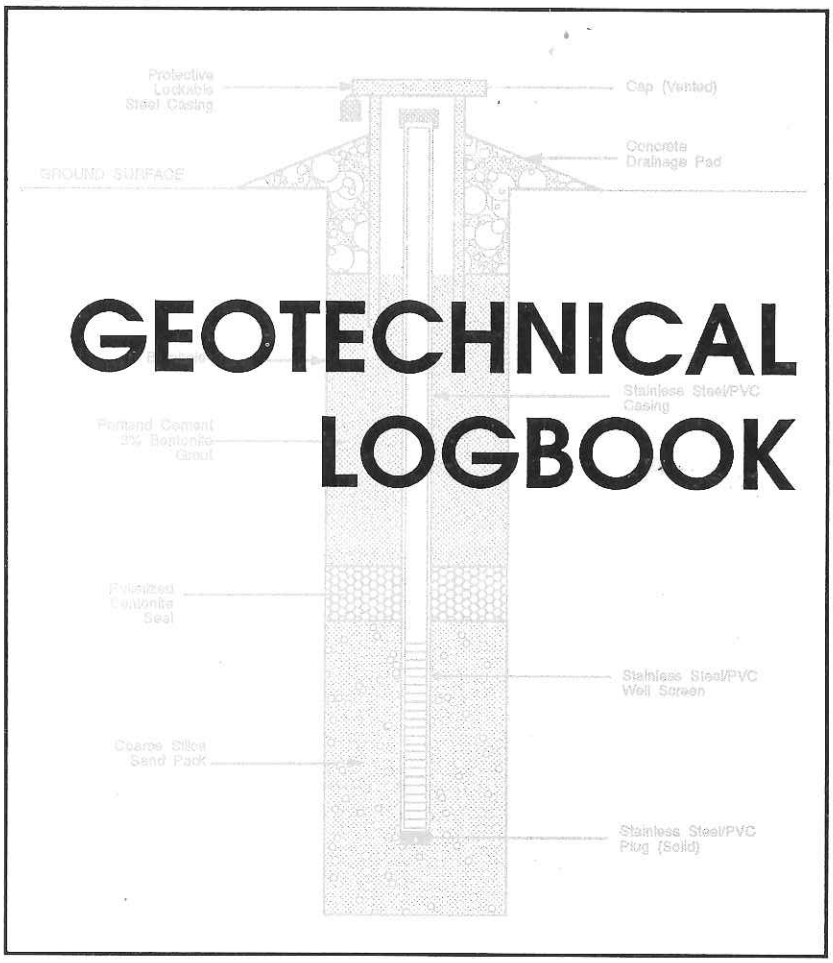
ecology and environment, inc.

International Specialists in the Environment



GEOTECHNICAL LOGBOOK

PROJECT NUMBER: TDD 12-11-0001

CLIENT/SITE NAME: Yakima Valley Nitrate

DRILLING COMPANY: Environmental West

DATE OF FIELD ACTIVITIES: 12/10/12 to

HOLES LOGGED IN BOOK:

BOREHOLE NO.

CLIENT: EPA Region 10

JOB NUMBER:

SITE NAME: Yakima Valley Nitrates

DRILLER: Environmental West Inc.

LOCATION: CITY/TOWN: Sunnyside

STATE: Washington

PROJECT MANAGER: Erin Lynch

FIELD TEAM LEADERS: Bryan Grecko / Jonathan Reeve

SITE SAFETY OFFICER(S): Erin Lynch /

TEAM MEMBERS:

JOB START/FINISH DATE: 12/10/12 /

BOOK 1 OF

E&E CORPORATE: (716) 684-8060 FAX (716) 684-0844

E&E EMERGENCY RESPONSE CENTER: (716) 684-8940

E&E ANALYTICAL SERVICE CENTER: (716) 685-8080 FAX (716) 685-0852

E&E EQUIPMENT SERVICE CENTER: (716) 685-8080 FAX (716) 685-0852

FEDERAL EXPRESS TOLL FREE: (800) 238-5355

AIRBORNE EXPRESS: (716) 685-5040

PROJECT/CLIENT CONTACT(S)	AFFILIATION	PHONE

For inquires regarding the distribution, scope, and/or organization of the Geotechnical Logbook please contact: Manager, Environmental Services Division, Buffalo Corporate Office. Your comments and suggestions are welcomed and will be considered in future revisions.

DAILY LOGS

BOREHOLE RECORDS

BOREHOLE NO. DC-03

BOREHOLE NO. DC-1

12/10/12 (9:30) Meet @ ARCO Station in Granger WA @ I 82 and WA223
Drillers, Air Knifing Contractor, Eric Wenicki and Rene Fuentes
EPA, E. Lynch EPA; Begin Air Knifing; Drill DC-03
Weather: Dry, Partly Sunny, Foggy; ~ °F; work complete @
17:30

12/11/12 H&S Mtg @ 6:15 am; On site @ 7:00 am set well DC-03;
Drill DC-14; Weather: Dry, Partly Sunny, ~ °F; work
complete @ 16:45

12/12/12 H&S Mtg @ 6:15 am; On site @ 7:30 am, set well DC-14;
Drill DC-07; Weather: Dry, Partly Sunny, °F; Lv. site @
17:30

12/13/12 H&S Mtg @ 6:15 am; @ DC-07 by 7:00 am; DC-07 complete; drill
and complete DC-08; Weather: Dry, Foggy 27°F; start DC-09; lv site @ 18:15

12/14/12 H&S Mtg @ 6:15 am @ DC-09 by 7:00 am; ~8:00 run out
of rod & casing; Weather: Snowing Lightly 32°F; demob to hotel
and Run & Back to Spokane for more Rod & Casing

12/15/12 H&S Mtg @ 6:15 am; 7:00 am @ DC-09; hit perched zone then
TD'd @ 196; Weather: Dry, Overcast 30°F; Flurries @ 11:30 and
throughout day; note artesian conditions; Lv. site @ 16:15

12/16/12 H&S Mtg @ 6:15 am @ HK-12 by 7:30 am, Mostly cloudy
~30°F;

12/17/12 H&S Mtg @

BOREHOLE RECORDS

BOREHOLE NO. DC-03

BOREHOLE NO. DC-15

DRILLING LOG FOR DC-03

Project Name: Yakima Valley Nitrate

Site Location: Near Sunnyside WA on Liberty between Carpenter & Kirks Rd on East side of Rd.

Date Started/Finished: 12/10/12 - 12/11/12

Drilling Company: Environmental West

Driller's Name: Ron Sink / Brent Johnson

Geologist's Name: Erin Lynch

Geologist's Signature: [signature]

Rig Type (s): Schramm T300

Drilling Method (s): Air Rotary

Bit Size (s): 4" Auger Size (s): 4"

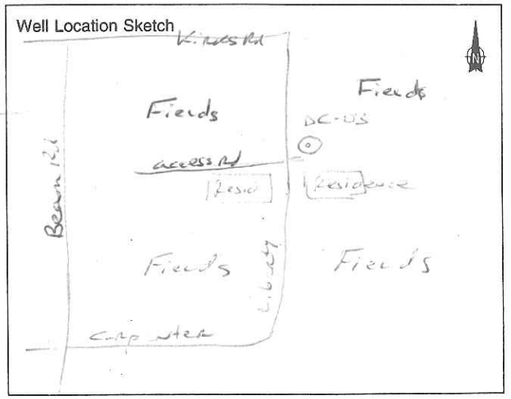
Auger/Split Spoon Refusal: —

Total Depth of Borehole Is: 85 ft

Total Depth of Corehole Is: —

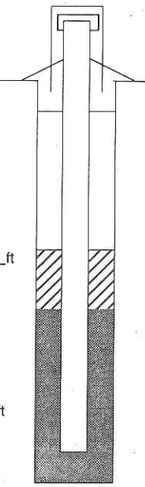
Water Level (TOIC)		
Date	Time	Level(Feet)
12/10/12	13 45	72.44

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
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

SCREENED WELL



Stick-up 5" Flush Mount ft

Top of Grout 3 ft

Top of Seal at 54.5 ft

Top of Sand Pack 58.5 ft

Top of Screen at 62.5 ft

Bottom of Screen at 82.5 ft

Bottom of Hole at 85 ft

Bottom of Sandpack at 85 ft

Lock Number _____

Inner Casing Material PVC

Inner Casing Inside Diameter 2 inches

GROUND SURFACE

Quantity of Material Used:

Bentonite Pellets _____

Cement 4

Borehole Diameter 4 inches

~~Cement/~~ Bentonite _____

Grout Bentonite Chips 12 bags

Screen Slot Size 0.010

Screen Type 20 ft

☒ PVC 2"

☐ Stainless Steel _____

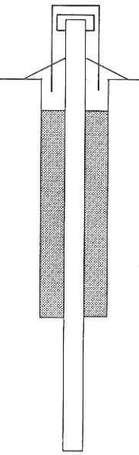
Pack Type/Size:

☒ Sand Colorado Silica 20/40 12.5 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

Sonotube offset to the east to finish away from waterline.

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
	* Note waterline (1") adjacent to well on side, use caution when abandoning, line @ ~1 ft depth	✓		
1				
2	Light brownish gray, soils pulverized to fine sand, very loose sand			
3				
4				
5				
6				
7				
8				
9				
10				
11	Light brownish gray, appears to contain gravel and silt			
12				
13				
14				
15		✓		

BOREHOLE NO. DC-14

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											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
16				
17	Same as above w/ clay			
18				
19				
20				
21	Light brown sandy gravel, medium to coarse			
22	sand little to no clay			
23				
24				
25				
26	Same as above w/ gravel size sandy clay			
27	nodules			
28				
29				
30				
31	Yellowish brown sandy gravel, higher			
32	percentage of gravel than above, sandy clay			
33	nodules gone			
34				
35				
36	Same as above, less gravel			
37				
38				
39				
40				
41	Light brown sandy gravel, fine to med			
42	sand much higher percentage gravel			
43				
44				
45				

BOREHOLE NO. AC-14

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											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											
63											
64											
65											
66											
67											
68											
69											
70											
71											
72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
46	Same as above			
47				
48				
49				
50				
51	Light brown fine to medium sand little to no gravel, no clay			
52				
53				
54				
55				
56	Same as above, slightly more gravel, light yellowish ~~Light~~ brown			
57				
58				
59				
60				
61	Same as above, fine to medium sand little to no gravel			
62				
63				
64				
65				
66	Light brown, fine to med sand little to no gravel, slightly moist			
67				
68				
69				
70				
71	Same as above			
72				
73				
74				
75				

BOREHOLE NO. AC-14

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											
81											
82											
83											
84											
85											
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		✓	
78			✓	
79			✓	
80			✓	
81	Same as above but ~~wet~~ EWT no gravel			✓
82				✓
83				✓
84				✓
85				✓
86				
87				
88				
89				
90				
91				
92				
93				
94				
95				
96				
97				
98				
99				
100				
101				
102				
103				
104				
105				

BOREHOLE NO. DC-14

DRILLING LOG FOR DC-14

Project Name: Yakima Valley Nitrates

Site Location: E Zirkle Dr, south side of road between N Arms and Liberty

Date Started/Finished: 12/11/12 - 12/12/12

Drilling Company: Environmental West

Driller's Name: Ron Sink/Brent Johnson

Geologist's Name: Erin Lynch

Geologist's Signature: [signature]

Rig Type (s): Schramm T300

Drilling Method (s): Air Rotary

Bit Size (s): 4" Auger Size (s): —

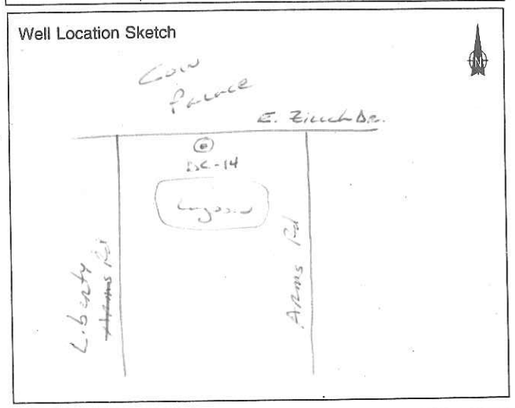
Auger/Split Spoon Refusal: —

Total Depth of Borehole Is: 151 ft 2"

Total Depth of Corehole Is: —

Water Level (TOIC)		
Date	Time	Level(Feet)
12/12/12	07:45	130.9

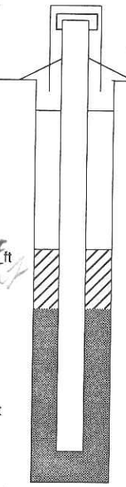
Well Location Sketch



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
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

SCREENED WELL

8" Flush Mount
~~Stick-up~~ ft



Top of Grout 3 ft

Top of Seal at 120 ft

Top of Sand Pack 124 ft

Top of Screen at 128 ft

Bottom of Screen at 148' 7" ft

Bottom of Hole at 151' 2" ft

Bottom of Sandpack at 151 ft 2"

Lock Number

Inner Casing Material: PVC

Inner Casing Inside Diameter: 2 inches

GROUND SURFACE

Quantity of Material Used:

Bentonite Pellets: 1 Bucket

Cement: 5 bags

Borehole Diameter: 4 inches

~~Cement/~~ Bentonite: chips 24 bags

~~Grout~~

Screen Slot Size: 0.010

Screen Type: 20 ft

☒ PVC 2"

☐ Stainless Steel

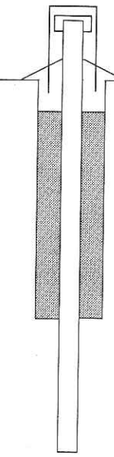
Pack Type/Size:

☒ Sand Colorado Silica 20/40 21 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				
2	Light brownish gray, gravelly fine to med sand			
3				
4				
5				
6	Light brown, fine to med sand w/ some gravel			
7				
8				
9				
10				
11	Same as above			
12				
13				
14				
15				

BOREHOLE NO. DC-07

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											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
16	Same as above			
17				
18	Light-brown, gravelly sand w/ brown rich @ about 18 to 20 ft			
19				
20				
21	Light brown, gravelly sand, sand is fine to medium			
22				
23				
24				
25				
26				
27				
28				
29				
30				
31	Same as above			
32				
33				
34				
35				
36				
37				
38				
39				
40				
41	Light brown fine to med sand, little to no gravel			
42				
43				
44				
45				

BOREHOLE NO. DC-07

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											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											
63											
64											
65											
66											
67											
68											
69											
70											
71											
72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
46				
47	Same as above			
48				
49				
50				
51	Same as above			
52				
53				
54				
55				
56	Same as above w/ more yellowish brown colors			
57				
58				
59				
60				
61	Light brown fine to medium sand (very little gravel)			
62				
63				
64				
65				
66	Same as above			
67				
68				
69				
70				
71	Same as above			
72				
73				
74				
75				

BOREHOLE NO. DC-07

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											
81											
82											
83											
84											
85											
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			
78				
79				
80				
81	Same as above w/ more gravel ~ 15%			
82				
83				
84				
85				
86	Light brown gravelly fine to med sand			
87				
88				
89				
90	Same as above			
91				
92				
93				
94				
95				
96	Light brown gray, gravelly fine to coarse			
97	sand becoming more gravel-rich (~30%)			
98	from 98 to 100 ft. Subangular to subangular			
99				
100				
101	Same as above			
102				
103				
104				
105				

BOREHOLE NO. IX-07

DC-14

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
77	Light gray brown sandy gravel, fine to ~~medium~~ coarse sand, fine to coarse gravel, subangular to subrounded, likely going through cobbles	○	○	○
78		○	○	○
79		○	○	○
80 110	very dry	○	○	○
81	Same as above	○	○	○
82		○	○	○
83		○	○	○
84		○	○	○
85 115		○	○	○
86		○	○	○
87		○	○	○
88		○	○	○
89		○	○	○
90 120		○	○	○
91		○	○	○
92		○	○	○
93		○	○	○
94		○	○	○
95 125		○	○	○
96		○	○	○
97		○	○	○
98		○	○	○
99		○	○	○
100 130		○	○	○
101	EOT Light gray brown, fine to coarse sand w/ gravel (~5 to 10%) slightly moist	○	○	○
102		○	○	○
103		○	○	○
104		○	○	○
105 135		○	○	○

BOREHOLE NO. ____

BOREHOLE NO. ____

BOREHOLE NO. ____

BOREHOLE NO. ____

BOREHOLE NO. ____

DC-14

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
77				
78				
79				
80 (140)				
81	Same as above			
82				
83				
84				
85 (145)				
86				
87				
88				
89				
90 (150)	151' 2" stop, meas water			
91				
92				
93				
94				
95				
96				
97				
98				
99				
100				
101				
102				
103				
104				
105				

BOREHOLE NO. ____

BOREHOLE NO. ____

BOREHOLE NO. ____

BOREHOLE NO. ____

BOREHOLE NO. ____

DRILLING LOG FOR DC-07

Project Name: Yakima Valley Nitrates

Site Location: South side of Kiness Rd between Liberty and N. Arms Rds adj to access road

Date Started/Finished: 12/12/12 – 12/13/12

Drilling Company: Environmental West Inc.

Driller's Name: Ron Sink / Brant Johnson

Geologist's Name: Erin Lynch

Geologist's Signature: [signature]

Rig Type (s): Schramm T300

Drilling Method (s): Air Rotary

Bit Size (s): 4" ~~Auger Size (s)~~

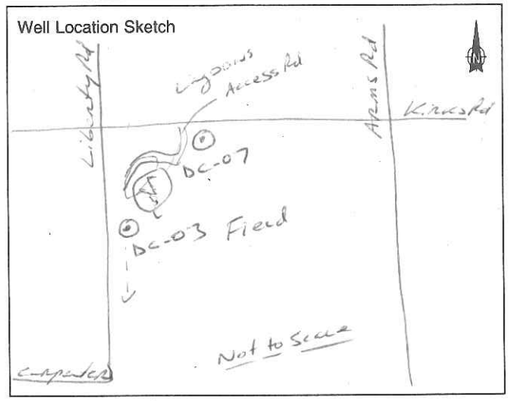
Auger/Split Spoon Refusal: —

Total Depth of Borehole Is: 61 ft

Total Depth of Corehole Is: —

Water Level (TOIC)		
Date	Time	Level(Feet)
12/13/12	7:45	44.5

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
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

SCREENED WELL

5"
Flush Mount
Stick-up _____ ft

Top of Grout 3 ft

Top of Seal at 30.5 ft

Top of Sand Pack 34.5 ft

Top of Screen at 38.5 ft

Bottom of Screen at 58.5 ft

Bottom of Hole at 61 ft

Bottom of Sandpack at 61 ft

Lock Number _____

Inner Casing Material PVC

Inner Casing Inside Diameter 2 inches

GROUND SURFACE

Quantity of Material Used:
Bentonite Pellets _____
Cement _____
Borehole 4 inches Diameter
~~Cement/~~ Bentonite _____
Grout Bentonite Chips
Screen Slot Size 0.010
Screen Type 20ft
☒ PVC
☐ Stainless Steel
Pack Type/Size:
☒ Sand Colorado Silica
☐ 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				
2	Light gray brown fine to med sand			
3				
4				
5				
6				
7				
8				
9				
10				
11	Light gray sandy gravel, likely breaking up cobbles			
12				
13				
14	Light brown fine to med sand w/ clay rich silty nodules			
15				

BOREHOLE NO. DC-04

BOREHOLE NO. DC-05

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											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
16	Light brown fine to med sand			
17				
18				
19				
20				
21	Same as above w/ ~5% fine gravel			
22				
23				
24				
25				
26	Same as above w/ ~5% fine gravel			
27				
28				
29				
30				
31	Same as above w/ gravel and clay-rich nodules			
32				
33				
34				
35				
36	Same as above minus gravel and clay nodules			
37				
38				
39				
40				
41	Light brown gravelly fine to med sand, rounded			
42	to subangular fine to coarse gravel ~15%			
43				
44	▽ 44.5' WT.			
45				

BOREHOLE NO. DC-04

BOREHOLE NO. DC-09

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											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											
63											
64											
65											
66											
67											
68											
69											
70											
71											
72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
46	Same as above but little to no gravel w/ some			
47	silty clay, rich nodules			
48				
49				
50				
51	Light brown fine to med sand			
52				
53				
54				
55				
56	Light brown fine to coarse sand			
57				
58				
59				
60	TD 61 ft			
61				
62				
63				
64				
65				
66				
67				
68				
69				
70				
71				
72				
73				
74				
75				

BOREHOLE NO. DC-04

BOREHOLE NO. DC-09

BOREHOLE NO. ____

BOREHOLE NO. ____

BOREHOLE NO. ____

DRILLING LOG FOR DC-04

Project Name: Yakima Valley Nitrates

Site Location: Southside of Knowles Rd between N Arms and Dekker Rds East of Creek

Date Started/Finished: 12/13/12

Drilling Company: Environmental West, Inc.

Driller's Name: Ron Sink / Brent Johnson

Geologist's Name: Erin Lynch

Geologist's Signature: [signature]

Rig Type (s): Schramm T300

Drilling Method (s): Air Rotary

Bit Size (s): 4" Auger Size (s): —

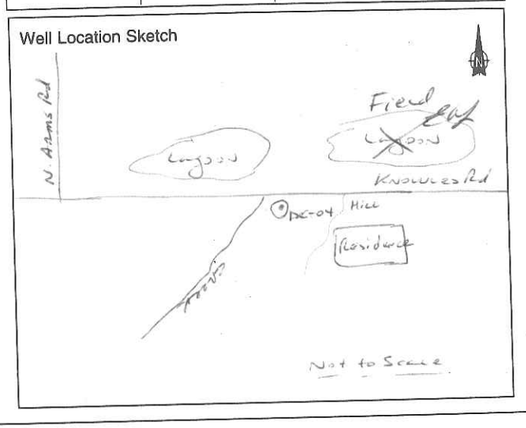
Auger/Split Spoon Refusal: —

Total Depth of Borehole Is: 51.33 ft

Total Depth of Corehole Is: —

Water Level (TOIC)		
Date	Time	Level(Feet)
12/13/12	10:45	36ft

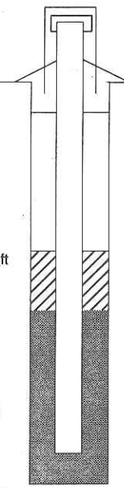
Well Location Sketch



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
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

SCREENED WELL

8" Flush Mount
~~Stick-up~~ ft



Top of Grout 3 ft

Top of Seal at 20.83 ft

Top of Sand Pack 24.83 ft

Top of Screen at 28.83 ft

Bottom of Screen at 48.83 ft

Bottom of Hole at 51.33 ft

Bottom of Sandpack at 51.33

Lock Number _____

Inner Casing Material PVC Sch 40

Inner Casing Inside Diameter 2 inches

GROUND SURFACE

Quantity of Material Used:
~~Bentonite Pellets~~ _____

Cement 4 bags

Borehole Diameter 6 inches

~~Cement/~~ Bentonite Chips 5 bags

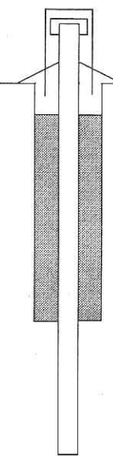
~~Grout~~ _____

Screen Slot Size 0.010

Screen Type 20ft
☒ PVC Sch 40
☐ Stainless Steel _____

Pack Type/Size:
☒ Sand Colorado Silica 20/40 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				
2	Light yellowish brown, fine to medium sand w/ silt			
3				
4				
5				
6	Light grayish brown, fine to coarse sand w/ gravel			
7				
8	Light grayish brown gravel w/ sand (fine tamed)			
9	appears to be breaking up cobbles			
10				
11				
12				
13	Light grayish brown gravelly sand ~30% gravel			
14				
15				

BOREHOLE NO. DC-09

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											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
16				
17	Yellowish Orange Clay w/silt			
18				
19				
20				
21				
22				
23				
24	Light Yellowish Brown fine sand w/silt			
25				
26	Light Yellowish Brown silt			
27				
28				
29				
30				
31	Light Yellowish Brown ~~sandy~~ Sand fine			
32				
33				
34				
35				
36	~~Same as above~~ Light Yellowish Brown Silty Sand (fine)			
37				
38				
39				
40				
41	Same as above			
42				
43				
44				
45				

BOREHOLE NO. AC-09

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											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											
63											
64											
65											
66											
67											
68											
69											
70											
71											
72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
46	Light Yellowish Brown Fine and Med Sand			
47				
48				
49				
50	TD 51.33			
51				
52				
53				
54				
55				
56				
57				
58				
59				
60				
61				
62				
63				
64				
65				
66				
67				
68				
69				
70				
71				
72				
73				
74				
75				

BOREHOLE NO. AC-02

BOREHOLE NO. ____

BOREHOLE NO. ____

BOREHOLE NO. ____

DRILLING LOG FOR DC-09

Project Name: Yakima Valley Nitrates

Site Location: E Zillah Dr between Dekker and N Chapelle Rd south side of rd

Date Started/Finished: 12/13/12 - 12/15/12

Drilling Company: Environmental West

Driller's Name: Ron Sink/Brent Johnson

Geologist's Name: Erin A. Lynch

Geologist's Signature: [signature]

Rig Type (s): Schramm T300

Drilling Method (s): Air Rotary

Bit Size (s): 4" Auger Size (s): —

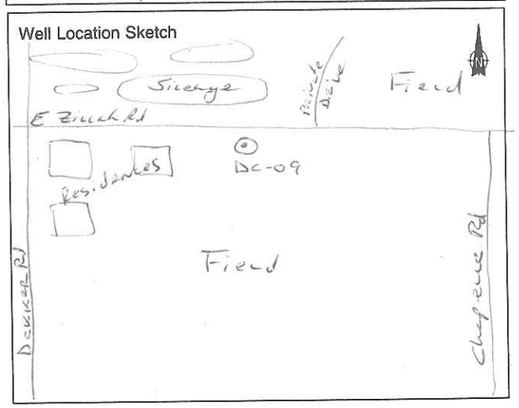
Auger/Split Spoon Refusal: —

Total Depth of Borehole Is: 196

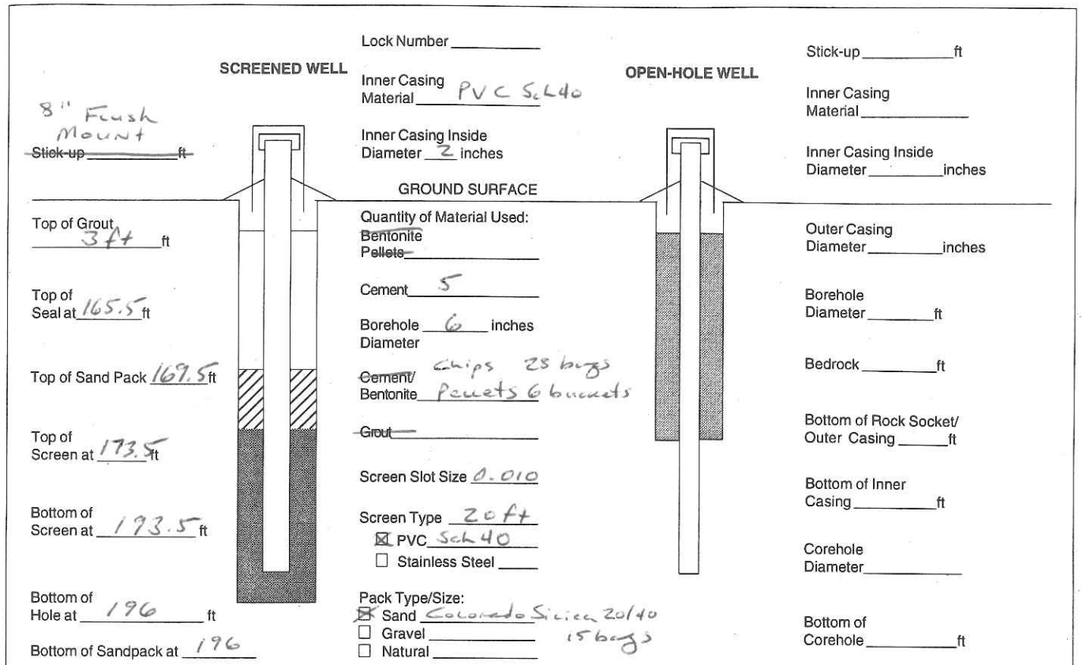
Total Depth of Corehole Is: —

Water Level (TOIC)		
Date	Time	Level(Feet)
12-15-12	09:25	146

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
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										



8" Flush Mount
~~Stick-up~~ ft

Top of Grout 3 ft ft

Top of Seal at 165.5 ft

Top of Sand Pack 169.5 ft

Top of Screen at 173.5 ft

Bottom of Screen at 193.5 ft

Bottom of Hole at 196 ft

Bottom of Sandpack at 196

Lock Number

Inner Casing Material PVC Sch40

Inner Casing Inside Diameter 2 inches

Quantity of Material Used:
~~Bentonite~~
~~Pellets~~

Cement 5

Borehole Diameter 6 inches

~~Cement/~~ Bentonite Chips 28 bags Pellets 6 buckets

~~Grout~~

Screen Slot Size 0.010

Screen Type 20 ft
☒ PVC Sch40
☐ Stainless Steel

Pack Type/Size:
☒ Sand Colorado Silica 20/40 15 bags
☐ Gravel
☐ Natural

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	Light gray brown sandy gravel			
2				
3	Light brown fine to coarse sand w/ gravel			
4				
5				
6				
7				
8				
9				
10				
11	Light gray brown sandy gravel			
12				
13				
14				
15	Light brown fine to med sand w/ fine gravel			

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											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
16	same as above			
17				
18				
19				
20				
21	Light brown fine to med sand			
22				
23				
24				
25				
26				
27				
28				
29				
30				
31	Same as above			
32				
33				
34				
35				
36				
37				
38				
39				
40				
41	Same as above			
42				
43				
44				
45				

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											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											
63											
64											
65											
66											
67											
68											
69											
70											
71											
72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
46	Same as above			
47				
48				
49				
50				
51	Same as above			
52				
53				
54				
55				
56				
57				
58				
59				
60				
61	Light brown fine to med sand w/ occasional silty clay-rich nodules and fine gravel ~10%			
62				
63				
64				
65				
66	Light yellowish brown fine sand w/ clay, silt			
67				
68				
69				
70				
71	Light brown fine to med sand			
72				
73				
74				
75				

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											
78											
79											
80											
81											
82											
83											
84											
85											
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			
78				
79				
80				
81	same as above			
82				
83				
84				
85				
86	same as above w/ trace of fine gravel			
87				
88				
89				
90				
91	Light gray brown sandy gravel (~35%)			
92	w/ cobbles subrounded to subangular			
93				
94				
95	Light gray brown sandy gravel			
96				
97				
98				
99				
100				
101	Same as above			
102				
103				
104				
105				

BOREHOLE NO. ____

BOREHOLE NO. ____

BOREHOLE NO. ____

DC-09

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
	Same as above			
77				
78				
79				
80 110				
81				
82				
83				
84				
85 115				
86				
87				
88				
89				
90 120				
91				
92				
93				
94				
95 125				
96				
97				
98				
99				
100 130				
101				
102				
103				
104 135	Light yellowish brown fine sand			
105				

BOREHOLE NO. ____

BOREHOLE NO. ____

BOREHOLE NO. ____

BOREHOLE NO. ____

BOREHOLE NO. ____

DC-09

(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
77	Fine sand Light yellowish brown w/ occasional fine gravel			
78				
79				
80	N2			
81	Same as above			
82				
83				
84				
85	N5			
86	146 ▽ Light gray brown fine to coarse sand w/ up to 15% fine gravel			
	WT 146			
87				
88				
89				
90	152 Light yellowish brown fine to med sand			
91				
92				
93				
94				
95	155			
96	Light yellowish brown fine to med sand w/ silt			
97				
98				
99				
100	160			
101	161			
102	162 Becoming more clay-rich			
103	163			
104	164			
105	165			

BOREHOLE NO. ____

BOREHOLE NO. ____

BOREHOLE NO. ____

BOREHOLE NO. ____

BOREHOLE NO. ____

BOREHOLE NO. ____

DC-09

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
77 167	Clay-rich			
78 168				
79 169	Dry fine sand to silt Light Gray			
80 170				
81 171				
82	Light ~~Clay Gray~~ Yellowish Brown fine sand w/ silt			
83	and occasional gravel			
84	up to 5% fine to coarse subangular			
85 175				
86 176				
87 177				
88 178				
89 179				
90 180				
91 181				
92 182				
93 183	Light yellowish gray clay rich w/ clay			
94 184	nodules and fine sand			
95 185				
96 186	Light gray fine sandy silt			
97 187				
98 188				
99 189				
100 190				
101 191				
102 192				
103 193				
104 194				
105 195				
	TD 196			

BOREHOLE NO

DRILLING LOG FOR HK-12

Project Name: Yakima Valley Nitrate

Site Location: South side of Independence Rd between Washout Rd and Lantz Rd. closer to Washout Rd

Date Started/Finished: 12/16/12

Drilling Company: Environmental West

Driller's Name: Ron Sink / ~~Benjamin Hagen~~ Brent Johnson

Geologist's Name: Erin Lynch

Geologist's Signature: [signature]

Rig Type (s): Schramm T300

Drilling Method (s): Air Rotary

Bit Size (s): 4" ~~Auger Size (s)~~

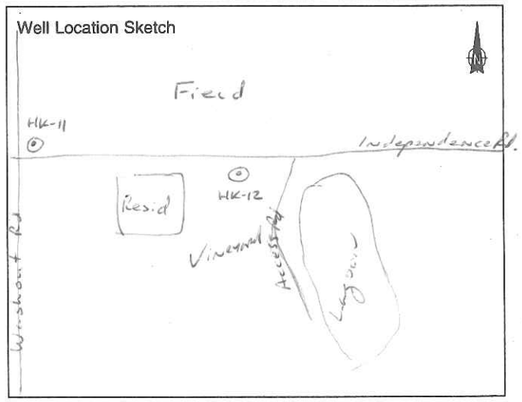
Auger/Split Spoon Refusal: —

Total Depth of Borehole Is: 76 ft

Total Depth of Corehole Is: —

Water Level (TOIC)		
Date	Time	Level(Feet)
12/16/12	12:00	29 ft
		Artesian

Well Location Sketch



SCREENED WELL

8" Flush Mount

~~Stick-up~~ ____ ft

Top of Grout 3 ft

Top of Seal at 55.5 ft

Top of Sand Pack 59.5 ft

Top of Screen at 63.5 ft

Bottom of Screen at 73.5 ft

Bottom of Hole at 76 ft

Bottom of Sandpack at 76

Lock Number ____

Inner Casing Material: PVC Sch 40

Inner Casing Inside Diameter: 2 inches

GROUND SURFACE

Quantity of Material Used:

~~Bentonite~~ Pellets ____

Cement: 4 bags

Borehole Diameter: 6 inches

~~Cement/~~ Bentonite: Chips 8 bags

~~Grout~~ Bentonite Pellets: 5 buckets

Screen Slot Size: 0.010

Screen Type: 10 ft

☒ PVC Sch 40

☐ Stainless Steel ____

Pack Type/Size:

☒ Sand Colorado Silica 20/40 6 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(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
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
1				
2				
3				
4				
5				
6				
7	Light brown fine to med sand w/ silt			
8				
9				
10				
11				
12	Light grayish brown fine to coarse sand w/			
13	~25% subrounded to subangular gravel			
14	appear to be breaking through cobbles			
15				

BOREHOLE NO. HK-11

BOREHOLE NO. HK-

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											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26	Light brown fine to coarse sand w/fine sub-			
27	rounded gravel (~10%)			
28				
29	~29ft ∇ W.T. Artesian			
30				
31				
32				
33				
34				
35	Light brown clay w/silt			
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				

BOREHOLE NO. MK-

BOREHOLE NO. MK-11

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											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											
63											
64											
65											
66											
67											
68											
69											
70											
71											
72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
46				
47				
48	Light yellowish brown silty fine sand w/ trace of fine gravel			
49				
50	Same as above w/ more medium sand			
51				
52	Same as above			
53				
54				
55				
56				
57	Couldn't get a good sample, driller			
58	indicates we are going through more			
59	of a gravel and we are in water			
60	cyclone was plugged			
61				
62				
63				
64				
65				
66	Light yellowish brown silty fine to coarse			
67	sand (predominantly fine sand) w/ fine			
68	gravel (~10%)			
69	increasing gravel w/ depth			
70	but still silty fine			
71	sand predominates			
72				
73				
74				
75	TD 76 ft			

BOREHOLE NO. HK-11

BOREHOLE NO. HK-

DRILLING LOG FOR HK-12

Project Name Yakima Valley Nitrate

Site Location South side of Independence Rd between Washout Rd and Lontz Rd. closer to Washout Rd

Date Started/Finished 12/16/12

Drilling Company Environmental West

Driller's Name Ron Sink / ~~Benjamin Wright~~ Brent Johnson

Geologist's Name Erin Lynch

Geologist's Signature [signature]

Rig Type (s) Schramm T300

Drilling Method (s) Air Rotary

Bit Size (s) 4" ~~Auger Size (s)~~

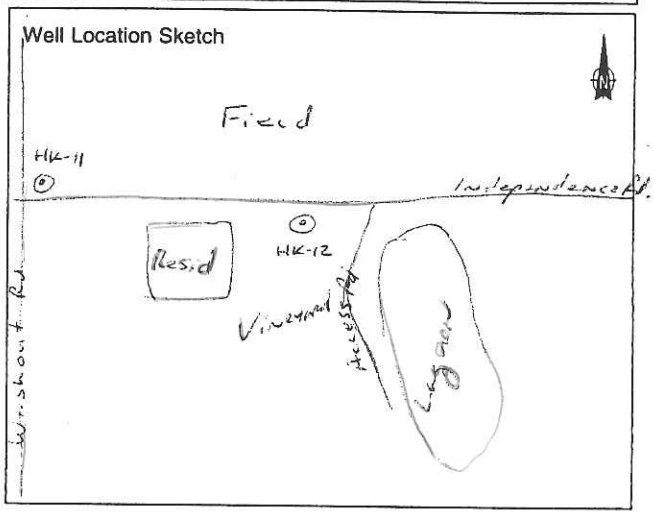
Auger/Split Spoon Refusal —

Total Depth of Borehole Is 76 ft

Total Depth of Corehole Is —

Water Level (TOIC)		
Date	Time	Level(Feet)
12/16/12	12:00	29 ft
		Artesian

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
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

SCREENED WELL

8" Flush Mount
~~Stick-up~~ _____ ~~ft~~

Top of Grout 3 ft

Top of Seal at 55.5 ft

Top of Sand Pack 59.5 ft

Top of Screen at 63.5 ft

Bottom of Screen at 73.5 ft

Bottom of Hole at 76 ft

Bottom of Sandpack at 76

Lock Number _____

Inner Casing Material PVC Sch40

Inner Casing Inside Diameter 2 inches

GROUND SURFACE

Quantity of Material Used:

~~Bentonite~~ Pellets _____

Cement 4 bags

Borehole Diameter 6 inches

~~Cement/~~ Bentonite chips 8 bags

Bentonite ~~Grout~~ Pellets 5 buckets

Screen Slot Size 0.010

Screen Type 10ft

☒ PVC Sch 40

☐ Stainless Steel _____

Pack Type/Size:

☒ Sand Colorado Silica 20/40

☐ Gravel _____ 6 bags

☐ 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				
2				
3				
4				
5				
6				
7	Light brown fine to med sand w/ silt			
8				
9				
10				
11				
12	Light grayish brown fine to coarse sand w/			
13	~35% subrounded to subangular gravel			
14	appear to be breaking through cobbles			
15				

HK-12

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26	Light brown fine to coarse sand w/fine sub-			
27	rounded gravel (~10%)			
28				
29	~29ft ▽ W.T. Artesian			
30				
31				
32				
33				
34				
35	Light brown clay w/silt			
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
46				
47				
48	Light yellowish brown silty fine sand w/ trace of fine gravel			
49				
50	Same as above w/ more medium sand			
51				
52	Same as above			
53				
54				
55				
56				
57	Couldn't get a good sample, driller			
58	indicates we are going through more			
59	of a gravel and we are in water			
60	(pressure was) plugged			
61				
62				
63				
64				
65				
66	Light yellowish brown silty fine to coarse			
67	sand (predominantly fine sand) w/ fine			
68	gravel (~10%)			
69	increasing gravel with depth			
70	but still silty fine			
71	sand predominates			
72				
73				
74				
75	TD 76 ft			

BOREHOLE NO

DRILLING LOG FOR HK-11

Project Name: Yakima Valley Nitrate

Site Location: North side of Independence Rd @ Washout Rd NE corner

Date Started/Finished: 12/17/12

Drilling Company: Environmental West

Driller's Name: Ron Sink / Brent Johnson

Geologist's Name: Erin Lynch

Geologist's Signature: [signature]

Rig Type (s): Schramm T300

Drilling Method (s): Air Rotary

Bit Size (s): 4" ~~Auger Size (s)~~

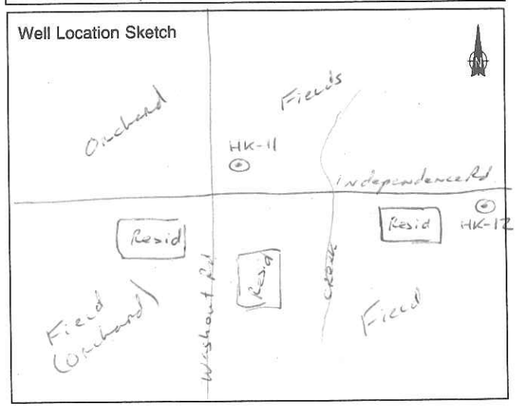
Auger/Split Spoon Refusal: —

Total Depth of Borehole Is: 66 ft

Total Depth of Corehole Is: —

Water Level (TOIC)		
Date	Time	Level (Feet)
12-17-12	13:00	46 ft

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
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

SCREENED WELL

Stick-up ____ ft

Top of Grout 3 ft

Top of Seal at 45.5 ft

Top of Sand Pack 49.5 ft

Top of Screen at 53.5 ft

Bottom of Screen at 63.5 ft

Bottom of Hole at 66 ft

Bottom of Sandpack at ____

Lock Number ____

Inner Casing Material ____

Inner Casing Inside Diameter ____ inches

GROUND SURFACE

Quantity of Material Used:
Bentonite Pellets ____
Cement ____
Borehole ____ inches Diameter
Cement/ Bentonite ____
Grout ____

Screen Slot Size ____

Screen Type ____
☐ PVC ____
☐ Stainless Steel ____

Pack Type/Size:
☐ Sand ____
☐ 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	Light brown gravel w/ fine to med sand			
2	gravel is subrounded to angular and fine			
3				
4				
5				
6				
7				
8				
9	Same as above becoming more sand-			
10	rich			
11	Light brown gravel w/ fine to med sand			
12	gravel is fine to coarse, likely w/			
13	cobbles, subrounded to angular			
14				
15				

BOREHOLE NO. HK-11

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											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
16	Same as above			
17				
18				
19				
20				
21				
22				
23	Light yellowish brown ~~silt~~ clay rich silt			
24				
25				
26				
27				
28				
29				
30				
31	Same as above but slightly more clay-rich			
32				
33				
34				
35				
36				
37				
38				
39				
40				
41	No sample, no cuttings potentially wet			
42				
43				
44				
45				

BOREHOLE NO. FK-10

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											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											
63											
64											
65											
66											
67											
68											
69											
70											
71											
72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
Artesian ▽ WT 46ft 46	No sample, no cuttings, wet, driller			
47	pauses to let water build up and			
48	potentially blow wet cutting out of the			
49	hole			
50				
51	Light yellowish brown silt w/ coarse sand			
52	to fine gravel & trace			
53				
54	* Cleaning out hole by letting			
55	water build up and blowing cuttings out *			
56	Same as above			
57				
58				
59				
60				
61				
62	?? probably same as above			
63				
64				
65				
66	TD 66 ft			
67				
68				
69				
70				
71				
72				
73				
74				
75				

BOREHOLE NO. HK-10

DRILLING LOG FOR HK-10

Project Name: Yakima Valley Nitrate

Site Location: North of Sunnyside, WA Washout Rd, North of Independence Rd.

Date Started/Finished: 12/18/12 - same

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): 4" Auger Size (s): —

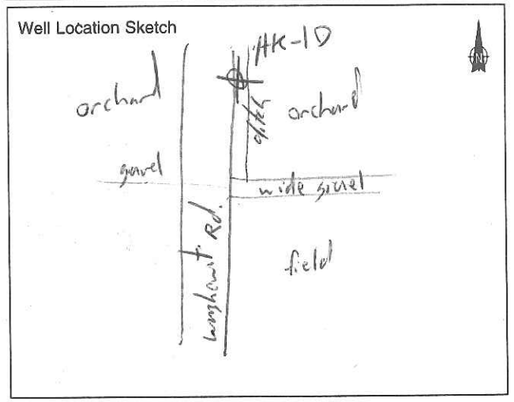
Auger/Split Spoon Refusal: —

Total Depth of Borehole Is: 66'

Total Depth of Corehole Is: —

Water Level (TOIC)		
Date	Time	Level(Feet)
12/18/12	0955	48.39

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
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

pre-sampled intervals

SCREENED WELL

flush mount

Stick-up 0 ft

Top of Grout ____ ft

Top of Seal at ~~35.5~~ ft JR (12/27/12)

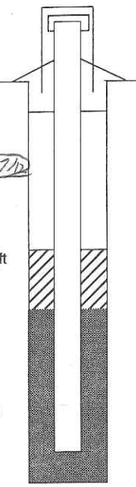
Top of Sand Pack 39.5 ft

Top of Screen at 43.5 ft

Bottom of Screen at 63.5 ft

Bottom of Hole at 66' ft

Bottom of Sandpack at 66'



Lock Number ____

Inner Casing Material ____

Inner Casing Inside Diameter 2 inches

GROUND SURFACE

Quantity of Material Used:

Bentonite Pellets ____

Cement 4 bags

Borehole Diameter @4" inches

Cement/ Bentonite 7 bags holeplug

Grout ____

Screen Slot Size 0.010"

Screen Type 20'

☒ PVC sch 40

☐ Stainless Steel ____

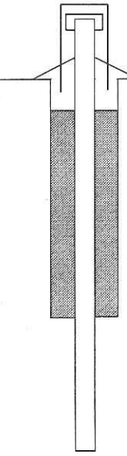
Pack Type/Size:

☒ Sand 9 (12/20)

☐ 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	0-5': lt. brn - yel brn grvy sd w/ slt. Grv is subrd-rd, sd is m-f, loose, dry. Grv 0.5-1cm.	X		
2		X		
3	5-10': lt. brn sd w/ slt & grv. sd is fine, loosed dry. Grv is 2mm-0.5cm, subrd, basalt & mixed litho	X		
4		X		
5		X		
6		X		
7		X		
8		X		
9		X		
10		X		
11	10-15' - lt brn sd w/ grv. sd is med-f, loose. Grv is 0.5cm, subrd. - subang & ang	X		
12		X		
13				
14		X		
15		X		

GEOTECHNICAL INFO.

REFERENCES

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											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
16	15-20': lt. brn sdy Grv. Sd is f-c gr, pred med. Grv is	X		
17	2mm-1.5cm, ang-subrd, w/ orng qtz, basalt, + SS.	X		
18		X		
19		X		
20		X		
21	20-25': Grv w/ sd. Sd is m-f gr. Grv is 0.5-2 cm, ang-occ.	X		
22	subrd. Clear qtz, pink quartzite, red S.S., + basalt. dry	X		
23		X		
24		X		
25		X		
26	25-30': lt. brn very fine Sd. Homogeneous. V.l. moist, loose.		X	
27			X	
28			X	
29			X	
30			X	
31	30-35': Same as above.		X	
32			X	
33			X	
34			X	
35			X	
36	35-40': lt. brn vf sd w/ Slt. v.l. moist, loose. 25-40'	X		
37	bys may be Touchet Beds (flood deposits).		X	
38			X	
39			X	
40			X	
41	40-45': lt. brn sdy Grv. Sd is f-m gr, Grv is rd-subrd	X		
42	+ ang. Lith as above, 0.5-2 cm. Dry, loose	X		
43		X		
44		X		
45		X		

GEOTECHNICAL INFO.

REFERENCES

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											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											
63											
64											
65			Total Depth = 66'								
66											
67											
68											
69											
70											
71											
72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
46	45-50': lt. brn sdy Grv. Sd is fcm gr. Grv is 2mm-		X	
47	0.5cm, subrd, v.l. moist, lse.		X	
48			X	
49			X	
50			X	
51	50-55': lt. brn gry Sd. Sd is m-f gr. Grv is subang		X	
52	- subrd, mixed litho, 0.5-1cm, v.l. moist, lse.		X	
53			X	
54			X	
55			X	
56	55-60': Same as above. L. moist.		X	
57			X	
58			X	
59			X	
60	60-66': Lt. brn Grv w/sd. Sd c-m gr. ~~Sd~~ SR 12/18/12		X	
61	Grv is subrd-rnd & ang, 0.5-2cm, many lith.		X	
62	moist, lse.		X	
63			X	
64			X	
65			X	
66	TD.		X	
67				
68				
69				
70				
71				
72				
73				
74				
75				

12/18/12

GEOTECHNICAL INFO.

REFERENCES