ecology and environment, inc.

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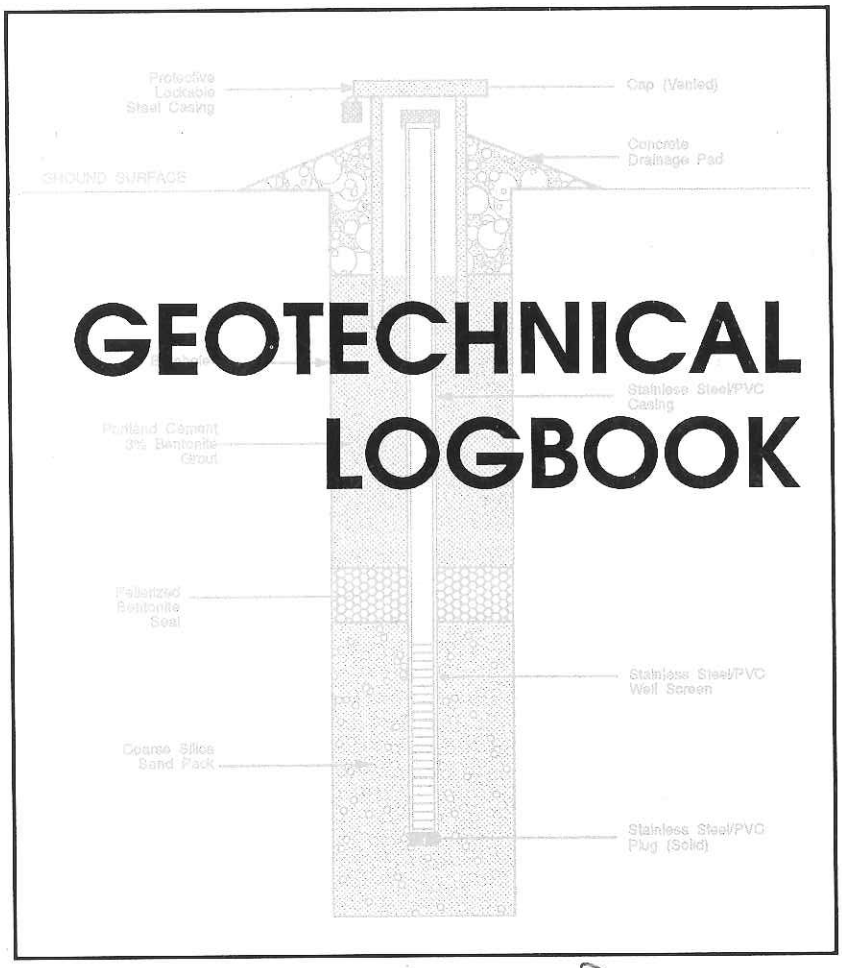


GEOTECHNICAL LOGBOOK

PROJECT NUMBER: EE-002233-0816-01TTO

CLIENT/SITE NAME: EPA / Yakima Valley Nitrate

DRILLING COMPANY: Environmental West

DATE OF FIELD ACTIVITIES: 10/18/12

HOLES LOGGED IN BOOK: DC-1

DRILLING LOG FOR DC-1

Project Name: Yakima Nitrate

Site Location: Zillah, WA, E Houghton Rd.

Date Started/Finished: 12/18/12 14:40 / 12/20/12

Drilling Company: Environmental West

Driller's Name: Ron Sink / Brent Johnson

Geologist's Name: Jonathan Reeve

Geologist's Signature: [signature]

Rig Type (s): Schramm T300

Drilling Method (s): Air Rotary

Bit Size (s): ~~7 1/4"~~ 10", 7" (JR 12-19-12) Auger Size (s): —

Auger/Split Spoon Refusal: —

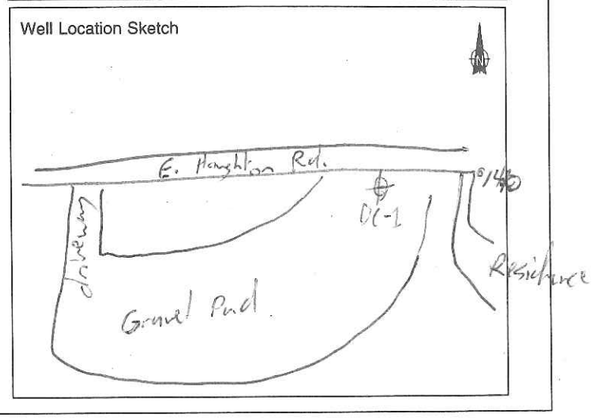
Total Depth of Borehole Is: 160'

Total Depth of Corehole Is: —

10' casing

Water Level (TOIC)		
Date	Time	Level(Feet)
12/19/12	14:40	153.7' bgs
12/19/12	14:50	153.5' bgs
12/20/12	08:10	151.80' bgs

Well Location Sketch



Depth(Feet)	Sample Number	Blows on Sampler	Soil Components Rock Profile CL SL S GR	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
				1440						
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

pipe sections

pipe sections

SCREENED WELL

Stick-up: flush ft

Top of Grout: ft

Top of Seal at: 2' ft

Top of Sand Pack: 135.5 ft

Top of Screen at: 139.5 ft

Bottom of Screen at: 159.5 ft

Bottom of Hole at: 160' ft

Bottom of Sandpack at: 160'

Lock Number:

Inner Casing Material: PVC

Inner Casing Inside Diameter: 2 inches

GROUND SURFACE

Quantity of Material Used:

Bentonite Pellets: 5 (JR 12/27/12)

Cement: 5 ~~4~~ bags

Borehole Diameter: 10"/7" inches

Cement/ Bentonite: 55 bags chips

Grout:

Screen Slot Size: 0.010

Screen Type: 20'

☒ PVC sch. 40

☐ Stainless Steel

Pack Type/Size:

☒ Sand 8 bags

☐ Gravel

☐ Natural

OPEN-HOLE WELL

Stick-up: ft

Inner Casing Material:

Inner Casing Inside Diameter: inches

Outer Casing Diameter: inches

Borehole Diameter: ft

Bedrock: ft

Bottom of Rock Socket/ Outer Casing: ft

Bottom of Inner Casing: ft

Corehole Diameter:

Bottom of Corehole: ft

NOTE: See pages 136 and 137 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
1	lt. brn v.f. gr. Sd w/ slt. loose, l. moist,		X	
2			X	
3			X	
4			X	
5			X	
6			X	
7			X	
8	lt. brn sdy Gravel. Sd (45%) is vf-m gr, loose, v.l. moist.		X	
9	Gravel is 0.5-3cm subrd-subang, many lith. Grv (55%).		X	
10			X	
11			X	
12			X	
13			X	
14			X	
15			X	

BOREHOLE NO. X

BOREHOLE NO. X

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27					1520						
28											
29											
30											
31											
32											
33											
34											
35											
36											
37					1530						
38											
39											
40											
41											
42											
43					1540						
44											
45											

pipe sections

pipe sections

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
16	Same as above		X	
17			X	
18			X	
19			X	
20			X	
21			X	
22			X	
23	lt. brn Sd w/ grav. Sd is v.f. gr. Grv 2-3cm, subang. Dry, loose.	X		
24		X		
25		X		
26		X		
27	lt. brn Sd w/ grav. Sd is vf-f gr. Grv is 2mm-1cm, subang-subrd, many lith. v.l. moist, loose.		X	
28			X	
29			X	
30			X	
31			X	
32			X	
33			X	
34	lt. brn sdy Slt. Sd is vf gr. Slt is no plast, l. moist, soft.		X	
35			X	
36			X	
37			X	
38	lt. brn ~~Sdy Gravel.~~ SR 12/18 Gravelly Sand. Grv (40%) is subrd-rd, 0.3-1cm. Sd is m-v.f. gr. v.l. moist.	X		
39		X		
40			X	
41	lt. brn ~~sdy~~ SR 12/18 sdy Grv. Sd is m-f gr. Grv is 0.5-1cm, subang-subrd. L moist		X	
42			X	
43		X		
44		X		
45			X	

BOREHOLE NO. X

BOREHOLE NO. X

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
46	↓										
47											
48	8" casing										
49											
50											
51											
52											
53											
54											
55											
56					12/18/12						
57			1620		1630 - stopped at 1700						
58	6" casing		switch to 6" casing								
59			4" bit		12/19/12						
60											
61			4' lead pipe in 6" casing								
62	6" casing		0740		0740 - 12/19/12						
63											
64											
65											
66	← pipe sections										
67											
68											
69					0750						
70			10' pipe w/ 1' stick-up								
71	↑										
72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet	Date
46			X		
47	lt. brn sdy Slt w/ grv. Grv 1-2 cm, subrd-rd. Sd v.f. gr. Slt		X		
48	is v.l.-low moist, no plast. Sticking to grv clasts in air rot.		X		
49	pipe.		X		
50	49'- lt. yel brn Silt. low moist, no plast. Trace 2cm grv.		X		
51	↓		X		
52			X		
53	lt. brn Slt w/ grv. Slt l. moist, no plast. Grv 1-2cm,		X		
54	subang. ↓		X		
55	Grv lens - approx 2'. 3-5cm, rd.		X		
56	↓		X		12/18
57	lt. brn Silt w/ tr. grv. Slt may contain very		X		12/19
58	fine sand. v.l. moist. Grv is subrd, 1cm.		X		
59	↓		X		
60			X		
61			X		
62			X		
63	M. brn sdy Slt. Sd (30%) is vf-f gr. Slt		X		
64	is l. moist, no plast.		X		
65	↓		X		
66			X		
67			X		
68			X		
69			X		
70			X		
71	lt. brn Silt. Very low moist, no plast. Appears to grade		X		
72	from above (decr. particle size, no vf sd).		X		
73	↓		X		
74			X		
75			X		

BOREHOLE NO. X

BOREHOLE NO. X

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
77											
78											
79											
80					0820						
81											
82											
83											
84											
85											
86											
87											
88											
89											
90					0830						
91											
92											
93											
94											
95											
96											
97											
98											
99											
100			0840		0840						
101											
102											
103											
104											
105											

pipe section

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
77		X		
78		X		
79		X		
80		X		
81	Same as above (lt. brn slt, v.l. moist, no plast)	X		
82		X		
83		X		
84		X		
85		X		
86		X		
87		X		
88		X		
89		X		
90		X		
91		X		
92	Grading from above to silt w/ vf gr sd. v.low	X		
93	moist, no plast.	X		
94		X		
95		X		
96		X		
97		X		
98		X		
99		X		
100		X		
101		X		
102		X		
103		X		
104		X		
105		X		

log continued on extra pages

BOREHOLE NO. X

BOREHOLE NO. X

borehole DC-1

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet	penetration times
pipe sections					
106 77	Same as above (lt. brn Silt w/ vf gr sand. v.l. moist, no plast).	X			
78		X			
79		X			
80		X			0855
110 81		X			
82		X			
83		X			
84		X			
85		X			
115 86		X			
87		X			
88		X			
89		X			
90		X			0905
120 91	Same as above	X			
92		X			
93		X			
94		X			
95		X			
125 96		X			
97		X			
98		X			
99		X			
100		X			0920
130 101	~~Same as above~~ JR 12-19-12	X			
102	m. brn Sd w/ Slt + grv. Sd f gr. Grv 1-2cm, subrd. l. moist.	X			
103		X			
104		X			
105		X			

pipe sections

JR 12-19-12

BOREHOLE NO

borehole DC-1

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet	penetration times
pipe sections					
135 77	lt-m. brn Sand w/ slt & grv. Sand is m-v.f. gr. Grv		X		930
78	is 1-4cm, subang & subrd. v.l. moist.		X		
79			X		
80			X		
81			X		
140 82			X		940
83			X		
84			X		
85			X		
86			X		950
145 87	M. brn Sand w/ tr. grv. Sand is m-f gr, pred m.		X		
88	gr. Grv is 0.5-2cm, subrd-rd, basalt & mixed lith. v.l. moist.		X		
89			X		
90			X		
91			X		1000
150 92	M.-dk brn grey Sd. Sd is m-f gr. Grv is 2mm-		X		
93	0.5cm, subang. V.l. plast. Color darker w/ depth.		X		
94	Very dark last 8".		X		
95			X		
96			X		1015
155 97	Black Sand w/ Grv. Grv is 2mm-1cm, ang-subang.	X			
98	Sand is c.f gr. dry. Drilling through basalt.	X			
99	Drilling rate slowed considerably.	X			
100		X			
101		X			1030
160 102	TD				12/19/12
	BOC = 160' bgs (measured)				
103					
104					
105					

BOREHOLE NO

DRILLING LOG FOR DC-5

Project Name: Yakima Valley Nitrate

Site Location: Yakima Valley, WA

Date Started/Finished: 12/20/12 ~~09:40~~ 09:20 (JC 12/20/12) | 12/20/12

Drilling Company: Environmental West

Driller's Name: Ron Sink / Brent Johnson

Geologist's Name: Jonathan Reeve

Geologist's Signature: [signature]

Rig Type (s): Schramm T300

Drilling Method (s): air rotary

Bit Size (s): 10" Auger Size (s): —

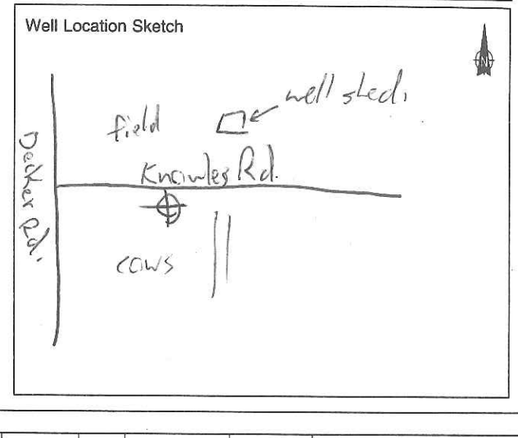
Auger/Split Spoon Refusal: —

Total Depth of Borehole Is: 86'

Total Depth of Corehole Is: —

Water Level (TOIC)		
Date	Time	Level(Feet)
12/20/12	11:30	69.03' bgs
12/20/12	11:35	69.04 bgs

Well Location Sketch



Depth(Feet)	Sample Number	Blows on Sampler	Soil Components Rock Profile CL SL S GR	Penetration Times (JR 12/20/12) ~~0940~~ 0920	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
1	pink sections									
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

SCREENED WELL

Stick-up: flush 9' ft

Top of Grout: ft

Top of Seal at: 2' ft

Top of Sand Pack: 59.5' ft

Top of Screen at: 63.5' ft

Bottom of Screen at: 83.5' ft

Bottom of Hole at: 86' ft

Bottom of Sandpack at: 86'

Lock Number:

Inner Casing Material: PVC

Inner Casing Inside Diameter: 2 inches

GROUND SURFACE

Quantity of Material Used:

Bentonite Pellets:

Cement: 4 bags

Borehole Diameter: 10" inches

Cement/ Bentonite: 14 bag chips

Grout:

Screen Slot Size: 0.010"

Screen Type: 20'

☒ PVC sch. 40

☐ Stainless Steel

Pack Type/Size:

☒ Sand: 8 bags

☐ Gravel

☐ Natural

OPEN-HOLE WELL

Stick-up: ft

Inner Casing Material:

Inner Casing Inside Diameter: inches

Outer Casing Diameter: inches

Borehole Diameter: ft

Bedrock: ft

Bottom of Rock Socket/ Outer Casing: ft

Bottom of Inner Casing: ft

Corehole Diameter:

Bottom of Corehole: ft

NOTE: See pages 136 and 137 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
1	lt. brn very sandy Silt. Sd is very fine grained. Silt is		X	
2	v.l. moist, no plast.		X	
3			X	
4			X	
5			X	
6			X	
7			X	
8			X	
9			X	
10			X	
11			X	
12			X	
13	lt. brn gray Silt w/ sd. brn is 2mm-0.5cm, subrd-		X	
14	subang. sd is vf gr. silt is l-m moist, no plast.		X	
15			X	

BOREHOLE NO. ____

BOREHOLE NO. ____

BOREHOLE NO. ____

BOREHOLE NO. ____

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
16	pipe sections										
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											
33											
34											
35	pipe sections										
36											
37											
38											
39											
40			100		1000						
41											
42											
43											
44											
45											

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
16	lt.-m brn very sdy Grv. Sd is m-f gr. Grv is 2mm-		X	
17	1cm, subrd-subang dang, w/ basalt, quartzite, & poss.		X	
18	igneous. l. moist.		X	
19			X	
20			X	
21			X	
22			X	
23			X	
24			X	
25			X	
26	Same as above, w/ rounder gravel.		X	
27			X	
28			X	
29			X	
30			X	
31	Grading from above to a lt. brn gray Sand. Sand is		X	
32	f-m gr. Gravel is subrd-ang, 2mm-2cm, l. moist		X	
33			X	
34			X	
35	lt. yel brn Silt w/ sd. Sd is v.f. gr, micaceous. Silt		X	
36	is low moist, non-v.l. plast		X	
37			X	
38			X	
39			X	
40			X	
41			X	
42			X	
43			X	
44			X	
45			X	

BOREHOLE NO.

BOREHOLE NO.

BOREHOLE NO.

BOREHOLE NO.

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
46											
47											
48											
49											
50					1010						
51	pipe sections										
52											
53											
54											
55					1015						
56											
57											
58											
59											
60					1020						
61											
62											
63											
64											
65					1025						
66											
67											
68											
69											
70					1035						
71											
72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
46	Same as above, increasing moisture (lt. yel brn Silt		X	
47	w/ sd. Sd is vf gr, Silt is v.l. plast, moist. micaceous.)		X	
48			X	
49			X	
50			X	
51	Same as above		X	
52			X	
53			X	
54			X	
55	Same as above, soil moist increasing		X	
56			X	
57			X	
58			X	
59			X	
60	Same as above, increasing moist & plast.		X	
61			X	
62			X	
63			X	
64	Very moist			X
65				X
66	lt. yel brn Sd. m-f gr, pred f, ang. moist.		X	
67			X	
68			X	
69			X	
70	Grading from above to lt. yel brn Sd w/ grv. Sd is		X	
71	m-f gr (pred f), ang. Grv is 0.5-1cm, subrd-rd. moist.		X	
72			X	
73			X	
74			X	
75	Water at 75' bgs		X	

BOREHOLE NO.

BOREHOLE NO.

BOREHOLE NO.

BOREHOLE NO.

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
77	pipe sections										
78											
79											
80			1042		1042						
81											
82											
83											
84											
85					1200						
86											
87											
88											
89											
90											
91											
92											
93											
94											
95											
96											
97											
98											
99											
100											
101											
102											
103											
104											
105											

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
77	Same as above, but wet (lt. yel brn Sd w/ grv. Sd m-f gr	○	○	⊗
78	(pred f), grv 0.5-1cm, subrd-rd.)	○	○	⊗
79		○	○	⊗
80		○	○	⊗
81	lt. brn grvy Sand w/ tr. silt. Sand is med. gr.	○	○	⊗
82	Grv is subrd-rd, 0.5-2cm. Wet.	○	○	⊗
83		○	○	⊗
84		○	○	⊗
85		○	○	⊗
86		○	○	⊗
87	TD: 86' bgs (measured)	○	○	○
88	at 12:00 12/29/12	○	○	○
89		○	○	○
90		○	○	○
91		○	○	○
92		○	○	○
93		○	○	○
94		○	○	○
95		○	○	○
96		○	○	○
97		○	○	○
98		○	○	○
99		○	○	○
100		○	○	○
101		○	○	○
102		○	○	○
103		○	○	○
104		○	○	○
105		○	○	○

BOREHOLE NO.

BOREHOLE NO.

BOREHOLE NO.

BOREHOLE NO.