0069206

Interim Change Notice
(ICN)

A. Document No.: PNNL-14301, Rev. 2 **Revision No. 2** September 2005 **Document Title:** *Monitoring Plan for RCRA Groundwater Assessment at the 216-U-12 Crib* **Document's Original Author:** B. A. Williams and C. J. Chou	**Effective Date of ICN:** 3/10/06 **Change Requested By:** Bruce A. Williams

66656

B. Action: Make changes in the 216-U-12 crib groundwater quality assessment plan as described in Section D below. Attach this ICN to the front of the document.

C. Effect of Change: This ICN updates the assessment plan to reflect the current wells in the monitoring system and the current constituent list for 216-U-12 crib in compliance with RCRA assessment monitoring.

D. Reason for Change/Description of Change:

Reason for Change: One new well, 299-W22-87, was constructed upgradient of the 216-U-12 crib and will be incorporated into the monitoring network. The old upgradient monitoring well, 299-W22-43, had gone dry due to the falling water table and had temporarily been replaced with an older existing upgradient well 299-W22-26. New well 299-W22-87 is a new compliant well that will replace the interim well, 299-W22-26, which is an older non-compliant well structure. The monitoring well list has been modified accordingly to accommodate these changes. The table of well constituents and frequency of sampling has been updated to include the new well.

Description of Change:

- Replace Figure 1 with revised Figure R1 attached.
- Replace Figure 1.1 with revised Figure R1.1 attached.
- Replace Table 1.1 with the revised Table R1.1 attached.
- Replace Table 1.2 with the revised Table R1.2 attached.
- Add to Appendix A the attached Well Construction Summary Report, Well Summary Sheet, Borehole Log, and the Well Survey Data Report for new well 299-W22-87.

E. Document Management Decisions: None.

F. Approval Signatures
(Please Sign and Date)

Task Manager: 3/20/06
S. P. Luttrell

Type of Change: (Check one):
____ Minor _✓_ Major

Project Quality Engineer: Thomas G. Walker Date: 3/20/06
T. G. Walker

Other Approvals: Date: 3/17/06
B. A. Williams

Mary J. Hartman Date: 20 Mar 06
M. J. Hartman

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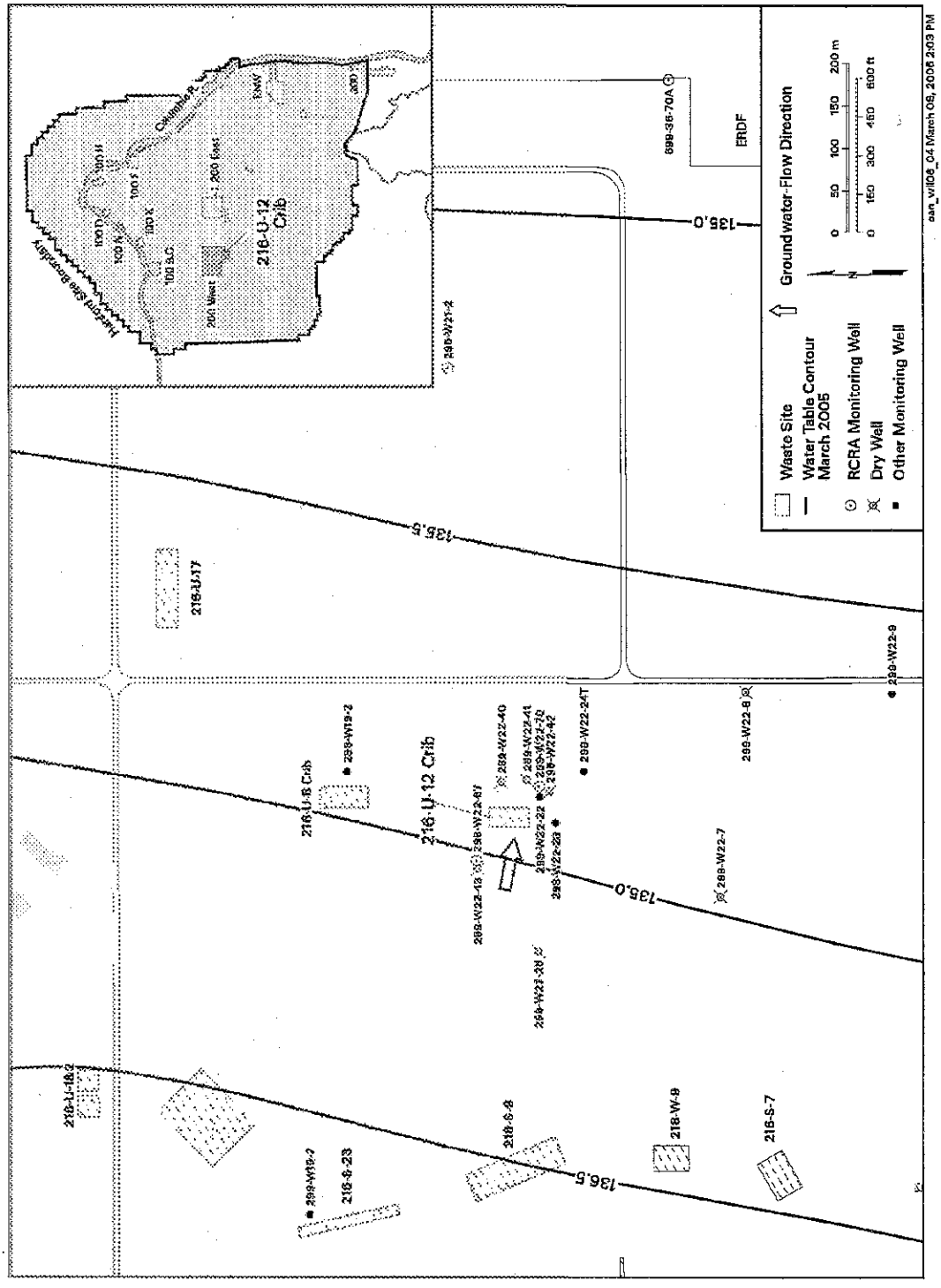


Figure R1. Location of 216-U-12 Crib on the Hanford Site, Washington

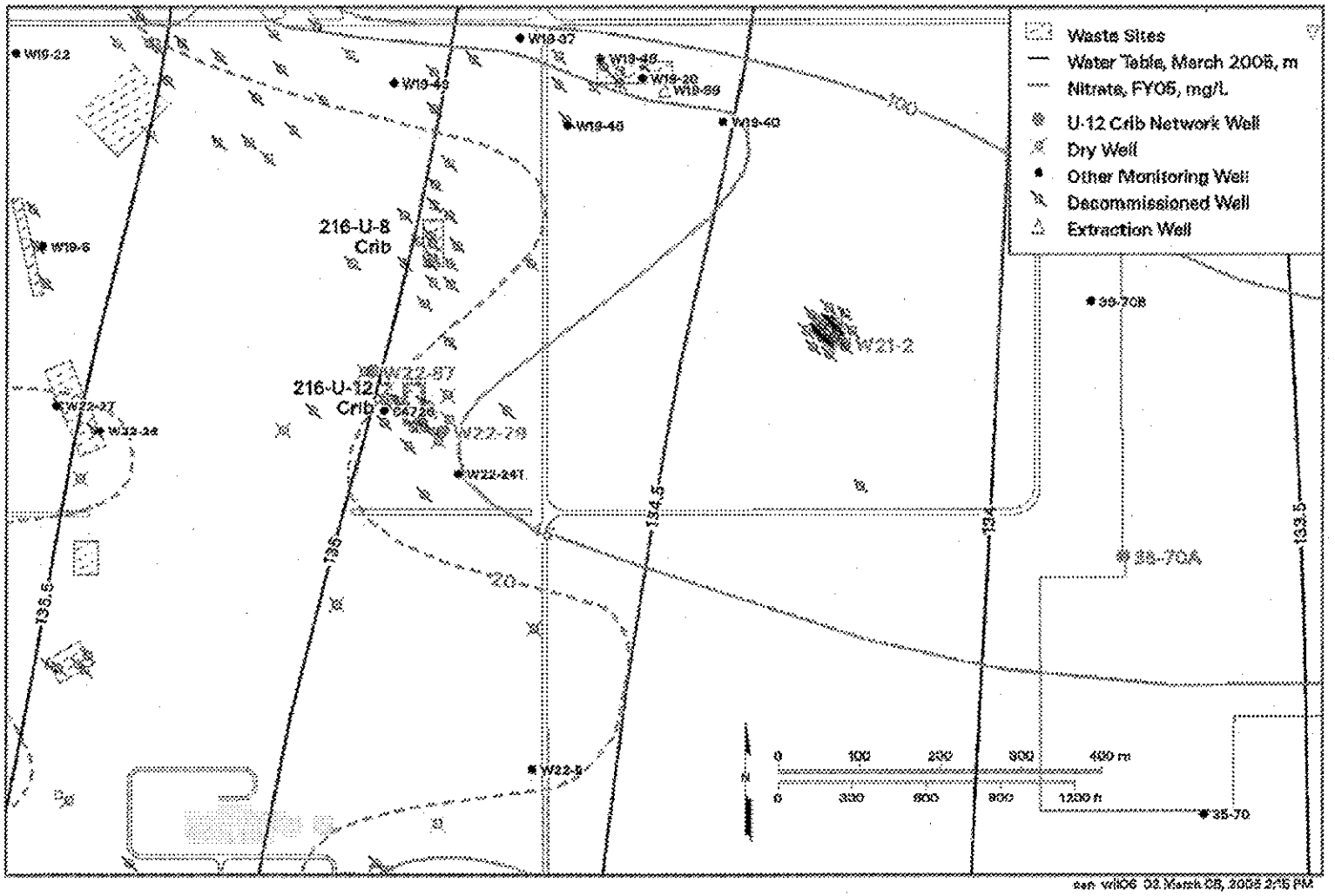


Figure R1.1. RCRA Interim-Status Assessment Monitoring Network for the 216-U-12 Crib

Table R.1.1. 216-U-12 Crib Interim Status Groundwater Monitoring Network

Well	Well Standard	Unit Monitored	Comment	Other Users
299-W22-87	WAC 173-160	Top of unconfined	Upgradient well location, installed in 2006	CERCLA
299-W22-79	WAC 173-160	Top of unconfined	In current network	CERCLA
699-36-70A	WAC 173-160	Top of unconfined	In current network	CERCLA
299-W21-2	WAC 173-160	Top of unconfined	Installed in CY04 for 200 UP-1 monitoring	CERCLA

Table R.1.2. Well Constituents and Frequency of Sampling at the 216-U-12 Crib

	Constituents Required Under This Plan			Constituents Supporting Interpretation									
Well Number	Arsenic	Chromium (total; filtered)	Nitrate	Alkalinity	Anions[a]	Metals (filtered)[b]	Technetium-99[a, c]	TDS	pH	Specific conductance	Temperature	Turbidity	Water Levels[d]
299-W22-87	A	A	Q	A	Q	A	Q	A	Q	Q	Q	Q	Q
299-W22-79	A	A	Q	A	Q	A	Q	A	Q	Q	Q	Q	Q
699-36-70A	A	A	Q	A	Q	A	Q	A	Q	Q	Q	Q	Q
299-W21-2	A	A	Q	A	Q	A	Q	A	Q	Q	Q	Q	Q

(a) Anions – Analyzed include, but not limited to, chloride, nitrate, sulfate, and fluoride.
(b) Metals – Analyzed include, but not limited to, calcium, potassium, magnesium, and sodium.
(c) Not regulated under RCRA; co-contaminant analyzed to help determine groundwater flow rate and direction and to support CERCLA and AEA monitoring.
(d) Measured before purging well for sampling.
A = annually; Q = quarterly.

WELL CONSTRUCTION SUMMARY REPORT

Start Date: 12-14-05
Finish Date: 1-25-06
Page 1 of 2

Well ID: C4977	Well Name: 299-W22-87	Approximate Location: S of U Plant
Project: 200-UP-1 OU Monitoring Wells		Other Companies: Gram, Inc
Drilling Company: Layne Christensen		Geologist(s): R. Henderson, N. Bowles
Driller: Dave Dewitt	License #: 2695	

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 9" From 0 to 379.5
9"x6" dual wall	0 - 379.5	9"x6"	Cable Tool:	Diameter ___ From ___ to ___
carbon steel	___ - ___		Air Rotary:	Diameter ___ From ___ to ___
	___ - ___		A.R. w/Sonic:	Diameter ___ From ___ to ___
	___ - ___			Diameter ___ From ___ to ___
	___ - ___			Diameter ___ From ___ to ___
*Indicate Welded (W) - Flush Joint (FJ) Coupled (C) & Thread Design				Diameter ___ From ___ to ___

379.5' RH	Drilling Fluid: NA	
Total Drilled Depth: ~~379.75'~~	Hole Dia @ TD: 9"	Total Amt. Of Water Added During Drilling: NA
Well Straightness Test Results: passed 12-29-05	Static Water Level: 250.47'	Date: 12-20-05

GEOPHYSICAL LOGGING

Sondes (type)	Interval	Date	Sondes (type)	Interval	Date
Spectral Gamma	0 - 379.5	12-28-05		___ - ___	
	___ - ___		N	___ - ___	
	___ - ___		A	___ - ___	

COMPLETED WELL

Size/Wt./Material	Depth	Thread	Slot Size	Type	Interval Annular Seal/Filter Pack	Volume	Mesh Size
Sch. 5 type 304 stainless riser	+2.10 - 250.23	✓	NA	Natural backfill	379.50 - 363.70	- NA -	
type 304 10-20 slot stainless screen	250.23 - 285.30	✓	0.020 ~~10-20~~	Colorado Silica Sand	363.70 - 296.80	72 bags	10-20
type 304 stainless steel sump	285.30 - 288.33	✓	NA LOW	Bentonite Pellets-coated	296.80' - 290.90'	2.5	1/4"
	___ - ___			Colorado silica Sand	290.90 - 240.90	36	10-20
	___ - ___			Bentonite Pellets-coated	240.90 - 234.03	2.5	1/4"

OTHER ACTIVITIES

Aquifer Test:	Date:	Well Decommission:	Yes:	No:	Date:
Description: N/A		Description: N/A			

WELL SURVEY DATA (if applicable) Not yet available -

	Protective Casing Elevation: 2/7/06
Washington State Plane Coordinates:	Brass Survey Marker Elevation: LOW

COMMENTS / REMARKS

4" stainless steel permanent well casing

Reported By:	Title:	Signature:	Date:
Robin Henderson	Geologist	Robin Henderson	12-14-05

A-6003-658 (04/03)

WELL CONSTRUCTION SUMMARY REPORT

Start Date: 12-14-05
Finish Date: 1-25-06
Page 2 of 2

Well ID: C4977	Well Name: 299-W22-87	Approximate Location: S. of U Plant
Project: 200 UP-1 OU Monitoring Wells		Other Companies: Gram, Inc
Drilling Company: Layne Christensen		Geologist(s): R. Henderson N Bowles
Driller: Dave Dewitt	License #: 2695	

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 9" From 0 to 379.5
9" x 6" dual wall	0 - 379.5	9" x 6"	Cable Tool:	Diameter ___ From ___ to ___
carbon steel	-		Air Rotary:	Diameter ___ From ___ to ___
	-		A.R. w/Sonic:	Diameter ___ From ___ to ___
	-			Diameter ___ From ___ to ___
	-			Diameter ___ From ___ to ___
*Indicate Welded (W) - Flush Joint (FJ) Coupled (C) & Thread Design				Diameter ___ From ___ to ___
			Drilling Fluid: NA	
Total Drilled Depth: 379.5'	Hole Dia @ TD: 9"		Total Amt. Of Water Added During Drilling: NA	
Well Straightness Test Results: passed 12-29-05			Static Water Level: 250.47'	Date: 12-20-05

GEOPHYSICAL LOGGING

Sondes (type)	Interval	Date	Sondes (type)	Interval	Date
Spectral Gamma	0 - 379.5	12-28-05		-	
	-			-	
	-			-	

COMPLETED WELL

Size/Wt./Material	Depth	Thread	Slot Size	Type	Interval Annular Seal/Filter Pack	Volume	Mesh Size
type 304 stainless steel screen	+210 - 250.23			Granular Bentonite	234.08 - 11.58	117	
10-20 slot stainless steel screen	250.23 - 285.30			Cement Grout	11.58 - 0	10	
type 304 stainless steel sump	285.30 - 288.33				-		
	-				-		
	-				-		

OTHER ACTIVITIES

Aquifer Test:	Date:	Well Decommission:	Yes:	No:	Date:
Description: Not Used		Description: Not Used			

WELL SURVEY DATA (if applicable)

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

COMMENTS / REMARKS

Reported By:	Title:	Signature:	Date:
Robin Henderson	Geologist	Robin Henderson	12-14-05

A-6003-658 (04/03)

WELL SUMMARY SHEET

Start Date: 12-14-05
Finish Date: 1-25-06
Page 1 of 3

Well ID: C4977	Well Name: 299-W22-87
Location: S of U Plant	Project: 200-UP-1-OU Monitoring Well
Prepared By: Robin Henderson Date: 12-29-05	Reviewed By: L.D. Walker Date: 2/7/06
Signature: Robin Henderson	Signature: LD Walker

CONSTRUCTION DATA

Description

4" stainless steel type 304 sch. 5 riser pipe: + 2.10' ags → 250.23' bgs

4" type 304 sch. 5 10-20 slot screen: 250.23' → 285.30

4" stainless steel type 304 sch. 5. sump: 285.30' → 288.33'

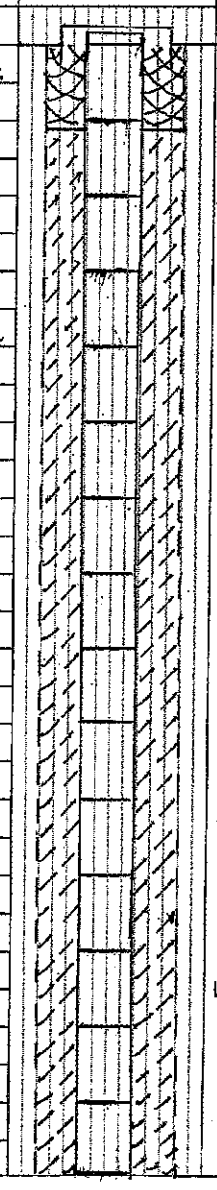
Cement Grout: 0' → 11.58'

Granular Bentonite: 11.58' → 234.03'

Protective surface casing, 6" SS set 1.0' above the 4" well casing

Temporary drill casing 9" by 6" dual wall

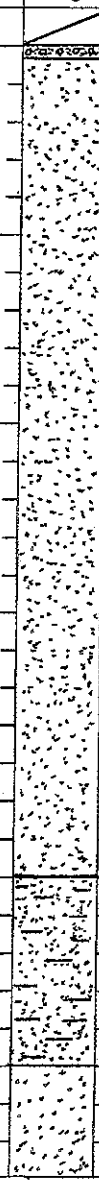
Diagram



GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 0, 25, 50, 75, 100, 125

Graphic Log



Lithologic Description

0 → 1.5' Sandy Gravel
1.5' → 110' Sand
110' → 135' Silty Sand
135' → 150' Sand

A-6003-643 (03/03)

WELL SUMMARY SHEET	Start Date: 12-14-05	Page 2 of 3
	Finish Date: 1-25-06	

Well ID: C4977		Well Name: 299-W22-87	
Location: S. of U-Plant		Project: 200-UR-1 OU Monitoring Wells	
Prepared By: Robin Henderson	Date: 2-29-05	Reviewed By: L.D. Walker	Date: 2/7/06
Signature: Robin Henderson		Signature: LD Walker	

CONSTRUCTION DATA

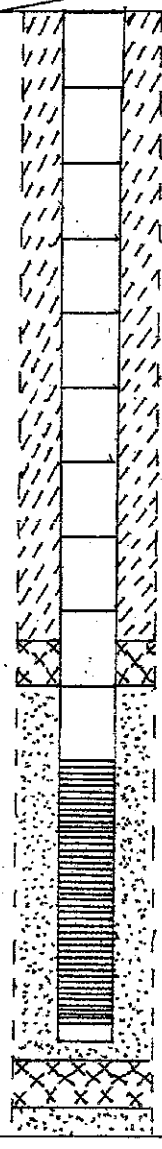
Granular Bentonite:
11.58' → 234.03'

Bentonite Pellets:
234.03' → 240.35'

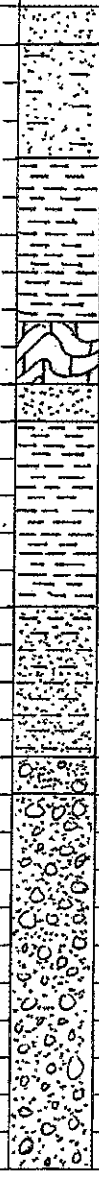
10-20 Colorado Silica sand:
240.35' → 290.90'

Bentonite Pellets:
290.90' → 296.80'

Static groundwater depth:
250.47' (12-20-05)



GEOLOGIC/HYDROLOGIC DATA



Depth in Feet	Lithologic Description
150'	150' → 105' silty sand
	105' → 187' silt
	187' → 195' caliche
	195' → 200' sand
200'	200' → 225' silt
225'	225' → 245' sandy silt
	245' → 250' gravelly sand
250'	250' → 330' sandy gravel

A-6003-643 (03/03)

WELL SUMMARY SHEET

Start Date: 12-14-05
Finish Date: 1-25-06
Page 3 of 3

Well ID: C4977	Well Name: 299-W22-87
Location: S. of U Plant	Project: 200-UR-1 OU Monitoring Wells
Prepared By: Robin Henderson Date: 12-29-05	Reviewed By: L. D. Walker Date: 2/7/06
Signature: Robin Henderson	Signature: [signature]

CONSTRUCTION DATA

Description:

Colorado Silica Sand backfill: 296.80' → 363.70'

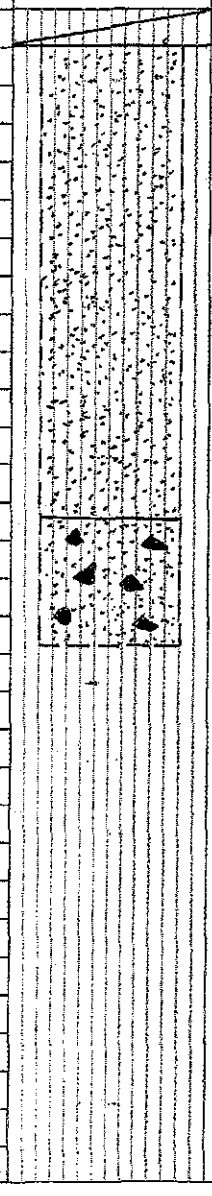
Natural backfill: 363.70' → 379.50'

Static groundwater: 250.47'

All depths are in feet below ground surface

All temporary casing was removed from ground surface

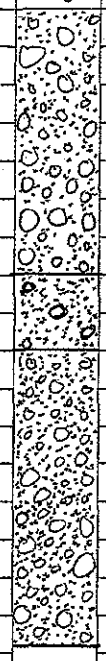
Diagram:



GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 300, 325, 350, 375, 400

Graphic Log:



Lithologic Description:

330' → 340' Gravelly Sand

340' → 379.5' Sandy Gravel

TD: 379.5' bgs

A-6003-643 (03/03)

BOREHOLE LOG

Page 1 of 5
Date: 12-14-05

Well ID: C4977 | Well Name: 299-W22-87 | Location: S. of U Plant

Project: 200 UP 1 OU Monitoring Wells | Reference Measuring Point: ground surface

Depth (Ft)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
0				0→1.5' Sandy Gravel. unconsolidated backfill for drill pad. Subrounded to subangular, very fine to med. sand. tan. gravel 65% metamorphic, 35% Mafic	Diesel hammer (Becker Hammer) with 9"x6" dual wall drill casing
	Archive				
10	Archive			1.5'→7' very fine to med. Sand. tan. possibly from sand dunes. little gravel	1-pint archive grab samples collected every 5 feet.
	Archive				
				7'→110' Sand of Hanford Fm.	
20	Archive			very fine to very coarse. Some basaltic gravel (less than 2%)	
	archive			Sand is 65% mafic, 35% felsic, qtz No RXN HCL. Subrounded to Rounded.	Red and organic vapor readings below background with Field instruments
30	archive			-20': very fine to medium sand	
	archive			sand is 65% Mafic, 35% qtz, felsic No RXN w/ HCL	
40	archive			-35': Med. to coarse sand. 75% mafic, 25% qtz & felsic, very sparse gravel. No RXN w/ HCL	
	archive			-40': very fine to med. sand. subrounded to subangular. 55% felsic/qtz, 45% mafic, very sparse gravel	
50	archive			-45': med. to very coarse sand, NO RXN w/ HCL. subrounded to subangular. Sand 50% mafic, 50% felsic/qtz	
	archive			NO gravel.	
60	archive			-50': coarse to very coarse sand with <2% small pebbles, otherwise same comp. as 45'	
	archive			-55': med. to very coarse	
				-60': med. to very coarse sand. 65% felsic/qtz, 35% mafic	
70	archive			subrounded to subangular	
				-70': 35% mafic, 65% felsic/qtz: ↓ bgrd content	
	archive				

Reported By: Robin Henderson | Reviewed By: L. D. Walker
Title: Geologist | Title: Geologist
Signature: Robin Henderson | Date: 12-14-05 | Signature: [signature] | Date: 2/7/06

A-6003-642 (03/03)

BOREHOLE LOG

Page 2 of 5
Date: 12-14-05

Well ID: C4977 | Well Name: 299-W22-87 | Location: S. of U Plant

Project: 200-UP-1 OU Monitoring Wells | Reference Measuring Point: ground surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
80	Archive			-80': fine to coarse sand. basalt content decreasing. 75% felsic/qtz & 25% mafic. Subrounded to Subangular. NO RXN w/ HCL	Diesel hammer 9"x 6" dual wall drill casing
	Archive				
90	Archive			-90': very fine to coarse sand, otherwise same as above @ 80'	1-pint archive grab samples collected at 5-foot intervals
	Archive			-95': very fine to med. sand. slightly silty (3%). mica in sand matrix (2%). sand is 80% felsic/qtz & 20% mafic.	
100	Archive			-100': very fine to fine sand. ↑ silt to 5% of matrix. sand is 85% felsic/qtz & 15% mafic. No RXN w/ HCL. Subrounded to rounded	Rad and organic vapor readings non-detect with field instruments
	Archive				
110	Archive			-105': ↑ silt to 10% of matrix. -110' ~~Sandy Silt~~ Silty Sand. very fine to medium sand (15% mafic, 83% felsic/qtz, 2% mica).	
	Archive			subangular to subrounded. NO RXN HCL	
120				-115': very fine to coarse sand	
	Archive				
130	Archive				
	Archive			150' ~~135 Silt~~ Sand. very fine to medium sand (88% felsic/qtz, 10% mafic, 2% mica) trace silt. small pebbles (max. size ½ inch). NO RXN HCL	
140	Archive			-140' vfine to coarse sand	
	Archive			-145' inc. in silt to 5% of matrix, sand 95%	
150	Archive			150'→165' Silty Sand. sand is very fine to med. & is 85% felsic/qtz 13% mafic, 2% mica). subrounded to subangular. NO RXN w/ HCL. 35% silt, 65% sand	
	Archive				

Reported By: Robin Henderson | Reviewed By: L.D. Walker
Title: Geologist | Title: Geologist
Signature: Robin Henderson | Date: 12-14-05 | Signature: LD Walker | Date: 2/7/06

A-6003-642 (03/03)

BOREHOLE LOG

Page 3 of 5
Date: 12-14-05

Well ID: C4977 | Well Name: 299-W22-87 | Location: S. of U Plant

Project: 200-UP-1 OU Monitoring Wells | Reference Measuring Point: ground surface

Depth (Ft.)	Sample Type No.	Sample Blows/Recovery	Graphic Log	Sample Description (Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level)
160	Archive			-160': decreasing sand, no RXN w/ HCL	Diesel hammer 9" x 6" dual wall drill casing
	Archive			-165' → 187': Silt of Cold Creek Unit, strong RXN w/ HCL. 95% qtz/felsic, 4% mafic, 1% mica	
170	Archive				1-pint archive grab samples collected at 5-ft. intervals
	Archive				
180	Archive				
	Archive				Rad and organic vapor readings non-detect with field instruments
190	Archive			-187' → 195' Caliche of Upper Ringold. Strong RXN w/ HCL	
	Archive			-195' → 200': Sand of Upper Ringold. 85% qtz/felsic, 14% mafic, 1% mica. No RXN w/ HCL. subrounded to subangular. Very sparse metamorphic pebbles (max size 1")	
200	Archive				
	Archive			-200' → 225': Silt. 85% qtz/felsic, 14% mafic, 1% mica. medium tan. No RXN w/ HCL. No gravel.	
210	Archive			-210': silt w/ clay nodules 90% silt 10% clay nodules	
	Archive			-215': clumpy. Fe reduction in clumps.	
220	Archive			225' → 240' Sandy silt. sand is very fine to fine. 70% silt, 30% sand. 85% felsic/qtz, 14% mafic, 1% mica.	
	Archive				
230	Archive			- coarseness inc. as depth inc. well-sorted.	
	Archive				

Reported By: Robin Henderson		Reviewed By: L.D. Walker	
Title: Geologist		Title: Geologist	
Signature: Robin Henderson	Date: 12-14-05	Signature: [signature]	Date: 2/7/06

A-6003-642 (03/03)

BOREHOLE LOG

Page 4 of 5
Date: 12-15-05

Well ID: C4977 | Well Name: 299-W22-87 | Location: S of U Plant

Project: 200-UP-1 OU Monitoring Wells | Reference Measuring Point: ground surface

Depth (Ft)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description (Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level)
240	archive				Diesel hammer 9"x6" dual wall drill casing
	archive			- 245'→250' gravelly Sand of Unit E of Ringold Fm. Max pebble size is 1". very fine to med. Sand (65% felsic, qtz, & 15% mafic) 25% gravel, 75% sand	1-pint grab samples for archive, every 5-Ft
250	archive				
	archive			-250'→330' Sandy Gravel very fine to very coarse sand. sand is 85% felsic/qtz, 12% mafic, 3% mica. gravel is 50% mafic, 50% basalt Max cobble of 6", subrounded to subangular, 45% gravel & 55% sand NO RXN w/ HCL	Static groundwater level: 250.47' bgs
260	split spoon shoe	30%			258': Split Spoon driven for PNNL sample
	archive				
	archive				
270	archive				groundwater sample @ 269' bgs HEIS No. B1H2K5
	archive				260': Grab sample for Sieve Analysis
	archive				
280	split spoon shoe	0%			280': Split Spoon 0% recovery
	archive				
290	Archive			-290': highly cemented w/ CO_2 material (strong RXN to HCL)	280': Grab sample for sieve analysis from the cyclone seperator
	archive				
300	archive				groundwater sample @ 299→300' bgs HEIS No.: B1H2K6
	archive			- 305': increased cobble size to 8", slight RXN to HCL	
310	archive				
	archive				

Reported By: Robin Henderson | Reviewed By: L.D. Walker
Title: Geologist | Title: Geologist
Signature: Robin Henderson | Date: 12-15-05 | Signature: [illegible] | Date: 2/7/06

A-6003-642 (03/03)

BOREHOLE LOG

Page 5 of 5
Date: 12-22-05

Well ID: C4977 | Well Name: 299-W22-87 | Location: S of U Plant

Project: 200-UP-1 OU Monitoring wells | Reference Measuring Point: Ground surface

Depth (Ft.)	Sample Type No.	Sample Blows Recovery	Graphic Log	Sample Description: Group Name, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Method, Method of Driving Sampling Tool, Sampler Size, Water Level
320	archive				Diesel hammer with 9"x6" dual wall casing
	archive				groundwater sample from 327'→331' bgs
330	archive			330'→340': gravelly sand, very fine to med. sand (85% felsic/qtz, 12% mafic, 3% mica), gravel up to 3" cobble, 65% metamorphic, 35% basalt 20% gravel, 5% silt, 75% sand	HEIS No's B1H3F8 B1H2K7
	archive				
340	archive			340'→379.5' Sandy Gravel very fine to very coarse sand, sand 85% felsic/qtz, 12% mafic, 3% mica max cobble of 4", gravel 75% metamorphic, 25% basalt, sandy matrix is subangular to subrounded, 45% gravel, 55% sandy	1-pint grab samples for archive every 5-feet.
	archive				
350	archive				
	archive			highly cemented w/ carbonate material from 340'→~360', loose sandy gravel after ~360'	
360	archive				
	archive			TD: 379.5' bgs	
370	archive				
	Archive				
380	Archive				Kabi's water sample @ 379'→380' bgs HEIS No. B1H2K8
390					

Reported By: Robin Henderson | Reviewed By: L.D. Walker
Title: Geologist | Title: Geologist
Signature: Robin Henderson | Date: 12-22-05 | Signature: [illegible] | Date: 2/7/06

A-6003-542 (03/03)

WELL SURVEY DATA REPORT

Project:	**Prepared By:** S. Wray **Company:** FGG
Date Requested: 1/30/06	**Requestor:** Chris Wright (FH)
Date of Survey: 2/15/06	**Surveyor:** N.P. Fastabend FGG Survey Dept.
ERC Point of Contact:	**Survey Co. Point of Contact:** G. Brazil, P.L.S.
Description of Work: Civil Survey of Groundwater Monitoring Well #C4977 (299-W22-87)	**Horizontal Datum:** NAD83(91) **Vertical Datum:** NAVD88 **Units:** METERS **Hanford Area Designation:** 200W

Coordinate System: Washington State Plane Coordinates (South Zone)

Horizontal Control Monuments: 2W-48 (FGG), 2W-143 (FGG)

Vertical Control Monuments: 2W-48 (FGG), 2W-57 (FGG)

Well ID	Well Name	Easting	Northing	Elevation	
C4977	299-W22-87	567541.75	134539.88		Center of Casing
				212.022	Top Pump Baseplate. N. Edge
				212.015	Top Casing, N. Edge
				211.274	Brass Survey Marker

Notes:

EQUIPMENT USED: TRIMBLE GPS 5800 RTK
TRIMBLE DiNi 12 LEVEL

Surveyor Statement:
I, Grant F. Brazil, a Professional Land Surveyor registered in the State of Washington (Registration No. 22326), hereby certify that this report is based on a field survey performed in February, 2006 under my direct supervision, and that the data contained here is true and correct.

GRANT F. BRAZIL
STATE OF WASHINGTON
22326
REGISTERED
PROFESSIONAL LAND SURVEYOR
EXPIRES: 5/10/07

Original to:
Distribution by DIS: