	
Title: <u>Geologist</u>		Title: <u>Geologist</u>	
Signature: <u>Charlene Martinez</u>	Date: <u>07/10/03</u>	Signature: <u>L.D. Walker</u>	Date: <u>10/1/03</u>

A-6003-642 (03/03)

BOREHOLE LOG

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Date: 07/11/03

Well ID: C4123

Well Name: 299-E24-22

Location: West of 241-A Y Tank Farm

Project: C403 RCAP drilling

Reference Measuring Point: Ground surface

Depth (ft.)	Sample		Graphic Log	Sample Description	Comments
	Type No.	Blows Recovery			
280	BH 9"	N/A		277'-281' SAND(S) 100% trace of pea-size gravel (basaltic), Sand, SR-SR, poorly sorted, vfn-vsse grained. 65% basalt, 35% qtz/other, trace mica. no rxn HCl. 2.5 Y 3/2 v. dark grayish brown (moist)	Becker Hammer using 9" dual wall casing. Collect 280' archive.
285	Grab BH 9"	100% rec.			6. w. @ 286.02 kg (7/11/03). Collect 285' archive. SS ¹ interval (284.0-288.5) sieve analysis indicated a silty sand here.
290	Grab BH 9"			281'-285' gravelly SAND(GS) 15% gravel 45% sand. Gravel, med. pea-size to sm pebbles, well-sorted, SR-R, basaltic. Sand, SR-SR, poorly sorted, vfn-vsse. 65% basalt, 35% qtz/other 2.5 Y 3/2 v. dk grayish brown rxn HCl.	Collect 290' archive.
295	Grab BH 9"			285'-290' SAND(S) 100% poorly sorted, vfn-vsse, SR-SR, 75% basalt, 25% qtz/other. Trace gravel (basaltic) 2.5 Y 3/2 v. dk grayish brown (very moist @ 286 kg)	Collect 295' archive.
300	Grab BH 9"			290'-300' gravelly SAND(GS) 20% gravel, 80% sand. Gravel, well-sorted, pea-size - sm pebbles, SR-R, basaltic. Sand, SR-SR, vfn-vsse, poorly sorted, 65% basalt, 35% qtz/other. 2.5 Y 3/2 v. dk grayish brown	Collect 300' archive. Thick: 2.0-3.8 ppm organics in borehole. Oxygen % depletion may be corrosive (acid or basic) or possible rad.
305	Grab BH 9"			300'-310' sandy GRAVEL(SG) 70% gravel, 25% sand, 5% silt. Gravel, 35% basalt, 65% qtz/other, v. poorly sorted. SR-R, pea-size to med cobbles mps 2-4". Sand, poorly sorted, vfn-vsse grained. SR-SR, 45% basalt, 35% qtz/other	Collect 305' archive. larger cobbles @ 310' hgs > 5"
310	Grab BH 9"				Collect 310' archive.
315	Grab BH 9"			Sample wet.	Collect 315' archive.
				210' (next page)	

Reported By: Charlene Martinez

Reviewed By: L.D. Walker

Title: Geologist

Title: Geologist

Signature: Charlene Martinez

Date: 07/11/03

Signature: L.D. Walker

Date: 10/1/03

A-6003-642 (03/03)

BOREHOLE LOG					Page <u>9</u> of <u>9</u>
					Date: <u>07/11/03</u>
Well ID: <u>C4123</u>		Well Name: <u>299-E24-22</u>		Location: <u>west of 241-AP Tank Farm</u>	
Project: <u>C403 RCRA drilling</u>				Reference Measuring Point: <u>Ground Surface</u>	
Depth (Ft.)	Sample Type No.	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
320	BT 20 Grab BT 20 sieve analysis BT 20	N/A ↓ N/A		310'-330' Silt, Sandy GRAVEL (ms G) 70% gravel, 30% sand, 10% silt Gravel, SR-A, v. poorly sorted, pea-size to med cobbles (mps ~ 1") 55% basalt, 45% qtz/other. Sand, med-sorted, SR-R, 70% basalt, 30% qtz/other, pred. vfn-med grain (~20% v. cse-cse), micaceous, Fe oxide staining. Sample wet.	Becker Hammer using 9" OD dual-wall casing Collected 320' archive Collect sample @ 321' bgs for sieve analysis (cyclone)
325	Grab BT 20	↓			Collect 325' archive
330	Grab TD = 330'	↓	bgs	TD = 330' bgs	Collect 330' archive
335					
340					
345					
350					
355					
360					
365					
370					
375					
380					
385					
390					
395					
400					
405					
410					
415					
420					
425					
430					
435					
440					
445					
450					
455					
460					
465					
470					
475					
480					
485					
490					
495					
500					

Reported By: <u>Charlene Martinez</u>		Reviewed By: <u>L.D. Walker</u>	
Title: <u>Geologist</u>		Title: <u>Geologist</u>	
Signature: <u>Charlene Martinez</u>	Date: <u>07/11/03</u>	Signature: <u>L.D. Walker</u>	Date: <u>10/1/03</u>

WELL SUMMARY SHEET		Start Date: 07/21/03		Page 1 of 2
		Finish Date: 07/25/03		
Well ID: C4127		Well Name: 299-E27-21		
Location: South of CR-vault		Project: C403 RCRA drilling		
Prepared By: Charlene Martinez	Date: 08/07/03	Reviewed By: L.D. Walker	Date: 8/11/03	
Signature: <i>Charlene Martinez</i>		Signature: <i>L.D. Walker</i>		
CONSTRUCTION DATA		GEOLOGIC/HYDROLOGIC DATA		
Description	Diagram	Depth in Feet	Graphic Log	Lithologic Description
9" OD Dual-wall temporary casing used		0		0'-1' Backfill (crushed gravel)
				1'-20' SAND(s)
6" ID SS protective casing set +1.0' above permanent				20'-25' gravelly SAND(gs)
				25'-40' SAND(s)
4" ID SS 304 sched. 10 riser: + 271.37' → 271.37'		40		40'-65' gravelly SAND(gs)
				65'-160' SAND(s)
Portland Cement Grout: 0' → 10.1'		80		
Granular Bentonite: 10.1' → 260.4'				
1/4" Bentonite Pellets: 260.4' → 265.5'		120		
		160	160'-170' gravelly SAND(gs)	
			170'-185' SAND(s)	
			185'-200' silty sandy GRAVEL (msG)	
All temporary casing removed from ground:		200	200'-225' silty SAND(ms)	
			225'-235' silty sandy GRAVEL (msG)	
All depths are in feet below ground surface.			235'-240' silty SAND(ms)	

A-6003-643 (03/03)

WELL SUMMARY SHEET		Start Date: 07/21/03		Page 2 of 2	
		Finish Date: 07/25/03			
Well ID: C4127		Well Name: 299-E27-21			
Location: South of CR-Uault		Project: C403 RCR drilling			
Prepared By: Charlene Martinez	Date: 08/01/03	Reviewed By: L.D. Walker	Date: 8/11/03		
Signature: <i>Charlene Martinez</i>		Signature: <i>L.D. Walker</i>			
CONSTRUCTION DATA		GEOLOGIC/HYDROLOGIC DATA			
Description	Diagram	Depth in Feet	Graphic Log	Lithologic Description	
10-20 mesh silica sand: 265.5' → 314.0'		240		240'-275' silty sandy GRAVEL (msG)	
ss 304 (4" ID) schedule 10 0.020-in. cont. wire-wrap well screen: 271.37' → 306.43'		275		275'-285' gravelly SAND (gs)	
4" ID ss 304 schedule 10 sump endcap: 306.43' → 308.83'		280		285'-318' sandy GRAVEL (sg)	
4-8 mesh silica sand: 314.0' → 318.0'		320		TD = 318' bgs Static water 271.38' bgs (07/25/03)	
		360			
All temporary casing removed from ground:					
All depths are in feet below ground surface.					

BOREHOLE LOG						Page 1 of 8
						Date: 07/21/03
Well ID: C4127		Well Name: 299-E27-21		Location: S. of CR-Vault		
Project: C403 RCRA drilling				Reference Measuring Point: Ground Surface		
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments	
	Type No.	Blows Recovery			Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level	
0	8H9"	N/A		0'-1' Backfill, Gravel, basalt	Becker Hammer using 9" OD dual-wall casing	
5	Grab 8H9"			1'-20' Sand (s), 100% vfn-fn grained, v. well sorted, non-basaltic, 10YR 4/4 dark yellowish brown (moist), weak rxn HCl.	2'-5' Aeglian sand	
10	Grab 8H9"			@ 5' 90% sand, 5% silt, 5% gravel, Gravel, pea-size-sm. pebbles, R. well sorted basaltic sand, vfn-cse, mod-sorted, 45% basalt, 55% qtz/other, SR-R, 2.5Y 4/3 olive brown (moist) strong rxn HCl. Loose matrix.	Collect 5' archive 5' Hanford ftn.	
15	Grab 8H9"			20'-25' gravelly SAND (s) 15% gravel, 78% sand, 7% silt, Gravel mod-sorted, SR-R, mps ~ 2", basaltic. Sand, poorly-sorted, SR-SA, vfn-vcse grained, 80% basalt, 20% qtz/other	Collect 15' archive	
20	Grab 8H9"			10YR 3/2, v. dark grayish brown (moist) mod rxn HCl. Loose matrix	Collect 20' archive	
25	Grab 8H9"			25'-40' SAND (s) 93% sand, 7% silt, Sand, poorly sorted, vfn-vcse grained, SR-SA, 80% basalt, 20% qtz/other, 10YR 3/2, v. dark grayish brown (moist) mod rxn HCl. Loose matrix	Collect 25' archive	
30	Grab 8H9"			@ 30' sand grading to mod-sorted, fn-cse, grained, non-basaltic, SR-R, trace mica, 2.5Y 5/3 light olive brown (moist), no rxn HCl. Unconsolidated	Collect 30' archive	
35	Grab 8H9"			@ 35' sand grading to v. poorly sorted, vfn-vcse grained, SR-SA, 80% basalt, 20% qtz/other, silt ~ 5%, trace of pea-size, basaltic gravel (< 5%) 10YR 3/2 v. dark grayish brown. Unconsolidated.	Collect 35' archive	
Reported By: charlene martinez				Reviewed By: L.D. Walker		
Title: Geologist				Title: Geologist		
Signature: charlene martinez		Date: 07/21/03		Signature: L.D. Walker		Date: 9/30/03

BOREHOLE LOG					Page 2 of 8	
					Date: 07/21/03	
Well ID: C4127		Well Name: 299-E27-21		Location: S. of CR-Vault		
Project: C403 RCRA drilling			Reference Measuring Point: Ground Surface			
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments	
	Type No.	Blows Recovery				
40	BA 9"	N/A		40'-65' gravelly SAND (GS) 10% gravel, 85% sand, 5% silt.	Becker Hammer using 9" OD dual-wall casing.	
	Grab BA 9"			Gravel, well-sorted, SR-R, basaltic, med. pea-size. Sand, SR-SA, v. poorly-sorted, vfn-vcsr grained. 80% basalt, 20% qtz/other w/ R3L2, v. dark grayish brown (moist). No rxn HCl.	collect 40' archive	
45	Grab BA 9"					
	Grab BA 9"					
50	Grab BA 9"				45'-160' sand (s) 95% sand, 5% silt. Sand, med-sorted, SR-SA, med-coe grained, 15% basalt, 85% qtz/other 2.5 Y 5/3 light olive brown (moist), micaceous. No rxn HCl.	collect 50' archive
55	Grab BA 9"					
	Grab BA 9"					
60	Grab BA 9"					collect 60' archive
	Grab BA 9"					
65	Grab BA 9"					collect 65' archive
	Grab BA 9"					
70	Grab BA 9"					collect 70' archive
	Grab BA 9"				@ 75' sand grading to v. poorly sorted, SR-SA, v. cse-vfn grained, 30% basalt, 30% qtz/other 2.5 Y 4/3, dark grayish brown. no rxn HCl.	collect 75' archive
75	Grab BA 9"					

Reported By: Charles Martinez		Reviewed By: L.D. Walker	
Title: Geologist		Title: Geologist	
Signature: Charles Martinez	Date: 07/21/03	Signature: L.D. Walker	Date: 7/30/03

BOREHOLE LOG					Page 3 of 8
					Date: 07/21/03
Well ID: C4127		Well Name: 299-E27-21		Location: S. of CR-Vault	
Project: 2403 RCRA drilling			Reference Measuring Point: Ground Surface		
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments
	Type No.	Blows Recovery			
80	Grab BH 9"	N/A		@ 80' basalt content decreasing to 60% at 80', other 40% Sand continues to be v. poorly sorted, SR-SA, vfn-veg-grained.	Becker Hammer using 9" OD dual-wall casing. collect 80' archive
85	Grab BH 9"			@ 85' trace of pea-size, basaltic gravel (< 5%) Sand. same as previous	collect 85' archive
90	Grab BH 9"				collect 90' archive
95	Grab BH 9"			@ 95' trace pea-size gravel, mps ~ 0.5" basaltic	collect 95' archive
100	Grab BH 9"			@ 100' trace of gravel (< 0.4") basaltic	collect 100' archive
105	Grab BH 9"				collect 105' archive
110	Grab BH 9"				collect 110' archive
115	Grab BH 9"			@ 115' gravel increasing to ~ 8% Pea-size to sm pebbles, med-sorted, SR-R, basaltic	collect 115' archive

Reported By: Charlene Martinez		Reviewed By: L. J. Walker	
Title: Geologist		Title: Geologist	
Signature: Charlene Martinez	Date: 07/21/03	Signature: L. J. Walker	Date: 9/30/03

BOREHOLE LOG					Page <u>4</u> of <u>8</u>		
					Date: <u>07/21/03</u>		
Well ID: <u>C4127</u>		Well Name: <u>299-E27-21</u>		Location: <u>S. of CR-Vault</u>			
Project: <u>C403 RCRA drilling</u>				Reference Measuring Point: <u>Ground Surface</u>			
Depth (Ft.)	Sample Type No.	Blows Recovery	Graphic Log	Sample Description	Comments		
				Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level		
120	Grab BH 9"	n/a			Becker Hammer using 9" OD dual wall casing collect 120' archive		
125	Grab BH 9"			@ 125' trace gravel, mps ~ 1.5" basaltic. no rxn HCl.	collect 125' archive		
130	Grab BH 9"				collect 130' archive		
135	Grab BH 9"			@ 135' basaltic gravel (~5%) mod-sorted basaltic, mps ~ 2", med med-pebbles. Sand grading to med-well sorted. fn-cse grained, ss-sa, 55% qtz other, 45% basalt. no rxn HCl.	collect 135' archive		
140	Grab BH 9"			@ 140' sand grading to vfn-cse, poorly-sorted, ss-sa, silt increasing to ~ 7%. no rxn HCl.	collect 140' archive		
145	Grab BH 9"				collect 145' archive		
150	Grab BH 9"				collect 150' archive		
155	Grab BH 9"			@ 155' increase in cse - cse grained sand. Traces of pea-sized gravel.	collect 155' archive		
Reported By: <u>Charlene Martinez</u>				Reviewed By: <u>L. D. Walker</u>			
Title: <u>Geologist</u>				Title: <u>Geologist</u>			
Signature: <u>Charlene Martinez</u>		Date: <u>07/21/03</u>		Signature: <u>L.D. Walker</u>		Date: <u>9/30/03</u>	

BOREHOLE LOG					Page <u>5</u> of <u>8</u>
					Date: <u>07/21/03</u>
Well ID: <u>C4127</u>		Well Name: <u>299-E27-21</u>		Location: <u>S. of CR-Vault</u>	
Project: <u>C403 RCRA drilling</u>				Reference Measuring Point: <u>Ground Surface</u>	
Depth (Ft.)	Sample Type No.	Blows Recovery	Graphic Log	Sample Description	Comments
				Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Depth of Casing, Drilling Method Method of Driving Sampling Tool Sampler Size, Water Level
160	3H9" Grab 3H9"	N/A		160'-170' gravelly SAND (gs) 15% gravel, 75% sand, 10% silt. Gravel, well-sorted, sm-med pebbles, max ~1", basaltic, SR-SA. Sand, poorly sorted, SR-SA, vfn-v-coe grained. 50% basalt, 50% qtz/other, 2.5Y5/1 gray (dry). No rxn HCl.	Becker Hammer using 9" on dual-wall casing. Collect 160' archive
165	Grab 3H9"				Collect 165' archive
170	Grab 3H9"			170'-185' SAND (s) 90% sand, 10% silt, trace gravel. Gravel pea-size, basaltic. Sand, poorly sorted, SR-SA, vfn-v-coe grained, 50% basalt, 50% qtz/other. 10YR5/2, grayish brown (dry) no rxn HCl.	Collect 170' archive
175	Grab 3H9"				Collect 175' archive
180	Grab 3H9"			185'-200' silty Sandy GRAVEL (msG) 40% gravel, 50% sand, 10% silt. Gravel, well-sorted, SR-SA basaltic, Sand, poorly sorted, SR-SA, 45% basalt, 55% qtz/other. 10YR5/2, grayish brown (dry) no rxn HCl.	Collect 180' archive
185	Grab 3H9"				Collect 185' archive
190	Grab 3H9"				Collect 190' archive
195	Grab 3H9"				Collect 195' archive

Reported By: <u>Charlene Martinez</u>		Reviewed By: <u>L.D. Walker</u>	
Title: <u>Geologist</u>		Title: <u>Geologist</u>	
Signature: <u>Charlene Martinez</u>	Date: <u>07/21/03</u>	Signature: <u>L.D. Walker</u>	Date: <u>9/30/03</u>

BOREHOLE LOG						Page 6 of 8
						Date: 07/21/03
Well ID: C 4127		Well Name: 299-E27-21		Location: S. of CR-Vault		
Project: C403 RCRA drilling				Reference Measuring Point: Ground surface		
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments	
	Type No.	Blows Recovery			Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
200	BH 9 th	N/A		200'-225' Silty sand (m5) 88% sand, 12% silt, trace gravel. Sand, med sorted, med-verse grained, SR-SA, 55% Qtz/other, 45% basalt. 2.545/1 gray (dry) no rxn HCl.	Becker Hammer using 9" OD dual-wall casing collect 200' archive	
205	BH 9 th			@ 205' sand grading to poorly sorted, fn-verse grained, trace of pea-sized, basaltic gravel.	collect 205' archive	
210	BH 9 th				collect 210' archive	
215	BH 9 th			@ 215' trace of mica.	collect 215' archive	
220	BH 9 th			@ 220' trace gravel, 1mm pebbles < 0.5"	collect 220' archive	
225	BH 9 th			225'-235' Silty sandy GRAVEL (m56) 35% gravel, 55% sand, 10% silt. gravel, well sorted, basaltic, pea-sized. Sand, poorly sorted, ufn-verse, 55% Qtz/other, 45% basalt. Consolidated silt nodules w/ Fe oxide staining. 2.545/1 gray (dry). No rxn HCl. micaceous	collect 225' archive	
230	BH 9 th				collect 230' archive	
235	BH 9 th			235'-240' Silty sand (m5) 88% sand, 12% silt. Sand, poorly sorted, fn-verse, SR-SA, 55% Qtz/other, 45% basalt. 2.545/1 gray (dry). No rxn HCl. micaceous	collect 235' archive	
Reported By: charlene Martinez				Reviewed By: L.O. Walker		
Title: Geologist				Title: Geologist		
Signature: charlene martinez		Date: 07/21/03		Signature: L.O. Walker		Date: 9/30/03

A-6003-642 (03/03)

BOREHOLE LOG						Page <u>7</u> of <u>8</u>
						Date: <u>07/21/03</u>
Well ID: <u>C4127</u>		Well Name: <u>399-227-21</u>		Location: <u>S. of CC-Vault</u>		
Project: <u>C403 RCRA drilling</u>				Reference Measuring Point: <u>Ground Surface</u>		
Depth (Ft.)	Sample Type No.	Blows Recovery	Graphic Log	Sample Description	Comments	
				Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Depth of Casing, Drilling Method Method of Driving Sampling Tool Sampler Size, Water Level	
240	BH 9" Grab BH 9"	N/A		240-275' silty sandy GRAVEL (msG)	Becker Hammer using 9" OD	
				30% gravel, 40% sand, 10% silt	dual-wall casing	
				Gravel, basaltic, well-sorted, pea-size	collect 240' archive	
				Sand, poorly sorted, vfn-vase, SR-SA		
				45% basalt, 55% qtz/other, 2.5 v 5/1		
245	BH 9" Grab BH 9"			gray (Arg) no rxn HCl, micaceous	collect 245' archive	
250	BH 9" Grab BH 9"			collect 250' archive		
				A.M. ILL. organics < detect		
255	BH 9" Grab BH 9"			@ 255' gravel increasing to 55%, sand 35%, silt 10%, Gravel, well-sorted, SR-SA, rounded pebbles, 45% basalt, 35% qtz/other, micaceous	collect 255' archive	
				A.M. RCTCK Sodium		
				Iodide meter used.		
				T @ background		
260	BH 9" Grab BH 9"				collect 260' archive	
265	BH 9" Grab BH 9"				collect 265' archive	
270	BH 9" Grab BH 9"				collect 270' archive	
275	BH 9" Grab BH 9"			275-285' gravelly SAND (gs) 20% gravel, 75% sand, 5% silt Gravel, poorly sorted, pea-size - 10 pebbles, msG, basaltic, SR-SA, Sand, poorly sorted, vfn-vase grained, SR-SA, 55% basalt, 45% qtz/other	collect 275' archive	
				collect sample from		
				cyclone (275'-280')		
				for sieve analysis		

Reported By: Charles Martine

Title: Geologist

Signature: Charles Martine

Reviewed By: L.D. Walker

Title: Geologist

Signature: L.D. Walker

Date: 07/21/03

Date: 9/30/03

BOREHOLE LOG					Page 8 of 8
					Date: 07/21/03
Well ID: C-4127		Well Name: 299-227-21		Location: S. of CR-vault	
Project: C403 RCRA drilling				Reference Measuring Point: Ground Surface.	
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments
	Type No.	Blows Recovery			
280	Grab BH 911	N/A		285' - 318' Sandy GRAVEL (AG) 45% gravel, 30% sand, 5% silt. Gravel, mod-sorted. 80% basalt, 20% qtz/other, SR-R, pea-size - med pebbles. Sand poorly sorted. SR-SA, 60% basalt, 40% qtz/other. unconsolidated	Becker Hammer using 9" OD dual-wall casing. Collect 280' archive
285	Grab BH 911				Collect 285' archive
290	Grab BH 911				Collect 290' archive
295	Grab BH 911				Collect 295' archive
300	Grab BH 911				Collect 300' archive
305	Grab BH 911				v. hard drilling @ 300' bgs.
310	Grab BH 911				@ 305' gravel v. poorly sorted, sm pebbles - lg cobbles mps ~ 5-6". No visible cementation. Basalt content down to 40% . 60% qtz/other.
315	Grab BH 911				Collect 310' archive
318	Grab BH 911				P.M. I.H. tech reported oxygen in casing is decreasing. Unknown substance is eating oxygen (~ 310' bgs)
315	Grab BH 911				Collect sample from cyclone (312-315') for sieve analysis
315	Grab BH 911			Collect 315' archive	
318	Grab BH 911			lg. cobble @ 318' bgs	
318	Grab BH 911			Collect TD @ 318' bgs	
TD => 318' bgs (07/21/03)					
Reported By: Charlene Martinez				Reviewed By: L.D. Walker	
Title: Geologist				Title: Geologist	
Signature: Charlene Martinez		Date: 07/21/03	Signature: L.D. Walker		Date: 9/30/03

WELL SUMMARY SHEET				Start Date: 07/28/03		Page 2 of 2	
				Finish Date: 08/05/03			
Well ID: C4126				Well Name: 299-E27-20			
Location: west of C-Tank Farm				Project: CY03 RCRA drilling			
Prepared By: Charlene Martinez		Date: 08/08/03		Reviewed By: L.D. Walker		Date: 8/12/03	
Signature: Charlene Martinez				Signature: L.D. Walker			
CONSTRUCTION DATA		GEOLOGIC/HYDROLOGIC DATA					
Description	Diagram	Depth In Feet	Graphic Log	Lithologic Description			
9" on dual-wall casing used.		240		240' - 278.5' sandy GRAVEL (SG)			
		280		STATIC WATER @ 273.5' bgs (07/29/03)			
				Refusal @ 278.5' bgs			
				Borehole decommissioned			
All temporary casing removed from ground:							
All depths are in feet below ground surface.							

BOREHOLE LOG					Page 1 of 7
					Date: 07/28/03
Well ID: C4126		Well Name: 299-827-20		Location: W. of C-Tank Farm	
Project: CY 03 RCRA drilling			Reference Measuring Point: Ground Surface		
Depth (Ft.)	Sample Type No.	Blows Recovery	Graphic Log	Sample Description	Comments
				Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	BH 94	N/A		0-1' Backfill material. Crushed basaltic gravel.	Becker Hammer using 9" OD steel wall casing.
5	Grab BH 94			1'-5' SAND (s) 95% sand, 5% silt. Sand, R. v. well sorted vfn med grained, non-basaltic. 2.5Y5/3 light olive brown (dry). micaceous. No rxn HCl.	Asolian sand. Collect 5' archive
10	Grab BH 94			5'-13' gravelly SAND (gs) 15% gravel, 85% sand, 5% silt. Gravel, med-sorted. SR-SA, basaltic, mps ~ 1.5". Sand, v. well sorted, R. vfn-med, non-basaltic. 2.5Y3/3 dark olive brown (moist). micaceous. Strong rxn HCl.	Hanford fmtn @ 5' bgs. Collect 10' archive
15	Grab BH 94			13'-16' Sand (s) 5% gravel, 8% sand, 8% silt. Gravel, poorly sorted, basaltic, SR-SA, mps ~ 3". Sand, poorly sorted, vfn-v. coarse, 85% basalt, 15% qtz/other, SR-SA 2.5Y3/3, v. dark grayish brown (moist). mod. rxn HCl.	Collect 15' archive
20	Grab BH 94			16'-20' gravelly sand (gs) 10% gravel, 82% sand, 8% silt. Gravel, poorly sorted, SR-SA, sm pebbles-med cobbles, mps ~ 4", basaltic. Sand, poorly sorted, SR-SA vfn-v. coarse grained, 85% basalt, 15% qtz/other, trace mica. 2.5Y3/3 v. dark grayish brown (moist). mod. rxn HCl.	Collect 20' archive. NH ₃ ~ 20 ppm in borehole. RST Surveying Spoils. Background @ 2200 ppm (Sodium) Spoils @ 3000 ppm
25	Grab BH 94			20'-85' SAND (s) 95% sand, 5% silt. Sand, poorly sorted, SR-SA vfn-v. coarse grained, 40% basalt, 10% qtz/other. 2.5Y5/3 grayish brown (moist). No rxn HCl.	Collect 25' archive
30	Grab BH 94				Collect 30' archive
35	Grab BH 94				Collect 35' archive

Reported By: Charlene Martinez	Reviewed By: L.D. Walker
Title: Geologist	Title: Geologist
Signature: Charlene Martinez	Signature: L.D. Walker
Date: 07/28/03	Date: 9/30/03

BOREHOLE LOG					Page 2 of 2
					Date: 07/29/03
Well ID: C4126		Well Name: 299-E27-20		Location: West of C-Tank Farm	
Project: C403 RCRA drilling			Reference Measuring Point: Ground Surface		
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments
	Type No.	Blows Recovery			
40	Grab BH94	NH		@20' sand, 0.5% vss, med sorted, basalt increase to 60% 40% get lother, 2.5 Y 4/3 olive brown (moist) no rxn HCl.	Becker Hammer using 9" dual-wheel casing collect 40' archive
45	Grab BH94			trace w. sorted gravel (basalt) @ 45' 25'-50' same sand description as 20' interval	collect 45' archive
50	Grab BH94				collect 50' archive @ 50' NH ₃ = 9 ppm
55	Grab BH94			@ 55' increase in pea-size basaltic gravel (~10%), well sorted, 3R sand same as before.	collect 55' archive
60	Grab BH94				collect 60' archive @ 60' NH ₃ = 18 ppm
65	Grab BH94			@ 65' increase in pea-size basaltic gravel (~8%) sand, poorly sorted, fine vss, med. sorted, 3R-5R, 50% basalt, 50% get lother, no rxn HCl.	collect 65' archive
70	Grab BH94				collect 70' archive @ 70' NH ₃ = 14 ppm
75	Grab BH94			@ 75' trace of pea-size gravel (~5%) sand same as above	collect 75' archive

Reported By: Charlene Martinez		Reviewed By: L.D. Walker	
Title: Geologist		Title: Geologist	
Signature: Charlene Martinez	Date: 07/30/03	Signature: L.D. Walker	Date: 9/30/03

A-6003-642 (03/03)

BOREHOLE LOG					Page <u>3</u> of <u>7</u>
Well ID: <u>C4126</u>			Well Name: <u>299-E27-20</u>		Date: <u>07/28/03</u>
Project: <u>C403 RCRA drilling</u>			Reference Measuring Point: <u>Ground Surface</u>		
Depth (Ft.)	Sample Type No.	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	Grab BH 9"	N/A			Becker Hammer using 900 dual-wall casing. collect 80' archive NH ₃ = 18 ppm (80')
85	Grab BH 9"			85'-90' gravelly SAND (s) 12% gravel, 85% sand, 3% silt. gravel, basaltic, SR-R, well-sorted, pea-size - 3/8 pebbles (mps ~ 0.3") sand poorly sorted, sm. v. coarse, SR-SA, 55% basalt, 45% qtz	collect 85' archive
90	Grab BH 9"			other, 2.5 Y 4/2 dark grayish brown (moist) no rxn HCl.	collect 90' archive NH ₃ = 18 ppm (90')
95	Grab BH 9"			90'-95' SAND (s) 95% sand, 5% silt, sand, SR-SA, v. poorly sorted, vfn. v. coarse grained, 55% basalt, 45% qtz / other, 2.5 Y 4/2 dark grayish brown (moist) no rxn HCl.	collect 95' archive
100	Grab BH 9"				collect 100' archive @ 100' 20 ppm NH ₃ RCT reports slight elevation of a.r., but below action levels.
105	Grab BH 9"				collect 105' archive
110	Grab BH 9"			95'-110' gravelly SAND (s), 15% gravel, 80% sand, 5% silt gravel, well sorted, SR-R, basaltic, pea-size - 3/8 pebbles sand, poorly sorted, SR-SA, vfn. v. coarse 55% basalt, 45% qtz / other, 2.5 Y 4/2, dark grayish brown (moist) no rxn HCl.	collect 110' archive
115	Grab BH 9"			110' (see next page) SAND (s)	collect 115' archive

Reported By: <u>Charlene Martinez</u>		Reviewed By: <u>L.D. Walker</u>	
Title: <u>Geologist</u>		Title: <u>Geologist</u>	
Signature: <u>Charlene Martinez</u>	Date: <u>07/28/03</u>	Signature: <u>L.D. Walker</u>	Date: <u>9/30/03</u>

BOREHOLE LOG

Page 4 of 7

Date: 07/28/03

Well ID: C4126

Well Name: 299-B27-20

Location: west of C-Tank Farm

Project: C403 RCR drilling

Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample		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
	Type No.	Blows Recovery			
120	BH 9"	N/A		110' - 160' SAND(s) 95% sand, 5% silt, 5% clay, 45% basaltic, 55% geol other, poorly sorted, 2.5 x 4 1/2 dark grayish brown (moist), no rxn HCl	Barker Hammer using 9" dual-wall casing. Collect 120' archive. @ 120' O.G.R. levels dropping @ 120' NH ₂ = 2.0 ppm
125	BH 9"			@ 120' sand, v. well sorted, non-basaltic, SR-R, v. fn-mad, micaceous 2.5 x 5 1/3, light olive brown (moist) no rxn HCl.	Collect 125' archive
130	BH 9"			@ 125' sand as described @ 120' trace basaltic gravel	Collect 130' archive @ 130' 19 ppm NH ₂
135	BH 9"			@ 130' sand as @ 125', trace gravel pea-size, basaltic, dry	Collect 135' archive
140	BH 9"			@ 135' trace gravel (pea-size) basaltic, dry	Collect 140' archive @ 140' NH ₂ = 11 ppm. O.G.R. slight elevation between 130'-140' bgs.
145	BH 9"			@ 145' trace gravel pea-size basaltic, dry	Collect 145' archive
150	BH 9"				Collect 150' archive @ 150' NH ₂ = 8 ppm. O.G.R. steady (good readings between 2400-2900 cpm). Background = 2200 cpm.
155	BH 9"			@ 155' trace pea-size gravel	Collect 155' archive

Reported By: Charlene Martinez

Reviewed By: L.D. Walker

Title: Geologist

Title: Geologist

Signature: Charles Martinez

Date: 07/28/03

Signature: L.D. Walker

Date: 9/30/03

BOREHOLE LOG					Page <u>5</u> of <u>7</u>	
					Date: <u>07/28/03</u>	
Well ID: <u>C4126</u>		Well Name: <u>299-G27-20</u>		Location: <u>west of C-Tank Farm</u>		
Project: <u>C403 RCRA drilling</u>				Reference Measuring Point: <u>Ground Surface</u>		
Depth (Ft.)	Sample		Graphic Log	Sample Description Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments	
	Type No.	Blows Recovery			Depth of Casing, Drilling Method Method of Driving Sampling Tool Sampler Size, Water Level	
160	BH 9"	N/A		160' - 175' silty, sandy GRAVEL (ms) 30' in gravel, 40' in sand, 10' in silt. Gravel, well-sorted, basaltic, pea-size, 3/4" pebbles, mps ~ 0.2". Sand, med-sorted, SR-SA, 40' to 95% other, 40' to 100% basaltic, med-vcse grained. 10% RSL, gray, dry. No rxn HCl.	Becker Hammer using 9" OD dual-wall casing. Collect 160' archive @ 160' NH ₃ = 19 ppm	
165	BH 9"				Collect 165' archive	
170	BH 9"				collect 170' archive @ 170' NH ₃ = 11 ppm	
175	BH 9"			175' - 220' silty SAND (ms) Sand, 85% silt 15% to Sand, 40% to basaltic, 60% to qtz, poorly sorted. SR-SA, vfn-vcse grained, trace mica, dry, 10% RSL, dry (gray) no rxn HCl.	collect 175' archive	
180	BH 9"			@ 180' sand grading to well-sorted sand, vfn med grain. No rxn HCl. 40% to basaltic, 60% to qtz/other	Collect 180' archive @ 180' NH ₃ = 9 ppm	
185	BH 9"				collect 185' archive	
190	BH 9"			@ 190' sand, med-sorted, fn-vcse grain.	collect 190' archive @ 190' NH ₃ = 14 ppm	
195	BH 9"			@ 195' sand, poorly sorted, vfn-vcse, SR-SA, silt decreasing.	Collect 195' archive	

Reported By: <u>Charlene Martinez</u>		Reviewed By: <u>L.D. Walker</u>	
Title: <u>Geologist</u>		Title: <u>Geologist</u>	
Signature: <u>Charlene Martinez</u>	Date: <u>07/28/03</u>	Signature: <u>L.D. Walker</u>	Date: <u>9/30/03</u>

BOREHOLE LOG					Page <u>6</u> of <u>7</u>
					Date: <u>07/28/03</u>
Well ID: <u>C4126</u>		Well Name: <u>299-227-20</u>		Location: <u>West of C-Tank Farm</u>	
Project: <u>C403 RCRA drilling</u>			Reference Measuring Point: <u>Ground Surface</u>		
Depth (Ft.)	Sample		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
	Type No.	Blows Recovery			
200	BH 9" Grab BH 9"	N/A		@ 200' increase in pea-size basaltic gravel, sand, poorly sorted, vfn-vcoe silt same	Becker Hammer using 9" OD dual-wall casing collect 200' archive @ 200' NH ₃ = 12 ppm 1 BT steady 58 CT off-size
205	Grab BH 9"			@ 205' sand grading to well-sorted vfn-med grain, 40% basalt, 40% other, dry, no rxn HCl. Silt same.	Collect 205' archive
210	Grab BH 9"			@ 210' sand, med. sorted, med-coe grained, dry. Silt same.	Collect 210' archive @ 210' NH ₃ = 8 ppm
215	Grab BH 9"			@ 215' trace gravel, pea-size, basalt, dry.	Collect 215' archive
220	Grab BH 9"			@ 220' - 240' SAND(S) 75% sand, 5% silt. Sand, poorly sorted SR-SA, vfn-vcoe 40% basalt, 60% other.	Collect 220' archive @ 220' NH ₃ = 21 ppm
225	Grab BH 9"				Collect 225' archive
230	Grab BH 9"			@ 230' sand grading to well-sorted SR-SA, med-coe grained, silt increase to ~8%.	Collect 230' archive @ 230' NH ₃ = 8 ppm
235	Grab BH 9"				Collect 235' archive
Reported By: <u>Charlene Martinez</u>			Reviewed By: <u>L.D. Walker</u>		
Title: <u>Geologist</u>			Title: <u>Geologist</u>		
Signature: <u>Charlene Martinez</u>		Date: <u>07/28/03</u>	Signature: <u>L.D. Walker</u>		Date: <u>9/30/03</u>

BOREHOLE LOG					Page 7 of 7
					Date: 07/28/03
Well ID: C 4126		Well Name: 299-C27-20		Location: west of C-Tank Farm	
Project: C403 RCLA Drilling			Reference Measuring Point: Ground Surface		
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments
	Type No.	Blows Recovery			
240	BH 94	N/A		@240' sand, v. well sorted, vfn-med grained, SR-R, 40% basalt, 40% qtz/other, micaceous, dry, no rxn HCl.	Becker Hammer using 9" dual-wall casing collect 240' archive @240' NH ₃ = 22 ppm
245	BH 94			240' → 245' sandy GRAVEL (SG) 35% gravel, 60% sand, 5% silt. Gravel med-well sorted, SR-SA, 45% basalt, 55% qtz/other. Sand well sorted, SR-SA, med-vcse grained, 40% basalt, 60% qtz/other, 10% RSL, grayish brown, dry, no rxn HCl.	collect 245' archive
250	BH 94			@250' gravel increased to 70% sand 20%, silt 10%. Gravel, poorly sorted, 3m-pebbles - 5m cobbles.	collect 250' archive @250' NH ₃ = 3 ppm
255	BH 94			@255' gravel, med-sorted, pea-size - 5m pebbles. Sand, poorly sorted, vfn-vcse. Basalt, 55% qtz/other 45% 10% RSL dark gray, dry, no rxn HCl.	collect 255' archive
260	BH 94			@260' gravel, well sorted, trace moisture, 55% gravel, 40% sand 5% silt.	collect 260' archive @260' NH ₃ = 3 ppm
265	BH 94			@265' gravel, 60% 35% sand 5% silt. Gravel, poorly sorted, SR-SA, basalt, 50% qtz/other 50% v. moist. Sand, poorly sorted, SR-SA, vfn-vcse, 45% qtz/other, 35% basalt.	collect 265' archive collect sample from cyclone (275'-277') sieve analysis collect 275' archive
270	BH 94			@270' gravel, increasing in size, med ~ 4", poorly sorted, pea-size - med cobbles. Sand, poorly sorted, SR-SA, same as above.	E.O.S. @ 278' (07/28/03) start 07/29/03 v. hard drilling @ 278' bgs Refusal @ 278.5' bgs
275	BH 94				
Reported By: Charlene Martinez			Reviewed By: L.D. Walker		
Title: Geologist			Title: Geologist		
Signature: Charlene Martinez		Date: 07/28/03	Signature: L.D. Walker		Date: 7/30/03
			TD = 278.5'		

WELL SUMMARY SHEET		Start Date: 08/05/03	Page 2 of 2
		Finish Date: 08/12/03	
Well ID: C4190	Well Name: 299-627-23		
Location: west of C-Tank Farm	Project: C403 RCR drilling		
Prepared By: Charlene Martinez	Date: 08/19/03	Reviewed By: L.D. Walker	Date: 9/5/03
Signature: Charlene Martinez		Signature: L.D. Walker	
CONSTRUCTION DATA		GEOLOGIC/HYDROLOGIC DATA	
Description	Diagram	Depth in Feet	Lithologic Description
10-20 mesh silica sand:		240	245'-255' silty sandy GRAVEL (msG)
267.8' → 318.0'			255'-260' GRAVEL (G)
4" ID ss 304 schedule 10,			260'-318' Sandy GRAVEL (SG)
0.020" cont. wire-wrap screen:			
273.51' → 308.54'		280	TD → 318' bgs
4" ID ss 304 schedule 10			static water @ 273.1' bgs
sumplendcap:			(08/12/03)
308.64' → 310.97'		320	
		340	
All temporary casing removed from ground:			
All depths are in feet below ground surface:			

BOREHOLE LOG						Page <u>1</u> of <u>8</u>
						Date: <u>08/05/03</u>
Well ID: <u>C4190</u>		Well Name: <u>299-E27-23</u>		Location: <u>West of C-Tank Farm</u>		
Project: <u>C403 RCRA drilling</u>				Reference Measuring Point: <u>Ground Surface</u>		
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments	
	Type No.	Blows Recovery		Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Depth of Casing, Drilling Method Method of Driving Sampling Tool Sampler Size, Water Level	
0	8 H 9"	N/A	△△△△	0'-1.5' Backfill material. Crushed gravel	Becker Hammer using 9" OD dual wall casing	
5			▽▽▽▽	1.5'-10' SAND(S) 100% 10. v. well sorted, vfn-med grained, R. 10YR 4/3 brown (moist). Strong rxn HCl	Redrill of C4126. no archive samples collected until 280' bgs	
10			○●○●	10'-12' gravelly sand (gs) 20% gravel, 80% sand. Gravel, poorly sorted sm pebbles-med cobbles, mps ~ 3.5", SR-SA sand, vfn-med, v. well sorted, 10YR 4/3 brown (moist) strong rxn HCl.	continuous IH support from 0' ~ 170' bgs due to NH ₃ detected @ C4126. NH ₃ ranged from 0 ppm - 5 ppm (~110' bgs) in borehole	
15			○●○●	12'-15' sandy GRAVEL (sg) 40% gravel, 55% sand, 5% silt. Gravel, v poorly sorted, SR-SA, sm pebbles-med cobbles, mps ~ 4". Sand, SR-SA, poorly sorted, vfn-vase, 75% basalt, 25% gtz/other. 10YR 3/2 v. dark grayish brown (moist) no rxn HCl.		
20			○●○●	15'-20' gravelly SAND (gs) 15% gravel, med-sorted, lg pebbles-sm cobbles sand, fn-vase, poorly sorted, SR-SA 2.5 Y 4/2 dark grayish brown (moist) 60% basalt, 40% gtz/other. No rxn HCl.		
25			○●○●	20'-103' SAND (S) 92% sand, 8% gravel. Gravel, basaltic, well-sorted, pea-sized. Sand, SR-SA, poorly sorted vfn-vase, 60% basalt, 40% gtz/other 2.5 Y 4/2 dark grayish brown (moist) No rxn HCl.		
30			○●○●			
35			○●○●			

Reported By: <u>Charlene Martinez</u>		Reviewed By: <u>L.D. Walker</u>	
Title: <u>Geologist</u>		Title: <u>Geologist</u>	
Signature: <u>Charlene Martinez</u>	Date: <u>09/05/03</u>	Signature: <u>L.D. Walker</u>	Date: <u>9/23/03</u>

BOREHOLE LOG					Page <u>2</u> of <u>8</u>		
					Date: <u>08/05/03</u>		
Well ID: <u>C4190</u>		Well Name: <u>299-E27-23</u>		Location: <u>West of C-Tank Farm</u>			
Project: <u>CY03 RCRA drilling</u>				Reference Measuring Point: <u>Ground Surface</u>			
Depth (Ft.)	Sample		Graphic Log	Sample Description <small>Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl</small>	Comments <small>Depth of Casing, Drilling Method Method of Driving Sampling Tool Sampler Size, Water Level</small>		
	Type No.	Blows Recovery					
40	349"	N/A		@ 40' no trace of gravel. 95% sand, 5% silt. Sand, vfm- v. ss.	Recker Hammer using 9" OD dual-wall casing		
45							
50							
55					@ 55' trace gravel, basaltic, mps ~ 3" sand, v. poorly sorted.		
60							
65					@ 65' trace gravel, basaltic, mps ~ 1.5" sand, v. poorly sorted.		
70							
75					@ 75' increase in pea-size basaltic gravel (~ 9%), Sand, v. poorly sorted.		

Reported By: <u>Charlene Martinez</u>		Reviewed By: <u>L.D. Walker</u>	
Title: <u>Geologist</u>		Title: <u>Geologist</u>	
Signature: <u>Charlene Martinez</u>	Date: <u>08/05/03</u>	Signature: <u>L.D. Walker</u>	Date: <u>9/24/03</u>

BOREHOLE LOG					Page <u>3</u> of <u>2</u>
					Date: <u>08/05/03</u>
Well ID: <u>C4190</u>		Well Name: <u>999-E27-23</u>		Location: <u>west of C-Tank Farm</u>	
Project: <u>C403 RCRA drilling</u>				Reference Measuring Point: <u>Ground Surface</u>	
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments
	Type No.	Blows Recovery		Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Depth of Casing, Drilling Method Method of Driving Sampling Tool Sampler Size, Water Level
80	BHA"	N/A		@ 80' 5-8% basaltic, pea-size gravel. Sand, v. poorly sorted.	Becker Hammer using 2" OD dual-wall casing
85				@ 85' gravel grading to well-sorted basaltic, sm pebbles, mps ~ 0.5" SR-SA, sand, v. poorly sorted.	
90				@ 90' silt coating on gravel, mps ~ 1.5" gravel, basaltic, SR-SA, < 5%.	
96				@ 95' gravel, pea-size - sm pebbles, ~ 9% basaltic	
100				@ 100' pea-size to med. pebbles, basaltic	
105				103' - 107' gravelly sand (s) 12% gravel, 88% sand, Gravel, basaltic mod-sorted, SR-SA, pea-size - sm pebbles Sand, v. poorly sorted, SR-SA, vfn= vase, 45% basaltic, 35% qtz / other 2.5 x 4 1/2 dk grayish brown (moist) No rxn HCl.	
110				107' - 110' Sand (s) trace gravel. Sand, poorly sorted, SR-SA, vfn= vase, graded, 2.5 x 4 1/2 dk grayish brown (moist). No rxn HCl. 60% basaltic, 40% qtz / other.	
115					

Reported By: <u>Charlene Martinez</u>		Reviewed By: <u>L.D. Walker</u>	
Title: <u>Geologist</u>		Title: <u>Geologist</u>	
Signature: <u>Charlene Martinez</u>	Date: <u>08/05/03</u>	Signature: <u>L.D. Walker</u>	Date: <u>9/24/03</u>

BOREHOLE LOG					Page 4 of 8
					Date: 08/05/03
Well ID: C4190		Well Name: 299-E27-23		Location: west of C-Tank Farm	
Project: C403 RCRA drilling			Reference Measuring Point: Ground Surface		
Depth (Ft.)	Sample		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
	Type No.	Blows Recovery			
120	B49"	N/A		@ 120' sand grading to med-sorted, SR-R, fn-ss, graded, 45% basalt, 55% gtz/other, 2.5 Y 4/3 olive brown (moist) no rxn HCl.	Becker Hammer using 9" ID dual-wall casing
125				@ 125' trace silt.	
130				@ 130' 8% basaltic, pea-size gravel. Sand grading to 60% basalt, 40% gtz/other, poorly sorted, vfn-vcse grain SR-sk, 2.5 Y 4/3 dk grayish brown (moist), no rxn HCl.	
135					
140				@ 140' trace gravel, mp 3 ~ 1"	
145				@ 145' trace mica. Increase in silt (< 5%) trace gravel, mp 3 ~ 1". Sand, poorly sorted, vfn-vcse, 60% basalt, 40% gtz/other.	
150					
155					
Reported By: Charles Martinez			Reviewed By: L.D. Walker		
Title: Geologist			Title: Geologist		
Signature: Charles Martinez		Date: 08/05/03	Signature: L.D. Walker		Date: 9/24/03

BOREHOLE LOG						Page <u>5</u> of <u>8</u>
						Date: <u>08/05/03</u>
Well ID: <u>C4190</u>		Well Name: <u>299-E27-23</u>		Location: <u>west of C-Tank Farm</u>		
Project: <u>C403 RCRA drilling</u>				Reference Measuring Point: <u>Ground surface</u>		
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments	
	Type No.	Blows Recovery		Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Depth of Casing, Drilling Method Method of Driving Sampling Tool Sampler Size, Water Level	
160	BH 9"	N/A		160' - 200' silty SAND (MS) 5% gravel, 82% sand, 13% silt (gravel, well-sorted, basaltic, pea-size, SR-R. sand, poorly-sorted, fn-vcse, 3R-SA, 50% basalt, 50% gtz) other, 2.5 Y 5/1 gray (dry) 2.5 Y 5/3 grayish brown (dry) No rxn HCl.	Recker Hammer using 2" OD dual-wall casing	
165						
170						
175						
180				@180' basalt content down to 40% gtz/other 60% sand, fn-vcse, poorly sorted		
185				@183' sand grading to well-sorted, fn-med grained, trace mica, 2.5 Y 4/4 olive brown (dry)		
190						
195				@195' sand grading to v. poorly sorted, 3R-SA, fn-vcse grained. Basalt 60%, gtz/other 40%. 10YR 4/2 dk. grayish brown (moist) No rxn HCl		

Reported By: <u>Charlene Martinez</u>		Reviewed By: <u>L.D. Walker</u>	
Title: <u>Geologist</u>		Title: <u>Geologist</u>	
Signature: <u>Charlene Martinez</u>	Date: <u>08/05/03</u>	Signature: <u>L.D. Walker</u>	Date: <u>9/23/03</u>

BOREHOLE LOG						Page 6 of 8
						Date: 08/05/03
Well ID: C4190		Well Name: 299-E27-23		Location: west of C-Tank Farm		
Project: CY03 RCR A drilling				Reference Measuring Point: Ground Surface		
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments	
	Type No.	Blows Recovery			Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
200	BHR	N/A		200' - 210.0' silty sandy GRAVEL (msG) 30% gravel, 60% sand, 10% silt. Gravel, well-sorted, SR-R, pea-size to sm. pebbles, mps ~ 0.5", basaltic. Sand, poorly sorted, SR-SA, vfn-vcsa, micaceous, 50% qtz/other, 50% basalt. 2.5 Y 4/2 dk. grayish brown (moist), no rxn HCl.	Becker Hammer using 9" OD dual-wall casing	
210				210' - 226' SAND(S) 95% sand, 5% silt. Sand, well sorted, med-coe grained SR-SA, micaceous. 10 Y R 5/2 grayish brown (dry) 40% basalt, 40% qtz/other no rxn HCl.		
226				226' - 230' gravelly SAND(S) 20% gravel, 75% sand, 5% silt. Gravel, well-sorted, SR-SA, basaltic, pea-size to sm. pebbles. Sand, poorly sorted, SR-SA vfn-vcsa, 40% basalt, 40% qtz/other 10 Y R 4/2 dk. grayish brown (moist) no rxn HCl.	A.M. RCT on site. ck'd spoils pile from 0' - 220' bgs. of A.R @ background.	
230				230' - 245' SAND(S) 95% sand, 5% silt, trace gravel. Sand, med-sorted SR-SA, fn-vcsa, 50% basalt, 50% qtz/other		
245				245' trace basaltic gravel, mps ~ 2". Sand, well sorted, vfn-med, SR-R micaceous, 35% basalt, 65% qtz/other. 2.5 Y 5/2 grayish brown (dry) no rxn HCl.		

Reported By: Charles Martinez	Reviewed By: L.D. Walker
Title: Geologist	Title: Geologist
Signature: Charles Martinez	Signature: L.D. Walker
Date: 08/05/03	Date: 9/24/03

BOREHOLE LOG						Page <u>2</u> of <u>8</u>
						Date: <u>08/05/03</u>
Well ID: <u>C4190</u>		Well Name: <u>299-E27-23</u>		Location: <u>West of C-Tank Farm</u>		
Project: <u>C403 RCRA drilling</u>				Reference Measuring Point: <u>Ground Surface</u>		
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments	
	Type No.	Blows Recovery		Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Depth of Casing, Drilling Method Method of Driving Sampling Tool Sampler Size, Water Level	
240	B419	N/A		245'-255' Silty Sandy GRAVEL (msg) 40% gravel, 50% sand, 10% silt. Gravel, well sorted, SR-SA, pea-size -sm pebbles, 70% basalt, 30% qtz/other Sand, poorly sorted, SR-SA, vfn-vsgs, 40% basalt, 60% qtz/other, micaceous. Silt nodules, 10YR 5/3 brown (moist) No rxn HCl.	Dual-wall casing 9" OD Becker Hammer	
245						
250				@ 250' gravel increase to 70% sand, 20% silt 10% Gravel, v. poorly sorted, pea-size - med. cobbles. mps ~ 5"		
255				255'-260' GRAVEL (g) 80% gravel, 15% sand, 5% silt. Gravel, poorly sorted, sm. pebbles - med cobbles, 65% basalt, 35% qtz/other, SR-SA. Sand, poorly sorted, SR-SA, 50% basalt, 50% qtz/other no rxn HCl. vfn-vsgs grained.		
260				260'-318' sandy GRAVEL (SG) 55% gravel, 38% sand, 7% silt. Gravel, poorly sorted, SR-SA, mps ~ 3.5", sm- pebble to med. cobbles, 65% basalt, 35% qtz/other, 10YR 4/2 dk. grayish brown (moist) No rxn HCl.		
265						
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275				@ 275' bgs => increase in basalt content 70% basalt, 30% qtz/other		
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Reported By: <u>Charlene Martinez</u>		Reviewed By: <u>L.P. Walker</u>	
Title: <u>Geologist</u>		Title: <u>Geologist</u>	
Signature: <u>Charlene Martinez</u>	Date: <u>08/05/03</u>	Signature: <u>L.P. Walker</u>	Date: <u>9/24/03</u>

BOREHOLE LOG					Page <u>8</u> of <u>8</u>	
					Date: <u>08/05/03</u>	
Well ID: <u>C4190</u>		Well Name: <u>299-E27-23</u>		Location: <u>west of C-Tank Farm</u>		
Project: <u>C403 RCRA drilling</u>				Reference Measuring Point: <u>Ground surface</u>		
Depth (Ft.)	Sample Type No.	Blows Recovery	Graphic Log	Sample Description <small>Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl</small>	Comments <small>Depth of Casing, Drilling Method Method of Driving Sampling Tool Sampler Size, Water Level</small>	
280	Grab BH94	N/A		@280' gravel v. poorly sorted, med. lg pebbles - lg cobbles. SR-A, very fragmented, basaltic. Sand, v. poorly sorted, vfn-vase, 90-95% basalt, 15-20% qtz/other	Becker Hammer using 2" dual-wall casing collect 280' archive	
285	Grab BH94				collect 285' archive	
290	Grab BH94				@290' increase in gravel content ~ 20% gravel, 25% sand, < 5% silt.	collect 290' archive
295	Grab BH94					collect 295' archive
300	Grab BH94					collect 300' archive
305	Grab BH94					collect 305' archive
310	Grab BH94	Sieve analysis sample			collect 310' archive collect sieve analysis sample (310' - 312' bgs)	large basalt boulder @311' bgs.
315	Grab BH94					collect 315' archive
318	Grab BH94					collect 318' archive
319	Grab BH94					collect 319' archive
Reported By: <u>Charlene Martinez</u>				Reviewed By: <u>L.D. Walker</u>		
Title: <u>Geologist</u>				Title: <u>Geologist</u>		
Signature: <u>Charlene Martinez</u>		Date: <u>08/05/03</u>		Signature: <u>L.D. Walker</u>		
				Date: <u>9/24/03</u>		

WELL SUMMARY SHEET			Start Date: 08/12/03		Page 1 of 2	
			Finish Date: 08/20/03			
Well ID: C4125			Well Name: 299-E27-4			
Location: west of C-Tank Farm			Project: C403 RCRA drilling			
Prepared By: Charlene Martinez		Date: 09/05/03	Reviewed By: L.D. Walker		Date: 9/5/03	
Signature: <i>Charlene Martinez</i>			Signature: <i>L.D. Walker</i>			
CONSTRUCTION DATA		Depth in Feet	GEOLOGIC/HYDROLOGIC DATA			
Description	Diagram		Graphic Log	Lithologic Description		
10 5/8" OD casing to 30' bgs		0		0'-2' Backfill (crushed Gravel)		
9" OD dual-wall temporary casing to 311' bgs				2'-28' SAND (s)		
				20'-22' Sandy GRAVEL (sG)		
				22'-45' SAND (s)		
6" ID ss protective casing set + 1.0' above permanent				45'-50' gravelly SAND (gs)		
				50'-80' SAND (s)		
4" 20 ss 304 schedule 10 riser: + 1.0' → 270.32'						
				80	80'-110' gravelly SAND (gs)	
Portland Cement Grout: 0' → 9.9'						
Granular Bentonite: 9.9' → 253.0'						
		120		110'-195' SAND (s)		
		160				
All temporary casing removed from ground:						
All depths in feet below ground surface.		200		195'-200' Sandy GRAVEL (sG)		
				200'-225' SAND (s)		
				225'-235' silty SAND (mS)		
				235'-240' SAND (s)		

BOREHOLE LOG						Page 1 of 2
						Date: 08/12/03
Well ID: C4125		Well Name: 299-527-4		Location: west of C-Tank Farm		
Project: C403 RCRA drilling				Reference Measuring Point: Ground Surface		
Depth (Ft.)	Sample		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	
	Type No.	Blows Recovery				
0	H.S.	N/A	△△△	0'-2' Backfill - Crushed basaltic gravel	med-risk 0-30' bgs.	
			△△△		Hollow-stem auger used	
			△△△	2'-20' sand(s) 100% sand, R, v. well sorted, vfn-fn grained, non-basaltic.	to 30' bgs. 10 9/16" OD	
				2.5Y4/3 olive brown, moist, strong rxn HCl.	single-wall casing used to 30' bgs. E.O.S. 08/12/03	
5	Grab H.S.				Start 08/12/03	
					Collect 5' archive	
				20'-22' Sandy GRAVEL (SG) 45% gravel, 35% sand, Gravel, poorly sorted, SE-SA, sm pebbles - sm cobbles	Collect 10' archive	
10	Grab H.S.			basaltic. Sand, vfn-fn grain, R, trace mica, non-basaltic, 2.5Y4/3 olive brown, moist, med rxn HCl.		
15	Grab H.S.			22'-45' SAND (S) 85% sand, 4% silt, 0% gravel. Gravel, well-sorted, poorly sorted, SE-R, basaltic. Sand, med-sorted, vfn-med grain, SE-SA, 2.5Y4/3 dark grayish brown, moist. No rxn HCl. Trace mica.	collect 15' archive	
20	Grab H.S.				Collect 20' archive	
25	Grab H.S.				Collect 25' archive	
30	Grab BH 9"				Cont. P.C.T./I.H. coverage 1st 30' at 8" @ background 11 Hz = 2 ppm @ 19' bgs. Collect 30' archive	
					Becker Hammer using 9" OD dual-wall casing 30'-TD.	
35	Grab BH 9"			@ 35' Sand, poorly sorted, vfn-vcoar grained, SE-SA, 45% silt/clay, 35% basaltic silt cement down. No gravel. 2.5Y5/2 grayish brown, moist. No rxn HCl.	Collect 35' archive	

Reported By: Charlene Martinez		Reviewed By: L.D. Walker	
Title: Geologist		Title: Geologist	
Signature: Charlene Martinez	Date:	Signature: L.D. Walker	Date: 9/30/03

BOREHOLE LOG						Page 2 of 8
						Date: 08/13/03
Well ID: C4125		Well Name: 299-E27-4		Location: west of C-Tank Farm		
Project: C403 RCRA drilling				Reference Measuring Point: Ground Surface		
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments	
	Type No.	Blows Recovery			Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level	
40	Grab B4194	N/A		@ 40' trace basaltic gravel, med ~ 3"	Recker Hammer using 9" OD dual-wall casing. Collect 40' archive	
45	Grab B4194			@ 45'-50' GRAVELLY SAND (gs) 15% gravel, 80% sand, 5% silt, Gravel, well-sorted, pea-size to sm pebbles, basaltic, R-SB. Sand, poorly sorted, fn-vcse grained, micaceous, 55% ptzlother, 45% basalt, No rxn HCl.	Collect 45' archive	
50	Grab B4194			50'-55' SAND (s) 95% sand, 5% silt, Sand, poorly sorted, SR-SB, ven-vcse, 55% ptzlother, 45% basalt, micaceous, no rxn HCl.	Collect 50' archive	
55	Grab B4194				Collect 55' archive	
60	Grab B4194				Collect 60' archive	
65	Grab B4194			@ 65' trace of pea-size basaltic gravel	Collect 65' archive	
70	Grab B4194			@ 70' trace of pea-size basaltic gravel	Collect 70' archive	
75	Grab B4194			@ 75' ~ 2% pea size basaltic gravel	Collect 75' archive	

Reported By: Charlene Martinez		Reviewed By: L.D. Walker	
Title: Geologist		Title: Geologist	
Signature: Charlene Martinez	Date: 08/13/03	Signature: L.D. Walker	Date: 9/30/03

BOREHOLE LOG					Page 3 of 8
					Date: 08/13/03
Well ID: C4125		Well Name: 299-E27-4		Location: west of C-Tank Farm	
Project: C403 RCRA drilling			Reference Measuring Point: Ground Surface		
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments
	Type No.	Blows Recovery			
80	Grab BH 9"	N/A		80'-110' gravelly sand (s) 20% gravel 25% sand, 5% silt. Gravel, well sorted, SR-R, 45% basalt, 35% quartz other, pea-size-sm pebbles. Sand, poorly sorted, SR-SA, vfn-vese, 45% basalt, 55% quartz. No rxn HCl, micaceous	Becker Hammer using 9" OD dual-wall casing collect 80' archive
85	Grab BH 9"			@ 85' gravel down to 15% Fred pea-size basaltic, SR-R	collect 85' archive
90	Grab BH 9"				collect 90' archive
95	Grab BH 9"			@ 95' gravel increasing to 20% mod-sorted, increasing to sm pebbles	collect 95' archive
100	Grab BH 9"			@ 100' sand mod sorted, basalt content decreasing to 45%. Gravel decreasing to 12%	collect 100' archive
105	Grab BH 9"			@ 105' gravel decreasing to 10%	collect 105' archive
110	Grab BH 9"			110' - 115' SAND(S) 94% sand, 6% silt. Sand, mod-sorted, med-vese, SR-SA 40% basalt, 60% quartz. Other, micaceous 2.5/5/2 grayish brown dry no rxn HCl.	collect 110' archive
115	Grab BH 9"			@ 115' sand grading to poorly sorted, vfn-vese, SR-SA.	collect 115' archive
Reported By: Charlene Martinez			Reviewed By: L.D. Walker		
Title: Geologist			Title: Geologist		
Signature: Charlene Martinez		Date: 08/13/03	Signature: L.D. Walker		Date: 9/30/03

BOREHOLE LOG					Page 4 of 8
					Date: 08/13/03
Well ID: C4125		Well Name: 299-E27-4		Location: west of C-Tank Farm	
Project: C403 RCRA drilling				Reference Measuring Point: Ground Surface	
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments
	Type No.	Blows Recovery			
120	BH 9" 9" 9"	N/A		@120' sand, v. poorly sorted, vfn-vsse grain, med. cse-vsse. Trace gravel. Simplex, mps ~ 0.5". silt ~ 6%.	Becker Hammer using 9" OD dual-wall casing. Collect 120' archive.
125	Grab BH 9"			@125' Increase in basaltic pea-size gravel (~ 3 1/2") sand, 50% basalt, 50% qtz/other. 6-7% silt.	Collect 125' archive.
130	Grab BH 9"			@130' pea-size basaltic gravel. Sand, poorly sorted, sr-sa, vfn-vsse. 6-7% silt.	Collect 130' archive.
135	Grab BH 9"			@135' still pea-size basaltic gravel.	Collect 135' archive.
140	Grab BH 9"			@140' pea-size gravel, basaltic. Sand vfn-vsse grain, poorly sorted, sr-sa. silt ~ 6%, 50% qtz/other, 50% basalt. No rxn HCl.	Collect 140' archive.
145	Grab BH 9"			@145' sand grading to med. sorted med-vsse grain, no gravel.	Collect 145' archive.
150	Grab BH 9"			@150' ~ 3% basaltic, pea-size gravel. Sand, sr-sa, med-vsse grain, 50% basalt, 50% qtz/other. No rxn HCl.	Collect 150' archive.
155	Grab BH 9"				Collect 155' archive.
Reported By: Charlene Martinez			Reviewed By: L.D. Walker		
Title: Geologist			Title: Geologist		
Signature: Charlene Martinez		Date: 08/13/03	Signature: L.D. Walker		Date: 9/30/03

BOREHOLE LOG					Page 5 of 8	
					Date: 08/13/03	
Well ID: C4125		Well Name: 29A-E27-4		Location: west of C-Tank Farm		
Project: C403 RCRA drilling				Reference Measuring Point: Ground Surface		
Depth (Ft.)	Sample Type No.	Blows Recovery	Graphic Log	Sample Description	Comments	
				Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level	
160	Grab BH 9"	N/A		@160' trace pea-size gravel (< 5%), basaltic sand, SR-SA, poorly sorted, fn-vcse, 50% ptzlothen, 50% basalt	Becker Hammer using 9" OD dual-wall casing collect 160' archive	
165	Grab BH 9"					collect 165' archive
170	Grab BH 9"				@170' trace pea-size basaltic gravel.	collect 170' archive
175	Grab BH 9"				@175' sand grading to med-sorted, SR-SA, 50% ptzlothen, 50% basalt, med-vcse	collect 175' archive
180	Grab BH 9"				@180' sand grading to poorly-sorted, SR-SA, fn-vcse grained, 50% basalt, 50% ptzlothen	collect 180' archive
185	Grab BH 9"				@185' pea-size basaltic gravel (~ 8%)	collect 185' archive
190	Grab BH 9"				@190' pea-size to small pebbles (~ 8%) pred. basaltic sand, v. poorly sorted, fn-vcse grain, SR-SA, silt 6-7%	collect 190' archive
195	Grab BH 9"				195' - 200' Sandy GRAVEL (26) 45% gravel, 50% sand, 5% silt. Gravel, v. well-sorted, SR-L, basaltic, pea-siz.	collect 195' archive
					Sand, med-sorted, m-vcse grained, 40% basalt, 60% ptzlothen, SR-SA, no rxn HCl	

Reported By: Charlene Martinez	Reviewed By: L.D. Walker
Title: Geologist	Title: Geologist
Signature: Charlene Martinez	Signature: L.D. Walker
Date: 08/13/03	Date: 9/30/03

BOREHOLE LOG					Page 6 of 8
					Date: 08/13/03
Well ID: C4125		Well Name: 299-E27-4		Location: west of C-Tank Farm	
Project: CY 03 RCRA drilling				Reference Measuring Point: Ground Surface	
Depth (Ft.)	Sample Type No.	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	BH 9" Grab BH 9"	N/A		200'-225' SAND (S) 5% gravel. 90% sand, 5% silt. Gravel: SR-SA basaltic, pea-size, well sorted. Sand, poorly sorted, vfn-vco, SR-SA, 40% Basalt, 40% qtzl other. No rxn HCl.	Recker Hammer using 2" OD dual-wall casing collect 200' archive P.M. RCT OK. All okay
205	Grab BH 9"				collect 205' archive
210	Grab BH 9"				collect 210' archive
215	Grab BH 9"			@ 215' no trace gravel. silt content same sand, SR-SA, poorly sorted.	collect 215' archive
220	Grab BH 9"			@ 220' sand grading to med-sorted. vfn-med grain. few coarse grains 40% basalt, 40% qtzl other.	collect 220' archive
225	Grab BH 9"			225'-235' silty SAND (ms) 85% sand, 12% silt. Sand, SR-SA, med- sorted, vfn-vco, 40% basalt, 40% qtzl other. No rxn HCl micaceous	collect 225' archive
230	Grab BH 9"			@ 230' sand grading to well-sorted, vfn-fn, silt same	collect 230' archive
235	Grab BH 9"			235'-240' SAND (S) 95% sand 5% silt. Sand, vfn-fn, v. well sorted. R, non-basaltic, micaceous, 2.5% l/2 light brownish gray (dry) No rxn HCl.	collect 235' archive
Reported By: Charlene Martinez			Reviewed By: L.D. Walker		
Title: Geologist			Title: Geologist		
Signature: Charlene Martinez		Date: 08/13/03	Signature: L.D. Walker		Date: 9/30/03

BOREHOLE LOG						Page 7 of 8
						Date: 08/13/03
Well ID: C4125		Well Name: 299-E27-4		Location: west of C-Tank Farm		
Project: C403 RCRA drilling				Reference Measuring Point: Ground Surface		
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments	
	Type No.	Blows Recovery		Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Depth of Casing, Drilling Method Method of Driving Sampling Tool Sampler Size, Water Level	
240	BH #11 Grab BH #11	N/A		240'-245' gravelly sand (gs) 15% to gravel, 80% sand, 5% silt. Gravel, well-sorted, basaltic, sm- pebbles, SR-R, sand poorly sorted SR-SA, vfn-vese, 40% basalt, 60% qtz/other	Becker Hammer using 9" OD dual-wall casing Collect 240' archive	
245	Grab BH #11			245'-255' Sandy GRAVEL (gs) Gravel 45% sand 50% silt 5% Gravel well sorted, SR-SA, 45% basalt, 35% qtz/other, sm pebbles, Sand poorly sorted, SR-SA, vfn-vese, 45% basalt, 55% qtz/other. No rxn HCl, micaceous.	Collect 245' archive	
250	Grab BH #11			@ 250' gravel, med-sorted, mps ~ 2"	Collect 250' archive f.m. 2 H ₂ O, 1 H ₂ + organics < detect	
255	Grab BH #11			255'-272' GRAVEL (gs) 85% gravel, 10% sand, 5% silt. Gravel, med-sorted, SR-SA 80% basalt, 20% qtz/other, pea-size (predominant) occasional med-psbbt, mps ~ 2.5". Sand, poorly sorted, vfn-vese, SR-SA, 45% basalt, 55% qtz/other. No rxn HCl.	Collect 255' archive	
260	Grab BH #11				Collect 260' archive	
265	Grab BH #11			272'-311' Sandy GRAVEL (gs) 55% gravel, 40% sand, 5% silt. Gravel, med-sorted, SR-R, 45% basalt, 55% qtz/other, mps ~ 3". Sand, poorly sorted, pred. cse-vese grained, SR-SA, increase in basalt content, 80% basalt, 20% qtz/other	Collect 265' archive RCT performed thorough survey of spoils, q, 3.2' @ background (0'-270')	
270	Grab BH #11	Sieve Sample			Collect 270' archive Collect sieve analysis sample (from cyclone) between 270'-271' bgs	
275	Grab BH #11				Collect 275' archive	

Reported By: Charlene Martinez		Reviewed By: L.D. Walker	
Title: Geologist		Title: Geologist	
Signature: Charlene Martinez	Date: 08/13/03	Signature: L.D. Walker	Date: 9/30/03

BOREHOLE LOG

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Date: 08/13/03

Well ID: C-4125

Well Name: 299-E27-4

Location: west - of C-Tank Farm

Project: C403 RCRA drilling

Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample		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
	Type No.	Blows Recovery			
280	Grab BH 9"	N/A			Becker Hammer using 9" OD dual-wall casing collected 280' archive
285	Grab BH 9"			@ 285' gravel size decreasing, sm-med pebbles, some sm cobbles. Increased basalt content	collect 285' archive
290	Grab BH 9"				Collect 290' archive
295	Grab BH 9"			@ 295' gravel, poorly sorted, pea-size to med cobbles. Basalt 60% to 40% to 40% to 40%.	Collect 295' archive
300	Grab BH 9"	sieve analysis sample N/A			Collect 300' archive collect sample for sieve analysis (from cyclone) @ 301'-303' bgs
305	Grab BH 9"			@ 305' gravel, med-sorted, SA-R basaltic.	Collect 305' archive
310	Grab BH 9"				collect 309' archive
	TD => 311' bgs			TD => 311' bgs	
315					

Reported By: Charlene Martinez

Reviewed By: L. D. Walker

Title: Geologist

Title: Geologist

Signature: Charlene Martine

Date: 08/13/23

Signature: *[Handwritten Signature]*

Date: 9/30/03

WELL SUMMARY SHEET		Start Date: 08/21/03		Page 1 of 2		
Finish Date: 09/10/03						
Well ID: C4124		Well Name: 299-E27-23				
Location: East of C-Tank Farm		Project: C403 RCRA drilling				
Prepared By: Charlene Martinez	Date: 09/10/03	Reviewed By: L.D. Walker	Date: 9/15/03			
Signature: <i>Charlene Martinez</i>		Signature: <i>L.D. Walker</i>				
CONSTRUCTION DATA		GEOLOGIC/HYDROLOGIC DATA				
Description	Diagram	Depth in Feet	Graphic Log	Lithologic Description		
9" OD dual-wall temporary casing used.		0		0'-1' Backfill (crushed gravel)		
				1'-5' SAND(S)		
6" ID protective casing set +1.0' above permanent.				5'-10' gravelly SAND(gS)		
				10'-29' SAND(S)		
4" ID 43304 sch 10 riser pipe + 2.2' → 228.05'				29'-36' sandy GRAVEL(sG)		
			40		36'-50' SAND(S)	
Portland cement Grout: 0' → 10.0'				50'-54' sandy GRAVEL(sG)		
				54'-56' SAND(S)		
Granular Bentonite: 10.0' → 217.2'				56'-60' sandy GRAVEL(sG)		
				60'-72' silty sandy GRAVEL(msG)		
1/4" Bentonite Pellets: 217.2' → 222.5'				72'-81.6' silty gravelly SAND(msS)		
			80		81.6'-89' SAND(S)	
10-20 mesh Silica Sand: 222.5' → 269.0'				89'-98' silty SAND(ms)		
				98'-105' SAND(S)		
				105'-112' silty SAND(ms)		
			120		112'-116' SAND(S)	
				116'-122' silty SAND(ms)		
				122'-138' SAND(S)		
				138'-145' silty SAND(ms)		
				145'-153' gravelly silty SAND(gms)		
		160		153'-157' silty sandy GRAVEL(msG)		
			157'-165' sandy GRAVEL(sG)			
			165'-185' SAND			
			185'-188' silty sandy GRAVEL(msG)			
			188'-192' silty SAND(ms)			
		200		192'-215' sandy GRAVEL(sG)		
			215'-219' gravelly SAND(gS)			
			219'-222' silty sandy GRAVEL(msG)			
			222'-227' SAND(S)			
		220		227'-233' silty sandy gravel (msG)		
All depths in feet below ground surface:						
All temporary casing removed from ground.						
170' of 1/4" OD pipe remain in ground (bentonite seal) from 47-217						

WELL SUMMARY SHEET		Start Date: 08/21/03		Page 2 of 2	
		Finish Date: 09/10/03			
Well ID: C 4124		Well Name: 299-E27-22			
Location: East of C-Tank Farm		Project: C403 RCRA drilling			
Prepared By: Charlene Martinez		Date: 09/11/03		Reviewed By: L.D. Walker	
Signature: Charlene Martinez		Date: 9/15/03		Signature: L.D. Walker	
CONSTRUCTION DATA		GEOLOGIC/HYDROLOGIC DATA			
Description	Diagram	Depth in Feet	Graphic Log	Lithologic Description	
4" ID 35304 sch.10, 0.020-in. slot. cont. wire-wrap wellscreen:		240		232' - 248' sandy GRAVEL (SG)	
238.05' → 248.02'		248' BASALT			
4" ID 35304 sch.10 endcap:		280		TD = 269' bgs.	
248.02' → 268.10'		Static water → 230.46' bgs (09/10/03)			
All depths are in feet below ground surface					
All temporary casing removed from ground.					

BOREHOLE LOG					Page 1 of 7
					Date: 08/21/03
Well ID: C4124		Well Name: 299-G27-22		Location: n.e. of C-Tank Farm	
Project: C403 RCRA Drilling				Reference Measuring Point: Ground Surface	
Depth (Ft.)	Sample Type No.	Blows Recovery	Graphic Log	Sample Description	Comments
				Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0	BH#1	N/A	XXXX	0'-1' Backfill material. Crushed gravel.	Becker Hammer using 9" O.D. dual-wall casing
5	Grab BH#1			1'-5' SAND(S). 100% sand, v. well sorted, vfn-fn, non basaltic, micaceous. 2.5Y5/3 light olive brown (moist) no rxn HCl.	Collect 5' archive
10	Grab BH#1			5'-10' gravelly SAND(S) 20% gravel, 75% sand, 5% silt. Gravel med. sorted. SR-SR, 65% basalt. 35% qtz/other. Sand, poorly sorted, prod. v. coarse grained. vfn-v. coarse, SR-SR, 80% basalt. 20% qtz/other. 10YR3/1, v. dark gray (moist) no rxn HCl.	Collect 10' archive @ 10' NH ₃ = 35 ppm
15	Grab BH#1			10'-20' SAND, 95% sand, 5% silt. Sand, SR-SR, v. poorly sorted. SR-SR, 80% basalt. 20% qtz/other, vfn-v. coarse, prod. v. coarse grained. 10YR3/1 v. dark gray (moist) no rxn HCl.	Collect 15' archive @ 20' NH ₃ = 17 ppm
20	Grab BH#1	100%		@ 15' sand graded to vfn-fn, v. well sorted, micaceous. 40% basalt. 60% qtz/other no rxn HCl. 2.5Y4/2, dark grayish brown. Rounded	SS#1 19.5'-21.5' bgs collect 20' archive SS#2 21.5'-24.0' bgs
25	Grab BH#1	100% recovery		@ 20' sand graded to v. poorly sorted vfn-v. coarse. 40% basalt. 60% qtz/other SR-SR.	SS#3 24.0'-26.5' bgs Collect 25' archive E.O.S. @ 26.5' bgs (8/21/03) start 08/22/03
30	Grab BH#1	93% recovery		@ 22' trace poorly sorted gravel (< 8%) mp 2-4". Basaltic, SR-SR	SS#4 26.5'-29.0' bgs 4 ppm NH ₃ SS#5 29.0'-31.5' bgs 5 ppm NH ₃
35	Grab BH#1	100% recovery		@ 24.5' basaltic cobbles w/ poorly sorted gravel. Sand grading to poorly sorted, SR-SR, vfn-v. coarse	Collect 30' archive SS#6 31.5'-34.0' bgs
	Grab BH#1	100% recovery		29'-36' Sandy Gravel (SG) 30% gravel, 65% sand 5% silt. Gravel, med. sorted, pea-size-med cobbles, basaltic. Sand, poorly sorted	Collect 35' archive SS#7 34.0'-36.5' bgs SS#8 36.5'-39.0' bgs
Reported By: charlene Martinez				Reviewed By: L.D. Walker	
Title: Geologist				Title: Geologist	
Signature: Charlene Martinez		Date: 08/21/03		Signature: L.D. Walker Date: 9/30/03	

BOREHOLE LOG					Page 2 of 2
					Date: 08/22/03
Well ID: C4124		Well Name: 229-E27-22		Location: N.E. of C-Tank Farm	
Project: C403 RCRA drilling			Reference Measuring Point: Ground Surface		
Depth (Ft.)	Sample Type No.	Blows Recovery	Graphic Log	Sample Description	Comments
40	BH 911	SS# 8		(29' cent.) sand, SR-SA, vfn-vcse,	Becker Hammer using
	Gmb	SS# 9		50% basalt, 50% gtz/other.	9" OD dual wall casing
	BH 911	SS# 10		10YR 4/2 dark grayish brown, moist	collect 40' archive
		SS# 9		No rxn HCl.	SS# 9 39'-41.5' bgs
		SS# 10			SS# 10 41.5'-44.0' bgs
45	Gmb	SS# 11		36'-50' SAND(S) 95% sand,	collect 45' archive
	BH 911	SS# 12		5% silt. sand, vfn-fn, R,	SS# 11 44.0-46.5' bgs
		SS# 12		well sorted, non-basaltic No	
		SS# 13		rxn HCl. 3.5Y 5/3, light olive brown	
		SS# 13		(moist)	SS# 12 46.5'-49.0' bgs
50	Gmb	SS# 14		48'-48.5' compact sand lens,	collect 50' archive
	BH 911	SS# 14		laminar bedding, vfn-fn grain. Rounded,	SS# 13 49.0'-51.5' bgs
		SS# 14		non-basaltic.	SS# 14 51.5'-54.0' bgs
		SS# 15		@ 48.5' vsc - vfn grain sand.	SS# 15 54.0'-56.5' bgs
		SS# 15		poorly sorted, basaltic.	collect 55' archive
55	Gmb	SS# 16		50'-54' sandy GRAVEL (SG) 50% gravel,	
	BH 911	SS# 16		40% sand, 10% silt. Gravel,	SS# 16 56.5'-59.0'
		SS# 17		poorly sorted, med. pea-size - sm. cobbles	SS# 17 59.0'-61.5' (0.6 m)
		SS# 17		SA-R. Sand, poorly sorted, SR-SA, 60% basalt,	collect 60' archive
		SS# 18	40% gtz/other, vfn-vcse grain	SS# 18 61.5'-64.0' bgs	
		SS# 18	higher % cse/vcse grain. 10YR 4/1, dk gray	SS# 19 64.0'-66.5' bgs	
		SS# 19	(moist). No rxn HCl.		
65	Gmb	SS# 19	54'-56' SAND SAND(S) 90% silt	collect 65' archive	
	BH 911	SS# 20	10% sand, med-sorted, SR-SA		
		SS# 20	vfn-med, non-basaltic, 2.5Y 4/3	SS# 20 66.5'-69.0' bgs	
		SS# 21	olive brown, moist. No rxn HCl.	SS# 21 69.0'-71.5' bgs (0.6 m)	
		SS# 21		collect 70' archive	
70	Gmb	SS# 22	52'-60' sandy GRAVEL (SG) 45% gravel,		
	BH 911	SS# 22	30% sand, 5% silt.	SS# 22 71.5' bgs (0.22 m)	
		SS# 23	Gravel, basaltic, SA-R, poorly sorted, med - 2" sand, poorly sorted	SS# 22 71.5'-74.0' bgs	
		SS# 23	SR-SA, 60% basalt, 40% gtz/other,		
		SS# 24	vfn-vcse, 10YR 4/1 dk gray (moist)	collect 75' archive	
		SS# 24	No rxn HCl.	SS# 24 76.5'-79.0' bgs	
75	Gmb	SS# 24	60'-72' silty sandy GRAVEL (SG) 65% gravel,		
	BH 911	SS# 24	25% sand, 10% silt		

Reported By: Charlene Martinez	Reviewed By: L.D. Walker
Title: Geologist	Title: Geologist
Signature: Charlene Martinez	Signature: L.D. Walker
Date: 08/22/03	Date: 9/30/03

BOREHOLE LOG					Page <u>3</u> of <u>7</u>
					Date: <u>08/25/03</u>
Well ID: <u>C4124</u>		Well Name: <u>299-E27-22</u>		Location: <u>n.e. of C-Tank Farm</u>	
Project: <u>C403 RCN drilling</u>			Reference Measuring Point: <u>Ground surface</u>		
Depth (Ft.)	Sample Type No.	Blows Recovery	Graphic Log	Sample Description	Comments
80	BH 94	SS#23 80% recovery		(60' cont.) Gravel, poorly sorted, SA-R, 45% to med cobbles, 45% basalt, 55% other. Sand, poorly sorted, SR-A, 50% qtz, 50% basalt, fn-vase grained.	Becker Hammer using 9" OD dual-wall casing. Collect 80' archive.
85	BH 94	SS#24 65% recovery		10YR 5/3 brown (dry), no rxn HCl.	SS#25 79.0'-81.5' bgs SS#26 81.5'-84.0' bgs
90	BH 94	SS#27 85% recovery		72'-81.5' silty, gravelly SAND (ms) 15% gravel, 73% sand, 12% silt.	Collect 85' archive SS#27 84.0'-86.5' bgs SS#28 86.5'-89.0' bgs
95	BH 94	SS#28 100% recovery		Gravel, med-sorted, SA-R, 50% basalt, 50% qtz, other, ms ~ 2" sand, poorly sorted, SR-A, fn-vase grained, 50% basalt, 50% qtz, other, 10YR 5/2, grayish brown (moist), no to weak rxn HCl.	SS#29 89.0'-91.5' bgs Collect 90' archive
100	BH 94	SS#29 100% recovery		81.5'-89' SAND(S) 95% sand, 5% silt, sand, R, v. well sorted, vfn-fn grained, non-basaltic, trace mica, 2.5Y 5/3 light olive brown (moist), weak rxn HCl.	SS#30 91.5'-94.0' bgs SS#31 94.0'-96.5' bgs
105	BH 94	SS#31 100% recovery		@ 84' sand grading to v. coarse-vfn grained, basaltic, poorly sorted.	Collect 95' archive SS#32 96.5'-99.0' bgs
110	BH 94	SS#32 100% recovery		@ 85' sand, grading to v. coarse-med grained, med. sorted, basaltic, trace well-sorted gravel, basaltic.	SS#33 99.0'-101.5' bgs Collect 100' archive
115	BH 94	SS#33 100% recovery		89'-98' silty SAND (ms) 85% sand, 15% silt, sand, SR-SA, poorly sorted, fn-vase grained, 35% basalt, 65% other, 2.5Y 4/3 olive brown (moist), micaceous, no rxn HCl.	SS#34 101.5'-104.0' bgs SS#35 104.0'-106.5' bgs
120	BH 94	SS#34 100% recovery		98'-105' SAND(S) 95% sand, 5% silt, sand, R, vfn-fn grain, compact matrix, micaceous, non-basaltic, v. well sorted, 2.5Y 5/2 grayish brown (moist), no rxn HCl.	Collect 105' archive SS#36 106.5'-109.0' bgs
125	BH 94	SS#35 100% recovery		@ 99.5' sand, poorly sorted, vfn-vase, SR-SA, 25% basalt, 75% qtz, other, increase in silt (~10%), unconsolidated.	SS#37 109.0'-111.5' bgs Collect 110' archive
130	BH 94	SS#36 100% recovery		@ 101.5' increase in basalt content (45%)	SS#38 114'-116.5' bgs Collect 115' archive

Reported By: <u>Charlene Martinez</u>	Reviewed By: <u>L.D. Walker</u>
Title: <u>Geologist</u>	Title: <u>Geologist</u>
Signature: <u>Charlene Martinez</u>	Signature: <u>L.D. Walker</u>
Date: <u>08/25/03</u>	Date: <u>9/30/03</u>

BOREHOLE LOG					Page 4 of 7
					Date: 08/26/03
Well ID: C4124		Well Name: 299-227-22		Location: East of 299 C-Tank Farm	
Project: C403 RCRA drilling				Reference Measuring Point: Ground Surface	
Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments
	Type No.	Blows Recovery			
120	911	100% recovery		105' - 112' silty SAND (ms) 85% sand, 15% silt, trace gravel. Gravel: basaltic, med. pebbles. Sand v. poorly sorted, SR-SA, 20% basalt, 80% quartz. Vfn - v. coarse grained, micaceous. 2.5Y 5/3 light olive brown, moist. No rxn HCl.	Becker Hammer using 9" OD dual-wall casing. Collect 120' archive. 55#39 119'-121.5' bgs. Collect 123' archive. 55#40 124'-126.5' bgs. Collect 125' archive.
125	911	100% recovery		112' - 114' SAND (s) 95% sand, 5% silt. Sand, SR-SA, med. sorted, med. fine-grained. Vfn - v. coarse grains present, non-basaltic micaceous. 2.5Y 5/4, light olive brown (moist). No rxn HCl.	Collect 127' archive. 55#41 129'-131.5' bgs. Collect 130' archive.
130	911	100% recovery		114' - 122' silty SAND (ms). Similar to description from 105'-112'.	Collect 133' archive. 55#42 134'-136.5' bgs. Collect 136' archive.
135	911	100% recovery		122' - 138' SAND (s) 95% sand, 5% silt. Sand, vfn - v. coarse, SR-SA, poorly sorted, 45% basalt, 55% quartz. Micaceous. 10YR 5/2, grayish brown, moist. No rxn HCl.	Collect 138' archive. 55#43 139.0'-141.5' bgs.
140	911	100% recovery		@ 127' silt increasing to ~10% sand, moderately sorted, SR-SA, med. med-coarse grained. Some fine v. coarse (small %s).	Collect 140' archive. @ 139' v. ppm NH ₄ in borings. 9 ppm NH ₄ in spoils.
145	911	100% recovery		@ 130' sand grading to well-sorted, vfn - med grained.	Collect 143' archive. 55#44 144.0'-146.5' bgs.
150	911	100% recovery		@ 133' sand graded to poorly sorted, vfn - v. coarse silt < 5%.	Collect 145' archive. E.O.S. @ 146.5' bgs (08/26/03).
155	911	100% recovery		138' - 145' silty SAND (ms) 85% sand, 15% silt. Sand, SR-SA, med. sorted, vfn - coarse, med. med grained, micaceous, 20% basalt, 80% quartz. 2.5Y 6/2 light brownish gray (moist). No rxn HCl.	Start 08/27/03. 55#45 149'-151.5' bgs. Collect 150' archive.
160	911	100% recovery		145' - 153' gravelly SAND (ms) 15% gravel, 70% sand, 15% silt. Gravel, basaltic, med. sorted, SR-SA, med. size to sm pebbles. Sand, poorly sorted, SR-SA, 40% quartz. 40% basalt, vfn - v. coarse grained, med. coarse - v. coarse, 10YR 5/3 brown (dry). Non-m.	Collect 153' archive. 55#46 154'-156.5' bgs. Collect 156' archive.
165	911	100% recovery			Collect 157' archive.

Reported By: Charlene Martinez	Reviewed By: L.D. Walker
Title: Geologist	Title: Geologist
Signature: Charlene Martinez	Signature: L.D. Walker
Date: 08/26/03	Date: 9/30/03

BOREHOLE LOG

Page 5 of 2Date: 08/27/03Well ID: C424Well Name: 299-E22-22Location: East of C-Tank FarmProject: C403 BCR A drillingReference Measuring Point: Ground Surface

Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments
	Type No.	Blows Recovery			
160	BH 91 Grab BH 91	55# 47 95% recovery N/A		155'-157' silty, sandy GRAVEL (msb) 20% gravel, 20% sand, 10% silt. Gravel, SA-R, med. sorted, basaltic. Sand, SR-A, poorly sorted, vfn-vcse grained, pred. cse-vcse, 40% basalt, 60% qtzl other, 10YR 5/3 brown (dry). No rxn HCl.	Becker Hammer using 9" on dual-wall casing. Collect 160' archive 55# 47 159.0'-161.5' bgs Collect 163' archive 55# 48 164'-166.5' bgs Collect 165' archive
165	Grab BH 91	55# 48 100% recovery N/A		157'-165' Sandy GRAVEL (s) 40% gravel, 55% sand, 5% silt. Gravel, basaltic, well-sorted, pea-size - sm pebbles SA-R, Sand SR-SA, 45% basalt, 35% qtzl other, vfn-vcse grained, pred med-vcse. Trace mica. 10YR 5/1 gray (moist). No rxn HCl.	Collect 167' archive 55# 49 169'-171.5' bgs Collect 170' archive
170	Grab BH 91	55# 49 100% recovery N/A		165'-185' SAND(S) 7% gravel, 88% sand, 5% silt. Gravel, v. well sorted, SR-SA, pea-sized, basaltic. Sand, v. poorly sorted, SR-A, vfn-vcse grained. 55% basalt, 45% qtzl other, micaceous. 10YR 5/1 gray (moist). No rxn HCl.	Collect 173' archive 55# 50 174'-176.5' bgs Collect 175' archive
175	Grab BH 91	55# 50 75% recovery N/A		185'-188' silty, sandy GRAVEL (msb) 45% gravel, 43% sand, 12% silt. gravel, med-sorted, basaltic, pea-size - med pebbles; SA-R, Sand, poorly sorted, SR-A, vfn-vcse grained, 25% basalt, 75% qtzl other 2.5Y 4/3, olive brown (moist). No rxn HCl.	Collect 177' archive R.T.K. 9, 8, 8 @ background 55# 51 179'-181.5' bgs Collect 180' archive
180	Grab BH 91	55# 51 100% recovery N/A		@ 170 only trace pea-size gravel.	Collect 182' archive 55# 52 184'-186.5' bgs Collect 185' archive
185	Grab BH 91	55# 52 75% recovery N/A		@ 175 silt increasing to 10%.	Collect 187' archive
190	Grab BH 91	55# 53 100% recovery N/A		188'-192' silty SAND (ms) 5% gravel, 83% sand, 12% silt. Gravel, pea-size to sm pebbles, SR-A, well-sorted, basaltic. Sand, med-sorted, med-vcse, SR-SA, 30% basalt, 20% qtzl other. 2.5Y 5/2 grayish brown (moist). No rxn HCl.	55# 53 189'-191.5' bgs. 2.0.3 @ 191.5 bgs (08/27/03) Start (09/02/03) Collect 190' archive
195	Grab BH 91	55# 54 100% recovery N/A			Collect 192' archive 55# 54 194'-196.5' bgs Collect 195' archive Collect 197' archive

Reported By: Charlene MartinezReviewed By: L.D. WalkerTitle: GeologistTitle: GeologistSignature: Charlene MartinezDate: 08/27/03Signature: L.D. WalkerDate: 9/30/03

BOREHOLE LOG

Page 6 of 7

Date: 09/02/03

Well ID: C4124

Well Name: 299-E27-22

Location: East of C-Tank Farm

Project: C403 RCPA drilling

Reference Measuring Point: Ground Surface

Depth (Ft.)	Sample		Graphic Log	Sample Description	Comments
	Type No.	Blows Recovery		Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Depth of Casing, Drilling Method Method of Driving Sampling Tool Sampler Size, Water Level
200	BH 911	SS 55 100% recovery		192'-215' Sandy GRAVEL (SG) 45% gravel, 50% sand, 5% silt. Gravel, well sorted, basaltic, pea-size to sm pebbles, sand, SE-SA, poorly sorted, vfn-vase grained, 40% basalt, 60% qtz/other	Becker Hammer using 9" OD dual-wall casing
	BH 910	N/A		Trace mica, 2.5 Y 4/2 dk grayish brown (moist), no rxn HCl.	SS 55 199'-201.5' bgs collect 200' archive
	BH 910	SS 56 100% recovery		@ 194' gravel increasing to lg-pebbles - sm cobbles, poorly-sorted.	SS 51 204'-206.5' bgs collect 205' archive
	BH 910	SS 57 60% recovery		@ 199' gravel content decreasing to ~30% pea-size to med-pebbles. silt increasing to 10%.	SS 57 209'-211.5' bgs collect 210' archive
	BH 910	N/A		@ 205' gravel content increasing to ~50% silt decreasing to ~7% Gravel mod-sorted, pea-size to med pebbles.	SS 59 214'-216.5' bgs collect 215' archive
	BH 910	SS 58 100% recovery		@ 209' gravel, v. poorly sorted, pea-size to med cobbles, mps ~ 6", 45% basalt, 55% felsics.	SS 59 219'-221.5' bgs collect 220' archive
	BH 910	SS 59 10% Recovery		215'-219' gravelly SAND (gs) 20% gravel, 92% sand, 9% silt. Gravel, mod-sorted, pea-size to med pebbles, SE-A, 40% basalt, 60% qtz/other. Sand, vfn-vase, SE-A, poorly sorted, 2nd. vase-vase, 40% basalt, 10% qtz/other, micaceous, 10YR 5/3, brown (moist), no rxn HCl.	SS 60 224'-226.5' bgs collect 225' archive
	BH 910	SS 60 75% Recovery		219'-222' silty, sandy GRAVEL (mg)	SS 61 229'-231.5' bgs collect 230' archive
	BH 910	SS 61 10% Recovery		Gravel 55% sand 35% silt 10% gravel, poorly-sorted, SE-A, 50% basalt, 50% qtz/other. Sand, SE-SA, poorly sorted, vfn-vase grained, 35-40% basalt, 40% qtz/other, trace mica.	SS 61 229'-231.5' bgs collect 230' archive
	BH 910	SS 62 10% Recovery		2.5 Y 4/2, dk grayish brown (moist), no rxn HCl.	SS 62 233'-235' bgs collect 233' archive
205	BH 910	SS 56 100% recovery		225'-227' SAND (S) + trace gravel, well sorted, sm. pebbles. Sand, SE-SA, poorly sorted, vfn-vase, trace mica, 50% basalt, 50% qtz/other, no rxn HCl.	Collect 225' archive
210	BH 910	SS 57 60% recovery			
215	BH 910	SS 58 100% recovery			
220	BH 910	SS 59 10% Recovery			
225	BH 910	SS 60 75% Recovery			
230	BH 910	SS 61 10% Recovery			
235	BH 910	SS 62 10% Recovery			
	BH 910	SS 63 10% Recovery			
	BH 910	SS 64 10% Recovery			
	BH 910	SS 65 10% Recovery			

Reported By: Charlene Martinez

Reviewed By: L.D. Walker

Title: Geologist

Title: Geologist

Signature: Charlene Martinez

Date: 09/02/03

Signature: L.D. Walker

Date: 9/30/03

BOREHOLE LOG					Page <u>7</u> of <u>7</u>
					Date: <u>09/03/03</u>
Well ID: <u>C4124</u>		Well Name: <u>29-E27-22</u>		Location: <u>East of C-Tank Farm</u>	
Project: <u>C403 RCR A drilling</u>				Reference Measuring Point: <u>Ground Surface</u>	
Depth (Ft.)	Sample Type No.	Blows Recovery	Graphic Log	Sample Description	Comments
240	BH 9" Grab BH 9"	n/a		235 - 233' silty sandy GRAVEL (ms6) 55% gravel, 32% sand, 12% silt. Gravel v. poorly sorted, SR-A, pea-size to med. cobbles, 20% basalt, 80% quartz. Sand, R-A, v. poorly sorted, vfn-v. cse. Grained, 15% basalt, 35% quartz. 2.545/2 grayish brown (dry) No rxn HCl.	Beckthammer using 9" OD dual-wall casing Collect 240' archive
245	BH 9" Grab BH 9"			233' - 240' Sandy GRAVEL (SG) 40% gravel 55% sand, 5% silt, Gravel, med sorted, pea-size to sm. pebbles, 55% quartz, 45% basalt, SR-SA, Sand, SR-SA, poorly sorted, vfn-v. cse. Grained, med. cse-v. cse, 45% basalt, 35% quartz. No rxn HCl.	E.O.S. @ 249' bgs (09/03/03) Start 09/04/03 Collect 250' archive
250	BH 9" Grab BH 9"			@ 237' gravel increasing in size 4% poorly sorted, sm pebbles - med cobbles, basaltic. Gravel, 60%, sand 35%, silt 5%.	E.O.S. @ 254' bgs (09/04/03) Start 09/05/03 Collect 255' archive
255	BH 9" Grab BH 9"			260' Basalt. weathered surface, iron oxide staining, vesicular surfaces, visible fractures, quartz streaks, chlorite, "peacock" iridescence	Collect 260' archive
260	BH 9" Grab BH 9"			TD @ 268' bgs.	Collect 265' archive
265	BH 9" Grab BH 9"				Collect 268' archive (TD)
270					
275					

Reported By: <u>charlene martinez</u>	Reviewed By: <u>L.D. Walker</u>
Title: <u>Geologist</u>	Title: <u>Geologist</u>
Signature: <u>Charlene Martinez</u>	Signature: <u>L.D. Walker</u>
Date: <u>09/03/03</u>	Date: <u>9/30/03</u>

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APPENDIX B
GEOPHYSICAL LOGS

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C-4122

Man-Made Radionuclides

Zero Reference = Ground Surface

Last Log Date - 07/07/03

C-4122

Natural Gamma Logs

Zero Reference = Ground Surface

◆ MDL

Last Log Date - 07/07/03

C-4122 Natural Gamma Logs

Zero Reference = Ground Surface

• MDL

Last Log Date - 07/07/03

C-4122 Natural Gamma Logs

C-4123

Man-Made Radionuclides

Zero Reference = Ground Surface

Last Log Date - 07/15/03

C-4123

Man-Made Radionuclides

Zero Reference = Ground Surface

Last Log Date - 07/15/03

C-4123

Natural Gamma Logs

Zero Reference = Ground Surface

• MDL

Last Log Date - 07/15/03

C-4123 Natural Gamma Logs

Zero Reference = Ground Surface

• MDL

Last Log Date - 07/15/03

C-4123 Natural Gamma Logs

Zero Reference = Ground Surface

MDL

Last Log Date - 07/15/03

Zero Reference = Ground Surface

Last Log Date - 07/15/03

C-4127

Man-Made Radionuclides

Zero Reference = Ground Surface

Last Log Date - 07/22/03

C-4127

Zero Reference = Ground Surface

Last Log Date - 07/22/03

C-4127 **Natural Gamma Logs**

Zero Reference = Ground Surface

Last Log Date - 07/22/03

C-4127

Natural Gamma Logs

Zero Reference = Ground Surface.

Last Log Date - 07/22/03.

C-4127 Natural Gamma Logs

C-4127 **Repeat Section of Natural Gamma Logs**

Zero Reference = Ground Surface

▲ Repeat Log Data

Last Log Date - 07/22/03

Zero Reference = Ground Surface

Date of Last Logging Run
8/08/2003

Zero Reference = Ground Surface

Date of Last Logging Run
8/08/2003

C4190

Natural Gamma Logs

C4190 **Natural Gamma Logs**

C4190

Rerun of Natural Gamma Logs (147.0 to 115.0 ft)

C-4125 Man-Made Radionuclides

Zero Reference = Ground Surface

Last Log Date - 08/16/03

C-4125 Natural Gamma Logs

Zero Reference = Ground Surface

• MDL

Last Log Date - 08/16/03

C-4125 **Natural Gamma Logs**

Zero Reference = Ground Surface

Last Log Date - 08/16/03

C-4125

Repeat Section of Natural Gamma Logs

Zero Reference = Ground Surface

Last Log Date - 08/16/03

C-4124

Man-Made Radionuclides

Zero Reference = Ground Surface

Depth scale: 1" = 20 ft

Last Log Date - 09/08/03

C-4124

Natural Gamma Logs

Zero Reference = Ground Surface

Depth scale: 1" = 20 ft

Last Log Date - 09/08/03

C-4124 Natural Gamma Logs

Zero Reference = Ground Surface

Depth scale: 1" = 20 ft

Last Log Date = 09/08/03

C-4124 Natural Gamma Logs

Zero Reference = Ground Surface

Depth scale: 1" = 20 ft

Last Log Date - 09/08/03

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APPENDIX C
PHYSICAL PROPERTIES
SIEVE ANALYSES

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CH2M Hill Hanford, Inc.

SIEVE ANALYSIS

WELL NAME	299-E25-93	DEPTH	280.0-282.5	SAMPLE#	E25-93-280.0	WELL ID#	C4122
TESTED BY	CRM	CONTACT	Dave Weekes	PHONE	372-9350	DATE	07/07/2003

SAMPLE WT (g)	SIEVE SIZE IN.	CUMULATIVE WEIGHT(g)	% WEIGHT RETAINED	% PASSING	Grain Size (mm)	COMMENTS
1307.00	2"	0.0	0.0	100.0	50.80	
	1.5"	0.0	0.0	100.0	38.10	
	3/4"	0.0	0.0	100.0	19.05	
	3/8"	296.0	22.6	77.4	9.42	
	#4	653.8	50.0	50.0	4.70	
	#10	965.0	73.8	26.2	1.98	
	#20	1147.7	87.8	12.2	0.83	
	#40	1220.6	93.4	6.6	0.42	
	#60	1256.5	96.1	3.9	0.25	
	#100	1275.9	97.6	2.4	0.150	
	#200	1288.4	98.6	1.4	0.074	

Sieve Analysis Data for Sample E25-93-280.0

Comments: Gravel - Field geologist collected sample from cyclone. Split spoon had 0% recovery.

Sieve analysis may not be representative of formation due to collection method.

All data are accurately and completely recorded.

Checked By: L. D. Walker

Date: 10-1-03

CH2M Hill Hanford, Inc.

SIEVE ANALYSIS

WELL NAME	299-E25-93	DEPTH	315.0-317.5	SAMPLE#	E25-93-315.0	WELL ID#	C4122
TESTED BY	CRM	CONTACT	Dave Weekes	PHONE	372-9350	DATE	07/07/2003

SAMPLE WT (g)	SIEVE SIZE IN.	CUMULATIVE WEIGHT(g)	% WEIGHT RETAINED	% PASSING	Grain Size (mm)	COMMENTS
1067.40	2"	0.0	0.0	100.0	50.80	
	1.5"	0.0	0.0	100.0	38.10	
	3/4"	0.0	11.9	88.1	19.05	
	3/8"	127.5	34.1	65.9	9.42	
	#4	363.9	44.1	55.9	4.70	
	#10	471.1	47.8	52.2	1.98	
	#20	510.2	49.1	50.9	0.83	
	#40	523.9	58.4	41.6	0.42	
	#60	623.1	69.5	30.5	0.25	
	#100	741.9	77.4	22.6	0.150	
	#200	1288.4	91.1	8.9	0.074	

Sieve Analysis Data for Sample E25-93-315.0

Comments: Gravel - Field geologist collected sample from cyclone. Split spoon had 0% recovery.

Sieve analysis may not be representative of formation due to collection method.

All data are accurately and completely recorded.

Checked By: *L.D. Walker*Date: *10-1-03*

CH2M Hill Hanford, Inc.

SIEVE ANALYSIS

WELL NAME	299-E24-22	DEPTH	286.0-288.5	SAMPLE#	E24-22-286.0	WELL ID#	C4123
TESTED BY	CRM	CONTACT	Dave Weekes	PHONE	372-9350	DATE	07/14/2003

SAMPLE WT (g)	SIEVE SIZE IN.	CUMULATIVE WEIGHT(g)	% WEIGHT RETAINED	% PASSING	Grain Size (mm)	COMMENTS
1262.60	2"	0.0	0.0	100.0	50.80	
	1.5"	0.0	0.0	100.0	38.10	
	3/4"	0.0	0.0	100.0	19.05	
	3/8"	30.9	2.4	97.6	9.42	
	#4	47.2	3.7	96.3	4.70	
	#10	74.6	5.9	94.1	1.98	
	#20	409.0	32.4	67.6	0.83	
	#40	856.6	67.8	32.2	0.42	
	#60	990.9	78.5	21.5	0.25	
	#100	1060.3	84.0	16.0	0.150	
	#200	1124.1	89.0	11.0	0.074	

Sieve Analysis Data for Sample E24-22-286.0

Comments: Silty Sand.

All data are accurately and completely recorded.

Checked By: L.D. McKee

Date: 10-1-03

CH2M Hill Hanford, Inc.

SIEVE ANALYSIS

WELL NAME	299-E24-22	DEPTH	321	SAMPLE#	E24-22-321.0	WELL ID#	C4123
TESTED BY	CRM	CONTACT	Dave Weekes	PHONE	372-9350	DATE	07/14/2003

SAMPLE WT (g)	SIEVE SIZE IN.	CUMULATIVE WEIGHT(g)	% WEIGHT RETAINED	% PASSING	Grain Size (mm)	COMMENTS
1047.70	2"	0.0	0.0	100.0	50.80	
	1.5"	0.0	0.0	100.0	38.10	
	3/4"	0.0	0.0	100.0	19.05	
	3/8"	109.2	10.4	89.6	9.42	
	#4	353.6	33.8	66.2	4.70	
	#10	718.0	68.5	31.5	1.98	
	#20	931.3	88.9	11.1	0.83	
	#40	989.1	94.4	5.6	0.42	
	#60	1005.4	96.0	4.0	0.25	
	#100	1015.1	96.9	3.1	0.150	
	#200	1024.6	97.8	2.2	0.074	

Sieve Analysis Data for Sample E24-22-321.0

Comments: Gravel. Sample collected from cyclone. Fines washed away.

Sample not representative of formation.

All data are accurately and completely recorded.

Checked By: L.D. Walker

Date: 10-1-03

CH2M Hill Hanford, Inc.

SIEVE ANALYSIS

WELL NAME	299-E27-21	DEPTH	277.0-280.0	SAMPLE#	E27-21-277.0	WELL ID#	C4127
TESTED BY	CRM	CONTACT	Dave Weekes	PHONE	372-9350	DATE	07/22/2003

SAMPLE WT (g)	SIEVE SIZE IN.	CUMULATIVE WEIGHT(g)	% WEIGHT RETAINED	% PASSING	Grain Size (mm)	COMMENTS
1625.60	2"	0.0	0.0	100.0	50.80	
	1.5"	0.0	0.0	100.0	38.10	
	3/4"	114.8	7.1	92.9	19.05	
	3/8"	148.8	9.2	90.8	9.42	
	#4	217.2	13.4	86.6	4.70	
	#10	522.5	32.1	67.9	1.98	
	#20	1098.4	67.6	32.4	0.83	
	#40	1502.1	92.4	7.6	0.42	
	#60	1565.5	96.3	3.7	0.25	
	#100	1584.6	97.5	2.5	0.150	
	#200	1596.2	98.2	1.8	0.074	

Sieve Analysis Data for Sample E27-21-277.0

Comments: Gravelly sand. Sample collected from cyclone.

Sample is representative of formation.

All data are accurately and completely recorded.

Checked By: L.D. Walker Date: 9/30/03

CH2M Hill Hanford, Inc.

SIEVE ANALYSIS

WELL NAME	299-E27-21	DEPTH	312-315	SAMPLE#	E27-21-312.0	WELL ID#	C4127
TESTED BY	CRM	CONTACT	Dave Weekes	PHONE	372-9350	DATE	07/22/2003

SAMPLE WT (g)	SIEVE SIZE IN.	CUMULATIVE WEIGHT(g)	% WEIGHT RETAINED	% PASSING	Grain Size (mm)	COMMENTS
1743.50	2"	0.0	0.0	100.0	50.80	
	1.5"	91.1	5.2	94.8	38.10	
	3/4"	413.1	23.7	76.3	19.05	
	3/8"	956.1	54.8	45.2	9.42	
	#4	1446.6	83.0	17.0	4.70	
	#10	1668.9	95.7	4.3	1.98	
	#20	1717.2	98.5	1.5	0.83	
	#40	1726.5	99.0	1.0	0.42	
	#60	1731.1	99.3	0.7	0.25	
	#100	1735.0	99.5	0.5	0.150	
	#200	1743.5	100.0	0.0	0.074	

Sieve Analysis Data for Sample E27-21-312.0

Comments: Gravel. Sample collected from cyclone. Fines washed away.

Sample not representative of formation.

All data are accurately and completely recorded.

Checked By: *L.D. Walker* Date: *9/30/03*

CH2M Hill Hanford, Inc.

SIEVE ANALYSIS

WELL NAME	299-E27-20	DEPTH	275.0-277.0	SAMPLE#	E27-20-275.0	WELL ID#	C4126
TESTED BY	CRM	CONTACT	Dave Weekes	PHONE	372-9350	DATE	07/30/2003

SAMPLE WT (g)	SIEVE SIZE IN.	CUMULATIVE WEIGHT(g)	% WEIGHT RETAINED	% PASSING	Grain Size (mm)	COMMENTS
1669.70	2"	0.0	0.0	100.0	50.80	
	1.5"	0.0	0.0	100.0	38.10	
	3/4"	128.8	7.7	92.3	19.05	
	3/8"	281.1	16.8	83.2	9.42	
	#4	555.7	33.3	66.7	4.70	
	#10	943.2	56.5	43.5	1.98	
	#20	1313.1	78.6	21.4	0.83	
	#40	1568.2	93.9	6.1	0.42	
	#60	1620.7	97.1	2.9	0.25	
	#100	1635.7	98.0	2.0	0.150	
	#200	1642.7	98.4	1.6	0.074	

Sieve Analysis Data for Sample E27-20-275.0

Comments: Sandy gravel. Sample collected from cyclone.

Sample is representative of formation.

All data are accurately and completely recorded.

Checked By: *L.D. Walker*Date: *9/30/03*

CH2M Hill Hanford, Inc.

SIEVE ANALYSIS

WELL NAME	299-E27-23	DEPTH	310-312	SAMPLE#	E27-23-310.0	WELL ID#	C4190
TESTED BY	CRM	CONTACT	Dave Weekes	PHONE	372-9350	DATE	08/06/2003

SAMPLE WT (g)	SIEVE SIZE IN.	CUMULATIVE WEIGHT(g)	% WEIGHT RETAINED	% PASSING	Grain Size (mm)	COMMENTS
1575.60	2"	0.0	0.0	100.0	50.80	
	1.5"	0.0	0.0	100.0	38.10	
	3/4"	193.2	12.3	87.7	19.05	
	3/8"	492.2	31.2	68.8	9.42	
	#4	645.9	41.0	59.0	4.70	
	#10	901.4	57.2	42.8	1.98	
	#20	1296.2	82.3	17.7	0.83	
	#40	1504.6	95.5	4.5	0.42	
	#60	1551.2	98.5	1.5	0.25	
	#100	1565.1	99.3	0.7	0.150	
	#200	1570.4	99.7	0.3	0.074	

Sieve Analysis Data for Sample E27-23-310.0

Comments: Sandy Gravel. Sample collected from cyclone.

Sample representative of formation.

All data are accurately and completely recorded.

Checked By: L.D. Walker

Date: 9/24/03

CH2M Hill Hanford, Inc.

SIEVE ANALYSIS

WELL NAME	299-E27-4	DEPTH	270-271	SAMPLE#	E27-4-270.0	WELL ID#	C4125
TESTED BY	CRM	CONTACT	Dave Weekes	PHONE	372-9350	DATE	08/14/2003

SAMPLE WT (g)	SIEVE SIZE IN.	CUMULATIVE WEIGHT(g)	% WEIGHT RETAINED	% PASSING	Grain Size (mm)	COMMENTS
1674.50	2"	0.0	0.0	100.0	50.80	
	1.5"	0.0	0.0	100.0	38.10	
	3/4"	249.2	14.9	85.1	19.05	
	3/8"	675.2	40.3	59.7	9.42	
	#4	1089.0	65.0	35.0	4.70	
	#10	1393.3	83.2	16.8	1.98	
	#20	1583.7	94.6	5.4	0.83	
	#40	1643.4	98.1	1.9	0.42	
	#60	1655.3	98.9	1.1	0.25	
	#100	1659.5	99.1	0.9	0.150	
	#200	1662.3	99.3	0.7	0.074	

Sieve Analysis Data for Sample E27-4-270.0

Comments: Gravel. Sample collected from cyclone.

Sample representative of formation.

All data are accurately and completely recorded.

Checked By: L.D. Walker Date: 9/30/03

CH2M Hill Hanford, Inc.

SIEVE ANALYSIS

WELL NAME	299-E27-4	DEPTH	301-303	SAMPLE#	E27-4-301.0	WELL ID#	C4125
TESTED BY	CRM	CONTACT	Dave Weekes	PHONE	372-9350	DATE	08/14/2003

SAMPLE WT (g)	SIEVE SIZE IN.	CUMULATIVE WEIGHT(g)	% WEIGHT RETAINED	% PASSING	Grain Size (mm)	COMMENTS
1502.20	2"	0.0	0.0	100.0	50.80	
	1.5"	0.0	0.0	100.0	38.10	
	3/4"	200.4	13.3	86.7	19.05	
	3/8"	524.6	34.9	65.1	9.42	
	#4	916.4	61.0	39.0	4.70	
	#10	1188.8	79.1	20.9	1.98	
	#20	1341.0	89.3	10.7	0.83	
	#40	1431.8	95.3	4.7	0.42	
	#60	1467.0	97.7	2.3	0.25	
	#100	1484.5	98.8	1.2	0.150	
	#200	1494.2	99.5	0.5	0.074	

Sieve Analysis Data for Sample E27-4-301.0

Comments: Sandy gravel. Sample collected from cyclone.

Sample representative of formation.

All data are accurately and completely recorded.

Checked By: L.D. Walker Date: 9/30/03

CH2M Hill Hanford, Inc.

SIEVE ANALYSIS

WELL NAME 299-E27-22	DEPTH 233	SAMPLE# E27-22-233.0	WELL ID# C4124
TESTED BY CRM	CONTACT Dave Weekes	PHONE 372-9350	DATE 09/05/2003

SAMPLE WT (g)	SIEVE SIZE IN.	CUMULATIVE WEIGHT(g)	% WEIGHT RETAINED	% PASSING	Grain Size (mm)	COMMENTS
1495.50	2"	0.0	0.0	100.0	50.80	
	1.5"	0.0	0.0	100.0	38.10	
	3/4"	88.8	5.9	94.1	19.05	
	3/8"	362.9	24.3	75.7	9.42	
	#4	523.8	35.0	65.0	4.70	
	#10	802.3	53.6	46.4	1.98	
	#20	1245.5	83.3	16.7	0.83	
	#40	1419.8	94.9	5.1	0.42	
	#60	1451.8	97.1	2.9	0.25	
	#100	1462.3	97.8	2.2	0.150	
	#200	1468.9	98.2	1.8	0.074	

Sieve Analysis Data for Sample E27-22-233.0

Comments: Sandy gravel. Sample collected from cyclone.

Sample representative of formation.

All data are accurately and completely recorded.

Checked By: L.D. Uhl/Ket Date: 9/30/03

CH2M Hill Hanford, Inc.

SIEVE ANALYSIS

WELL NAME	299-E27-22	DEPTH	268	SAMPLE#	E27-22-268.0	WELL ID#	C4124
TESTED BY	CRM	CONTACT	Dave Weekes	PHONE	372-9350	DATE	09/05/2003

SAMPLE WT (g)	SIEVE SIZE IN.	CUMULATIVE WEIGHT(g)	% WEIGHT RETAINED	% PASSING	Grain Size (mm)	COMMENTS
1417.80	2"	0.0	0.0	100.0	50.80	
	1.5"	0.0	0.0	100.0	38.10	
	3/4"	133.8	9.4	90.6	19.05	
	3/8"	441.1	31.1	68.9	9.42	
	#4	790.1	55.7	44.3	4.70	
	#10	1038.0	73.2	26.8	1.98	
	#20	1193.9	84.2	15.8	0.83	
	#40	1324.0	93.4	6.6	0.42	
	#60	1381.0	97.4	2.6	0.25	
	#100	1403.7	99.0	1.0	0.150	
	#200	1413.5	99.7	0.3	0.074	

Sieve Analysis Data for Sample E27-22-268.0

Comments: Sandy gravel. Sample collected from cyclone.

Sample representative of formation.

All data are accurately and completely recorded.

Checked By: L.D. Walker Date: 9/30/03

APPENDIX D
WELL CONSTRUCTION SUMMARY REPORT

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WELL CONSTRUCTION SUMMARY REPORT				Start Date: 07/01/03			
				Finish Date: 08/14/03			
				Page 1 of 1			
ID: C4122		Well Name: 299-625-93		Approximate Location: East of 241-A Tank Farm			
Project: C4032 CRA Drilling		Other Companies: CHG, FH		Geologist(s): C. Martinez, M.J. Hocking			
Drilling Company: Loyne Christensen		Driller: Paul ("Derry") Lodger		License #: 1628			
TEMPORARY CASING AND DRILL DEPTH			DRILLING METHOD	HOLE DIAMETER (in.) / INTERVAL (ft)			
*Size/Grade/Lbs. Per Ft.	Interval	Shoe O.D./I.D.	Auger:	Diameter _____ From _____ to _____			
Carbon Steel, dual	0' - 320'	9"	Cable Tool:	Diameter _____ From _____ to _____			
wall casing.	_____ - _____		Air Rotary:	Diameter _____ From _____ to _____			
outer 9" OD	_____ - _____		A.R. w/Sonic:	Diameter _____ From _____ to _____			
Inner 7 1/4", FJ	_____ - _____		Reverse Circulation	Diameter _____ From _____ to _____			
	_____ - _____		(Becker Hammer)	Diameter 9" From 0' to 320'			
*Indicate Welded (W) - Flush Joint (FJ) Coupled (C) & Thread Design				Diameter _____ From _____ to _____			
			Drilling Fluid: N/A				
Total Drilled Depth: 320'		Hole Dia @ TD: 9"		Total Amt. Of Water Added During Drilling: 0			
Well Straightness Test Results: Passed using 20' long, 4.5" OD			Static Water Level: 278.04'		Date: 07/15/03		
Tool on 07/08/03							
GEOPHYSICAL LOGGING							
Sondes (type)	Interval	Date	Sondes (type)	Interval	Date		
Spectral Gamma	0' - 321'	07/07/03		_____ - _____			
	_____ - _____			_____ - _____			
	_____ - _____			_____ - _____			
COMPLETED WELL							
Size/Wt./Material	Depth	Thread	Slot Size	Type	Interval Annular Seal/Filter Pack	Volume	Mesh Size
(4" ID) SS 304, sched 10 riser	120' - 278.23'	P480	N/A	Portland Cement Grout (94#)	0' - 105'	6 bags	N/A
(4" ID) SS 304, sched 10 well screen	278.23' - 313.26'	"	0.020"	Granular Bentonite (50#)	10.5' - 269.5'	132 bags	N/A
SS 304 sched 10 pump 4" ID	313.26' - 315.26'	"	N/A	Bentonite Pellets (50#)	269.5' - 273.1'	3 buckets	1/4"
	_____ - _____			Colorado Silica Sand	273.1' - 320.0'	30 bags	10-20
	_____ - _____						
OTHER ACTIVITIES							
Aquifer Test: well development		Date: 08/14/03		Well Decommission:		Yes:	No:
Description: SHP Franklin submersible pump, developed 3				Description:			
Stages: Intake set @ 316.1', 306.0', 294.0', pump rate 26							
gpm. Final turbidity 0.124 NTU / 0.83 NTU / 1.19 NTU.							
WELL SURVEY DATA (If applicable)							
				Protective Casing Elevation:			
Washington State Plane Coordinates:				Brass Survey Marker Elevation:			
COMMENTS / REMARKS							
Vol calcs: P.C., 6 bags * 1.285 ^{ft³} bag = 7.71 ^{ft³} ; Granules, 132 bags * 0.71 ^{ft³} bag = 93.72 ^{ft³} ; pellets, 3 buckets * 0.42 ^{ft³} bucket = 1.26 ^{ft³} ; 10-20 sand, 30 bags * 0.535 ^{ft³} bag = 16.05 ^{ft³}							
Reported By:		Title:		Signature:		Date:	
Charlene Martinez		Geologist		Charlene Martinez		09/06/03	

WELL CONSTRUCTION SUMMARY REPORT

Start Date: 07/21/03

Finish Date: 08/28/03

Page 1 of 1

ID: C4127

Well Name: 299-227-21

Approximate Location: South of CR-Vault

Project: C403 RCR drilling

Other Companies: FH, CHG

Drilling Company: Layne Christensen

Geologist(s): C. Martinez, M.J. Hocking

Driller: Paul ("Derry") Loder License #: 1628

TEMPORARY CASING AND DRILL DEPTH

DRILLING METHOD

HOLE DIAMETER (in.) / INTERVAL (ft)

*Size/Grade/Lbs. Per Ft.	Interval	Shoe O.D./I.D.	Auger:	Diameter	From	to
Carbon Steel, dual-wall casing, F.S.	0' - 318'	9"	Cable Tool:	Diameter	From	to
Outer 9" O.D.			Air Rotary:	Diameter	From	to
Inner 7 1/4"			A.R. w/Sonic:	Diameter	From	to
			Reverse Air	Diameter	9"	From 0' to 318'
			(Becker-Hammer)	Diameter	From	to
*Indicate Welded (W) - Flush Joint (FJ) Coupled (C) & Thread Design				Diameter	From	to

Drilling Fluid: N/A

Total Drilled Depth: 318'

Hole Dia @ TD: 9"

Total Amt. Of Water Added During Drilling: 0

Well Straightness Test Results: Passed using 4.5" O.D., 20.4' long

Static Water Level: 271.38' Date: (07/25/03)

Tool on 07/23/03

GEOPHYSICAL LOGGING

Sondes (type)	Interval	Date	Sondes (type)	Interval	Date
Spectral Gamma	0' - 318'	07/21 & 07/22 2003			

COMPLETED WELL

Size/Wt./Material	Depth	Thread	Slot Size	Type	Interval Annular Seal/Filter Pack	Volume	Mesh Size
4" 30 SS 304 sched 10 casing	±2.0' - 271.37'	F480	N/A	Portland Cement (94%)	0' - 10.1'	4 bags	N/A
4" 30 SS 304 sched 10 well screen	271.37' - 306.43'	"	2.020"	Granular-Bentonite (50%)	10.1' - 260.4'	100 bags	N/A
4" 30 SS 304 sched 10 sump	306.43' - 308.83'	"	N/A	Bentonite Pellets (50%)	260.4' - 265.5'	2.5 buckets	1/4"
				Silica sand (50%)	265.5' - 314.0'	29 bags	10-20
				Silica sand (50%)	314.0' - 318.0'	2 bags	4-8

OTHER ACTIVITIES

Aquifer Test: well development	Date: 08/28/03	Well Decommission:	Yes:	No:	Date:
Description: 5 HP Franklin submersible pump. Developed 3 stages. Intake @ 306.7' 292.7' 285.4'. Flow rate: 23 gpm.		Description:			
23.5 gpm, 21 gpm. Final turb: (NTU) 1.24 1.64 1.83					

WELL SURVEY DATA (if applicable)

Washington State Plane Coordinates:	Protective Casing Elevation:
	Brass Survey Marker Elevation:

COMMENTS / REMARKS

Vol. calcs: P.C., 4 bags * 1.285 ^{ft³}/bag = 5.14 ^{ft³}; Granules, 100 bags * 0.71 ^{ft³}/bag = 71.0 ^{ft³}; Pellets, 12.5 buckets * 0.42 ^{ft³}/bucket = 5.25 ^{ft³}; 10-20 sand, 29 bags * 0.525 = 15.52 ^{ft³}; 4-8 sand 2 bags * 0.663 ^{ft³}/bag = 1.33 ^{ft³}.

Reported By: Charlene Martinez Title: Geologist Signature: Charlene Martinez Date: 09/06/03

WELL CONSTRUCTION SUMMARY REPORT

Start Date: 07/28/03

Finish Date: 04/03

Page 1 of 1

Well ID: <u>24126</u>		Well Name: <u>299-E27-2D</u>		Approximate Location: <u>West of C-Tank Farm</u>			
Project: <u>2403 RCRA Drilling</u>				Other Companies: <u>F.H. CH6</u>			
Drilling Company: <u>Layne Christensen</u>				Geologist(s): <u>C. Martinez, M.J. Hocking</u>			
Driller: <u>Chris Dean / Paul Lodder</u>		License #: <u>2534</u>					
		License #: <u>1628</u>					
TEMPORARY CASING AND DRILL DEPTH			DRILLING METHOD		HOLE DIAMETER (in.) / INTERVAL (ft)		
Size/Grade/Lbs. Per Ft.	Interval	Shoe O.D./I.D.	Auger:	Diameter	From to		
Dual-wall carbon steel,	<u>0' - 278.5'</u>	<u>9"</u>	Cable Tool:	Diameter	From to		
FS, 9" OD (outer) 7" ID (inner)			Air Rotary:	Diameter	From to		
			A.R. w/Sonic:	Diameter	From to		
			Becker Hammer	Diameter	<u>9"</u> From <u>0'</u> to <u>278.5'</u>		
			(Reverse Air)	Diameter	From to		
*Indicate Welded (W) - Flush Joint (FJ) Coupled (C) & Thread Design				Diameter	From to		
			Drilling Fluid: <u>n/a</u>				
Total Drilled Depth: <u>278.5'</u>		Hole Dia @ TD: <u>9"</u>	Total Amt. Of Water Added During Drilling: <u>—</u>				
Well Straightness Test Results: <u>n/a</u>			Static Water Level: <u>273.15'</u>	Date: <u>07/29/03</u>			
GEOPHYSICAL LOGGING							
Sondes (type)	Interval	Date	Sondes (type)	Interval	Date		
<u>n/a</u>	<u>0' - 278.5'</u>	<u>07/29/03</u>	<u>n/a</u>	<u>0' - 278.5'</u>	<u>07/29/03</u>		
COMPLETED WELL							
Size/Wt./Material	Depth	Thread	Slot Size	Type	Interval Annular Seal/Filter Pack	Volume	Mesh Size
<u>n/a</u>	<u>0' - 10.3'</u>			Quick-crete Cement (80#)	<u>0' - 10.3'</u>	<u>14 bags</u>	<u>n/a</u>
<u>n/a</u>	<u>10.3' - 242.8'</u>			Granular Bentonite (50#)	<u>10.3' - 242.8'</u>	<u>141.5 bags</u>	<u>n/a</u>
<u>n/a</u>	<u>242.8' - 278.5'</u>			Colorado Silica Sand (50#)	<u>242.8' - 278.5'</u>	<u>11 bags</u>	<u>10-20</u>
OTHER ACTIVITIES							
Aquifer Test:		Date:	Well Decommission:		Yes: ☒ No: ☐	Date:	
Description: <u>n/a</u>			Description: <u>Decommissioned on 08/04/03. H2S refusal @ 278.5' bgs ~ 5' into water table.</u>				
WELL SURVEY DATA (if applicable)							
				Protective Casing Elevation:			
Washington State Plane Coordinates:				Brass Survey Marker Elevation:			
COMMENTS / REMARKS							
<u>Vol. calcs: Quick-crete = 80#/94" * 1.285 ft³/bag * 14 bags = 15.31 ft³; granular bentonite = 141.5 bags * 0.71 ft³/bag = 100.47 ft³; 10-20 sand = 11 bags * 0.535 ft³/bag = 5.89 ft³</u>							
Reported By: <u>Charlene Martinez</u> Title: <u>Geologist</u> Signature: <u>Charlene Martinez</u> Date: <u>09/08/03</u>							

WELL CONSTRUCTION SUMMARY REPORT

Start Date: 08/05/03

Finish Date: 09/02/03

Page 1 of 1

Well ID: C 4190		Well Name: 299-E27-23		Approximate Location: west of C-tank Farm			
Project: C403 RCRB drilling		Other Companies: CHG, FH					
Drilling Company: Layne Christensen		Geologist(s): C. Martinez, M.J. Hocking					
Driller: Paul ("Derry") Lodder		License #: 1628					
TEMPORARY CASING AND DRILL DEPTH			DRILLING METHOD		HOLE DIAMETER (in.) / INTERVAL (ft)		
*Size/Grade/Lbs. Per Ft.	Interval	Shoe O.D./I.D.	Auger:	Diameter _____ From _____ to _____			
Carbon Steel dual-wall	0' - 318'	9"	Cable Tool:	Diameter _____ From _____ to _____			
casing, FS. 2" O.D. (outer)	_____ - _____	_____	Air Rotary:	Diameter _____ From _____ to _____			
7" 16" (inner)	_____ - _____	_____	A.R. w/Sonic:	Diameter _____ From _____ to _____			
_____	_____ - _____	_____	Reverse Air (Becker Hammer)	Diameter 9" From 0' to 318'			
_____	_____ - _____	_____	_____	Diameter _____ From _____ to _____			
*Indicate Welded (W) - Flush Joint (FJ) Coupled (C) & Thread Design			_____	Diameter _____ From _____ to _____			
Total Drilled Depth: 318'			Hole Dia @ TD: 9"				
Well Straightness Test Results: Passed using 4" ID, 20.4' long			Total Amt. Of Water Added During Drilling: none				
test on 08/14/03			Static Water Level: 273.1' Date: 08/12/03				
GEOPHYSICAL LOGGING							
Sondes (type)	Interval	Date	Sondes (type)	Interval	Date		
Spectral Gamma	0' - 318'	08/07/03 & 08/08/03	_____	_____	_____		
_____	_____	_____	_____	_____	_____		
_____	_____	_____	_____	_____	_____		
COMPLETED WELL							
Size/Wt./Material	Depth	Thread	Slot Size	Type	Interval Annular Seal/Filter Pack	Volume	Mesh Size
4" x 0.55304 sch. 10 casing	11.8' - 273.51'	4400	N/A	Portland Cement (94#)	0' - 9.9'	5 bags	N/A
4" x 0.55304 sch. 10 well screen	273.51' - 308.54'	"	0.020"	Granular Bentonite (50#)	9.9' - 243.0'	107.5 bags	N/A
4" x 0.55304 sch. 10 pump	308.54' - 310.97'	"	N/A	Bentonite Pellets (50#)	243.0' - 247.8'	2 buckets	4"
_____	_____	_____	_____	Colorado Silica Sand (50#)	247.8' - 318.0'	29.5 bags	10-20
_____	_____	_____	_____	_____	_____	_____	_____
OTHER ACTIVITIES							
Aquifer Test: well development		Date: 09/02/03		Well Decommission:		Yes:	No:
Description: 5 HP Franklin Submersible pump. Developed 3 stages intake 311.3' / 301.3' / 291.3'. Pump rate 24.5 gpm, 24 gpm, 4 gpm. Final turb (NTU) 3.93 / 0.72 / 3.0				Description:			
WELL SURVEY DATA (if applicable)							
Washington State Plane Coordinates:				Protective Casing Elevation:			
				Brass Survey Marker Elevation:			
COMMENTS / REMARKS							
Vol. calcs: P.C., 5 bags * 1.285 ft ³ /bag = 6.43 ft ³ ; Granules, 107.5 bags * 0.71 ft ³ /bag = 74.33 ft ³ ; pellets, 2 buckets * 0.62 ft ³ /bucket = 1.24 ft ³ ; 10-20 sand, 29.5 bags * 0.535 = 15.78 ft ³							
Reported By: Charlene Martinez Title: Geologist Signature: Charlene Martinez Date: 09/06/03							

WELL CONSTRUCTION SUMMARY REPORT						Start Date: 08/12/03	
						Finish Date:	
						Page 1 of 1	
ID: C4125		Well Name: 299-E27-4		Approximate Location: West of C-Tank Farm			
Project: C403 RCRA drilling				Other Companies: F H, CHG			
Drilling Company: Layne Christensen				Geologist(s): C. Martinez, M. J. Hocking			
Driller: Paul "Derry" Loder License #: 1629							
TEMPORARY CASING AND DRILL DEPTH			DRILLING METHOD		HOLE DIAMETER (in.) / INTERVAL (ft)		
*Size/Grade/Lbs. Per Ft.	Interval	Shoe O.D./I.D.	Auger: Hollow stem	Diameter 9"	From 0'	to 30'	
Dual-wall carbon steel, FS	0' - 311'	9"	Cable Tool:	Diameter	From	to	
9" OD (outer); 7 1/4" Inner			Air Rotary:	Diameter	From	to	
			A.R. w/Sonic:	Diameter	From	to	
10 5/8" 10" Carbon	0 - 30'	10 5/8" 10"	Becker Hammer	Diameter 9"	From 30'	to 311'	
steel, FS			(Reverse Air.)	Diameter	From	to	
*Indicate Welded (W) - Flush Joint (FJ) Coupled (C) & Thread Design					Diameter	From to	
			Drilling Fluid: none				
Total Drilled Depth: 311'		Hole Dia @ TD: 9"		Total Amt. Of Water Added During Drilling: n/a			
Well Straightness Test Results: Passed using a 20 ft long, 4.5"				Static Water Level: 270.65'		Date: 08/20/03	
GEOPHYSICAL LOGGING							
Sondes (type)	Interval	Date	Sondes (type)	Interval	Date		
Spectral Gamma	0' - 309'	08/15 + 08/16 2003					
COMPLETED WELL							
Size/Wt./Material	Depth	Thread	Slot Size	Type	Interval Annular Seal/Filter Pack	Volume	Mesh Size
4" 20 3304 sch. 10 riser	41.9' - 270.32'	F480	N/A	Portland Cement (94")	0 - 9.9'	6 bags	N/A
4" 20 3304 sch. 10 well screen	270.32' - 305.33'	"	0.020"	Granular Bentonite (50")	9.9' - 259.0'	99 bags	N/A
4" 20 3304 pump	305.33' - 307.76'	"	N/A	Bentonite pellets (50")	259.0' - 264.4'	2 buckets	4"
				Colorado Silica Sand (50")	264.4' - 309.0'	23 bags	10-20
OTHER ACTIVITIES							
Aquifer Test:		Date:		Well Decommission:		Yes:	No:
Description:				Description:			
WELL SURVEY DATA (if applicable)							
				Protective Casing Elevation:			
Washington State Plane Coordinates:				Brass Survey Marker Elevation:			
COMMENTS / REMARKS							
vol. calcs: p.c. => 6 bags * 1.285 ^{ft³} /bag = 7.71 ^{ft³} ; Granules => 99 bags * 0.71 ^{ft³} /bag = 70.29 ^{ft³} . pellets => 2 buckets * 0.62 ^{ft³} /bucket = 1.24 ^{ft³} ; 10-20 sand => 23 bags * 0.535 ^{ft³} /bag = 12.31 ^{ft³}							
Reported By:		Title:		Signature:		Date:	
Charlene Martinez		Geologist		Charlene Martinez		09/09/03	

WELL CONSTRUCTION SUMMARY REPORT				Start Date: 08/21/03			
				Finish Date: 09/12/03			
				Page 1 of 1			
ID: C-4124		Well Name: 299-E27-22		Approximate Location: East of C-Tank Farm			
Project: C403 RCRA drilling		Other Companies: F H, C H G		Geologist(s): C. Martinez, M.S. Hocking			
Drilling Company: Layne Christensen		Driller: Paul ("Perry") Lodder		License #: 1628			
TEMPORARY CASING AND DRILL DEPTH			DRILLING METHOD	HOLE DIAMETER (in.) / INTERVAL (ft)			
*Size/Grade/Lbs. Per Ft.	Interval	Shoe O.D./I.D.	Auger:	Diameter	From to		
Dual-wall, carbon steel,	0' - 268'	9"	Cable Tool:	Diameter	From to		
F.S. 9" OD (outer)			Air Rotary:	Diameter	From to		
7" 16" (inner)			A.R. w/Sonic:	Diameter	From to		
			Becker Hammer	Diameter 9"	From 0' to 268'		
			(Reverse Air)	Diameter	From to		
*Indicate Welded (W) - Flush Joint (FJ) Coupled (C) & Thread Design				Diameter	From to		
			Drilling Fluid: none				
Total Drilled Depth: 268'	Hole Dia @ TD: 9"	Total Amt. Of Water Added During Drilling: —					
Well Straightness Test Results: Passed using a 20.4' long, 4.5" ID			Static Water Level: 230.46'	Date: 09/10/03			
Tool on 09/09/03							
GEOPHYSICAL LOGGING							
Sondes (type)	Interval	Date	Sondes (type)	Interval	Date		
Spectral Gamma	0' - 268'	09/08/03					
COMPLETED WELL							
Size/Wt./Material	Depth	Thread	Slot Size	Type	Interval Annular Seal/Filter Pack	Volume	Mesh Size
4" ID 35304 sch 10 riser	22.2' - 228.05'	8480	N/A	Portland Cement (94 bags)	0' - 10.0'	6 bags	N/A
4" ID 35304 sch 10 wellbore	228.05' - 268.02'	"	0.020"	Granular Bentonite (50 bags)	10' - 217.2'	102.5 bags	N/A
4" ID 35304 sch 10 endcap	268.02' - 268.1'	"	N/A	Bentonite Pellets (50 bags)	217.2' - 222.5'	2 buckets	1/4"
				Colorado silica sand (9 bags)	222.5' - 225.8'	3.5 bags	4-8
				Colorado silica sand (50 bags)	225.8' - 268.0'	82 bags	10-20
OTHER ACTIVITIES							
Aquifer Test: well development		Date: 09/12/03		Well Decommission:		Yes:	No: Date:
Description: Franklin 5 HP submersible pump, 3 stages				Description:			
Intake @ 244.5' / 255.5' / 243.3'. 23-25 gpm.							
Final turbidity: 1.08 NTU / 0.97 / 2.31 (NTU's.)							
WELL SURVEY DATA (if applicable)							
				Protective Casing Elevation:			
Washington State Plane Coordinates:				Brass Survey Marker Elevation:			
COMMENTS / REMARKS							
Calculations: P.C. $\Rightarrow$ 6 bags * 1.285 $\frac{ft^3}{bag}$ = 6.43 ft^3 ; Granules $\Rightarrow$ 102.5 bags * 0.71 $\frac{ft^3}{bag}$ = 72.78 ft^3 ; pellets $\Rightarrow$ 2 buckets * 0.62 $\frac{ft^3}{bucket}$ = 1.24 ft^3 ; 10-20 sand $\Rightarrow$ 82 bags * 0.535 $\frac{ft^3}{bag}$ = 43.87 ft^3 ; 4-8 sand $\Rightarrow$ 3.5 bags * 0.663 $\frac{ft^3}{bag}$ = 2.32 ft^3 .							
Reported By:		Title:		Signature:		Date:	
Charlene Martinez		Geologist		Charlene Martinez		09/18/03	

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APPENDIX E
WELL DEVELOPMENT DATA

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WELL DEVELOPMENT AND TESTING DATA																
Well Name: <u>299-E25-93</u>		Well ID: <u>04122</u>	Well Location: <u>East of 241-A Tank Farm</u>													
		Date: <u>08/14/03</u>	Report # <u>3</u> Page 1 of 3													
Reference Measuring Point (unless otherwise noted): TOP OF OUTER CASING (TOC)																
Has the well been surveyed? ☐ Yes ☒ No		Does the well have a cement pad? ☒ Yes ☐ No														
PART 1		PART 4														
STATIC WATER LEVEL:		<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px; width: 45%;"> Last Recorded Measurements Date: <u>08/06/03</u> </div> <div style="border: 1px solid black; padding: 5px; width: 45%;"> Current Measurements Date: <u>08/14/03</u> </div> </div> <div style="text-align: center; margin-top: 20px;"> </div>														
Start of Job <u>281.26' TOC</u>																
End of Job <u>-</u>																
DEPTH TO BOTTOM:																
Start of Job <u>318.82' TOC</u>																
End of Job <u>-</u>																
PART 2		<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> A = <u>2.58'</u> B = <u>1.47'</u> C = <u>1.11'</u> </div> <div style="width: 45%;"> A' = <u>2.58'</u> B' = <u>1.47'</u> C' = <u>1.11'</u> </div> </div>														
WELL DEVELOPMENT DATA		Are there any reference marks on the casing strings? ☐ Yes ☐ No														
Pump Model <u>Franklin 5 HP submersible</u>																
Intake Depth <u>316.1' m</u> <u>306' T</u> <u>296'</u>																
Starting Turbidity <u>12.6</u> <u>149.1</u> <u>6.14</u>																
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Pump Start</th> <th>Stop</th> <th>Flow Rate</th> </tr> </thead> <tbody> <tr> <td><u>(59 mins) 1041</u></td> <td><u>(1504.5 gals) 1140</u></td> <td><u>25.5 gpm</u></td> </tr> <tr> <td><u>(64 mins) 1228</u></td> <td><u>(1664 gals) 1342</u></td> <td><u>26.0 gpm</u></td> </tr> <tr> <td><u>(52 mins) 1437</u></td> <td><u>(1378 gals) 1520</u></td> <td><u>26.0 gpm</u></td> </tr> <tr> <td colspan="2"><u>1504.5 + 1664 + 1378 = 4547 gals</u></td> <td></td> </tr> </tbody> </table>				Pump Start	Stop	Flow Rate	<u>(59 mins) 1041</u>	<u>(1504.5 gals) 1140</u>	<u>25.5 gpm</u>	<u>(64 mins) 1228</u>	<u>(1664 gals) 1342</u>	<u>26.0 gpm</u>	<u>(52 mins) 1437</u>	<u>(1378 gals) 1520</u>	<u>26.0 gpm</u>	<u>1504.5 + 1664 + 1378 = 4547 gals</u>
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<u>1504.5 + 1664 + 1378 = 4547 gals</u>																
Total Pumped <u>4547 gals</u>		PART 5														
Final Turbidity <u>1.26</u> <u>0.83</u> <u>1.19</u>		COMMENTS: <u>0850 Tagged p.w. => 281.26' from TOC</u> <u>0852 Tagged bottom => 318.82' from TOC. No fill</u> <u>0852 Pump setting rig on site. Setting up.</u> <u>0906 measured pump: motor = 2.3'. Intake @ 2.3'-2.5'</u> <u>(0.2' long). upper portion of pump => 2.35' long. Total</u> <u>pump = 4.65' long. Franklin 5 HP submersible electric.</u> <u>0907 Assembling pump. Testing. Works.</u> <u>0929 Tripping in pump / tremmie pipe.</u> <u>0938 purge water truck on site.</u> <u>0940 Instruments calibrated.</u> <u>1025 Pump / tremmie pipe installed. Pump @ 316.1' TOC.</u> <u>1030 Setting transducer.</u>														
XD SN/Range (PSI) <u>20.0 psi</u>																
PART 3																
INSTANTANEOUS SLUG TEST																
Static Water Level (TOC)																
Transducer Depth																
Baseline Start		(Note: <u>Not used</u> and <u>Cancelled</u> are written diagonally across this section.)														
Injection Start																
Baseline Start																
Withdrawal Start																
Slug Volume																
XD SN/Range (PSI)																
pared by (print name): <u>Charlene Martinez</u>		Signature: <u>Charlene Martinez</u>	Date: <u>08/14/03</u>													
Reviewed by (print name): <u>L.D. Walker</u>		Signature: <u>L.D. Walker</u>	Date: <u>10-1-03</u>													

WELL DEVELOPMENT AND TESTING DATA

Report 1; Page 1 of 2

Well Name: 299-E24-22	Well ID: C4123	Well Location: West of 241-A Tank Farm	Date: 09/08/03
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Reference Measuring Point (unless otherwise noted): TOP OF OUTER CASING (TOC)

Has the well been surveyed? ☐ Yes ☒ No	Does the well have a cement pad? ☒ Yes ☐ No
---	--

PART 1

STATIC WATER LEVEL:

Start of Job 288.94' TOC

End of Job 288.9' TOC

DEPTH TO BOTTOM:

Start of Job 326.5' TOC

End of Job 326.45' TOC

PART 2

WELL DEVELOPMENT DATA

Pump Model Franklin 5 HP Submersible

Intake Depth 324.2' 314.2' 303.1'

Starting Turbidity 24.3 50.8 14.4

Pump Start	Stop	Flow Rate
(80 mins) 0850	(1800 gals) 1010	22.5 gpm
(43 mins) 1059	(1512 gals) 1202	24 gpm
(31 mins) 1229	(720 gals) 1300	25 gpm
1800 + 1512 + 720 = 4032 gals		

PART 4

Last Recorded Measurements

Date:

Current Measurements

Date: 09/08/03

A =

B =

C =

A' = 2.38'

B' = 1.46'

C' = 0.92'

Are there any reference marks on the casing strings? ☐ Yes ☒ No

PART 5

COMMENTS: 0600 P.O.D. Safety meeting. Discussing

well development activities. It's raining. It's pouring

0620 on site. waiting for pump setting rig.

0635 Tagged g.w. @ 288.94' (TOC)

Tagged TD @ 326.5' (TOC)

0650 Rig on site.

0710 Setting up rig.

0735 Tripping in Pump & tremmie pipe.

0740 Calibrating instruments.

0838 Lowering transducer

0849 Initial XD = 32.688'

0850 Begin test #1: Readings: 497' 24.3' 18.7' 32.583'

PART 3

INSTANTANEOUS SLUG TEST

Static Water Level (TOC)

Transducer Depth

Baseline Start

Injection Start

Baseline Start

Withdrawal Start

Slug Volume

XD SN/Range (PSI)

pared by (print name):

Charlene Martinez

Reviewed by (print name):

L.D. Walker

Signature:

Charlene Martinez

Signature:

L.D. Walker

Date:

09/08/03

Date:

10-1-03

WELL DEVELOPMENT AND TESTING DATA

Report 1 Page 1 of 3

Well Name: 299-E27-21 Well ID: C4127 Well Location: South of CR Vault Date: 08/28/03

Reference Measuring Point (unless otherwise noted): TOP OF OUTER CASING (TOC)

Has the well been surveyed? ☐ Yes ☒ No Does the well have a cement pad? ☒ Yes ☐ No

PART 1

STATIC WATER LEVEL:

Start of Job 274.56' TOC

End of Job 274.47' TOC

DEPTH TO BOTTOM:

Start of Job 312.0' TOC

End of Job 311.9' TOC

PART 2

WELL DEVELOPMENT DATA

Pump Model Franklin 5 HP Submersible electric

Intake Depth 306.7' 297.7' 285.6'

Starting Turbidity 11.8 7.98 17.6

Pump Start	Stop	Flow Rate
0940	1043	1449 gallons
48 mins =	1128	23 gpm
1055	1143	23.5 gpm
62 mins =	1305	21.0 gpm
1243	1345	
1449 + 1128 + 1305 =		3879 gals

PART 4

Last Recorded Measurements

Date: 08/28/03

Current Measurements

Date:

Are there any reference marks on the casing strings? ☐ Yes ☒ No

Total Pumped 3879 gallons

Final Turbidity 1.24 1.24 1.83

XD SN/Range (PSI) 20.0 psi

PART 3

INSTANTANEOUS SLUG TEST

Static Water Level (TOC)

Transducer Depth

Baseline Start

Injection Start

Baseline Start

Withdrawal Start

Slug Volume

XD SN/Range (PSI)

pared by (print name):

Charlene Martinez

Reviewed by (print name):

L.D. Walker

PART 5

COMMENTS:

0600 P.O.D. / Safety meeting

0615 Back to office

0705 AC site.

0730 Tagged g.w. => 274.56' TOC

0730 Setting up rig.

0735 Tagged TD => 312' TOC. No fill in well.

0753 Tripping in Franklin 5 HP submersible pump.

0755 Calibrating instruments.

0900 Running 20.0 psi to depth. Initial XD => 47.78'

Begin test 1 on Hermit 3000. (No Test)

Initial Readings: TURB COND TEMP XD

0915 Transducer not working. Will develop old-fashioned

Signature:

Charlene Martinez

Signature:

L.D. Walker

Date:

08/28/03

Date:

9/30/03

1 of 5

WELL DEVELOPMENT AND TESTING DATA

Well Name: <u>299-E27-23</u>	Well ID: <u>C4190</u>	Well Location: <u>West of 241-C Tank Farm</u>	Date: <u>9-2-03</u>
---------------------------------	--------------------------	--	------------------------

Reference Measuring Point (unless otherwise noted): TOP OF OUTER CASING (TOC)

Has the well been surveyed? ☐ Yes ☒ No	Does the well have a cement pad? ☒ Yes ☐ No
---	--

PART 1

STATIC WATER LEVEL:

Start of Job 276.52' TOCEnd of Job 276.40' TOC

DEPTH TO BOTTOM:

Start of Job 314.4' TOCEnd of Job 314.4' TOC

PART 2

WELL DEVELOPMENT DATA

Pump Model <u>5 HP Franklin Electric</u>		
Intake Depth	<u>311.3'</u>	<u>301.3'</u>
Starting Turbidity	<u>35 NTU</u>	<u>1.8 NTU</u>
Pump Start	Stop	Flow Rate
<u>0940</u>	<u>1037</u>	<u>24.5 GPM</u>
<u>1105</u>	<u>1135</u>	<u>26 GPM</u>
<u>1347</u>	<u>1505</u>	<u>6 GPM</u>

PART 4

Last Recorded
Measurements
Date: N/A

Current
Measurements
Date: 9-2-03

A = N/A
B = N/A
C = N/A

A' = 3.42'
B' = 1.8'
C' = 1.62'

Are there any reference marks on the casing strings? ☐ Yes ☒ No

Total Pumped 3,624.5 Gal.
Final Turbidity 3.93 NTU 0.74 NTU 3.00 NTU

XD SN/Range (PSI) 20.0 Psi

PART 3

INSTANTANEOUS SLUG TEST

Static Water Level (TOC)

Transducer Depth

Baseline Start

Injection Start

Baseline Start

Withdrawal Start

Slug Volume

XD SN/Range (PSI)

PART 5

COMMENTS:

0600 - POD / Safety Mtg.
0610 - Geologist on site.
0615 - Geologist waits on Layne to set up pump rig.
0700 - Layne to go get generator & forklift; Geologist takes measurements.
0715 - DTW = 276.52' TOC (273.10' bgs); DTB = 314.4' TOC (310.98' bgs); Skup = 3.42'; Fill = 311.0' - 310.98' = 0.02'
0730 - Layne set up and ready to start.
0745 - Layne wants to pull bailer loads (even though there is only 0.02'); waiting for barrel from FWS
Tim Hottell.
0750 - Begin bailing.
0817 - End bailing; begin dropping pump.

Prepared by (print name):

Jess Hocking

Reviewed by (print name):

L.D. Walker

Signature:

Jess Hocking

Signature:

L.D. Walker

Date:

9/2/03

Date:

9/24/03

WELL DEVELOPMENT AND TESTING DATA															
Well Name: <u>292-E27-4</u>		Well ID: <u>C4125</u>	Well Location: <u>west of C-Tank Farm</u>												
		Date: <u>09/11/03</u>	Report # <u>2</u> , Page <u>1</u> of <u>2</u>												
Reference Measuring Point (unless otherwise noted): TOP OF OUTER CASING (TOC)															
Has the well been surveyed? ☐ Yes ☒ No		Does the well have a cement pad? ☒ Yes ☐ No													
PART 1		PART 4													
STATIC WATER LEVEL:		<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 5px; width: 45%;"> Last Recorded Measurements Date: <u>09/10/03</u> </div> <div style="border: 1px solid black; padding: 5px; width: 45%;"> Current Measurements Date: <u>09/11/03</u> </div> </div>													
Start of Job <u>274.29'</u>
End of Job <u>274.30'</u>		<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> A = <u>2.88'</u> B = <u>1.33'</u> C = <u>1.55'</u> </div> <div style="width: 45%;"> A' = <u>2.88'</u> B' = <u>1.33'</u> C' = <u>1.55'</u> </div> </div>													
DEPTH TO BOTTOM:		Are there any reference marks on the casing strings? ☐ Yes ☐ No													
Start of Job <u>311.35'</u>		PART 5													
End of Job <u>N/A</u>		COMMENTS:													
PART 2		<u>0600 P.O.D. / Safety meeting</u>													
WELL DEVELOPMENT DATA		<u>0615 On site. Prepare to develop well. old fashioned development</u>													
Pump Model <u>Franklin 5HP submersible</u>		<u>0630 Trying to get E-tape into well. Troubles lowering e-tape</u>													
Intake Depth <u>304.4'</u> <u>305.4'</u>		<u>0651 Raising/lowering pump to try to get e-tape in well.</u>													
Starting Turbidity <u>26.6</u> <u>4.23</u>		<u>0653 Calibrating instruments.</u>													
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Pump Start</th> <th>Stop</th> <th>Flow Rate</th> </tr> </thead> <tbody> <tr> <td><u>0845</u> (70 mins)</td> <td><u>0955</u> (1840 gals)</td> <td><u>36-27 gpm</u></td> </tr> <tr> <td><u>1000</u> (50 mins)</td> <td><u>1050</u> (1300 gals)</td> <td><u>24 gpm</u></td> </tr> <tr> <td colspan="3"><u>1840 + 1300 = 3140 gals</u></td> </tr> </tbody> </table>		Pump Start	Stop	Flow Rate	<u>0845</u> (70 mins)	<u>0955</u> (1840 gals)	<u>36-27 gpm</u>	<u>1000</u> (50 mins)	<u>1050</u> (1300 gals)	<u>24 gpm</u>	<u>1840 + 1300 = 3140 gals</u>			<u>0800 Geologist miscalculated where pump was to be set. Tripped in more tremmie pipe.</u>	
Pump Start	Stop	Flow Rate													
<u>0845</u> (70 mins)	<u>0955</u> (1840 gals)	<u>36-27 gpm</u>													
<u>1000</u> (50 mins)	<u>1050</u> (1300 gals)	<u>24 gpm</u>													
<u>1840 + 1300 = 3140 gals</u>															
Total Pumped <u>3140 gals.</u>		<u>0830 Running in E-tape. Trying again.</u>													
Final Turbidity <u>3.20</u> <u>0.74</u>		<u>0842 Ready to go. Hooking up hoses & valves. XD = 274.29' TOC</u>													
XD SN/Range (PSI) <u>N/A</u>		<u>0845 Turn on pump. Initial measurements: 19.2° C 530 cond</u>													
PART 3		<u>Turb 26.6: XD = steady @ 274.33' below TOC. 27 gpm</u>													
INSTANTANEOUS SLUG TEST		<u>See page 2 for measurements.</u>													
Static Water Level (TOC)		Signature: <u>Charles Martine</u>													
Transducer Depth		Date: <u>09/11/03</u>													
Baseline Start		Signature: <u>L.D. Walker</u>													
Injection Start		Date: <u>9/30/03</u>													
Baseline Start															
Withdrawal Start															
Slug Volume															
XD SN/Range (PSI)															
Prepared by (print name): <u>Charles Martine</u>															
Reviewed by (print name): <u>L.D. Walker</u>															

WELL DEVELOPMENT AND TESTING DATA																											
Report # 3: Page 1 of 2																											
Well Name <u>299-E27-4</u>	Well ID <u>C4125</u>	Well Location <u>West of C-Tank Farm</u>	Date <u>09/12/03</u>																								
Reference Measuring Point (unless otherwise noted). TOP OF OUTER CASING (TOC) <u>CA</u>																											
Has the well been surveyed? ☐ Yes ☒ No			Does the well have a cement pad? ☒ Yes ☐ No																								
PART 1			PART 4																								
STATIC WATER LEVEL:			<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 5px; width: 45%;"> Last Recorded Measurements Date <u>09/11/03</u> </div> <div style="border: 1px solid black; padding: 5px; width: 45%;"> Current Measurements Date <u>09/12/03</u> </div> </div>																								
Start of Job <u>274.29'</u>			<div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: center;"> </div> <div style="margin: 0 20px;"> </div> <div style="text-align: center;"> </div> </div>																								
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DEPTH TO BOTTOM.			Ground Level																								
Start of Job <u>311.35'</u>																											
End of Job <u>311.35'</u>																											
PART 2																											
WELL DEVELOPMENT DATA																											
Pump Model <u>Franklin 5 HP</u>																											
Intake Depth <u>283.3'</u>																											
Starting Turbidity <u>35.16</u>																											
Pump Start	Stop	Flow Rate																									
(new 15) <u>0647</u>	(1960915) <u>0757</u>	<u>28 gpm</u>																									
Total Pumped <u>1960 gallons</u>																											
Final Turbidity <u>1.16 NTU</u>																											
XD SN/Range (PSI) <u>20.0</u>																											
PART 3																											
INSTANTANEOUS SLUG TEST																											
Static Water Level (TOC)																											
Transducer Depth																											
Baseline Start																											
Injection Start																											
Baseline Start																											
Withdrawal Start																											
Slug Volume																											
XD SN/Range (PSI)																											
<div style="display: flex; justify-content: space-between;"> <div> Prepared by (print name) <u>Charlene Martinez</u> Reviewed by (print name) <u>L.D. Walker</u> </div> <div> Signature <u>Charlene Martinez</u> Signature <u>AD Walker</u> </div> <div> Date <u>09/12/03</u> Date <u>9/30/03</u> </div> </div>																											
PART 5 COMMENTS: <u>0600' P.O.D. Safety meeting. Discuss well development.</u> <u>0612 on site. Prepare for stage 3, using Hermit data logger.</u> <u>0615 Calibrating instruments</u> <u>0620 Setting intake. Remove 2' pipe. Add 9' pipe.</u> <u>0645 Ready for test #1 (intake @ 283.3'). Initial XD = 8.31' (test #2 on data logger)</u> <u>0647 Begin test Initial readings: XD = 8.233' Cond = 407</u> <u>T = 18.3°C, TURB = 35.6 NTU. measurements listed below</u> <table border="1" style="width: 100%; border-collapse: collapse; font-size: small;"> <thead> <tr> <th>Time</th> <th>XD (ft)</th> <th>TURB NTU</th> <th>Cond $\mu S/cm$</th> <th>T°C</th> <th>Flow rate</th> </tr> </thead> <tbody> <tr> <td>0658</td> <td>8.272</td> <td>6.46</td> <td>402</td> <td>18.2</td> <td rowspan="3">28 gpm => flow rate</td> </tr> <tr> <td>0719</td> <td>8.253</td> <td>1.70</td> <td>403</td> <td>17.4</td> </tr> <tr> <td>0730</td> <td>8.247</td> <td>1.28</td> <td>402</td> <td>18.0</td> </tr> </tbody> </table>						Time	XD (ft)	TURB NTU	Cond $\mu S/cm$	T°C	Flow rate	0658	8.272	6.46	402	18.2	28 gpm => flow rate	0719	8.253	1.70	403	17.4	0730	8.247	1.28	402	18.0
Time	XD (ft)	TURB NTU	Cond $\mu S/cm$	T°C	Flow rate																						
0658	8.272	6.46	402	18.2	28 gpm => flow rate																						
0719	8.253	1.70	403	17.4																							
0730	8.247	1.28	402	18.0																							

WELL DEVELOPMENT AND TESTING DATA

Report # 1, Page 1 of 2

Well Name: 299-627-22	Well ID: C4124	Well Location: East of C-Tank Farm	Date: 09/12/03
Reference Measuring Point (unless otherwise noted): TOP OF OUTER CASING (TOC)			
Has the well been surveyed? ☐ Yes ☒ No		Does the well have a cement pad? ☐ Yes ☒ No	

PART 1

STATIC WATER LEVEL:

Start of Job 233.69'

End of Job —

DEPTH TO BOTTOM:

Start of Job 271.3'

End of Job —

PART 2

WELL DEVELOPMENT DATA

Pump Model Franklin 5 Hp submersible

Intake Depth 264.5' / 255.5' / 243.3'

Starting Turbidity 30.9 / 24.7 / 11

Pump Start	Stop	Flow Rate
(40 min) 1158	(1500 gals) 1258	25 gpm
(33 min) 1312	(1272 gals) 1355	24 gpm
(43 min) 1412	(1089 gals) 1455	23 gpm
1500 + 1032 + 989 = 3521 gals.		

Total Pumped 3521 gals.

Final Turbidity 1.08 / 0.97 / 2.31

XD SN/Range (PSI) 20.0

PART 3

INSTANTANEOUS SLUG TEST

Static Water Level (TOC)

Transducer Depth

Baseline Start

Injection Start

Baseline Start

Withdrawal Start

Slug Volume

XD SN/Range (PSI)

Prepared by (print name):

Charlene Martinez

Reviewed by (print name):

L.D. Walker

PART 4

Last Recorded
Measurements
Date: N/A

Current
Measurements
Date: 09/12/03

Are there any reference marks on the casing strings? ☐ Yes ☒ No

PART 5

COMMENTS:

1016 Pump setting rig on site from decon.

1018 Setting up rig.

1025 Tagged g.w. @ 233.69' (TOC)

Tagged bottom @ 271.3' (TOC) No fill.

1100 Tripping in pump & tremmie pipe.

1145 Intake set 264.5' TOC

1157 Ready to run test (*4 on data logger). XD = 26.76'

1158 Begin test. Initial readings: XD = 26.365' TUEB 20.974

cond = 974 cm T = 20.7°C. 25 gpm

See page 2 for readings.

1258 Start recovery test (*5 on data logger)

1306 Stop test. Final XD = 26.698'. 99.8% recovery

Signature:

Charlene Martinez

Signature:

L.D. Walker

Date:

09/12/03

Date:

9/30/03

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APPENDIX F
WELL DEVIATION SURVEYS

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Directional Survey (Gyroscope)

WMP-18472, Rev. 0
Directional Survey (Gyroscope)

APPENDIX G
PUMP INSTALLATION

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FIELD ACTIVITY REPORT - WELL SERVICES						Page <u>1</u> of <u>1</u>
Date <u>09/16/03</u>	Well No. <u>C4122</u> <u>299-E25-93</u>	Rig Type/Model <u>Pump setting rig</u>	Rig No.	Contract/Work Order No.	Report No. <u>1</u>	
Purpose <u>Install pumps in C403 RCRA wells.</u>				Reference	Location <u>East of 241-A Tank Farm</u>	
HISTORICAL DATA			PUMP SYSTEM CONFIGURATION			
Construction Depth <u>315.26' bgs</u>				Pre-Maintenance	Post-Maintenance	
Casing Size <u>4" ID SS304, sch. 10</u>	Type <u>Set At</u>	Set At <u>42.0' - 278.23'</u>	Pump Type <u>0.7 HP</u>	Grundfos Rediflo3		
Casing Perforations Schedule <u>278.23' - 313.26'</u>	Interval		Pump Model <u>Prod. 2240 33713 model A</u>			
Well Screen(s) Type <u>4" ID SS304, sch. 10, 0.020" slot</u>	Interval		Tubing Size/Type <u>0.75" ID SS304</u>			
Last Recorded Depth-to-Water <u>281.26'</u>	Last Recorded Depth-to-Bottom <u>318.82'</u>		Length-Bottom of Tubing to Pump Intake <u>1.11'</u>			
Current Depth-to-Water <u>281.3'</u>	Current Depth-to-Bottom <u>318.92'</u>		Tubing Length <u>285.0'</u>			
			Length-Top of Tubing to Reference Point			
			Pump Intake Set at (Depth) <u>284.1' TOC</u>			
			Reference/Measuring Point <u>Top of casing</u>			
Start Time <u>0845</u>	Personnel <u>PH - FWS (T. Hottell)</u>		Materials Used <u>Grundfos Rediflo3 pump</u>			
End Time <u>1315</u>	<u>CH6 geologist - C. Martinez</u>		<u>0.75" OD schedule 40, SS304</u>			
Time	<u>Layne Christensen drill crew:</u>		<u>tremmie pipe.</u>			
Contract Time	<u>. Dale</u>		<u>28" ID 10' sections = 280'</u>			
Total Time <u>4.5 hrs</u>	<u>. Ken</u>		<u>1" ID 5' section = 5'</u>			
Description of Operations/Remarks						
<u>0845 On-site. FWS (T. Hottell) & drill crew @ laydown yard testing pump.</u>						
<u>0900 Tagged g.w. (281.3' TOC). Tagged TD (318.92' TOC).</u>						
<u>1038 Pump setting rig & drill crew on site.</u>						
<u>1039 Setting up rig.</u>						
<u>1050 Installing 0.7 HP Grundfos Rediflo3 pump & 0.75" OD tremmie pipe.</u>						
<u>Intake of Pump set @ 284.1' TOC</u>						
<u>1200 Landing plate stuck on 5' casing, while removing 5' casing crew discovered wire on pump had broken. Cut ~ 1' off wire & wire splicing kit in town.</u>						
<u>1315 Geologist released. Drill crew off-site to decon more tremmie pipe. Will repair wires in A.M.</u>						
<u>1320 Geologist off site.</u>						
<u>not used</u>						
<u>Charlene Martinez 09/16/03</u>						
Report By <u>Charlene Martinez</u>			Reviewed By <u>L.D. Walker</u>			
Title <u>Geologist</u>			Title <u>Geologist</u> Date <u>10-1-03</u>			
Signature <u>Charlene Martinez</u>			Signature <u>L.D. Walker</u>			

FIELD ACTIVITY REPORT - WELL SERVICES					Page <u>1</u> of <u>1</u>	
Date	Well No.	Rig Type/Model	Rig No.	Contract/Work Order No.	Report No.	
09/09/03	242-624-22	Pump setting rig			1	
Purpose				Reference	Location	
Install sampling/monitoring pump in C403 RCRA wells.					West of 241-AV Tank Farm	
HISTORICAL DATA			PUMP SYSTEM CONFIGURATION			
Construction Depth			Pre-Maintenance		Post-Maintenance	
323.48' (bgs)						
Casing Size	Type	Set At	Pump Type			
4" 20	SS 304	+2.00 - 284.21' bgs	Model Aisenta 1200 Grundfos			
Casing Perforations Schedule	Interval		Pump Model			
0.20" cont. wire wrap			5HP (0.7)	RediFlo 3		
Well Screen(s) Type	Interval		Tubing Size/Type	0.75" / SS 304 L		
286.21' - 321.26'			Length-Bottom of Tubing to Pump Intake	0.9'		
Last Recorded Depth-to-Water	Last Recorded Depth-to-Bottom		Tubing Length	295'		
288.9' TOC	326.5' TOC		Length-Top of Tubing to Reference Point			
Current Depth-to-Water	Current Depth-to-Bottom		Pump Intake Set at (Depth)	295.9'		
288.8' TOC	326.46' TOC		Reference/Measuring Point	Top of casing (TOC)		
Start Time	End Time	Time	Contract Time	Total Time	Personnel	
1400	1600				Layne Christensen → Dave Smith drawn	
					FH → Tim Howell	
					CHG → Charlene Martinez	
					Materials Used SS 304 L, Schedule 40 0.75" tremmie pipe + SS couplers. 5HP Grundfos RediFlo 3 pump. 0.7	
Bottom of pump = 1.62'			Description of Operations/Remarks			
Intake = 0.22'			Total = 2.74'			
Top = 0.9'						
1405						
0905 Tripping in 5HP, Grundfos RediFlo 3 pump, + 0.75" SS 304, schedule 40 tremmie pipe + couplers.						
1524 pump/pipes installed.						
1525 Rigging down pump setting rig.						
1555 Control box not programmed for pump. Geologist released.						
0919/03 Pump tested. Works						
0919/03						
09108/03						
Report By			Reviewed By			
Charlene Martinez			L.D. Walker			
Title			Title			
Geologist			Geologist			
Signature			Signature			
Charlene Martinez			L.D. Walker			

FIELD ACTIVITY REPORT - WELL SERVICES						Page <u>1</u> of <u>1</u>
Date <u>09/19/03</u>	Well No. <u>C 4127</u>	Rig Type/Model <u>Pump setting rig</u>	Rig No.	Contract/Work Order No.	Report No. <u>1</u>	
Purpose <u>Install pumps in C403 RCR wells.</u>				Reference	Location <u>South of the CR-Vault</u>	
HISTORICAL DATA			PUMP SYSTEM CONFIGURATION			
Construction Depth <u>308.83' bgs</u>					Pre-Maintenance	Post-Maintenance
Casing Size <u>4" ID</u>	Type <u>SS 304, sch. 10</u>	Set At <u>+2.0' - 271.37' bgs</u>	Pump Type <u>0.7 HP</u>		Grundfos Rediflo3 Prod # 135	
Casing Perforations Schedule Interval			Pump Model <u>Model A, 960309</u>			
Well Screen(s) Type <u>0.020" slot</u>			Tubing Size/Type <u>0.75" OD SS 304</u>			
Interval <u>271.37' - 306.43' bgs</u>			Length-Bottom of Tubing to Pump Intake <u>1.10'</u>			
Last Recorded Depth-to-Water <u>274.56' TOC</u>			Tubing Length <u>280.0'</u>			
Last Recorded Depth-to-Bottom <u>312.0' TOC</u>			Length-Top of Tubing to Reference Point			
Current Depth-to-Water <u>274.46' TOC</u>			Pump Intake Set at (Depth) <u>281.10'</u>			
Current Depth-to-Bottom <u>311.95' TOC</u>			Reference/Measuring Point <u>TOC (TOP OF CASING)</u>			
Start Time <u>1215</u>		Personnel <u>Layne Christensen</u>		Materials Used <u>28 X 10' sections</u>		
End Time <u>1400</u>		• Dave DeWitt		<u>SS 304 schedule 40, 0.75" OD</u>		
Time _____		• Ken Johnson Jones		<u>tremmie pipe, & couplers</u>		
Contract Time _____		• Pluen Hanford		<u>Grundfos Rediflo3 (0.7 HP)</u>		
Total Time <u>1.75 hrs</u>		• Ed Rafuse (BTR)		<u>electric submersible pump.</u>		
		• Chaz Hill (CHG)				
		• Charlene Martinez (geologist)				
Description of Operations/Remarks						
<u>1215 P.O.D. / Safety meeting</u>						
<u>1235 on site. Pump setting rig set up.</u>						
<u>1245 Tagged g.w. @ 274.56' TOC.</u>						
<u>Tagged TD @ 311.95' TOC.</u>						
<u>1250 Preparing to install Grundfos Rediflo3 (0.7 HP) pump using SS 304, schedule 40, 0.75" OD tremmie pipe.</u>						
<u>1255 Begin installing pump.</u>						
<u>By the way - Happy birthday to me. Happy birthday to me.</u>						
<u>1400 Done. mast on rig down.</u>						
<u>1405 Pump setting rig off-site to C4190</u>						
<u>09/19/03 Tested pump & works.</u>						
<u>09/19/03</u>						
<u>09/18/03</u>						
Report By <u>Charlene Martinez</u>			Reviewed By <u>L.D. Walker</u>			
Title <u>Geologist</u>			Title <u>Geologist</u> Date <u>9/30/03</u>			
Signature <u>Charlene Martinez</u>			Signature <u>L.D. Walker</u>			

FIELD ACTIVITY REPORT - WELL SERVICES					Page <u>1</u> of <u>1</u>	
Date <u>09/18/03</u>	Well No. <u>C4190</u>	Rig Type/Model <u>Pump setting rig</u>	Rig No.	Contract/Work Order No.	Report No. <u>1</u>	
Purpose <u>Install pump in C403 RECA wells.</u>				Reference	Location <u>west of C-Tank Farm</u>	
HISTORICAL DATA		PUMP SYSTEM CONFIGURATION				
Construction Depth <u>310.97' bgs</u>					Pre-Maintenance	Post-Maintenance
Casing Size <u>4" 20.55304 sch 10</u>	Type <u>1.8' - 273.51'</u>	Pump Type <u>2.7 HP</u>			<u>Grundfos Rediflo3</u>	
Casing Perforations Schedule <u>Interval</u>		Pump Model <u>Prod. # 96030-139</u>			<u>Model A</u>	
Well Screen(s) Type <u>0.020" slot</u>		Tubing Size/Type <u>2.7500 20.55304 sch 10</u>				
Interval <u>273.51' - 308.54'</u>		Length-Bottom of Tubing to Pump Intake <u>1.11'</u>				
Last Recorded Depth-to-Water <u>276.52' TOC</u>		Tubing Length <u>280.0'</u>				
Last Recorded Depth-to-Bottom <u>314.4' TOC</u>		Length-Top of Tubing to Reference Point				
Current Depth-to-Water <u>276.46' TOC</u>		Pump Intake Set at (Depth) <u>281.11'</u>				
Current Depth-to-Bottom <u>314.45' TOC</u>		Reference/Measuring Point <u>TOC (TOP OF CASING)</u>				
Start Time <u>1400</u>		Personnel <u>Layne Christensen</u> <u>Dave Dewitt</u> <u>Ken Jones</u> <u>Alvin Hanford</u> <u>Ed Rafuse</u> <u>CH2M Hill (CH2)</u> <u>Charlene Martinez</u>			Materials Used <u>28 x 10' long 20.55304, schedule 40, 0.75" OD tremmie pipe & couplers</u> <u>0.7 HP Grundfos Rediflo3 electric submersible pump.</u>	
End Time <u>1630</u>						
Time						
Contract Time						
Total Time <u>2.5 hrs</u>						
Description of Operations/Remarks						
<u>1405 on site from C4127</u>						
<u>1410 Drill crew off site to pick up tremmie pipe & pump for installation.</u>						
<u>1415 Tagged g.w. => 276.46' TOC</u>						
<u>Tagged TD => 314.45' TOC</u>						
<u>Still my birthday. Happy birthday to me. Happy birthday to me.</u>						
<u>1440 Drill crew on site. Setting up rig to install Grundfos Rediflo3 (0.7 HP) pump.</u>						
<u>1445 Installing pump & tremmie pipe</u>						
<u>1449 Done</u> <u>09/19/03 Tested pump=works</u>						
<u>1458 Lowering mast on pump setting rig.</u> <u>(cm) 09/19/03</u>						
<u>1430 Site secure. End of shift.</u>						
<u>Charlene Martinez</u> <u>NOT used</u>						
<u>09/18/03</u>						
Report By <u>Charlene Martinez</u>				Reviewed By <u>L.D. Walker</u>		
Title <u>Geologist</u>				Title <u>Geologist</u> Date <u>9/30/03</u>		
Signature <u>Charlene Martinez</u>				Signature <u>L.D. Walker</u>		

FIELD ACTIVITY REPORT - WELL SERVICES						Page <u>1</u> of <u>1</u>
Date <u>09/19/03</u>	Well No. <u>C4125</u>	Rig Type/Model <u>Pump setting rig</u>	Rig No.	Contract/Work Order No.	Report No. <u>()</u>	
Purpose <u>Install pumps in C403 RORA wells</u>				Reference	Location <u>West of C-Tank Farm</u>	
HISTORICAL DATA		PUMP SYSTEM CONFIGURATION				
Construction Depth <u>307.76' bgs</u>				Pre-Maintenance	Post-Maintenance	
Casing Size <u>4" ID</u>	Type <u>SS 304 sch 10</u>	Set At <u>+1.9' - 270.32'</u>	Pump Type <u>0.7 HP</u>	<u>Grundfos Rediflo3</u>		
			Pump Model <u>prod # 96030139</u>	<u>model A</u>		
Casing Perforations Schedule <u>Interval</u>			Tubing Size/Type <u>0.75" OD</u>	<u>SS 304 sch 40</u>		
Well Screen(s) Type <u>(4" ID)</u>			Length-Bottom of Tubing to Pump Intake <u>1.11'</u>			
<u>Interval</u>			Tubing Length <u>280.0'</u>			
<u>SS 304 sch 10 270.32' - 305.33'</u>			Length-Top of Tubing to Reference Point			
Last Recorded Depth-to-Water <u>274.29' (TOC)</u>	Last Recorded Depth-to-Bottom <u>311.35' (TOC)</u>	Pump Intake Set at (Depth) <u>281.11'</u>				
Current Depth-to-Water <u>274.21' (TOC)</u>	Current Depth-to-Bottom <u>311.35' (TOC)</u>	Reference/Measuring Point <u>(TOC) Top of Casing</u>				
Start Time <u>0600</u>	Personnel <u>Layne Christensen</u> <u>Dave Dewitt</u> <u>Ken Jones</u> <u>Fluor Hanford</u> <u>Tim Hottell</u> <u>CH2M Hill (C406)</u> <u>Charlene Martinez</u>		Materials Used <u>28 x 10' long sections</u> <u>SS 304 sch. 40, 0.75" OD tremmie</u> <u>pipe & couplers (ss)</u> <u>0.7 HP Grundfos Rediflo3 pump.</u>			
End Time <u>0810</u>						
Time <u></u>						
Contract Time <u></u>						
Total Time <u>2.25 hrs</u>						
Description of Operations/Remarks						
<u>0600 P.O.D. / Safety meeting</u>						
<u>0615 Drill crew off to get ss tremmie pipe.</u>						
<u>0630 Drill crew on site. Setting up rig.</u>						
<u>0640 Tagged g.w. => 274.21' (TOC)</u>						
<u>Tagged TD => 311.35' (TOC)</u>						
<u>0650 Tripping in 0.7 HP Grundfos Rediflo3 pump & 0.75" OD ss 304, schedule 40 tremmie pipe.</u>						
<u>0906 Done. Lowering mast. Preparing to move to C4124.</u>						
<u>0908 Drill crew + rig off site. Geologist tagging along.</u>						
<u>1122 Pump tested. Works. (cm)</u>						
<u>not used</u>						
<u>Charlene Martinez 09/19/03</u>						
Report By <u>Charlene Martinez</u>			Reviewed By <u>L.D. Walker</u>			
Title <u>Geologist</u>			Title <u>Geologist</u>			
Signature <u>Charlene Martinez</u>			Date <u>9/30/03</u>			
			Signature <u>L.D. Walker</u>			

FIELD ACTIVITY REPORT - WELL SERVICES					Page <u>1</u> of <u>1</u>	
Date <u>09/19/03</u>	Well No. <u>C4124</u>	Rig Type/Model <u>Pump setting rig</u>	Rig No.	Contract/Work Order No.	Report No. <u>1</u>	
Purpose <u>Install pumps in C403 RCRA wells</u>				Reference	Location <u>East of C-Tank Farm</u>	
HISTORICAL DATA			PUMP SYSTEM CONFIGURATION			
Construction Depth <u>248.1' bgs</u>					Pre-Maintenance	Post-Maintenance
Casing Size <u>4" ID SS 304, Sch. 10</u>	Type <u>2.2"</u>	Set At <u>228.05'</u>	Pump Type <u>0.5 HP</u>		Grundfos Rediflo2	
Casing Perforations Schedule			Pump Model <u>model 1A106003</u>			
Well Screen(s) Type <u>4" ID SS 304, Sch. 10</u>			Tubing Size/Type			
Interval <u>228.05' - 248.05'</u>			Length-Bottom of Tubing to Pump Intake <u>0.98'</u>			
Last Recorded Depth-to-Water <u>233.69' (TOC)</u>			Tubing Length <u>240.0'</u>			
Last Recorded Depth-to-Bottom <u>271.3' (TOC)</u>			Length-Top of Tubing to Reference Point			
Current Depth-to-Water <u>233.4' (TOC)</u>			Pump Intake Set at (Depth) <u>240.96'</u>			
Current Depth-to-Bottom <u>271.3' (TOC)</u>			Reference/Measuring Point (TOC) <u>TOP OF CASING</u>			
Start Time <u>0810</u>	Personnel <u>Layne Christensen</u>		Materials Used <u>24 X 10' long, SS 304, Sch. 40, 0.75" OD tremmie pipe.</u>			
End Time	• Dave DeWitt		0.5 HP Grundfos			
Time	• Ken Jones					
Contract Time	Fluor Hanford					
Total Time	• Tim Hottell					
	CHam Hill (CHG)					
	• Charlene Martinez					
Description of Operations/Remarks						
<u>0810 On site from C4125. Drill crew dropped off pump setting rig. off site to get 0.75" OD SS 304, Schedule 40 tremmie pipe & 0.5 HP Grundfos Rediflo2 pump.</u>						
<u>0848 Drill crew on site. Setting up rig. Prepare to install pump.</u>						
<u>0848 FWS (T. Hottell) off site to get pump.</u>						
<u>0904 Missing an adapter (SS coupler from 3/4" to 1/2") to attach pump to tremmie pipe. FWS (T. Hottell) & driller (D. DeWitt) working on problem.</u>						
<u>0910 T. Hottell off site looking for an adapter.</u>						
<u>0918 Drill crew off site looking for an adapter.</u>						
<u>0933 Adapter located, drill crew back.</u>						
<u>0934 Begin installing Rediflo2 pump (0.5 HP Grundfos)</u>						
<u>1022 Done.</u>						
<u>1025 mast down on pump setting rig. Off site to C4122 to begin testing pumps.</u>						
<u>1105 Testing pump. control box not working. End of shift off site.</u>						
<u>* Notes: Pump tested (09/24/03), worked @ 400hz on control box.</u>						
Report By <u>Charlene Martinez</u>			Reviewed By <u>L. D. Walker</u>			
Title <u>Geologist</u>			Title <u>Geologist</u>		Date <u>9/30/03</u>	
Signature <u>Charlene Martinez</u>			Signature <u>L. D. Walker</u>			

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