



LOG OF TEST BORING

Start Card _____

Job No 33758613.04000 SR 90

Elevation 2522.4 ft (768.8 m)

HOLE No. CUL-005-07

Sheet 1 of 2

Project I 90 Snoqualmie Pass East

Driller Bobby Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Suren Balendra

Start June 23, 2007 Completion June 25, 2007 Well ID# Not Applicable Equipment Skid Mounted CME 45 w/autohammer

Station 1307+62' Offset 27.90'R Casing HW 45" Method Wet Rotary

Northing 1071115.68 Easting 1752351.28 Latitude 47°22'02.243"N Longitude 121°22'22.498"W

County Kittitas Subsection SE 1/4 of NW 1/4 Section 26 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0								D 1 SM	3 6 10 (16)	0 to 2 feet: Topsoil Silty SAND with grass roots, medium dense, dark brown, moist, homogenous, no HCl reaction.			
1						6		C 2 GP		2 to 8 feet: Poorly graded GRAVEL with or without cobbles, subrounded to subangular, brown to gray, moist to wet, homogenous, no HCl reaction. 2 feet: Poorly graded GRAVEL with sand.			
5						50		C 3 GP(C)		grades to poorly graded GRAVEL with cobbles.			
2											▽		
8						63		D 4 OL	1 2 3 (5)	8 to 10 feet: Sandy ORGANIC SOIL with gravel and decayed wood, subangular, loose, dark brown, wet, homogenous, no HCl reaction.			
10						3		D 5 SM	0 1 3 (4)	10 to 28 feet: Poorly to well graded GRAVEL, occasionally silty GRAVEL and silty SAND with gravel, occasional cobbles, very loose to very dense, dark brown to gray, wet, homogenous, No HCl reaction. 10 feet: Very loose, silty SAND with gravel.			
4						0		D 6	2 1 1 (2)				
15						39		D 7 GW	3 4 50 for 2"	grades to very dense, silty GRAVEL with sand.			
5						78		C 8 GP(C)		grades to poorly graded GRAVEL with cobbles.			
20													

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No 33758613.04000 SR 90

Elevation 2528.8 ft (770.8 m)

HOLE No. CUL-006-07

Sheet 1 of 2

Project I 90 Snoqualmie Pass East

Driller Bobby Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Suren Balendra

Start June 23, 2007 Completion June 25, 2007 Well ID# Not Applicable

Equipment Skid Mounted CME 45 w/autohammer

Station 1312+01.98 Offset 46.95'R Casing HW, HQ

Method Wet Rotary

Northing 1070684.86 Easting 1752360.54 Latitude 47°21'57.993"N

Longitude 121°22'22.295"W

County Kittitas Subsection SE 1/4 of NW 1/4 Section 26 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
								D 1 SM	2 4 10 (14)	0 to 4 feet: Poorly graded silty SAND with gravel with trace of organic soil, subrounded to subangular, loose to medium dense, dark brown, moist to wet, homogenous, No HCl reaction. 0 feet: Medium dense silty SAND with gravel.			
1								D 2 SM-OL/GM	3 4 4 7 (8)	2.5 feet: grades to loose, silty SAND with gravel with trace of organic soil.			
5								C 3 GW(C)		4 to 29.5 feet: Poorly graded to well graded GRAVEL with or without sand, occasional silty GRAVEL, occasional cobbles and boulders, subangular, very dense, brown to gray, wet, homogenous, no HCl reaction. 4 feet: Well graded GRAVEL with cobbles. Maximum size of the			
2								D 4 GW	11 29 21 (50)	6 feet: grades to well graded GRAVEL with sand.			
								C 5 GW(C)		7.5 feet: grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 5.5 inches.			
								D 6 GM	19 25 50 for 5"	8.5 feet: grades silty GRAVEL with sand.			
10								C 7 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 4 inches.			
								D 8 GP(C)	50 for 2"	grades to poorly graded GRAVEL. grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 7.5 inches.			
4								D 10	50 for 5"	grades to poorly graded GRAVEL with sand.			
								C 11 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 3.5 inches.			
15								D 12	50 for 5"	grades to poorly graded GRAVEL with sand.			
								C 13 GW		grades to well graded GRAVEL with sand.			
5								D 14 GP	25 21 50 for 5"	grades to poorly graded GRAVEL with sand.			
6								C 15					
20													

DRAFT ROCKN BOR NGS - 9010082007 GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
									GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 4 inches.			
									D 16	50 for 5 5"	grades to well graded GRAVEL with sand.			
									C 17 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 11 inches.			
7														
25														
8									C 18A					
9									C 18B					
30														
									C 19		29.5 to 41 feet: Dacite to Basalt, pale blue green to grayish blue, fine to medium grained, very weak rock (R1). No HCl reaction. Discontinuities are closely spaced and in very poor condition. CR= 50 to 100%, RQD=0 to 39%, FF=5 to 8. 29.5 feet: Pale blue green Dacite. 31 feet: grades to grayish blue Basalt.			
10														
35														
11									C 20					
40														
12														
41											Bottom of boring at 41 feet depth below ground surface. Backfilled to ground surface with bentonite chips.			
13											Water level measurements (below existing ground surface): 6/25/07: 14.3 feet.			
45														

DRAFT ROCKN BOR NGS -90-10082007 GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90

Elevation 2523.6 ft (769.2 m)

HOLE No. CUL-007-07

Sheet 1 of 2

Project I 90 Snoqualmie Pass East

Driller Robert Walker Lic# 2864T

Drilling Contractor WSDOT Field Exploration Unit

Inspector Tom Jackson

Start August 29, 2007 Completion August 29, 2007 Well ID# Not Applicable Equipment Skid Mounted CME 45 w/autohammer

Station 1423+34.59 Offset 98.71'L Casing HW, HQ Method Wet Rotary

Northing 1061373.67 Easting 1756107.37 Latitude 47°20'26.518"N Longitude 121°21'26.405"W

County Kittitas Subsection NW 1/4 of NW 1/4 Section 1 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										0 to 10 feet: Poorly graded GRAVEL with or without sand and cobbles, subrounded, loose, gray, moist, homogenous, no HCl reaction. 4 feet: Poorly graded GRAVEL with sand.			
1													
5						39		D 1 GP	3 3 4 (7)				
2						100		C 2 GP(C)		grades to poorly graded GRAVEL with cobbles.			
10						89		C 3 GP(C)					
3						17		D 4 SM	7 10 14 (24)	10 to 23 feet: Poorly to well graded GRAVEL with sand, occasional cobbles and silty SAND with gravel, subangular, medium dense, gray, moist, homogenous, no HCl reaction. 10 feet: Well graded silty SAND with gravel. 12 feet: grades to poorly graded GRAVEL.			
4						50		C 5 GP					
15						17		D 6 GW	3 5 7 (12)	grades to well graded GRAVEL with sand.			
5						50		C 7 GP(C)		grades to poorly graded GRAVEL with cobbles.			
20													

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No 33758613.04000 SR 90 Elevation 2480.2 ft (756.0 m)

HOLE No. CUL-008-07

Sheet 1 of 3

Project I 90 Snoqualmie Pass East

Driller Mike Harvey Lic# 2599

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang, Bob Featherstone

Start July 13, 2007 Completion July 13, 2007 Well ID# Not Applicable Equipment CME45 Skid Mounted w/autohammer

Station 1423+29.72 Offset 58.43'R Casing HW, HQ Method Wet Rotary on Barge

Northing 1061217.468 Easting 1756087.913 Latitude 47° 20' 24.9756"N Longitude 121° 21' 26.661"W

County Kittitas Subsection NW 1/4 of NW 1/4 Section 1 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 4 feet: Poorly graded GRAVEL, subrounded to angular, medium dense, bluish gray, wet, homogenous, no HCl reaction.			
1														
5						<u>30</u>			<u>D 1</u> SM	5 3 4 (7)	4 to 28 feet: Silty SAND, occasionally silty GRAVEL, subrounded to subangular, very loose to medium dense, reddish brown, wet, homogenous, no HCl reaction. 4 feet: Silty SAND with gravel, homogenous.			
2														
10						<u>87</u>			<u>D 2</u> SM	1 2 5 (7)	grades to silty SAND.			
3						<u>10</u>			<u>D 3</u> GM	4 2 3 (5)	grades to silty GRAVEL with sand.			
4						<u>67</u>			<u>D 4</u> SM	1 3 3 (6)	grades to silty SAND.			
15						<u>100</u>			<u>D 5</u> SM	1 1 1 (2)				
5														
20						<u>100</u>			<u>D 6</u> SM	1 3 5 (8)				

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7													
25													
8													
30													
9													
10													
35													
11													
40													
12													
13													
45													

DRAFT ROCKN BOR NGS -90-10082007 GPJ 9/10/08

grades to silty SAND with gravel.

28 to 39 feet: Sandy SILT, occasionally SILT and Lean CLAY, soft to medium stiff, brown to gray, wet, none to medium plasticity, medium to rapid dilitancy, low to medium toughness, homogenous, occasionally stratified, no HCl reaction.

28 feet: SILT/Sandy SILT, medium stiff, wet, none to low plasticity, rapid dilitancy, low dry strength, low toughness, stratified, no HCl reaction. PP=0.5 to 1 tsf.

grades to SILT, soft, low plasticity, medium toughness, medium dry strength, homogenous. PP=0.5 tsf.

39 to 41.3 feet: Lean CLAY, stiff, brown, moist, medium plasticity, homogenous, no HCl reaction.

41.3 to 51 feet: Sandy SILT, loose to very dense, light brown, wet, non plastic, rapid dilitancy, low toughness, low dry strength, homogenous, no HCl reaction.



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90

Elevation 2480.2 ft (756.0 m)

HOLE No. CUL-008-07

Sheet 3 of 3

Project I 90 Snoqualmie Pass East

Driller Mike Harvey

Lic# 2599

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14									D 13 ML	2 1 3 (4)				
15														
50									D 14 ML	41 50 (>50)				
16											Bottom of boring at 51 feet depth below ground surface. Backfilled to mudline with bentonite.			
55											Water level measurements: 7/13/07 at 13:30: 22.0 feet above mudline.			
17														
18														
60														
19														
65														
20														
21														
70														

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No 33758613.04000 SR 90

Elevation 2525.6 ft (769.8 m)

HOLE No. CUL-009-07

Sheet 1 of 2

Project I 90 Snoqualmie Pass East

Driller Robert Walker Lic# 2864T

Drilling Contractor WSDOT Field Exploration Unit

Inspector Tom Jackson

Start August 28, 2007 Completion August 28, 2007 Well ID# Not Applicable Equipment Skid Mounted CME 45 w/autohammer

Station 1424+77.49 Offset 103.09'L Casing HW, HQ Method Wet Rotary

Northing 1061366.55 Easting 1756250.19 Latitude 47°20'26.463"N Longitude 121°21'24.331"W

County Kittitas Subsection NW 1/4 of NW 1/4 Section 1 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 26 feet: Well graded to poorly graded GRAVEL with sand, occasionally silty GRAVEL, occasional cobbles and boulders, subangular to angular, loose to very dense, bluish gray to light gray, dry to wet, homogenous, no HCl reaction. 4.5 feet: Well graded GRAVEL with sand.			
1														
5							33		D 1 GW	7 13 11 (24)				
2							100		C 2 GW(C)		grades to well graded GRAVEL with cobbles.			
3											grades to well graded GRAVEL.			
10							33		D 3 GM	3 4 5 (9)	grades to loose, silty GRAVEL with sand.			
4							40		C 4 GW(C)		grades to well graded GRAVEL with cobbles.			
15							33		D 5 GW	20 43 25 (68)	grades to well graded GRAVEL with sand.			
5							100		C 6 GP(C)		grades to very dense, poorly graded GRAVEL with cobbles.			
6														
20														

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0													
7								D 7 GW(C/B)	>50	grades to poorly graded GRAVEL with cobbles and boulders.			
25								C 9 GW(C/B)	92	grades to well graded GRAVEL with cobbles and boulders.			
8										26 to 33 feet: Well graded to poorly graded GRAVEL with occasional boulders, subangular to angular, dense, gray, wet, homogenous, no HCl reaction. 29.5 feet: Dense, well graded GRAVEL with sand.			
30								D 10	15 17 19 (36)				
9								C 11 GP(B)	100	grades to poorly graded GRAVEL with boulders.			
10								D 12 ML	67	33 to 34.5 feet: Sandy SILT, loose, dark gray, wet, homogenous, no HCl reaction.			
35								C 13 GW(C)	67	34.5 to 41.5 feet: Well graded GRAVEL with cobbles to silty GRAVEL with sand, subangular, gray, wet, homogenous, no HCl reaction. 34.5 feet: Well graded GRAVEL with cobbles.			
11								D 14 GM	39	grades to dense, silty GRAVEL with sand.			
40								C 15	39				
12								D 16	15 20 36 (56)				
13										Bottom of boring at 41.5 feet depth below ground surface. Backfilled to ground surface with bentonite chips.			
45													

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No 33758613.04000 SR 90 Elevation 2492.0 ft (759.6 m)

HOLE No. CUL-010-07

Sheet 1 of 3

Project I 90 Snoqualmie Pass East

Driller Mike Harvey Lic# 2599

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang, Bob Featherstone

Start July 12, 2007 Completion July 13, 2007 Well ID# Not Applicable Equipment CME45 Skid Mounted w/autohammer

Station 1424+79.75 Offset 63.28'R Casing HQ 55' Method Wet Rotary on Barge

Northing 1061197.532 Easting 1756241.488 Latitude 47° 20' 24.795"N Longitude 121° 21' 24.429"W

County Kittitas Subsection NW 1/4 of NW 1/4 Section 1 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										0 to 5 feet: Silty SAND with gravel, subrounded, very loose, reddish brown, wet, homogenous, no HCl reaction.			
1						33		D 1 SM	3 2 2 (4)				
5						20		D 2 GW	3 2 5 (7)	5 to 13 feet: Poorly to well graded GRAVEL with sand, subrounded, loose to very dense, brown to reddish brown, wet, homogenous, no HCl reaction. 5 feet: Loose, well graded GRAVEL with sand.			
10						33		D 3 GP	23 11 18 (29)	grades to dense, poorly graded GRAVEL with sand.			
15						20		D 4 GP	56 for 6"	grades to very dense.			
20						87		D 5 SM-ML	3 3 4 (7)	13 to 35.6 feet: Silty SAND, occasional sandy SILT, subrounded, loose to medium dense, brown to reddish brown, wet, homogenous, no HCl reaction. 13 feet: Medium dense silty SAND/sandy SILT. 13.5 feet: grades to silty SAND.			
25						50		D 6 SM	6 7 7 (14)				
30						73		D 7 SM	5 4 3 (7)	grades to loose.			

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
						<u>67</u>		D 8 SM	3 4 3 (7)				
7													
25						<u>90</u>		D 9 SM	9 7 7 (14)	grades to medium dense.			
8													
30						<u>90</u>		D 10 SM	3 4 4 (8)	grades to loose.			
9													
35						<u>100</u>		D 11 ML	3 2 5 (7)	35.6 to 45 feet: Sandy SILT, loose, brown to gray, moist to wet, homogenous, no HCl reaction.			
10													
40						<u>100</u>		D 12 ML	2 2 3 (5)				
11													
45						<u>100</u>		UD 13 ML					
12													
13													

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No 33758613.04000 SR 90

Elevation 2492.0 ft (759.6 m)

HOLE No. CUL-010-07

Sheet 3 of 3

Project I 90 Snoqualmie Pass East

Driller Mike Harvey

Lic# 2599

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14							100		D 14 CL	0 0 2 (2)	45 to 50 feet: LEAN CLAY, occasionally silty CLAY, soft, brown to gray, wet, medium plasticity, homogenous, occasionally laminated, no HCL reaction. PP = 0.5 0.75 tsf.			
50							100		D 15 SM/ML	1 2 2 (4)	50 to 54 feet: Silty SAND and/or sandy SILT, very loose, brown to gray, moist, homogenous, no HCL reaction.			
55							87		D 16 SM	9 29 21 (50)	54 to 56.5 feet: Poorly graded silty SAND, subrounded, dense, gray, wet, homogenous, no HCL reaction.			
18											Bottom of boring at 56.5 feet depth below ground surface. Backfilled to mudline with bentonite. Water level measurements: 7/12/07 at 15:00: 11.0 feet above mudline.			
60														
19														
65														
20														
21														
70														

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No 33758613.04000 SR 90

Elevation 2527.8 ft (770.5 m)

HOLE No. CUL-011-07

Sheet 1 of 2

Project I 90 Snoqualmie Pass East

Driller Mike Harvey Lic# 2599

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang / Dave Nelson

Start August 29, 2007 Completion August 29, 2007 Well ID# Not Applicable Equipment Skid Mounted CME 45 w/autohammer

Station 1426+27.07 Offset 111.62'L Casing HW 8', HQ 40' Method Wet Rotary

Northing 1061363 Easting 1756399.95 Latitude 47°20'26.444"N Longitude 121°21'22.156"W

County Kittitas Subsection NW 1/4 of NW 1/4 Section 1 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 11.5 feet: Well graded GRAVEL with sand, occasional boulders, angular to subrounded, very dense, gray, moist to wet, homogenous, no HCl reaction. 5 feet: Well graded GRAVEL with sand.			
1														
5						67			D 1 GW	7				
						45			C 2 GW(B)	50 for 5" (>50)		grades to well graded GRAVEL with boulders. Maximum size of the boulders encountered is 15 inches.		
2														
3														
10														
						10			D 3 GW	4		11.5 to 30.7 feet: Well graded GRAVEL with sand, occasional cobbles and boulders, subrounded to angular, loose to very dense, moist to wet, homogenous, no HCl reaction. 11.5 feet: Loose, well graded GRAVEL with sand.		
4						36			C 4 GW	4 4 4 (8)				
15														
						50			D 5 GW	41		grades to dense.		
5										20				
						91			C 6 GW(C)	13 (33)		grades to GRAVEL with sand and cobbles. Maximum size of the cobbles encountered is 7 inches.		
6														
20														

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No 33758613.04000 SR 90 Elevation 2493.8 ft (760.1 m)

HOLE No. CUL-012-07

Sheet 1 of 3

Project I 90 Snoqualmie Pass East

Driller Mike Harvey Lic# 2599

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang, Bob Featherstone

Start July 12, 2007 Completion July 12, 2007 Well ID# Not Applicable Equipment CME45 Skid Mounted w/autohammer

Station 1426+22.71 Offset 60.56'R Casing HQ 67" Method Wet Rotary on Barge

Northing 1061192.353 Easting 1756376.559 Latitude 47° 20' 24.7554"N Longitude 121° 21' 22.467"W

County Kittitas Subsection NW 1/4 of NW 1/4 Section 1 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										0 to 4 feet: Silty SAND with gravel, loose, brown, wet, homogenous, no HCL reaction.			
1						33		D 1 SM	3 3 3 (6)				
5						27		D 2 GW	10 10 12 (22)	4 to 12 feet: Well graded to poorly graded GRAVEL with sand, subrounded to angular, medium dense to dense, brown to gray, wet, homogenous, no HCL reaction. 5 feet: Medium dense, well graded GRAVEL with sand.			
2						67		D 3 GP	13 14 26 (40)	grades to dense, poorly graded GRAVEL with sand.			
10						33		D 4 GW	14 30 17 (47)	grades to well graded GRAVEL with sand.			
4						50		D 5 SM	22 15 10 (25)	12 to 42 feet: Silty fine to medium SAND, with occasional fine gravel, subrounded to angular, loose to medium dense, brown to reddish brown, wet, homogenous, no HCL reaction. 12 feet: Dense, silty SAND with gravel.			
15						50		D 6 SM	3 9 5 (14)	grades to medium dense.			
5						100		D 7 SM	2 2 3 (5)	grades to loose, silty SAND.			
20													

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90

Elevation 2493.8 ft (760.1 m)

HOLE No. CUL-012-07

Sheet 2 of 3

Project I 90 Snoqualmie Pass East

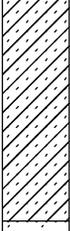
Driller Mike Harvey

Lic# 2599

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
							<u>33</u>	D 8 SM	3 2 3 (5)				
							<u>50</u>	D 9 SM	2 2 3 (5)				
7													
25													
8							<u>50</u>	D 10 SM	4 4 5 (9)				
30													
9							<u>80</u>	D 11 SM	5 5 6 (11)	grades to medium dense.			
35													
10							<u>87</u>	D 12 SM	3 4 6 (10)	grades to loose.			
40													
11							<u>100</u>	D 13 CL	1 2 3 (5)	42 to 48.5 feet: Lean CLAY, occasionally silty CLAY and SILT, soft to medium stiff, light gray to reddish brown, moist, medium plasticity, homogenous, occasionally laminated, no HCL reaction. 42 feet: Medium stiff, silty CLAY. 42.5 feet: grades to lean CLAY.			
12													
45													

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14														
							<u>100</u>		UD 14 ML					
							<u>100</u>		D 15	9 9 5 (14)	grades to soft SILT. PP=0.5 tsf.			
15											48.5 to 52 feet: Well graded silty or clayey SAND, with occasional gravel, subrounded to subangular, medium dense, gray, moist, homogenous, no HCL reaction.			
50														
16							<u>0</u>		D 16	50 for 0"	Bottom of boring at 52 feet depth below ground surface. Backfilled to mudline with bentonite.			
											Water level measurements: 7/12/07 at 06:50: 9.5 feet above mudline.			
55														
17														
18														
60														
19														
65														
20														
21														
70														

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No 33758613.04000 SR 90 Elevation 2529.5 ft (771.0 m)

HOLE No. CUL-013-07

Sheet 1 of 3

Project I 90 Snoqualmie Pass East

Driller Mike Harvey Lic# 2599

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang, Dave Nelson

Start August 28, 2007 Completion August 28, 2007 Well ID# Not Applicable Equipment Skid Mounted CME 45 w/autohammer

Station 1427+70.73 Offset 122.89'L Casing HW 15', HQ 41' Method Wet Rotary

Northing 1061362.22 Easting 1756546.16 Latitude 47°20'26.452"N Longitude 121°21'20.033"W

County Kittitas Subsection NW 1/4 of NW 1/4 Section 1 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0							100	B	B/C SM		0 to 2.5 feet: Silty SAND, angular, loose to medium dense, gray, dry to moist, homogenous, no HCl reaction.		
1											2.5 to 16.5 feet: Poorly graded to well graded GRAVEL with occasional cobbles, subangular to subrounded, dense, gray, wet, homogenous, no HCl reaction.		
5							10		D 1 GP	10 14 15 (29)	2.5 feet: Poorly graded GRAVEL with sand.		
10							20		D 2 GP	8 12 14 (26)			
							30		C 3 GW(C)		grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 4.5 inches.		
15							13		D 5 GM	7 6 6 (12)	16.5 to 38 feet: Poorly graded to well graded GRAVEL, occasionally silty GRAVEL, occasional cobbles, subangular to subrounded, loose to dense, gray, wet, homogenous, no HCl reaction.		
							57		C 5 GW(C)		16.5 feet: Medium dense, silty GRAVEL. 18 feet: grades to well graded GRAVEL with cobbles.		
20													

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7							20	D 6 GP	31 15 18 (33)	grades to dense, poorly graded GRAVEL with sand.			
25							57	C 7 GW		grades to well graded GRAVEL.			
8							0	D 8	5 5 4 (9)	grades to loose.			
9							43	C 9 GW(C)		grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 5 inches.			
30							67	D 10 GM	6 10 22 (32)	grades to silty GRAVEL with sand.			
10							71	C 11 GW(C)		grades to well graded GRAVEL with sand and cobbles. Maximum size of the cobbles encountered is 3.75 inches.			
35							80	D 12 GM	10 18 20 (38)	grades to dense, silty GRAVEL.			
12							100	C 13 CL		38 to 40.5 feet: Sandy Lean CLAY with gravel, very stiff, gray, wet, medium plasticity, homogenous, no HCl reaction. PP=2 tsf.			
40							60	D 14 GM	6 7 18 (25)	40.5 to 43 feet: Silty GRAVEL with sand, angular to subrounded, dense, reddish brown, wet, homogenous, no HCl reaction.			
13										Bottom of boring at 43 feet depth below ground surface. Backfilled to ground surface with bentonite chips.			
45										Water level measurements (below existing ground surface):			

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No 33758613.04000 SR 90

Elevation 2529.5 ft (771.0 m)

HOLE No. CUL-013-07

Sheet 3 of 3

Project I 90 Snoqualmie Pass East

Driller Mike Harvey

Lic# 2599

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14											8/28/07: 34.5 feet.			
15														
50														
16														
55														
17														
18														
60														
19														
65														
20														
21														
70														

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No 33758613.04000 SR 90 Elevation 2493.0 ft (759.9 m)

HOLE No. CUL-014-07

Sheet 1 of 2

Project I 90 Snoqualmie Pass East

Driller Mike Harvey Lic# 2599

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang, Bob Featherstone

Start July 11, 2007 Completion July 11, 2007 Well ID# Not Applicable Equipment CME45 Skid Mounted w/autohammer

Station 1427+73.78 Offset 59.68'R Casing HW, HQ Method Wet Rotary on Barge

Northing 1061170.821 Easting 1756525.466 Latitude 47° 20' 24.5616"N Longitude 121° 21' 20.2998"W

County Kittitas Subsection NW 1/4 of NW 1/4 Section 1 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										0 to 10 feet: Silty SAND with gravel to well graded GRAVEL with sand, angular to subrounded, medium dense to dense, brown to gray, wet, homogenous, no HCl reaction. 3 feet: Medium dense, silty SAND with gravel.			
1						53		D 1 SM/GW	5 6 8 (14)				
5													
2						47		D 2 GW	11 20 18 (38)	grades to dense, well graded GRAVEL with sand.			
10						47		D 3 SM	4 8 11 (19)	grades to medium dense, silty SAND with gravel.			
15													
3						67		D 4 SM	6 4 4 (8)	10 to 33 feet: Silty SAND with gravel, occasionally well graded GRAVEL with sand, occasionally SILT, angular to subrounded, loose to medium dense, wet, homogenous, no HCl reaction. 10 feet: Loose, silty SAND with gravel.			
4						67		D 5 SM	3 5 9 (14)	grades to medium dense.			
5						80		D 6 GW	7 8 10 (18)	grades to medium dense, well graded GRAVEL with sand.			
20						60		D 7 SM	4 5 9 (14)	grades to medium dense, silty SAND with gravel.			

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7														
25														
8														
9														
30														
10														
35														
11														
12														
40														
13														
45														

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08

grades to loose.

grades to very stiff, SILT to sandy SILT, low plasticity, low toughness, rapid dilatancy. PP=2.75 tsf
grades to silty SAND.
grades to stiff, SILT to sandy SILT, low plasticity, low toughness, rapid dilatancy. PP=1.25 tsf

33 to 39.5 feet: Andesite, dusky yellowish green, medium grained, fresh, strong rock (R4). No HCl reaction. Discontinuities are closely spaced and in poor condition.
CR=62 to 90%, RQD=60 to 71%, FF= 1.7 to 2.

Bottom of boring at 39.5 feet depth below ground surface. Backfilled to mudline with bentonite.

Water level measurements:
7/11/07 at 07:30: 11.1 feet above mudline.



LOG OF TEST BORING

Start Card _____

Job No 33758613.04000 SR 90 Elevation 2536.2 ft (773.0 m)

HOLE No. CUL-015-07(OW)

Sheet 1 of 2

Project I 90 Snoqualmie Pass East

Driller Bobby Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Tom Jackson

Start September 13, 2007 Completion September 13, 2007 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto hammer

Station 1440+56' Offset 150.98'L Casing HW, HQ Method Wet Rotary

Northing 1060767.59 Easting 1757760.13 Latitude 47°20'20.713"N Longitude 121°21'02.316"W

County Kittitas Subsection NW 1/4 of NW 1/4 Section 1 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										0 to 13 feet: Well graded GRAVEL with sand, subangular to subrounded, very dense to dense, gray, moist, homogenous, no HCl reaction. 5 feet: very dense.			
1													
5						<u>22</u>		D 1 GW	11 21 39 (60)				
2													
10						<u>33</u>		D 2 GW	15 15 22 (37)	grades to dense.			
3													
4													
15						<u>100</u>		D 3 SC	50 for 5"	13 to 27 feet: Clayey SAND with gravel, occasional silty gravel, subangular, very dense, gray, moist, homogenous, no HCl reaction.			
5													
6													
20													

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90 Elevation 2524.7 ft (769.5 m)

HOLE No. CUL-016-07

Sheet 1 of 2

Project I 90 Snoqualmie Pass East

Driller Bobby Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Tom Jackson

Start September 12, 2007 Completion September 12, 2007 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto hammer

Station 1440+50' Offset 10.26'R Casing HW, HQ Method Wet Rotary

Northing 1060662.34 Easting 1757637.97 Latitude 47°20'19.662"N Longitude 121°21'04.073"W

County Kittitas Subsection NW 1/4 of NW 1/4 Section 1 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0 - 4	0 - 1.2								GP(C/B)?		Drilling behavior indicated presence of cobbles and boulders between 0 and 4 feet.			
4 - 9	1.2 - 2.7								D 1 GC-GM	1 2 2 (4)	4 to 9 feet: Clayey/silty GRAVEL with sand, subangular, loose, brown, moist, homogenous, no HCl reaction.			
9 - 13	2.7 - 3.9								D 2 ML	3 1 3 (4)	9 to 13 feet: Sandy SILT with gravel, loose, dark brown, moist, homogenous, no HCl reaction.			
13 - 41.5	3.9 - 12.6								D 3 GM	23 13 32 (45)	13 to 41.5 feet: Well graded GRAVEL with sand to silty GRAVEL with sand, occasionally well graded SAND with gravel, subangular, dense to very dense, brown to gray, moist, homogenous, no HCl reaction. 13 feet: Dense, silty GRAVEL with sand.			

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
							18	D 4 GW	41 50 for 5"	grades to very dense, well graded GRAVEL with sand.			
7								C 4A					
25													
8							39	D 5 SW	9 16 17 (33)	grades to dense, well graded SAND with gravel.			
9													
30							33	D 6 GM	11 16 23 (39)	grades to dense, silty GRAVEL with sand.			
10													
35							50	D 7 GW	50 for 4"	grades to very dense, well graded GRAVEL.			
11													
40							0	D 8	50 for 0"				
12													
13										Bottom of boring at 41.5 feet depth below ground surface. Backfilled to ground surface with bentonite chips.			
45													

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No 33758613.04000 SR 90

Elevation 2529.1 ft (770.9 m)

HOLE No. CUL-017-07

Sheet 1 of 2

Project I 90 Snoqualmie Pass East

Driller Mike Harvey Lic# 2599

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang, Dave Nelson

Start August 30, 2007 Completion August 30, 2007 Well ID# Not Applicable Equipment Skid Mounted CME 45 w/autohammer

Station 1428+26 Offset 127.88'L Casing HW 6.5', HQ Method Wet Rotary

Northing 1061360.37 Easting 1756605.97 Latitude 47°20'26.440"N Longitude 121°21'19.165"W

County Kittitas Subsection NW 1/4 of NW 1/4 Section 1 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 14 feet: Poorly graded to well graded GRAVEL with sand, with occasional boulders, angular to subrounded, dense, gray, wet, homogenous, no HCl reaction. 5.5 feet: Poorly graded GRAVEL with sand.			
1														
5														
2						20			D 1 GP	9 12 29 (41)				
3						42			C 2 GW(B)		grades to well graded GRAVEL with boulders.			
10														
4						30			D 3 GP	4 4 21 (25)	grades to poorly graded GRAVEL.			
15						86			C 4 GW/GC					
5											14 to 40 feet: Well graded to poorly graded GRAVEL with sand, occasional silty GRAVEL and clayey GRAVEL, occasional cobbles, angular to subrounded, medium dense to very dense, gray to brown, wet, homogenous, no HCl reaction. 14 feet: Clayey GRAVEL/well graded GRAVEL with sand.			
6						30			D 5 GC	7 7 10 (17)	grades to well graded GRAVEL. grades to medium dense, clayey GRAVEL.			
20						43			C 6 GW		grades to well graded GRAVEL.			

DRAFT ROCKN BOR NGS -90-10082007 GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90

Elevation 2529.1 ft (770.9 m)

HOLE No. CUL-017-07

Sheet 2 of 2

Project I 90 Snoqualmie Pass East

Driller Mike Harvey

Lic# 2599

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7										grades to very dense, poorly graded GRAVEL with sand.			
								D 7 GP	37				
								C 8 GW	50 for 6" (>50)				
25										grades to well graded GRAVEL.			
8													
								D 9 GP	14				
								C 10 GW(C)	8				
									6				
									(14)				
30										grades to medium dense, poorly graded GRAVEL.			
9										grades to well graded GRAVEL with cobbles.			
								D 11 GP	14				
								C 12 GW(C)	8				
									6				
									(14)				
35										grades to very dense, poorly graded GRAVEL.			
10										grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 4 inches. A 4 inch thick lense of silt was encountered in this sample.			
								D 13 GP	50 for 3" (>50)				
								C 14 GW(C)					
40										grades to poorly graded GRAVEL.			
11													
								D 15 SP	21				
									42				
									48				
									(90)				
41										grades to well graded GRAVEL with sand and cobbles. Maximum size of the cobbles encountered is 5 inches.			
12													
42										40 to 41 feet: Poorly graded fine SAND, very dense, gray, moist, no HCl reaction.			
13										41 to 41.5 feet: Possible bedrock. Silty GRAVEL with sand, angular, very dense, gray, moist, homogenous, No HCl reaction.			
										Bottom of boring at 41.5 feet depth below ground surface. Backfilled to ground surface with bentonite chips.			
										Water level measurements (below existing ground surface):			
										8/30/07 at 13:40: 29.9 feet.			
45													

DRAFT ROCKN BOR NGS -90-10082007 GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No 33758613.04000 SR 90 Elevation 2495.5 ft (760.6 m)

HOLE No. CUL-018-07

Sheet 1 of 2

Project I 90 Snoqualmie Pass East

Driller Bobby Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Tom Jackson

Start September 11, 2007 Completion September 11, 2007 Well ID# Not Applicable Equipment CME 45 (skid rig) w/autohammer

Station 1428+37 Offset 29.66'R Casing HW, HQ Method Wet Rotary

Northing 1061202.76 Easting 1756595.9 Latitude 47°20'24.883"N Longitude 121°21'19.286"W

County Kittitas Subsection NW 1/4 of NW 1/4 Section 1 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										0 to 13 feet: Well graded GRAVEL or silty GRAVEL with sand, subangular, dense, bluish gray, moist to dry, homogenous, no HCl reaction. 5 feet: Well graded GRAVEL with sand.			
1													
5						<u>33</u>		D 1 GW	30 15 30 (45)				
2													
10						<u>67</u>		D 2 GM	11 13 19 (32)	grades to silty GRAVEL with sand.			
3													
4													
15						<u>67</u>		D 3 SM	7 5 6 (11)	13 to 28 feet: Silty SAND with or without gravel, medium dense, light brown, moist, homogenous, no HCl reaction. 13 feet: Silty SAND with gravel.			
5													
6													
20													

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
							<u>72</u>	D 4 SM	14 13 8 (21)				
7													
25							<u>83</u>	D 5 SM	8 10 11 (21)	grades to silty SAND.			
8													
										28 to 40 feet: Sandy SILT with or without gravel, medium dense, gray, moist, homogenous, no HCl reaction. 28 feet: Sandy SILT.			
30							<u>83</u>	D 6 ML	1 2 22 (24)				
9													
35							<u>33</u>	D 7 ML	5 7 9 (16)	grades to sandy SILT with gravel.			
10													
40							<u>0</u>	D 8	50 for 0"	Bottom of boring at 40 feet depth below ground surface. Backfilled to ground surface with bentonite chips.			
11													
45													
12													
13													

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



Start Card S 26190

Job No XL-2779 SR I 90 Elevation ft

HOLE No CUL-019-10

Sheet 1 of 3

Project I 90 Snoqualmie Pass East Phase 2

Driller Wason, James Lic# 2941T

Site Address I 90 to snowqualmie pass

Inspector Cooper, Kerry #2552

Start May 10, 2010 Completion May 11, 2010 Well D# _____ Equipment CME 45 (9C4 2) AH

Station 0. Offset 0. Hole Dia 4 (inches) Method Mud Rotary

Northing 732547.00 Easting 1429443.00 Collected by _____ Datum _____

County Kittitas Subsection NE1/4 of NW1/4 Section 1 Range 11ewm Township 21

Depth (ft)	Elevation (ft)	Profile	Field SPT (N)				Blows/6" (N) and/or RQD FF	Sample Type	Sample No (Tube No)	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
5 10 15 20													
						3 23 20 (43)	D-1			S ty GRAVEL, subangular, dense, Brown, dry, homogenous, HC not tested. Length Recovered:0.5 ft. Length Retained:0.5 ft.			
						>>	D-2			S ty GRAVEL, subangular, very dense, Brown, dry, homogenous, HC not tested. Length Recovered:0.2 ft. Length Retained:0.2 ft.			
						10 8 15 (23)	D-3			S ty GRAVEL, subangular, medium dense, Brown, wet, homogenous, HC not tested. Length Recovered:0.5 ft. Length Retained:0.5 ft.			
							C-4			ANDESITE, Gray, fine grained, slightly weathered, strong rock. Discontinuities are moderately spaced and in good condition. Recovered:100% RQD:100 FF:1			
							C-5			ANDESITE, Gray, fine grained, slightly weathered, strong rock. Discontinuities are moderately spaced and in good condition. Recovered:70% RQD:70 FF:1			
						11 12 8 (20)	D-6			S ty GRAVEL, subangular, medium dense, Gray, wet, homogenous, HC not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.			
							C-7			No Recovery			
						8 10 12 (22)	D-8			S ty GRAVEL, subangular, medium dense, Gray, wet, homogenous, HC not tested. Length Recovered:1.1 ft. Length Retained:1.1 ft.			
						C-9			S ty GRAVEL, subangular, Gray, wet, HC not tested.				

SOLA XL-2779 -90 SNOQUALMIE PASS EAS HYAH O KEECHELUS DAM/GPJ SOL GD 9/22/10



Depth (ft)	Elevation (ft)	Profile	Field SPT (N)				Blows/6" (N) and/or RQD FF	Sample Type	Sample No (Tube No)	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
50			RQD						C-15		ANDESITE, Gray, medium grained, slightly weathered, strong rock. Discontinuities are closely spaced and in good condition. Recovered:97% RQD:88 FF:1		
55										The reported accuracy of the borehole location information displayed on this boring log is typically submeter (X,Y) when collected by the HQ Geotech Division and subcentimeter (X,Y,Z) when collected by the Region Survey Crew.			
60										End of test hole boring at 50 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field observations and laboratory test data. Note: REF = SPT Refusal			
65													
70													

SO LA XL-2779 -90 SNOQUALMIE PASS EAST HYAH O KEECHELUS DAM GPJ SO L GD 9/22/10



LOG OF TEST BORING

Start Card _____

Job No 33761951.00008 SR 90 Elevation 2530.5 ft (771.3 m)

HOLE No. CUL-020-10

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Dennis Dunn

Start July 15, 2010 Completion July 16, 2010 Well ID# Not applicable Equipment CME 45 (Skid rig) with auto hammer

Station _____ Offset _____ Casing _____ Method Wet Rotary

Nor hing 1060757.92 Easting 1757689.52 Latitude 47°20'20.61"N Longitude 121°21'03.33"W

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 21.0 feet: poorly to well graded GRAVEL with sand, occasional silt, cobbles and boulders, occasionally silty SAND, subangular to angular, medium dense to very dense, brown, greenish gray or gray, wet, homogenous, no HCl reaction.			
5							50		D-1 SM	2 1 50/5" (>50)	5 feet: Very dense, silty SAND.			
10							50		D-2 GP	6 50/4" (>50)	grades to poorly graded GRAVEL with sand.			
15							50		D-3 GP	7 50 (50)	grades to poorly graded GRAVEL with cobbles and boulders.			
20							100		C-4 GP(C/B)					

DRAFT ROCKN BORINGS & TESTPITS 2010.GPJ 9/14/10



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90

Elevation 2530.5 ft (771.3 m)

HOLE No. CUL-020-10

Sheet 3 of 3

Project I-90 Snoqualmie Pass East

Driller Robert Haller

Lic# 2779

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14							100		C-12		PLT - Moderately strong (R3) rock.			
15											PLT - Moderately strong (R3) rock.			
50												PLT - Moderately weak (R2) rock.		
16											PLT - Moderately strong (R3) rock.			
55											Bottom of boring at 51.0 feet depth below the ground surface. Backfilled to ground surface with bentonite chips.			
17														
18														
60														
19														
65														
20														
21														
70														



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90 Elevation 2524.7 ft (769.5 m)

HOLE No. CUL-021-10

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start September 22, 2010 Completion September 22, 2010 Well ID# Not applicable Equipment CME 45 (Skid rig) with auto hammer

Station _____ Offset _____ Casing _____ Method Wet Rotary

Northing 1061717.85 Easting 1756660.88 Latitude 47°20'29.97"N Longitude 121°21'18.42"W

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										0 to 42.0 feet: Poorly to well graded GRAVEL with cobbles, silty GRAVEL with sand, Silty SAND with gravel, poorly graded SAND with gravel, subangular to subrounded, loose to very dense, gray to brown, moist to wet, homogenous, no HCl reaction.			
1						77		C-2 GP(C)			2.0 feet: Poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 8 inches.		
5						20		D-3 GM	4 2 8 (10)	grades to loose, silty GRAVEL with sand.			
2						89		C-4 GW(C)		grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 7.25 inches.			
10						72		C-5 GW(C)		Maximum size of the cobbles encountered is 4.5 inches.			
4													
15						60		D-6 SW	13 38 29 (67)	grades to very dense, well graded SAND with gravel.			
5						80		C-7 GW(C)		grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 9.5 inches.			
20													



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90

Elevation 2524.7 ft (769.5 m)

HOLE No. CUL-021-10

Sheet 2 of 3

Project I-90 Snoqualmie Pass East

Driller Robert Haller

Lic# 2779

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
									D-8 SM	48 19 38 (57)	grades to silty SAND with gravel.			
									C-9 GW(C)		grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 7 inches.			
7														
25									D-10 SM	30 50/4" (>50)	grades to silty SAND with gravel.			
8									C-11 GW(C)		25.8 feet: grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 8 inches. Note: Light gray, moist, hard to very stiff sandy silt was encountered between 26.6 and 26.8 feet depth below the ground surface.			
30									D-12 SP	21 21 23 (44)	grades to poorly graded SAND with gravel.			
									C-13 GW		grades to well graded GRAVEL.			
10														
35									D-14 SM	24 44 50/3" (>50)	grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 7 inches.			
11									C-15 GW(C)					
40									D-16 SM C-17A GW(C)	50/6" (>50)	grades to silty SAND. 40.5 feet: grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 6 inches.			
									C-17B		42.0 to 50.0 feet: Andesite, gray to greenish gray, fine grained, fresh, moderately strong (R3). Discontinuities are closely to very closely spaced and in fair to poor condition. No HCl reaction. (CR - 100%, RQD - 30 to 57%, FF - 2.6 to 3) 42.0 feet: Gray rock.			
13														
45														

DRAFT ROCKN BORINGS & TESTPITS 2010.GPJ 2/11/11



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90

Elevation 2524.7 ft (769.5 m)

HOLE No. CUL-021-10

Sheet 3 of 3

Project I-90 Snoqualmie Pass East

Driller Robert Haller

Lic# 2779

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14											grades to gray to greenish gray rock.			
15														
50														
											Bottom of boring at 50.0 feet depth below the ground surface. Backfilled to ground surface with bentonite chips. No groundwater measurements were taken.			
16														
55														
17														
18														
60														
19														
65														
20														
21														
70														



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90 Elevation 2525.2 ft (769.7 m)

HOLE No. CUL-022-10

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start September 23, 2010 Completion September 24, 2010 Well ID# Not applicable Equipment CME 45 (Skid rig) with auto hammer

Station _____ Offset _____ Casing _____ Method Wet Rotary

Northing 1061728.66 Easting 1756697.11 Latitude 47°20'30.08"N Longitude 121°21'17.90"W

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0							100	D-1 GM	10 12 11 (23)	0 to 43.0 feet: Silty GRAVEL with sand, well graded to poorly graded GRAVEL with sand and cobbles and occasional boulders, well graded to poorly graded SAND with gravel or silty SAND with gravel, angular to subangular, medium dense to very dense, gray, greenish gray or brownish gray, moist to wet, homogenous, no HCl reaction. 0 feet: Medium dense, silty GRAVEL with sand.			
5							67	D-2 GM	15 17 28 (45)	grades to dense.			
2							74	C-3 GW(C/B)		grades to well graded GRAVEL with cobbles and boulders. Maximum size of the boulders encountered is 14 inches.			
10							50	D-4 GW	16 11 17 (28)				
4							54	C-5 GW(C/B)		Maximum size of the boulders encountered is 12 inches.			
15							80	D-6 SW	24 21 25 (46)	grades to well graded SAND with gravel.			
20							48	C-7 GW(C)		grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 4 inches.			

DRAFT ROCKN BORINGS & TESTPITS 2010.GPJ 2/11/11



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7							60		D-8 SP	20 15 40 (55)	grades to poorly graded SAND with gravel.			
25							86		C-9 GW(C)		grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 5 inches.			
8							33		D-10 SP	12 27 25 (52)	grades to poorly graded SAND with gravel.			
9							100		C-11 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 7 inches.			
30							0 60		D-12 C-13 GP(C)	50/4" (>50)	grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 7.5 inches.			
10							52		C-14 GP(C)		Maximum size of the cobbles encountered is 7 inches.			
35							100 6		D-15 C-16A SP	50/4" (>50)	grades to silty SAND. grades to poorly graded SAND with gravel.			
11							100 2.7		C-16B		43.0 to 51.0 feet: Andesite, fine to coarse grained, fresh, very weak (R1) to moderately strong (R3). Discontinuities are closely to very closely spaced and in very poor to fair condition. No HCl reaction. (CR - 100%, RQD - 27 to 66%, FF - 1.8 to 2.7)			
40														
12														
40														
13														
45														

DRAFT ROCKN BORINGS & TESTPITS 2010.GPJ 2/11/11



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90

Elevation 2525.2 ft (769.7 m)

HOLE No. CUL-022-10

Sheet 3 of 3

Project I-90 Snoqualmie Pass East

Driller Robert Haller

Lic# 2779

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14												43.0 feet: Fine to medium grained, very weak (R1) to moderately weak (R2) rock. Discontinuities are closely to very closely spaced and in poor to very poor condition. 46.0 feet: grades to fine to coarse grained, moderately weak (R2) to moderately strong (R3) rock. Discontinuities are closely and in very poor to fair condition. Note: Gray, medium stiff, wet, low plasticity SILT was encountered between 46.3 and 46.6 feet depth below the ground surface.		
50														
16												Bottom of boring at 51.0 feet depth below the ground surface. Backfilled to ground surface with bentonite chips. Groundwater was measured at 22.6 feet below the ground surface on 9/23/2010 at 10:00. This water level may be unstable.		
55														
17														
18														
60														
19														
65														
20														
21														
70														



LOG OF TEST BORING

Start Card _____

Job No 33758613.04000 SR 90 Elevation 2547.7 ft (776.5 m)

HOLE No. EMB-020-07

Sheet 1 of 2

Project I 90 Snoqualmie Pass East

Driller Bobby Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Tom Jackson

Start September 18, 2007 Completion September 18, 2007 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto hammer

Station 1332+07.12 Offset 41.97'R Casing HW, HQ Method Wet Rotary

Northing 1068696.307 Easting 1752444.97 Latitude 47°21'38.380"N Longitude 121°22'20.749"W

County Kittitas Subsection SW 1/4 of SE 1/4 Section 26 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 26 feet: Well graded to poorly graded GRAVEL with sand, occasional silty GRAVEL, silty SAND, with occasional cobbles, subrounded to subangular, very loose to dense, gray to brown, wet, homogenous, no HCl reaction.			
1														
5									D 1 GW	11 10 8 (18)	Medium dense, well graded GRAVEL with sand.			
2														
10									C 2 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 7 inches.			
3														
15									C 3 GP(C)					
4														
5									D 4 SM	3 1 1 (2)	grades to very loose, silty SAND.			
20									C 5 GW(C)		grades to well graded GRAVEL with cobbles.			

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90

Elevation 2547.7 ft (776.5 m)

HOLE No. EMB-020-07

Sheet 2 of 2

Project I 90 Snoqualmie Pass East

Driller Bobby Haller

Lic# 2779

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7							<u>44</u>		D 6 GM	0 20 15 (35)	grades to dense, silty GRAVEL with sand.			
25							<u>100</u>		C 7 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 4 inches.			
8											Bottom of boring at 26 feet depth below ground surface. Backfilled to ground surface with bentonite chips.			
9														
30														
10														
35														
11														
40														
12														
45														
13														

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No 33758613.04000 SR 90 Elevation 2540.6 ft (774.4 m)

HOLE No. EMB-021-07

Sheet 1 of 1

Project I 90 Snoqualmie Pass East

Driller Robert Walker Lic# 2864T

Drilling Contractor WSDOT Field Exploration Unit

Inspector Tom Jackson

Start October 16, 2007 Completion October 16, 2007 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto hammer

Station 1331+80.36 Offset 54.53'L Casing HW, HQ Method Wet Rotary

Northing 1068765.19 Easting 1752517.62 Latitude 47°21'39.067"N Longitude 121°22'19.705"W

County Kittitas Subsection SW 1/4 of SE 1/4 Section 26 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0	0						25				0 to 4 feet: Well graded GRAVEL.			
4	4						100		C 1A		4 to 10 feet: Lapilli Tuff, olive gray, medium grained, slightly weathered, strong rock (R4). CR= 100%, RQD=80 to 100%.			
10	10						100		C 2		Bottom of boring at 10 feet depth below ground surface. Backfilled to ground surface with bentonite chips.			

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90 Elevation 2493.8 ft (760.1 m)

HOLE No. EMB-022-07

Sheet 1 of 2

Project I 90 Snoqualmie Pass East

Driller Bobby Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Tom Jackson

Start October 9, 2007 Completion October 10, 2007 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto hammer

Station 1431+71.59 Offset 32.67'R Casing HW, HQ Method Wet Rotary

Northing 1061123.34 Easting 1756914.07 Latitude 47°20'24.134"N Longitude 121°21'14.655"W

County Kittitas Subsection NE 1/4 of NW 1/4 Section 1 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										0 to 18 feet: Well graded silty GRAVEL with sand, subrounded to subangular, medium dense to dense, gray, moist, homogenous, no HCl reaction.			
1													
5													
2							<u>78</u>		<u>D 1</u> GM	8 10 13 (23)	Medium dense, silty GRAVEL with sand.		
10							<u>68</u>		<u>D 2</u> GM	22 22 23 (45)	grades to dense.		
15							<u>56</u>		<u>D 3</u> GM	9 8 8 (16)	grades to medium dense.		
18											18 to 32 feet: Well graded SAND with gravel to silty SAND with gravel, loose to very dense, brown, moist, homogenous, no HCl reaction.		
20.5											20.5 feet: Loose, well graded SAND with gravel.		
20													

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7							<u>78</u>		D 4 SW	4 4 4 (8)			
25	8						<u>44</u>		D 5 SW	8 6 9 (15)	grades to medium dense.		
30	9						<u>56</u>		D 6 SM	41 22 50 for 4"	grades to very dense, poorly graded silty SAND with gravel.		
10											Bottom of boring at 32.0 feet depth below ground surface. Backfilled to ground surface with bentonite chips.		
35	11												
40	12												
45	13												



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90 Elevation 2530.4 ft (771.3 m)

HOLE No. EMB-023-07

Sheet 1 of 3

Project I 90 Snoqualmie Pass East

Driller Mike Harvey Lic# 2599

Drilling Contractor WSDOT Field Exploration Unit

Inspector Suren Balendra

Start September 20, 2007 Completion September 20, 2007 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto hammer

Station 1430+99 Offset 169.86'L Casing HW, HQ Method Wet Rotary

Northing 1061339.13 Easting 1756904.81 Latitude 47°20'26.262"N Longitude 121°21'14.823"W

County Kittitas Subsection NE 1/4 of NW 1/4 Section 1 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										0 to 2 feet: Topsoil Silty SAND with gravel			
1										2 to 8 feet: Poorly graded GRAVEL with sand, subrounded, very dense, black, moist, no HCl reaction.			
5						<u>72</u>		D 1 GP	22 23 18 (52)				
2										8 to 29 feet: Well graded silty GRAVEL with or without sand, subrounded to subangular, medium dense, dark brown, wet to moist, homogenous, no HCl reaction. 10 feet: Silty GRAVEL.			
10						<u>28</u>		D 2 GM	4 14 10 (24)				
4										grades to silty GRAVEL with sand.			
15						<u>31</u>		D 3 GM	4 7 8 (15)				
5													
20													

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90

Elevation 2530.4 ft (771.3 m)

HOLE No. EMB-023-07

Sheet 3 of 3

Project I 90 Snoqualmie Pass East

Driller Mike Harvey

Lic# 2599

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14							<u>38</u>		D 9 GP	18 50 for 2"				
15														
50							<u>0</u>		D 10 GP	50 for 4"				
16														
55							<u>0</u>		D 11 GP	50 for 5"				
17														
18														
60							<u>90</u>		D 12 SM	25 50 for 4"		57 to 61 feet: Well graded silty SAND with gravel, subrounded, very dense, gray, wet, homogenous, no HCl reaction.		
19												Bottom of boring at 61 feet depth below ground surface. Backfilled to ground surface with bentonite chips.		
65												Water level measurements (below existing ground surface): 7/20/07 at 16:30: 10.2 feet.		
20														
21														
70														

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No 33758613.04000 SR 90 Elevation 2524.2 ft (769.4 m)

HOLE No. EMB-024-07

Sheet 1 of 3

Project I 90 Snoqualmie Pass East

Driller Bobby Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Tom Jackson

Start October 10, 2007 Completion October 11, 2007 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto hammer

Station 1450+53 Offset 17.37 'R Casing HW, HQ Method Wet Rotary

Northing 1059835.28 Easting 1758202.18 Latitude 47°20'11.561"N Longitude 121°20'55.754"W

County Kittitas Subsection SW 1/4 of NE 1/4 Section 1 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										0 to 11 feet: Silty GRAVEL with sand, subangular, medium dense, gray, moist, homogenous, no HCl reaction.			
1													
5													
2						39		D 1 GM	2 11 9 (20)				
10													
3						11		D 2 ML	2 7 6 (13)	11 to 25 feet: Sandy SILT with gravel, very loose to medium dense, brown to gray, moist, homogenous, no HCl reaction. 11 feet: Medium dense.			
4													
15													
5						94		D 3 ML	0 0 4 (4)	grades to very loose.			
20													

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7													
25													
8													
30													
9													
35													
10													
35													
11													
40													
12													
45													
13													

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08

grades to medium dense.

25 to 52.7 feet: Silty GRAVEL with sand to silty SAND with gravel, occasional SILT and well graded SAND, subangular to subrounded, medium dense to very dense, gray to brown, moist, homogenous, no HCl reaction. 25 feet: Medium dense, silty GRAVEL with sand.

grades to very dense. grades to poorly graded GRAVEL.

grades to very dense, silty SAND with gravel.



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14														
15														
50														
16									D 12 ML	50 for 4"	grades to very dense, sandy SILT.			
16									D 13 SW	32	grades to very dense, well graded SAND with lenses of silty sand.			
16									C 14	50 for 2"	52.7 to 59 feet: Andesite?, coarse grained, moderately weathered. CR=83 to 100%, RQD=56 to 83%.			
55														
17														
17														
18									C 15					
18														
60											Bottom of boring at 59 feet depth below ground surface. Backfilled to ground surface with bentonite chips.			
19														
65														
20														
21														
70														

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No 33758613.04000 SR 90 Elevation 2546.5 ft (776.2 m)

HOLE No. EMB-025-07

Sheet 1 of 1

Project I 90 Snoqualmie Pass East

Driller Bobby Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Tom Jackson

Start October 15, 2007 Completion October 15, 2007 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto hammer

Station 1450+09 Offset 171.96' L Casing HW, HQ Method Wet Rotary

Northing 1059977.92 Easting 1758334.43 Latitude 47°20'12.982"N Longitude 121°20'53.856"W

County Kittitas Subsection SW 1/4 of NE 1/4 Section 1 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 7 feet: Silty GRAVEL with sand, subangular, very dense, gray, moist, stratified, no HCl reaction.			
1														
5														
2							100		D 1	23	50 for 6"			
							100		C 2			7 to 16 feet: Andesite?, bluish gray, fine grained, slightly to highly weathered. No HCl reaction. Discontinuities are closely spaced. CR=100%, RQD=50 to 100%. 7 feet: highly weathered rock.		
10							100		D 3					
							100		C 4		50 for 4"	grades to slightly weathered.		
15														
5														
16												Bottom of boring at 16 feet depth below ground surface. Backfilled to ground surface with bentonite chips.		
20														

DRAFT ROCKN BOR NGS - 90-10082007 GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No 33758654.00009 SR 90 Elevation 2479.2 ft (755.6 m)

HOLE No. EMB-027-09

Sheet 1 of 3

Project I 90 Snoqualmie Pass East

Driller Richard Cooper Lic# 2964T

Drilling Contractor _____

Inspector Ken Yang

Start June 17, 2009 Completion June 17, 2009 Well ID# Not applicable Equipment CME 45 (Barge rig) with auto hammer

Station 1450+55 Offset 125.5 R Casing HWT 10', HQ 51' Method Wet Rotary

Northing 1059781.58 Easting 1758122.49 Latitude _____ Longitude _____

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										0 to 20 feet: Silty SAND or poorly graded SAND with gravel, subrounded to angular, medium dense to dense, brownish gray to gray, wet, homogenous, no HCl reaction.			
1													
5							<u>47</u>	 D 1 SM	11 11 15 (25)	5 feet: Dense, silty SAND with fine gravel.			
2													
10							<u>40</u>	 D 2 SP	5 5 6 (11)	grades to medium dense, poorly graded SAND with gravel.			
3													
15							<u>50</u>	 D 3 SM	6 9 31 (40)	grades to dense, silty SAND with fine gravel.			
4													
5													
20													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7							80		D 4 GW (B) C 6 GM (C/B)	50/3" (>50)	20.0 to 31.0 feet: Well graded GRAVEL with sand or silty GRAVEL with sand, occasional cobbles and boulders, occasional silty SAND with fine gravel, angular to subangular, dense to very dense, greenish gray to gray, wet, homogenous, no HCl reaction. 20.0 feet: Very dense, well graded GRAVEL with sand. 20.2 feet: grades to well graded GRAVEL with boulders. Maximum size of the boulder encountered is 1.8 feet long. 21 feet: grades to silty GRAVEL with cobbles and boulders. Maximum size of the boulders encountered is 17 inches.			
8							96		C 7 GM		grades to dense, silty SAND with fine gravel. grades to silty GRAVEL with sand (cemented).			
9							98 44		C 8		31.0 to 51.0 feet: Sandstone?, gray to dark gray, fine grained, fresh, very weak (R1) to strong (R4). Discontinuities are very closely to medium spaced and in very poor to fair condition. (CR = 70 to 100%, RQD = 18 to 56%, FF = 2.0 to 4.4) 31.0 feet: very weak (R1) to moderately weak (R2) rock. Discontinuities are very closely to closely spaced and in very poor to poor condition. 32.5 feet: PLT: very weak (R1) rock.			
10							94 30		C 9		grades to very weak (R1) to strong (R4) rock. Discontinuities are very closely to medium spaced and in very poor to fair condition. PLT: very weak (R1) rock.			
11							100 24		C 10		PLT: moderately strong (R3) rock. grades to moderately strong (R3) to strong (R4) rock. Discontinuities are closely to medium spaced and in poor to fair condition.			
12											PLT: moderately strong (R3) rock.			
13														
45														

DRAFT ROCKN BOR NGS & TESTP TS 2009 GPJ 9/14/10



LOG OF TEST BORING

Start Card _____

Job No 33758654.00009 SR 90

Elevation 2479.2 ft (755.6 m)

HOLE No. EMB-027-09

Sheet 3 of 3

Project I 90 Snoqualmie Pass East

Driller Richard Cooper

Lic# 2964T

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14									C 11		grades to moderately weak (R2) to moderately strong (R3) rock. Discontinuities are very closely to closely spaced. PLT: moderately weak (R2) rock.			
15														
50														
16											Bottom of boring at 51.0 feet below the mudline. Backfilled to ground surface with bentonite chips.			
17											Lake level measurements: 06/17/2009 at 10:00: 37 feet above the mudline.			
55														
18														
60														
19														
65														
20														
21														
70														

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. 90 Section LK _____ SHOW SHED V.I.C. Job No. L-3397
Hole No. H-1 Sub Section SOIL INVESTIGATIONS Cont. Sec. 1901
Station \checkmark 28720 100' 244' 12" Offset \checkmark Ground El. \checkmark 2' 18" 1
Type of Boring WASH BORE - BLAST - CORE Casing 3" X 83' 6" W.T. El. \checkmark
Inspector E.E. DUNN Date 9 Nov - 21 Nov 1973 Sheet 1 of 5

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL	
	45	↑	1 ↑ STD. 20 ↑ PEN.	LAVIS - GRAVEL, COBBLES, BOULDERS, ROCK	
			25 ↓ 32 ↓	FRAGMENTS, MIXED WITH SAND & SILT, BROWN, MOIST	
				SOFTER - MOSTLY COARSE SAND OR ROCK	
				FRAGMENTS & PARTICLES, SILTY, SCATTERED	
5				GRAVEL COBBLES OCCASIONAL BOULDER	
	18			16 ↑ STD. 11 ↑ PEN.	BROWN, WET (DISPLACES FBSP)
				7 ↓ 6 ↓	2 CALL SIZES GRAVEL, COBBLES, BOULDERS ON SURFACE
					LOST ALL WATER
10	100 / 6"			100 ↓ STD. PEN. 3	D#3 ON COBBLE OR BOULDER 11" BLAST 2 STICKS 60% 8' X 1 1/8"
15	7			6 ↑ STD. 3 ↑ PEN.	
			7 ↓ 6 ↓	4	
20					

Hole No. H-1

Sub Section SOIL INVESTIGATIONS

Sheet 2 of 5

DEPTH	BLOWS PER FT	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
	15		8 ↑ STD. PEN. 9 ↓ 5	COARSE SAND, OR ROCK FRAGMENTS PARTICLES SILTY, SCATTERED GRAVEL, COBBLES, OCCASIONAL BOULDER, BROWN WET
25	47		6 ↑ STD. PEN. 20 ↑ STD. PEN. 27 ↓ 6 25 ↓ 6	D 6 PAST COBBLE OR BOULDER
30	12		7 ↑ STD. PEN. 6 ↑ STD. PEN. 6 ↓ 7 6 ↓ 7	
35	13		6 ↑ STD. PEN. 4 ↑ STD. PEN. 9 ↓ 8 10 ↓ 8	
40	9		6 ↑ STD. PEN. 4 ↑ STD. PEN. 5 ↓ 9 14 ↓ 9	
45				

Hole No. H-1 Sub Section SOIL INVESTIGATIONS Sheet 3 of 5

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
	63		40 ↑ STD. 42 ↑ PEN.	# D 10 PAST COBBLE OR BOULDER
			21 ↓ 40 ↓ 10	45' 6" BLAST 2 STICKS 60% 8" X 1 1/8"
50	7		7 ↑ STD. 3 ↑ PEN.	
			4 ↓ 6 ↓ 11	CLAYEY SILT IN BIT, BROWN, DAMP
				LOST ALL WATER 0' TO 52'
55	12			52' TO 54' NEAR ALL WATER BACK; 54' LOST ALL
			4 ↑ STD. 4 ↑ PEN.	COARSE SAND OR ROCK FRAGMENTS & PARTICLES,
			8 ↓ 10 ↓ 12	SILTY, SCATTERED GRAVEL, COBBLES, OCCASIONAL BOULDER, BROWN, WET
60	25		19 ↑ STD. 13 ↑ PEN.	
			12 ↓ 12 ↓ 13	
65	18		10 ↑ STD. 11 ↑ PEN.	
			7 ↓ 8 ↓ 14	69' VERY DENSE, TIGHTLY PLACED, APPEARS CEMENTED, SANDY TILL, GRAVEL, COBBLES BOULDERS, GRAY
70				69' COBBLE OR BOULDER BLAST 3 STICKS 60%

Hole No. H-1 Sub Section SOIL INVESTIGATIONS Sheet 4 of 5

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL
				VERY DENSE, TIGHTLY PLACED, APPEARS CEMENTED, SANDY TILL, GRAVEL, COBBLES, BOULDERS, GRAY
				72' HIT BOULDER
75	140 / 3"		140 # STD PEN. 13	73' BLAST 3 STICKS STICKS 60%
				79' " " " "
				80' " " " "
				FROM 75' MOST WATER RETURN
80	200 / 1"		200 # STD PEN. 16	
	250 / 5"		250 # STD PEN. 17	<i>bedrock</i>
85			REC. CORE 18	BEDROCK - RICHERS RICHERS HANDSITE
			REC. CORE 19	
90			REC. CORE 20	
			REC. CORE 21	
95			REC. CORE 22	

H-1-77

I. F. 26.66 (Rev. 5-67)

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. 90 Section Lake Knochelw Sno-Shed Vic. Job No. 4580
 Hole No. H-1 Sub Section Slope Stabilization Ret. Wall Cont. Sec. 1901
 Station _____ Offset _____ Ground El. _____
 Type of Boring Wash Bore + Coring Casing NX - 25.0' W.T. El. Note Bottom of Log
 Inspector Donald L. Nelson Date Nov. 4, 1977 Sheet 1 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
				TALUS - ALL SIZE ROCK FRAGMENTS -
				SILTY ANDESITE SAND ANGULAR
				WEATHERED - TREE ROOTS THROUGH
				MATERIAL - OPEN VOIDS - 100%
5				WATER LOSS AT 18.0'
	135/16"		135 ↓ STD. PEN.	DRIVE BETWEEN TWO ROCK FRAGMENTS
			1	STD. PEN. #1
10				
	12		7 ↑ STD. PEN.	
			5	
			7 ↓ 2	
			20	
				BLAST 1 Tube Kinopak 2" x 9" 15.0'
				" " " " 16.0'
15			↑ C	" " " " 20.5'
			0	
			R	
			E	
			65%	
			Rec. 3	STD. PEN. #4 Drive BETWEEN ROCK FRAGMENTS
	115/19"		65 * STD. PEN.	
			50/31 ↓ PEN.	
			4	
			↑ STD.	ALPINE TILL - SANDY SILTY CLAY - ALL SIZE
20	62		48	
			30 PEN.	
			32	ROCK FRAGMENTS - Brown - Very Dense

Hole No. H-1 Sub Section Slope Stabilization Ret. Wall Sheet 2 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
			50 ↓	
25	50/8"	X	STD. PEN. 6 10" ↑ PEN. 6 20% 50" 80% REC. 7	ANDESITE - Moderately f. H. S. ALY FRACTURED - Large CRACK 27.0' to 27.5'
			X	STD. PEN. 8 27.5' to 28.5' 66/6" - 80/6"
30			C O R E 100% REC. 9	BEST PENETROMETER down crack in Rock - NO Recovery. Cured From 27.5' to 32.5' Recovered 5.0' Rock From 5.0' Run.
			X C O R E 115% REC. 10	TEST BORING STOPPED AT 35.0'
35				WATER TABLE - While drilling through Tube drill water drained out through material. MAINTAINED WATER CIRCULATION drilling through Till. WATER DRAINED OFF through crack AT 27.0'. AFTER A FEW MINUTES WAIT THE Hole drains dry below that while coring.
40				
45				

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.R. _____ S.R. 90 Section MP. 59.08 Settlement Job No. OL-3101
 Hole No. H-1-97 Sub-Section _____ Cont. Sec. 1901
 Station _____ Offset _____ Ground El. 2541.6
 Type of Boring Wet entry Casing 6" XHA 35' x HWT W.T. EL. 36'
 Inspector J. Hicks Date 9-29-97 Sheet 1 of 3

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
5'-6.5'	² 15-34		D-1	(5'-6.5') GRAVEL (G-P) with sand and silty, angular, dense, light blue brown, wet, and homogeneous 1.5' recovery on down.
10'-10.2'	⁴ 10-13		D-2	(10'-10.2') GRAVEL (G-P), angular, medium dense, greenish grey, wet, and homogeneous 2' recovery on down.
(12)	00000			(12) Lost circulation
13'-14.5'				(13'-14.5') Void (AIR)
15'	¹ 9-10		D-3	(15') No recovery; Void present.
16.5'-17'				(16.5'-17') Void (material)
18'-18.5'				(18'-18.5') Void (AIR)

1	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
21'-21.3'	7 5-12		D-4	(21'-21.3') SAND (SU) with gravel, angular, medium dense, olive grey, wet, and homogeneous. 3' recovery on drive.
21.3'-26'			(-5)	(21.3'-26') Loose gravel over ANDESITE, grayish green (5G/3/2), medium to fine grained, mainly weathered, strong rock (R4). Discontinuities are moderately spaced and in poor condition. (R-55% RQD-35% FF-a)
22'-24.5'			D-6	(22'-24.5') VOID (AIR)
26'	100 50, 0"		D-6	(26') No Recovery
26.5'-27.5'			(-7)	(26.5'-27.5') VOID (AIR)
28'-30'			(-7)	(28'-30') VOID (AIR)
26'-31'			(-7)	(26'-31') ANDESITE, grayish green (5G/3/2), medium to fine grained, moderately weathered, strong rock (R4). Discontinuities are moderately spaced and in poor condition.
33'-34'			(-8)	(33'-34') VOID (AIR)
31'-36'			(-8)	(31'-36') ANDESITE, grayish green (5G/3/2), fine to medium grained, moderately weathered, strong rock (R4). Discontinuities are moderately spaced and in fair condition. (R-75% RQD-50% FF-7)
36'-41'			(-9)	(36'-41') ANDESITE, grayish green (5G/3/2), fine to medium grained, highly weathered, strong rock (R4). Discontinuities are closely spaced and in poor condition. (R-80% RQD-50% FF-8)
37'-38'			(-9)	(37'-38') (38.5'-39') (39.5'-40.5') VOID (with material)
41.5'-42.5'			D-10	(41.5'-42.5') VOID (AIR)
44'-44.3'	25 10-33		D-10	(44'-44.3') GRAVEL (GP) with sandy angular, dense, olive brown, wet, and homogeneous. 3' recovery on drive.

	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
44'-46'		XXXXXX XXXXXX	C-11	(44'-46') ANDESITE, grayish green (5.6 x 3/2), medium to fine grained
		XXXXXX XXXXXX		highly weathered, strong rock (R4), Discontinuities are closely spaced and in fair to poor condition. CL-66.2a ROD-0 FF-2t
47'-48'		XXXXXX XXXXXX		(47'-48') VOID (AIR)
46'-51'		XXXXXX XXXXXX	C-12	(46'-51') ANDESITE, grayish green (5.6 x 3/2), medium to fine grained, medium
		XXXXXX XXXXXX		weathered; strong rock (R4), Discontinuities are moderately spaced and in fair condition. CL-75.2a ROD-65.2a FF-7
51'-56'	2000 -0100+		(-13)	(51'-56') No core recovered just soil GRAVEL (GP) with silt and clay.
52'-53'				(52'-53') VOID (AIR)
56'-56.5'	3 5-17	2000 2100 2200 2300 2400 2500	D-14	(56'-56.5') GRAVEL (GP) with clay, angular, medium dense, light yellowish brown, wet, and homogeneous. 15' recovery on drive.
				No instrumentation installed



Washington State
Department of Transportation

LOG OF TEST BORING

Start Card R-65950

Job No. XL-1571

SR I-90

Elevation 2503.4 ft
ft (m)

HOLE No. H-1-05

Sheet 1 of 5

Project Snoqualmie Pass East EIS

Driller Kerry Cooper

Lic# 2552

Site Address I-90 vic. mp 58.7

Inspector Brian Harris

Start April 20, 2005 Completion May 5, 2005

Well ID# AHN-799

Equipment CME 45 w/ autohammer

Station Offset

Casing 6"x55' 4"x97' 3"x118"

Method Well Rotary

Northing 733591.1

Easting 426375.3

Latitude

Longitude

County Kittitas

Subsection NE1/4 NE1/4

Section 2

Range 11 EWM

Township 21

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/ft (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
0-1								C-1		Well graded GRAVEL, cobbles and boulders, subrounded, very dense, greenish gray, wet. Homogeneous, HCl reaction not tested. We did not do a spt because we were on a cobble or boulder. Length Recovered 0.7 ft, Length Retained 0.7 ft			
5-2							ROD 38 FF 3	C-2		ANDISITE, greenish gray, fine grained, fresh, strong rock, HCl reaction not tested. Discontinuities are very closely spaced and in fair condition, 100% drilling fluid loss. We tried a spt with no results as the sampler was just bouncing on a rock., Percent Recovered 73.0%			
10-3							ROD 46 FF 3	C-3		ANDISITE ROCK, greenish gray, fine grained, fresh, strong rock, HCl reaction not tested. Discontinuities are very closely spaced and in fair condition, Percent Recovered 80.0%			
15-4							47 6 5 (11)	C-4		No Recovery			
20-5								C-5		Well graded GRAVEL, angular, medium dense, greenish gray, wet, Homogeneous, HCl reaction not tested. All fines washed out with 100% water loss. Length Recovered 2.2 ft, Length Retained 2.2 ft			

SON 1990 SNOQUALMIE PASS EAST (CPJ) SOIL GDT BRIDE, 12/31/14 PB



Washington State
Department of Transportation

LOG OF TEST BORING

Start Card R-65950

2503.4 ft

HOLE No. H-1-05

Job No. XL-1571

SR I-90

Elevation ft (m)

Sheet 2 of 5

Project Snoqualmie Pass East EIS

Driller Kerry Cooper

Lot 2552

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
6													
7													
25													
8													
9													
30													
10													
35													
11													
40													
12													
45													

SOIL 7, 080 SNOQUALMIE PASS EAST EIS/ SOIL LOG/ 8/2005, 12:34:15 PM



LOG OF TEST BORING

Start Card R-66950

2503-4-ft

HOLE No. H-1-05

Job No. XI-1571

SR I-90

Elevation ft (m)

Sheet 3 of 5

Project Snoqualmie Pass East EIS

Driller Kerry Cooper

Lot 2552

Depth (ft)	Meters (m)	Profile	Standard Penetration Blowcount				SPT Blows/ft (N)	Sample Type	Sample No. (Tube No.)	Lab Test	Description of Material	Groundwater	Instrument
			10	20	30	40							
14							50'S (50'S)	D-15 C-16		Well graded GRAVEL, cobbles, angular, very dense, brown, wet, Homogeneous, HCl reaction not tested, Hammering on a cobble that is in core box #4. Length Recovered 0.1 ft. Length Retained 0.1 ft			
50							3 8 9 (17)	D-17 C-18		Well graded GRAVEL, angular, medium dense, brown, wet, Homogeneous, HCl reaction not tested, With silty, clayey matrix. Length Recovered 0.3 ft. Length Retained 0.3 ft			
16										Well graded GRAVEL, one cobble, angular, very dense, greenish gray, wet, Homogeneous, HCl reaction not tested, With a trace of clayey matrix because most fines washed out. Length Recovered 2.4 ft. Length Retained 2.4 ft			
55							50'1" (50'1")	D-19 C-20		No Recovery Poorly graded GRAVEL, boulders and cobbles, subrounded, very dense, bluish gray, wet, Stratified, HCl reaction not tested, With some soil infilling and mostly boulders. Length Recovered 4.2 ft. Length Retained 4.2 ft			
18													
60							27 15 10 (25)	D-21 C-22		Well graded GRAVEL with sand, angular, dense, brown, wet, Homogeneous, HCl reaction not tested, With some silt and FeO stains. Length Recovered 0.9 ft. Length Retained 0.9 ft			
19										Well graded GRAVEL, cobbles and boulders, angular, dense, bluish gray, wet, Stratified, HCl reaction not tested, With some clayey infilling. Length Recovered 3.2 ft. Length Retained 3.2 ft			
65							33 3 6 (9)	D-23 C-24		Well graded GRAVEL angular, loose, bluish gray, wet, Homogeneous, HCl reaction not tested, Looks like broken up rock. Length Recovered 0.5 ft. Length Retained 0.5 ft			
21										Well graded GRAVEL, angular, medium dense, bluish gray, wet, Stratified, HCl reaction not tested, With some soil infilling. Length Recovered 1.6 ft. Length Retained 1.6 ft			
70													

SOIL LOG - SNOQUALMIE PASS EAST OF I-90 - RTRD 12/21/15 PB



Washington State
Department of Transportation

LOG OF TEST BORING

Start Card R-65950

Job No. XL-1571

SR 1-90

Elevation 8 (m)

2503-4

HOLE No. H-1-05

Sheet 4 of 5

Project Snoqualmie Pass East EIS

Driller Kerry Cooper

Log 2552

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft	SPT Blows/6 (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
22				12 15 18 (33)		C-25 C-26		Well graded GRAVEL with sand, angular, dense, brown, wet, Homogeneous, HCl reaction not tested. With some wood debris and a trace of silt. Length Recovered 1.0 ft, Length Retained 1.0 ft Well graded GRAVEL, cobbles, subangular, dense, bluish gray and brown, wet, Stratified, HCl reaction not tested. With some wood debris and clayey infilling. Length Recovered 2.0 ft, Length Retained 2.0 ft		
75	23			58 6 8 (14)		D-27 C-28		Well graded GRAVEL, angular, medium dense, bluish gray, wet, Homogeneous, HCl reaction not tested, With some FeO stains. Hammering on a large gravel or cobble. Length Recovered 0.2 ft, Length Retained 0.2 ft Well graded GRAVEL, cobbles, subrounded, very dense, bluish gray, wet, Stratified, HCl reaction not tested, With FeO stains. Length Recovered 2.2 ft, Length Retained 2.2 ft		
80	24			>>		D-29 C-30		No Recovery Well graded GRAVEL, boulders and cobbles, subrounded, dense, bluish gray, wet, Stratified, HCl reaction not tested, Fines washed out. From 81' to approx. 82.5' the drill took off. (void or loose soil) Length Recovered 2.2 ft, Length Retained 2.2 ft		
85	26					C-31		Well graded GRAVEL, subrounded, dense, bluish gray, wet, Stratified, HCl reaction not tested Length Recovered 0.6 ft, Length Retained 0.6 ft		
90	27					C-32		LAPILLI TUFF, light bluish gray, fine grained, fresh, strong rock, HCl reaction not tested. Discontinuities are very widely spaced and in good condition. We encountered bedrock at approx. 92'. Percent Recovered 100.0%		
95	28					R0D S1 FP 1.3				

SOIL XL-1571-90 SNOQUALMIE PASS EAST GPJ SOIL.GDT 4/26/05 13:24:15 P4



Depth (ft)	Meters (m)	Profile	Standard Penetration Blowcount				SPT Blows/5' (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
29							ROD 70 FF 1.8	C-33		LAPILLI TUFF, Light BLUIS GRAY, fine grained, fresh, strong rock. HCl reaction not tested. Discontinuities are closely spaced and in good condition. Percent Recovered 100.0%			
30													
100							ROD 78 FF 1	C-34		LAPILLI TUFF, light bluish gray, fine grained, fresh, strong rock. HCl reaction not tested. Discontinuities are very closely spaced and in good condition. Percent Recovered 100.0%			
31													
105							ROD 0 FF 0	C-35		LAPILLI TUFF, LIGHT BLUSH GRAY, fine grained, fresh, strong rock, HCl reaction not tested. Discontinuities are closely spaced and in good condition. (note) We couldn't pump the core out due to a seized up core inner-barrel. We had to hammer the core out, breaking the core up. This did influence the ROD and Fracture frequency. I was not able to make an accurate guess. Percent Recovered 100.0%			
33													
110							ROD 83 FF 1	C-36		LAPILLI TUFF ROCK, light bluish gray, fine grained, fresh, strong rock, HCl reaction not tested. Discontinuities are closely spaced and in good condition. Percent Recovered 100.0%			
34													
115										End of test hole boring at 115 ft below ground elevation. This is a summary Log of Test Boring. SoilRock descriptions are derived from visual field identifications and laboratory test data.			
36													
120													

SOIL X-RAY 1190 SNOQUALMIE PASS EAST.GPJ SOL.LGDT M7105.12134.18.P8

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS
LOG OF TEST BORING

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

S.H. _____ S.R. 90 Section _____ Job No. 4340
Hole No. H-2 Sub Section _____ Cont. Sec. _____
Station L² 282+30 Offset 50' Rt L² Ground El. 2454.0'
Type of Boring Work Done & Rotary Casing 3" X 110' Bx X 115' W.T. El. Lake elev 2506.6'
Inspector Donald L. Nebgen Date June 13, 1977 Sheet 1 of 3

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
			4 ↑ STD. PEN.	GRAVELLY SAND - SILTY FINE to COARSE
			8 ↓	
	9		5 ↑ 1	BROWN - LOOSE - WET.
			11 ↑ STD. PEN.	TALUS MATERIAL - ALL SIZE COBBLES
	28		12 ↓	
			16 ↓ 2	Boulders & Rock Fragments - Pieces are
5				sandy clayey silt - some fragments
				are weathered voids in material
				Rock fragments to 6.0' in diameter
	46		17 ↑ STD. PEN.	visible on lake bed when lake is drawn
			23 ↓	
	15		23 ↑ 3	down.
10			9 ↓	100% water loss while drilling
			6 ↓	surface at 58.5'
	12		8 ↑ STD. PEN.	BLAST 2 Tubes Kinopak 14.0'
			6 ↓	
15			6 ↓ 4	
	13		6 ↑ STD. PEN.	
			7 ↓	
			8 ↓ 5	
20			5 ↓	

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
	16		9 ↑ STD. 7 PEN. 9 ↓ 6 16	
25				
	20		4 ↑ STD. 9 PEN. 22 20 ↓ 7 11	
30				
				BLAIR 2 SILK, KINGPAK 310' AFTER SAMPLING
	26		9 ↑ STD. 25 PEN. 16 ↓ 8 10	
35				
	14		3 ↑ STD. 5 PEN. 9 ↓ 9 16	SAMPLE CLAYEY SILT & ROCK FRAGMENTS
40				
	28		20 ↑ STD. 17 PEN. 17 ↓ 10 11	SANDY SAMPLE
45				

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
			27 ↑ STD. 49 PEN 3 1/2" ↓ 11	Weathered Rock Fragment
50				
	10		8 ↑ STD. 5 PEN 5 ↓ 12	
55				
60			↑ C	BEDROCK - Highly Fractured to crushed andesite - Good Dense Rock
			O	white in place.
			100% R	
			REC. E	
			13	
65			↓ C	
			O	
			100% R	
			REC. E	
			14	
70			100% REC. C-15	TEST BORING STOPPED AT 70.0'

H-2-77

H.S. 26.66 (Rev. 5.67)

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. 90 Section Lake Keechelus SNO-shed Vic. Job No. L-4540
 Hole No. H-2 Sub Section Slope Stabilization - Retaining Wall Cont. Sec. 1901
 Station _____ Offset _____ Ground El _____
 Type of Boring Wash. Bor. + Rotary Casing 3" x 40.0' W.T. El Bottom of Log
 Inspector Donald L. Neugeb. Date 11-30-1977 Sheet 1 of 3

DEPTH	BLOWS PER FT	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL
				TALUS - ALL SIZE Rock Fragments -
				Weathered angular and/or sand silty light brown - dense
5				100% water loss 0.0' to 25.0'
	34		38 ↑ STD. 13 PEN. 21 ↓ 1 25 ↓	
				BLAST 8.0' 1 Tube KINPAK 2" x 5"
10				
	46		13 ↑ STD. 15 PEN. 25 ↓ 2 18 ↓	
15				
	46		62 ↑ STD. 17 PEN. 29 ↓ 3 22 ↓	BLAST 17.0' 1 Tube KINPAK 2" x 5"
				" 17.5' " " "
				" 18.0' " " "
			90% ↑ CORE REC. ↓ 4	" 18.5' " " " AFTER Core #4
20				Large Rock Fragment 17.0' to 19.8'

Hole No. H-2 Sub Section Slope Stabilization - Ret. Wall Sheet 2 of 3

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
			5 ↑ STD. PEN. 5	
			5 1/2" X	
			9 1/2" CORE # 6	
			5 REC. X	BLAST 21.0' 1 Tube KINGPAK AFTER SAMPLE
	36		16 STD.	
			20 PEN.	BLAST 22.5' 1 Tube KINGPAK 2" X 5"
			20 ↓ 7	
25		X		ALPINE TILL - Brown - Very Dense
	51		25 ↑ STD.	
			26 PEN.	
			50 1/2" ↓ 8	50% WATER LOSS
				BLAST 26.5' 1 Tube KINGPAK 2" X 5"
30				" 28.5' " " "
			30 ↑ STD.	
			50 PEN.	
	75		40 ↓ 9	
			35	
35				
	90/16"		90 ↓ STD.	
			50 1/2" PEN.	BLAST 34.5' 1 Tube KINGPAK 2" X 5"
			10	" 37.5' " " "
	100/11"			STD. PEN. #11 38.0' 100/11"
			90% CORE # 12	BLAST 39.0' 1 Tube KINGPAK 2" X 5" AFTER CORE #
40	100/3"	X	100% REC. ↓ STD. #13	12 + Sample #13.
				ANDESITE - Moderately Fractured
			C	
			D	Hard Dense Rock
			100% REC. #14	
45				

Hole No. H-2 Sub Section Slope Stabilization Ret. Wall Sheet 2 of 3

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL
		↓	↑ C	
			O	
			R	
			REC. 15	
				TEST BORING STOPPED AT 49.0'
50				
				100% WATER LOSS WHILE DRILLING
				0.0' to 25.0' Hole drained dry
				IMMEDIATELY.
				25.0' to 40.0' WATER LOSS IN MINUTES
				while drilling. WATER broke seal
				around casing and ran out AT ABOUT
				25' DOWN IN hole. Hole drained
				dry overnight.



Job No. XL-1571 SR I-90

Elevation 2510.7 ft (m)

HOLE No. H-2-05

Sheet 1 of 3

Project Snoqualmie Pass East EIS

Driller Sean Verlo Lic# 2615

Site Address I-90 vic. mp 59.1

Inspector Dan Reed

Start April 18, 2005 Completion April 19, 2005

Well ID# Equipment CME 45 w/ autohammer

Station Offset Casing HW-4.5/HQ-3.5 Method Wet Rotary

Northing 735857.6 Easting 1426205.1 Latitude Longitude

County Kittitas Subsection NE 1/4 of the SE 1/4 Section 35 Range 11 EWM Township 22

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
0-1	0-0.3							C-1		No Recovery			
5	1.5					3		D-2		Well graded GRAVEL with sand, angular, very dense, light brown, wet, Homogeneous, no HCl reaction, Slightly silty. With large gravels and cobbles as indicated by drilling process.			
10	3.0					37		C-3		Length Recovered 0.3 ft, Length Retained 0.3 ft BASALT (gravel), medium grained, highly weathered, moderately strong rock, no HCl reaction. Discontinuities are closely spaced and in poor condition, Fill material 100% drilling fluid loss., Percent Recovered 57.0%	04/19/2005		
15	4.5					5.7		D-4		No Recovery	04/19/2005		
20	6.0					32		C-5		BASALT (gravel), medium grained, highly weathered, moderately strong rock, no HCl reaction. Discontinuities are closely spaced and in poor condition, Faults within rock mass in filled with well graded gravel with sand, slightly silty fill material (100% drilling fluid loss)., Percent Recovered 77.0%			
25	7.5					4.8		D-6		Well graded GRAVEL with sand, slightly silty, angular, very dense, light brown, wet, Homogeneous, no HCl reaction, With large gravel and cobbles as indicated by drilling process.			
30	9.0					2		C-7		Length Recovered 0.1 ft, Length Retained 0.1 ft BASALT (gravel), medium grained, highly weathered, moderately strong rock, no HCl reaction. Discontinuities are closely spaced and in poor condition, Faults within rock mass in filled with well graded gravel with sand, slightly silty fill material. 100% drilling fluid loss., Percent Recovered 91.0%			

SO 30 SNOQUALMIE PASS EAST, GPJ, SOIL, GDT, 5/9/05, 94001 AS



2510.7 ft

Project Snoqualmie Pass East EIS

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/ft (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
7							24 51 (51) ROD 30 FF 20+	D-8 C-9		Well graded GRAVEL with sand, slightly silty, angular, very dense, light brown, wet, Homogeneous, no HCl reaction, With large gravel and cobbles as indicated by drilling process. Length Recovered 0.4 ft, Length Retained 0.4 ft BASALT (gravel), medium grained, highly weathered, moderately strong rock, no HCl reaction. Discontinuities are closely spaced and in poor condition, Faults within rock mass in filled with well graded gravel with sand, slightly silty fill material 100% drilling fluid loss., Percent Recovered 82.0%			
25							67/5 (67/5)	D-10 C-11		Well graded GRAVEL with sand, slightly silty, angular, very dense, light brown, wet, Homogeneous, no HCl reaction, With large gravel as indicated by drilling process. Drove into cobble. Length Recovered 0.5 ft, Length Retained 0.5 ft Well graded GRAVEL with sand, slightly silty, angular, very dense, light brown, wet, Disrupted, no HCl reaction, Faults within rock mass. With large gravel and cobbles as indicated by drilling process with voids. 100% drilling fluid loss. Length Recovered 2.2 ft, Length Retained 2.2 ft			
30							57 (57/6) ROD 100 FF 0.6	D-12 C-13		Well graded GRAVEL with sand, slightly silty, angular, very dense, light brown, wet, Homogeneous, no HCl reaction, With large gravel and cobbles as indicated by drilling process. End of fill material. Length Recovered 0.4 ft, Length Retained 0.4 ft PYROCLASTIC TUFF, coarse grained, fresh, moderately strong rock, no HCl reaction. Discontinuities are moderately spaced and in good condition. Out of fill material. 100% drilling fluid loss., Percent Recovered 100.0%			
35							ROD 94 FF 0.8	C-14		PYROCLASTIC TUFF, coarse grained, fresh, strong rock, no HCl reaction. Discontinuities are moderately spaced and in good condition, Rock color change at 37.0 gray to light brown joints in filled with silt 38.0 to 38.4. 100% drilling fluid loss., Percent Recovered 100.0%			
40							RQD 100 FF 0.8	C-15		PYROCLASTIC TUFF, medium grained, fresh, strong rock, no HCl reaction. Discontinuities are moderately spaced and in good condition, Joints in filled with elastic silt 44.5 to 44.7., Percent Recovered 100.0%			
45													

40 SNOQUALMIE PASS EAST.GPJ SOIL.GDT 8/18/06 8:40:02 AS

SOIL



Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
14							RQD 100 FF 0.6	C-16		PYROCLASTIC TUFF, medium grained, fresh, strong rock, no HCl reaction. Discontinuities are moderately spaced and in good condition. Joints in filled with silt. Percent Recovered 100.0%			
15													
50							RQD 96 FF 0.6	C-17		PYROCLASTIC TUFF, medium grained, slightly weathered, strong rock, no HCl reaction. Discontinuities are moderately spaced and in good condition. Moderately weathered joints within rock mass 50.0 to 53.0. Percent Recovered 100.0%			
16													
55							RQD 100 FF 0	C-18		PYROCLASTIC TUFF, medium grained, fresh, strong rock, no HCl reaction. Discontinuities are very widely spaced and in excellent condition, 100% drilling fluid loss. Percent Recovered 100.0%			
17													
18													
60							RQD 100 FF 1.5	C-19		PYROCLASTIC TUFF, medium grained, slightly weathered, strong rock, no HCl reaction. Discontinuities are moderately spaced and in excellent condition, Percent Recovered 100.0%			
19													
65										End of test hole boring at 63 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.			
20										Water table measured 4-18-05 at 5:00 p.m. 10.5', measured on 4-19-05 at 7:00a.m. 9.8', measured on 4-19-05 at 5:00p.m. 9.2', attempted bail with pump (water level same as lake level) stabilized at 9.2'.			
21													
70													

SOIL - 0_SNOQUALMIE PASS EAST.GPJ_SOIL_GDT_5/9/05,9:40:02.A3

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. 90 Section Soil Investigation Job No. L-4540
 Hole No. H-3 Sub Section Vic. Exit Sno-shed Cont. Sec. _____
 Station L2 285+90 Offset 75' RT L2 E Ground El. 2451.5'
 Type of Boring Wash Core + Rotate Casing 120' X 3" CASE W.T. El. Lake elev 2508
 Inspector Donald L. Nebgen Date June 20, 1978 Sheet 1 of 3

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
			11 ↑ STD. 13 ↓ PEN.	TALUS - ALL SIZE ROCK FRAGMENTS cobbles
22			12 ↓ 1	+ Boulders with sandy silt fines - Loose
				to compact - possible voids - brown. wet
5				Rock fragments 1/2 to 6" visible on lake
				bed when down.
			12 ↑ STD. 6 ↓ PEN. 17 2	100% water loss while drilling
23			10 ↓	BLAST 2 Tubes Kinopak 8.5'
10				
			50/10' ↓ STD. PEN. 3	
15				
			8-17 ↑ STD. 16 ↓ PEN. 9 4	BLAST 2 Tubes Kinopak 15.5' after samples
17			25/2 ↓ C	
			75% REC. ↓ ORE	BLAST 2 Tubes Kinopak 18.0' after sample
20			5 A ↓ U-6	

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
	75/16		B U-6 75 STD. PEN. 7	
25			A U-8 17 STD. 22 PEN. 7 9 8	BLAST 2 tubes KINAPAK 27.0'
30	15		5 STD. 8 PEN. 21 15 10 7	
35	20		10 STD. 10 PEN. 10 15 11	
		*		SAND GRAVEL COBBLES & BOLDERS - SILTY FINE to coarse rounded & angular - BROWN-DARK
40	43		25 STD. 30 PEN. 25 18 12	
45	110/16		110 STD. PEN. 13	BLAST 2 tubes KINAPAK 49.0' AREA SAMPLE

Hole No. H-3 Sub Section SOIL INVESTIGATION No. E-5-10, Sheet 3 of 3

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
				BLAIT 2 TUBES KINGPARK 46.5'
				" " " 47.0'
				SAND & GRAVEL. SLIGHTLY SILTY FINE & COARSE - LIGHT BROWN - 100% WATER LOSS
50	10		P 5 ↑ STD. PEN. 5 ↓ 14 4	
				SAND & GRAVEL. SILTY FINE & COARSE WITH SCATTERED Boulders - Grey - Very Dense
	120/5'		70 ↑ STD. PEN. 50/5" ↓ 15	BLAIT 1 TUBE KINGPARK AFTER SAMPLE 53.0'
55			C	ANDESITE - Highly & moderately
			O	Fractured
			100% REC 2	
			E	
			16	
60			100% REC. C-17	TEST BORING STOPPED AT 60.0'
65				

H-3-77

H. F. 26 50 (Rev. 3-67)

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. 90 Section Lake Washington Snow Bed Job No. 2 HSHO
Hole No. H-3 Sub Section Slope Stabilization Retaining Wall Cont. Sec. _____
Station _____ Offset _____ Ground El. _____
Type of Boring Wash Boring and Casing Casing 3" X 16" W.T. El. _____
Inspector Severill, C.H. Date 11/18/1977 Sheet 1 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL	
	26	↑	5 STD 12 Pen 14 30 ↓ 1	Talus, Organic Material on Surface	
				3' Blast 1/2 Stick K-1 Kinetics	
5				5' " " " " "	
	27		33 STD 16 Pen 11 10 ↓ 2	7 Blast 1. Stick K-1 Kinetics	
				9 " " " " "	
10				10 " " " " "	
	153		63 STD 40 Pen 3		
				13' Blast 1. Stick K-1 Kinetics	
15	104 12"		↓	110 STD 5" Pen 4	Andesite
				Core 5	
20			↓		

H-4-77

H. F. 26 66 (Rev. 5-67)

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. 90 Section Lehigh Creek Keys Snow Shed Job No. 2-45-10
 Hole No. H 4 Sub Section Slope Stabilization Retaining Wall Cont. Sec. _____
 Station _____ Offset _____ Ground El. _____
 Type of Boring Wash and Core Casing 3" X 33' W.T. El. _____
 Inspector Seaworth, C. H. Date 12/9/1977 Sheet 1 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
				Tales with Boulder size Rock fragments ON SURFACE Some Organic material
5				
	28		10 ↑ STD 12 Per 16 ↓ 20 ↓ 1	
10				
	33		18 ↑ STD 21 Per 12 ↓ 8 ↓ 2	
15				
			17 ↑ STD 14 Per 15 ↓ 22 ↓ 3	
20				

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. 90 Section Lake Kiechlaus Job No. L-4540
 Hole No. H-5 Sub Section Soil Investigation Near E. Saw Shed Cont. Sec. _____
 Station L² 291+30 Offset 85' RT L² E Ground El. 2453.2'
 Type of Boring Wash Bore + Rotary Casing 4" X 27.5' W.T. El. 2513.7' ?
 Inspector Donald L. Nckgen Date July 1974 Sheet 1 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
			30 ↑ D-1	GRAVELLY SAND - slightly silty. Fine to coarse sand with scattered gravel
			37	
			41	
			60 ↓	
			12 * STD. PEN.	
	27		12	Cobbles + Boulders - brown - compact & dense
			15	
			20 ↓ 2	
5			90 ↑ D-3	
			102	
			16 * STD. PEN.	
	30		16	
			14 ↓ 4	
			20	
10			81 ↑ D-5	
			79	
			28 * STD. PEN.	
	60		30	
			37 ↓ 6	
			23	
15			43 ↑ D-7	
			33	
			36	
			53	
			22 * STD. PEN.	
	39		18	-19.0' Horizontal thin brown silt lens.
			21 ↓ 8	
			42	
20				SAND GRAVEL + BOULDERS - SILTY FINE to coarse

Hole No. H-5 Sub Section Vic. East SWO - Street Lak Kuchlaw Sheet 2 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
				LIGHT BROWN - DENSE
	30	*	22 ↑ STD. 15 PEN.	ROCK FRAGMENTS - SLIGHTLY SILTY ALL
			15 21 ↓ 9	SIZE ANDESITE FRAGMENTS - COMPACT
25		*	↑ CO	BEDROCK - HIGHLY to MODERATELY
			50% RE REC. 10	FRACTURED ANDESITE WEATHERED 240'
			62 X STD. 100% PEN. 15" ↓ 11	A 27.5' clay seam 36.0'
				BLAIT 27.5' Tube 2" x 5" Kingpak
			C O	" 25.5' Tube 2" x 5" Kingpak
30			80% RE REC. 12	
			X	
			C O	
35			90% RE REC. 13	
			X	
			C	
40			100% RE REC. E	
			19	
		▼	↓	TEST BORING STOPPED AT 42.5'
45				SAMPLES # 1-3-5-7 WERE TAKEN WITH 3" CASE-DRIVEN WITH 350 LB HAMMER w/ 15" drop.



Washington State
Department of Transportation

LOG OF TEST BORING

Start Card S-0480

Job No. RL-0381 SR 90 Elevation 2456.7 ft (748.8 m)

HOLE No. H-6-98

Sheet 1 of 4

Project Hyak to Easton(Lake keechelus)

Driller Jason Rosaschi Lic# 1724

Site Address _____

Inspector Dave Nelson

Start November 18, 1998 Completion November 19, 1998 Well ID# _____ Equipment CS-1000

Station 1357+77.67 Offset 10:48 LL Casing HW & HQ Method wet rotary

Northing 738619.195 Easting 1425558.442 Latitude _____ Longitude _____

County Kittitas Subsection SW1/4,NW1/4 Section 35 Range 11 Township 22 N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec FPF	Rock Strength Sample Type	Sample No.	Blows/ft SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
1								D-1	11 11 9 (20)	Poorly graded SAND with gravel, subangular, medium dense, yellowish brown, wet, Homogeneous, no HCl reaction Length Recovered 0.8 ft			
5								D-2	11 18 19 (37)	Well graded SAND with gravel, suangular, dense, yellowish brown, wet, Homogeneous, no HCl reaction Length Recovered 0.6 ft			
10								D-3	9 11 7 (18)	Well graded GRAVEL with sand, subangular, medium dense, yellowish brown, wet, Homogeneous, no HCl reaction Length Recovered 0.2 ft			
15								D-4	3 11 8 (19)	Well graded GRAVEL with sand, silty, subangular, medium dense, yellowish brown, wet, Homogeneous, no HCl reaction Length Recovered 0.4 ft			
20													

MUCKIN KLUUBI HYAK TO EASTON.GPJ 4/11/06 10:45:28 A4



LOG OF TEST BORING

Start Card S-0480

Job No. RL-0381

SR 90

Elevation 2456.7 ft (748.8 m)

HOLE No. H-6-98

Sheet 2 of 4

Project Hyak to Easton(Lake keechelus)

Driller Jason Rosaschi Lic# 1724

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% R _q FPF	Rock Strength Sample Type	Sample No.	Blows/ft SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								D-5	10 9 15 (24)	Well graded GRAVEL with sand, silty, subangular, medium dense, yellowish brown, wet, Homogeneous, no HCl reaction Length Recovered 0.8 ft			
8								D-6	8 13 7 (20)	Well graded GRAVEL with sand, silty, subangular, medium dense, yellowish brown, wet, Homogeneous, no HCl reaction Length Recovered 0.6 ft			
9								D-7	100 (100)	No Recovery			
10													
11													
12								D-8	7 22 22 (44)	Well graded GRAVEL with sand, silty, subangular, dense, brown, wet, Homogeneous, no HCl reaction Length Recovered 0.5 ft			
13													
14								D-9	23 17	Well graded GRAVEL with sand, silty, subangular, dense, grayish brown, wet, Homogeneous, no HCl			

ROCKN RL0381 HYAK TO EASTON GPJ 4/11/06 10:45:28 A4

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Blows/S* SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
14									21 (38)	reaction Length Recovered 0.5 ft			
15								D-10	3 5 7 (12)	Well graded GRAVEL with sand, silty, subangular, medium dense, grayish blue, wet, Homogeneous, no HCl reaction Length Recovered 0.1 ft			
16								D-11	50 (50)	Well graded GRAVEL with sand, silty, subangular, very dense, grayish blue, wet, Homogeneous, no HCl reaction Length Recovered 0.1 ft			
17													
18							100/5	C-12	RQD 0	Andesite, fine grained, slightly weathered, Strong Rock, no HCl reaction, closely spaced, good condition, Percent Recovered 100.0%			
60							100/2	C-13	FF 5 RQD 85 FF 2	Andesite, fine grained, slightly weathered, Strong Rock, no HCl reaction, moderately spaced, good condition, sandy SILT infilling, Percent Recovered 100.0%			
19													
65							100/2	C-14	RQD 70 FF 2	Andesite, fine grained, slightly weathered, Strong Rock, no HCl reaction; moderately spaced, good condition, Percent Recovered 100.0%			
20													
21							100/2	C-15	RQD 85	Andesite, fine grained, slightly weathered, Strong Rock, no HCl reaction, moderately spaced, good			
70													

ROCKN RL0381 HYAK TO EASTON.GPJ 4/11/08, 10:45:29 A4



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec FPF	Rock Strength	Sample Type	Sample No.	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
			[Hatched Area]								FF 2	condition, Percent Recovered 100.0%		
22			[Hatched Area]											
	75		[Hatched Area]				100 1			C-16	RQD 90 FF 1	Andesite, fine grained, slightly weathered, Strong Rock, no HCl reaction, moderately spaced, good condition, Percent Recovered 100.0%		
23			[Hatched Area]											
	80		[Hatched Area]				100 2			C-17	RQD 89 FF 2	Andesite, fine grained; slightly weathered, Strong Rock, no HCl reaction, moderately spaced, good condition, Percent Recovered 100.0%		
24			[Hatched Area]											
	85		[Hatched Area]				100 2			C-18	RQD 85 FF 2	Andesite, fine grained, slightly weathered, Strong Rock, no HCl reaction, moderately spaced, good condition, Percent Recovered 100.0%		
25			[Hatched Area]											
	90		[Hatched Area]									End of test hole boring at 89 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.		
26			[Hatched Area]											
	95		[Hatched Area]											
27			[Hatched Area]											
			[Hatched Area]											
28			[Hatched Area]											
			[Hatched Area]											
29			[Hatched Area]											

ROCKY RL0381 HYAK TO EASTON.GPJ 4/11/06 10:46:28 AM

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. 90 Section Lake Keechelus Snow Shed Job No. L-4540
 Hole No. H-7 Sub Section Bridge Outline - P1425 Cont. Sec. 1901
 Station L3291+20 Offset ONLY E Ground El. 2515.6'
 Type of Boring Wash Bore + Rotate Casing 3" X 4.5' W.T. El. Not Bottom Log
 Inspector Donald L. Negeen Date Dec 4, 1974 Sheet 1 of 3

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
	3	*	3 2 ↑ STD. PEN.	FILL MATERIAL - ALL SIZE ROCK FRAGMENTS
			1 2 ↓ 1	COVERED WITH SILTY FINE TO COARSE GRAVELLY SAND - BROWN - VERY LOOSE
				FILL MATERIAL - ALL SIZE ROCK FRAGMENTS
5				& Boulders with slightly silty fine to
	2		3 1 ↑ STD. PEN.	COARSE SAND & GRAVEL - OPEN VOIDS - 100% TO WATER
			1 2 ↓ 2	Loss - Very Loose to Loose - BROWN
10				
	5		2 8 10 3 ↑ STD. PEN.	
				3
15				
		100 15. ↑ STD. PEN.	DRIVING THROUGH WEATHERED ANDERITE FRAGMENT	
			4	
20				

Hole No. H-7 Sub Section Lake Kachhwa Snow Shed Bridge P125 Sheet 2 of 3

DEPTH	BLOWS PER FT	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL
			3 ↑ STD. 6 PEN.	
	7		4 ↓ 3 5	
		X		SAND GRAVEL COBBLES + SCATTERED BOULDERS
25				SLIGHTLY SILTY FINE TO COARSE - BROWN
	84		30 ↑ STD. 41 PEN. 43 ↓ 6	VERY DENSE & DENSE
30				
	44		26 ↑ STD. 22 PEN. 22 ↓ 7 24	
35				
	82		57 ↑ STD. 56 PEN. 40 ↓ 8 42	BLAST 35.5' 1 Tube Kinepak AFTER SAMPLE #8
40				
	82/10"		52 ↑ STD. 30/4 ↓ PEN. 25/0" 9	BLAST 41.5' 1 Tube Kinepak
45				

Hole No. H-7 Sub Section Lake Kaecklam Swastad Bridge P.A. #15 Sheet 3 of 3

DEPTH	BLOWS PER FT	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
			100% 13. STD. PEN. 10	BLAST 45.0' 1 Tube KINGPAK #172 Sample # 10
50			90% REC. C D R E 11	BEDROCK - Highly to Moderately Fractured andesite
55			90% REC. C D R E 12	
60			100% REC. * C D R E 13	
65			100% REC. * C D R E 14	
				TEST BORING STOPPED AT -65.5'
				WATER 340' Below GROUND SURFACE
				SAME LEVEL AS LAKE WATER.
70				



Washington State
Department of Transportation

LOG OF TEST BORING

Start Card S-04802

Job No. RL-0381 SR 90 Elevation 2454.4 ft (748.1 m)

HOLE No. H-7-98

Sheet 1 of 3

Project Hyak to Easton(Lake keechelus)

Driller Jason Rosaschi Lic 1724

Site Address

Inspector Cleo Andrews

Start November 8, 1998 Completion November 10, 1998 Well ID# Equipment CS-1000

Station 1364+16.36 Offset 68.67 Ft. Casing Method wet rotary.

Northing 737992.901 Easting 1425705.085 Latitude Longitude

County Kittitas Subsection SW 1/4, NW 1/4 Section 35 Range 11 EWM Township 22 N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Blows/SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										Surface: Gravel, cobbles, boulders, rip-rap and slide material.			
1								D-1	4 17 5 (22)	Silly GRAVEL with sand cobbles and boulders, medium dense, moderate yellowish brown, moist, homogeneous, no HCl reaction. Recovered and Retained: 0.5 ft.			
5								D-2	4 17 50.5* (67/117)	Well graded GRAVEL with sand and cobbles, angular; very dense, moderate yellowish brown, moist, homogeneous, no HCl reaction. Recovered and Retained: 1.0 ft.			
10								D-3	50.3*	Well graded GRAVEL with sand and cobbles, angular, very dense, moderate yellowish brown, moist, homogeneous, no HCl reaction. Recovered and Retained: 0.2 ft.			
15								D-4	12 15 12 (27)	Well graded GRAVEL with sand and cobbles, angular, very dense, dark yellowish brown, moist, homogeneous, no HCl reaction. Recovered and Retained: 0.2 ft.			
20								C-5					

RDC-KN RL0381-HYAK TO EASTON.GPJ 4/11/05, 10:45:32 AM

11/10/98



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% R _q FF	Rock Strength Sample Type	Sample No.	Blow/ft SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7													
25								C-6		Well-graded GRAVEL with cobbles and silt, brownish gray, laminated, no HCl reaction. Core recovery = 40%			
8							100 20			ANDESITE, medium bluish gray, fine grained, slightly weathered, strong pyroclastic rock. Discontinuities are widely spaced and in poor condition with silty sand and calcite bedding, very mild HCl reaction. Core recovery = 100%			
9							100 3	C-7		AGGLOMERATE, medium bluish gray, fine grained, slightly weathered, fresh, strong pyroclastic rock. Discontinuities are closely spaced and in good to excellent condition with clayey silt bedding, no HCl reaction. Core recovery = 100%			
10							100 11	C-8		AGGLOMERATE, medium bluish gray, fine grained, slightly weathered, fresh, strong pyroclastic rock. Discontinuities are moderately spaced and in fair condition with clayey silt bedding, no HCl reaction. Core recovery = 100%			
11							100 5	C-9		AGGLOMERATE, medium bluish gray, fine grained, slightly weathered, fresh, strong pyroclastic rock. Discontinuities are moderately spaced and in fair condition with clayey silt bedding, no HCl reaction. Core recovery = 100%			
12							100	C-10		AGGLOMERATE, medium bluish gray, fine grained,			
13													
45													

ROCKN RL0381 NYAK TO EASTON.GPJ 4/11/06 10:45:32 A4



LOG OF TEST BORING

Start Card S-04802

Job No. RL-0381

SR 90

Elevation 2454.4 ft (748.1 m)

HOLE No. H-7-98

Sheet 3 of 3

Project Hyak to Easton(Lake keechelus)

Driller Jason Rosaschi

Lic# 1724

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec FPF	Rock Strength	Sample Type	Sample No.	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14							3				fresh, strong pyroclastic rock. Discontinuities are closely spaced and in good to excellent condition, no HCl reaction. Core recovery = 100%			
15							100		C-11		AGGLOMERATE, medium bluish gray, fine grained, fresh, strong pyroclastic rock. Discontinuities are closely spaced and in good to excellent condition, no HCl reaction. Core recovery = 100%			
50							3							
16														
55											End of Test Hole Boring at 26.5 feet below ground elevation. 54.5			
17														
18														
60														
19														
65														
20														
21														
70														

ROCKY RL0381 HYAK TO EASTON.GPJ 4/11/06, 10:45:32 A4

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. 90 Section LAKE KEECHLAUS SAND SHED Job No. 19590
 Hole No. H-8 Sub Section BRIDGE ON 13 LINE - PIER 1 Cont. Sec. 1901
 Station 13 284 + 10 Offset ONE Ground El. 2528.4
 Type of Boring ROTARY AND CORING Casing 4" TO 4 3/4" W.T. El. 2987.4
 Inspector R. G. BENNETT Date DECEMBER 4, 1974 Sheet 1 of 13

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
				ROCK FRAGMENT 10-5" IN DIA NOTED ON SURFACE
			29 ↑	FILL MATERIAL - SAND AND GRAVEL - WITH
			27 STD	
49			22 PEU	SCATTERED COBBLES, BOULDERS AND ROCK FRAGMENTS
			20 ↓ 1	Slightly SILTY, LIGHT BROWN AND GRAYISH, DAMP, DENSE
5				
		*		
			16 ↑ STD	SAND, GRAVEL, COBBLES AND ROCK FRAGMENTS -
	35		7 PEU	VARIOUS SIZES, Slightly SILTY, LIGHT BROWN AND
	20 1/2"		31 ↓ 2	GRAY, MOIST, LOOSELY COMPACTED
			8	
			20 1/2"	
10				
			15 ↑ STD	
	30		20 PEU	
			10 3	
	11 1/6"		15 ↓ STD	
	35 1/8"		11 PEU	
			35 1/8" ↓ 4	
			8	
			53 STD	
15	89		36 PEU	
			31 ↓ 5	
			7 ↑	
	5		4 STD	
			1 PEU	
	22		10 6	
			12 ↓	
20				

Hole No. H-5 Sub Section PIER #1 Sheet 2 of 3

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL
			13 STD	
	22		11 PEN	
			11 7	
	$\frac{5}{6}$		7	
25	$\frac{30}{2}$		5 STD	
			30" PEN	
			8	
	12		7 STD	
			6 PEN	
			6 9	
	9		4	
30	$\frac{30}{2}$		5 STD	
			4 PEN	
			30" 10	
	25		16 STD	
			10 PEN	
	$\frac{36}{2}$		15 11	
			36" 11	
35				GRAVELLY SAND - WITH SCATTERED CORRIES AND ROCK FRAGMENTS, GRAY, DAMP, DENSE, SILTY
	$\frac{114}{6}$		114 STD	
			12 PEN	
40				
	$\frac{136}{2}$		134 STD	
			13 PEN	
				BED ROCK - ANDESITE - HIGHLY FRACTURED AND WEATHERED
45				



Job No. RL-0381 SR 90 Elevation 2461.3 R (750.2 m)

HOLE No. H-8-98

Sheet 1 of 2

Project Hyak to Easton(Lake keechelus)

Driller Jason Rosaschi Lic# 1724

Site Address

Inspector Cleo Andrews

Start November 5, 1998 Completion November 6, 1998 Well ID# Equipment CS-1000

Station 1377+39.19 Offset 108.70 Rt. Casing NQ x 35.0' Method wet rotary

Northing 736741.745 Easting 1426085.268 Latitude Longitude

County Kittitas Subsection NW 1/4, NW 1/4 Section 35 Range 11 EWM Township 22 N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Blows/ft SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0									C-1		Surface: Cobbles, boulders, concrete slabs, (rip-rap) Cobbles and boulders with clayey sand and gravel, dark yellowish brown, moist, laminated. Core recovery = 66%			
1														
5									D-2	27	Clayey SAND with gravel, very dense, dark yellowish brown, moist, homogeneous, no HCl reaction. Recovered and Retained: 0.8 ft.			
									C-3	16	ANDESITE, medium bluish gray, very fine grained, slightly weathered, fresh strong pyroclastic rock. Discontinuities are closely spaced and in good condition with clay bedding, no HCl reaction. Core recovery = 87%			
2							11			50/1" (66/7")				
10							11		C-4		ANDESITE, medium bluish gray, very fine grained, slightly weathered, fresh strong pyroclastic rock. Discontinuities are moderately spaced and in good condition with clay bedding, no HCl reaction. Core recovery = 100%			
15							10		C-5		ANDESITE, medium bluish gray, very fine grained, slightly weathered, fresh strong pyroclastic rock. Discontinuities are moderately spaced and in good condition with clay bedding, no HCl reaction. Core recovery = 100%	11/06/1998		
20														

ROCKN RL0381 HYAK TO EASTON.GPJ 4/17/06 10:45:34 A4

15'



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec FPF	Rock Strength	Sample Type	Sample No.	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7							100%			C-6		ANDESITE, medium bluish gray, very fine grained, slightly weathered, fresh strong pyroclastic rock. Discontinuities are widely spaced and in good condition with clay and calcite bedding, mild HCl reaction. Core recovery = 100%		
25							100%			C-7		ANDESITE, medium bluish gray, very fine grained, slightly weathered, fresh strong pyroclastic rock. Discontinuities are widely spaced and in good condition with clay and calcite bedding, mild HCl reaction. Core recovery = 100%		
30							100%			C-8		ANDESITE, medium bluish gray, very fine grained, slightly weathered, fresh strong pyroclastic rock. Discontinuities are widely spaced and in good condition with clay and calcite bedding, mild HCl reaction. Core recovery = 100%		
35												End of test hole boring at 35 ft below ground elevation.		
11												This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.		
40														
13														
45														

ROCKN RL0381 HYAK TO EASTON.GPJ 4/11/06 10:46:35 A4

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. 90 Section LAKE KEECHICAN SNO. SHED Job No. L-4540
 Hole No. H-9 Sub Section BRIDGE ON L3 LINE Cont. Sec. 1901
 Station L3 284+10 Offset 39' RT L3 E Ground El. 2518.8'
 Type of Boring Wash Bore - Rotary Casing (3" X) X 540' W.T. El. 2515.9'
 Inspector DONALD L. NEBGEN Date JUNE 17, 1975 Sheet 1 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
		X	1 7	FILL MATERIAL. ALL SIZE ROCK FRAGMENTS
	9		5 4	↓ 1 GRAVELS WITH SILTY SAND + ROCK FRAGMENTS AT BOTTOM VERY LOOSE & SLIGHTLY COMPACTED - BRANN ROCK FRAGMENTS TO 6.0' VISIBLE ON SURFACE.
5				PERIODIC WATER RECOVERY.
	10		5 3	↑ STD. PEN.
			7 3	↓ 2
10				
	20		8 12	↑ STD. PEN.
			12 15	↓ 3
				BLAST 14.0' DEPTH SAMPLE 1 TUBE KINPAK 2" X 8"
15			14 10	↑ STD. PEN.
	25		15 14	↓ 4
				ROCK FRAGMENTS - ALL SIZE ROCK FRAGMENTS
				↓ GRAVELS VERY SMALL PERCENT SAND + FINE ROCK
20				FRAGMENTS - OPEN VOIDS - LOOSE - 100% WATER LOSS.

Hole No. H-9 Sub Section Bridge on L³ Line Sheet 2 of 4

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
	5/6"	8	5 ↑ STD. 100 ↓ PEN. 5	DRIVE COBBLE
			100 ↑ STD. PEN. 6	DRIVING BETWEEN BOULDERS.
25				BLAIT 22.0' AFTER Sample 1 Tube KINERAK 2" X 5"
	9		7 ↑ STD. 4 PEN.	
			5 ↓ 6 7	
				BLAIT 28.0' 1 Tube KINERAK 2" X 5"
30	(10) 8			
			5 ↑ STD. 5 PEN.	
			23 ↓ 12 8	
35	10/4"			
		10/4" ↑ STD. 30/2" ↓ PEN. 100/6" 9	BLAIT 36.0' 1 Tube KINERAK 2" X 5"	
40				
		100 ↑ STD. 50 PEN. 10	DRIVING BETWEEN BOULDERS.	
			BLAIT 41.0' 1 Tube KINERAK 2" X 5"	
			GRAVEL COBBLES + ROCK FRAGMENTS	
			UNDETERMINED SIZE NO LARGE MATERIAL excavated	
45			while drilling. 1' MINUS - Very LOOSE - Very Small	

Hole No. H-9 Sub Section Bridge on L³ Line Sheet 3 of 4

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL
	5		5 ↑ STD.	POOR FINE MATERIAL. 100% WATER
			4 PEN.	
			3 ↓ 11	
				LOOS.
50	7		5 ↑ STD.	
			3 PEN.	
			7 ↓ 12	
		X		BEDROCK - Moderately to Slightly
55			↑ C	Fractured ANDERITE - Good Sound
			O	Rock.
			R	
			E	
			100% REC. 13	
			* C	
			O	
			R	
			E	
60			100% REC. 14	
			* C	
			O	
			R	
			E	
			100% REC. 15	
65			* C	
			100% CORE REC. 16	
			* C	
			O	
			R	
			E	
			100% REC. 17	
70			* C	

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. 90 Section LAKE KACHESS SNOW SHED Job No. 24590
 Hole No. H-10 Sub Section BRIDGE ON 13 LINE Cont. Sec. 1901
 Station 13 2821+00 Offset 40' RT. Ground El. 2334.0
 Type of Boring ROTARY AND CORE Casing 4" To - 12' W.T. El. 2519.0
 Inspector DUNNALL Bennett Date JUNE 18, 1975 Sheet 1 of 2

DEPTH	BLOWS PER FT.	PROF. NO.	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
			17 STD	ROCK FRAGMENT TO 12" IN DIA. NOTED IN FILL MATERIAL
	39		19 PEN	FILL MATERIAL - SILT, SAND AND ROCK FRAGMENTS
			20	
			15 ↓	WITH GRAVEL, COBBLES AND BOULDERS, DRY, LIGHT BROWN TO GRAY, LOOSELY PLACED
5				
	11		5 STD	
			5 PEN	
			6 ↓	
			13	
				BLAST 1 STICK KIDEMK
10				
	13		5 STD	
			4 PEN	
			9 ↓	
			4	
			15	
				BLAST 1 STICK KIDEMK (PROBABLY ORIGINAL GROUND)
15				FINE SANDY SILT - WITH SMALL ROCK FRAGMENTS,
	33% 40% 70%		STD PEN	BITS OF WOOD, LIGHT BROWN
			33" ↓	
			40" ↓	HARD ROCK - ANDESITE - GRAY, OCCASIONAL
			70" ↓	FRACTURES
20			REL 100%	

Hole No. H-10 Sub Section BRIDGE ON 1³ LINE Sheet 2 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL
			X	3 HORIZONTAL FRACTURES THIS 1 FT. AREA
			C	
			O	
			R	
25			REL. 100% E ₁	
			C	
			X	
			C	
			O	
			R	
30			REL. 100% E ₂	
			C	2 HORIZONTAL FRACTURES THIS AREA
			O	
			R	
35			REL. 100% E ₃	
			C	
			O	
			R	
40			REL. 100% E ₄	
			X	
			C	
			O	
			R	
			REL. 100% E ₅	
			X	
			C	
			O	
			R	
			REL. 100% E ₆	
			X	
			C	
			O	
			R	
			REL. 100% E ₇	
			X	
			C	
			O	
			R	
			REL. 100% E ₈	
			X	
			C	
			O	
			R	
			REL. 100% E ₉	
			X	
			C	
			O	
			R	
			REL. 100% E ₁₀	
			X	
			C	
			O	
			R	
			REL. 100% E ₁₁	
			X	
			C	
			O	
			R	
			REL. 100% E ₁₂	
			X	
			C	
			O	
			R	
			REL. 100% E ₁₃	
			X	
			C	
			O	
			R	
			REL. 100% E ₁₄	
			X	
			C	
			O	
			R	
			REL. 100% E ₁₅	
			X	
			C	
			O	
			R	
			REL. 100% E ₁₆	
			X	
			C	
			O	
			R	
			REL. 100% E ₁₇	
			X	
			C	
			O	
			R	
			REL. 100% E ₁₈	
			X	
			C	
			O	
			R	
			REL. 100% E ₁₉	
			X	
			C	
			O	
			R	
			REL. 100% E ₂₀	
			X	
			C	
			O	
			R	
			REL. 100% E ₂₁	
			X	
			C	
			O	
			R	
			REL. 100% E ₂₂	
			X	
			C	
			O	
			R	
			REL. 100% E ₂₃	
			X	
			C	
			O	
			R	
			REL. 100% E ₂₄	
			X	
			C	
			O	
			R	
			REL. 100% E ₂₅	
			X	
			C	
			O	
			R	
			REL. 100% E ₂₆	
			X	
			C	
			O	
			R	
			REL. 100% E ₂₇	
			X	
			C	
			O	
			R	
			REL. 100% E ₂₈	
			X	
			C	
			O	
			R	
			REL. 100% E ₂₉	
			X	
			C	
			O	
			R	
			REL. 100% E ₃₀	
			X	
			C	
			O	
			R	
			REL. 100% E ₃₁	
			X	
			C	
			O	
			R	
			REL. 100% E ₃₂	
			X	
			C	
			O	
			R	
			REL. 100% E ₃₃	
			X	
			C	
			O	
			R	
			REL. 100% E ₃₄	
			X	
			C	
			O	
			R	
			REL. 100% E ₃₅	
			X	
			C	
			O	
			R	
			REL. 100% E ₃₆	
			X	
			C	
			O	
			R	
			REL. 100% E ₃₇	
			X	
			C	
			O	
			R	
			REL. 100% E ₃₈	
			X	
			C	
			O	
			R	
			REL. 100% E ₃₉	
			X	
			C	
			O	
			R	
			REL. 100% E ₄₀	
			X	
			C	
			O	
			R	
			REL. 100% E ₄₁	
			X	
			C	
			O	
			R	
			REL. 100% E ₄₂	
			X	
			C	
			O	
			R	
			REL. 100% E ₄₃	
			X	
			C	
			O	
			R	
			REL. 100% E ₄₄	
			X	
			C	
			O	
			R	
			REL. 100% E ₄₅	
			X	
			C	
			O	
			R	
			REL. 100% E ₄₆	
			X	
			C	
			O	
			R	
			REL. 100% E ₄₇	
			X	
			C	
			O	
			R	
			REL. 100% E ₄₈	
			X	
			C	
			O	
			R	
			REL. 100% E ₄₉	
			X	
			C	
			O	
			R	
			REL. 100% E ₅₀	
			X	
			C	
			O	
			R	
			REL. 100% E ₅₁	
			X	
			C	
			O	
			R	
			REL. 100% E ₅₂	
			X	
			C	
			O	
			R	
			REL. 100% E ₅₃	
			X	
			C	
			O	
			R	
			REL. 100% E ₅₄	
			X	
			C	
			O	
			R	
			REL. 100% E ₅₅	
			X	
			C	
			O	
			R	
			REL. 100% E ₅₆	
			X	
			C	
			O	
			R	
			REL. 100% E ₅₇	
			X	
			C	
			O	
			R	
			REL. 100% E ₅₈	
			X	
			C	
			O	
			R	
			REL. 100% E ₅₉	
			X	
			C	
			O	
			R	
			REL. 100% E ₆₀	
			X	
			C	
			O	
			R	
			REL. 100% E ₆₁	
			X	
			C	
			O	
			R	
			REL. 100% E ₆₂	
			X	
			C	
			O	
			R	
			REL. 100% E ₆₃	
			X	
			C	
			O	
			R	
			REL. 100% E ₆₄	
			X	
			C	
			O	
			R	
			REL. 100% E ₆₅	
			X	
			C	
			O	
			R	
			REL. 100% E ₆₆	
			X	
			C	
			O	
			R	
			REL. 100% E ₆₇	
			X	
			C	
			O	

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. 90 Section Lake Kachlous Snow shed Job No. L-4540
 Hole No. H-11 Sub Section Bridge on L3 Line Cont. Sec. 1901
 Station L3 283+10 Offset 38' RT 13' E Ground El. 2519.7'
 Type of Boring Wash Bore - Rotate Casing 3" X 23.5' W.T. El. 2514.0'
 Inspector Donald L. Nebgen Date June 25, 1975 Sheet 1 of 3

PTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL	
	5		2 ↑ STD. PEN.	FILL MATERIAL - ALL SIZE ROCK FRAGMENTS	
			3 ↓		
			9 ↓ 1		
			11 ↓		
					GRAVEL & Cobbles - sandy SILT FINE ROCK FRAGMENTS 4' - SMALL PERCENTAGE FINE MATERIAL 4' to 14' - Brown - Loose -
5					100% WATER LOSS
	11		5 ↑ STD. PEN.		
			5 ↓		
			6 ↓ 2		
			7 ↓		
10			BLAST 10.0' AFTER sample 1/2 Tube Kierpak 2" X 5"		
		10 ↑ STD. PEN.	" 10.5' 1 Tube Kierpak 2" X 5"		
	18	15 ↓ 3	" 15.0' 1 Tube Kierpak 2" X 5" AFTER SAMPLES 4-7		
		12 ↓			
15			SAND GRAVEL COBBLES & ROCK FRAGMENTS		
		100% REL. CORE	ALL SIZES SILTY - BROWN - DENSE		
		5 1/2" ↓ 4	STD PEN. 5 5 1/2"		
		100% REL. CORE	100% WATER LOSS		
		9 ↓ STD. PEN.			
	32	18 ↓			
		15 ↓ 7			
20			15 ↑		

Hole No. H-11 Sub Section Bridge on L3 Line Sheet 2 of 3

DEPTH	BLOWS PER FT	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
	45	*	21 STD. 24 PEN. 25 1/2" 8	ROCK - Highly fractured weathered andesite.
		*		
		*		
25			90% C REC. O R E 9	BEDROCK - Highly fractured andesite with scattered weathered areas + open cracks -
			20 54% * ←	STD. PEN. 10
30			90% C REC. O R E 11	
			*	
			100% C REC. O R E 12	STD. PEN. 13 56/0"
35			*	Void or open crack 345' x 35.5'
		*	C O R E 14	BEDROCK - Moderately fractured andesite.
			90% R REC. E 14	
40			*	
			C O R E 15	
			100% R REC. E 15	
45			*	

LOG OF TEST BORING



Washington State
Department of Transportation

HOLE No. H-11-98

PROJECT Hyak to Easton(Lake keechelus)

Job No. RL-0381

S.R. 90

Station _____

Offset _____

C.S. 1901

Equipment CS-1000

Casing _____

Ground El (m)

Method of Boring wet rotary

Start Date October 25, 1998

Completion Date October 26, 1998

Sheet 1 of 4

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
1							23	D-1	-	Silty GRAVEL with cobbles and boulders.			
5							21					Silty GRAVEL with sand and cobbles, subrounded, dense, pale brown, wet, homogeneous, no HCl reaction. Length Recovered: 0.9 ft, Length Retained: 0.9 ft	
							23 (44)						
2								14	D-2	Clayey GRAVEL with sand and cobbles, subrounded, dense, pale brown, wet, homogeneous, no HCl reaction. Length Recovered: 0.9 ft, Length Retained: 0.9 ft			
10							24 (48)						
4								7	D-3	Silty GRAVEL with sand and cobbles, subrounded, dense, pale brown, wet, homogeneous, no HCl reaction. Length Recovered: 0.8 ft, Length Retained: 0.8 ft			
15						13 (27)							
5								C-4		Well graded GRAVEL with sand and cobbles, fines washed away during coring. Core recovery = 16 %			
20													

10/26/98

LOG OF TEST BORING



Washington State
Department of Transportation

HOLE No. H-11-98

Sheet 3 of 4

PROJECT Hyak to Easton(Lake keechelus)

Job No. RL-0381

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
14		[Hatched Profile]					11	40 50/5" 50/5"	C-11		homogeneous. Length Recovered: 0.8 ft, Length Retained: 0.8 ft Lapilli TUFF, medium bluish gray, very weak pyroclastic rock. Discontinuities are widely spaced and in poor condition, no HCl reaction. Core recovery = 85 %			
15										D-12		Lapilli TUFF, very dense, medium bluish gray, moist, homogeneous.		
50		[Hatched Profile]					6		C-13		Length Recovered: 0.9 ft, Length Retained: 0.9 ft Lapilli TUFF, medium bluish gray, very weak pyroclastic rock. Discontinuities are widely spaced and in poor condition, no HCl reaction. Core recovery = 100 %			
16														
55		[Hexagonal Profile]					5		C-14		ANDESITE, medium bluish gray, very fine grained, fresh strong pyroclastic rock. Discontinuities are closely spaced and in good condition with calcium infilling, weak HCl reaction. Core recovery = 100 %			
17														
60		[Hatched Profile]					100		C-15		Lapilli TUFF, medium bluish gray, very weak pyroclastic rock. Discontinuities are widely spaced and in fair to poor condition, no HCl reaction. Core recovery = 100 %			
18														
65		[Hexagonal Profile]					2		C-16		ANDESITE, medium bluish gray, very fine grained, fresh strong pyroclastic rock. Discontinuities are closely spaced and in excellent condition, no HCl reaction. Core recovery = 100 %			
19														
70		[Hexagonal Profile]							C-17		ANDESITE, medium bluish gray, very fine grained,			

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. _____ Section LX KACHESS SNOW SHED Job No. L-4540
 Hole No. H-12 Sub Section BRIDGE ON L3 LINE Cont. Sec. 1901
 Station 13 294+40 Offset 40' RT. E Ground El. 2515 NOTE OF
 Type of Boring WASH BORE CORRE Casing 3" X 20' W.T. El. 2512.5 29401
 Inspector EUGENE F. DUVAL Date JUNE 18-20 1975 Sheet 1 of 2

PTH	BLOWS PER FT	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
	7	↑	2 ↑ STD. 4 ↑ PEN.	TALUS - RUBBLE OF ROCK FRAGMENTS
			3 ↓ 6 ↓ 1	ALL SIZES, SAND & SILT, BROWN, DRY TO WET, 0-3 DRY, 3' WAT
				LOST ALL WATER 0' TO 15' 6"
				MATERIAL DISPLACES EASY
S	41		10 ↑ STD. 24 ↑ PEN.	
			17 ↓ 6 ↓ 2	D #2 PAST BOULDER
10	14		24 ↑ STD. 8 ↑ PEN.	
			6 ↓ 5 ↓ 3	
15	59 / 5"	↓	12 ↑ STD. 50 ↑ PEN.	BEDROCK - SOFT, GRAY, WEATHERED, MODERATELY FRACTURED
			4	KACHESS ANDESITE
			I.D.	
			5	I.D. SAMPLE #5 WASH 18'
				15' TO 20' WASH & DRIVE CASING IN SOFT ROCK
20				NO WATER LOST

Hole No. H-12 Sub Section BRIDGE ON L³ LINE Sheet 2 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL
	$\frac{75}{2}$		75 STEP DEN	CORE 20'6" TO 25'6" 33MIN FOR 5' 5 TO 7 MIN. PER FT. LOST ALL WATER
			60% CORE REC. 7	
25			X	
			100% CORE REC. 8	
30				29'0-29'6" HIGHLY FRACTURED
			X	29'6" BEDROCK, HARD, GRAY, SOLID KACHESS ANDESITE
			100% CORE REC. 9	
35			X	
			100% CORE REC. 10	
40				STOPPED TEST BORING AT 40'6" W.T. 3.5 BELOW CR. EL

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. 90 Section LAKE KACHESS SNOW SHED Job No. 29540
 Hole No. H-13 Sub Section BRIDGE ON L³ LINE Cont. Sec. 1901
 Station L³ 298+00 Offset 37' RT. Ground El. 2534.6
 Type of Boring Rainfall W.M. CORING Casing 4" TO -10' W.T. El. _____
 Inspector K. G. Bennett Date JULY 20, 1975 Sheet 1 of 2

PTH	BLOWS PER FT	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL	
		*		ROAD SHOULDER - 2" ASPHALT SURFACING 6" OF SAND AND PEB GRAVEL	
	46		39 27	STD PEU	FILL MATERIAL - ROCK FRAGMENTS, GRAVEL
			19 20	1 2	FINE COBBLES IN A LIGHT BROWN SAND AND SILT. Damp, Compact To Slightly Compact
5					
	32 8 1/2" 1/6"			8 18 14 8	STD PEU 2
		*		BED ROCK - ANDESITE - HIGHLY WEATHERED AND FRACTURED, GRAY	
10	39 1/2"			30	STD PEU 3
				REC 100%	6 R 24 4
					C
15					C
				R REC 100%	
				EE 5	
				C	
20				GR E	

Hole No. 1-13 Sub Section BRIDGE ON 13 LINE Sheet 2 of 2

DEPTH	BLOWS PER FT	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
			12 G	
			REL. 100%	
			X	
			C	
25			O	
			REL. 100%	
			P E ² 7	(MODERATELY FRACTURED)
			X C	
			REL. 100%	
30			O P E ² 8	TEST BORING STOPPED AT -30'-0"
		W.T. APPROX. SAME AS LAKE LEVEL		

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ SR. 90 Section LAKE RACHNESS SHOULDER Job No. 29540
 Hole No. H-14 Sub Section BRIDGE ON I-3 LINE Cont. Sec. 1901
 Station L³ 297+00 Offset 30' RT. Ground El. 2533.3
 Type of Boring ROTARY AND CORING Casing 9" TO 15' W.T. El. 2513.7
 Inspector R. E. BENNETT Date JUNE 29, 1975 Sheet 1 of 2

PTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL
			18 ↑ STD	ROAD SHOULDER - 2" ASPHALT SURFACING
	55		26 PEN	FILL MATERIAL - ROCK FRAGMENTS OF VARIOUS
			27 1	SIZES, OCCASIONAL COBBLES, GRAVEL, SILT AND
			22 ↓	SAND - LIGHT BROWN, DAMP, LOOSELY COMPACTED
5				
	12		5 ↑ STD	
			6 PEN	
			6 2	
			42 ↓	
10				
	14		9 ↑ STD	
			10 PEN	
			6 3	
	9		5 × STD	
			5 PEN	
	39		9 4	
15		*	14 4	
			25 ↓	BED ROCK - ANDESITE - HIGHLY TO MODERATELY
			A	FRACTURED, GRAY
			C	
			D	
			R	
			REC'D	(VERTICAL SEAMS)
			100%	
20			EE	
			5	



Washington State
Department of Transportation

LOG OF TEST BORING

Start Card S-04808

Job No. RL-0381

SR 90

Elevation 2445.7 ft (745.4 m)

HOLE No. H-14-98

Sheet 1 of 4

Project Hyak to Easton(Lake keechelus)

Driller Tom Schmidt Lic# 2024

Site Address _____

Inspector Bob Featherstone

Start October 30, 1998

Completion November 2, 1998

Well ID# _____

Equipment CME-45

Station 1358+35.13

Offset 182.15 Rt.

Casing 3"-HQ, 4.5"-HW

Method wel rotary

Northing 738494.346

Easting 1425401.286

Latitude _____

Longitude _____

County Kititas

Subsection NW1/4, SW1/4

Section 35

Range 11

Township 22 N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
1									D-1	13 4 4 (8)	Silly SAND with gravel and cobbles, subrounded, loose, brown, wet, homogeneous. Retained: 0.3 ft.			
5									D-2	4 2 5 (7)	Well graded GRAVEL with sand, subrounded, loose, brown, wet, homogeneous. Retained: 0.7 ft.			
10									D-3	1 2 1 (3)	SILT with sand, very loose, gray, moist, homogeneous. Retained: 1.5 ft.			
15									U-4		None representative sample			
20									D-5	9 12 7 (19)	Well graded SAND with gravel and cobbles, subrounded, medium dense, dark grayish brpwn, moist, homogeneous. Retained: 0.4 ft.			

ROCKN RL0381 HYAK TO EASTON.GPJ 4/11/98 10:45:00 A4



LOG OF TEST BORING

Start Card S-04808

Job No. RL-0381

SR 90

Elevation 2445.7 ft (745.4 m)

HOLE No. H-14-98

Sheet 2 of 4

Project Hyak to Easton (Lake Keechelus)

Driller Tom Schmidt

Uch 2024

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7														
25									D-6	6 4 11 (15)	Silty well graded SAND with gravel, subrounded, medium dense, dark grayish brown to greenish gray, moist, homogeneous. Retained: 0.5 ft.			
8														
30									D-7	50/6 (50/6)	Silty SAND with gravel and cobbles, subrounded, very dense, greenish gray, moist, homogeneous. Retained: 0.4 ft.			
9														
35									D-8	50/6 (50/6)	Silty SAND with gravel and cobbles, subrounded, very dense, greenish gray, moist, homogeneous. (Note: highly weathered andesite) Retained: 0.4 ft.			
10														
40									D-9 C-10	50/5 (50/5) RQD-10% FF-1	Highly weathered ANDESITE and lapilli tuff, subrounded, very dense, greenish gray, moist, homogeneous. Retained: 0.2 ft. Low grade ANDESITE and lapilli tuff, pale green, fine grained, highly weathered, moderately weak rock, closely spaced in very poor condition. Core recovery = 46 %			
11														
45									C-11	RQD-42%	Low grade ANDESITE and lapilli tuff, pale green, fine			
12														
13														

ROCKN_RLD0381_HYAK TO EASTON.GPJ 4/1/08 10:45:00 A4

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Blows/ft SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
14									FF-2	grained, slightly weathered, moderately strong rock, very closely spaced in fair condition. Core recovery = 100 %			
50	15							C-12	ROD-84% FF-1	Low grade ANDESITE and lapilli tuff, pale green, fine grained, slightly weathered, strong rock, very closely spaced in fair to good condition. Core recovery = 100 %			
55	17							C-13	RQD-92% FF1	Low grade ANDESITE and lapilli tuff, pale green, fine grained, fresh, strong rock, very closely spaced in fair condition. Core recovery = 100 %			
60	18							C-14	ROD-94% FF-1	Low grade ANDESITE and lapilli tuff, pale green, fine grained, fresh, strong rock, very closely spaced in good condition. Core recovery = 100 %			
65	19							C-15	RQD-68% FF-1	Low grade ANDESITE and lapilli tuff, pale green, fine grained, slightly weathered, strong rock, very closely spaced in fair condition. Core recovery = 90 %			
70	20												
	21												

RUC:KJ RL0381-HYAK TO EASTON.GPJ 4/11/08 10:45:00 AM



LOG OF TEST BORING

Start Card S-04808

Job No. RL-0381

SR 90

Elevation 2445.7 ft (745.4 m)

HOLE No. H-14-98

Sheet 4 of 4

Project Hyak to Easton(Lake keechelus)

Driller Tom Schmidt

Lot# 2024

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rc FPF	Rock Strength	Sample Type	Sample No.	Blows/S* SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22														
75														
23														
24														
80														
25														
65														
26														
27														
90														
28														
95											End of Test Hole Boring at 69.5 feet below ground elevation.			

ROCKM RL0381 HYAK TO EASTON.GPJ 4/11/05 10:46:01 A4



Job No. 33758573 SR 90 Elevation 2533.3 ft (772.1 m)

Start Card _____

HOLE No. H-14-06

Sheet 1 of 3

Project WSDOT I-90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Kranti Maturi

Start June 28, 2006 Completion June 29, 2006 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto-hammer

Station 1286+37 Offset B'R Casing HWT, HQ Method Wet Rotary

Northing 744934.29 Easting 1423158.39 Latitude _____ Longitude _____

County Kittitas Subsection SW 1/4 of SW 1/4 Section 23 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec FF	Rock Strength	Sample Type	Sample No.	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
1							47		D-1	3 4 5 (9)	Silty SAND, subangular, loose, brown, moist, homogenous, no HCl reaction. (Note: trace organics) Recovered = 0.7 feet.			
5							47		D-2	38 11 11 (22)	Silty SAND with gravel, subangular, medium dense, brown, wet, homogenous, no HCl reaction. Recovered = 0.7 feet.			
2							71		C-3		Well graded GRAVEL with cobbles, subangular to subrounded, gray, wet, homogenous, no HCl reaction. Recovered = 2.5 feet.			
10							17		D-4	12 7 8 (15)	Poorly graded GRAVEL with sand, subangular, medium dense, gray, wet, homogenous, no HCl reaction. Recovered = 0.25 feet.			
							52		C-5		COBBLE, rounded, very dense, gray, wet, homogenous, no HCl reaction. Recovered = 1.3 feet.			
4							52		C-6		Poorly graded GRAVEL with cobbles, subangular, gray, wet, homogenous, no HCl reaction. Recovered = 1.3 feet.			
15							50		D-7	15 10 20 (30)	Well graded GRAVEL with sand, subangular, dense, brown, wet, homogenous, no HCl reaction. Recovered = 0.75 feet.			
							66		C-8		Well graded GRAVEL, subangular, gray, wet, homogenous, no HCl reaction. Recovered = 2.3 feet.			
20														

ROCKN BORING.BPJ 11/17/06.9:18:49 A11



Job No. 33758573

SR 90

Elevation 2533.3 ft (772.1 m)

Start Card _____

HOLE No. H-14-06

Sheet 2 of 3

Project WSDOT I-90 Snoqualmie Pass East

Driller Kerry Cooper

Lic# 2552

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec FF	Rock Strength Sample Type	Sample No.	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7							<u>100</u> <u>15</u>	D-9 C-10	50/3*	Well graded GRAVEL with sand, subangular, very dense, gray, wet, homogenous, no HCl reaction. Recovered = 0.25 feet. Poorly graded GRAVEL, subangular to subrounded, gray, wet, homogenous, no HCl reaction. Recovered = 0.5 feet.			
25							<u>0</u>		50/0*	No recovery. Attempted SPT, but SPT sampler pounded on rock.			
8													
9													
30							<u>100</u>	D-11	50/3*	Well graded GRAVEL with sand, subangular, very dense, gray, wet, homogenous, no HCl reaction. Recovered = 0.25 feet.			
10													
35										Attempted SPT, but SPT sampler pounded on rock.			
11													
12													
40							<u>50</u>	D-12	50/6*	Poorly graded GRAVEL with sand, subangular, very dense, gray, wet, homogenous, no HCl reaction. Recovered = 0.25 feet.			
13													
45													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No.	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
14							<u>27</u>	D-13	8 9 9 (18)	Well graded GRAVEL, subangular, medium dense, gray, wet, homogenous, no HCl reaction. Recovered = 0.4 feet.			
50							<u>87</u>	D-14	17 22 18 (40)	Poorly graded SAND with gravel, subangular, dense, gray, wet, homogenous, no HCl reaction. Recovered = 1.3 feet.			
55							<u>47</u>	D-15	15 11 14 (25)	Poorly graded GRAVEL with sand, subangular, dense, gray, wet, homogenous, no HCl reaction. Recovered = 0.7 feet.			
18										Bottom of boring at 56.5 feet below ground surface. Backfilled to ground surface with bentonite chips. Water level measurement (below ground surface): - 6/29/06 at 07:30: 24.3 feet with casing depth 56.5 feet.			
60													
19													
65													
20													
21													
70													

BRIDGE ON L3 LINE

Hole No. H 15

Sub Section LK. KACHESS SNOW SHEED

Sheet 2 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL	
	15 1/2"		75 STD PEN.	OUT OF TALUS - SANDY GRAVEL, COBBLES, BOULDER	
			5	BROWN SILT BINDER, WET, VERY DENSE, TIGHTLY	
	12 5/9"		41 STD PEN.	PLACED, APPEARS TO BE ALPINE TILL	
			50 STD PEN.		
25			75 3/4"	4	BLEST 22 1/2" 1 STICK.
			3	" 24' "	
				" 25' "	
	40 1/11"		46 STD PEN.	7	BEDROCK - GRAY, HIGHLY FRACTURED
			40 1/11"		KACHESS ANDESITE
				CORE 8	
				100% REC	
30					LOST ALL WATER 0' TO 43' 6"
				43' 6" NO WATER LOST	
			CORE 9		
			100% REC		
35					
			CORE 10		
			100% REC		
40			CORE 11		
			100% REC		
			CORE 12	43' 6" HIGHLY WEATHERED & FRACTURED	
			100% REC		
45				STOPPED TEST BORING AT 46'	
46					

LOG OF TEST BORING



Washington State
Department of Transportation

HOLE No. H-15-98

PROJECT Hyak to Easton(Lake keechelus)

Job No. RL-0381

S.R. 90

Station n/a Offset n/a

C.S. 1901

Equipment CME-45 Casing HQ/HW

Ground El (m)

Method of Boring wet rotary

Start Date November 13, 1998 Completion Date November 13, 1998 Sheet 1 of 2

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
0							50/0 (50/0")	D-1		No recovery			
							RQD-100%	C-2		Low grade ANDESITE and lapilli tuff, pale green, fine grained, fresh, very strong rock, very closely spaced in good condition.			
							FF-0	C-3		Core recovery = 100 %			
							RQD-100%			Low grade ANDESITE and lapilli tuff, pale green, fine grained, slightly weathered, very strong rock, very closely spaced in fair condition.			
							FF-0			Core recovery = 100 %			
5													
10													
							RQD-100%	C-4		Low grade ANDESITE and lapilli tuff, pale green, fine grained, slightly weathered, very strong rock, very closely spaced in good condition.			
							FF-0			Core recovery = 100 %			
15													
							RQD-94%	C-5		Low grade ANDESITE and lapilli tuff, pale green, fine grained, slightly weathered, very strong rock, very closely spaced in good condition.			
							FF-0			Core recovery = 100 %			
20													
							RQD-94%	C-6		Low grade ANDESITE and lapilli tuff, pale green, fine grained, fresh, very strong rock, very closely spaced in good condition.			
							FF-1			Core recovery = 100 %			

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. 90 Section Lake Kirkham Snow Shed Job No. L-4540
 Hole No. H-16 Sub Section Bridge on L³ Line Cont. Sec. 1901
 Station L³ 282765 Offset 4.27 E Ground El. 2532.0
 Type of Boring Wash Bored Percuss Casing 4" X 22.5' W.F. El. None Bottom Log
 Inspector Bartholomew - Nebygen Date JULY 25, 1975 Sheet 1 of 2

DEPTH	BLOWS PER FT	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL
			30 ↑ STD.	SAND + GRAVEL - SILTY FINE TO COARSE
	63		33 PEN	
			30 ↓ 1	ROCK FRAGMENTS - POSSIBLE COBBLES + Boulders
			26 ↓	COMPACT to Dense - moist to wet Brown.
5				
	20		16 ↑ STD.	
			5 PEN	
			15 ↓ 2	
			46 ↓	
10				
	20		↑ C-3	BLAST IN core Hole AFTER samples 1 Tube
			12 ↑ STD.	
			10 PEN	Kinipak 2" X 5"
			10 ↓ 4	
			10 ↓	
15				
	55		100% ↑ CORE	BLAST IN core Hole AFTER samples 1 Tube
			REC. 5	Kinipak 2" X 5"
			15 ↑ STD.	
			40 PEN	
			6 ↓	
20				

Hole No. H- Sub Section Bridge on L³ Line Sheet 2 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL	
	80/6"		80 ↓ STD. PEN.		
			7	BEDROCK - andesitic highly fractured	
				Weathered 21.5' to 290'	
				↑	
25				C D R E	
				REC. 8	
				*	
				C D R E	
30				REC. 9	BEDROCK - andesitic moderately fractured.
				*	
				C D R E	
35			REC. 10		
			*		
			C D R E		
40			REC. 11		
				TEST BORING STOPPED AT 41.5'	
				Hole Dry to 31.5' 7-25-75 Very small amount water lost while coving - 100% water lost in granular material.	
45					

LOG OF TEST BORING



Washington State
Department of Transportation

HOLE No. H-16-98

PROJECT Hyak to Easton(Lake Keechelus)

Job No. RL-0381

S.R. 90

Station _____ Offset _____

C.S. 1901

Equipment CME-45 Casing HW x 45', NQ x 74.5'

Ground EI (m)

Method of Boring wet rotary

Start Date November 15, 1998

Completion Date November 17, 1998

Sheet 1 of 3

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
0							RQD-0%	C-1		Low grade ANDESITE and lapilli tuff, pale green, fine grained, moderately weathered, very strong rock, very closely spaced in fair condition. Core recovery = 80 % Low grade ANDESITE and lapilli tuff, pale green, fine grained, moderately weathered, very strong rock, closely spaced in fair condition. Core recovery = 70 %			
5							RQD-40%	C-2					
10							RQD-22%	C-3					
15						15 18 5 (23)		D-4		Well graded GRAVEL with sand and cobbles and boulders, subangular, medium dense, dark gray, moist, homogeneous. Retained: 0.6 ft.			
20						32 50/3		C-5		Low grade ANDESITE and lapilli tuff, grayish green, fine grained, highly weathered, very strong rock, moderately spaced in very poor condition. Core recovery = 34 %			
20								D-6		Well graded GRAVEL with sand and cobbles and boulders, subrounded, very dense, pale green, moist,			

LOG OF TEST BORING



Washington State
Department of Transportation

HOLE No. H-16-98

Sheet 2 of 3

PROJECT Hyak to Easton(Lake keechelus)

Job No. RL-0381

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft				SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			10	20	30	40							
7							(50/3") RQD-36% FF-0	C-7		homogeneous. Retained: 0.2 ft. Low grade ANDESITE and lapilli tuff, light bluish gray, fine grained, slightly weathered, moderately strong rock, very closely spaced in good condition. Core recovery = 79 %			
25							RQD-100% FF-0	C-8		Low grade ANDESITE and lapilli tuff, light bluish gray, fine grained, slightly weathered, strong rock, very closely spaced in fair condition (Note: 85 healed, calcium infilled fractures) Core recovery = 100 %			
30							RQD-100% FF-0	C-9		Low grade ANDESITE and lapilli tuff, greenish gray, fine grained, slightly weathered, strong rock, very closely spaced in good condition. Core recovery = 100 %			
35							RQD-100% FF-0	C-10		Low grade ANDESITE and lapilli tuff, greenish gray, fine grained, slightly weathered, strong rock, very closely spaced in good condition. Core recovery = 100 %			
40							RQD-100% FF-0	C-11		Low grade ANDESITE and lapilli tuff, greenish gray, fine grained, fresh, strong rock, very closely spaced in good condition. Core recovery = 100 %			
45							RQD-100% FF-0	C-12		Low grade ANDESITE and lapilli tuff, greenish gray, fine grained, fresh, strong rock, very closely spaced in good condition. Core recovery = 100 %			

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. 90 Section LAKE KEECHELUS VIADUCT Job No. 2-4540
 Hole No. H-17 Sub Section BRIDGE ON L³ LINE Cont. Sec. 1901
 Station L³ 28.5 + 21 PIER # 3 Offset 20.5 FT. E Ground El. 25.28
 Type of Boring WASH. BORE - CORE Casing 4" X 49' W.T. El. NOT DETERMINED
 Inspector E. E. DUVAL Date OCT. 15-20 1975 Sheet 1 of 3

PTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
		▲	49 ▲ STD.	TALUS RUBBLE OF ROCK FRAGMENTS ALL SIZES, SAND & SILT BROWN
	35		29 ▲ PEN.	
			6 ▼	
			21 ▼ 1	
5				
	30		20 ▲ STD.	MATERIAL DISPLACES EASY DRIVING 4" CASING.
		13 ▲ PEN.		
		17 ▼ 2		
10				
	22		22 ▲ STD.	
		11 ▲ PEN.		
		15 ▼ 3		
15				
	8		22 ▲ STD.	
		35 ▲ PEN.		
		5 ▼ 4		
		4 ▼		
		4 ▼		
20				

Hole No. H-17 Sub Section BRIDGE ON L3 LINE Sheet 2 of 3

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
			37 ↑	TALUS - RUBBLE OF ROCK FRAGMENTS ALL SIZES, SAND & SILT, BROWN
	21		35	
			15	
			9	
			12	
			10	
			10 ↓	
25				
	105		8 ↑ STD. PEN.	BLAST 25' 1 STICK KINEPAK " 30' 1 " "
			85 ↓ PEN.	
			29/6	
30				
	122/6"		122 ↑ STD. PEN.	
			124" ↓ PEN.	
			75/6" ↓	
35				
	18		13 ↑ STD. PEN.	
			21	
			13	
			10	
			8	
			13 ↓	
40				
	32		85 ↑ STD. PEN.	
			29	
			18	
			14	
			17	
			13	
			8 ↓	
45				

...

Hole No. M-17 Sub Section BRIDGE ON L3 LINE Sheet 3 of 3

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL
	78		17 ▲ STP. 16 PEN. 10.2 4.2 ▼ 10	
50				BED ROCK - LARE KEECHENUS, ANDESITE MODERATELY FRACTURED, GRAY
			100% REC. CORE 11	C.C. = 13,210 PSI
55				
			100% REC. CORE 12	
60				
			100% REC. CORE 13	C.C. = 25,465 PSI
65				STOPPED TEST BORING AT 65'-0"

S.R. 90 Section Hyak to Easton - Lake Keechelus Job No. RL-0381
 Hole No. B-17-98 For _____ Cont. Sec. _____
 Station _____ Offset _____ Ground El. _____
 Type Of Boring Wet Rotary Drill Contract Hammer None Casing HQ W.T. El. _____
 Inspector Featherstone - Clayton - Breck Starting Date 11/12/98 Sheet 1 of 10
 Prepared by - Brian M. Breck

DEPTH	PROFILE	DESCRIPTION OF MATERIAL
0		C - 1 (0.0' to - 4.0') Low grade ANDESITE and LAPILLI TUFF ,Light olive gray ,Moderately weathered ,Medium strong - rock ,Discontinuities are very closely spaced and in fair condition. CR - 100% RQD - 90% FF= 2
5		C - 2 (- 4.0' to - 5.5') Low grade ANDESITE and LAPILLI TUFF ,Light olive gray ,Moderately weathered ,Medium strong - rock ,Discontinuities are very closely spaced and in fair condition. CR - 100% RQD - 45% FF= 2
10		C - 3 (- 5.5' to - 9.1') Low grade ANDESITE and LAPILLI TUFF ,Light olive gray ,Moderately weathered ,Medium strong - rock ,Discontinuities are very closely spaced and in fair condition. CR = 100% RQD - 70% FF= 2
15		C - 4 (- 9.1' to - 14.0') Low grade ANDESITE and LAPILLI TUFF ,Light olive gray ,Moderately weathered ,Strong rock , Discontinuities are very closely spaced and in fair condition. CR - 70% RQD - 64% FF= 1 Note - (- 9.5 to - 10.8) - Very dark gray ,Highly weather ANDESITE ,Low recovery.
20		C - 5 (- 14.0' to - 16.5') Low grade ANDESITE and LAPILLI TUFF ,Light olive gray ,Moderately weathered ,Strong rock , Discontinuities are very closely spaced and in fair condition. CR = 100% RQD - 98% FF= 0 C - 6 (- 16.5' to - 19.9') Low grade ANDESITE and LAPILLI TUFF ,Light olive gray ,Moderately weathered ,Very strong rock , Discontinuities are very closely spaced and in fair condition. CR = 100% RQD - 85% FF= 1



DEPTH	PROFILE	DESCRIPTION OF MATERIAL
		C - 7 (- 19.9' to - 24.5')
		Low grade ANDESITE and LAPILLI TUFF ,Pale green ,Moderately weathered ,Very strong rock ,
		Discontinuities are very closely spaced and in good condition. CR = 100% RQD = 98% FF= 1
		C - 8 (- 24.5' to - 26.3')
25		Low grade ANDESITE and LAPILLI TUFF ,Pale green ,Slightly weathered ,Very strong rock ,
		Discontinuities are very closely spaced and in good condition. CR = 100% RQD = 100% FF= 0
		C - 9 (- 26.3' to - 30.8')
		Low grade ANDESITE and LAPILLI TUFF ,Pale green ,Slightly weathered ,Very strong rock ,
30		Discontinuities are very closely spaced and in good condition. CR = 100% RQD = 95% FF= 0
		Note - Hugh Clayton took over inspecting 11-13-98
		C - 10 (- 30.8' to - 34.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Strong rock ,Discontinuities are widely spaced and
		in good condition. CR = 90% RQD = 100% FF= 0
35		C - 11 (- 34.5' to - 39.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Strong rock ,Discontinuities are widely spaced and
		in good condition. CR = 100% RQD = 100% FF= 1
40		C - 12 (- 39.5' to - 44.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Strong rock ,Discontinuities are closely spaced and
		in good condition. CR = 100% RQD = 100% FF= 6
45		

DEPTH'	PROFILE	DESCRIPTION OF MATERIAL
		C - 13 (- 44.5' to - 49.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Strong rock ,Discontinuities are widely spaced and in good condition.
		CR = 100% RQD = 100% FF= 2
50		
		C - 14 (- 49.5' to - 54.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Strong rock ,Discontinuities are widely spaced and in good condition.
		CR = 100% RQD = 100% FF= 1
55		
		C - 15 (- 54.5' to - 59.0')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Strong rock ,Discontinuities are widely spaced and in good condition.
		CR = 88% RQD = 65% FF= 3
60		
		C - 16 (- 59.0' to - 64.0')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Strong rock ,Discontinuities are widely spaced and in good condition.
		CR = 100% RQD = 96% FF= 2
65		
		C - 17 (- 64.0' to - 69.0')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Strong rock ,Discontinuities are widely spaced and in good condition.
		CR = 100% RQD = 96% FF= 4
70		

DEPTH	PROFILE	DESCRIPTION OF MATERIAL
		C - 18 (- 69.0' to - 74.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Strong rock ,Discontinuities are closely spaced and in good condition. CR - 100% RQD = 98% FF= 6
75		
		C - 19 (- 74.5' to - 79.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Strong rock ,Discontinuities are widely spaced and in good condition. CR - 100% RQD = 100% FF= 2
80		
		C - 20 (- 79.5' to - 84.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Strong rock ,Discontinuities are moderately spaced and in good condition. CR - 100% RQD = 100% FF= 3
85		
		C - 21 (- 84.5' to - 89.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Strong rock ,Discontinuities are moderately spaced and in good condition. CR - 100% RQD = 100% FF= 4
90		
		C - 22 (- 89.5' to - 94.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Strong rock ,Discontinuities are widely spaced and in good condition. CR - 100% RQD = 96% FF= 0
95		

DEPTH	PROFILE	DESCRIPTION OF MATERIAL
		C - 23 (- 94.5' to - 97.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Weak rock ,Discontinuities are very closely spaced and in poor condition. CR - 60% RQD - 0% FF- 26
100		C - 24 (- 97.5' to - 102.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Strong rock ,Discontinuities are very widely spaced and in excellent condition. CR - 100% RQD - 100% FF- 0
105		C - 25 (- 102.5' to - 104.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Strong rock ,Discontinuities are very widely spaced and in excellent condition. CR - 100% RQD - 100% FF- 0
		C - 26 (- 104.5' to - 109.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Strong rock ,Discontinuities are very widely spaced and in excellent condition. CR - 100% RQD - 100% FF- 0
110		C - 27 (- 109.5' to - 114.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Strong rock ,Discontinuities are very widely spaced and in excellent condition. CR - 100% RQD - 100% FF- 0
115		C - 28 (- 114.5' to - 119.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Strong rock ,Discontinuities are very widely spaced and in excellent condition. CR - 100% RQD - 100% FF- 0
120		

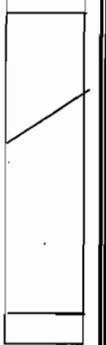
DEPTH	PROFILE	DESCRIPTION OF MATERIAL
		C - 29 (- 119.5' to - 124.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Very strong rock ,Discontinuities are very widely spaced and in excellent condition. CR = 100% RQD = 100% FF= 0
125		
		C - 30 (- 124.5' to - 129.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Very strong rock ,Discontinuities are very widely spaced and in excellent condition. CR = 100% RQD = 100% FF= 0
130		
		C - 31 (- 129.5' to - 134.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Very strong rock ,Discontinuities are very widely spaced and in excellent condition. CR = 100% RQD = 100% FF= 0
135		
		C - 32 (- 134.5' to - 139.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Very strong rock ,Discontinuities are very widely spaced and in excellent condition. CR = 100% RQD = 100% FF= 0
140		
		C - 33 (- 139.5' to - 144.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Very strong rock ,Discontinuities are very widely spaced and in excellent condition. CR = 100% RQD = 100% FF= 0
145		



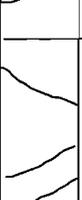
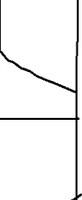
DEPTH	PROFILE	DESCRIPTION OF MATERIAL
		C - 34 (- 144.5' to - 149.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Very strong rock ,Discontinuities are very widely spaced and in excellent condition. CR - 100% RQD - 96% FF- 3
150		
		C - 35 (- 149.5' to - 154.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Very strong rock ,Discontinuities are very widely spaced and in excellent condition. CR - 100% RQD = 100% FF- 0
155		
		C - 36 (- 154.5' to - 159.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Very strong rock ,Discontinuities are very widely spaced and in excellent condition. CR - 100% RQD - 100% FF- 1
160		
		C - 37 (- 159.5' to - 164.5')
		ANDESITE ,Light gray ,Coarse grained ,Slightly ,Weak rock ,Discontinuities are closely and in good condition. CR - 100% RQD - 85% FF- 20
165		
		C - 38 (- 164.5' to - 169.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Very strong rock ,Discontinuities are very widely spaced and in excellent condition. CR - 100% RQD - 100% FF- 0
170		

DEPTH	PROFILE	DESCRIPTION OF MATERIAL
		C - 39 (- 169.5' to - 174.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Very strong rock ,Discontinuities are very widely spaced and in good condition.
		CR - 100% RQD - 97% FF- 5
175		
		C - 40 (- 174.5' to - 179.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Very strong rock ,Discontinuities are very widely spaced and in good condition.
		CR - 100% RQD - 95% FF- 5
180		
		C - 41 (- 179.5' to - 184.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Very strong rock ,Discontinuities are very widely spaced and in good condition.
		CR - 100% RQD - 95% FF- 3
185		
		C - 42 (- 184.5' to - 189.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Very strong rock ,Discontinuities are very widely spaced and in good condition.
		CR - 100% RQD - 95% FF- 4
190		
		C - 43 (- 189.5' to - 194.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Very strong rock ,Discontinuities are very widely spaced and in good condition.
		CR - 100% RQD - 95% FF- 4
195		



DEPTH	PROFILE	DESCRIPTION OF MATERIAL
		<p>C - 44 (- 194.5' to - 199.5') ANDESITE ,Light gray ,Coarse grained ,Fresh ,Very strong rock ,Discontinuities are very widely spaced and in excellent condition. CR = 100% RQD = 100% FF= 0</p>
200		<p>C - 45 (- 194.5' to - 204.5') ANDESITE ,Light gray ,Coarse grained ,Fresh ,Very strong rock ,Discontinuities are very widely spaced and in excellent condition. CR = 100% RQD = 100% FF= 0</p>
205		<p>C - 46 (- 204.5' to - 209.5') ANDESITE ,Light gray ,Coarse grained ,Fresh ,Very strong rock ,Discontinuities are very widely spaced and in good condition. CR = 100% RQD = 100% FF= 2</p>
210		<p>C - 47 (- 209.5' to - 214.5') ANDESITE ,Light gray ,Coarse grained ,Fresh ,Very strong rock ,Discontinuities are very widely spaced and in excellent condition. CR = 100% RQD = 100% FF= 0</p>
215		<p>C - 48 (- 214.5' to - 219.5') ANDESITE ,Light gray ,Coarse grained ,Fresh ,Very strong rock ,Discontinuities are very widely spaced and in excellent condition. CR = 100% RQD = 100% FF= 1</p>
220		



DEPTH	PROFILE	DESCRIPTION OF MATERIAL
		C - 49 (- 219.5' to - 224.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Very strong rock ,Discontinuities are very widely spaced and in excellent condition. CR - 100% RQD - 100% FF= 0
225		
		C - 50 (- 224.5' to - 229.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Strong rock ,Discontinuities are very closely spaced and in fair condition. CR - 100% RQD - 40% FF= 28
230		
		C - 51 (- 229.5' to - 234.5')
		ANDESITE ,Light gray ,Coarse grained ,Fresh ,Very strong rock ,Discontinuities are very widely spaced and in good condition. CR - 100% RQD - 97% FF= 8
235		Note - Brian Breck took over the inspecting on 11/16/98
		C - 52 (- 234.5' to - 239.5')
		ANDESITE ,Light gray ,Medium grained ,Fresh ,Very strong rock ,Discontinuities are very widely spaced and in good condition. CR - 100% RQD - 96% FF= 4
240		
		C - 53 (- 239.5' to - 244.5')
		ANDESITE ,Light gray ,Medium grained ,Fresh ,Very strong rock ,Discontinuities are very widely spaced and in good condition. CR - 100% RQD - 100% FF= 1
245		

DEPTH	PROFILE	DESCRIPTION OF MATERIAL
		C - 54 (- 244.5' to - 249.5') ANDESITE ,Light gray ,Medium grained ,Fresh ,Very strong rock ,Discontinuities are very widely spaced and in good condition. CR - 100% RQD - 98% FF- 5
250		
		C - 55 (- 249.5' to - 254.5') ANDESITE ,Light gray ,Medium grained ,Fresh ,Strong rock ,Discontinuities are very widely spaced and in good condition. CR - 100% RQD - 100% FF- 2
255		
		C - 56 (- 254.5' to - 259.5') ANDESITE ,Light gray ,Medium grained ,Fresh ,Strong rock ,Discontinuities are very widely spaced and in good condition. CR - 100% RQD - 100% FF- 2
260		
		C - 57 (- 259.5' to - 264.5') ANDESITE ,Light gray ,Medium grained ,Fresh ,Strong rock ,Discontinuities are very widely spaced and in good condition. CR - 100% RQD - 100% FF- 1
265		
		End of test boring - - 264.5' Installed piezometer to - 264.5'

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. _____ Section LAKE KEECHELUS VIADUCT Job No. 1-4540
 Hole No. H-18 Sub Section BRIDGE ON L3 LINE Cont. Sec. 1901
 Station L3 287+0.4 PIER #4 Offset 31' L.T.E. Ground El. 2527
 Type of Boring WASH BORE ~ CORE Casing 4" X 6.5' WT Fl. - 3.8' - 0"
 Inspector E.E. DUVALL Date OCT 22 - 1975 Sheet 1 of 4

PTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL
			9 ↑ STD. 19 PEN.	TALUS - RUBBLE OF ROCK FRAGMENTS ALL SIZES,
	58		37 ↓ 29 ↓ 1	
				SAND & SILT, BROWN
5			32 ↑ STD. 20 PEN.	
	50 7"		30 1/2" ↓ 2	
10			8 ↑ STD. 11 PEN.	
	22		11 ↓ 9 ↓ 3	
15			21 ↑ STD. 23 PEN.	
	89		66 ↓ 4	
20				

Hole No. H-18 Sub Section B. RIDGE ON L³ LINE Sheet 3 of 4

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
			1" C O R E E 12	(BLAST 2 STICKS KINEPAR) 14" DIA. BOULDER
			REC 60% STD PEU 13	
50	49 1/4" 45/10		C O R E E 14	(BLAST 2 STICKS KINEPAR)
			REC 33 1/2%	
55			C O R E E 15	(BLAST 2 STICKS KINEPAR) 12" DIA. BOULDER
		*	C O R E E 16	(TILL LIKE) SAND AND SILT - WITH GRAVEL AND ^{ROUNDED} SMALL
				ROCK FRAGMENTS, LIGHT BROWN, MOIST, DENSE
60			24 STD 20 PEU 38 14 39 *	
	58	*		BED ROCK - KEECHICUS ANDESITE - HIGHLY FRACTURED, GRAY
65			C O R E E 16	(BLAST 2 STICKS KINEPAR)
			REC 95/10	
70			C O R E E 19	

Hole No. H-18 Sub Section BRIDGE ON L³ LINE Sheet 4 of 4

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL
			REC ↓	
	70/1 1/2		STD PEN 20 C	
75			O	(BROWN CLAYEY SILT NOTED IN THE SEAMS)
			R	
			REC 100 % EG 21 *	
			C	
80			O	
			R	
			REC 100 % EG 22 *	
			C	
85			O	
			R	
			REC 100 % EG 23 *	
			C	
			↓	TEST BORING STOPPED AT - 88'-0"
			↓	W.T. - 38'-0" BELOW GROUND ELEV.
90				



LOG OF TEST BORING

Start Card _____

Job No 33758573 SR 90

Elevation 2543.1 ft (775.1 m)

HOLE No. H-18-06

Sheet 1 of 2

Project WSDOT I 90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Kranti Maturi

Start June 18, 2006 Completion June 18, 2006 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto hammer

Station 1324+05 Offset 63'L Casing HQ Method Wet Rotary

Northing 741352.29 Easting 1424005.73 Latitude _____ Longitude _____

County Kittitas Subsection NE 1/4 of SW 1/4 Section 26 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
								D 1	1 2 4 (6)	Well graded silty SAND with gravel, angular to subangular, loose, brown, moist, homogenous, no HCl reaction. Recovered = 0.4 feet.			
1						49		C 2		Well graded GRAVEL with cobbles, angular to rounded, greenish gray and brown, wet, homogenous, no HCl reaction. Recovered = 1.7 feet.			
5						33		D 3	21 44 26 (70)	Poorly graded GRAVEL with sand, angular, very dense, reddish brown, wet, homogenous, no HCl reaction. Recovered = 0.5 feet.			
2						35		C 4		Poorly graded GRAVEL with cobbles, angular, greenish gray and brown, wet, homogenous, no HCl reaction. Recovered = 1.3 feet.			
10						0		D 4	8 8 10 (18)	No recovery.			
4						29		C 5		Poorly graded GRAVEL with cobbles, angular, brown and gray, wet, homogenous, no HCl reaction. Recovered = 1 foot.			
15						13		D 6	49/6"	Poorly graded GRAVEL, subangular, very dense, gray, wet, homogenous, no HCl reaction. Recovered = 0.07 feet. ANDESITE, greenish gray, fine grained, moderately weathered, strong rock (R4). No HCl reaction. Discontinuities are very closely spaced, and in poor condition. CR = 97.7%, RQD = 20.6%, FF=2.67.			
5						98 26		C 7					
20													

DRAFT ROCKN BOR NG GFJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7									C 8		ANDESITE and Lapilli Tuff, moderate yellowish to bluish gray, fine grained, highly weathered, strong rock (R4). Weak HCl reaction. Discontinuities are closely spaced, and in very poor condition. CR = 96%, RQD = 36%, FF = 2.2.	▽		
25									C 9		ANDESITE and Lapilli Tuff, greenish gray and bluish gray, fine grained, fresh, moderately strong rock (R3) based on Point Load Test results. Weak HCl reaction. Discontinuities are very closely spaced, and in fair to poor condition. CR = 100%, RQD = 66%, FF=3.6.			
30									C 10		ANDESITE and Lapilli Tuff, greenish gray, fine grained, fresh, very strong rock(R5). Weak HCl reaction. Discontinuities are very closely spaced to medium spaced, and in poor condition. CR = 100%, RQD = 83%, FF = 2.			
35									C 11		ANDESITE and Lapilli Tuff, greenish gray, fine grained, fresh, very strong rock(R5). Weak HCl reaction. Discontinuities are closely spaced, and in fair condition. CR = 96%, RQD = 91%, FF = 0.2.			
40											Bottom of boring at 41.0 feet below ground surface. Backfilled to ground surface with bentonite chips.			
45											Water level measurement (below existing ground surface): 6/8/06 at 13:12: 21.0 feet with casing depth 41.0 feet.			

DRAFT ROCKN BOR NG GPJ 9/10/08

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. 90 Section Lake Knappton Saw-Steel Bridge Job No. 6-45380
 Hole No. H-19 Sub Section Pier # 7 Cont. Sec. 1901
 Station 13 292 +53 Offset 17' E Ground El. 2528
 Type of Boring Wash. Bore - Core Casing 3" X 41'6" W.T. El. NOT DETERMINED
 Inspector Nedger - DUVALL Date Oct 28 - Nov 7, 1955 Sheet 1 of 3

PTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
	11		2 9	SAND GRAVEL & ROCK FRAGMENT - SILTY FINE &
			25 30	CLAY WITH SCATTERED COBBLES - BROWN - COMPACT FILL MATERIAL.
5	10 2/3"		10 13	SMALL BOULDER 4.0'-5.0' BLAST 1/2 TUBE 2" X 3" KINGPAK
			2	
				TALUS - ALL SIZE ROCK FRAGMENTS & GRAVEL VERY SMALL % FINE MATERIAL - LOOSE OPEN VOIDS.
10	15 1/6"		10 42	BLAST 12' 1 TUBE 2" X 3" KINGPAK
			25 22	
15	19		10 9	
			10 12	
20				

Hole No. H-19 Sub Section Lake Keweenaw Sun Shed Bridge Sheet 2 of 3

DEPTH	BLOWS PER FT	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
	14 1/6"		19	BLAST 22' 1 TUBE KINERAK 2" X 9"
	12.1		6.8	
			53	
			7	
25	26 1/10"		57d	FRAGMENT 266" TO 316" ANDESITE DETER HIGHLY FRACTURED WEATHERED BROWN, (POSSIBLE FRACTURED FROM BLAST) 266" TO 316" NO WATER LOST, 316" LOST ALL WATER TO 416"
			16 10/4" PEN. 6	
			50 1/1"	
30			316" REC CORE 7	11-3-75 W.T. DOWN 22.5 BELOW GR. EL. 11-4-75 DRY HOLE HOLE SET OVER WEEK END
			16" REC. #9 S.D. PEN #9	FOR I.D. HOLE FILLED IN OVERNIGHT
35			8" REC CORE 8	
				11-7-75 W.T. WITH 416" CASING, HOLE DEPTH 666" W.T. DOWN 22' BELOW GR. EL. PULLED 5' CASING - HAD DRY HOLE
40				
	146 9"		81 76 78 1/3" STD. PEN. 10	416" NO WATER LOST
				416" BEDROCK - HIGHLY FRACTURED
				KEECHELUS ANDESITE BROWNISH GRAY
45			51 REC CORE 11	

Hole No. H-19 Sub Section BRIDGE ON 1/3 LINE PIER #7 Sheet 3 of 3

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
				BEDROCK HIGHLY FRACTURED
			X	KEECHELUS ANDESITE BROWNISH GRAY TO GRAY
			5' CORE REC. 12	
50				
			X	
			5' CORE REC. 13	
55				
			X	
			5' CORE REC. 14	
60				
			X	
			4' CORE REC. 15	
65				
				STOPPED TEST BORING AT 66'



LOG OF TEST BORING

Start Card _____

Job No 33758573 SR 90 Elevation 2543.8 ft (775.4 m)

HOLE No. H-19-06

Sheet 1 of 3

Project WSDOT I 90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Kranti Maturi

Start August 9, 2006 Completion August 9, 2006 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto hammer

Station 1326+18 Offset 33'L Casing HQ Method Wet Rotary

Northing 741142.89 Easting 1424009.32 Latitude _____ Longitude _____

County Kittitas Subsection NE 1/4 of SW 1/4 Section 26 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0													
1													
5													
2													
10													
4													
15													
5													
20													

DRAFT ROCKN BOR NG GFJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758573

SR 90

Elevation 2543.8 ft (775.4 m)

HOLE No. H-19-06

Sheet 2 of 3

Project WSDOT I 90 Snoqualmie Pass East

Driller Kerry Cooper

Lic# 2552

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
						<u>20</u>		D 8	5 5 6 (11)	Poorly graded GRAVEL, subangular, medium dense, gray, wet, homogenous, no HCl reaction. Recovered = 0.3 feet.			
						<u>71</u>		C 9		Well graded GRAVEL with cobbles (max. size = 0.5 feet), angular, gray, wet, homogenous, no HCl reaction. Recovered = 2.5 feet.			
7													
						<u>27</u>		D 10	7 8 9 (17)	Poorly graded GRAVEL with sand, subangular, medium dense, gray, wet, homogenous, no HCl reaction. Recovered = 0.4 feet.			
25						<u>66</u>		C 11		Poorly graded GRAVEL with cobbles (max. size = 0.4 feet), subangular, gray, wet, homogenous, no HCl reaction. Recovered = 2.3 feet.			
8													
						<u>7</u>		D 12	4 8 14 (22)	Poorly graded GRAVEL, subangular, medium dense, gray, wet, homogenous, no HCl reaction. Recovered = 0.1 feet.			
30						<u>54</u>		C 13		Poorly graded GRAVEL with cobbles (max. size = 0.7 feet), subangular, gray, wet, homogenous, no HCl reaction. Recovered = 1.9 feet.			
9													
						<u>27</u>		D 14	20 20 12 (32)	Poorly graded GRAVEL, subangular, dense, gray, wet, homogenous, no HCl reaction. Recovered = 0.4 feet.			
35						<u>29</u>		C 15		Poorly graded GRAVEL, subangular, dense, gray, wet, homogenous, no HCl reaction. Recovered = 1 foot.			
11													
						<u>27</u>		D 16	10 16 8 (24)	Poorly graded GRAVEL with sand, subangular, medium dense, gray, wet, homogenous, no HCl reaction. Recovered = 0.4 feet.			
40						<u>51</u>		C 17		Poorly graded GRAVEL, subangular, gray, wet, homogenous, no HCl reaction. Recovered = 1.8 feet.			
12													
45													

DRAFT ROCKN BOR NG GFJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
14							$\frac{30}{}$	D 18	9 9 50/4"	Poorly graded GRAVEL with sand, subangular, very dense, gray, wet, homogenous, no HCl reaction. Recovered = 0.4 feet.			
15							$\frac{96}{17}$	C 19		BASALT, greenish gray, fine grained, moderately weathered, moderately weak rock (R2). Strong HCl reaction. Discontinuities are very closely spaced, and in very poor condition. CR = 96%, RQD = 31%, FF = 1.7.			
50							$\frac{70}{>10}$	C 20		BASALT, greenish gray, fine grained, completely weathered, moderately weak rock (R2). Discontinuities are very closely spaced, and in very poor condition. CR = 70%, RQD = 16%, FF > 10. (There was about 0.3 feet of very soft clay, pocket penetrometer reading on clay was 0.5 tsf.)			
55							$\frac{98}{>10}$	C 21		BASALT, greenish gray, fine grained, moderately weathered, very weak rock (R1) based on Point Load Test result. Strong HCl reaction. Discontinuities are very closely spaced, and in very poor condition. CR = 98%, RQD = 54%, FF > 10.			
60										Bottom of boring at 60.0 feet below ground surface. Backfilled to ground surface with bentonite chips. No groundwater was encountered.			
65													
70													

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R.E. 90 Section LAKE KEECHICANUS VIADUCT Job No. 24590
 Hole No. H-20 Sub Section BRIDGE ON 13 LINE Cont. Sec. 1901
 Station L3 285 + 21 Offset 20' RT. " PIER 3 Ground El. 2510.0
 Type of Boring WASH. AND CHOP AND CORING Casing 3" TO 5' - 9" W.T. El. _____
 Inspector R. G. BEMENT Date NOVEMBER 29, 1975 Sheet 1 of 4

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
				FILL MATERIAL - RUBBLE - SILT, SAND AND GRAVEL WITH ROCK FRAGMENTS AND CONCRETE SLABS - VARIOUS SIZES, LIGHT BROWN, LOOSELY COMPACTED
5	25 39 1/2"		10 ↑ STD 15 ↓ PEN 39 1/2" 1	BLAST 1/2 STICK KINERAK
10	17 40 1/2"		7 ↑ STD 14 ↓ PEN 40 1/2" 2	BLAST 1/2 STICK KINERAK BLAST 1 STICK KINERAK
15	12		30 ↑ STD 6 ↓ PEN 7 3 5 12 15 ↓	BLAST 2 STICKS KINERAK
20				

Hole No. H-20 Sub Section BRIDGE ON 13 LINE Sheet 2 of 4

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
	60 1/2"		60 1/2" STD PEU 4	
				BLAST 2 STICKS KINERAK
25			13 10 9 12 11 11	
	21		13 9 12 11 11	
30	22 40 1/1"		13 9 40 1/1" 6	BLAST 4 STICKS KINERAK
35	150 15		150 STD PEU 7	(LOG OR STUMP 60° FROM HORIZONTAL) DRILLED THROUGH 32" OF WOOD BLAST 4 STICKS OF KINERAK
40	14		16 11 8 6 11 11	
45		*		SILTY SAND AND VARIOUS SIZED ROCK FRAGMENTS - TILL LIKE, LIGHT BROWN

Hole No. H-20 Sub Section BRIDGE ON L³ LINE Sheet 3 of 4

DEPTH	BLOWS PER FT	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL
	94	X	59 STD PEN	BLAST 4 STICKS KINEPAX
	26 1/10		37 9	
			26 1/10	
50	140	X	140 STD 2" PEN	BLAST 2 STICKS KINEPAX
	12 1/2		10	BLAST 2 STICKS KINEPAX
55	102	X	27 STD 70 PEN	BLAST 4 STICKS KINEPAX
			32 11	BLAST 2 STICKS KINEPAX
			26	
60		X	C O R E	BED ROCK - REFGHEWUS ANDESITE - MODERATELY FRACTURED, TRACES OF SILT IN THE SEAMS
			REC'D 100%	12
65		X	C O R E	
			REC'D 100%	B 13
70		X	C O R E	
			REC'D 100%	B 14



LOG OF TEST BORING

Start Card _____

Job No 33758573 SR 90

Elevation 2538.4 ft (773.7 m)

HOLE No. H-20-06 (OW)

Sheet 1 of 2

Project WSDOT I 90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Kranti Maturi

Start June 14, 2006 Completion June 14, 2006 Well ID# H 20 06 (OW) Equipment CME 45 (skid rig) w/auto hammer

Station 1336+94 Offset 53'L Casing HQ Method Wet Rotary

Northing 740242.13 Easting 1424531.23 Latitude _____ Longitude _____

County Kittitas Subsection SE 1/4 of SW 1/4 Section 26 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
							67		D 1	1	Well graded silty SAND with gravel (trace organics), subangular, medium dense, dark grayish brown, moist, homogenous, no HCl reaction.			
							67		C 2	10	Poorly graded GRAVEL with cobbles, subangular to rounded, medium dark gray and greenish gray, wet, homogenous, no HCl reaction.			
							100/30		C 3	10	Recovered = 1 foot.			
5							100		C 4	10	Recovered = 2 feet.			
10							100/14		C 5		ANDESITE, greenish gray, medium grained, slightly weathered, strong rock (R4). Weak HCl reaction. Discontinuities are very closely to closely spaced, and in very poor condition. CR = 100%, RQD = 38%, FF = 3.			
15							92/10		C 6		ANDESITE, greenish gray, medium grained, slightly weathered, strong rock (R4). Weak HCl reaction. Discontinuities are very closely to closely spaced, and in poor condition. CR = 100%, RQD = 84%, FF = 1.4.			
20							100/14		C 6		ANDESITE, greenish gray, medium grained, slightly			

DRAFT ROCKN BOR NG GFJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7											weathered, very strong rock (R5). Weak HCl reaction. Discontinuities are very closely to closely spaced, and in poor condition (clay/silt infilling). CR = 100%, RQD = 56%, FF = 1.4.			
25	8										<p>Bottom of boring at 23.5 feet below ground surface. Installed 1 inch diameter observation well:</p> <ol style="list-style-type: none"> Backfilled from 18.0 feet to 23.5 feet with bentonite chips. Installed 1 inch diameter observation well: <ul style="list-style-type: none"> PVC screen interval with 0.010 inch slots: 5.0 to 17.0 feet PVC riser: 1.9 feet above ground surface to 5.0 feet Sand filter pack: 5.0 to 18.0 feet Backfilled from 2.0 to 5.0 feet with bentonite chips. Installed quickcrete surface seal (0 to 2.0 feet) and protective steel casing (2.5 inch I.D., approximately 3 feet long). <p>Water level measurements (below existing ground surface):</p> <p>6/14/06 at 11:45: 3.0 feet with casing depth 23.5 feet.</p> <p>6/19/06 at 15:30: 5.0 feet in observation well.</p>			
30	9													
35	10													
40	11													
45	12													
	13													

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. 90 Section LAKE KEECHELUS VIADUCT Job No. L-4540
 Hole No. H-21 Sub Section BRIDGE ON L3 LINE Cont. Sec. 1901
 Station L3 290+70 PIER # 6 Offset 25.5 LT Ground El. 25.26
 Type of Boring WASH. BORE - BLAST - CORE Casing 3" X 50' W.T. El. NOT DETERMINED
 Inspector EUGENE E. DUVAL Date NOV. 11 DEC. 3 1975 Sheet 1 of 3

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL
		↑		TALUS -
				4' BLAST 1 STICK KINEPAK
5				
10	4		4 2 STD. 2 PEN. 3 4 3	15' BLAST 2 STICKS KINEPAK
				15' (2)
				17' (1)
15				17' (2)
			24 8 9 STD. 14 PEN. 12	17' (3)
	17			
20				

Hole No. H-21 Sub Section BRIDGE ON L3 LINE Sheet 2 of 3

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL
	$\frac{175}{4''}$		175 ↓ STD. PEN. 3	
				20' BLAST 2 STICKS KINE PAK
				25' 2
25	$\frac{100}{5''}$		100 ↓ STD. PEN. 4	266" 2
				28' 2
				30' 2
				326" 2
				45' 2
30	$\frac{52}{5''}$		19 ↑ STD. PEN. 13 39 ↓ 50 ↓ 5	
35		✱		SANDY TILL -
			20 ↑ STD. PEN. 50 19 14 ← 23 25 23 ↓	
40	$\frac{62}{5''}$		28 ↑ STD. PEN. 31 31 ↓ 30 ↓ 7	
		✱		GRAVELLY TILL -
45				

Hole No. H-21 Sub Section LAKE KEECHELUS VIADUCT Sheet 3 of 3

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
	210		90 \uparrow STD 120 \downarrow PEN 8	
	6.2		42 \uparrow STD PEN	
50	125 1'	\times	40 \downarrow 100 5" 9 125 \downarrow STD PEN 10	BEDROCK - LAKE KEECHELUS, ANDESITE HIGHLY FRACTURED, GRAY
			\uparrow	
			5' CORE REC 11	
55			\times	
			4 1/2' CORE REC 12	
60			\times	
			4' CORE REC 13	
65			\times	
			5' CORE REC 14	
70			\downarrow	STOPPED TEST BORING AT 70'-0"



LOG OF TEST BORING

Start Card _____

Job No 33758573 SR 90

Elevation 2545.8 ft (776.0 m)

HOLE No. H-21-06

Sheet 1 of 2

Project WSDOT I 90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Kranti Maturi

Start June 7, 2006 Completion June 7, 2006 Well ID# Not Applicable

Equipment CME 45 (skid rig) w/auto hammer

Station 1343+78 Offset 7'L Casing HQ

Method Wet Rotary

Northing 739693.38 Easting 1424943.1 Latitude _____

Longitude _____

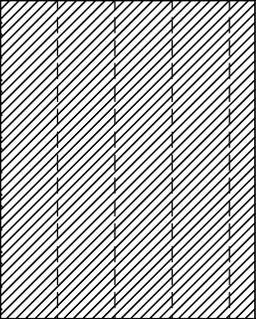
County Kittitas Subsection SE 1/4 of SW 1/4

Section 26 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0	0						60	D 1	2 4 6 (10)	Well graded silty SAND, angular to subangular, loose, brown, moist, homogenous, no HCl reaction. Recovered = 0.9 feet.			
1	1						60	D 2	38 33 30 (63)	Well graded silty GRAVEL with sand, angular, very dense, brown, moist, homogenous, no HCl reaction. Recovered = 0.9 feet.			
2	2						69 23	C 3		DACITE BRECCIA, pale yellowish green, medium to coarse grained, highly weathered, moderately weak rock (R2). No HCl reaction. Discontinuities are very closely spaced, and in poor condition. CR = 68.5%, RQD = 0%, FF > 3.			
10	3						96 24	C 4		DACITE BRECCIA, greenish gray, medium to coarse grained, fresh, moderately weak rock (R2). No HCl reaction. Discontinuities are very closely spaced, and in poor condition. CR = 96%, RQD = 23%, FF = 2.4.			
15	4						100 08	C 5		DACITE BRECCIA, greenish gray, medium to coarse grained, fresh to slightly weathered, moderately weak rock (R2). No HCl reaction. Discontinuities are very closely spaced, and in good condition. CR = 100%, RQD = 95%, FF = 0.8.			
20	6												

DRAFT ROCKN BOR NG GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7														
25														
8														
9														
30														
10														
35														
11														
12														
40														
13														
45														

DRAFT ROCKN BORING GPJ 9/10/08

DACITE BRECCIA, greenish gray, medium to coarse grained, fresh to slightly weathered, moderately weak rock (R2). No HCl reaction. Discontinuities are very closely spaced, and in good to poor condition. CR = 100%, RQD = 89%, FF = 1.8.

Bottom of boring at 25.0 feet below ground surface.
Water level measurement (below existing ground surface):
6/7/06 at 15:30: 13.5 feet with casing depth 25.0 feet.

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. 90 Section Lake Keechelus Roadcut Job No. L-45-40
 Hole No. H-22 Sub Section Pic # 7 Cont. Sec. 1901
 Station L3 292+53 Offset 21' RT E Ground El. 2507.2
 Type of Boring Walk Bore + Core Casing 3" x 37.5' W.T. El. Samoa Lake
 Inspector Donald L. Neibgen Date Nov. 24, 1975 Sheet 1 of 3

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
				TALUS - ALL SIZE Rock Fragments
				& Rock Rubble - Very small to 5.6" &
				Fine material - Loose to slightly compact
				open voids - 100% water loss
5				
	35/10"		35/10" STD. PEN. 1	
10				
				BLAST 11.0' 1 Tube Kinopak 2" x 5"
				" 12.0' " " "
				" 13.0' " " "
				" 14.5' " " "
15				" 15.0' " " "
				" 20.0' " " "
	34		25 ↑ STD. PEN. 2 ↓ 16 17	
20				

Hole No. H-22 Sub Section Little Rockblow Vent. Pit # 7 Sheet 2 of 3

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL
	50/11"		50/11" STD. PEN. 3	
				Very Loose 21.0' to 25.0'
25	50/11"		50/11" STD. PEN. 4	BLAST 25.0' 1 tube Kingspank 2" x 5"
				" 28.5' " " "
				" 30.5' " " " DEPTH SAMPLE
				Very Loose 26.0' to 28.5'
30		*	25 STD. 26 PEN. 27 5 28	ROCK FRAGMENTS - ALL SIZES to 3"
	17			Slightly silty - slightly compact
				WEATHERED ANDESITE FRAGMENTS
35	18	*	7 STD. 8 PEN. 10 6 12	ANDESITE - Highly to moderately
				FRACTURED - Particle Rock
40				
			C	
			100% D	
			REC. E	
			7	
45		*		

Hole No. H-2.2

Sub Section Lake Keadikau, Vineyard Pt #7

Sheet 3 of 3

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL
			C ₀	
			100% REC. R	
			E	
			B	
50			*	
			C	
			75% REC. R	Weathered sandy silt like gouge 51.5' to 52.5'
			E	
			9	
55			*	
			100% CORE	
			REC. 10	
			*	
			100% CORE	
60			REC. 11	
			C ₀	
			100% REC. R	
			E	
			REC. 12	
			*	
			C	
65			O	
			100% REC. R	
			E	
			13	TEST BORING STOPPED AT 66.0'
70				



LOG OF TEST BORING

Start Card _____

Job No 33758573 SR 90 Elevation 2545.8 ft (776.0 m)

HOLE No. H-22-06

Sheet 1 of 2

Project WSDOT I 90 Snoqualmie Pass East

Driller Danny Henderson Lic# 2742

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start August 8, 2006 Completion August 8, 2006 Well ID# Not Applicable Equipment CME 850 Track w/auto hammer

Station 1343+45 Offset 7.8'R Casing HWT Method Wet Rotary

Northing 739710.47 Easting 1424911.82 Latitude _____ Longitude _____

County Kittitas Subsection SE 1/4 of SW 1/4 Section 26 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
							<u>80</u>		D 1	5 6 11 (17)	Well graded silty SAND, medium dense, gray, dry, homogenous, no HCl reaction. Recovered = 1.2 feet.		
1							<u>67</u>		D 2	11 11 8 (19)	Poorly graded silty GRAVEL with sand (coarse), angular to subrounded, medium dense, gray, moist, homogenous, no HCl reaction. Recovered = 1 foot.		
5							<u>0</u>				Note: Driller noted that there was water loss between 7 feet and 8 feet.		
2											No recovery.		
10										1 1 2 (3)			
3													
4													
15							<u>93</u>		D 3	33 54/3"	Poorly graded silty GRAVEL with sand, angular to subrounded, very dense, bluish gray, moist, homogenous, no HCl reaction. Recovered = 0.7 feet.		
5													
6							<u>100</u> 0		D 4 C 5	50/2"	Poorly graded silty GRAVEL with sand and cobbles, angular to subangular, very dense, greenish gray, wet,		
20													

DRAFT ROCKN BOR NG GFJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7									C 6		<p>homogenous, no HCl reaction. Recovered = 0.17 feet.</p> <p>C 5: DACITE BRECCIA, olive gray, medium grained, slightly weathered, moderately weak rock (R2). No HCl reaction. Discontinuities are widely spaced, and in good condition. CR = 100%, RQD = 100%, FF = 0.</p> <p>C 6: DACITE BRECCIA, olive gray, medium grained, fresh, strong rock (R4). No HCl reaction. Discontinuities are widely spaced, and in good condition. CR = 100%, RQD = 100%, FF = 0.</p>			
25									C 7		<p>DACITE BRECCIA, olive gray, medium grained, fresh, strong rock (R4). No HCl reaction. Discontinuities are medium to widely spaced, and in poor to good condition. [Clay (gouge) existing in discontinuity.] CR = 100%, RQD = 100%, FF = 0.6.</p>			
30									C 8		<p>DACITE BRECCIA, olive gray, medium grained, fresh, very weak rock (R1) (based on Point Load Test Results.). No HCl reaction. No discontinuities existed. CR = 100%, RQD = 100%, FF = 0.</p>			
35											<p>Bottom of boring at 36.1 feet below ground surface. Backfilled to ground surface with bentonite chips.</p> <p>Water level measurement (below existing ground surface): 8/8/06 at 13:20: 11.0 feet below ground surface with casing depth at 19.0 feet.</p>			
40														
45														

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. 90 Section Lake Keechelus Roadcut Job No. 1-4590
 Hole No. H-23 Sub Section Pile # 5 Cont. Sec. 1901
 Station 13285+46 Offset 20' 11" E Ground El. 2512.5'
 Type of Boring Wash Pipe + Core Casing 3" x 57.5' W.T. El. Approx. 14' below
 Inspector Donald L. Nelson Date Feb 16, 1975 Sheet 1 of 4

PTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
				TALUS: ALL SIZE ROCK FRAGMENTS - largest hit while drilling 18" with scattered gravel
				small amount slightly silty fine material
				voids in material - Brown - Very loose
5'				1/2 slightly compact - material
	16		2 ↑ STD. PEN. 4 10 ↓ 1 14	displaces easily.
				100% WATER LOSS 0.0' h - 34.0'
10'				
	7		2 ↑ STD. PEN. 5 3 ↓ 2	
15'				BLIND 15.0' AFTER SAMPLE 1 Tube Kingpak
	18		12 ↑ STD. PEN. 15 18 ↓ 3	2" x 9"
20'				

Hole No. H-23 Sub Section Lake Kuchel's V. S. S. T Sheet 2 of 4

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
	16		12 7 4 7 ↑ STD. PEN. ↓ 4	Blas: 23.0' 1 Tube Kinepak 2" x 5"
25				
	14		6 8 6 ↑ STD. PEN. ↓ 5	
30				
	5		4 3 2 3 ↑ STD. PEN. ↓ 6	
35		*		SAND GRAVEL & ROCK FRAGMENTS - SILTY FINE & COARSE WITH SCATTERED ANDESITE FRAGMENTS & 15" - Brown DENT.
	44		10 22 22 34 1/2 78% REL. ↑ STD. PEN. ↓ 7 ↑ CORE ↓ 5	Blasit 36.5' 1 Tube Kinepak 2" x 5" " 37.0' " " " " 38.0' " " " WITH CORE #9 & STD PEN #9
40	37		10 15 22 23 ↑ STD. PEN. ↓ 9	
45				

Hole No. H-23 Sub Section Laki Kumbalei V. Roadcut Sheet 3 of 4

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL
	20/6"		26 15 ↑ STD. PEN. 10	BLAST 46.0' 1 Tube KINOPAK 2" X 5"
50	66		27 38 ↑ STD. PEN. 75% 75% CORE REC. ↓ 12	BLAST 52.0' 1 Tube KINOPAK 2" X 5" R.F.T.H. CORE #12
55			75% CORE REC. 13	BLAST 57.0' 1 Tube KINOPAK 2" X 5" R.F.T.H. CORE #13 + STD PEN. #14
	52		90 30 ↑ STD. PEN. 72 19	BLAST 55.0' 1 Tube KINOPAK
				↑ BEDROCK - Highly to Moderately Fractured Andesite - Hard Dense Rock.
60			100% REC. 15	
				* C _D
65			100% REC. 16	
				* C _D
			100% REC. 17	
70				

Hole No. H-23 Sub Section Lake Keesel, Wis. P-5 Sheet 4 of 4

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
			*	
			C ₀	
			100% R _E	
75			REG. 15	
			*	
			C	
			R _E	
			100% E	
80			REG. 19	
			*	
			C	
			R _E	
			100% E	
			REG. 20	
85				TEST BORING STOPPED AT 83.5'
90				
95				



Job No. 33758573

SR 90

Elevation 2484.7 ft (757.3 m)

Start Card _____

HOLE No. H-23-06

Sheet 1 of 2

Project WSDOT I-90 Snoqualmie Pass East

Driller Kerry Cooper

Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Kranti Maturi

Start July 20, 2006

Completion July 21, 2006

Well ID# Not Applicable

Equipment CME 45 (barge) w/auto-hammer

Station 1350+00

Offset 3.7'L

Casing HW, HQ, NQ

Method Wet Rotary

Northing 739173

Easting 1425283

Latitude _____

Longitude _____

County Kittitas

Subsection SE 1/4 of SW 1/4

Section 26

Range 11E

Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% R FF	Rock Strength Sample Type	Sample No.	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0-1							52		C-1				
1-2							100 0.2		C-2		ANDESITE, greenish gray, medium grained, fresh, strong rock (R4). No HCl reaction. Discontinuities are medium spaced, and in fair condition. [Very thin silt infilling.] CR = 100%, RQD = 100%, FF = 0.22.		
2-3							50 0		C-3		ANDESITE, greenish gray, medium grained, fresh, strong rock (R4). No HCl reaction. Discontinuities are medium spaced, and in fair condition. CR = 50%, RQD = 50%, FF = 0.		
3-4							95 0.5		C-4		ANDESITE, greenish gray, medium grained, fresh, strong rock (R4). No HCl reaction. Discontinuities are closely spaced, and in fair condition. [Very thin silt infilling] CR = 95%, RQD = 95%, FF = 0.5.		
4-5							100 0.4		C-5		ANDESITE, greenish gray, medium grained, fresh, strong rock (R4). No HCl reaction. Discontinuities are closely spaced, and in fair condition. [Very thin silt infilling] CR = 100%, RQD = 100%, FF = 0.4.		
5-6							100 0.4		C-6		ANDESITE, greenish gray, medium grained, fresh, strong rock (R4). No HCl reaction. Discontinuities are closely spaced, and in fair condition. [Very thin silt infilling.] CR = 100%, RQD = 76%, FF = 0.4.		



Start Card _____

Job No. 33758573

SR 90

Elevation 2484.7 ft (757.3 m)

HOLE No. H-23-06

Sheet 2 of 2

Project WSDOT I-90 Snoqualmie Pass East

Driller Kerry Cooper

Lic# 2552

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No.	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7											Bottom of boring at 20.0 feet below ground surface. Backfilled to mudline with bentonite. Water level measurements: - 7/20/06 at 17:00: 10.0 feet above mudline. - 7/21/06 at 07:00: 9.0 feet above mudline.			
25														
8														
9														
30														
10														
35														
11														
40														
12														
45														
13														

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. 90 Section Lake Keechelus Viaduct Job No. L-4540
 Hole No. H-24 Sub Section _____ Cont. Sec. 1401
 Station L³288+86 Offset 27' Rt. L³ 2 Ground El. 2479.0'
 Type of Boring Wash Core + Logging Casing 4" X 47' W.T. El. Lake Keechelus
 Inspector Donald L. Neeson Date June, 1976 Sheet 1 of _____

PTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
	8		1 4 4 4 ↑ STD. PEN.	ROCK FRAGMENTS - ALL SIZE ANDERITE
			4 4 ↓ 1	ROCK FRAGMENTS - GRAVELS - BOULDERS cobblers very small amount fines
				SURFACE COVERED WITH ALL SIZE BLOCKS BROKEN CONCRETE PAVEMENT - OPEN VOIDS Loose to slightly compact.
5				
	17		19 12 9 8 ↑ STD. PEN.	100% WATER LOSS WHILE DRILLING 0.0' to 21'
10			8 ↓ 2	1 Tube KINERAK 2" X 9" 10'
	57		30 27 100 ↑ STD. PEN.	
15			100 ↓ 3	
	14		6 5 9 50% ↑ STD. PEN.	1 Tube KINERAK 2" X 7" 19'
20			9 50% ↓ 4	

Hole No. H-24 Sub Section Lake Kuchelus Madut Sheet 2 of

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
		*		SAND + GRAVEL - SILTY FINE & COARSE
				SAND GRAVEL + ROCK FRAGMENTS - BROWN
	24		20 ↑ STD. PEN. 11 13 ↓ 5" 18	COMPACT - ANGULAR GRAVELS
25				50% WATER LOSS 21' & 31'
		*		
	24			15 ↑ STD. PEN. 12 12 ↓ 6 18
30				ROCK FRAGMENTS - ALL SIZE ANDERITE
				ROCK FRAGMENTS & 4' (37.5' to 41.5')
			21 ↑ STD. PEN. 37 15 ↓ 7 21	+ FINE & COARSE SAND - ANGULAR GRAVELS
	36			BROWN - COMPACT
35				75% WATER LOSS 31' & 45'
				STD. DRIVING BETWEEN LARGE ROCK FRAGMENTS
			120 ↓ PEN. 8	BLAST 1 Tube KINERAK 2" X 9" 37.5'
40			100% ↑ CORE REC. 9	
			35 * 19 ↑ STD. PEN. 13 ↓ 10 12	DEPTH SAMPLE # 9 & 10 BLAST 1 Tube KINERAK
	25			2" X 9" 41'
45				

Hole No. H-24

Sub Section Lake Kachelus Vinduit

Sheet 3 of

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL
		* 		BEDROCK - Highly Fractured
			C	Andesite 46' to 49'
			O	
50			95% R	Moderately Fractured Andesite 49' to 53'
			REC. E	
			11	
			* C	
			O	Highly Fractured andesite 53' to 57'
55			100% R	
			REC. E	
			12	
		* C	Moderately Fractured Andesite 57' to 61'	
		O		
60		100% R		
		REC. E	Highly Fractured andesite 61' to 63'	
		13		
		* C		
		O	crushed andesite 63' to 65'	
65		100% R		
		REC. E	Moderately Fractured Andesite 65' to 68.5'	
		14		
		C	Highly to Moderately Fractured 68.5' to 77'	
		O	Recemented w/ Calcite	
70		100% R		

Hole No. H-24 Sub Section Laka Kambalu Vadant Sheet 4 of

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.		DESCRIPTION OF MATERIAL
			REC.	E	
				15	
			*	C	
				O	
75			100%	R	
			REC.	E	
				16	
			*	C	Moderately Fractured andesite 77' to 81.5'
				O	
80			100%	R	
			REC.	E	
				17	Crushed andesite 81.5' to 82'
			*	C	
				O	Moderately Fractured Andesite 82' to 87'
85			100%	R	
			REC.	E	
				18	
			*	C	Slightly Fractured Andesite 87' to 94'
				O	
90			100%	R	
			REC.	E	
				19	
			*	C	
			100%	Core	
			REC.	20	
95					



Start Card _____

Job No. 33758573

SR 90

Elevation 2537.2 ft (773.3 m)

HOLE No. H-24-06 (OW)

Sheet 1 of 3

Project WSDOT I-90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Kranti Maturi

Start June 8, 2006

Completion June 12, 2006

Well ID# H-24-06 (OW)

Equipment CME 45 (skid rig) w/auto-hammer

Station 1365+92

Offset 13'L

Casing HQ

Method Wet Rotary

Northing 737703.9

Easting 1425895.01

Latitude _____

Longitude _____

County Kittitas

Subsection SE 1/4 of NE 1/4

Section 35

Range 11E

Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No.	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
								D-1	1	Well graded silty SAND, subangular, loose, brown, moist, homogenous, no HCl reaction. Recovered = 0.8 feet.			
						53			2				
									3				
								C-2	(5)	Poorly graded GRAVEL with cobbles, subangular, loose, brown, wet, homogenous, no HCl reaction. Recovered = 1.2 feet.			
1						34							
5								D-3	7	Poorly graded GRAVEL, angular to subangular, loose, gray, wet, homogenous, no HCl reaction. Recovered = 0.3 feet.			
									3				
						17			6				
2								C-4	(9)	Poorly graded GRAVEL with cobbles, angular to subangular, greenish gray and gray, wet, homogenous, no HCl reaction. Recovered = 3 feet.			
						86							
10								D-5	4	Poorly graded GRAVEL with sand, angular to subangular, loose, light brown, wet, homogenous, no HCl reaction. Recovered = 0.3 feet.			
									2				
						20			3				
								C-6	(5)	Poorly graded GRAVEL with cobbles, angular to subangular, gray, wet, homogenous, no HCl reaction. Recovered = 3 feet.			
						89							
15								D-6	5	No recovery.			
									5				
						0			3				
								C-7	(8)	Poorly graded GRAVEL with cobbles, angular, greenish gray, wet, homogenous, no HCl reaction. Recovered = 2.2 feet.			
						63							
20													



Job No. 33758573

SR 90

Elevation 2537.2 ft (773.3 m)

HOLE No. H-24-06 (OW)

Sheet 2 of 3

Project WSDOT I-90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No.	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7													
25								C-8		Poorly graded GRAVEL with cobbles, angular to subangular, greenish gray, wet, homogenous, weak HCl reaction. Recovered = 1.8 feet.			
8								C-9		ANDESITE, medium grained, greenish gray, fresh, strong rock (R4). Weak HCl reaction. Discontinuities are very closely spaced, and in fair condition. CR = 96%, RQD = 80%, FF = 0.8.			
9								C-10		ANDESITE, greenish gray, medium grained, moderately weathered, strong rock (R4). Weak HCl reaction. Discontinuities are very closely spaced, and in fair condition. CR = 98%, RQD = 92%, FF = 10. (Note: There were 6 vertical fractures. Quality was poor if vertical fractures were considered.)			
10								C-11		ANDESITE, greenish gray, medium grained, slightly to moderately weathered, moderately strong rock (R3). Weak HCl reaction. Discontinuities are very closely spaced, and in poor condition. CR = 100%, RQD = 50%, FF = 1. (Note: There were 4 vertical fractures. Quality was poor when vertical fractures were considered.)			
35								C-12		ANDESITE, greenish gray, medium grained, moderately weathered, moderately strong rock (R3). Weak HCl reaction. Discontinuities are very closely spaced, and in very poor condition. CR = 100%, RQD = 62%, FF = 2. (Note: There were many vertical fractures in the sample and it was breaking up.)			
40													
11													
12													
13													
45													

ROCKN BORING.GPJ 11/17/06 9:27:53 A:11



Job No. 33758573

SR 90

Elevation 2537.2 ft (773.3 m)

Start Card

HOLE No. H-24-06 (OW)

Sheet 3 of 3

Project WSDOT I-90 Snoqualmie Pass East

Driller Kerry Cooper

Lic# 2552

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No.	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
14								C-13		ANDESITE, greenish gray, medium grained, moderately weathered, moderately weak (R2) based on Point Load Test results. Weak HCl reaction. Discontinuities are very closely spaced, and in poor condition. CR = 100%, RQD = 88%, FF = 1.6. (Note: There were many vertical fractures and the sample was breaking up.)			
15								C-14		ANDESITE, greenish gray, medium grained, moderately weathered, strong rock (R4). Weak HCl reaction. Discontinuities are very closely spaced, and in fair condition. CR = 100%, RQD = 88%, FF = 1.8. (Note: 4 vertical fractures.)			
50								C-15		ANDESITE, greenish gray, medium grained, slightly weathered, strong rock (R4). Weak HCl reaction. Discontinuities are very closely spaced, and in fair condition. CR = 100%, RQD = 78%, FF = 1.2. (Note: 3 vertical fractures.)			
16													
55													
17													
18													
60										Bottom of boring at 60.0 feet below ground surface. Installed 1-inch diameter observation well: 1. Backfilled from 41.0 to 60.0 feet with bentonite chips. 2. Installed 1-inch diameter observation well: - PVC screen interval with 0.010-inch slots: 15.0 to 40.0 feet - PVC riser: 1.5 feet above ground surface to 15.0 feet - Sand filter pack: 13.0 to 41.0 feet 3. Backfilled from 2.0 to 13.0 feet with bentonite chips. 4. Installed quickcrete surface seal (0 to 2.0 feet) and stick-up monument steel casing (2.5-inch I.D., approximately 3 feet long). Water level measurements (below existing ground surface): - 6/13/06 at 09:00: 20.3 feet with casing depth 60.0 feet. - 6/19/06 at 15:50: 20.7 feet in observation well.			
19													
65													
20													
21													
70													

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. 90 Section LAKE KEELHELLS VIA DUCT Job No. 4570
Hole No. H-25 Sub Section LAKE KEELHELLS SMASHED VICINITY Cont. Sec. 1401
Station L3 290 + 70 PIER # 7 Offset 26.5 RT. E Ground El. 2488
Type of Boring WASH. BORE - CORE - BLAST Casing 16" X 34" W.T. El. NOT DETERMINED
Inspector E.E. DWYLL Date JUNE 22-30 1976 Sheet 1 of 3

DEPTH	BLOWS PER FT	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL	
		↑		TALUS RUBBLE OF ROCK FRAGMENTS SAND & SILT	
				BROWN, LOOSE	
				GRAVEL SIZE PARTICLES TO BOULDER SIZE FRAGMENTS	
5					
	10			8 11 6 10	STD. PEN. 1
10					
	9			6 7 2 4	STD. PEN. 2
15					
	70 16 ⁵			70	STD. PEN. 3
20			↓		2*3 ALONG SIDE BOULDER SIZE ROCK FRAGMENT CASING STOPPED BLAST 1 STICK KINE PAR 2" X 9"

Hole No. H-25 Sub Section LAKE KEECHELUS VIADUCT Sheet 2 of 3

DEPTH	BLOWS PER FT	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
		↑		20' VERY DENSE SILTY SAND WITH ROCK
	110 6"		110 STD. PEN. 4	FRAGMENTS, BROWN
25		↓		23' VERY DENSE COARSE SAND LITTLE SILTY WITH ROCK PARTICLES & FRAGMENTS (GRAY (GRAVEL SIZE PARTICLES BOULDER SIZE FRAGMENTS))
	58		39 STD. PEN. 5 30 28 60" 5	29' BLAST 1 STICK KINEPAK 2" X 9'
30		↓		
	96		35 STD. PEN. 6 40 56	33' BLAST 1 STICK KINEPAK 2" X 9'
35		↑		BEDROCK LAKE KEECHELUS ANDESITE MODERATELY FRACTURED GRAY
			5' CORE REC. 7	
40		↓		
			16" CORE REC. 8	SOLID
45		↓		
			5' CORE REC. 9	

Hole No. H-25 Sub Section LAKE KEECHELUS VIADUCT Sheet 3 of 3

DEPTH	BLOWS PER FT	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
			X	BEDROCK LAKE KEECHELUS ANDESITE
			4' CORE REC 10	SOLID GRAY
50				
			X	
			5' CORE REC 11	
55				MODERATELY FRACTURED
			X	
			4' CORE REC 12	
60				
			X	
			5' CORE REC 13	
65				STOPPED TEST BORING AT 64' 6"



Job No. 33758573 SR 90 Elevation 2535.0 ft (772.7 m)

Start Card _____

HOLE No. H-25-06

Sheet 1 of 3

Project WSDOT I-90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Kranti Maturi

Start August 8, 2006 Completion August 9, 2006 Well ID# Not Applicable

Equipment CME 45 (skid rig) w/auto-hammer

Station 1376+61 Offset 39'L Casing HW/HQ x 42 ft, HQ/NQ

Method Wet Rotary

Northing 736687.81 Easting 1426239.22 Latitude _____ Longitude _____

County Kittitas Subsection SE 1/4 of NE 1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No.	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
1							100	D-1	3 4 5 (9)	Well graded silty SAND, subangular, loose, brown, moist, homogenous, no HCl reaction. Recovered = 1.5 feet.			
5							40	D-2	10 9 9 (18)	Poorly graded GRAVEL with sand, subangular, medium dense, brown, moist, homogenous, no HCl reaction. Recovered = 0.6 feet.			
10							20	D-3	10 6 6 (12)	Poorly graded GRAVEL, subangular, medium dense, brown, moist, homogenous, no HCl reaction. Recovered = 0.3 feet.			
15							18	C-4		Poorly graded GRAVEL with cobbles, subrounded, gray, moist, homogenous, no HCl reaction. Recovered = 0.8 feet.			
20							27	D-5	16 16 10 (26)	Poorly graded GRAVEL, subangular, dense, greenish gray, moist, homogenous, no HCl reaction. Recovered = 0.4 feet.			
25							71	C-6		Poorly graded GRAVEL, subangular to subrounded, greenish gray, wet, homogenous, no HCl reaction. Recovered = 2.5 feet.			



Job No. 33758573

SR 90

Elevation 2535.0 ft (772.7 m)

Start Card _____

HOLE No. H-25-06

Sheet 2 of 3

Project WSDOT I-90 Snoqualmie Pass East

Driller Kerry Cooper

Lic# 2552

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No.	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7							36		C-7	50/0*	Attempted SPT, sampler was pounding on rock. Poorly graded GRAVEL, subangular, greenish gray, wet, homogenous, no HCl reaction. Recovered = 1.8 feet.		
25							64		C-8	50/0*	Attempted SPT. Poorly graded GRAVEL with cobbles (max size = 0.5 feet), subangular, very dense, greenish gray, wet, homogenous, no HCl reaction. Recovered = 3.2 feet.		
30							90		D-9 C-10	50/4*	No recovery. Poorly graded GRAVEL with cobbles (max size = 0.6 feet), subangular, very dense, greenish gray, wet, homogenous, no HCl reaction. Recovered = 4.3 feet.		
35							60		C-11		Poorly graded GRAVEL with cobbles (max size = 0.6 feet), subangular, greenish gray, wet, homogenous, no HCl reaction. Recovered = 3.0 feet.		
40							65		C-12		Poorly graded GRAVEL with cobbles (max size = 0.5 feet), subangular, greenish gray, wet, homogenous, no HCl reaction. Recovered = 1.3 feet.		
45							96 1.4		C-13		ANDESITE, greenish gray, medium grained, fresh, strong rock (R4). No HCl reaction. Discontinuities are very closely spaced, and in good condition. CR = 96%, RQD = 81%, FF = 1.4.		



Job No. 33758573

SR 90

Elevation 2535.0 ft (772.7 m)

Start Card _____

HOLE No. H-25-06

Sheet 3 of 3

Project WSDOT I-90 Snoqualmie Pass East

Driller Kerry Cooper

Lic# 2552

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No.	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14							100 1.4		C-14		ANDESITE, greenish gray, medium grained, fresh, strong rock (R4). No HCl reaction. Discontinuities are very closely spaced, and in poor condition (thin silt in some of the fractures). CR = 100%, RQD = 91%, FF = 1.4. Note: There are some vertical fractures in core sample.			
15							100 0.9		C-15		ANDESITE, greenish gray, medium grained, fresh, strong rock (R4). No HCl reaction. Discontinuities are closely spaced, and in fair condition. CR = 100%, RQD = 89%, FF = 0.9. Note: There are some vertical fractures in core sample.			
55							100 2.2		C-16		ANDESITE, greenish gray, medium grained, fresh, strong rock (R4). No HCl reaction. Discontinuities are closely spaced, and in poor condition (thin silt infilling). CR = 100%, RQD = 80%, FF = 2.2. Note: There are some vertical fractures in core sample.			
17							100 0.8		C-17		ANDESITE, greenish gray, medium grained, fresh, strong rock (R4). No HCl reaction. Discontinuities are closely spaced, and in poor condition (thin silt infilling). CR = 100%, RQD = 93%, FF = 0.8.			
18														
60														
19														
65														
20											Bottom of boring at 64.8 feet below ground surface. Backfilled to ground surface with bentonite chips. No groundwater was encountered while drilling.			
21														
70														

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. 90 Section LAKE KEECHELUS SNOW-SHED VIC Job No. 24540
 Hole No. H-24 Sub Section LAKE KEECHELUS VIADUCT Cont. Sec. 1401
 Station 13+293.73 Offset GULF PIER 9 Ground El. 2530.0
 Type of Boring WASH & CHOP & CORING Casing 4" TO -13'-0" W.T. El. UNDETERMINED
 Inspector R. G. B. C. M. E. G. Date JUNE 23, 1976 Sheet 1 of 2

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL
			14 STD	ROAD SHOULDER - 2" OF ASPHALT SURFACING
	71		24 PEN	
			47 1	FILL MATERIAL - SILT, SAND AND ROCK
			48	FRAGMENTS - GRAVEL TO BOULDER SIZE
				FRAGMENTS, BROWN, DENSE
5	70		42 STD	
			28 PEN	
	31		15 2	
			16	
			12 STD	
	21		11 PEN	MEDIUM DENSE TO LOOSE
10			10 3	
			12	
			5 STD	
	10		3 PEN	
			7 4-P	
	170		23	SOFT ROCK - KEECHELUS ANDESITE - GRAY
			97 4-B	BED ROCK - KEECHELUS ANDESITE -
	50% "		8% " STD	HARD, GRAY, HIGHLY TO MODERATELY
			5 PEN	
15			C	FRACTURED
			R	
			E	
			REC 95%	
			C	
			R	
			REC	
20			100% EIT	



LOG OF TEST BORING

Start Card _____

Job No. 33758573 SR 90 Elevation 2532.7 ft (772.0 m)

HOLE No. H-26-06

Sheet 1 of 3

Project WSDOT I 90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Kranti Maturi

Start August 7, 2006 Completion August 7, 2006 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto hammer

Station 1384+28 Offset 2'R Casing HQ Method Wet Rotary

Northing 735917.59 Easting 1426251.5 Latitude _____ Longitude _____

County Kittitas Subsection NE 1/4 of SE 1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
							<u>67</u>	D 1	5 7 8 (15)	Well graded SAND, subangular, medium dense, brown, moist, homogenous, no HCl reaction. Recovered = 1 foot.			
							<u>29</u>	C 2		Well graded GRAVEL with sand, gray, moist, homogenous, no HCl reaction. Recovered = 1 foot.			
1													
5							<u>60</u>	D 3	7 18 50/3"	Poorly graded GRAVEL with sand, subangular, very dense, brown, wet, homogenous, no HCl reaction. Recovered = 0.9 feet.			
							<u>100</u>	C 4		Well graded GRAVEL with cobbles, subangular, gray, wet, homogenous, no HCl reaction. Recovered = 3.75 feet.			
2													
10							<u>88</u>	C 5		Poorly graded GRAVEL with cobbles and boulders (boulder size = 1.1 feet), subangular, gray and brown, wet, homogenous, no HCl reaction. Recovered = 4.4 feet.			
4													
15							<u>16</u>	C 6		Poorly graded GRAVEL, subangular, brown, wet, homogenous, no HCl reaction. Recovered = 0.8 feet.			
5													
6													
20													

DRAFT ROCKN BOR NG GFJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
							53	D 7	7	6 15 (21)	Poorly graded silty GRAVEL with sand, subangular, medium dense, brown, moist, homogenous, no HCl reaction. Recovered = 0.8 feet.		
							49	C 8			Poorly graded GRAVEL, subangular, brown, wet, homogenous, no HCl reaction. Recovered = 1.7 feet.		
7							100	C 9			Poorly graded GRAVEL, subangular, gray, wet, homogenous, no HCl reaction.		
25							100 / 0.6				DACITE BRECCIA, light bluish gray, medium to coarse grained, slightly weathered, moderately strong rock (R3). Discontinuities are closely spaced, and in very poor condition. [Clay/silt infilling] CR = 100%, RQD = 76%, FF = 0.6.		
8							100 / 1.1	C 10			DACITE BRECCIA, light bluish gray, medium to coarse grained, slightly weathered, strong rock (R4). Moderate HCl reaction. Discontinuities are closely spaced, and in poor condition. [Clay infilling in some of the fractures] CR = 100%, RQD = 91%, FF = 1.1.		
30							96 / 1.0	C 11			DACITE BRECCIA, light bluish gray, medium to coarse grained, slightly weathered, strong rock (R4). Moderate HCl reaction. Discontinuities are closely spaced, and in poor to good condition. CR = 100%, RQD = 96%, FF = 1.0.		
9							100 / 0.2	C 12			DACITE BRECCIA, light bluish gray, medium to coarse grained, slightly weathered, strong rock (R4). Moderate HCl reaction. Discontinuities are medium spaced, and in good condition. CR = 100%, RQD = 100%, FF = 0.2.		
35													
40													
10													
11													
12													
13													
45													

DRAFT ROCKN BOR NG GFJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14							100 10			C 13		DACITE BRECCIA, light bluish gray, medium to coarse grained, slightly weathered, strong rock (R4). Moderate HCl reaction. Discontinuities are very closely spaced, and in poor condition. CR = 100%, RQD = 92%, FF = 1.0.		
15														
50												Bottom of boring at 50.1 feet below ground surface. Backfilled to ground surface with bentonite chips. No groundwater was encountered while drilling.		
16														
55														
17														
18														
60														
19														
65														
20														
21														
70														

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. 90 Section LAKE KEECHELUS SWAMP SHED VIC. Job No. 24540
 Hole No. H-27 Sub Section LAKE KEECHELUS VIADUCT Cont. Sec. 1401
 Station 23 294 + 03 Offset 14' L.F. PIER 70 Ground El. 2528.9
 Type of Boring WASH. BORE - CORING Casing 4" TO 19.6" W.T. El. _____
 Inspector R. G. BENNETT Date JUNE 29, 1976 Sheet 1 of 3

DEPTH	BLOWS PER FT	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
				FILL MATERIAL - SAND AND ROCK FRAG.
	12		4 ↑ STD 9 PEN 3 ↓ 1	MENTS - GRAVEL TO BOULDER SIZE
				FRAGMENTS, SUTY TO SLIGHTLY SILTY, BROWN, DAMP, MEDIUM DENSE
5				
	3 1/16"		31 ↑ STD 60 2" ↓ 2	ROCK FRAGMENT 3' + DIA. BLAST 2 STICKS KINE PER 2" X 9"
10				
	5		5 ↑ 2 STD 3 PEN 4 ↓ 3 14	LOOSE
15		*		
	8		13 ↑ STD 3 PEN 5 ↓ 4 4	FINE SAND AND ROCK FRAGMENTS - GRAVEL SIZED FRAGMENTS, BROWN, LOOSE
20		*	4	BED ROCK - KEECHELUS ANDESITE - MODERATELY TO HIGHLY FRACTURED, GRAY

Hole No. H-27

Sub Section LAKE REEGHEUS UNIDUCT Sheet 2 of 3

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL
			C	
			O	
			R	
			E	
			REC	(SILT FILLED SEAMS)
			100%	
			1/4c	
			*	
25				
			C	
			O	
			R	
			E	
			REC	
			100%	
			1/10	
			*	
30				
				HIGHLY FRACTURED AND DECOMPOSED
			C	
			O	
			R	
			E	
			REC	
			100%	
			1/10	
			*	
35				
			C	
			O	
			R	
			E	
			REC	
			100%	
			1/10	
			*	
40				
				MODERATELY FRACTURED
			C	
			O	
			R	
			E	
			REC	
			100%	
			1/10	
			10	
			*	
45				



LOG OF TEST BORING

Start Card _____

Job No 33758573 SR 90 Elevation 2537.2 ft (773.3 m)

HOLE No. H-27-06 (E)

Sheet 1 of 4

Project WSDOT I 90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Kranti Maturi

Start August 4, 2006 Completion August 6, 2006 Well ID# H 27 06 (E) Equipment CME 45 (skid rig) w/auto hammer

Station 1397+50 Offset 35'R Casing HQ, NQ Method Wet Rotary

Northing 734606.73 Easting 1426055.53 Latitude _____ Longitude _____

County Kittitas Subsection SE 1/4 of SE 1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
1											Boring conducted for extensometer installation only; therefore, no samples collected from ground surface to 71.0 feet. Refer to boring log for H 27 06 (I) (approx. 10 feet south) for soil and rock conditions in this area.			
5														
2														
10														
4														
15														
5														
6														
20														

DRAFT ROCKN BOR NG GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No 33758573

SR 90

Elevation 2537.2 ft (773.3 m)

HOLE No. H-27-06 (E)

Sheet 2 of 4

Project WSDOT I 90 Snoqualmie Pass East

Driller Kerry Cooper

Lic# 2552

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7														
25														
8														
9														
30														
10														
35														
11														
12														
40														
13														
45														



LOG OF TEST BORING

Start Card _____

Job No 33758573

SR 90

Elevation 2537.2 ft (773.3 m)

HOLE No. H-27-06 (E)

Sheet 3 of 4

Project WSDOT I 90 Snoqualmie Pass East

Driller Kerry Cooper

Lic# 2552

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14														
15														
50														
16														
55														
17														
18														
60														
19														
65														
20											Driller reported that there was about 7 feet of clay in occasional intervals between 65 feet and 75 feet.			
21														
70														

DRAFT ROCKN BOR NG GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22									C 1		Poorly graded GRAVEL with cobbles, subangular, brown, wet, homogenous, moderate HCl reaction. Recovered = 1.6 feet.			
23									C 2		Poorly graded GRAVEL with cobbles, subangular, greenish gray and brown, wet, homogenous, moderate HCl reaction. Recovered = 1.6 feet.			
25									C 3		DACITE BRECCIA, light bluish gray and brown, medium to coarse grained, slightly weathered, strong rock (R4). Moderate HCl reaction. Discontinuities are very closely spaced, and in poor condition. [Thin clay infilling in one of the fractures] CR = 100%, RQD = 84%, FF = 1.6.			
26									C 4		DACITE BRECCIA, light bluish gray, medium to coarse grained, fresh, strong rock (R4). Moderate HCl reaction. Discontinuities are very closely spaced, and in good condition. CR = 100%, RQD = 92%, FF = 1.7.			
27														
28											Bottom of boring at 89.6 feet below ground surface. An extensometer was installed. Bottom of extensometer casing was at 87 feet. Water level measurement (below existing ground surface): 8/6/06 at 09:00: 62.0 feet.			

DRAFT ROCKN BOR NG GFJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No 33758573 SR 90 Elevation 2537.4 ft (773.4 m)

HOLE No. H-27-06 (I)

Sheet 1 of 4

Project WSDOT I 90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Kranti Maturi

Start July 18, 2006 Completion July 19, 2006 Well ID# H 27 06 (I) Equipment CME 45 (skid rig) w/auto hammer

Station 1397+60 Offset 34'R Casing HWT, HQ Method Wet Rotary

Northing 734596.2 Easting 1426056.06 Latitude _____ Longitude _____

County Kittitas Subsection SE 1/4 of SE 1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0 - 1	0 - 0.3						67	D 1	3 3 4 (7)	Well graded silty SAND, subangular, loose, brown, moist, homogenous, no HCl reaction. Recovered = 1 foot.			
1 - 2	0.3 - 0.6						67	D 2	25 21 35 (56)	Poorly graded silty GRAVEL with sand, subangular, very dense, brown, wet, homogenous, no HCl reaction. Recovered = 1 foot.			
2 - 3	0.6 - 0.9						40	D 3	5 4 3 (7)	Poorly graded silty GRAVEL with sand, subangular, loose, brown, wet, homogenous, no HCl reaction. Recovered = 0.6 feet.			
3 - 4	0.9 - 1.2						27	D 4	4 3 3 (6)	Poorly graded GRAVEL with sand, subangular, loose, brown, wet, homogenous, no HCl reaction. Recovered = 0.4 feet.			
4 - 5	1.2 - 1.5												
5 - 6	1.5 - 1.8												
6 - 7	1.8 - 2.1												
7 - 8	2.1 - 2.4												
8 - 9	2.4 - 2.7												
9 - 10	2.7 - 3.0												
10 - 11	3.0 - 3.3												
11 - 12	3.3 - 3.6												
12 - 13	3.6 - 3.9												
13 - 14	3.9 - 4.2												
14 - 15	4.2 - 4.5												
15 - 16	4.5 - 4.8												
16 - 17	4.8 - 5.1												
17 - 18	5.1 - 5.4												
18 - 19	5.4 - 5.7												
19 - 20	5.7 - 6.0												

DRAFT ROCKN BOR NG GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758573

SR 90

Elevation 2537.4 ft (773.4 m)

HOLE No. H-27-06 (I)

Sheet 3 of 4

Project WSDOT I 90 Snoqualmie Pass East

Driller Kerry Cooper

Lic# 2552

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
14								D 9	6 5 4 (9)	Poorly graded GRAVEL with sand, subangular, loose, gray, wet, homogenous, no HCl reaction. Recovered = 0.1 feet.			
15								C 10		Well graded GRAVEL with cobbles, subangular, gray and brown, wet, homogenous, no HCl reaction. Recovered = 1.5 feet.			
16								D 11	6 6 6 (12)	Poorly graded GRAVEL with sand, subangular, medium dense, brown, wet, homogenous, no HCl reaction. Recovered = 0.6 feet.			
17								C 12		Poorly graded GRAVEL with cobbles, subangular, brown and gray, wet, homogenous, no HCl reaction. Recovered = 1.6 feet.			
18								C 13		No recovery. (material likely washed away)			
19								D 14	6 6 4 (10)	Well graded GRAVEL with sand, subangular, loose, brown and gray, wet, homogenous, no HCl reaction. Recovered = 1.1 feet.			
20								C 15		Poorly graded GRAVEL with cobbles and boulders, subangular, brown, wet, homogenous, no HCl reaction. Recovered = 3.1 feet.			
21								D 16 C 17	50/3"	Poorly graded silty GRAVEL with sand, subangular, very dense, brown, wet, homogenous, no HCl reaction. Recovered = 0.25 feet.			
21										DACITE BRECCIA, light bluish gray, medium to coarse grained, moderately weathered (0.6 feet of rock is disintegrated into clay), strong rock (R4). Strong HCl reaction. Discontinuities are closely spaced, and in very poor condition. [0.6 feet of residual soil] CR = 100%, RQD = 91%, FF = 1.14.			

DRAFT ROCKN BOR NG GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22									C 18		DACITE BRECCIA, light bluish gray, medium to coarse grained, moderately weathered, strong rock (R4). Strong HCl reaction. Discontinuities are closely spaced, and in very poor condition. [0.2 feet of clay] CR = 100%, RQD = 84%, FF = 1.4.			
23									C 19		DACITE BRECCIA, light bluish gray, medium to coarse grained, moderately weathered, strong rock (R4). Strong HCl reaction. Discontinuities are closely spaced, and in very poor condition. [0.1 feet of clay] CR = 100%, RQD = 84%, FF = 1.2.			
24														
25											Bottom of boring at 80.5 feet below ground surface. An inclinometer was installed. Bottom of inclinometer casing is at 79.5 feet. Refer to inclinometer log and as built diagram for installation details. Water level measurement (below existing ground surface): 7/19/06 at 07:00: 46.5 feet with casing depth 53.0 feet.			
26														
27														
28														
95														

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.11 S.R. 90 Section LAKE KEECHELUS S.W. QUAD, VICT Job No. L 4540
 Hole No. H-28 Sub Section LAKE KEECHELUS VIADUCT Cont. Sec. 14.01
 Station L3 294 + 77 Offset 16' RT. 2 PIER 11 Ground El. 2530.5
 Type of Boring WASH. BORE & CORE Casing 4" To 13" W.T. El. DRY HOLE
 Inspector R. E. BENNETT Date JUNE 30, 1976 Sheet 1 of 2

TH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
			6	↑ STD
			21	PEU
	41		20	↓ 1
	60/3"			GRAVEL TO BOULDER SIZE, SILTY TO SLIGHTLY SILTY, BROWN, DENSE
5				MEDIUM DENSE
	15		8	↑ STD
			8	PEU
			7	↓ 2
			15	
				LOOSE
10			6	↑ STD
	6		3	PEU
			3	3
			4	*
	50/3"	*	3	↑ STD
			10	PEU
			50/3"	↓ 1
15				BED ROCK - KEECHELUS ANDESITE - GRAY, HIGHLY FRACTURED, SILT IN THE SEAMS
			C	
			D	
			REC	
			R	
			E	
			100/100	5
			*	
			C	
20			D	



LOG OF TEST BORING

Start Card _____

Job No 33758573 SR 90 Elevation 2462.9 ft (750.7 m)

HOLE No. H-28-06

Sheet 1 of 4

Project WSDOT I 90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Kranti Maturi

Start August 1, 2006 Completion August 2, 2006 Well ID# Not Applicable Equipment CME 45 (barge) w/auto hammer

Station 1397+47 Offset 92'R Casing HW/HQ x 25 ft, HQ/NQ Method Wet Rotary

Northing 734621 Easting 1425951 Latitude _____ Longitude _____

County Kittitas Subsection SE 1/4 of SE 1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
1														
5									C 1 D 2	20 38 40 (78)	Poorly graded GRAVEL with cobbles, subrounded, greenish gray, wet, homogenous, no HCl reaction. Recovered = 0.5 feet. Well graded SAND with gravel, subangular, very dense, brown and gray, wet, homogenous, no HCl reaction. Recovered = 1.5 feet.			
2									C 3		Poorly graded GRAVEL with cobbles and boulders, rounded, greenish gray, wet, homogenous, weak HCl reaction. Recovered = 3.5 feet.			
10									C 4	50/0"	Attempted SPT, sampler was pounding on rock. Poorly graded GRAVEL with cobbles, subangular to subrounded, greenish gray, wet, homogenous, no HCl reaction. Recovered = 2.1 feet.			
15									C 5		Poorly graded GRAVEL, subangular, greenish gray, wet, homogenous, no HCl reaction. Recovered = 1.9 feet.			
5														
6														
20														

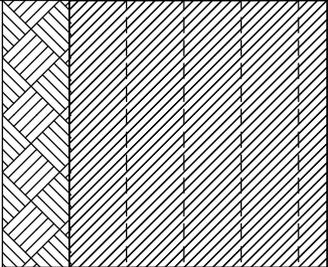
DRAFT ROCKN BOR NG GFJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14							52		C 13		Poorly graded GRAVEL with cobbles and boulders, subangular, greenish gray, wet, homogenous, no HCl reaction. Recovered = 2.6 feet.			
15	50						40		C 14		Top 0.8 feet: Silty CLAY, soft, brown, moist, homogenous, no HCl reaction. Pocket Penetrometer = 0.5 tsf. Bottom 1.2 feet: Poorly graded GRAVEL with cobbles, subangular, greenish gray, wet, homogeneous, no HCl reaction. (cobble size <0.6 feet) Recovered = 2 feet. (material likely washed away)			
16							76		C 15		Poorly graded GRAVEL with cobbles and boulders, subangular, greenish gray, wet, homogenous, no HCl reaction. (1.2 feet boulder size, 0.4 feet cobble size) Recovered = 3.8 feet.			
55	17						100		C 16		DACITE BRECCIA, greenish gray, medium to coarse grained, fresh, strong rock (R4). Weak HCl reaction. Discontinuities are very closely spaced, and in poor condition. CR = 100% (Note: Driller had to insert the core barrel three times to complete the core run.)			
18	60						100		C 17		DACITE BRECCIA, greenish gray, medium to coarse grained, slightly weathered, strong rock (R4). Weak HCl reaction. Discontinuities are very closely spaced, and in poor condition. [Thin clay infilling] CR = 100%, RQD = 92%, FF = 2. (Note: There were two vertical fractures.)			
65	20						100							
21	70													

DRAFT ROCKN BOR NG GFJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22							100/10			C 18		DACITE BRECCIA, greenish gray, medium to coarse grained, fresh, strong rock (R4). Weak HCl reaction. Discontinuities are very closely spaced, and in poor condition. [Thin silt/clay infilling] CR = 100%, RQD = 90%, FF = 1.0.		
75	23										Bottom of boring at 74.2 feet below ground surface. Backfilled to mudline with bentonite.			
											Water level measurement: 8/1/06 at 08:50: 18.0 feet above mudline.			
80	24													
	25													
85	26													
	27													
90	28													
95														

WASHINGTON
STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS

Original to Materials Engineer
Copy to Bridge Engineer
Copy to District Engineer
Copy to _____

LOG OF TEST BORING

S.H. _____ S.R. 40 Section Lake Keechelus Viaduct Job No. L-9520
 Hole No. H-29 Sub Section PI# 5 Cont. Sec. 1401
 Station L3 287+09 Offset 26' RT 13 E Ground El. 2497
 Type of Boring Wash Bore & Rotate Casing 4" x 540' 8" x 705' W.T. El. Lake Keechelus
 Inspector DUKALL - Nebgan Date July 14, 1976 Sheet 1 of 1

DEPTH	BLOWS PER FT	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL
				ROCK FRAGMENTS - TALUS RUBBLE OF
				ROCK FRAGMENTS - GRAVEL & Boulder size
				SAND & SILT - BROWN - LOOSE & SLIGHTLY
				COMPACT
5				
	22		11 STD. 12 PEN. 10 12 1	
10				
	19		5 STD. 9 PEN. 10 12 2	
15				
	20		35 STD. 10 PEN. 10 12 3	DROVE along side ROCK FRAGMENT
20				

Hole No. H-29 Sub Section Lake Kerehelus Kivier Pit # 5 Sheet 2 of 4

DEPTH	BLOWS PER FT.	PROFILE	SAMPLE TUBE NOS.	DESCRIPTION OF MATERIAL
			11 ↑ STD.	
			10 PEN.	
	27		17 ↓ 4	
25				
	27		20 ↑ STD.	
			13 PEN.	
			14 ↓ 5	
			15	
30				
	42	36 ↑ STD.		
		21 PEN.	TURNING TO GRAYISH BROWN	
		21 ↓ 6		
		50/100		
			COARSE SAND - Very Dense Grey	
			LITTLE SILTY WITH GRIND SIZE ROCK	
			FRAGMENTS	
35				
	81	30 ↑ STD.		
		58 PEN.		
		23 ↓ 7		
		30		
40				
	33	7 ↑ STD.		
		18 PEN.	GRIND SIZE ROCK FRAGMENTS - COMPACT.	
		15 ↓ 8		
		14		
45				

Hole No. H-29 Sub Section Laka Kuchelus Vedat P10 #5 Sheet 3 of 4

DEPTH	BLOWS PER FT	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL
		↑	50/10 STD. PEN.	ROCK FRAGMENTS - GRAVEL & Boulder
			9	size sand & silt - Gray - COMPACT
	33		20 STD. PEN.	2' Rock Fragment 47.5' to 46.5'
			19	
50			16	1 Tube Kinopak 45' 2" x 9"
			22 STD. PEN.	
	41		18	
			23	ROCK - Highly Fractured slightly weathered Andesite.
			50/30	
			*	
55		C		ROCK - Highly Fractured
		D		Andesite
		95% R		
		REC. E		
		12		
60		C		
		D		
		100% R		
		REC. E		
		13		
65		C		
		D		
		100% R		
		REC. E		
		14		
70		100% REC. C-15		

Hole No. H-29 Sub Section Lake Keechelus Viaduct Pier #5 Sheet 7 of 7

DEPTH	BLOWS PER FT	PROFILE	SAMPLE TUBE NOS	DESCRIPTION OF MATERIAL	
			*		
			C		
			100%	O	
			REC.	P	
75			E	16	
			*		
			C		
			100%	R	
			REC.	17	
80			*		
			C		
			100%	R	
			REC.	18	
85			*		
			C		
			100%	R	
			REC.	19	
90			*		
			C		
			100%	R	
		REC.	20		
95		↓	↓	TEST BORING STOPPED AT 94.5'	



LOG OF TEST BORING

Start Card _____

Job No 33758573 SR 90 Elevation 2540.7 ft (774.4 m)

HOLE No. H-29-06 (E)

Sheet 1 of 4

Project WSDOT I 90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Kranti Maturi

Start June 27, 2006 Completion June 28, 2006 Well ID# H 29 06 (E) Equipment CME 45 (skid rig) w/auto hammer

Station 1403+22 Offset 30'R Casing HQ Method Wet Rotary

Northing 734039.37 Easting 1426181.93 Latitude _____ Longitude _____

County Kittitas Subsection NE 1/4 of NE 1/4 Section 2 Range 11E Township 21N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
1											Boring conducted for extensometer installation only; therefore, no samples collected from ground surface to 62 feet. Refer to boring log H 29 06 (I) (approx. 10 ft north) for soil and rock conditions in this area.			
5														
2														
10														
4														
15														
5														
6														
20														



LOG OF TEST BORING

Start Card _____

Job No 33758573

SR 90

Elevation 2540.7 ft (774.4 m)

HOLE No. H-29-06 (E)

Sheet 2 of 4

Project WSDOT I 90 Snoqualmie Pass East

Driller Kerry Cooper

Lic# 2552

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7											No samples were taken out in this boring. This boring was intended for extensometer installation.			
25														
8														
9														
30														
10														
35														
11														
40														
12														
45														
13														



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14											No samples were taken out in this boring. This boring was intended for extensometer installation.			
15														
50														
16														
55														
17														
18														
60														
19											DACITE BRECCIA, greenish gray, medium to coarse grained, fresh, very strong rock (R5). No HCl reaction. Discontinuities are closely spaced, and in poor condition. [Clay infilling in one of the fractures] CR = 100%, RQD = 77%, FF = 2.7 (Note: Drillers told me that they threw the pieces together. So this is not a good sample. The pieces are not in order. RQD and FF may not be right. This sample can just be used for uniaxial testing)			
65														
20														
21														
70											Bottom of boring at 69.3 feet below ground surface.			

DRAFT ROCKN BOR NG GFJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No 33758573

SR 90

Elevation 2540.7 ft (774.4 m)

HOLE No. H-29-06 (E)

Sheet 4 of 4

Project WSDOT I 90 Snoqualmie Pass East

Driller Kerry Cooper

Lic# 2552

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22											Magnetic extensometer was installed at this boring. Bottom of extensometer is at 67.5 feet depth.			
75														
23														
24														
80														
25														
85														
26														
27														
90														
28														
95														



LOG OF TEST BORING

Start Card _____

Job No 33758573 SR 90

Elevation 2540.5 ft (774.3 m)

HOLE No. H-29-06 (I)

Sheet 1 of 4

Project WSDOT I 90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Kranti Maturi

Start June 20, 2006 Completion June 22, 2006 Well ID# H 29 06 (I) Equipment CME 45 (skid rig) w/auto hammer

Station 1403+13 Offset 30'R Casing HQ Method Wet Rotary

Northing 734048.45 Easting 1426177.8 Latitude _____ Longitude _____

County Kittitas Subsection SE 1/4 of NW 1/4 Section 26 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
1													
5													
2													
10													
4													
15													
5													
20													

DRAFT ROCKN BOR NG GFJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758573

SR 90

Elevation 2540.5 ft (774.3 m)

HOLE No. H-29-06 (I)

Sheet 2 of 4

Project WSDOT I 90 Snoqualmie Pass East

Driller Kerry Cooper

Lic# 2552

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
									4 4 8 (12)	No recovery.			
								C 9		Poorly graded GRAVEL with cobbles, subangular, greenish gray and brown, wet, homogenous, weak HCl reaction. Recovered = 2.9 feet.			
7						83							
								D 10	7 9 7 (16)	Well graded GRAVEL, subangular, medium dense, gray, wet, homogenous, no HCl reaction. Recovered = 0.3 feet.			
25						20							
								C 11		Poorly graded GRAVEL with cobbles, subangular, gray, wet, homogenous, weak HCl reaction. Recovered = 1.4 feet.			
8						40							
								C 12	50/2"	No recovery. Well graded GRAVEL with cobbles, subangular, gray, wet, homogenous, weak HCl reaction. Recovered = 2.8 feet.			
30						0 58							
								D 13	13 5 4 (9)	Well graded GRAVEL with sand, subangular, loose, gray to brown, wet, homogenous, no HCl reaction. Recovered = 0.4 feet.			
10						27							
								C 14		Poorly graded GRAVEL with cobbles, subangular, gray to brown, wet, homogenous, no HCl reaction. Recovered = 3.5 feet.			
35						100							
								D 15	3 6 9 (15)	Poorly graded silty GRAVEL with sand, subangular, medium dense, brown, wet, homogenous, no HCl reaction. Recovered = 0.4 feet.			
11						27							
								C 16		Well graded GRAVEL with cobbles, subangular, brown, wet, homogenous, no HCl reaction. Recovered = 2.5 feet.			
40						71							
12													
45													

DRAFT ROCKN BOR NG GFJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
14							23	D 17	4 4 2 (6)	Well graded clayey GRAVEL with sand, subangular, loose, brown, wet, homogenous, no HCl reaction. Recovered = 0.35 feet.			
							49	C 18		Poorly graded clayey GRAVEL with sand with cobbles, subangular, brown, wet, homogenous, no HCl reaction. Recovered = 1.7 feet.			
15							0			No recovery.			
50							56	C 19	19 50/0"	Poorly graded GRAVEL with cobbles, subangular, very dense, gray and brown, wet, homogenous, no HCl reaction. Recovered = 2.5 feet.			
16							0			No recovery.			
55							97	C 20	5 50/0"	DACITE BRECCIA, greenish gray, coarse grained, slightly weathered, strong rock (R4). Weak HCl reaction. Discontinuities are closely spaced, and in poor condition. CR = 77%, RQD = 76%, FF = 0.66. (Clay/Silt infilling in one of the fractures)			
17							100			DACITE BRECCIA, greenish gray, coarse grained, fresh, strong rock (R4). No HCl reaction. Discontinuities are moderately spaced, and in poor condition. CR = 100%, RQD = 92%, FF = 1.4. (Clay/Silt infilling)			
18							14	C 21		(there are approx 3 vertical fractures)			
60							100			DACITE BRECCIA, greenish gray, coarse grained, fresh, strong rock (R4). No HCl reaction. Discontinuities are closely spaced, and in good condition. CR = 100%, RQD = 100%, FF = 0.4.			
19							04	C 22					
65							100						
20							04						
21													
70													

DRAFT ROCKN BOR NG GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22									C 23		DACITE BRECCIA, greenish gray, coarse grained, fresh, strong rock (R4). No HCl reaction. Discontinuities are closely spaced, and in good condition. CR = 100%, RQD = 98%, FF = 0.8. (FeO staining on some of the fractures)			
75	23								C 24		DACITE BRECCIA, greenish gray, coarse grained, fresh, strong rock (R4). No HCl reaction. Discontinuities are closely spaced, and in poor condition. CR = 100%, RQD = 71.4%, FF = 2.2. (Possible FeO staining on some of the fractures, some vertical fractures)			
80	24								C 25		DACITE BRECCIA, greenish gray, coarse grained, fresh, strong rock (R4). Weak HCl reaction. Discontinuities are closely spaced, and in poor condition (to good condition for some of the fractures). CR = 100%, RQD = 88%, FF = 1. (There are 2 vertical fractures)			
85	25								C 26		DACITE BRECCIA, greenish gray, coarse grained, fresh, strong rock (R4). Weak HCl reaction. Discontinuities are closely spaced, and in poor to good condition. CR = 100%, RQD = 80%, FF = 1. (There are 2 or 3 vertical fractures)			
90	26										Bottom of boring at 90.0 feet below ground surface. An inclinometer was installed. Bottom of inclinometer is at 72.5 feet. Refer to inclinometer log and as built diagram for installation details.			
95	28										Water level measurement (below existing ground surface): 6/22/06 at 07:30: 27.0 feet with casing depth 50.5 feet.			

DRAFT ROCKN BOR NG GFJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No 33758573 SR 90 Elevation 2475.3 ft (754.5 m)

HOLE No. H-30-06

Sheet 1 of 3

Project WSDOT I 90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Kranti Maturi

Start July 25, 2006 Completion July 26, 2006 Well ID# Not Applicable Equipment CME 45 (barge) w/auto hammer

Station 1403+19 Offset 132.1'R Casing HWT, HQ Method Wet Rotary

Northing 734003 Easting 1426086 Latitude _____ Longitude _____

County Kittitas Subsection NE 1/4 of NE 1/4 Section 2 Range 11E Township 21N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											No recovery.			
1						0/88		D 1 C 2	50/0"		Poorly graded GRAVEL with cobbles and boulders, subangular, greenish gray, wet, homogenous, no HCl reaction. Recovered = 4.4 feet. (Note: Approximately 0.5 feet retained in sample bag, rest is preserved in a core box.)			
5						27		D 3	15 9 41 (50)		Poorly graded GRAVEL with sand, subangular, dense, greenish gray, wet, homogenous, no HCl reaction. Recovered = 0.4 feet.			
10						66		C 4			Poorly graded GRAVEL with cobbles and boulders, subangular, greenish gray, wet, homogenous, no HCl reaction. Recovered = 2.3 feet.			
15						7		D 5	8 5 5 (10)		Poorly graded GRAVEL with sand, subangular, loose, greenish gray, wet, homogenous, no HCl reaction. Recovered = 0.1 feet.			
20						66		C 6			Poorly graded GRAVEL with cobbles, subangular, greenish gray, wet, homogenous, no HCl reaction. Recovered = 2.3 feet.			
25						27		D 7	11 14 9 (23)		Poorly graded SAND, subangular, medium dense, gray, wet, homogenous, no HCl reaction. Recovered = 0.4 feet.			
30						100		C 8			Poorly graded GRAVEL with sand and cobbles,			

DRAFT ROCKN BOR NG GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
											subangular, greenish gray, wet, homogenous, no HCl reaction. Recovered = 3.7 feet.			
7						47			D 9	18				
25						54			C 10	45 43 (88)	Poorly graded GRAVEL with sand, subangular, very dense, greenish gray, wet, homogenous, no HCl reaction. Recovered = 0.7 feet.			
8											Poorly graded GRAVEL with boulders and cobbles, subangular, greenish gray, wet, homogenous, no HCl reaction. Recovered = 1.9 feet.			
9									C 11		Poorly graded GRAVEL with cobbles, subangular, greenish gray, wet, homogenous, no HCl reaction. Recovered = 2.3 feet.			
30									C 12	50/0"	No recovery.			
10						90					Top 1.8 feet: Poorly graded GRAVEL with cobbles and boulders, subangular, very dense, greenish gray, wet, homogenous, weak HCl reaction.			
35						90					Bottom 3.2 feet: DACITE BRECCIA, greenish gray, medium to coarse grained, fresh, strong rock (R4). Weak HCl reaction. Discontinuities are medium spaced, and in good condition. Recovered = 4.5 feet. CR = 90%, RQD = 64%, FF = 0.			
11														
40						100			C 13		DACITE BRECCIA, greenish gray, medium to coarse grained, fresh, strong rock (R4). Moderate to strong HCl reaction. Discontinuities are closely spaced, and in fair condition. [Very thin silt infilling] CR = 100%, RQD = 92%, FF = 0.6.			
12														
45						100			C 14		DACITE BRECCIA, greenish gray, medium to coarse grained, fresh, strong rock (R4). Moderate HCl reaction. Discontinuities are widely spaced, and in excellent condition. CR = 100%, RQD = 100%, FF = 0.			
13														

DRAFT ROCKN BOR NG GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No / WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14														
15														
50									C 15		DACITE BRECCIA, greenish gray, medium to coarse grained, fresh, strong rock (R4). Moderate HCl reaction. Discontinuities are moderately spaced, and in excellent condition. CR = 100%, RQD = 100%, FF = 0.			
55											Bottom of boring at 50.4 feet below ground surface. Backfilled to ground surface with bentonite chips.			
16											Water level measurement: 7/25/06 at 14:00: 14.0 feet above mudline.			
17														
18														
60														
19														
65														
20														
21														
70														



LOG OF TEST BORING

Start Card _____

Job No. 33758573 SR 90 Elevation 2541.9 ft (774.8 m)

HOLE No. H-32-06

Sheet 1 of 3

Project WSDOT I-90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Kranti Maturi

Start June 29, 2006 Completion July 6, 2006 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto-hammer

Station 1411+12 Offset 30'R Casing HWT/HQ x 45 ft, HQ/NQ Method Wet Rotary

Northing 733413.04 Easting 1426673.04 Latitude _____ Longitude _____

County Kittitas Subsection NE 1/4 of NE 1/4 Section 2 Range 11E Township 21N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0 - 1	0 - 0.3						<u>80</u>	D-1	6 6 5 (11)	Well graded silty SAND, subangular, medium dense, brown, moist, homogenous, no HCl reaction. Recovered = 1.2 feet.			
1 - 2	0.3 - 0.6						<u>60</u>	D-2	8 20 20 (40)	Well graded silty SAND with gravel, subangular, dense, brown, moist, homogenous, no HCl reaction. Recovered = 0.9 feet.			
2 - 3	0.6 - 0.9						<u>80</u> <u>400</u>	D-3 C-4	50/3"	Poorly graded GRAVEL with sand, subangular, very dense, gray, moist, homogenous, no HCl reaction. Recovered = 0.2 feet. Well graded GRAVEL with sand, cobbles and boulders, subangular, gray, wet, homogenous, no HCl reaction. Recovered = 4.75 feet.			
3 - 4	0.9 - 1.2						<u>47</u>	D-5	6 18 10 (28)	Poorly graded GRAVEL with sand, subangular, dense, brown, moist, homogenous, no HCl reaction. Recovered = 0.7 feet.			
4 - 5	1.2 - 1.5						<u>66</u>	C-6		Poorly graded GRAVEL with cobbles and boulders, subangular, brown, wet, homogenous, no HCl reaction. Recovered = 2.3 feet.			
5 - 6	1.5 - 1.8												

DRAFT ROCKN BORING.GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
							13	D-7	4 9 4 (13)	Poorly graded GRAVEL, subangular, medium dense, gray, wet, homogenous, no HCl reaction. Recovered = 0.2 feet.			
							69	C-8		Poorly graded GRAVEL with cobbles and boulders, subangular, gray, wet, homogenous, no HCl reaction. Recovered = 2.4 feet.			
7													
25							64 0.6	D-8A C-9	50/0"	No recovery. ANDESITE, greenish gray, medium grained, slightly weathered, strong rock (R4). No HCl reaction. Discontinuities are closely spaced, and in fair condition. CR = 64%, RQD = 64%, FF = 0.6.			
8													
30							58 >10	C-10		ANDESITE, greenish gray, medium grained, completely weathered, moderately strong rock (R3). No HCl reaction. Discontinuities are very closely spaced, and in very poor condition. CR = 58%, RQD = 0%, FF > 10.			
9													
10													
35							100 >10	C-11		ANDESITE, greenish gray, medium grained, highly weathered, moderately strong rock (R3). No HCl reaction. Discontinuities are very closely spaced, and in very poor condition. [Clay/silt infilling] CR = 100%, RQD = 12%, FF > 10.			
11													
40							100 1.8	C-12		DACITE BRECCIA, greenish gray, medium to coarse grained, slightly to moderately weathered, strong rock (R4). No HCl reaction. Discontinuities are very closely spaced, and in poor condition. CR = 100%, RQD = 80%, FF = 1.8.q (Note: Silt infilling or deposit in the sample fractures less than 0.1 feet thick.)			
12													
13													
45													



LOG OF TEST BORING

Start Card _____

Job No. 33758573

SR 90

Elevation 2541.9 ft (774.8 m)

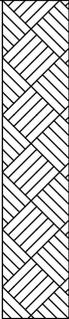
HOLE No. H-32-06

Sheet 3 of 3

Project WSDOT I-90 Snoqualmie Pass East

Driller Kerry Cooper

Lic# 2552

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14							100 1.0			C-13		DACITE BRECCIA, greenish gray, medium to coarse grained, fresh, strong rock (R4). No HCl reaction. Discontinuities are very closely spaced, and in poor condition. CR = 100%, RQD = 70%, FF = 1.		
15														
50												Bottom of boring at 50.0 feet below ground surface. Backfilled to ground surface with bentonite chips.		
16														
55														
17														
18														
60														
19														
65														
20														
21														
70														



Start Card _____

Job No. 33758573 SR 90

Elevation 2494.1 ft (760.2 m)

HOLE No. H-33-06

Sheet 1 of 2

Project WSDOT I-90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Kranti Maturi

Start July 11, 2006 Completion July 11, 2006 Well ID# Not Applicable Equipment CME 45 (barge) w/auto-hammer

Station 1411+39 Offset 115.5'R Casing HQ x 9 ft, NQ Method Wet Rotary

Northing 733302.4 Easting 1426679.37 Latitude _____ Longitude _____

County Kittitas Subsection NE 1/4 of NE 1/4 Section 2 Range 11E Township 21N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
1							87	D-1	8 15 20 (35)	Poorly graded GRAVEL with sand, subangular, dense, brown, wet, homogenous, no HCl reaction. (Trace wood or organics were present.) Recovered = 1.3 feet.			
2							40	D-2	1 2 7 (9)	Well graded SAND, subrounded, loose, reddish brown, wet, homogenous, no HCl reaction. Recovered = 0.6 feet.			
3								C-3		Poorly graded GRAVEL.			
4							88 0.2	C-4		DACITE BRECCIA, greenish gray, medium to coarse grained, fresh, very strong rock (R5). Weak HCl reaction. Discontinuities are closely spaced, and in good condition. CR = 88%, RQD = 62%, FF = 0.22.			
5							100 1.7	C-4		DACITE BRECCIA, greenish gray, medium to coarse grained, fresh, very strong rock (R5). Weak HCl reaction. Discontinuities are very closely spaced, and in poor condition. [Clay/silt infilling in some of the fractures] CR = 100%, RQD = 83%, FF = 1.7.			
6							70 >10	C-5		DACITE BRECCIA, greenish gray, medium to coarse grained, moderately weathered, very strong rock (R5). Weak HCl reaction. Discontinuities are very closely spaced, and in very poor condition. [Clay infilling in some of the fractures] CR = 70%, RQD = 68%, FF > 10. (Note: Driller reported that there was about 1.5 feet of soft soil.)			

DRAFT ROCKN BORING.GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758573 SR 90

Elevation 2533.6 ft (772.2 m)

HOLE No. H-34-06

Sheet 1 of 2

Project WSDOT I-90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Kranti Maturi

Start July 6, 2006 Completion July 7, 2006 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto-hammer

Station 1419+07 Offset 40'R Casing HWT, HQ Method Wet Rotary

Northing 733107.53 Easting 1427416.3 Latitude _____ Longitude _____

County Kittitas Subsection NW 1/4 of NW 1/4 Section 1 Range 11E Township 21N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0													
1													
5													
2													
10													
4													
15													
5													
6													
20													

DRAFT ROCKN BORING.GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								D-8	3	Poorly graded GRAVEL with sand, subangular, dense, brown, wet, homogenous, no HCl reaction. Recovered = 0.4 feet.			
25							C-9	15	16				Top 2.6 feet: Poorly graded GRAVEL with cobbles, subangular, gray, wet, homogenous, no HCl reaction. Recovered = 1.9 feet.
8								C-10	(31)	Bottom 0.9 feet: DACITE BRECCIA, greenish gray, medium to coarse grained, fresh, strong rock (R4). Discontinuities are very closely spaced, and in poor condition. [Silt infilling] CR = 54%, RQD = 25%, FF = 0.28 for 0.9 feet			
30										DACITE BRECCIA, greenish gray, medium to coarse grained, slightly weathered, strong rock (R4). No HCl reaction. Discontinuities are very closely spaced, and in poor condition. CR = 100%, RQD = 68%, FF = 1.4.			
10										Bottom of boring at 31.5 feet below ground surface. Backfilled to ground surface with bentonite chips.			
35										Water level measurement (below existing ground surface): - 7/7/06 at 10:00: 23.0 feet with casing depth 25.5 feet.			
11													
12													
40													
13													
45													



LOG OF TEST BORING

Start Card _____

Job No. 33758573 SR 90

Elevation 2497.7 ft (761.3 m)

HOLE No. H-35-06

Sheet 1 of 1

Project WSDOT I-90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Kranti Maturi

Start July 11, 2006 Completion July 11, 2006 Well ID# Not Applicable

Equipment CME 45 (barge) w/auto-hammer

Station 1419+28 Offset 121.4'R Casing HQ

Method Wet Rotary

Northing 733029 Easting 1427419 Latitude _____

Longitude _____

County Kittitas Subsection NW 1/4 of NW 1/4

Section 1 Range 11E Township 21N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
									C-1		ANDESITE, greenish gray, medium grained, fresh, strong rock (R4). No HCl reaction. Discontinuities are closely spaced, and in good condition.			
						100			C-2		ANDESITE, greenish gray, medium grained, fresh, strong rock (R4). No HCl reaction. Discontinuities are closely spaced, and in poor condition. [Clay/silt infilling in some of the fractures, there was one vertical fracture]			
1						100					CR = 100%, RQD = 100%, FF = 1.			
5									C-3		ANDESITE, greenish gray, medium grained, fresh, strong rock (R4). No HCl reaction. Discontinuities are very closely to closely spaced, and in poor condition. [Clay/silt infilling in two fractures]			
2						100					CR = 100%, RQD = 89%, FF = 1.33.			
10									C-4		ANDESITE, greenish gray, medium grained, highly to moderately weathered, moderately strong rock (R3). No HCl reaction. Discontinuities are very closely spaced, and in poor condition. [There are many vertical fractures in the sample.]			
4						100					CR = 100%, RQD = 36%, FF > 10.			
15											Bottom of boring at 15.5 feet below ground surface. Backfilled to mudline with bentonite.			
5											Water level measurement: -7/11/06 at 07:30: 6.0 feet above mudline.			
											Note: Location moved 8 feet SW from the original location.			
20														

DRAFT ROCKN BORING.GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758573 SR 90 Elevation 2484.1 ft (757.2 m)

HOLE No. H-36-06

Sheet 1 of 4

Project WSDOT I-90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Kranti Maturi

Start July 20, 2006 Completion July 20, 2006 Well ID# Not Applicable Equipment CME 45 (barge) w/auto-hammer

Station 1425+22 Offset 171.6'R Casing HQ x 55.5 ft, NQ Method Wet Rotary

Northing 732950 Easting 1428176 Latitude _____ Longitude _____

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
1													
5													
2							<u>87</u>	D-1	2 4 8 (12)	Poorly graded silty SAND (fine), medium dense, brown, wet, homogenous, no HCl reaction. Recovered = 1.3 feet.			
10							<u>73</u>	D-2	5 5 9 (14)	Well graded SAND (fine to medium) with gravel, subangular, medium dense, brown, wet, homogenous, no HCl reaction. Recovered = 1.1 feet.			
15							<u>20</u>	D-3	4 4 4 (8)	Well graded SAND (fine to medium) with gravel, subangular, loose, brown, wet, homogenous, no HCl reaction. Recovered = 0.3 feet.			
20													

DRAFT ROCKN BORING.GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758573

SR 90

Elevation 2484.1 ft (757.2 m)

HOLE No. H-36-06

Sheet 2 of 4

Project WSDOT I-90 Snoqualmie Pass East

Driller Kerry Cooper

Lic# 2552

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7													
25													
8													
30													
9													
35													
10													
35													
11													
40													
12													
45													
13													
45													

DRAFT ROCKN BORING.GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
14								D-9	13 18 30 (48)	Clayey SILT, hard, gray, moist, homogenous, no HCl reaction. Pocket Penetrometer = 4.0 tsf. Recovered = 1.1 feet.			
15								D-10	50/4"	Clayey SILT, very dense, gray, moist, homogenous, no HCl reaction. Pocket Penetrometer = 4.5 tsf. Recovered = 0.35 feet.			
16								D-11	50/4"	Well graded GRAVEL with sand, subangular, very dense, gray, wet, homogenous, no HCl reaction. Recovered = 0.25 feet.			
17								C-12		BASALT, gray, fine-grained, fresh, strong rock (R4). Weak HCl reaction. Discontinuities are closely spaced, and in good condition. CR = 54%, RQD = 37%, FF = 0.28.			
18								C-13		BASALT, gray, fine-grained, fresh, strong rock (R4). Weak HCl reaction. Discontinuities are closely spaced, and in fair condition. CR = 100%, RQD = 98%, FF = 1.2.			
19								C-14		BASALT, gray, fine-grained, fresh, strong rock (R4). Weak HCl reaction. Discontinuities are medium spaced, and in good condition. CR = 100%, RQD = 100%, FF = 0.2.			
20													
21													
70													

DRAFT ROCKN BORING.GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758573

SR 90

Elevation 2484.1 ft (757.2 m)

HOLE No. H-36-06

Sheet 4 of 4

Project WSDOT I-90 Snoqualmie Pass East

Driller Kerry Cooper

Lic# 2552

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
												Bottom of boring at 70.5 feet below ground surface. Backfilled to mudline with bentonite.		
												Water level measurement: - 7/20/06 at 08:00: 11.0 feet above mudline.		
22														
75														
23														
24														
80														
25														
85														
26														
27														
90														
28														
95														



LOG OF TEST BORING

Start Card _____

Job No. 33758573 SR 90 Elevation 2493.9 ft (760.1 m)

HOLE No. H-37-06

Sheet 1 of 3

Project WSDOT I-90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Kranti Maturi

Start July 11, 2006 Completion July 12, 2006 Well ID# Not Applicable Equipment CME 45 (barge) w/auto-hammer

Station 1436+41 Offset 112.1'R Casing HQ x 41.5 ft, NQ Method Wet Rotary

Northing 732724.82 Easting 1429023 Latitude _____ Longitude _____

County Kittitas Subsection SE 1/4 of NW 1/4 Section 1 Range 11E Township 21N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
1													
5													
2													
10													
3													
4													
15													
5													
6													
20													

DRAFT ROCKN BORING.GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7							100	D-5	50/6"	Poorly graded silty SAND with gravel, subangular, very dense, gray, moist, homogenous, no HCl reaction. Recovered = 0.5 feet.			
25							40	D-6	50/6"	Poorly graded silty GRAVEL, subangular, very dense, gray, wet, homogenous, no HCl reaction. Recovered = 0.2 feet.			
30							100	D-7	50/6"	Poorly graded silty SAND with gravel, subangular, very dense, gray, moist, homogenous, no HCl reaction. Recovered = 0.5 feet.			
35							0		50/0"	Tried an SPT, but sampler was pounding on very dense material. (Note: Driller reported very stiff clay encountered between 37 feet and 39 or 40 feet.)			
40							100	C-8		DACITE, gray, fine grained, fresh, slightly weathered, strong rock (R4). Discontinuities are closely spaced, and in poor condition. [Clay/silt infilling in some of the fractures] CR = 100%, RQD = 92%, FF = 0.8.			
45							100	C-9		DACITE, gray, fine grained, fresh, slightly weathered, strong rock (R4). Discontinuities are closely spaced to			

DRAFT ROCKN BORING.GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758573

SR 90

Elevation 2493.9 ft (760.1 m)

HOLE No. H-37-06

Sheet 3 of 3

Project WSDOT I-90 Snoqualmie Pass East

Driller Kerry Cooper

Lic# 2552

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14											moderately spaced, and in very poor condition. [Clay/silt infilling] CR = 100%, RQD = 100%, FF = 0.6.			
15											Bottom of boring at 49.0 feet below ground surface. Backfilled to mudline with bentonite.			
50											Water level measurement: - 7/11/06 at 10:05: 9.5 feet above mudline.			
16														
55														
17														
18														
60														
19														
65														
20														
21														
70														



LOG OF TEST BORING

Start Card _____

Job No. 33758573 SR 90

Elevation 2526.6 ft (770.1 m)

HOLE No. H-38-06 (OW)

Sheet 1 of 2

Project WSDOT I-90 Snoqualmie Pass East

Driller Mike Harvey Lic# 2599

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start July 11, 2006 Completion July 11, 2006 Well ID# H-38-06 (OW) Equipment CME 45 (skid rig) w/auto-hammer

Station 1449+24 Offset 55'L Casing HWT Method Wet Rotary

Northing 731836.89 Easting 1429922.24 Latitude _____ Longitude _____

County Kittitas Subsection SE 1/4 of NW 1/4 Section 1 Range 11E Township 21N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0	0												
1	0.3												
5	1.5					87		D-1	1 7 15 (22)	Poorly graded silty SAND with gravel, angular, medium dense, light brown, dry, homogenous, no HCl reaction. Recovered = 1.3 feet.			
2	0.6					80		D-2	9 9 13 (22)	Well graded silty SAND with gravel, angular to subangular, medium dense, grayish brown, moist, homogenous, no HCl reaction. Gravel diameter 1.5 inches. Recovered = 1.2 feet.			
10	3.0					80		D-3	10 29 19 (48)	Well graded SAND with gravel, subangular to subrounded, dense, gray, wet, homogenous, no HCl reaction. Gravel diameter 1.3 inches. Recovered = 1.2 feet.			
4	1.2					0 0			50/1"	No recovery. (Drill rig wobbled when drilling).			
15	4.5					13		D-4	41 25 14 (39)	Poorly graded GRAVEL (coarse) with sand, occasionally with cobbles, angular, dense, greenish gray, wet, homogenous, no HCl reaction. Recovered = 0.2 feet.			
20	6.0												



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7							54	D-5	7 11 50/4"	Poorly graded GRAVEL (fine) with sand, angular to subrounded, very dense, light brown, wet, homogenous, no HCl reaction. Recovered = 0.7 feet.			
25	8						40	D-6	50/0.5"	Poorly graded SAND with gravel, angular, very dense, bluish gray, moist, homogenous, weak HCl reaction. Recovered = 0.2 inches. (Probably bedrock)			
30	9						50	D-7	50/1"	Poorly graded SAND, very dense, bluish gray, moist, homogenous, weak HCl reaction. Recovered = 0.5 inches. (Possibly tuff)			
10										Bottom of boring at 30.1 feet below ground surface. Installed 1-inch diameter observation well: 1. Backfilled from 30.0 feet to 30.1 feet with sand. 2. Installed 1-inch diameter observation well: - PVC screen interval with 0.010-inch slots: 18.0 to 30.0 feet - PVC riser: 0.3 to 18.0 feet - Sand filter pack: 15.0 to 30.1 feet 3. Backfilled from 1.3 to 15.0 feet with bentonite chips. 4. Installed quickcrete surface seal (0 to 1.3 feet) and flush-mount protective steel casing (7.5-inch I.D., approximately 2.0 feet long).			
35	11									Water level measurements (below existing ground surface): - 7/11/06 at 17:15: 4.2 feet with casing depth 30.1 feet. - 7/12/06 at 07:00: 19.9 feet in observation well.			
40	12												
45	13												



Job No. 062-2002 SR I-90 Elevation 2800.3 ft (853.5 m)

HOLE No. H-102-06

Sheet 1 of 9

Project Slide Curve Feasibility Investigation

Driller L. Murphy / S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 59

Inspector B. Hamilton

Start September 13, 2006 Completion September 20, 2006 Well ID# H-102-06 Equipment Skid Mounted Burely 4500-1

Station 1396 + 02 Offset 460.6 Feet Left Casing Stick-up Monument Method HQ Triple-Tube Wireline

Northing 734716 Easting 1426553.2 Latitude 47.204129903 N Longitude 121.214555998 W

County Kittitas Subsection SE Quarter Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
1						69 0.8		1		SANDY GRAVEL [GP] sandy GRAVEL and COBBLES, loose, dry [Colluvium and Fill]			
							R4		PLT - D	META-WELDED LAPILLI DACITE TUFF pale green (10G 6/2) to grayish green (10G 4/2) groundmass, multi-color lapilli-sized rock fragments (10 - 20%), fine to medium grained phenocrysts of plagioclase (10 - 25%) and quartz (5 - 15%), fresh (I) to slightly weathered (II), strong rock (R4), poorly sorted, altered with secondary mineralization, devitrified glass in groundmass, discontinuities are closely to moderately spaced and in fair condition. [Lake Keechelus member, Ohanapecosh Formation]			
5						90 2.2		2		90 - 100% drilling fluid circulation Becomes fresh (I), very strong rock (R5), discontinuities become closely spaced and in poor to fair condition			
2													
10						103 0.9		3		Loose drilling fluid circulation			
4						106 0.6		4					
							R5		PLT - D				
15						100 1.0		5		Discontinuities become moderately to closely spaced and in fair to poor condition			
5													
20						98 0.8		6					
							R4		PLT - A				

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:07:49 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7													
25													
8													
9													
30													
10													
35													
11													
12													
40													
13													
45													

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:07:49 A1

At 43.9 to 44.3 feet bgs, 0.35 foot thick zone of broken up rock with clay infilling, very poor condition,



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14			[Hatched pattern]								discontinuities become moderately spaced and in fair to poor condition		
15			[Hatched pattern]				$\frac{92}{1.3}$	R4	12	PLT - D	Becomes slightly olive gray (5Y 4/1) to grayish olive green (5GY 3/2) groundmass, fresh (I) to slightly weathered (II), discontinuities become moderately spaced and in fair to poor condition		
16			[Hatched pattern]				$\frac{100}{1.2}$		13				
55			[Hatched pattern]				$\frac{100}{0.4}$	R5	14	PLT - D			
17			[Hatched pattern]								Becomes pale green (10G 6/2) to grayish green (10G 4/2) groundmass, fresh (I) with typically slight weathering (II) and grayish olive green (5GY 3/2) discoloration adjacent to discontinuities, multicolor lapilli-sized rock fragment concentrations increase to 15 to 25%, discontinuities become moderately spaced and in fair to good condition		
18			[Hatched pattern]				$\frac{104}{0.4}$	R5	15	PLT - D			
60			[Hatched pattern]										
19			[Hatched pattern]										
65			[Hatched pattern]				$\frac{100}{0.6}$		16				
20			[Hatched pattern]										
21			[Hatched pattern]				$\frac{100}{0.6}$	R5	17	PLT - D			
70			[Hatched pattern]										

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:07:49 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22													
75													
80													
85													
90													
95													

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:07:49 A1

Becomes olive gray (5Y 4/1) to brownish gray (5YR 4/1) groundmass, fresh (I) to slightly weathered (II), moderately strong (R3) to strong rock (R4), discontinuities become closely to moderately spaced and in fair to good condition

Becomes pale green (10G 6/2) to grayish green (10G 4/2) groundmass, fresh (I), strong rock (R4), discontinuities become widely spaced and in good condition, 2 - 4 per foot healed discontinuities between 93.6 and 97.6 feet bgs

Becomes medium gray (N5) to pale green (10G 6/2) groundmass, fresh (I), moderately strong (R3) to



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29										strong rock (R4), discontinuities are widely spaced and in good condition			
						$\frac{100}{0}$	R3	24	PLT - D				
30						$\frac{100}{0.4}$		25					
100													
31													
						$\frac{100}{0}$	R3	26	PLT - D				
105													
32													
						$\frac{100}{1.2}$		27		Becomes pale green (10G 6/2) to grayish green (10G 4/2) groundmass, fresh (I), very strong rock (R5)			
110										At 109.0 - 111.0 feet bgs, Discontinuities become closely spaced and in good condition			
34										Discontinuities become moderately to closely spaced and in good to fair condition			
						$\frac{100}{1.2}$		28					
115													
35													
						$\frac{100}{2.4}$		29		Becomes dark greenish gray (5GY 4/1) to olive gray (5Y 4/1) and greenish gray (5G 6/1) groundmass,			
120													

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:07:50 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
37										fresh (I), strong (R4) to very strong rock (R5), discontinuities become closely to moderately spaced and in good to fair condition			
125	38					$\frac{100}{0.8}$		30					
39							R5		PLT - D				
130	40					$\frac{100}{0.5}$		31	PLT - D				
41							R5		PLT - A				
135	42					$\frac{100}{0}$		32					
43						$\frac{100}{0.4}$		33	PLT - D	Becomes pale green (10G 6/2) to grayish green (10G 4/2) groundmass, fresh (I), strong (R4) to very strong rock (R5), discontinuities become moderately to widely spaced and in poor to good condition			
140	44					$\frac{100}{0.4}$		34					
45							R5		PLT - D	Becomes dark greenish gray (5GY 4/1) to olive gray (5Y 4/1) and greenish gray (5G 6/1) groundmass.			

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:07:50 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
45										fresh (I) to slightly weathered (II), moderately strong (R3) to very strong rock (R5), discontinuities become closely to moderately spaced and in poor to fair condition, 1 to 3 per foot healed discontinuities			
150								36	PLT - D				
46													
155								37	PLT - D	Becomes pale green (10G 6/2) to grayish green (10G 4/2) groundmass, fresh (I), very strong rock (R5), discontinuities become moderately to widely spaced and in good condition			
47													
160								38	PLT - D				
48													
165								39		At 166.0 - 166.4 feet bgs, three closely spaced discontinuities and in good condition, slight weathering (II) with dusky yellowish green (5GY 5/2) discoloration			
49													
170								40	PLT - A PLT - D	Discontinuities become widely spaced and in good to fair condition			
50													
51													

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:07:50 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
52		▲▲	[Diagonal Hatching]				100 0.2	R5 R4		PLT - D PLT - A			
53		▲▲											
175		▲▲	[Diagonal Hatching]				100 0.2	R5	42	PLT - D	Becomes grayish olive green (5GY 3/2) to dusky yellowish green (5GY 5/2) groundmass, discontinuities become widely spaced and in fair to good condition		
54		▲▲											
180		▲▲	[Diagonal Hatching]				100 0.2	R4	43	PLT - D	Becomes pale green (10G 6/2) to grayish green (10G 4/2) groundmass Discontinuities are very widely to widely spaced and in good condition		
55		▲▲											
185		▲▲	[Diagonal Hatching]				100 0	R4	44		[Diagonal Hatching]		
56		▲▲											
190		▲▲	[Diagonal Hatching]				100 0	R4	45	PLT - D	[Diagonal Hatching]		
57		▲▲											
195		▲▲	[Diagonal Hatching]				100 0		46		[Diagonal Hatching]		
58		▲▲											
59		▲▲	[Diagonal Hatching]				100 0				[Diagonal Hatching]		
59		▲▲											

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:07:50 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
60								R5		PLT - D			
200	61						$\frac{93}{0}$		47				
62										<p>Borehole completed to 200.0 feet bgs on September 20, 2006. Borehole was flushed for preparation of optical and acoustical televiewer survey and completed with 10 feet of surface casing (3" PVC). Optical and acoustical televiewer survey completed on September 23, 2006. Borehole completed with two vibrating wire piezometers at 74.0 feet and 197.2 feet bgs on September 30, 2006. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at 118.2 feet bgs during drilling activities and at 139.2 feet on September 23, 2006 prior to beginning optical borehole survey.</p> <p>VWP #87451 = 73.2 to 74.7 feet bgs VWP #87179 = 196.5 to 198.0 feet bgs #10-20 silica sand filter pack from 160.0 to 200.0 feet bgs Grout mix from 0.0 to 160.0 feet bgs: 1 94 lb bag Type I-II Portland Cement 5 gallons water 4 lbs pure bentonite powder Well Tag # = AFS 290</p> <p>Borehole logs were prepared under the direction of Wyllie & Norrish Rock Engineers Inc., Project number 062-2002. Original field logs contain detailed source information.</p> <p>Rock strength values provided on the gINT log represent those values obtained by performing field Diametral Point Load Tests (PLT-D) or Axial Point Load Tests (PLT-A) at specific test depths. Only valid failure results (passing through the plane of the platens) are represented on the log.</p>			
205	63												
210	64												
215	65												
66													
220	67												

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:07:50 A1



Job No. 062-2002 SR I-90

Elevation 2717.4 ft (828.3 m)

HOLE No. H-103-06

Sheet 1 of 7

Project Slide Curve Feasibility Investigation

Driller D. Ott / S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 59

Inspector B. Strickler

Start September 7, 2006 Completion September 11, 2006 Well ID# H-103-06

Equipment Skid Mounted Burely 5500-2

Station 1401 + 18 Offset 336.6 Feet Left Casing Stick-up Monument

Method HQ Triple-Tube Wireline

Northing 734332.37 Easting 1426467.02 Latitude 47.203750364 N

Longitude 121.214675031 W

County Kittitas Subsection SE Quarter

Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
1								1		GRAVEL AND COBBLES [GP] slightly silty and sandy GRAVEL and COBBLES, angular [COLLUVIUM]. Borehole collared in colluvium at base of exfoliating cliff. Loose drilling fluid circulation at contact with bedrock			
5								2		META-WELDED LAPILLI DACITE TUFF pale (10G 6/2) to grayish green (10G 4/2) and medium gray (N5) groundmass, multi-color lapilli-sized rock fragments (10 - 25%), fine to medium grained phenocrysts of plagioclase (15 - 25%) and quartz (5 - 12%), fresh (I), strong (R4) to very strong rock (R5), poorly sorted, altered with secondary mineralization, devitrified glass in groundmass, discontinuities are widely spaced and in fair condition with 0.3 to 0.4 foot zones of healed discontinuities. [Lake Keechelus member, Ohanapecosh Formation]			
2								3					
10								4		At 7.0 feet bgs, discontinuities become closely to moderately spaced and in fair to good condition, 2-3 healed discontinuities per foot, slightly weathered (II)			
4								5		Healed discontinuities 3 to 5 per foot			
15								6					
5								7					
20													

ROCK SLIDE CURVE BOREHOLES.GPJ 1/18/07, 11:05:04 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7													
25								8		At 19.7 - 20.3 feet bgs, slightly discolored to moderate olive brown (5Y 4/4), slightly weathered (II) adjacent to discontinuity, discontinuities become widely spaced and in good condition.			
8								9					
30								10		At 27.8 to 28.6 feet bgs, fine sand with silty and clay, moderately (III) to highly weathered (IV) zone with very closely spaced (up to seven) discontinuities in poor to very poor condition, slightly weathered (II) for 0.3 feet above and below zone Discontinuities become very closely spaced on widely spaced intervals and in good condition			
10								11					
35								12					
11								11					
40								12					
12								11					
45								12	PLT - D	Discontinuities become moderately spaced and in poor to fair condition with partial clay (moderate yellowish brown, 10YR 5/4) infilling, slightly weathered (II) adjacent to discontinuities, strong (R4) to very strong rock (R5)			
13								12					

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:08:04 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14							100 0.8	R4	13	PLT - A	Discontinuities become closely spaced on widely spaced intervals in poor to good condition, slightly weathered (II) adjacent to discontinuities		
	R5							PLT - D					
15							88 0		14				
50							100 0.2		15				
16							R3		PLT - D				
55							104 0.8		16				
17							R5		PLT - D				
18							92 0		17				
60							R4		PLT - D				
19							100 0		18				
65							R4		PLT - D				
20							100 0.6		19				
21							R4		PLT - D				
70							R4		PLT - A				

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:08:04 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22			[Diagonal hatching pattern]				100 / 0.6		20		Discontinuities become closely to moderately spaced and in fair to good condition, 1-2 per foot healed discontinuities		
75	23												
24			[Diagonal hatching pattern]				100 / 0.2	R4	21	PLT - D	Discontinuities become widely spaced and in good condition		
80	24												
25			[Diagonal hatching pattern]				100 / 0.4	R4	22	PLT - A PLT - D			
85	26												
27			[Diagonal hatching pattern]				100 / 0.6	R5	23	PLT - D	Discontinuities become closely to moderately spaced and in poor to good condition, slightly weathered (II) adjacent to discontinuities		
90	27												
28			[Diagonal hatching pattern]				100 / 0	R5 R4	24	PLT - D PLT - A	No discontinuities observed in rock core until 119 feet bgs.		
95	28												

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:08:05 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29													
							R5	25	PLT - D				
						100/0							
30							R4		PLT - A	Up to 2mm pyrite crystals observed (less than 1% of rock mass)			
							R5		PLT - D				
100													
31								26					
						100/0							
										Approximately 0.2 foot zone of light brown (5YR 5/4) discoloration around ~1% of phenocrysts, slightly weathered (II)			
105							R4	27	PLT - A				
						100/0	R5		PLT - D				
32								28					
						100/0							
33										Healed discontinuity			
							R4		PLT - A				
110							R5		PLT - D				
34								29					
						100/0							
115							R4		PLT - A				
35							R4		PLT - D				
								30					
						98/0.2							
36										Discontinuity in fair condition			
120													

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:08:05 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
37													
125													
38													
39													
130													
40													
41													
135													
42													
140													
43													
44													
145													

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:08:05 A1

Discontinuities become closely spaced and in poor to fair condition
Discontinuities become moderately to widely spaced and in fair to good condition

At 135.0 - 135.5 feet bgs, discontinuities become closely spaced and in fair to good condition



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
45							103 0	R5	36	PLT - D			
150								R4		PLT - D			
155													
160													
165													
170													

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:08:05 A1

Borehole completed to 150.0 feet bgs on September 11, 2006. Borehole was flushed for preparation of optical and acoustical televiewer survey and completed with 10 feet of surface casing (3" PVC). Optical and acoustical televiewer survey completed on September 20, 2006. Borehole completed with one vibrating wire piezometer at 147.2 feet bgs on September 28, 2006. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at 46.1 feet bgs during drilling activities and at 45.3 feet on September 20, 2006 prior to beginning optical borehole survey.

VWP #87187 = 146.5 to 148.0 feet bgs
 #10-20 silica sand filter pack from 120.0 to 150.0 feet bgs
 Grout mix from 0.0 to 120.0 feet bgs:
 1 94 lb bag Type I-II Portland Cement
 5 gallons water
 4 lbs pure bentonite powder
 Well Tag # = AFS 292

Borehole logs were prepared under the direction of Wyllie & Norrish Rock Engineers Inc., Project number 062-2002. Original field logs contain detailed source information.

Rock strength values provided on the gINT log represent those values obtained by performing field Diametral Point Load Tests (PLT-D) or Axial Point Load Tests (PLT-A) at specific test depths. Only valid failure results (passing through the plane of the platens) are represented on the log.



Job No. 062-2002

SR I-90

Elevation 2652.6 ft (808.5 m)

HOLE No. H-105-06

Sheet 1 of 7

Project Slide Curve Feasibility Investigation

Driller L. Murphy / S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 59

Inspector B. Hamilton

Start August 29, 2006

Completion August 31, 2006

Well ID# H-105-06

Equipment Skid Mounted Burley 4500-1

Station 1409 + 40

Offset 181.9 Feet Left

Casing Stick-up Monument

Method HQ Triple-Tube Wireline

Northing 733679.64

Easting 1426684.15

Latitude 47.203108528 N

Longitude 121.214349404 W

County Kittitas

Subsection NE Quarter

Section 2

Range 11E

Township 21N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
1									1		SILTY GRAVEL [GM] fine to coarse GRAVEL and small COBBLES with silt and sand. [Construction Road Fill]			
5						77	R5			PLT - D	META-WELDED LAPILLI DACITE TUFF right olive (10Y 5/4) to grayish olive (10Y 4/2) with dark yellow orange clasts (10YR 6/6) in groundmass, multi-color lapilli-sized rock fragments (10 - 20%), fine to medium grained phenocrysts of plagioclase (10 - 25%) and quartz (5 - 12%), fresh (I) to slightly weathered (II), strong rock (R4), poorly sorted, altered with secondary mineralization, devitrified glass in groundmass, discontinuities are moderately spaced and in fair to good condition. [Lake Keechelus member, Ohanapecoh Formation]			
2						96	R5		2	PLT - D				
3						104	R4		3	PLT - A				
4						96			4					
15						100	R5		5	PLT - D				
5							R5			PLT - D				
6											Becomes pale green (10G 6/2) to grayish green (10G 4/2) with grayish olive green (5GY 3/2) near discontinuities in groundmass, fresh (I) with slight weathering (II) adjacent to discontinuities			
20											Becomes pale green (10G 6/2) to grayish green (10G 4/2) groundmass, discontinuities become closely spaced and in fair to good condition			

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:08:34 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7													
25													
8													
9													
30													
10													
35													
11													
40													
12													
13													
45													

Becomes strong (R4) to very strong rock (R5)

Becomes slightly discolored to grayish olive green (5GY 3/2) groundmass adjacent to discontinuities, fresh (I) to slightly weathered (II) adjacent to discontinuities, discontinuities become closely to moderately spaced and in fair to good condition

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:08:34 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14													
						100		13					
						0.8							
15													
							R5		PLT - D	Becomes grayish olive green (5GY 3/2) to pale green (10G 6/2) and grayish green (10G 4/2) groundmass, fresh (I) to slightly weathered (II) adjacent to discontinuities, discontinuities become closely to moderately spaced and in good condition			
50													
						92		14					
						1.2							
16													
							R5		PLT - A				
55													
						100		15					
						2.4							
17													
						96		16					
						1.6							
18													
							R5		PLT - D				
60													
						100		17					
						1.1							
19													
						97		18					
						1.2							
65													
							R4		PLT - D	Becomes medium gray (N5) to grayish olive green (5GY 3/2) groundmass, fresh (I), discontinuities become closely spaced and in good condition			
20													
						97		19					
						1.7							
21													
70													

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:08:34 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
37										Occasional fine bomb sized rock fragments (less than 5%) up to 3 inches in diameter			
125							R5 R5	33	PLT - D PLT - A	Discontinuities become moderately spaced and in good condition			
130								34					
135								35					
140										<p>Borehole completed to 135.0 feet bgs on August 31, 2006. Borehole was flushed for preparation of optical and acoustical televiwer survey with installation 10 feet of 3" PVC surface casing. Optical and acoustical televiwer survey completed on September 6, 2006. Borehole completed with one vibrating wire piezometers at 132.2 feet bgs on September 27, 2006. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at 71.6 feet bgs during drilling activities.</p> <p>VWP #87454 = 131.5 to 133.0 feet bgs #10-20 silica sand filter pack from 115.0 to 135.0 feet bgs Grout mix from 0.0 to 115.0 feet bgs: 1 94 lb bag Type I-II Portland Cement 5 gallons water 4 lbs pure bentonite powder Well Tag # = AFS 287</p> <p>Borehole logs were prepared under the direction of Wyllie & Norrish Rock Engineers Inc., Project number 062-2002. Original field logs contain detailed source information.</p> <p>Rock strength values provided on the gINT log</p>			
145													

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:08:35 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
45										<p>represent those values obtained by performing field Diametral Point Load Tests (PLT-D) or Axial Point Load Tests (PLT-A) at specific test depths. Only valid failure results (passing through the plane of the platens) are represented on the log.</p>			
150													
46													
47													
155													
48													
160													
49													
50													
165													
51													
170													

ROCK_SLIDE_CURVE_BOREHOLES.GPJ 1/19/07,11:08:35 A1



Job No. 062-2002

SR I-90

Elevation 2774.6 ft (845.7 m)

HOLE No. H-106-06

Sheet 1 of 9

Project Slide Curve Feasibility Investigation

Driller L. Murphy / S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 59

Inspector B. Strickler

Start August 25, 2006 Completion August 28, 2006 Well ID# H-106-06

Equipment Skid Mounted Burley 4500-1

Station 1408 + 85 Offset 383.2 Feet Left Casing Stick-up Monument

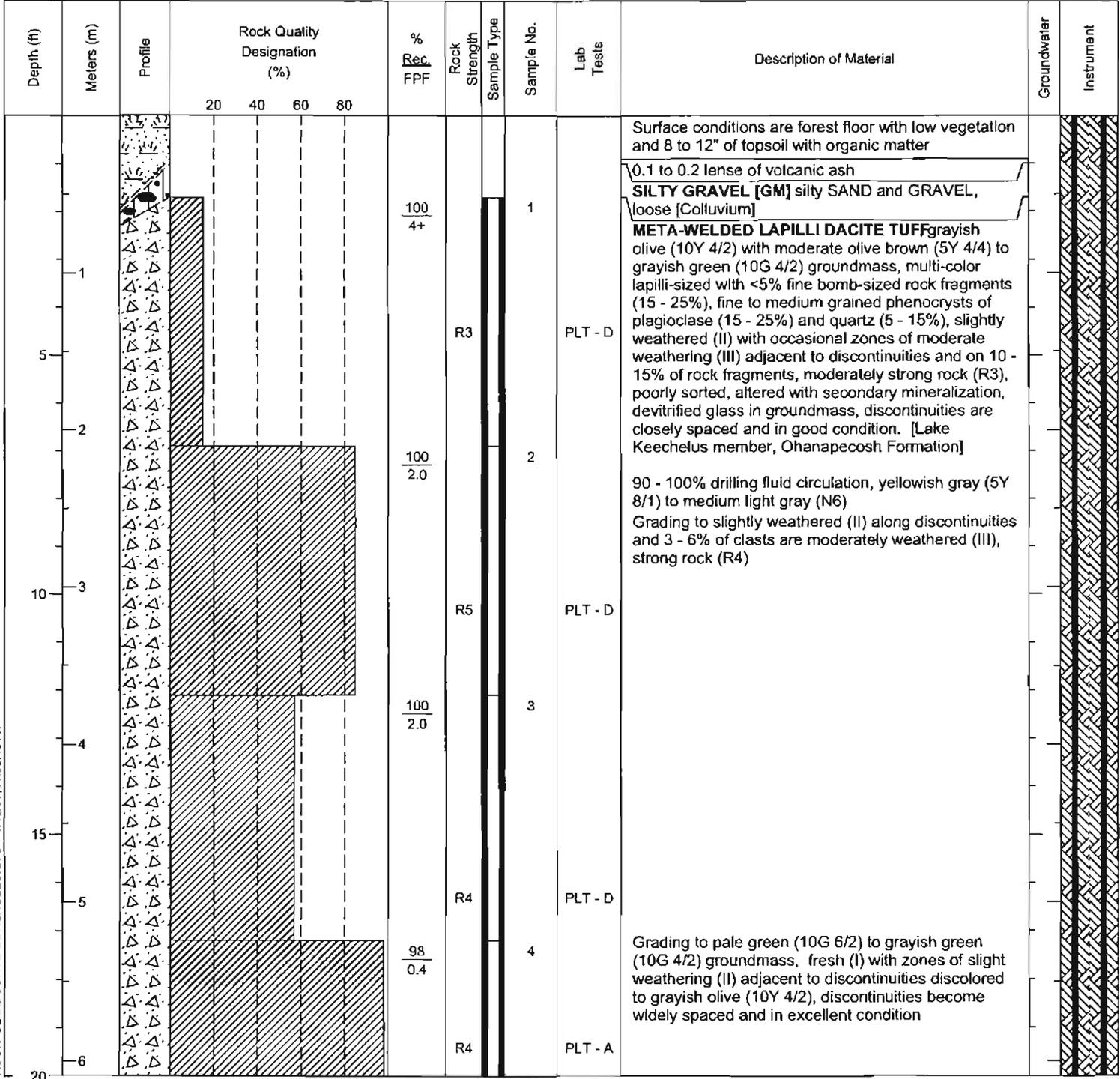
Method HQ Triple-Tube Wireline

Northing 733854.62 Easting 1426793.2 Latitude 47.203282389 N

Longitude 121.214193846 W

County Kittitas Subsection NE Quarter

Section 2 Range 11E Township 21N



ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:08:48 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7							$\frac{98}{0.2}$	R4	5	PLT - D			
25							$\frac{100}{0.2}$	R4	6	PLT - D			
30							$\frac{104}{0.2}$	R4	7	PLT - D			
35							$\frac{100}{0}$	R3	8	PLT - D			
40							$\frac{100}{0}$	R4	8	PLT - D			
45							$\frac{102}{0.8}$	R4	9	PLT - D	At 42.7 and 43.2 feet bgs, two discontinuities, very poor condition, loose drilling fluid circulation		

ROCK_SLIDE CURVE_BOREHOLES.GPJ 1/13/07, 11:08:48 A-1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14							R5		PLT - D				
						$\frac{100}{0.4}$		10					
15													
50													
16						$\frac{98}{0}$		11		At 51.6 feet bgs, discontinuity with partial fine sand infilling			
55													
17							R4		PLT - D				
						$\frac{99}{0.2}$		12					
18													
60							R2		PLT - D	META-WELDED LAPILLI DACITE TUFF light green (5G 7/4) to grayish green (10G 4/2) with medium gray (N5) to medium dark gray (N4) groundmass, multi-color lapilli-sized rock fragments (15 - 25%), fine to medium grained phenocrysts of plagioclase (10 - 25%) and quartz (5 - 15%), fresh (I) with occasional zones of slight weathering (II) discolored to light brown (5YR 5/6) to dark yellowish orange (10YR 6/6) adjacent to discontinuities, very weak (R1) to moderately weak rock (R2), poorly sorted, altered with secondary mineralization, devitrified glass in ground mass, upper and lower contacts are gradational, discontinuities are widely spaced and in fair to good condition. [Lake Keechelus member, Ohanapecosh Formation]			
19						$\frac{99}{0.6}$		13					
							R1		PLT - D				
65										At 64.4 - 65.5 feet bgs, becomes mostly light brown (5YR 5/6) stained and slightly weathered (II) adjacent to discontinuities, discontinuities become closely spaced and in fair to good condition			
20							R2		PLT - D	Slight weathering (II) and light brown (5YR 5/6) staining adjacent to discontinuities, discontinuities become moderately to widely spaced and in fair to good condition			
						$\frac{104}{0.2}$		14					
21													
70													

ROCK SLIDE CURVE BOREHOLES.GPJ 1/13/07, 11:08:48 A-1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22							R4	15	PLT - D	META-WELDED LAPILLI DACITE TUFF pale green (10G 6/2) to grayish green (10G 4/2) and medium gray (N5) ground mass with occasional moderate olive brown (5Y 4/4) groundmass, multi-color lapilli-sized with <5% fine bomb-sized rock fragments (15 - 25%), fine to medium grained phenocrysts of plagioclase (15 - 25%) and quartz (5 - 15%), fresh (I) with slight weathering adjacent to discontinuities, strong (R4) to very strong rock (R5), poorly sorted, altered with secondary mineralization, devitrified glass in ground mass, discontinuities are widely spaced and in fair condition. [Lake Keechelush member, Ohanapecash Formation]			
75							R4 R4	16	PLT - A PLT - D	Becomes slightly weathered (II), discontinuities become closely spaced on widely spaced intervals and in very poor to fair condition			
24													
80							R5	17	PLT - D	Becomes fresh (I), discontinuities become widely spaced and in fair condition			
25													
85							R4	18	PLT - D	At 87.8 to 89.5 feet bgs, becomes slightly weathered (II) and moderately weak rock (R2) associated with steeply dipping discontinuity in very poor condition			
26													
90													
27													
95							R5	19	PLT - D	Becomes fresh (I) and strong (R4) to very strong rock (R5), discontinuities become very widely spaced and in good condition			
28													

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:08:48 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
45								32	PLT - A PLT - D				
						100 0.3	R4 R5						
46								33	PLT - D				
						100 0	R5						
47								34		Beomes partially light brown (5YR 5/6) and dark yellowish orange (10Y 6/6) groundmass associated with slight weathering (II) of discontinuities, discontinuities become moderately to closely spaced and in very poor to good condition			
						102 0.6							
48								35	PLT - D				
						98 0.8	R5						
49								36	PLT - D	Beomes medium light gray (N6) to medium gray (N5) groundmass, fresh (I) with slight weathering (II) adjacent to discontinuities, discontinuities become widely spaced and in fair to good condition			
						100 0	R4						
50													
51								37	PLT - A				
						102 0.2	R4						
170							R4 R4		PLT - D PLT - A				

ROCK SLIDE CURVE BOREHOLES.GPJ 1/18/07, 11:08:49 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
52		▲▲▲▲	[Hatched pattern]				$\frac{98}{0.2}$	R4	38	PLT - A	Grading to medium light gray (N6) to yellowish gray (5Y 8/1) groundmass, discontinuities become very widely spaced and in good to excellent condition	[Dotted pattern]	[Hatched pattern]
53		▲▲▲▲											
175		▲▲▲▲	[Hatched pattern]				$\frac{100}{0}$	R5	39	PLT - D	META-WELDED LAPILLI DACITE TUFF pale green (10G 6/2) to grayish green (10G 4/2) and medium gray (N5) ground mass with occasional moderate olive brown (5Y 4/4) groundmass, multi-color lapilli-sized rock fragments (15 - 25%), fine to medium grained phenocrysts of plagioclase (15 - 25%) and quartz (5 - 15%), fresh (I) with slight weathering adjacent to discontinuities, strong (R4) to very strong rock (R5), poorly sorted, altered with secondary mineralization, devitrified glass in ground mass, discontinuities are very widely spaced and in good to excellent condition. [Lake Keechelus member, Ohanapecohsh Formation]	[Dotted pattern]	[Hatched pattern]
54		▲▲▲▲											
180		▲▲▲▲	[Hatched pattern]				$\frac{100}{0}$	R4	40	PLT - D		[Dotted pattern]	[Hatched pattern]
55		▲▲▲▲											
185		▲▲▲▲	[Hatched pattern]				$\frac{100}{0}$	R5 R4	41	PLT - D PLT - A		[Dotted pattern]	[Hatched pattern]
56		▲▲▲▲											
190		▲▲▲▲	[Hatched pattern]				$\frac{102}{0}$	R5 R4	42	PLT - D PLT - A		[Dotted pattern]	[Hatched pattern]
57		▲▲▲▲											
195		▲▲▲▲	[Hatched pattern]									[Dotted pattern]	[Hatched pattern]
58		▲▲▲▲											
		▲▲▲▲	[Hatched pattern]									[Dotted pattern]	[Hatched pattern]
59		▲▲▲▲											

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:08:50 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
60							104 0.4	R4	43	PLT - A PLT - D			
200	61									<p>Borehole completed to 200.0 feet bgs on August 28, 2006. Borehole was flushed for preparation of optical and acoustical televiewer survey and completed with 10 feet of surface casing (3" PVC). Optical and acoustical televiewer survey completed on September 5 and 6, 2006. Borehole completed with two vibrating wire piezometers at 65.0 feet and 197.2 feet bgs on September 24, 2006. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at 96.7 feet bgs during drilling activities.</p> <p>VWP #87453 = 64.2 to 65.7 feet bgs VWP #87178 = 196.5 to 198.0 feet bgs #10-20 silica sand filter pack from 150.0 to 200.0 feet bgs Grout mix from 0.0 to 150.0 feet bgs: 1 94 lb bag Type I-II Portland Cement 5 gallons water 4 lbs pure bentonite powder Well Tag # = AFS 286</p> <p>Borehole logs were prepared under the direction of Wyllie & Norrish Rock Engineers Inc., Project number 062-2002. Original field logs contain detailed source information.</p> <p>Rock strength values provided on the gINT log represent those values obtained by performing field Diametral Point Load Tests (PLT-D) or Axial Point Load Tests (PLT-A) at specific test depths. Only valid failure results (passing through the plane of the platens) are represented on the log.</p>			
205	62												
210	64												
215	65												
220	67												

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:08:50 A1



Job No. 062-2002 SR I-90

Elevation 2714.7 ft (827.4 m)

HOLE No. H-107-06

Sheet 1 of 6

Project Slide Curve Feasibility Investigation

Driller D. Ott / S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 59

Inspector B. Strickler

Start September 21, 2006 Completion September 23, 2006 Well ID# H-107-06 Equipment Skid Mounted Burely 5500-2

Station 1396 + 79 Offset 354.5 Feet Left Casing Stick-up Monument Method HQ Triple-Tube Wireline

Northing 734668.39 Easting 1426444.62 Latitude 47.204081740 N Longitude 121.214712901 W

County Kittitas Subsection SE Quarter Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
1									1		<p>SANDY GRAVEL [GM] sandy GRAVEL and COBBLES, dry, loose [Colluvium and Fill]</p> <p>META-WELDED LAPILLI DACITE TUFF pale to grayish green (10G 6/2 to 4/2) and medium gray (N5) groundmass with slightly grayish olive (10Y 4/2) near discontinuities, multi-color lapilli-sized rock fragments (15 - 25%), fine to medium grained phenocrysts of plagioclase (10 - 25%) and quartz (5 - 12%), fresh (I) with slight weathering (II) adjacent to discontinuities, very strong rock (R5), poorly sorted, altered with secondary mineralization, devitrified glass in groundmass, discontinuities are closely to moderately spaced and in poor to fair condition, 1 - 3 per foot healed discontinuities. [Lake Keechelus member, Ohanapecosh Formation]</p> <p>At 5.0 feet bgs, loose drilling fluid circulation</p> <p>At 8.0 - 8.6 feet bgs, becomes slightly (II) to highly weathered (IV) adjacent to 60 to 70 degree dipping, 0.2 to 0.3 foot thick discontinuity filled with grayish orange (10YR 7/4) and pale yellowish orange (10 YR 8/6) clay with 10 - 20% sand</p> <p>At 9.0 feet bgs, Discontinuities become closely to moderately spaced and in fair to good condition, 0 - 2 per foot healed discontinuities</p>			
5						100 1.6	R5		2	PLT - D				
2							R5			PLT - D				
							R5			PLT - A				
10						100 1.2			3					
4							R5			PLT - D				
15						100 0.4			4					
5							R4			PLT - A				
							R3			PLT - D				
20						100 1.8			6					

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:09:05 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7			[Hatched pattern]					R3		PLT - D	Discontinuities become closely to moderately spaced and in fair to good condition, 1 - 3 per foot healed discontinuities	[Hatched pattern]	[Hatched pattern]
			[Hatched pattern]				$\frac{100}{1.4}$		7 8				
25			[Hatched pattern]								Discontinuities become closely spaced and in poor to fair condition, 1 - 2 per foot healed discontinuities	[Hatched pattern]	[Hatched pattern]
8			[Hatched pattern]				$\frac{96}{2.4}$	R5	9	PLT - D			
30			[Hatched pattern]								Becomes medium gray (N5) to grayish olive (10Y 4/2) with light brown (5YR 5/6) streaks in groundmass, slightly weathered (II), moderately strong (R3) to strong rock (R4), discontinuities become closely spaced and in very poor to fair condition, 10+ per foot healed discontinuities	[Hatched pattern]	[Hatched pattern]
9			[Hatched pattern]				$\frac{100}{1.75}$	R5	10	PLT - D			
35			[Hatched pattern]								At 37.0 - 38.4 feet bgs, becomes moderately (III) to highly (IV) weathered, extremely weak (R0) to very weak (R1) rock, associated with closely spaced 70 degree dipping clay filled discontinuities	[Hatched pattern]	[Hatched pattern]
10			[Hatched pattern]				$\frac{100}{2.2}$	R4	11	PLT - D			
40			[Hatched pattern]								Becomes grayish olive (10Y 4/2) to light brown (5YR 5/6) groundmass, slightly weathered (II) with moderate weathering (III) adjacent to discontinuities, moderately weak (R2) to moderately strong (R3) rock, discontinuities become very closely spaced and in poor to fair condition, 10+ per foot healed discontinuities	[Hatched pattern]	[Hatched pattern]
11			[Hatched pattern]				$\frac{133}{1.0}$	R2	12 13	PLT - D			
45			[Hatched pattern]								Becomes light brown (5YR 5/6) to dark yellowish orange (10YR 6/6) groundmass	[Hatched pattern]	[Hatched pattern]
			[Hatched pattern]				$\frac{100}{1.5}$		14				

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:09:05 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
22									25		fresh (I) with slight weathering (II) adjacent to discontinuities, strong (R4) to very strong (R5) rock, discontinuities become closely spaced and in very poor to fair condition, 1 - 4 per foot healed discontinuities			
						82					At 71.0 - 72.4 feet bgs, becomes slightly (II) to moderately weathered (III) and very weak (R1) to moderately weak rock (R2), 0.2' of core loss at 71.8 to 72.0 feet bgs due to blocking off of bit on run 24 and high water pressures on start of run 25			
						104			26	PLT - D	At 74.0 feet bgs, becomes grayish olive (10Y 4/2) with medium gray (N5) and pale green (10G 6/2) to grayish green (10G 4/2) groundmass, fresh (I) with slight weathering (II) adjacent to discontinuities, strong (R4) to very strong rock (R5), discontinuities are closely spaced and in fair condition			
75								R5						
						100			27		Becomes medium gray (N5) with pale green (10G 6/2) to grayish green (10G 4/2) groundmass, fresh (I) with slight weathering (II) adjacent to discontinuities, strong (R4) to very strong rock (R5), discontinuities become closely to moderately spaced and in fair condition			
						100			28	PLT - D	Becomes medium gray (N5) with pale green (10G 6/2) to grayish green (10G 4/2) groundmass, fresh (I), discontinuities become widely to moderately spaced and in very poor condition			
80								R5						
						100			29	PLT - D				
						100			30		Becomes medium gray (N5) with pale green (10G 6/2) to grayish green (10G 4/2) and zones of grayish olive (10Y 4/2) groundmass, fresh (I) with slight weathering (II) adjacent to discontinuities, strong (R4) to very strong rock (R5), discontinuities become closely to moderately spaced and in fair to good condition, 1 - 4 per foot healed discontinuities			
						100			31	PLT - D				
85								R5						
						96								
						1.8								
90								R4						
95														

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:09:05 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29										Becomes medium gray (N5) with pale green (10G 6/2) to grayish green (10G 4/2) groundmass, fresh (I), discontinuities become moderately spaced and in good condition			
							R5 R4		PLT - D PLT - A				
30													
								102 1.0	32		Becomes medium gray (N5) with pale green (10G 6/2) to grayish green (10G 4/2) and zones of grayish olive (10Y 4/2) groundmass, fresh (I) with slight weathering (II) adjacent to discontinuities, discontinuities become closely to moderately spaced and in good condition, 1 - 3 per foot healed discontinuities		
							R5 R5		PLT - D PLT - A				
31													
								102 0.4	33		Becomes medium gray (N5) with some pale green (10G 6/2) to grayish green (10G 4/2) groundmass, fresh (I), very strong rock (R5), discontinuities become moderately spaced and in good condition		
							R5		PLT - D				
105								100 0	34				
							R5		PLT - D				
33													
								89 1.1	35				
34													
								104 1.4	36		Becomes fresh (I) with slight weathering (II) adjacent to discontinuities with grayish olive (10Y 4/2) discoloration, discontinuities become closely to moderately spaced and in fair to good condition, 0 - 5 per foot healed discontinuities		
							R5		PLT - D				
115													
36													
								120	37		Becomes fresh (I), discontinuities become moderately spaced and in good condition		
								91	38				
120													

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:05:05 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
37							R5	39 40	PLT - D				
125	38									<p>Borehole completed to 124.0 feet bgs on September 23, 2006. Borehole was flushed for preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on September 23 and 24, 2006. Borehole completed with time domain reflectometer cable from the ground surface to 122.0 feet bgs and two vibrating wire piezometers at 68.2 feet and 121.2 feet bgs on September 25, 2006. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at 57.5 feet bgs during drilling activities.</p> <p>TDR Cable installed from ground surface to 122.0 feet bgs VWP #87186 = 67.5 to 69.0 feet bgs VWP #87188 = 120.5 to 122.0 feet bgs #10-20 silica sand filter pack from 110.0 to 124.0 feet bgs Grout mix from 0.0 to 110.0 feet bgs: 1 94 lb bag Type I-II Portland Cement 5 gallons water Well Tag # = AFS 285</p> <p>Borehole logs were prepared under the direction of Wyllie & Norrish Rock Engineers Inc., Project number 062-2002. Original field logs contain detailed source information.</p> <p>Rock strength values provided on the GINT log represent those values obtained by performing field Diametral Point Load Tests (PLT-D) or Axial Point Load Tests (PLT-A) at specific test depths. Only valid failure results (passing through the plane of the platens) are represented on the log.</p>			
130	39												
135	40												
135	41												
140	42												
140	43												
145	44												

ROCK_SLIDE_CURVE_BOREHOLE.GPJ 1/19/07, 11:08:05 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
0														
1						40			1		SANDY GRAVEL [GM] silty and sandy GRAVEL and COBBLES, dry, loose [Colluvium and Fill]			
5						100			2		META-WELDED LAPILLI DACITE TUFF grayish olive green (5GY 3/2) to grayish green (10G 4/2) groundmass, multi-color lapilli-sized rock fragments (15 - 25%), fine to medium grained phenocrysts of plagioclase (10 - 25%) and quartz (5 - 15%), fresh (f) to slightly weathered (ll), very strong rock (R5), poorly sorted, altered with secondary mineralization, devitrified glass in groundmass, discontinuities are moderately spaced and in fair condition. [Lake Keechelus member, Ohanapecosh Formation] At 6.0 feet bgs, becomes pale green (10G 6/2) to medium gray (N5) groundmass, fresh (l), discontinuities become closely to moderately spaced and in good to fair condition			
2						95	R4		3	PLT - D				
10						100	R4		4	PLT - A				
15						100	R4		5	PLT - D				
20						100								

ROCK SLIDE CURVE BOREHOLES.GPJ 1/18/07, 11:09:25 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7		△△△△△	[Hatched pattern]				100 0.2	R4	6	PLT - D			
25		△△△△△	[Hatched pattern]				98 0.8	R4 R4	7	PLT - A PLT - D	Becomes grayish green (10G 4/2) to dusky yellowish green (5GY 5/2) groundmass, discontinuities become moderately to closely spaced and in fair condition, 0 - 1 per foot healed discontinuities		
30		△△△△△	[Hatched pattern]				96 3.0	R4	8	PLT - D	Becomes pale green (10G 6/2) to medium gray (N5) groundmass, slightly weathered (II), strong rock (R4), discontinuities become closely spaced and in very poor to fair condition, 1 - 3 per foot healed discontinuities		
35		△△△△△	[Hatched pattern]				102 1.0		9		Becomes pale green (10G 6/2) to grayish green (10G 4/2) groundmass, fresh (I) to slightly weathered (II), discontinuities become closely spaced and in very poor to fair condition		
40		△△△△△	[Hatched pattern]				92 2.6		10				
43.2 - 43.5		△△△△△	[Hatched pattern]				100 3.3		11		43.2 - 43.5 feet bgs, 0.3 feet of core loss associated with -70 degree dipping closely spaced discontinuities in very poor condition		
45		△△△△△	[Hatched pattern]					R4		PLT - D			

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:08:25 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14		△					$\frac{98}{0.8}$		12				
15		△											
50		△					$\frac{102}{0.6}$		13		Becomes pale green (10G 6/2) and medium gray (N5) groundmass, fresh (I), strong rock (R4), discontinuities become moderately spaced and in fair to good condition		
16		△						R4		PLT - A			
55		△					$\frac{98}{0.8}$	R4	14	PLT - D			
17		△									Discontinuities become closely to moderately spaced and in good condition, 0 - 1 per foot healed discontinuities		
18		△						R4		PLT - A			
60		△					$\frac{100}{1.0}$	R4	15	PLT - D			
19		△											
65		△					$\frac{100}{1.6}$		16			Becomes olive gray (5Y 4/1) to medium gray (N5) groundmass, fresh (I) to slightly weathered (II), discontinuities become closely spaced and in good to fair condition	
20		△						R4		PLT - D			
21		△											
70		△											

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:09:25 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22							100 1.2	R4	17	PLT - D	<p>Becomes greenish gray (5G 6/1) to medium gray (N5) groundmass, fresh (I), discontinuities become closely spaced and in good to fair condition</p>		
75	23						100 1.0	R5	18	PLT - D			
80	24						100 2.2	R2	19	PLT - D	<p>Becomes pale green (10G 6/2) to medium gray (N5) groundmass, moderately weak (R2) to strong rock (R4), discontinuities become closely spaced and in good condition</p>		
85	25						100 1.6	R3	20	PLT - D	<p>Becomes fresh (I) to slightly weathered (II), discontinuities become closely spaced and in poor to fair condition, 1 - 4 per foot healed fractures</p>		
90	27						100 2.2		21				
95	28										<p>Becomes pale green (10G 6/2) to medium gray (N5) groundmass with light brown (5YR 5/6) discoloration adjacent to discontinuities, fresh (I) to slightly weathered (II), strong rock (R4), discontinuities become closely spaced and fair to poor condition, 2 - 8+ per foot healed discontinuities</p>		

ROCK SLIDE CURVE BOREHOLE.GPJ 1/19/07, 11:05:28 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument									
			20	40	60	80																
29							100 4+		22		At 94.7 - 95.4 feet bgs, becomes highly (IV) to completely weathered (V), extremely weak rock (R0) At 95.4 feet bgs, becomes moderately (III) to completely weathered (V), extremely weak (R0) to very weak (R1) with zones of strong (R4) rock, discontinuities become closely spaced and in very poor condition, >8 per foot healed discontinuities											
30																						
100																						
31																						
105																						
32							100 0.8	R3 R4	24	PLT - A PLT - D	Becomes pale green (10G 6/2) to medium gray (N5) groundmass, fresh (I), moderately strong (R3) to strong rock (R4), discontinuities become closely to moderately spaced and in poor to good condition											
33																						
110																						
34							100 1.4	R2	25	PLT - D												
35																						
115							100 0.8	R3	26	PLT - D	Becomes strong rock (R4), discontinuities become closely to moderately spaced and in poor condition, 1 - 5 per foot healed discontinuities											
36																						
120								R4		PLT - D												

ROCK_SLIDE_CURVE_BOREHOLES.GPJ 1/19/07, 11:09:26 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
37								27					
125	38							28					
130	39						R1 R4	29	PLT - D PLT - D	Discontinuities become closely to moderately spaced and in good to poor condition, 1 - 5 per foot healed discontinuities			
135	40							30	PLT - D	Becomes very strong rock (R5), discontinuities become closely to moderately spaced and in good to fair condition			
140	41							31	PLT - D				
143	42												
144	43												
145	44						R4		PLT - D				

ROCK SLIDE CURVE BOREHOLE.GPJ 1/18/07 11:09:26 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
45							100 0.8	R5	32	PLT - D			
46							100 0.8		33		Discontinuities become closely to moderately spaced and in fair to good condition, 1 - 6 per foot healed discontinuities		
47							100 1.0		34				
48								R5		PLT - D			
49											Borehole completed to 159.7 feet bgs on September 8, 2006. Borehole was flushed for preparation of optical and acoustical televiwer survey and 10 feet of surface casing is installed (3" PVC). Optical and acoustical televiwer survey completed on September 20 and 21, 2006. Borehole completed with time domain reflectometer cable from the ground surface to 158.0 feet bgs and two vibrating wire piezometers at 95.5 feet and 157.1 feet bgs on September 29, 2006. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at 78 feet bgs during drilling activities and at 80.2 feet on September 20, 2006 prior to beginning optical borehole survey.		
50											TDR Cable installed from ground surface to 158.0 feet bgs VWP #87180 = 94.8 to 96.3 feet bgs VWP #87185 = 156.3 to 157.8 feet bgs #10-20 silica sand filter pack from 130.0 to 159.7 feet bgs Grout mix from 0.0 to 130.0 feet bgs: 1 94 lb bag Type I-II Portland Cement 5 gallons water Well Tag # = AFS 288		
51													
170											Borehole logs were prepared under the direction of		

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:08:26 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
52										<p>Wyllie & Norrish Rock Engineers Inc., Project number 062-2002. Original field logs contain detailed source information.</p> <p>Rock strength values provided on the gINT log represent those values obtained by performing field Diametral Point Load Tests (PLT-D) or Axial Point Load Tests (PLT-A) at specific test depths. Only valid failure results (passing through the plane of the platens) are represented on the log.</p>			
53													
175													
54													
180													
55													
56													
185													
57													
190													
58													
59													
195													

ROCK SLIDE CURVE BOREHOLES.GPJ 1/18/07, 11:09:26 A1



Job No. 062-2002 SR I-90

Elevation 2779.3 ft (847.1 m)

HOLE No. H-109-06

Sheet 1 of 10

Project Slide Curve Feasibility Investigation

Driller L. Murphy / S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 59

Inspector B. Strickler

Start August 15, 2006 Completion August 23, 2006 Well ID# Not Applicable

Equipment Skid Mounted Burely 4500-1

Station 1406 + 81 Offset 324.2 Feet Left Casing No Installation

Method HQ Triple-Tube Wireline

Northing 733934.63 Easting 1426647.11 Latitude 47.203359780 N

Longitude 121.214407232 W

County Kittitas Subsection SE Quarter

Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
0	0										<p>TOPSOIL 0.0 to 0.75 feet of pedogenic soil with organics [Topsoil]</p> <p>0.1 to 0.2 foot thick ash layer</p> <p>SILTY GRAVEL [GM] fine to coarse gravel and small cobble clasts with 10-20%, medium bluish gray (5B 5/1) to dark gray (N3) and moderate yellowish brown (10YR 5/4) silt and sand infilling, clasts are aphenitic with phenocrysts, slightly weathered (II) and medium strong rock (R3). [Colluvium or broken up Andesitic Dike]</p>			
1	0.3					103 2.3			1					
5	1.5						R2			PLT - D	<p>META-WELDED LAPILLI DACITE TUFF Right olive (10Y 5/4) to grayish olive (10Y 4/2) with dark yellow orange clasts (10YR 6/6) groundmass, multi-color lapilli-sized and <5% fine bomb-sized rock fragments (15 - 25%), fine to medium grained phenocrysts of plagioclase (10 - 25%) and quartz (5 - 15%), slightly weathered (II), strong rock (R4), poorly sorted, altered with secondary mineralization, devitrified glass in groundmass, discontinuities are closely spaced and generally in fair to good condition. [Lake Keechelus member, Ohanapecosh Formation]</p>			
2	1.8					100 1.2			2					
10	3.0										<p>90 - 100% drilling fluid circulation, light gray (N7) Grading to greenish gray (5G 6/1) groundmass, fresh (I) to slightly weathered (II), strong (R4) to very strong rock (R5), discontinuities become closely to moderately spaced and in good to excellent condition</p>			
3	3.3					100 0.6			3					
4	3.6						R4			PLT - D	<p>Becomes fresh (I) with slight weathering (II) adjacent to discontinuities, discontinuities become moderately spaced and in excellent condition with one discontinuity at 15.4 feet bgs in poor to fair condition</p>			
15	4.5													
5	4.8					100 0.8			4					
6	5.1						R4			PLT - D	<p>Grading to dusky yellowish green (10GY 3/2) to light olive (10Y 5/4) groundmass, fresh (I) to slightly weathered (II), discontinuities become closely to moderately spaced and in good condition</p>			
20	6.1													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7		△-△	[Hatched pattern]				$\frac{102}{0.4}$		5		Grading to slightly weathered (II) adjacent to discontinuities, discontinuities become moderately spaced and in good to excellent condition	▽	
25		△-△											
8		△-△	[Hatched pattern]				$\frac{94}{0.8}$	R4	6	PLT - A	Discontinuities become closely to moderately spaced and in good to excellent condition		
30		△-△											
9		△-△	[Hatched pattern]				$\frac{103}{0.5}$	R4	7	PLT - D	At 29.5 to 30.3 feet bgs, slightly weathered (II) adjacent to discontinuity, discontinuity at 29.9 feet bgs is wide with approximately 0.1 foot of core loss, drilling fluid circulation fluids changed color to light brown (5YR 5/6) until approximately 35 feet bgs.		
10		△-△											
11		△-△	[Hatched pattern]				$\frac{105}{0}$	R4	8	PLT - D	Becomes pale green (10G 6/2) to grayish green (10G 4/2) groundmass, fresh (I) with slight weathering (II) adjacent to discontinuities, discontinuities become very widely spaced and in good condition		
35		△-△											
12		△-△	[Hatched pattern]				$\frac{105}{0}$	R4	9	PLT - D	Becomes pale green (10G 6/2) to grayish green (10G 4/2) groundmass, fresh (I) with slight weathering (II) adjacent to discontinuities, discontinuities become very widely spaced and in good condition		
40		△-△											
13		△-△	[Hatched pattern]				$\frac{94}{0.3}$	R4	10	PLT - D	Becomes pale green (10G 6/2) to grayish green (10G 4/2) groundmass, fresh (I) with slight weathering (II) adjacent to discontinuities, discontinuities become very widely spaced and in good condition		
45		△-△											
		△-△	[Hatched pattern]				$\frac{102}{0}$	R4	11	PLT - D			
		△-△											

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:05:39 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14			[Hatched pattern]				$\frac{102}{0}$	R4	12	PLT - D			
15													
50			[Hatched pattern]				$\frac{102}{0.2}$	R3 R4	13	PLT - A PLT - D			
16													
55			[Hatched pattern]				$\frac{103}{0}$	R4	14	PLT - D	Healed discontinuity		
17													
60			[Hatched pattern]				$\frac{100}{0.4}$	R4	15	PLT - D			
18													
65			[Hatched pattern]				$\frac{96}{0.2}$	R4	16	PLT - D	Becomes pale green (10G 6/2) to grayish green (10G 4/2) with medium gray (N5) and slightly light olive (10Y 5/4) groundmass adjacent to discontinuities, fresh (I) to slightly weathered (II) adjacent to discontinuities, discontinuities become moderately spaced and in good to excellent condition		
19													
70			[Hatched pattern]					R4		PLT - D	At 67.6 to 67.7 feet bgs, discontinuity dipping at 45 degrees, filled with clay and silty sand		
21													

ROCK SLIDE CURVE BOREHOLES.GPJ 1/18/07, 11:08:39 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument		
			20	40	60	80									
22		△△△					$\frac{100}{0}$		17						
75		△△△													
23		△△△													
24		△△△									$\frac{104}{0}$	R4	18	PLT - D	
80		△△△										R4		PLT - D	
25		△△△									$\frac{100}{98}$		20 21		Bit blocks off at 81.7 feet bgs, at top of next run is partial coated with white (N9) clay
85		△△△										R4 R4		PLT - D PLT - A	
26		△△△									$\frac{100}{0}$		22		
27		△△△													
90		△△△													
28		△△△									$\frac{100}{0}$	R4	23	PLT - D	
95		△△△													

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07,11:09:39 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument											
			20	40	60	80																		
29							$\frac{100}{0.2}$	R4	24	PLT - D	Discontinuities become very widely spaced and in good to fair condition, <1 per foot healed discontinuities													
30																								
31																								
32																								
33																								
34																								
35																								
36																								
100																			R4	25	PLT - D	At 99.3 to 101.4 feet bgs, becomes fresh (I) to slightly weathered (II) associated with discontinuity at 100.2 feet bgs		
105																			$\frac{103}{0.2}$	R4	26	PLT - D		
110							$\frac{98}{0}$	R4	27	PLT - D														
115							$\frac{98}{0}$	R5	28	PLT - D	At 113.0 feet bgs, steeply dipping healed discontinuity													

ROCK_SLIDE CURVE BOREHOLES.GPJ 1/18/07,11:09:39 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% R _{eq} FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
37							R4 R4	29	PLT - D PLT - A	At 122.0 feet bgs, becomes pale green (10G 6/2) to medium light gray (N6) groundmass			
125							R4	30	PLT - D	META-WELDED LAPILLI DACITE TUFF dark yellowish orange (10YR 6/6) to moderate yellowish brown (10YR 5/4) groundmass, multi-color lapilli-sized rock fragments (15 - 30%), fine to medium grained phenocrysts of plagioclase (10 - 25%) and quartz (5 - 15%), slightly weathered (II) with heavy discoloration, very weak (R1) to moderately weak rock (R2), poorly sorted, altered with secondary mineralization, devitrified glass in groundmass, discontinuities are closely spaced and in fair to good condition. [Lake Keechelus member, Ohanapecosh Formation]			
130							R1		PLT - D				
40								31		Becomes medium gray (N5) groundmass, fresh (I) with slight weathering (II) adjacent to discontinuities, moderately weak (R2), discontinuities become closely to moderately spaced and in good condition			
41													
135													
42								32	PLT - D	Becomes light brown (5YR 5/6) and dark yellowish orange (10YR 6/6) with zones of medium gray (N5) groundmass, slightly weathered (II) to fresh (I) rock, moderately weak rock (R2) with zones of strong (R4) rock, discontinuities become closely spaced and in fair to good condition			
140									PLT - D				
43								33	PLT - D				
145													

ROCK_SLIDE_CURVE_BOREHOLES.GPJ 1/19/07, 11:09:39 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
45			[Hatched pattern]				102 / 0.6	R3 R4 R4		34	PLT - D PLT - D PLT - A	Becomes light brown (5YR 5/6) and moderate olive brown (5Y 4/4) with zones of pale green (10G 6/20 to grayish green (10G 4/2) groundmass, intermixed zones of fresh (I) and slightly weathered (II) rock, moderately strong rock (R3), discontinuities become moderately spaced and in good condition		
150			[Hatched pattern]				102 / 1.4	R4		35	PLT - D	At 152.5 to 157.5 feet bgs, discontinuities become closely spaced and fair to good condition		
155			[Hatched pattern]				102 / 0.4	R4		36	PLT - D	META-WELDED LAPILLI DACITE TUFF grayish olive (10Y 4/2) with light brown (5YR 5/6) and zones of grayish green (10G 4/2) groundmass, multi-color lapilli-sized rock fragments (15 - 30%), fine to medium grained phenocrysts of plagioclase (15 - 25%) and quartz (5 - 15%), slightly weathered (II), strong (R4) to very strong rock (R5), poorly sorted, altered with secondary mineralization, devitrified glass in groundmass, discontinuities are widely spaced and in good to excellent condition. [Lake Keechelus member, Ohanapecosh Formation]		
160			[Hatched pattern]				100 / 0.4	R4 R5		37	PLT - A PLT - D			
165			[Hatched pattern]				96 / 0.2			38		Becomes grayish olive (10Y 4/2) with pale green (10G 6/2) to grayish green (10G 4/2) and <7% light brown (5YR 5/6) discoloration of groundmass, fresh (I) with zones of slight weathering (II), strong (R4) to very strong rock (R5), discontinuities become widely spaced and in good to excellent condition, <1 per foot healed discontinuities		
170			[Hatched pattern]											

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07,11:09:40 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
60			[Hatched pattern]				$\frac{102}{0}$	R4 R4		45	PLT - D PLT - A			
61														
62			[Hatched pattern]				$\frac{100}{0.4}$			46				
63														
205			[Hatched pattern]				$\frac{102}{0}$	R4		47	PLT - D			
64														
210			[Hatched pattern]				$\frac{98}{0.8}$			48	Discontinuities become moderately spaced and in fair to good condition, with 1-2 per foot healed discontinuities and slight weathering (II) around discontinuity at 214.7 feet bgs			
65														
215			[Hatched pattern]				$\frac{100}{0}$	R5		49	Discontinuities become widely spaced and in excellent condition, <1 per 2 feet healed discontinuities			
66														
220			[Hatched pattern]											
67														

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:09:40 A-1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
68		△△△△△	[Hatched Area]				100/0	R4	50	PLT - D				
		△△△△△						R4		PLT - A				
225		△△△△△	[Hatched Area]				102/0.4	R4	51	PLT - A				
		△△△△△						R5		PLT - D				
69		△△△△△	[Hatched Area]				100/0.8	R5	52	PLT - D	Discontinuities become moderately spaced and in good to excellent condition, <1 per foot healed discontinuity			
		△△△△△						R4		PLT - D				
230		△△△△△	[Hatched Area]					R4		PLT - A				
		△△△△△						R5		PLT - D				
71		△△△△△	[Hatched Area]								Borehole completed to 235.0 feet bgs on August 23, 2006. Borehole was flushed and completed with 10 feet of surface casing (3" PVC) for preparation of optical and acoustical televiwer survey. Optical and acoustical televiwer survey completed on August 31, 2006 and September 5, 2006. Borehole backfilled with bentonite chips on September 24, 2006. Groundwater was measured at 24 feet during drilling activities and at 121.8 feet on August 31, 2006 prior to begining optical borehole survey.			
		△△△△△												
235		△△△△△	[Hatched Area]								Borehole logs were prepared under the direction of Wyllie & Norrish Rock Engineers Inc., Project number 062-2002. Original field logs contain detailed source information.			
		△△△△△												
72		△△△△△	[Hatched Area]								Rock strength values provided on the gINT log represent those values obtained by performing field Diametral Point Load Tests (PLT-D) or Axial Point Load Tests (PLT-A) at specific test depths. Only valid failure results (passing through the plane of the platens) are represented on the log.			
		△△△△△												
240		△△△△△	[Hatched Area]											
		△△△△△												
74		△△△△△	[Hatched Area]											
		△△△△△												
245		△△△△△	[Hatched Area]											
		△△△△△												

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07,11:08:40 A1



Job No. 062-2002

SR I-90

Elevation 2697.6 ft (822.2 m)

HOLE No. H-110-06

Sheet 1 of 7

Project Slide Curve Feasibility Investigation

Driller D. Ott / S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 59

Inspector B. Strickler

Start September 26, 2006 Completion September 28, 2006 Well ID# H-110-06

Equipment Skid Mounted Burely 5500-2

Station 1394 + 30

Offset 286.7 Feet Left

Casing Stick-up Monument

Method HQ Triple-Tube Wireline

Northing 734883.71

Easting 1426397.7

Latitude 47.204293734 N

Longitude 121.214784456 W

County Kittitas

Subsection SE Quarter

Section 35

Range 11E

Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
0 - 1	0 - 0.3						41 N/A			1	SILTY SAND AND GRAVEL [SMGM] , silty fine to coarse SAND and GRAVEL to COBBLE, angular to sub angular, loose, moderate yellowish brown (10YR 5/4), moist [Mixed Colluvium and Fill]			
1 - 5	0.3 - 1.5						96 0.8			2	META-WELDED LAPILLI DACITE TUFF Right brown (5YR 5/6) to dark yellowish orange (10YR 6/6) with medium gray (N5) to medium light gray (N6) groundmass, multi-color lapilli-sized rock fragments (15 - 25%), fine to medium grained phenocrysts of plagioclase (10 - 25%) and quartz (5 - 15%), fresh (I) to slightly weathered (II), strong (R4) to very strong rock (R5), poorly sorted, altered with secondary mineralization, devitrified glass in groundmass, discontinuities are closely to moderately spaced and in very poor to fair condition. [Lake Keechelus member, Ohanapecoh Formation]			
5 - 10	1.5 - 3.0						100 1.6			3	Circulation is maintained at 0 to 20% and is light gray (N7) At 9.0 feet bgs, becomes moderate olive brown (5Y 4/4) to medium gray (N5) with light brown (5YR 5/6) and dark yellowish orange (10YR 6/6) groundmass			
10 - 15	3.0 - 4.5						100 0.2	R5		4	PLT - D PLT - D PLT - A Becomes medium gray (N5) with slight grayish green (10G 4/2) groundmass, fresh (I) with slight weathering (II) adjacent to discontinuities, discontinuities become moderately spaced and in good to excellent condition			
15 - 20	4.5 - 6.0						100	R5 R4		5	Becomes moderate olive brown (5Y 4/4) with medium gray (N5) and light brown (5YR 5/6) groundmass,			



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
										fresh (I) to slightly weathered (II) with slight (II) to moderate weathering (III) between 21.4 and 22.8 feet bgs, discontinuities become closely to moderately spaced and in poor to good condition.			
7								6	PLT - D	Loose circulation			
25								7		Becomes medium gray (N5) with slight grayish olive (10Y 4/2) groundmass, fresh (I) with slight weathering (II) adjacent to discontinuities, discontinuities become moderately to closely spaced and in good condition			
8									PLT - D				
30								8		Becomes moderate olive brown (5Y 4/4) and pale green (10G 6/2) to grayish green (10G 4/2) with medium light gray (N4) groundmass			
9									PLT - D				
35								9		1-3 per foot healed discontinuities			
10													
35								10		Becomes moderate olive brown (5Y 4/4) to grayish olive (10Y 4/2) groundmass, slightly weathered (II) with zone of slightly (II) to highly weathered (IV) from 38.8 to 40.2 feet bgs, discontinuities become closely spaced and in very poor to fair condition, up to 10 per foot healed discontinuities to 41.5 feet			
11													
40								11		At 39.2 - 39.6 feet bgs, 0.4 feet of core loss in moderate (III) to highly weathered (IV) zone, approximately 0.6 feet of broken up clasts from 39.6 to 40.2 feet bgs feet likely caused by drilling action			
12													
45								12	PLT - A	Becomes medium light gray (N6) groundmass, fresh (I) with slight weathering (II) adjacent to discontinuities, discontinuities become moderately spaced and in fair to good condition, up to 4 per foot healed discontinuities			

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:09:54 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14		△△	[Hatched]					R5		PLT - D			
15		△△	[Hatched]				$\frac{100}{0.2}$		13		Becomes medium gray (N5) groundmass, fresh (I), discontinuities become widely spaced and in good condition, 1 to 3 per foot healed discontinuities		
16		△△	[Hatched]										
55		△△	[Hatched]				$\frac{97}{0}$		14		Becomes medium gray (N5) to pale green (10G 6/2) to grayish green (10G 4/2) groundmass		
17		△△	[Hatched]					R5		PLT - D			
18		△△	[Hatched]				$\frac{100}{0}$		15				
60		△△	[Hatched]				$\frac{100}{0.2}$		16				
19		△△	[Hatched]										
65		△△	[Hatched]				$\frac{100}{0}$		17		PLT - D		
20		△△	[Hatched]					R4					
21		△△	[Hatched]										
70		△△	[Hatched]				$\frac{96}{1.6}$		18				

ROCK_SLIDE_CURVE_BOREHOLES.GPJ 1/19/07,11:09:54 A:1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Reg. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22										Becomes moderate olive brown (5Y 4/4) with light brown (5YR 5/6) interbedded with medium gray (N5) with pale green (10G 6/2) and grayish green (10G 4/2) groundmass, fresh (I) with slight weathering (II) adjacent to discontinuities, discontinuities become closely spaced and in poor to good condition			
75								104 1.0	19				
23							R4		PLT - A	Becomes medium gray (N5) with pale green (10G 6/2) to grayish green (10G 4/2) groundmass, fresh (I), discontinuities become widely spaced and in good condition, 1 to 2 per foot healed discontinuities			
24							R4		PLT - D				
80								104 0.3	20				
25							R4		PLT - A				
26								90 0	21				
85							R5		PLT - D	Becomes pale green (10G 6/2) to grayish green (10G 4/2) with occasional medium gray (N5) groundmass, fresh (I), rock fragments increase to occasional bomb-sized (1 - 10%, increasing downward), discontinuities become widely spaced and in good condition, 1 to 2 per foot healed discontinuities			
27							R4		PLT - A				
90								100 0.4	23				
28							R5		PLT - D				
95								100 0.2	24				

ROCK SLIDE CURVE BOREHOLES.GPJ 1/19/07,11:09:54 A.1

At 94.6 - 95.1 feet bgs, 6 - 8 healed discontinuities.



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29										calcite filled with spotty iron staining as light brown (5YR 5/6)			
30													
100													
31													
105													
32													
33													
110													
34													
115													
35													
36													
120													

ROCK SLIDE CURVE BOREHOLES GPJ 1/19/07, 11:08:54 A1

At 102.0 feet bgs, slightly weathered (II) adjacent to discontinuity

Becomes pale green (10G 6/2) to grayish green (10G 4/2) with occasional medium gray (N5) and zones of moderate olive brown (5Y 4/4) groundmass, fresh (I) with slight weathering (II) adjacent to discontinuities, discontinuities become closely to moderately spaced and in fair to good condition, 1 to 5 per foot healed



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
37													
125	38						R4	33	PLT - A PLT - D	Becomes pale green (10G 6/2) to grayish green (10G 4/2) with occasional medium gray (N5) groundmass, fresh (I), discontinuities become widely spaced and in good condition, 1 to 2 per foot healed discontinuities			
						100 0.6							
130	39						R5	34	PLT - D	META-WELDED LAPILLI DACITE TUFF Right gray (N7) to yellowish gray (5Y 8/1) groundmass, multi-color lapilli-sized rock fragments (15 - 25%), fine to medium grained phenocrysts of plagioclase (10 - 25%) and quartz (5 - 10%), fresh (I) to slightly weathered (II) adjacent to discontinuities, strong rock (R4), gradational upper contact, poorly sorted, altered with secondary mineralization, devitrified glass in groundmass discontinuities are closely to moderately spaced and in fair condition, 1 - 4 per foot healed discontinuities. [Lake Keechelus member, Ohanapecosh Formation]			
						98 0.6							
135	40						R4	35	PLT - D	At 132.4 feet bgs, 0.2' thick discontinuity, light brown (5YR 5/6), highly (IV) to completely weathered (V), extremely weak rock (R0)			
						102 0.4							
140	41						R5	36	PLT - D	Discontinuities become widely to very widely spaced, 0 - 3 per foot healed discontinuities			
						102 0							
145	42						R4	37	PLT - D				
						100 0							

ROCK SLIDE CURVE BOREHOLES.GPJ 1/18/07, 11:09:54 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
45							R4		PLT - D				
150										<p>Borehole completed to 149.2 feet bgs on September 28, 2006. Borehole was flushed for preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on September 29, 2006. Borehole completed with time domain reflectometer cable from the ground surface to 148.0 feet bgs and two vibrating wire piezometers at 72.2 feet and 147.2 feet bgs on September 29, 2006. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at 67.7 feet bgs during drilling activities.</p> <p>TDR Cable installed from ground surface to 148.0 feet bgs VWP #87189 = 71.5 to 73.0 feet bgs VWP #87177 = 146.5 to 148.0 feet bgs #10-20 silica sand filter pack from 129.0 to 149.2 feet bgs Grout mix from 0.0 to 129.0 feet bgs: 1 94 lb bag Type I-II Portland Cement 5 gallons water Well Tag # = AFS 289</p> <p>Borehole logs were prepared under the direction of Wyllie & Norrish Rock Engineers Inc., Project number 062-2002. Original field logs contain detailed source information.</p> <p>Rock strength values provided on the gINT log represent those values obtained by performing field Diametral Point Load Tests (PLT-D) or Axial Point Load Tests (PLT-A) at specific test depths. Only valid failure results (passing through the plane of the platens) are represented on the log.</p>			
155													
160													
165													
170													

R0CK SLIDE CURVE BOREHOLES.GPJ 1/19/07, 11:05:54 A1



LOG OF TEST BORING

Start Card S 28652

Job No. 062-2002

SR 90

Elevation 2641.9 ft (805.3 m)

HOLE No. H-202-06

Sheet 1 of 6

Project Jenkins Knob Design Investigation

Driller L. Murphy / S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 57.6

Inspector B. Hamilton

Start September 22, 2006 Completion September 25, 2006 Well ID# Not Applicable

Equipment Skid-Mounted Burley 4500-1

Station 1333 + 35 Offset 155.8 Feet Left Casing None

Method HQ Triple Tube Wireline

Northing 740572.89 Easting 1424391.09 Latitude 47.213886598 N

Longitude 121.221789375 W

County Kittitas Subsection SE Quarter

Section 26 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
1											Borehole collared as an angle boring at an azimuth of 058 degrees (True North) at 80 degree dip from horizontal			
5									1		TOPSOIL, fine sandy SILT with organics, light olive gray (5Y 6/1), dry, homogeneous			
2									2		SANDY GRAVEL AND COBBLES [GM] fine sandy and silty, fine to coarse GRAVEL and COBBLES, olive gray (5Y 4/1) to light brownish gray (5 YR 6/1), multiple rock types observed, angular. [Glacial Till and Colluvium]			
10									3					
4									4	PLT - D	META WELDED LAPILLI DACITE TUFF medium dark gray (N4) groundmass, multi-color lapilli-sized rock fragments (15 - 25%), fine to medium grained phenocrysts of plagioclase (10 - 25%) and quartz (5 - 12%), fresh (I) with slight (II) to moderate weathering (III) adjacent to discontinuities, strong (R4) to very strong rock (R5), poorly sorted, altered with secondary mineralization, devitrified glass in groundmass, discontinuities are closely to moderately spaced in fair to very poor condition. [Lake Keechelus member, Ohanapecosh Formation]			
15									5	PLT - D	Becomes fresh (I), discontinuities become moderately to closely spaced and in fair condition			
20									6	PLT - D				



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7		△△△△△	[Hatched Rock Quality Designation Area]				$\frac{104}{1.2}$	R4	6	PLT - D	Discontinuities become closely to moderately spaced and in poor to fair condition		
25		△△△△△					$\frac{100}{1.1}$		R5			7	PLT - A
8		△△△△△						R5	7	PLT - D			
9		△△△△△											
30		△△△△△											
10		△△△△△					$\frac{98}{1.3}$		8				
35		△△△△△											
11		△△△△△						R5	9	PLT - O			
40		△△△△△					$\frac{100}{1.8}$						
12		△△△△△											
45		△△△△△	$\frac{98}{1.8}$	R5	10	PLT - D							

ROCK_JENKINS_KNOB_BOREHOLES.GPJ 1/19/07,11:04:50 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Reg. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14		△△△	[Hatched pattern]					R4		PLT - D			
		△△△	[Hatched pattern]				$\frac{90}{2.0}$		11		Becomes dusky yellowish green (10GY 3/2) groundmass, discontinuities become closely to moderately spaced and in fair to poor condition		
15		△△△	[Hatched pattern]										
50		△△△	[Hatched pattern]										
16		△△△	[Hatched pattern]				$\frac{108}{2.4}$		12				
		△△△	[Hatched pattern]					R5		PLT - D	Becomes dark gray (N3) groundmass, discontinuities become closely to moderately spaced and in good to fair condition		
55		△△△	[Hatched pattern]				$\frac{108}{2.4}$		13				
17		△△△	[Hatched pattern]										
		△△△	[Hatched pattern]					R5		PLT - D			
18		△△△	[Hatched pattern]				$\frac{104}{0}$		14		No discontinuities observed from 58 to 65 feet		
60		△△△	[Hatched pattern]										
		△△△	[Hatched pattern]					R4		PLT - A			
19		△△△	[Hatched pattern]				$\frac{150}{0.8}$	R5	15				
		△△△	[Hatched pattern]						16				
65		△△△	[Hatched pattern]										
20		△△△	[Hatched pattern]								Discontinuities become closely to moderately spaced and in good to very poor condition		
		△△△	[Hatched pattern]				$\frac{96}{0.6}$		17				
21		△△△	[Hatched pattern]										
70		△△△	[Hatched pattern]										

ROCK_JENKINS-KNOB BOREHOLES.GPJ 1/19/07 11:04:50 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29		▲▲▲▲▲	[Hatched Rock Quality Designation Area]				$\frac{102}{0.2}$	R4	23	PLT - D	Becomes dark gray (N3) to greenish black (5GY 2/1) groundmass, discontinuities become widely spaced and in good condition, 0 - 2 per foot healed discontinuities		
30		▲▲▲▲▲											
100		▲▲▲▲▲											
31		▲▲▲▲▲											
32		▲▲▲▲▲											
105		▲▲▲▲▲											
33		▲▲▲▲▲											
110		▲▲▲▲▲											
34		▲▲▲▲▲											
115		▲▲▲▲▲											
35		▲▲▲▲▲											
36		▲▲▲▲▲											
120		▲▲▲▲▲											

ROCK JENKINS KNOB BOREHOLE.S GP.J 1/19/07, 11:04:50 A1



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0								1		<p>TOPSOIL, Surface conditions are low vegetation with roots and pedogenic soils</p> <p>1 to 3" thick very light gray (N8) ash deposit</p> <p>SANDY GRAVEL [GP] recovered material is fine gravel to coarse cobble with all sand or finer grain sized material washed out. Clasts are of various rock types. [Colluvium and Glacial Till]</p> <p>Full circulation maintained with recirculating fluids a light olive gray color</p>			
1								2					
5								3		<p>META WELDED LAPILLI DACITE TUFF medium dark gray (N4) groundmass, multi-color lapilli-sized rock fragments (10 - 20%), fine to medium grained phenocrysts of plagioclase (20 - 25%) and quartz (3 - 7%), fresh (I) with slight weathering (II) adjacent to discontinuities, moderate strong (R3) to very strong rock (R5), poorly sorted, altered with secondary mineralization, devitrified glass in groundmass, discontinuities are closely to moderately spaced in fair to good condition. [Lake Keechelus member, Ohanapocosh Formation]</p>			
2								4	PLT - D				
10								5		90 - 100% drilling fluid circulation, light olive gray (5Y 5/2)			
3								6	PLT - D	Grading to grayish olive (10Y 4/2) groundmass			
4										At 13.8 - 15.0 feet bgs, 4 discontinuities up to 0.2' thick with silty sand to clay infilling with occasional gravel clasts.			
15										Discontinuities become very widely spaced in good to excellent condition			
5													
20										Grading to medium dark gray (N4) groundmass			
6													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29							103 0.5		26				
30													
100													
31													
105													
32													
33													
110													
34													
35													
36													
120													

Borehole completed borehole to 100.0 feet bgs on September 6, 2006. Borehole was flushed and completed with 10 feet of surface casing (3" PVC) for preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on September 25, 2006. Borehole completed with two vibrating wire piezometers at 55.0 feet and 97.2 feet bgs on September 27, 2006. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at 5.2 to 9.6 feet bgs during drilling activities and at 91.5 feet on September 25, 2006 prior to beginning optical borehole survey.

VWP #87194 = 54.2 to 55.7 feet bgs
 VWP #87452 = 96.5 to 98.0 feet bgs
 #10-20 silica sand filter pack from 85.0 to 100.0 feet bgs
 Grout mix from 0.0 to 85.0 feet bgs:
 1 94 lb bag Type I-II Portland Cement
 15 gallons water
 4 lbs pure bentonite powder
 Well Tag # = AFS 293

Borehole logs were prepared under the direction of Wylie & Norrish Rock Engineers Inc., Project number 062-2002. Original field logs contain detailed source information.

Rock strength values provided on the gINT log represent those values obtained by performing field Diametral Point Load Tests (PLT-D) or Axial Point Load Tests (PLT-A) at specific test depths. Only valid failure results (passing through the plane of the platens) are represented on the log.

ROCK_JENKINS_KNOB_BOREHOLES.GPJ 1/19/07, 11:04:59 A 1



Job No. 103-WA SR 90 Elevation 2639.5 ft (804.5 m)

HOLE No. MRE-03-08

Sheet 1 of 5

Project Interstate 90 Hyak Re-Alignment - 2008 Geotechnical Investigation

Driller M. Starling/S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector R. Beyer

Start October 9, 2008 Completion October 11, 2008 Well ID# MRE-03-08 Equipment Burley 4500

Station 1334+89 Offset -100 Left Casing Stick-up Monument Method HQ3 Triple Tube Wireline

Northing 740503.69 Easting 1424476.34 Latitude 47°21'38.192"N Longitude 121°22'16.644"W

County Kittitas Subsection SW Quarter Section 26 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
								1		The borehole collar elevation is approximately 0.7 feet below the existing ground surface due to rig platform preparation. There was approximately 1 foot of topsoil encountered.			
1								2		SILTY SAND WITH GRAVEL [SM/GM] , angular to rounded, loose to medium dense, medium bluish gray (5B 5/1), dry to moist, occasional cobbles and boulders from various geologic origin. [Colluvium]			
5								3		META WELDED LAPILLI TUFF , pale olive (10Y 6/2) to olive gray (5Y 5/2), massive aphanitic groundmass with fine to medium phenocrysts (5-15%), lapilli sized rock fragments (10-20%), lapilli sized pumice fragments (5-10%), slightly weathered (II), moderately strong (R3). Discontinuities are closely to moderately spaced and in fair condition. [Ohanapecosh Formation]			
10								4	PLT-D	At 10.0 feet, core becomes fresh (I) to slightly weathered (II) and moderately strong (R3) to strong (R4).			
15								5	PLT-D	At 15.0 feet, core becomes greenish gray (5G 6/1), fresh (I) and very strong (R5).			
16.8										At 16.8 feet, core becomes slightly weathered (II), moderately strong (R3) to strong (R4) and discontinuities become closely spaced and in fair to poor condition.			
18.6										At 18.6 feet, core becomes fresh (I), very strong (R5), and discontinuities become moderately to widely spaced.			



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								6		<p>META WELDED LAPILLI TUFF, greenish gray (5G 6/1), massive aphanitic groundmass with fine to medium phenocrysts(10-15%), lapilli sized rock fragments (10-15%), lapilli sized pumice fragments (10-15%), fresh (I), very strong (R5). Discontinuities are moderately spaced and in fair condition. [Ohanapecoh Formation]</p> <p>At 23.5 feet, observed broken rock zone. Core becomes fresh (I) to slightly weathered (II) and moderately strong (R3).</p>			
25	8							7		<p>At 25.0 feet, core becomes fresh (I), very strong (R5), and discontinuities become moderately spaced and in fair to good condition.</p>			
30	9							8		<p>At 30.0 feet, core becomes medium gray (N5) to greenish gray (5G 6/1).</p>			
10							R5		PLT-D	<p>At 32.2 feet, discontinuities become moderately to widely spaced and in fair condition.</p>			
35	11							9					
40	12							10					
13							R5		PLT-D				
45								11					



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14								12		<p>META WELDED LAPILLI TUFF, greenish gray (5G 6/1), massive aphanitic groundmass with fine to medium phenocrysts (10-15%), lapilli sized rock fragments (10-15%), lapilli sized pumice fragments (10-15%), fresh (I), very strong (R5). Discontinuities are widely spaced and in good condition. [Ohanapecosh Formation]</p>			
15							R5		PLT-D				
50								13					
16								14					
55								15		<p>At 55.7 feet, core becomes medium bluish gray (5B 5/1) and discontinuities become closely to moderately spaced and in fair condition.</p>			
17							R4 R5		PLT-A PLT-D				
18								16					
60								16		PLT-D			
19													
65								17			<p>At 62.8 feet, discontinuities become moderately spaced and in fair condition.</p>		
20							R5		PLT-A				
21								18					
70													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22								19		<p>META WELDED LAPILLI TUFF, medium gray (N5), massive aphanitic groundmass with fine to medium phenocrysts (10-15%), lapilli sized rock fragments (10-15%), lapilli sized pumice fragments (10-15%), fresh (I), very strong (R5). Discontinuities are closely to moderately spaced and in poor to fair condition. [Ohanapecoh Formation]</p>			
75							R5 R5	20	PLT-D PLT-A				
23								106 1.3					
24								166 87 1.3	21 22				
80								106 0.7	23				
25								86 1.1	24				
85								106 0.4	25				
27													
90								96 4.8	26				
28									R5	PLT-D			
								96 1.2	27				
95													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29							$\frac{102}{0.2}$	R5	28	PLT-D	<p>META WELDED LAPILLI TUFF, medium dark gray (N4), massive aphanitic groundmass with fine to medium phenocrysts (15-20%), lapilli sized rock fragments (15-20%), lapilli sized pumice fragments (15-20%), fresh (I), very strong (R5). Discontinuities are widely spaced and in good condition. [Ohanapecoh Formation]</p>		
30													
100													
31							$\frac{100}{1.2}$	R5	29	PLT-D	<p>At 103.2 feet, discontinuities become closely spaced and in poor to fair condition.</p>		
32													
105													
33							$\frac{100}{1.0}$	R5	30	PLT-D	<p>At 106.2 feet, discontinuities become widely spaced and in good condition.</p>		
34													
110													
35											<p>Borehole completed to 110.0 feet below ground surface (bgs) on October 11, 2008. Borehole was overcased with HWT casing and was flushed in preparation of optical and acoustical televiwer survey. Optical and acoustical televiwer survey completed on October 17, 2008. Borehole completed with time domain reflectometry cable from ground surface to 110 feet bgs. Borehole backfilled with cement grout on October 26, 2008.</p> <p>Grout mix from 0.0 to 110.0 feet bgs: One 94 pound bag of Type I-II Portland Cement 6 gallons of water</p> <p>Well Tag # = APA 652</p>		
36													
120													



Job No. 103-WA SR 90 Elevation 2622.5 ft (799.3 m)

HOLE No. MRE-04-08

Sheet 1 of 5

Project Interstate 90 Hyak Re-Alignment - 2008 Geotechnical Investigation

Driller B. Orton/K. Yang, P.E. Lic# K. Yang, P.E. #

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector K. Yang

Start September 9, 2008 Completion September 12, 2008 Well ID# Not Installed Equipment 2800 SIMCO

Station 1337+02 Offset -75 Left Casing Not Installed Method HQ3 Triple Tube Wireline

Northing 740332.77 Easting 1424582.38 Latitude 47°21'36.517"N Longitude 121°22'15.077"W

County Kittitas Subsection SW Quarter Section 26 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
										The borehole collar elevation is approximately 0.5 feet below the existing ground surface due to rig platform preparation. There was approximately 1 foot of topsoil encountered.			
1										SILTY SAND WITH GRAVEL [SM/GM] , angular to rounded, loose to medium dense, light brownish gray (10YR 6/2), dry to moist, homogeneous. [Alpine Till]			
5						$\frac{95}{}$	R5	1	PLT-D				
2						$\frac{79}{}$		2					
10						$\frac{104}{0.8}$	R5	3	PLT-D	META WELDED LAPILLI TUFF , dark greenish gray (10Y 4/1), massive aphanitic groundmass with fine to medium phenocrysts (10-20%), lapilli sized rock fragments (10-25%), lapilli sized pumice fragments (5-15%), fresh (I), very strong (R5). Discontinuities are moderately spaced and in good condition. [Ohanapecoh Formation]			
3						$\frac{80}{1.4}$	R4	4	PLT-D				
4										At 12.8 feet, discontinuities become closely spaced and in fair condition.			
15										At 14.0 feet, discontinuities become moderately to widely spaced and in fair to good condition.			
5						$\frac{87}{0.0}$	R4 R4	5	PLT-A PLT-D				
20													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14							R4	12	PLT-A	At 44.7 feet, discontinuities become moderately to widely spaced and in fair to good condition. META WELDED LAPILLI TUFF , greenish gray (10BG 5/1), massive aphanitic groundmass with fine to medium phenocrysts (15-30%), lapilli sized rock fragments (10-20%), lapilli sized pumice fragments (10-20%), alterations of epidote, chlorite, and zeolites, fresh (I), strong (R4). Discontinuities are moderately to widely spaced and in fair to good condition. [Ohanapecoh Formation]			
							R5				PLT-D		
15									13	PLT-D	At 53.0 feet, core becomes fresh (I) to slightly weathered (II), and moderately strong (R3) to strong (R4).		
							R4			PLT-D			
50									14		META WELDED BOMB TUFF , greenish gray (5BG 6/1), massive, aphanitic groundmass with fine to medium phenocrysts (35-50%), bomb sized rock and pumice fragments (10-20%), fresh (I), moderately strong (R3) to strong (R4). Discontinuities are moderately to widely spaced and in fair to good condition. [Ohanapecoh Formation]		
							R3			PLT-D			
16									15		At 58.7 feet, discontinuities become closely spaced and in fair condition.		
							R4			PLT-D			
55									16		BASALT , green gray (5BG 6/1) to pale green (5G 6/2), massive, aphanitic groundmass with fine to medium phenocrysts (5-10%), fresh (I), strong (R4) to very strong (R5). Discontinuities are closely spaced and in fair condition. [Ohanapecoh Formation]		
							R4			PLT-D			
17									16	PLT-A	At 63.8 feet, discontinuities become moderately spaced and in fair condition.		
							R5			PLT-D			
18													
60													
19													
65													
20													
21													
70													

ROCK MRE.GPJ 2/16/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
22							$\frac{102}{0.4}$		17		<p>META WELDED LAPILLI TUFF, dark greenish gray (10Y 4/1), massive aphanitic groundmass with fine to medium phenocrysts (10-20%), lapilli sized rock fragments (10-25%), lapilli sized pumice fragments (5-15%), fresh (I), very strong (R5). [Ohanapecosh Formation]</p> <p>BASALT, brown gray (5YR 4/1) to bluish gray (10B 6/1), massive, aphanitic groundmass with fine to medium phenocrysts (5-10%), fresh (I), strong (R4) to very strong (R5). [Ohanapecosh Formation]</p>			
75								R4		PLT-D				
23							$\frac{98}{1.0}$		18		<p>META WELDED LAPILLI TUFF, greenish gray (10BG 5/1), massive aphanitic groundmass with fine to medium phenocrysts (15-30%), lapilli sized rock fragments (10-20%), lapilli sized pumice fragments (10-20%), fresh (I), strong (R4). Discontinuities are moderately to widely spaced and in fair to good condition. [Ohanapecosh Formation]</p>			
24								R4		PLT-D				
80								R5		PLT-A				
25							$\frac{98}{1.4}$		19		<p>At 81.0 feet, discontinuities become closely spaced and in fair condition.</p> <p>At 82.2 feet, discontinuities become moderately to widely spaced and in fair to good condition.</p>			
85								R5		PLT-A				
26								R5		PLT-D				
90							$\frac{102}{0.4}$		20		<p>At 86.0 feet, core becomes strong (R4) to very strong (R5).</p>			
27								R5		PLT-D				
95							$\frac{103}{0}$		21					
28								R4		PLT-D				
95								R3		PLT-A				



LOG OF TEST BORING

Start Card S25754

Job No. 103-WA

SR 90

Elevation 2622.5 ft (799.3 m)

HOLE No. MRE-04-08

Sheet 5 of 5

Project Interstate 90 Hyak Re-Alignment - 2008 Geotechnical Investigation

Driller B. Orton/K. Yang, P.E. Lic# K. Yang, P.E. #

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
29											Borehole completed to 95.0 feet below ground surface (bgs) on September 12, 2008. Borehole was flushed in preparation of optical and acoustical televiwer survey. Optical and acoustical televiwer survey completed on September 13, 2008. Groundwater was measured at approximately 44.6 feet bgs during drilling activities on September 11, 2008 prior to beginning optical borehole survey. Borehole backfilled with cement grout on September 13, 2008.			
30														
100														
31														
105														
32														
33														
110														
34														
115														
35														
36														
120														



Job No. 103-WA SR 90 Elevation 2620.6 ft (798.8 m)

HOLE No. MRE-05-08

Sheet 1 of 4

Project Interstate 90 Hyak Re-Alignment - 2008 Geotechnical Investigation

Driller T. Washington/S. Tunisian # 2628

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector R. Beyer

Start October 24, 2008 Completion October 25, 2008 Well ID# Not Installed Equipment Burley 4500

Station 1361+46 Offset -100 Left Casing Not Installed Method HQ3 Triple Tube Wireline

Northing 738311.67 Easting 1425968.03 Latitude 47°21'16.721"N Longitude 121°21'54.629"W

County Kittitas Subsection NE Quarter Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
0	0										The borehole collar elevation is approximately 0.5 feet below the existing ground surface due to rig platform preparation. There was approximately 1 foot of topsoil encountered.			
1	0.3								1		POORLY GRADED SAND WITH GRAVEL [SM/GM] , angular to rounded, loose to very dense, medium bluish gray (5B 5/1), dry to moist, occasional cobbles and boulders. [Colluvium]			
5	1.5													
2	0.6													
10	3.0								2		META WELDED LAPILLI TUFF , light olive gray (5Y 6/1) to greenish gray (5GY 6/1), massive aphanitic groundmass with fine to medium phenocrysts, lapilli sized rock fragments (5-7%), lapilli sized pumice fragments (5-7%), fresh (I) to slightly weathered (II), moderately weak (R2) to moderately strong (R3). Discontinuities are moderately spaced and in good condition. [Ohanapecosh Formation]			
4	1.2							R3		PLT-D	At 12.8 feet, core becomes slightly weathered (II) and moderately weak (R2) to moderately strong (R3).			
15	4.6													
5	1.5								3		At 15.5 feet, core becomes light olive gray (5Y 6/1) and moderately strong (R3).			
								R2		PLT-D	At 17.8 feet, discontinuities become widely spaced and in fair condition.			
20	6.1													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								4		META WELDED LAPILLI TUFF , greenish gray (5G 6/1), massive aphanitic groundmass with fine to medium phenocrysts, lapilli sized rock fragments (5-8%), lapilli sized pumice fragments (8-10%), fresh (I), moderately strong (R3). Discontinuities are widely spaced and in fair condition. [Ohanapecoh Formation]			
25							R2		PLT-D				
8								5		At 25.5 feet, core becomes light olive gray (5GY 6/1) to greenish gray (5Y 6/1), slightly weathered (II), moderately weak (R2) to moderately strong (R3), and discontinuities become closely spaced and in poor to fair condition.			
30								6					
9							R2		PLT-D				
10													
35								7		At 35.5 feet, core becomes medium gray (N5) to greenish gray (5GY 6/1), fresh (I) and moderately strong (R3).			
11													
40								8		At 42.0 feet, core becomes medium gray (N5) and discontinuities become closely to moderately spaced and in poor to fair condition.			
12							R3		PLT-D				
13													
45													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14							$\frac{96}{2.8}$	R2	9	PLT-D	<p>META WELDED LAPILLI TUFF, medium light gray (N6) to greenish gray (5G 6/1), massive aphanitic groundmass with fine to medium phenocrysts, lapilli sized rock fragments (10-15%), lapilli sized pumice fragments (10-15%), fresh (I), and moderately strong (R3). Discontinuities are closely to moderately spaced and in poor to fair condition.[Ohanapecoh Formation]</p> <p>At 48.0 feet, discontinuities become widely spaced and in fair condition.</p> <p>At 53.4 feet, core becomes medium bluish gray (5B 5/1) to greenish gray (5G 6/1) and discontinuities become closely to moderately spaced and in poor to fair condition.</p> <p>At 63.0 feet, core becomes greenish gray (5G 6/1) and discontinuities become moderately spaced and in fair condition.</p>		
15													
50							$\frac{96}{1.8}$		10				
16													
55								R3		11		PLT-D	
17							$\frac{104}{5.4}$						
18								R3				PLT-A	
60							$\frac{100}{1.8}$			12			
19								R2				PLT-D	
65										13			
20							$\frac{98}{0.8}$						
21								R2				PLT-D	
70													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
22									14		META WELDED LAPILLI TUFF , greenish gray (5G 6/1), massive aphanitic groundmass with medium phenocrysts, lapilli sized rock fragments (8-10%), lapilli sized pumice fragments (5-10%), fresh (I), moderately strong (R3). Discontinuities are widely spaced and in good condition. [Ohanapecosh Formation]			
75	23						R2		15	PLT-D	At 77.5 feet, core becomes slightly weathered (II) and moderately weak (R2) to moderately strong (R3). Observed light olive gray (5Y 6/1) weathering envelopes. At 78.0 feet, core becomes fresh (I) and moderately strong (R3).			
80	25						R4		16	PLT-D	At 80.5 feet, core becomes light gray to medium light gray (N7-N6). At 82.0 feet, discontinuities become closely to moderately spaced and in fair condition.			
85	26										Borehole completed to 85.5 feet below ground surface (bgs) on October 25, 2008. Borehole was flushed in preparation of optical and acoustical televiwer survey. Optical and acoustical televiwer survey completed on October 28, 2008. Groundwater was measured at approximately 34.0 feet bgs during drilling activities on October 24, 2008 prior to beginning optical borehole survey. Borehole backfilled with cement grout on October 29, 2008.			
90	27													
95	28													



Job No. 103-WA SR 90 Elevation 2652.9 ft (808.6 m)

HOLE No. MRE-06-08

Sheet 1 of 5

Project Interstate 90 Hyak Re-Alignment - 2008 Geotechnical Investigation

Driller M. Starling/S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector R. Beyer

Start October 21, 2008 Completion October 23, 2008 Well ID# Not Installed Equipment Burley 4500

Station 1368+74 Offset -92 Left Casing Not Installed Method HQ3 Triple Tube Wireline

Northing 737605.37 Easting 1426140.81 Latitude 47°21'09.770"N Longitude 121°21'52.008"W

County Kittitas Subsection NE Quarter Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0	0							1		The borehole collar elevation is approximately 0.4 feet below the existing ground surface due to rig platform preparation. There was approximately 1 foot of topsoil encountered.			
1	0.3					$\frac{55}{1.1}$				POORLY GRADED GRAVEL WITH SILTY SAND [GM/SM] , angular, loose to very dense, medium dark gray (N4), dry to moist, homogeneous. [Colluvium]			
5	1.5					$\frac{100}{2}$	R4	2	PLT-D	META WELDED LAPILLI TUFF , medium dark gray (N4), aphanitic groundmass with fine to medium phenocryst (5-10%), lapilli size rock fragments (3-5%), lapilli size pumice fragments (5-10%), slightly weathered (II), moderately weak (R2) to moderately strong (R3). Discontinuities are closely to moderately spaced and in fair condition. Observed 3-5 healed discontinuities per foot. [Ohanapecosh Formation]			
2	0.6									At 5.5 feet, core becomes fresh (I) and moderately strong (R3) to strong (R4).			
10	3.0					$\frac{110}{1.5}$	R5	3	PLT-D				
4	1.2					$\frac{83}{1}$		4					
15	4.5					$\frac{100}{1.6}$	R5	5	PLT-D				
5	1.5						R5		PLT-A				
6	1.8						R4		PLT-D				
20	6.0												



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								6		<p>META WELDED LAPILLI TUFF, medium gray (N5) to medium dark gray (N4), aphanitic groundmass with fine to medium phenocrysts (8-15%), lapilli size rock fragments (3-5%), lapilli size pumice fragments (5-10%), slightly weathered (II), moderately strong (R3) to strong (R4). Discontinuities are closely spaced and in fair condition. [Ohanapecoh Formation]</p> <p>At 29.0 feet, run #9 has a RQD value of 27% and is likely due to drilling induced core breakage.</p> <p>At 40.5 feet, discontinuities become moderately to widely spaced.</p>			
25						$\frac{102}{2.6}$							
8						$\frac{108}{1.2}$	R3	7	PLT-D				
							R5		PLT-D				
9						$\frac{100}{1}$		8					
30						$\frac{100}{7.3}$		9					
						$\frac{98}{3}$		10					
10							R4		PLT-D				
35						$\frac{120}{3.6}$		11					
11													
40						$\frac{75}{1.5}$	R4	12	PLT-D				
12						$\frac{130}{1}$	R4	13	PLT-A				
13						$\frac{60}{1}$	R4	14	PLT-D				
45													

ROCK MRE.GPJ 2/16/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14		[Hatched pattern]					$\frac{100}{1}$		15		META WELDED LAPILLI TUFF , medium gray (N5) to medium dark gray (N4), aphanitic groundmass phenocrysts (8-15%), lapilli size rock fragments (3-5%), lapilli size pumice fragments (5-10%), fresh (I), strong (R4). Discontinuities are moderately spaced and in fair to good condition. [Ohanapecoh Formation]		
15													
50							$\frac{102}{4.2}$	R3	16	PLT-D		At 50.5 feet, core becomes moderately strong (R3) to strong (R4) and discontinuities become closely spaced and in fair condition.	
16													
55		[Hatched pattern]					$\frac{104}{2}$		17		At 55.5 feet, core becomes medium dark gray (N4) and fresh (I) to slightly weathered (II).		
17													
18								R3		PLT-D			
60		[Hatched pattern]					$\frac{100}{0.6}$		18				
19													
65		[Hatched pattern]					$\frac{80}{0.7}$		19		At 65.5 feet, core becomes fresh (I), moderately strong (R3), and discontinuities become moderately spaced and in fair condition.		
20							$\frac{102}{0.7}$	R4	20	PLT-D			
21		[Dotted pattern]						R4		PLT-A			
70													

ROCK MRE.GPJ 2/16/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22								21		META WELDED LAPILLI TUFF , medium dark gray (N4) to medium dark gray (N4), aphanitic groundmass with phenocrysts (10-15%), lapilli size rock fragments (5-8%), lapilli size pumice fragments (10-12%), fresh (I), moderately strong (R3). Discontinuities are moderately spaced and in fair to good condition. [Ohanapecoh Formation]			
75							R4	22	PLT-D	At 75.5 feet, core becomes moderately strong (R3) to strong (R4).			
24							R3	23	PLT-D	At 79.0 feet, discontinuities become closely spaced and in fair to poor condition.			
80								24					
25							R2	24	PLT-D				
85								25					
26								25					
87.8								26		At 87.8 feet, core becomes medium gray (N5) to medium dark gray (N4) with light olive gray (5Y 6/1) weathering envelopes, slightly weathered (II), and moderately strong (R3).			
90							R3	26	PLT-D				
28													
95													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29							$\frac{95}{5}$		27		<p>META WELDED LAPILLI TUFF, grayish olive (10Y 4/2) to medium gray (N5), aphanitic groundmass with fine to medium phenocrysts (10-15%), lapilli size rock fragments (5-8%), lapilli size pumice fragments (2-4%), slightly weathered (II), moderately strong (R3). Discontinuities are closely spaced and in fair condition. [Ohanapecosh Formation]</p> <p>At 104.0 feet, core becomes medium gray (N5) to medium dark gray (N4) and fresh (I).</p>		
							$\frac{100}{3}$	R3	28	PLT-D			
30								R3	29	PLT-A			
31							$\frac{96}{5.4}$						
100								R3	30	PLT-D			
105						$\frac{100}{1.6}$							
32							R3	31	PLT-D				
33													
110						$\frac{100}{3.7}$							
34													
115						$\frac{113}{1.3}$							
35							R3	32	PLT-D				
36													
120										<p>Borehole completed to 115.5 feet below ground surface (bgs) on October 23, 2008. Borehole was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on October 29, 2008. Groundwater was measured at approximately 22.0 feet bgs during drilling activities on October 22, 2008 prior to beginning optical borehole survey. Borehole backfilled with cement grout on October 30, 2008.</p>			



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
0.4	0.12								1		The borehole collar elevation is approximately 0.4 feet below the existing ground surface due to rig platform preparation. There was approximately 1 foot of topsoil encountered.			
1.0	0.30					56					SILTY SAND WITH GRAVEL [SM/GM] , angular to rounded, loose to very dense, medium bluish gray (5B 5/1), dry to moist, occasional cobbles and boulders. [Colluvium]			
5.0	1.52					100	R5		2	PLT-D	META WELDED LAPILLI TUFF , medium gray (N4) to medium dark gray (N5), massive aphanitic groundmass with medium phenocrysts (12-15%), lapilli sized rock fragments (8-10%), lapilli sized pumice fragments (10-12%), slightly weathered (II), moderately strong (R3) to strong (R4). Discontinuities are moderately spaced and in fair condition. [Ohanapecosh Formation]			
7.4	2.26					100	R5			PLT-D	At 7.4 feet, discontinuities become closely spaced and in fair condition.			
13.0	3.96					102			3		At 13.0 feet, core becomes strong (R4).			
15.9	4.84					100			4		At 15.9 feet, core becomes fresh (I) and discontinuities become closely to moderately spaced and in fair condition. Observed 5 weakly healed joints per foot.			
20.0	6.10													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument	
			20	40	60	80								
14														
							$\frac{96}{2.0}$	R5	11	PLT-D	META WELDED LAPILLI TUFF , medium gray (N5) to medium dark gray (N4), massive aphanitic groundmass with medium phenocrysts (10-15%), lapilli sized rock fragments (8-10%), lapilli sized pumice fragments (8-10%), fresh (I) to slightly weathered (II), moderately strong (R3). Discontinuities are moderately spaced and in fair to good condition. [Ohanapecosh Formation]			
15											At 49.0 feet, core becomes medium dark gray (N4), fresh (I) and strong (R4) to very strong (R5).			
50							$\frac{96}{1.6}$	R5	12	PLT-D				
16								R5		PLT-A				
55														
17							$\frac{94}{0.6}$	R5	13					
18														
60														
							$\frac{100}{0}$		14			At 59.9 feet, core becomes medium dark gray (N4) to medium bluish gray (5B 5/1).		
19														
65														
20							$\frac{100}{0}$	R5	16	PLT-A	At 66.0 feet, discontinuities become moderately to widely spaced and in fair condition.			
							$\frac{93}{0.7}$		17					
21														
70														



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29													
						$\frac{100}{3.8}$	R4	28	PLT-A	<p>META WELDED LAPILLI TUFF, medium gray (N4) to medium bluish gray (5B 5/1), massive aphanitic groundmass with medium phenocrysts (12-17%), lapilli sized rock fragments (4-6%), lapilli sized pumice fragments (6-8%), fresh (I), strong (R4) to very strong (R5). Discontinuities are closely to moderately spaced and in fair condition. [Ohanapecoh Formation]</p>			
30													
100						$\frac{98}{1.2}$		29		<p>At 99.1 feet, core becomes medium dark gray (N4), fresh (I) to slightly weathered (II), strong (R4) to very strong (R5) and discontinuities become closely spaced and in fair condition.</p>			
31													
105						$\frac{100}{1.6}$		30		<p>At 103.8 feet, discontinuities become moderately spaced and in fair condition.</p>			
32													
33													
110						$\frac{100}{6.4}$	R4	31	PLT-D	<p>At 111.3 feet, core becomes slightly weathered (II) and discontinuities become closely spaced and in poor to fair condition.</p>			
34													
115													
35													
36													
120													
										<p>Borehole completed to 115.9 feet below ground surface (bgs) on October 28, 2008. Borehole was flushed in preparation of optical and acoustical televiwer survey. Optical and acoustical televiwer survey completed on October 29, 2008. Groundwater was measured at approximately 56.7 feet bgs during drilling activities on October 28, 2008 prior to beginning optical borehole survey. Borehole backfilled with cement grout on October 29, 2008.</p>			



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
								1		The borehole collar elevation is approximately 0.5 feet below the existing ground surface due to rig platform preparation. There was approximately 1 foot of topsoil encountered.			
1										SILTY SAND WITH GRAVEL [SM/GM] , angular to rounded, loose to very dense, medium dark gray (N4), dry to moist, occasional cobbles and boulders. [Colluvium]			
5								2					
2										META WELDED LAPILLI TUFF , dark greenish gray (5GY 4/1), massive aphanitic groundmass with medium phenocrysts (10-15%), lapilli sized rock fragments (3-5%), lapilli sized pumice fragments (3-5%), fresh (I), moderately strong (R3) to strong (R4). Discontinuities are moderately spaced and in fair condition. [Ohanapecoh Formation]			
10							R5	3	PLT-D				
							R3	4	PLT-D				
								5					
4													
15							R4		PLT-D	At 12.8 feet, discontinuities become closely spaced and in fair condition.			
							R5		PLT-A				
5								6		At 16.0 feet, core becomes medium dark gray (N4), strong (R4) to very strong (R5), and discontinuities become moderately to widely spaced and in fair condition.			
20													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14								14		<p>META WELDED LAPILLI TUFF, medium bluish gray (5B 5/1), massive aphanitic groundmass with medium phenocrysts (10-15%), lapilli sized rock fragments (3-5%), lapilli sized pumice fragments (3-5%), fresh (I), strong (R4) to very strong (R5). Discontinuities are moderately to widely spaced and in fair to good condition. [Ohanapecosh Formation]</p>			
15						112 / 0.6		15					
50								15	PLT-D				
16						92 / 0.6	R5	16					
55								16					
17						98 / 1.2		16					
18								17		At 57.3 feet, core becomes fresh (I) to slightly weathered (II), strong (R4) to very strong (R5) and discontinuities become closely spaced and in fair condition. At 58.2 feet, core becomes fresh (I) and discontinuities become moderately to widely spaced and in fair to good condition.			
60								17					
19						123 / 0.8	R4	17	PLT-A	At 61.2 feet, core becomes fresh (I) to slightly weathered (II) and strong (R4).			
65						95 / 0.3		18		At 62.5 feet, core becomes medium bluish gray (5B 5/1) to medium dark gray (N4), fresh (I), strong (R4) to very strong (R5), and discontinuities become moderately to widely spaced and in fair to good condition.			
20							R4	18	PLT-D				
65						98 / 0.8		19		At 66.2 feet, core becomes medium dark gray (N4).			
21								19					
70													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
22									20		<p>META WELDED LAPILLI TUFF, medium dark gray (N4), massive aphanitic groundmass with medium phenocrysts (8-10%), lapilli sized rock fragments (4-6%), lapilli sized pumice fragments (6-8%), fresh (I), strong (R4). Discontinuities are moderately spaced and in fair condition. [Ohanapecosh Formation]</p> <p>At 72.8 feet, discontinuities become closely spaced and in poor to fair condition.</p>			
75	23								21		<p>At 76.8 feet, core becomes strong (R4) to very strong (R5) and discontinuities become moderately spaced and in fair condition.</p>			
24										22				
80	25									23				
85	26													
27											<p>Borehole completed to 86.4 feet below ground surface (bgs) on November 4, 2008. Borehole was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on November 5, 2008. Groundwater was measured at approximately 18.3 feet bgs during drilling activities on November 4, 2008 prior to beginning optical borehole survey. Borehole backfilled with cement grout on November 5, 2008.</p>			
90														
28														
95														



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2525.5 ft (769.8 m)

HOLE No. RCB-001-08

Sheet 1 of 5

Project I-90 Snoqualmie Pass East

Driller Robert Grocery Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Ken Yang

Start May 29, 2008 Completion June 4, 2008 Well ID# Not Applicable Equipment Skid-mounted 5500-1 w/ manual-hammer

Station 1425+96.22 Offset 13.79'L Casing HW, HQ Method Wet Rotary

Northing 1061276.34 Easting 1756357.86 Latitude 47°20'25.584"N Longitude 121°21'22.753"W

County Kittitas Subsection NW1/4 of NW1/4 Section 1 Range 11E Township 21N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
1													
5													
2													
10													
3													
4													
15													
5													
6													
20													

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7													
25													
8													
9													
30													
10													
35													
11													
12													
40													
12													
40													
13													
13													
45													

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2525.5 ft (769.8 m)

HOLE No. RCB-001-08

Sheet 3 of 5

Project I-90 Snoqualmie Pass East

Driller Robert Grocery Lic# N/A

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
14													
15	50							D-20 SM	7 4 5 (9)	47.0 to 71.3 feet: Silty SAND with or without gravel, occasional poorly graded GRAVEL, subrounded, loose to medium dense, reddish brown to gray, wet, homogenous, no HCl reaction. 47.0 feet: Loose, silty SAND.			
								C-21 GP		grades to poorly graded GRAVEL with cobbles.			
								D-22 SM	1 3 6 (9)	grades to silty SAND with gravel.			
								C-23 SM		No recovery. Material was probably washed away. Material is probably silty SAND.			
								C-24 SM		No recovery. Material was probably washed away. Material is probably silty SAND.			
16	55							D-25 SM	12 11 16 (27)	grades to meium dense, silty SAND with gravel.			
								C-26 SM		No recovery. Material was probably washed away. Material is probably silty SAND.			
17								D-27 SM	4 6 3 (9)	grades to loose, silty SAND with gravel.			
								C-28 GP		grades to poorly graded GRAVEL.			
18	60							D-29 SM	4 8 6 8 (14)	grades to medium dense, silty SAND (fine).			
								C-30 SM		No recovery. Material was probably washed away. Material is probably silty SAND.			
19	65												
20													
21	70												

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2525.5 ft (769.8 m)

HOLE No. RCB-001-08

Sheet 4 of 5

Project I-90 Snoqualmie Pass East

Driller Robert Grocery Lic# N/A

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
22							100	D-31 CL	3 3 3 5 (6)	71.3 to 73.3 feet: Lean CLAY, medium stiff, light greenish gray, wet, homogenous, no HCl reaction.			
75							83	C-32 SM		73.3 to 82.8 feet: Silty SAND, dense to very dense, brown to light gray, wet, homogenous, no HCl reaction. 73.3 feet: Silty SAND.			
23							100	D-33 SM	11 20 12 (32)	grades to dense.			
24							100 67	C-34 SM C-35 SM					
80							100	D-36 SM	11 12 50 for 5" (>50)	grades to very dense.			
25							49	C-37 GP(B)		82.8 to 96.6 feet: Poorly graded GRAVEL with sand to silty GRAVEL with sand, occasionally silty SAND, occasional cobbles, subangular to angular, very dense, gray to greenish gray, wet, homogenous, no HCl reaction. 82.8 feet: Poorly graded GRAVEL with occasional boulders.			
85							75	D-38 SM	48 50 for 3" (>50)	grades to silty SAND with gravel.			
26							0	C-39 GM(C)		grades to silty GRAVEL with sand and cobbles. Finer material may have been washed away.			
27							75	D-40 SM	>50	91.7 feet: grades to silty SAND.			
90							0	C-41 GP		grades to poorly graded GRAVEL with sand.			
28													
95													

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2525.5 ft (769.8 m)

HOLE No. RCB-001-08

Sheet 5 of 5

Project I-90 Snoqualmie Pass East

Driller Robert Grocery Lic# N/A

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
29														
							100		D-42 SM	50 for 3" (>50)	grades to very dense, silty SAND (with trace gravel and clay).			
30											Bottom of boring at 96.6 feet below ground surface (bgs). Backfilled with asphalt material from 0 to 0.8 ft bgs, with silty sand with gravel from 0.8 to 40 ft bgs and with bentonite chips from 40 to 96.6 ft bgs.			
100														
31														
105														
32														
33														
110														
34														
115														
35														
36														
120														

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2524.8 ft (769.5 m)

HOLE No. RCB-002-08(OW)

Sheet 1 of 4

Project I-90 Snoqualmie Pass East

Driller Danny Herdson Lic# 2742

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start September 4, 2008 Completion September 4, 2008 Well ID# Not Applicable Equipment CME 55 Truck-mounted w/ auto-hammer

Station 1427+73.82 Offset 27.89' L Casing HWT, HQ Method Wet Rotary

Northing 1061277.33 Easting 1756536.89 Latitude 47°20'25.613"N Longitude 121°21'20.154"W

County Kittitas Subsection NW 1/4 of NW 1/4 Section 1 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 25 feet: Poorly to well graded GRAVEL with or without sand, occasionally silty GRAVEL with sand, occasional cobbles and boulders, subrounded to angular, loose to very dense, brown to gray, wet, homogenous, no HCl reaction. 0 feet: Asphalt concrete pavement. 0.3 feet: very dense, well graded GRAVEL with sand.			
1						44			D-1 GW	34				
5						49			C-2 GP(C/B)	50 for 5" (>50)				
2														
10						13			D-3 GP	3	grades to loose, poorly graded GRAVEL.			
4						9			C-4 GP	3 2 (5)				
15						0			D-5 GP	6 6 7 (13)	No recovery. Material is probably poorly graded GRAVEL.			
5						63			C-6 GM		grades to silty GRAVEL with sand.			
20														

DRAFT ROCKN BORINGS I-90-2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2524.8 ft (769.5 m)

HOLE No. RCB-002-08(OW)

Sheet 2 of 4

Project I-90 Snoqualmie Pass East

Driller Danny Herdson Lic# 2742

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
							33	D-7 GM	12 7 8 (15)	Note: Trace of organics were encountered.			
							14	C-8 GP		grades to poorly graded GRAVEL.			
7													
25							50	D-9 GM/SM	18 9 18 (27)	25.0 to 76.3 feet: Silty fine to medium SAND with gravel, occasional poorly graded GRAVEL with sand, occasionally silty GRAVEL with sand and occasional cobbles, subrounded to subangular, dense to very dense, brown to reddish brown to gray, wet, homogenous, no HCl reaction.			
8							71	C-10 GM		25.0 feet: Dense, silty SAND with gravel. A piece of wood was encountered. 26.5 feet: grades to silty GRAVEL with sand.			
30							100 24	D-11 GP C-12 GP(C)	50 for 6" (>50)	grades to very dense, poorly graded GRAVEL with sand. grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 5 inches.			
10													
35							93	D-13 GP	3 17 31 (48)	grades to dense, poorly graded GRAVEL with sand.			
11							57	C-14 GP(C)		grades to poorly graded GRAVEL with sand and cobbles. Maximum size of the cobbles encountered is 3.5 inches.			
40							83	D-15 SM	13 19 15 (34)	40.0 to 71.3 feet: Silty SAND with or without gravel, occasional silty GRAVEL with sand, subrounded or subangular, medium dense to very dense, brown to gray, wet, homogenous, no HCl reaction.			
12							34	C-16 GM		40.0 feet: Dense, silty SAND with gravel. grades to silty GRAVEL with sand.			
13													
45													

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2524.8 ft (769.5 m)

HOLE No. RCB-002-08(OW)

Sheet 3 of 4

Project I-90 Snoqualmie Pass East

Driller Danny Herdson Lic# 2742

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
14								D-17 SM	1 8 11 (19)	grades to medium dense, silty SAND with gravel.			
								C-18 SM					
15								D-19 SM	12 18 11 (29)	grades to dense.			
50								C-20 SM					
16								D-21 SM	14 17 20 (37)	No recovery. Material was probably washed away. Material is probably silty SAND with gravel.			
55								C-22 SM					
17								D-23 SM	4 6 9 (15)	grades to medium dense, silty fine SAND.			
60								C-24 SM		No recovery. Material was probably washed away. Material is probably silty fine SAND.			
18								D-25 SM	3 8 8 (16)	grades to silty fine SAND with trace of fine gravel.			
65								C-26 SM					
19													
20													
21													
70													

DRAFT ROCKN BORINGS I-90-2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2527.5 ft (770.4 m)

HOLE No. RCB-003-08(OW)

Sheet 1 of 5

Project I-90 Snoqualmie Pass East

Driller Andy Gold Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Ken Yang

Start May 31, 2008 Completion June 2, 2008 Well ID# Not Applicable Equipment Skid-mounted 5500-1 w/ manual-hammer

Station 1425+89.54 Offset 102.19'L Casing HW, HQ Method Wet Rotary

Northing 1061364.99 Easting 1756357.16 Latitude 47°20'26.459"N Longitude 121°21'22.777"W

County Kittitas Subsection NW 1/4 of NW 1/4 Section 1 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 29.0 feet: Well graded to poorly graded GRAVEL with sand, occasional silty GRAVEL with sand and silty SAND with gravel, occasional cobbles and boulders, subrounded to angular, dense to very dense, brown to gray, wet, homogenous, no HCl reaction.			
1														
5									D-1 GM	48 16 26 (42)	4.6 feet: Silty GRAVEL with sand.			
2														
10									D-2 GM GW(C)	50 for 4" (>50)	grades to very dense, silty SAND with gravel. grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 6 inches.			
3														
4									C-4 GW(C)		Maximum size of the cobbles encountered is 5 inches.			
15														
5									D-5 GM C-6 GM	13 50 for 1" (>50)	grades to silty fine GRAVEL with sand. No recovery. Material was probably washed. Material is probably is silty gravel (fine).			
6									C-7 GW(C) C-8 GW(C)		grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 5 inches.			
20									C-9 GM		grades to silty GRAVEL with sand.			

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2527.5 ft (770.4 m)

HOLE No. RCB-003-08(OW)

Sheet 2 of 5

Project I-90 Snoqualmie Pass East

Driller Andy Gold Lic# N/A

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								C-10 GM(B)		grades to silty GRAVEL with boulders. Maximum size of the boulders encountered is 14 inches.			
25								D-11 GP(C)	50 for 1" (>50)	grades to silty GRAVEL. 26.2 feet: grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 3.25 inches.			
30								D-13 GP	12 22 25 (47)	29.0 to 44.0 feet: Silty GRAVEL with sand or well graded to poorly graded GRAVEL with sand, occasional cobbles, trace of organic material, subrounded to angular, dense to very dense, brown to reddish brown to gray, wet, homogenous, no HCl reaction. 29.0 feet: Poorly graded GRAVEL with sand. 30.5 feet: grades to silty GRAVEL with sand and cobbles. Maximum size of the cobbles encountered is 6 inches.			
35								D-15 GW	28 24 24 (48)	grades to well graded GRAVEL with sand.			
40								C-16 GW(C)	100	grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 3.5 inches.			
42								C-17 GM(C)	82	grades to silty GRAVEL with cobbles. Maximum size of the cobbles encountered is 4 inches.			
43								D-18 GW	55	grades to well graded GRAVEL with sand.			
44								C-19 GM(C)	100	grades to silty GRAVEL with sand and cobbles. Maximum size of the cobbles encountered is 4 inches.			
45										44.0 to 65.0 feet: Silty fine to medium SAND, occasionally with gravel, occasionally silty CLAY/clayey			

DRAFT ROCKN BORINGS I-90-2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2527.5 ft (770.4 m)

HOLE No. RCB-003-08(OW)

Sheet 3 of 5

Project I-90 Snoqualmie Pass East

Driller Andy Gold Lic# N/A

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
14								D-20 SM	4 5 8 (13)	SILT, rounded to subrounded, medium dense, brown to dark brown, moist to wet, homogenous, no HCl reaction. 44.0 feet: Silty SAND.			
								C-21 SM	0	No recovery. Material was probably washed away. Material is probably silty SAND.			
15													
50													
16								D-22 CL-ML	7 5 8 (13)	grades to silty CLAY/clayey SILT.			
								C-23 SM	77	grades to silty SAND (fine).			
55													
17								C-24 SM	50	grades to silty SAND with gravel.			
18													
60													
19								D-25 SM	87	grades to silty SAND (fine to medium).			
								C-26 SM	0	No recovery. Material was probably washed away. Material is probably silty SAND.			
65													
20								D-27 CL	100	65.0 to 68.3 feet: Lean CLAY, medium stiff to stiff, medium plasticity, light brown to gray, homogenous, no HCl reaction (PP=1.0 to 1.25 tsf).			
								C-28 SM	57	68.3 to 86.3 feet: Silty fine to medium SAND, occasional SILT, occasional well graded GRAVEL with sand or silty GRAVEL with sand and cobbles, subrounded to angular, medium dense to very dense, reddish brown to greenish			
21													
70													

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
22								D-29 SM	9 12 6 (18)	gray, wet, homogenous, no HCl reaction. 68.3 feet: Medium dense, silty SAND (fine to medium) with fine gravel.			
								C-30 GM		grades to silty GRAVEL with sand.			
23								D-31 SM	5 10 17 (27)	grades to dense, silty fine SAND.			
24								C-32 SM/ML		grades to SILT. grades to silty SAND.			
25								C-33 GW(C)		grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 5.25 inches.			
26								D-34 GM	50 for 3.5" (>50)				
27								C-36		86.3 to 101.5 feet: Meta welded lapilli tuff, bluish gray, fine to medium grained, fresh, moderately weak (R2) to strong (R4) rock. Discontinuities are very closely to widely spaced, and in very poor to fair condition. none to weak HCl reaction. (CR=94% to 100%, RQD=0 to 100%, FF=0.4 to 3.0) 86.3 feet: Slightly weathered, strong (R4) rock, weak HCl reaction. Discontinuities are widely spaced and in fair condition. 88.5 feet: grades to highly weathered, moderately weak (R2) rock, no HCl reaction. Discontinuities are very closely spaced and in very poor condition.			
28								D-37 C-38	50 for 2" (>50)	grades to moderately weathered, strong (R4) rock. Discontinuities are widely spaced and in poor to fair condition.			
95													

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
29														
									C-39		Discontinuities are in fair condition.			
30														
100														
31											Bottom of boring at 101.5 feet below ground surface (bgs).			
											Installed 1-inch diameter PVC observation well:			
											1. -PVC screen interval with 0.010 -inch slots: 50.0 to 70.0 feet.			
											-PVC riser: 2.2 to 50.0 feet.			
105											-Sand filter pack: 45.0 to 46.0 feet with pel plug.			
											2. Backfilled from 2.0 to 45.0 feet with bentonite chips.			
											4. Installed quickcrete surface seal from 0 to 2.0 feet and a stick-up monument casing (2.5-inch ID, approx. 3.0 feet long)			
											Water level measurements (below existing ground surface):			
											-6/1/08 to 10/29/08 between 10.7 and 36.7 feet in observation well.			
33														
110														
34														
115														
35														
36														
120														



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90 Elevation 2529.3 ft (770.9 m)

HOLE No. RCB-004-10

Sheet 1 of 5

Project I-90 Snoqualmie Pass East

Driller Richard Cooper Lic# 2964T

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start May 4, 2010 Completion May 11, 2010 Well ID# Not Applicable Equipment CME 45 with auto hammer

Station _____ Offset _____ Casing HWT, HQ Method Wet Rotary

Northing 1061361.53 Easting 1756516.69 Latitude 47°20'26.44"N Longitude 121°21'20.46"W

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 41 feet: Samples were not collected from ground surface to 41 feet depth below ground surface. Refer to Boring CUL-013-07 for information in this depth interval.			
1														
5														
10														
15														
20														



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90

Elevation 2529.3 ft (770.9 m)

HOLE No. RCB-004-10

Sheet 2 of 5

Project I-90 Snoqualmie Pass East

Driller Richard Cooper Lic# 2964T

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7														
25														
8														
9														
30														
10														
35														
11														
12														
40														
13							<u>13</u>		D-1 GW	6 3 6 (9)	41 to 46 feet: Well graded GRAVEL with sand to silty GRAVEL with sand, occasional cobbles, subangular to subrounded, loose, gray to brown, wet, homogenous, no Hcl reaction. 41 feet: Well graded GRAVEL with sand. 42.5 feet: grades to silty GRAVEL with sand and cobbles. Maximum size of the cobbles encountered is 3.5 inches.			
45							<u>71</u>		C-2 GM(C)					

DRAFT ROCKN BORINGS & TESTPITS 2010.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
14													
						<u>20</u>		D-3 SM	4 10 15 (25)	46 to 76 feet: Silty SAND with gravel to silty GRAVEL with sand, subangular to subrounded, loose to dense, reddish brown, wet, homogenous, no HCl reaction. 46 feet: Medium dense to dense, silty SAND with gravel (medium to fine gravel).			
						<u>86</u>		C-4					
15													
50						<u>80</u>		D-5 SM	9 8 6 (14)				
16						<u>43</u>		C-6 GW					
55													
17						<u>67</u>		D-7 SM	8 9 10 (19)				
						<u>0</u>		C-8		No recovery. Material was probably washed away.			
18													
60						<u>50</u>		D-9 SM	9 8 10 (18)				
19						<u>43</u>		C-10 GM		62.5 feet: grades to silty GRAVEL with sand.			
65													
20						<u>13</u>		D-11 GM	13 20 9 (29)				
						<u>34</u>		C-12		67.5 feet: grades to loose silty SAND.			
21													
70													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
22								D-13 SM	2 4 6 (10)				
23								C-14					
24								D-15 GM	13 16 20 (36)	76 to 88.6 feet: Well graded GRAVEL with sand to Silty GRAVEL with sand, occasional cobbles and boulders, angular to subrounded, dense to very dense, gray, wet, homogeneous, no HCl reaction. 76 feet: Dense, silty GRAVEL with sand. 77.5 feet: grades to well graded GRAVEL.			
25								C-16 GW					
26								D-17 GW (R)	50/2" (>50)	81 feet: grades to well graded GRAVEL with cobbles and boulders. Maximum diameter of the boulders encountered is 1.8 feet.			
27								C-20A	32 32 18/3" (>50)				
28								C-20B		88.6 to 106.0 feet: Andesite, bluish gray, fine grained, fresh, very weak (R1) to moderately weak (R2). Discontinuities are very closely to closely spaced and in fair to good condition. None to weak HCl reaction. (CR = 80 to 100%, RQD = 40 to 83%, FF = 1.6 to 2.8) 88.6 feet: Moderately weak (R2) rock. Discontinuities are closely to very closely spaced and in fair condition. PLT - moderately strong (R3) rock PLT-moderately strong (R3) rock.			
29								C-21					
30								C-22		93.5 feet: Discontinuities are in fair to good condition.			

DRAFT ROCKN BORINGS & TESTPITS 2010.GPJ 9/14/10



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90 Elevation 2498.0 ft (761.4 m)

HOLE No. RCB-005-10

Sheet 1 of 5

Project I-90 Snoqualmie Pass East

Driller Richard Cooper Lic# 2964T

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start April 20, 2010 Completion April 21, 2010 Well ID# Not Applicable Equipment CME 45 with auto hammer

Station _____ Offset _____ Casing HWT, HQ Method Wet Rotary

Northing 1061216.12 Easting 1756351.68 Latitude _____ Longitude _____

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 34 feet: Samples were not collected from ground surface to 34 feet depth below ground surface. Refer to Boring CUL-012-07 for information in this depth interval.			
1														
5														
2														
10														
3														
4														
15														
5														
6														
20														



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90

Elevation 2498.0 ft (761.4 m)

HOLE No. RCB-005-10

Sheet 2 of 5

Project I-90 Snoqualmie Pass East

Driller Richard Cooper Lic# 2964T

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7														
25														
8														
9														
30														
10														
35							<u>100</u>			1 1 6 (7)	34 to 56.5 feet: Silty sand with or without gravel (fine to medium sand), occasionally sandy SILT with or without gravel, subrounded, loose to medium dense, reddish to grayish brown, wet, homogenous, no HCl reaction. 34 feet: Loose, Silty SAND with fine gravel.			
11														
12														
40														
13														
45														



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90

Elevation 2498.0 ft (761.4 m)

HOLE No. RCB-005-10

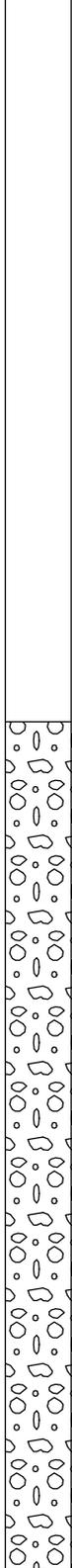
Sheet 3 of 5

Project I-90 Snoqualmie Pass East

Driller Richard Cooper Lic# 2964T

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
14													
15													
50													
16													
55													
17													
18													
60													
19													
65													
20													
21													
70													

DRAFT ROCKN BORINGS & TESTPITS 2010.GPJ 9/14/10



87



1
9
12

51 feet: grades to medium dense, silty SAND.
51.5 feet: grades to stiff, sandy SILT, PP= 0.5 tsf.
52.2 feet: grades to sandy SILT with fine gravel.

67



SM

18/50/6"
(>50)

56.0 feet: grades to dense, Silty SAND.
56.5 feet: Silty SAND with or without gravel, poorly to well graded GRAVEL with sand, angular to subrounded, very dense, occasionally loose, wet, homogenous, no HCl reaction.
56.5 feet: Very dense, silty SAND.

80



SM

30
44
50/3"
(>50)

66 feet: Well graded GRAVEL with sand.

22



GW

25
50/5"
(>50)



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
22							100	SM	50/3" (>50)	71 feet: Sandy SILT or silty SAND with gravel.			
23	75						40	GP	50/5" (>50)	76 feet: Poorly graded GRAVEL with trace of sandy SILT.			
25	80						$\frac{100}{1.3}$		50/3" (>50)	81 feet: Silty SAND with gravel. 81.2 feet: Loose, silty SAND, stratified. Andesite, light gray, fine to medium grained, fresh, moderately weak (R2) to strong (R4). Discontinuities are closely to medium spaced and in poor to fair condition. Weak HCl reaction. (CR = 96 to 100%, RQD = 70 to 88%, FF = 1.0 to 1.3) PLT - moderately weak (R2) rock			
26	85						$\frac{98}{1.0}$			PLT - moderately weak (R2) rock			
27	90									PLT - moderately weak (R2) rock			
28	95						$\frac{96}{1.0}$			PLT - very weak (R1) rock.			

DRAFT ROCKN BORINGS & TESTPITS 2010.GPJ 9/14/10



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90

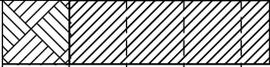
Elevation 2498.0 ft (761.4 m)

HOLE No. RCB-005-10

Sheet 5 of 5

Project I-90 Snoqualmie Pass East

Driller Richard Cooper Lic# 2964T

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
29														
											Bottom of the boring at 96 feet depth below the ground surface. Backfilled to ground surface with bentonite chips.			
30														
100														
31														
105														
32														
33														
110														
34														
115														
35														
36														
120														



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90 Elevation 2497.0 ft (761.1 m)

HOLE No. RCB-006-10

Sheet 1 of 4

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Kranti Maturi

Start April 20, 2010 Completion April 21, 2010 Well ID# Not Applicable Equipment CME 45 with auto hammer

Station _____ Offset _____ Casing HWT, HQ Method Wet Rotary

Northing 1061198.71 Easting 1756514.09 Latitude _____ Longitude _____

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 40.5 feet: Samples were not collected from ground surface to 40.5 feet depth below ground surface. Refer to Boring CUL-014-07 for information in this depth interval.			
1														
5														
2														
10														
3														
4														
15														
5														
6														
20														



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90

Elevation 2497.0 ft (761.1 m)

HOLE No. RCB-006-10

Sheet 2 of 4

Project I-90 Snoqualmie Pass East

Driller Robert Haller

Lic# 2779

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7														
25														
8														
9														
30														
10														
35														
11														
12														
40							<u>93</u>		D-1 SP-ML	4 9 20 (29)	40.5 to 52.0 feet: SAND or sandy SILT with gravel, dense to very dense, subrounded to subangular, brown to grayish brown, moist, homogenous, no HCl reaction. 40.5 feet: Dense, SAND. 41.6 feet: grades to dense, sandy SILT.			
13														
45														

DRAFT ROCKN BORINGS & TESTPITS 2010.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
14							53	D-2 ML	2 31 24 (55)	grades to very dense, sandy SILT with gravel.			
15							67	D-3	50/4" (>50)				
50							100 4.0	C-4					
16							100 1.6	C-5		52.0 to 70.5 feet: Lapilli Tuff or Basalt, medium gray to dark gray, fine to coarse grained, fresh to completely weathered, very weak (R1) to strong (R4). Discontinuities are closely to medium spaced and in fair to poor condition. weak HCl reaction. (CR = 100%, RQD = 40 to 75%, FF = 1.5 to 4.0) 52.0 feet: Lapilli Tuff, highly to completely weathered, very weak to moderately weak rock. Discontinuities are very closely to closely spaced and in poor condition. PLT - very weak (R1) rock. 53.6 feet: grades to fresh, moderately strong (R3) rock. Discontinuities are closely spaced and in fair condition. 55 feet: grades to moderately strong (R3) to strong (R4) rock. Discontinuities are closely to medium spaced and in poor condition. PLT - very weak (R1) rock. PLT - very weak (R1) rock.			
55							100 3.8	C-6		grades to Lapilli Tuff/Basalt, fine grained, fresh, strong (R4) rock. Discontinuities are closely spaced and in fair condition. PLT - very weak (R1) rock.			
17							100 2.0	C-7		PLT - strong (R4) rock.			
18							100 1.5	C-8		grades to moderately strong (R3) rock. Discontinuities are closely spaced and in fair condition.			
60													
19													
65													
20													
21													
70													

DRAFT ROCKN BORINGS & TESTPITS 2010.GPJ 9/14/10



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90

Elevation 2497.0 ft (761.1 m)

HOLE No. RCB-006-10

Sheet 4 of 4

Project I-90 Snoqualmie Pass East

Driller Robert Haller

Lic# 2779

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
											PLT - very weak (R1) rock.			
											Bottom of the boring at 70.5 feet depth below the ground surface. Backfilled to ground surface with bentonite chips.			
22														
75														
23														
24														
80														
25														
85														
26														
27														
90														
28														
95														



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90 Elevation 2525.3 ft (769.7 m)

HOLE No. RCB-007-10

Sheet 1 of 6

Project I-90 Snoqualmie Pass East

Driller Richard Cooper Lic# 2964T

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start April 22, 2010 Completion April 28, 2010 Well ID# Not Applicable Equipment CME 45 with auto hammer

Station _____ Offset _____ Casing HWT, HQ Method Wet Rotary

Northing 1061266.68 Easting 1756385.77 Latitude 47°20'25.49"N Longitude 121°21'22.35"W

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 101 feet: Samples were not collected from ground surface to 101 feet depth below ground surface. Refer to Boring RCB-001-08 for information in this depth interval.			
1														
5														
2														
10														
3														
4														
15														
5														
6														
20														



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90

Elevation 2525.3 ft (769.7 m)

HOLE No. RCB-007-10

Sheet 2 of 6

Project I-90 Snoqualmie Pass East

Driller Richard Cooper Lic# 2964T

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7														
25														
8														
9														
30														
10														
35														
11														
12														
40														
13														
45														



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90

Elevation 2525.3 ft (769.7 m)

HOLE No. RCB-007-10

Sheet 3 of 6

Project I-90 Snoqualmie Pass East

Driller Richard Cooper

Lic# 2964T

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14														
15														
50														
16														
55														
17														
18														
60														
19														
65														
20														
21														
70														



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90

Elevation 2525.3 ft (769.7 m)

HOLE No. RCB-007-10

Sheet 4 of 6

Project I-90 Snoqualmie Pass East

Driller Richard Cooper Lic# 2964T

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22														
75														
23														
24														
80														
25														
85														
26														
27														
90														
28														
95														



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
29														
31							9		C-1A		101.0 to 103.2 feet: Silty GRAVEL with sand, angular, bluish gray, wet, stratified, no HCl reaction.			
32							100 2.1		C-1B		103.2 to 121.0 feet: Andesite, bluish gray to dark gray, fine grained, fresh, very weak (R1) to moderately strong (R3). Discontinuities are very closely to medium spaced and in very poor to good condition. None to weak HCl reaction. (CR = 84% to 100%, RQD = 36 to 92%, FF = 0.8 to 2.1)			
33							84 1.2		C-2		103.2 feet: Very weak (R1) rock. Discontinuities are very closely to closely spaced and in very poor to fair condition. Weak HCl reaction. PLT - moderately weak (R2) rock			
34							98 1.2		C-3		106 feet: grades to very weak (R1) to moderately strong (R3) rock. None to weak HCl reaction. Note: Silty sand with gravel, angular to subrounded infilling was observed from 106.2 to 106.4 feet depth below ground surface and from 106.5 to 106.8 feet depth below ground surface. Gray silt, stiff to hard, infilling was encountered from 106.4 to 106.5 feet depth below ground surface. PLT - moderately weak (R2) rock			
35											PLT - very weak (R1) rock.			
36							100 0.8		C-4		PLT - moderately weak (R2) rock			
120														

DRAFT ROCKN BORINGS & TESTPITS 2010.GPJ 9/14/10



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90

Elevation 2525.3 ft (769.7 m)

HOLE No. RCB-007-10

Sheet 6 of 6

Project I-90 Snoqualmie Pass East

Driller Richard Cooper Lic# 2964T

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
											PLT - moderately weak (R2) rock.			
37											Bottom of the boring at 121 feet depth below the ground surface. Backfilled to ground surface with bentonite chips.			
125	38													
130	39													
135	40													
140	41													
145	42													
	43													
	44													



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90 Elevation 2524.4 ft (769.4 m)

HOLE No. RCB-008-10

Sheet 1 of 5

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start April 25, 2010 Completion April 27, 2010 Well ID# Not Applicable Equipment CME 45 with auto hammer

Station _____ Offset _____ Casing HWT, HQ Method Wet Rotary

Northing 1061264.92 Easting 1756510.77 Latitude 47°20'25.49"N Longitude 121°21'20.53"W

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 93 feet: Samples were not collected from ground surface to 93 feet depth below ground surface. Refer to Boring RCB-002-08 for information in this depth interval.			
1														
5														
2														
10														
3														
4														
15														
5														
6														
20														



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90

Elevation 2524.4 ft (769.4 m)

HOLE No. RCB-008-10

Sheet 2 of 5

Project I-90 Snoqualmie Pass East

Driller Robert Haller

Lic# 2779

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7														
25														
8														
9														
30														
10														
35														
11														
12														
40														
13														
45														



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90

Elevation 2524.4 ft (769.4 m)

HOLE No. RCB-008-10

Sheet 3 of 5

Project I-90 Snoqualmie Pass East

Driller Robert Haller

Lic# 2779

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14														
15														
50														
16														
55														
17														
18														
60														
19														
65														
20														
21														
70														



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90

Elevation 2524.4 ft (769.4 m)

HOLE No. RCB-008-10

Sheet 4 of 5

Project I-90 Snoqualmie Pass East

Driller Robert Haller

Lic# 2779

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22														
75														
23														
24														
80														
25														
85														
26														
27														
90														
28														
95							0 100		C-1A C-1B		93.0 to 93.2 feet: Silty GRAVEL with sand, angular, bluish gray, wet, stratified, no HCl reaction. 93.2 to 109.2 feet: Andesite, bluish gray, fine grained, fresh, very weak (R1) to strong (R4). Discontinuities are very closely to medium spaced and in poor to fair			

DRAFT ROCKN BORINGS & TESTPITS 2010.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
29											<p>condition. None to weak HCl reaction. (CR = 98% to 100%, RQD = 68 to 98%, FF = 0.6 to 2.3)</p> <p>93.2 feet: Moderately strong (R3). Discontinuities are very closely to closely spaced and in poor to fair condition. No HCl reaction.</p> <p>94 feet: PLT - very weak (R1) rock.</p> <p>96 feet; grades to moderately strong (R3) to strong (R4) rock. Discontinuities are closely to medium spaced and in fair condition.</p> <p>98.3 feet: PLT - very weak (R1) rock.</p> <p>PLT - very weak (R1) rock.</p> <p>101.0 feet: Discontinuities are very closely to medium spaced. None to weak HCl reaction.</p> <p>PLT - very weak (R1) rock.</p> <p>107.9 feet: PLT - very weak (R1) rock.</p>			
30														
100														
31														
105														
32														
33														
110														
34														
115														
35														
36														
120														



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2523.4 ft (769.1 m)

HOLE No. RCW-001-08

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Andy Gold Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Abhijit Bathe

Start May 29, 2008 Completion May 30, 2008 Well ID# Not Applicable Equipment Burley 4000 RT w/ manual-hammer

Station 1420+68.37 Offset 81.2'L Casing HW, HQ Method Wet Rotary

Northing 1061379.19 Easting 1755835.76 Latitude 47°20'26.543"N Longitude 121°21'30.349"W

County Kittitas Subsection NW 1/4 of NW 1/4 Section 1 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 26.4 feet: Poorly graded GRAVEL, occasional cobbles and boulders, subrounded to subangular, dense to very dense, gray to brownish gray, moist to wet, homogenous, none to weak HCl reaction.			
5							$\frac{0}{66}$		D-1 C-2	50 for 1" (>50)	4.6 feet: Poorly graded GRAVEL with cobbles, weak HCl reaction.			
2											loss of drilling water circulation.			
10							$\frac{100}{60}$		C-3 C-4		No HCl reaction.			
4							$\frac{85}{100}$		C-5 C-6 GP(C/B)		grades to poorly graded GRAVEL with cobbles or boulders. Weak HCl reaction.			
15							$\frac{83}{27}$		C-7 GP		grades to poorly graded GRAVEL.			
20							$\frac{63}{}$		C-8 C-9					

DRAFT ROCKN BORINGS I-90-2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14							100		C-19 GP(C/B)		grades to poorly graded GRAVEL with cobbles and boulders.			
							32		C-20 GP(C)		grades to poorly graded GRAVEL with cobbles.			
15							100		C-21A		grades to poorly graded GRAVEL.			
50							100 1.6		C-21B		49.5 to 65 feet: Meta welded Lapilli Tuff, brownish to greenish gray, fine to medium grained, fresh, moderately strong (R3) to strong (R4) rock, none to weak HCl reaction. Discontinuities are closely spaced, and in poor to fair condition.			
16							89 1.7		C-22		49.5 feet: Strong (R4) rock. Discontinuities are closely spaced and in poor to fair condition. No HCl reaction. 50.0 feet: PLT - Very strong (R5) rock. Discontinuities are in fair condition. 52.0 feet: PLT - Moderately weak (R2) rock. 52.4 feet: PLT - Moderately strong (R3) rock.			
55							100 1.8		C-23		grades to strong (R4) to moderately strong (R3) rock. Weak HCl reaction.			
17														
18														
60							100 1.6		C-24		63.1 feet: PLT - Strong (R4) rock.			
19														
65														
20											Bottom of boring at 65.0 feet depth below ground surface. Backfilled to ground surface with bentonite chips.			
											Water level measurements (below existing ground surface): - 5/30/08 at 14:45: 20.0 feet.			
21														
70														

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0													
1													
5									SPT n=59/0.9'	Blow Counts/0.5' = 5, 9, 50/0.4' [n = 59/0.9', Recovery = 0.5'/1.4']			
10									SPT n=70	Blow Counts/0.5' = 13, 26, 44 [n = 70, Recovery = 0.8'/1.5']			
15									SPT n=50/0.1'	Blow Counts/0.5' = 50/0.1' [n = 50/0.1', Recovery = 0.1'/0.1']			
20							100 2.1	1					

ROCK NAF BOREHOLES_2007.GPJ 1/26/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								2		META-BASALT , medium bluish gray (5B 5/1) to greenish gray (5G 6/1), fine grained groundmass with fine to coarse grained phenocrysts (10 to 20%), fresh (I), strong (R4) rock, with moderate yellowish brown (10YR 5/4) rock enveloping discontinuities, discontinuities are closely spaced and in fair to good condition, discontinuities in very poor to poor condition occur at a 10% to 20% frequency. [Naches Formation]			
25								3		At 26.2 feet, becomes medium gray (N5), fine to coarse grained phenocrysts (5 to 15%), calcite healed discontinuities occur at 1 to 2 per foot			
30							R4 R4	4	PLT - D PLT - A	At 30.4 feet, becomes medium gray to olive gray (N5 - 5Y 4/1) rock, slightly weathered (II), zones of concentrated medium to coarse grained phenocryst alteration (20 to 35%), discontinuities become closely to moderately spaced and in very poor to good condition, discontinuities in poor to very poor condition occur at a 13 to 18% frequency, discontinuities in fair condition occur at a 40 to 45% frequency			
35								5		At 36.2 feet, becomes medium gray to pale brown (N5 - 5YR 5/2) rock			
40							R4 R4	6	PLT - A PLT - A	At 41.0 feet, discontinuities become moderately spaced and in poor to very poor condition			
45							R4		PLT - D				

ROCK NAF BOREHOLES_2007.GPJ 1/26/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14							$\frac{100}{1.2}$	R3	7	PLT - A	<p>META-BASALT, medium gray (N5) to pale brown (5YR 5/2), fine grained groundmass with fine to coarse grained phenocrysts (10 to 20%), fresh (I), strong (R4) rock, with moderate yellowish brown (10YR 5/4) rock enveloping discontinuities, discontinuities are moderately spaced and in poor to very poor condition, discontinuities in very poor to poor condition occur at a 10% to 20% frequency. [Naches Formation]</p> <p>At 49.3 feet, discontinuities become closely spaced and in poor to fair condition</p>		
15													
50								$\frac{98}{>5.1}$		8	<p>At 50.9 feet, gradational contact within meta-basalt flow, becomes medium gray to pale brown (N5 - 5YR 5/2) rock, fine to coarse grained phenocrysts (10 to 25%), discontinuities become moderately to closely spaced and in fair condition</p> <p>At 53.2 to 54.8 feet, discontinuities are closely spaced and in very poor condition</p>		
16									9	<p>At 54.9 feet, sharp to gradational contact within meta-basalt flow, becomes medium gray to dark greenish gray (N5 - 5G 4/1) rock, with zones of concentrated medium to coarse grained phenocryst alteration (20 to 35%), discontinuities become moderately to closely spaced and in good to fair condition</p>			
55							$\frac{90}{0.9}$	R4		PLT - A			
17								R3		PLT - D			
18													
60													
19													
65													
20													
21													
70													

ROCK NAF BOREHOLES_2007.GPJ 1/26/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0 - 4.9	0 - 1.5									<p>TOPSOIL/FOREST DUFF [TS], pedogenic soil, moss and root organics with fine to coarse sand and silt, very loose, moist. Advanced borehole using HWT with tri-cone advancer to approximately 4.9 feet bgs.</p> <p>POORLY-GRADED GRAVEL [GP - GM], fine to coarse GRAVEL, with cobbles, fine to coarse sand and silt, very dense, moderate yellowish brown (10YR 5/4), moist. [Alpine Till]</p>			
5.0 - 5.4	1.5 - 1.6							1		<p>SPT n=50/0.4'</p> <p>Blow Counts/0.5' = 28, 50/0.4' [n = 50/0.4', Recovery = 0.6'/0.9']</p>			
5.5 - 6.0	1.6 - 1.8							2					
6.1 - 11.0	1.8 - 3.3							3		<p>META-BASALT, medium dark gray to dark greenish gray (N4 - 5G 4/1), fine grained groundmass with fine to coarse grained phenocrysts (5 to 20%), slightly weathered (II), with moderate reddish brown to dark red brown (10R 4/6 - 10R 3/4) hematite infilled healing of very closely spaced discontinuities occurring greater than 10 per foot and in fair condition, extremely weak to very weak (R0 - R1) rock determined by strength of healed discontinuities, moderately weak to moderately strong (R2 - R3) groundmass between healed discontinuities, discontinuities are moderately to closely spaced and in fair to poor condition. [Ohanapcosh Formation]</p> <p>At 11.0 feet, discontinuities become closely to very closely spaced and in fair to very poor condition, discontinuities in poor to very poor condition occur at a 85 to 90% frequency</p>			
11.1 - 17.6	3.3 - 5.3							4					
17.7 - 20.0	5.3 - 6.1							5					
20.1 - 20.0	6.1 - 6.1												



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								6		<p>META-BASALT, medium dark gray to dark greenish gray (N4 - 5G 4/1), fine grained groundmass with fine to coarse grained phenocrysts (5 to 20%), fresh (I) to slightly weathered (II), with moderate reddish brown to dark red brown (10R 4/6 - 10R 3/4) hematite infilled healing of very closely spaced discontinuities occurring greater than 10 per foot and in fair condition, extremely weak to very weak (R0 - R1) rock determined by strength of healed discontinuities, moderately weak to moderately strong (R2 - R3) groundmass between healed discontinuities, discontinuities are moderately to closely spaced and in fair to poor condition. [Ohanapecosh Formation] At 24.7 feet, discontinuities become closely to very closely spaced and in very poor to fair condition</p> <p>At 30.0 feet, discontinuities become moderately to closely spaced and in fair to good condition</p> <p>At 33.4 feet, becomes moderately weak (R2) and discontinuities become very closely spaced</p> <p>At 35.5 feet, becomes medium dark gray to medium bluish gray (N4 - 5B 5/1), fine to coarse grained phenocrysts (2 to 13%), fresh (I), moderately weak to moderately strong (R2 - R3) rock, with moderate reddish brown to dark red brown (10R 4/6 - 10R 3/4) hematite infilled healing of very closely spaced discontinuities occurring greater than 10 per foot and in fair condition</p> <p>At 41.5 feet, discontinuities become closely spaced and in poor to fair condition</p> <p>At 43.0 feet, becomes medium dark gray (N4) rock, with moderate reddish brown (10R 4/6) mottling and banding occurring at 10 to 30%</p>			
25													
8								7					
30													
9													
35													
10							R3	8	PLT - A				
35													
11								9					
40													
12													
45													
13								10					
45								11					

ROCK NAF BOREHOLES_2007.GPJ 1/26/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
22											META-BASALT , medium dark gray to dark greenish gray to medium bluish gray (N4 - 5G 4/1 - 5B 5/1), fresh to slightly weathered (I - II), moderately strong (R3) rock, discontinuities become moderately to closely spaced and in fair to poor condition. [Ohanapecosh Formation]			
75	23										Borehole completed to 72.0 feet bgs on August 1, 2007. Borehole was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on August 7 and 21, 2007. Borehole completed with two vibrating wire piezometers at 51.5 feet and 62.3 feet bgs on August 24, 2007. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at approximately 2.2 feet bgs during drilling activities and at 12.4 feet on August 7, 2007 prior to beginning optical borehole survey.			
80	24										VWP #92091 = 50.0 to 51.5 feet bgs VWP #92055 = 60.8 to 62.3 feet bgs #10-20 silica sand filter pack was not used Grout mix from 0.0 to 72.0 feet bgs: 1 94 lb bag Type I-II Portland Cement 30 gallons water 25 lbs pure bentonite powder Well Tag # = APC 427			
85	26													
90	27													
95	28													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0	0							1		<p>TOPSOIL/FOREST DUFF [TS], pedogenic soil, moss and root organics with fine to coarse sand and silt, very loose, moist.</p> <p>POORLY-GRADED GRAVEL [GP - GM], fine to coarse GRAVEL, with cobbles, boulders, fine to coarse sand, and silt, trace root organics, very dense, light brown (5YR 6/4), moist. [Colluvium]</p>			
1	0.3												
5	1.5									<p>META-WELDED LAPILLI DACITE TUFF, olive gray (5Y 4/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli clasts (20 to 35%), slightly welded, fresh (I), moderately strong to strong (R3 - R4) rock, discontinuities are moderately spaced and in good to fair condition. [Ohanapecoh Formation]</p>			
2	0.6							2		At 7.5 feet, becomes olive gray to medium dark gray (5Y 4/1 - N4) rock			
10	3.0									At 10.0 to 11.5 feet, becomes fresh to slightly weathered (I - II) rock, discontinuities become closely spaced and in poor to very poor condition			
4	1.2							3					
15	4.5									At 15.0 to 15.8 feet, discontinuities become very closely spaced and in poor to very poor condition			
5	1.5												
20	6.0							4	PLT - D	Becomes medium dark gray (N4) rock, with olive gray (5Y 4/1) rock enveloping discontinuities, discontinuities become moderately to closely spaced and in very poor to good condition, discontinuities in poor to very poor condition occur at a 15 to 20% frequency			

ROCK NAF BOREHOLES_2007.GPJ 1/26/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								5		<p>META-WELDED LAPILLI DACITE TUFF, medium dark gray (N4) with olive gray (5Y 4/1) rock enveloping discontinuities, fine grained groundmass with fine to medium grained phenocrysts and lapilli clasts (20 to 35%), slightly welded, fresh (I), moderately strong to strong (R3 - R4) rock, discontinuities are moderately to closely spaced and in very poor to fair condition, discontinuities in poor to very poor condition occur at a 15 to 20% frequency. [Ohanapecosh Formation]</p>			
25						$\frac{100}{0.4}$	R4 R4	6	PLT - A PLT - D				
8						$\frac{100}{1.0}$		7		<p>At 32.6 feet, becomes greenish gray (5GY 6/1), slightly weathered (II), moderately strong (R3) rock, discontinuities become closely spaced and in poor to excellent condition, discontinuities in poor condition occur at a 13 to 18% frequency At 33.7 to 33.9 and 34.1 to 34.3 feet, moderately weak (R2) rock enveloping discontinuities, discontinuities become very closely spaced and in fair condition</p>			
30						$\frac{92}{4.3}$		8					
35						$\frac{100}{1.6}$	R3	9	PLT - D	<p>At 39.6 feet, becomes light olive to medium dark gray (5Y 5/2 - N4), fresh (I) rock, discontinuities become moderately to closely spaced and in very poor to good condition, discontinuities in poor to very poor condition occur at a 60 to 65% frequency</p>			
40						$\frac{98}{0.8}$							
45										At 42.0 feet, becomes moderately strong to strong (R3 - R4) rock			

ROCK NAF BOREHOLES_2007.GPJ 1/26/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14													
15													
50													
16													
55													
17													
18													
60													
19													
65													
20													
21													
70													

ROCK NAF BOREHOLES_2007.GPJ 1/26/09

META-WELDED LAPILLI DACITE TUFF, light olive to medium dark gray (5Y 5/2 - N4), fine grained groundmass with fine to medium grained phenocrysts and lapilli clasts (20 to 35%), slightly welded, fresh (I), moderately strong to strong (R3 - R4) rock, discontinuities become widely spaced and in fair to good condition. [Ohanapecosh Formation]
At 47.0 feet, becomes medium gray to greenish gray (N5 - 5GY 6/1), strong (R4) rock

At 52.0 feet, becomes medium gray to medium bluish gray (N5 - 5B 5/1) rock

At 63.2 feet, discontinuities become closely spaced and in fair condition

Borehole completed to 65.0 feet bgs on August 7, 2007. Borehole was flushed in preparation of optical and acoustical televiwer survey. Optical and acoustical televiwer survey completed on August 8, 2007. Groundwater was measured at approximately 14.1 feet bgs during drilling activities and at 40.3 feet on August 8, 2007 prior to beginning optical borehole survey. Borehole backfilled with cement grout on August 29, 2007.



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0	0									<p>TOPSOIL/FOREST DUFF [TS], pedogenic soil, moss and root organics with fine to coarse sand and silt, very loose, moist.</p> <p>SANDY SILT [ML], sandy SILT, some subrounded to subangular coarse sand and gravels, hard, light olive gray (5Y 5/2), moist, non-plastic to low-plasticity. [Alpine Till]</p>			
1	0.3												
5	1.5								SPT n=72	Blow Counts/0.5' = 7, 25, 47 [n = 72, Recovery = 0.9'/1.5']			
2	0.6												
10	3.0								SPT n=50/0.4'	Blow Counts/0.5' = 50/0.4' [n = 50/0.4', Recovery = 0.4'/0.4']			
4	1.2					95	R4	1	PLT - A	<p>META-BASALT, dark gray to grayish blackish red (N3 - 5R 4/2 - 5R 2/2), fine grained groundmass with fine to coarse grained phenocrysts (20 to 30%), slightly weathered (II), moderately strong to strong (R3-R4) rock, discontinuities are closely spaced and in fair to very poor condition, discontinuities in poor to very poor condition occur at a 38 to 43% frequency. [Ohanapechosh Formation]</p>			
4	1.2					97		2					
15	4.6						R2		PLT - D				
5	1.5					102		3					
5	1.5					2.2							
6	1.8						R4		PLT - D	<p>At 17.0 feet, becomes medium bluish gray to medium dark gray (5B 5/1 - N4), fine to coarse grained phenocrysts (5 to 7%), fresh to slightly weathered (I - II), very weak to moderately weak (R1 - R2) rock</p> <p>At 18.6 feet, becomes strong (R4) rock</p>			
20	6.1												

ROCK NAF BOREHOLES_2007.GPJ 1/26/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								4		At 20.3 to 20.7 feet, flow boundary observed, clay filled, with coarse sand, trace small wood fragments, discontinuity in very poor condition			
25								5		META-BASALT , medium bluish gray to medium dark gray (5B 5/1 - N4) with slightly weathered (II) light olive gray to medium dark gray (5Y 5/2 - N4) rock enveloping discontinuities, fine to coarse grained phenocrysts (3 to 15%), slightly weathered (II), moderately strong (R3) to strong (R4) rock, and discontinuities are moderately to closely spaced and in poor to very poor condition. [Ohanapecoh Formation]			
8								6		At 30.7 feet, becomes medium dark gray (N4), strong (R4) rock, with slightly weathered (II), light olive gray (5Y 5/2) rock enveloping discontinuities			
30								7		At 35.4 to 36.0 feet, discontinuity in very poor condition			
35								8		At 36.0 feet, becomes medium bluish gray to medium dark gray (5B 5/ - N4), fresh (I), moderately weak (R2) rock, with slightly weathered (II), light olive gray to medium dark gray (5Y 5/2 - N4) rock enveloping discontinuities, discontinuities become moderately to closely spaced and in good to fair condition			
40										At 39.0 feet, becomes strong (R4) rock			
12													
13													

ROCK NAF BOREHOLES_2007.GPJ 1/26/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14								9		META-BASALT , medium bluish gray to medium dark gray (5B 5/1 - N4), fine to coarse grained phenocrysts (3 to 15%), fresh (I), strong (R4) rock, and discontinuities are closely to very closely spaced and in good condition. [Ohanapecosh Formation] At 46.6 feet, becomes moderately weak (R2) rock			
15							R4		PLT - A				
50								10		At 50.0 feet, becomes dark gray to grayish blackish red (N3 - 5R 4/2 - 5R 2/2), slightly weathered (II), moderately weak (R2) to moderately strong (R3) rock, fine to coarse grained phenocrysts (20 to 35%) and discontinuities become closely spaced and in fair to poor condition, discontinuities in fair condition occur at a 15 to 20% frequency.			
16								11					
55								12					
17								13					
18							R2		PLT - D	META-LAPILLI DACITE TUFF , dark greenish gray (5G 4/1), fine grained groundmass with fine to coarse grained phenocrysts and lapilli-sized entrained clasts (20 to 40%), fresh to slightly weathered (I - II), moderately strong (R3) rock, discontinuities become moderately to closely spaced and in good condition. [Ohanapecosh Formation]			
60													
19													
65													
20													
21													
70													

ROCK NAF BOREHOLES_2007.GPJ 1/26/09



Start Card RE02065

Job No. 03-2007 SR 90 Elevation 2614.1 ft (796.8 m)

HOLE No. RKS-06-07

Sheet 1 of 4

Project 2007 I-90 Geotechnical New Alignment Feasibility Investigation

Driller R. Gregory/S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector M. Hommeyer

Start August 7, 2007 Completion August 10, 2007 Well ID# RKS-06-07 Equipment Skid-Mounted Burley 5500-1

Station 1346+76 Offset 67 Feet Left Casing Stick-up Monument Method HQ3 Triple Tube Wireline

Northing 739623.95 Easting 1425254.44 Latitude 47°21'29.595"N Longitude 121°22'05.202"W

County Kittitas Subsection SE Quarter Section 26 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										<p>TOPSOIL/FOREST DUFF [TS], pedogenic soil, moss and root organics with fine to coarse sand and silt, very loose, moist.</p> <p>SANDY SILT [ML], sandy SILT, with gravels, hard, yellowish gray to light olive gray (5Y 7/2 - 5Y 5/2), moist, non-plastic to low-plasticity. [Colluvium]</p>			
1													
5									SPT n=50	Blow Counts/0.5' = 22, 50/0.3' [n = 50/0.3', Recovery = 0.5'/0.8']			
2							48 N/A	1					
										POORLY-GRADED SAND [SP - SM] , fine to coarse SAND, some gravels, with cobbles and silt, loose, light olive-gray (5Y 5/2), dry. [Alpine Till ?]			
10							130 N/A	2					
							50	3	SPT n=20	Blow Counts/0.5' = 6, 7, 13 [n = 20, Recovery = 0.0'/1.5']			
							89 N/A	4		SANDY SILT [ML] , sandy SILT, with gravels, hard, light olive gray (5Y 5/2), moist, non-plastic. [Alpine Till]			
15							12.5	5	SPT n=6	Blow Counts/0.5' = 3, 4, 2 [n = 6, Recovery = 0.3'/1.5']			
							100 N/A	6					
20													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
									SPT n=54/0.8'	Blow Counts/0.5' = 16, 14, 40/0.3' [n = 54/0.8', Recovery = 0.8'/1.3']			
						0.0		7					
						121 N/A		8					
7						1.8 N/A		9					
						138 0.0		10					
25						98 0.6		11		META-BASALT , olive gray to dark greenish gray (5Y 4/1 - 5G 4/1), fine grained groundmass with fine to coarse grained phenocrysts (5 to 15%), fresh (I) to slightly weathered (II), moderately strong to strong (R3-R4) rock, discontinuities are moderately to closely spaced and in good to excellent condition. [Ohanapecosh Formation]			
8													
9										At 29.0 to 29.8 feet, becomes strong (R3) rock, discontinuities become closely spaced and in poor to very poor condition			
30													
						102 1.2		12		At 31.1 to 31.6 feet, becomes moderately weak (R2) rock, discontinuities become very closely to closely spaced and in fair condition			
10													
35									R3	PLT - D			
						98 1.2		13		At 35.8 feet, healed discontinuities occur at 0 to 1 per foot			
11													
40													
						103 0.3		14					
12													
45													
						105 1.0		15		PLT - D			
13									R4				

ROCK NAF BOREHOLES_2007.GPJ 1/26/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14								16		<p>META-BASALT, olive gray to dark greenish gray (5Y 4/1 - 5G 4/1), fine grained groundmass with fine to coarse grained phenocrysts (5 to 15%), fresh (I), moderately strong (R3) rock, discontinuities are very closely spaced and in fair condition. [Ohanapecosh Formation]</p> <p>At 46.4 feet, becomes medium bluish gray to dark greenish gray (5B 5/1 - 5G 4/1), fresh (I), strong (R4) rock, discontinuities become very widely to widely spaced and in good condition</p>			
15								17		<p>At 50.8 feet, becomes medium bluish gray (5B 5/1) rock, fine to coarse grained phenocrysts (<5%), healed discontinuities occur at 0 to 2 per foot</p>			
50								17		<p>META-WELDED LAPILLI DACITE TUFF, dark greenish gray (5G 4/1), fine grained groundmass with fine to coarse grained phenocrysts and lapilli-sized clasts (10 to 30%), slightly welded, slightly weathered (II), moderately weak to moderately strong (R2-R3) rock, discontinuities become very widely to widely spaced and in good condition. [Ohanapecosh Formation]</p>			
55								18		<p>At 58.4 feet, becomes moderately weak (R2) rock</p>			
17								18					
18								19	PLT - D				
60								19					
19								19					
65								20		<p>META-BASALT, dark greenish gray to brownish black (5G 4/1 - 5YR 2/1), fine grained groundmass with fine to medium grained phenocrysts (5 to 10%), fresh to slightly weathered (I - II), moderately weak to moderately strong (R2 - R3) rock, possible dike, discontinuities become very widely to widely spaced and in good condition. [Ohanapecosh Formation]</p>			
20								20	PLT - D	<p>META LAPILLI DACITE TUFF, greenish gray to dark greenish gray (5GY 6/1 - 5GY 4/1), fine grained groundmass with fine to coarse grained phenocrysts and lapilli-sized clasts (25 to 50%), fresh (I), moderately strong (R3) rock, discontinuities become very widely to widely spaced and in good condition. [Ohanapecosh Formation]</p>			
21													
70													

ROCK NAF BOREHOLES_2007.GPJ 1/26/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22							R3	21	PLT - D	META LAPILLI DACITE TUFF , greenish gray to dark greenish gray (5GY 6/1 - 5G 4/1), fine grained groundmass with fine to coarse grained phenocrysts and lapilli-sized entrained clasts (25 to 50%), fresh (I), moderately strong (R3) rock, discontinuities become very widely to widely spaced and in good condition. [Ohanapecosh Formation]			
75							R3	22	PLT - D				
23							R3	22	PLT - D				
24							R3		PLT - D				
80								23		At 80.0 to 82.2 feet, becomes very weak to moderately weak (R1 - R2) rock, discontinuities become closely spaced in poor to very poor condition			
25								24		At 82.6 to 85.4 feet, becomes moderately strong to strong (R3 - R4) rock, discontinuities become closely spaced in poor to very poor condition			
85								24					
26										Borehole completed to 85.4 feet bgs on August 10, 2007. Borehole was overcased with HWT casing to 25.4 feet bgs and was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on August 10, 2007. Borehole completed with two vibrating wire piezometers at 25.7 feet and 84.0 feet bgs on August 11, 2007. Refer to well construction diagram and below for as-built construction details. Groundwater level measurements taken during drilling and the optical borehole survey activities are not available.			
27													
90										VWP #92057 = 24.2 to 25.7 feet bgs VWP #92090 = 82.5 to 84.0 feet bgs #10-20 silica sand filter pack from 73.9 to 85.4 feet bgs Grout mix from 0.0 to 73.9 feet bgs: 1 94 lb bag Type I-II Portland Cement 30 gallons water 25 to 30 lbs pure bentonite powder Well Tag # = APC 429			
28													
95													

ROCK NAF BOREHOLES_2007.GPJ 1/26/09



Start Card SE01785

Job No. 03-2007 SR 90 Elevation 2648.8 ft (807.4 m)

HOLE No. RKS-07-07

Sheet 1 of 4

Project 2007 I-90 Geotechnical New Alignment Feasibility Investigation

Driller S. Wilson/S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector A. Shriver

Start August 15, 2007 Completion August 23, 2007 Well ID# Not Applicable Equipment Skid-Mounted Burley 5500-2

Station 1350+61 Offset 150 Feet Left Casing Not Applicable Method HQ3 Triple Tube Wireline

Northing 739359.1 Easting 1425562.91 Latitude 47°21'27.015"N Longitude 121°22'00.680"W

County Kittitas Subsection SE Quarter Section 26 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0	0									<p>TOPSOIL/FOREST DUFF [TS], pedogenic soil, moss and root organics with fine to coarse sand and silt, very loose, moist.</p> <p>POORLY-GRADED GRAVEL [GP - GM], fine to coarse GRAVEL, with cobbles, boulders, fine to coarse sand and silt, medium dense to very dense, moist. [Colluvium]</p>			
1	1												
5	5								SPT n=19	Blow Counts/0.5' = 11, 10, 9 [n = 19, Recovery = 0.4'/1.5']			
2	2												
10	10								SPT n=35	Blow Counts/0.5' = 10, 12, 23 [n = 35, Recovery = 0.7'/1.5']			
4	4												
15	15								SPT n=75	Blow Counts/0.5' = 20, 26, 49 [n = 75, Recovery = 0.9'/1.5']			
5	5												
20	20												

ROCK NAF BOREHOLES_2007.GPJ 1/26/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7									SPT n=22	Blow Counts/0.5' = 9, 8, 14 [n = 22, Recovery = 0.9'/1.5']			
25													
8													
9													
30													
10									SPT n=29	Blow Counts/0.5' = 11, 14, 15 [n = 29, Recovery = 0.5'/1.5']			
35													
11													
40													
12									SPT n=21	Blow Counts/0.5' = 19, 12, 9 [n = 21, Recovery = 0.3'/1.5']			
45													
13									SPT n=50/0.0'	Blow Counts/0.5' = 50/0.0' [n = 50/0.0', Recovery = 0.0'/0.0']			



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14													
15									SPT n=50/0.4'	Blow Counts/0.5' = 50/0.4' [n = 50/0.4', Recovery = 0.4'/0.4']			
50										POORLY-GRADED GRAVEL [GP - GM] , fine to coarse GRAVEL, with cobbles, boulders, fine to coarse sand and silt, medium dense to very dense, moist. [Alpine Till]			
16									SPT n=50/0.3'	Blow Counts/0.5' = 26, 50/0.3' [n = 50/0.3', Recovery = 0.5'/0.8']			
55													
17													
18									SPT n=35	Blow Counts/0.5' = 23, 15, 20 [n = 35, Recovery = 0.9'/1.5']			
60													
19									SPT n=50/0.4'	Blow Counts/0.5' = 50/0.4' [n = 50/0.4', Recovery = 0.3'/0.4']			
65										META-WELDED LAPILLI DACITE TUFF , medium gray (N5), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (20 to 45%), slightly welded, fresh (I), moderately strong to strong (R3 - R4) rock, discontinuities become moderately to closely spaced and in good to poor condition, discontinuities in poor condition occur at a 12 to 17% frequency. [Ohanapecosh Formation]			
20									PLT - A PLT - D				
21										At 67.0 feet, becomes medium gray to olive gray (N5 - 5Y 4/1) rock, healed discontinuities occur at 1 to 3 per foot			
70													

ROCK NAF BOREHOLES_2007.GPJ 1/26/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22								3		<p>META-WELDED LAPILLI DACITE TUFF, dark gray to olive gray (N3 - 5Y 4/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (20 to 45%), slightly welded, fresh (I), strong (R4) rock, discontinuities become closely spaced at moderately spaced intervals and in good to very poor condition, discontinuities in poor to very poor condition occur at a 25 to 30% frequency. [Ohanapecosh Formation]</p> <p>At 81.8 feet, becomes medium dark gray (N4), very strong (R5) rock</p>			
75								4					
23													
24							R5		PLT - D				
80													
25								5					
85													
26													
27							R5		PLT - A				
90													
28										<p>Borehole completed to 91.4 feet bgs on August 23, 2007. Borehole was flushed in preparation of optical and acoustical televiewer survey and was completed on August 23, 2007. Groundwater was measured at approximately 66.1 feet bgs during drilling activities. Groundwater level measurements taken during the optical borehole survey activities are not available. Borehole backfilled with cement grout on September 5, 2007.</p>			
95													

ROCK NAF BOREHOLES_2007.GPJ 1/26/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0 - 1	0 - 0.3	[Pattern]								<p>TOPSOIL/FOREST DUFF [TS], pedogenic soil, moss and root organics with fine to coarse sand and silt, very loose, moist. Advanced borehole using HWT with tri-cone advancer to approximately 5.0 feet bgs.</p> <p>SILTY SAND [SM], silty, fine to coarse SAND, some gravels and cobbles, loose, pale yellowish brown (10YR 6/2), dry. [Colluvium]</p>			
1 - 2	0.3 - 0.6	[Pattern]						1	SPT N=29	<p>POORLY-GRADED SAND [SP - SC], fine to medium SAND, with gravels and clay, medium dense to dense, dark yellowish orange to moderate yellowish brown (10YR 6/6 - 10YR 6/2), moist. [Colluvium] Blow Counts/0.5' = 5, 17, 12 [N = 29, Recovery = 0.5'/1.5']</p>			
2 - 10	0.6 - 3.0	[Pattern]					R2 R2	2	PLT - A PLT - D	<p>META-WELDED LAPILLI DACITE TUFF, olive gray to dark greenish gray (5Y 4/1 - 5G 4/1), fine grained groundmass with fine to coarse grained phenocrysts and lapilli-sized clasts (10 to 30%), slightly welded, fresh to slightly weathered (I - II), moderately weak to moderately strong (R2 - R3) rock, discontinuities are moderately to closely spaced and in good condition. [Ohanapecosh Formation] At 10.0 feet, becomes moderately strong (R3) rock</p>			
10 - 15	3.0 - 4.5	[Pattern]						3		<p>At 15.0 feet, becomes dark greenish gray (5G 4/1), slightly weathered (II), moderately weak to moderately strong (R2 - R3) rock</p>			
15 - 20	4.5 - 6.0	[Pattern]					R3 R3		PLT - A PLT - D				

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								4		META-WELDED LAPILLI DACITE TUFF , greenish gray to dark greenish gray (5G 6/1 - 5GY 4/1), fine grained groundmass with fine to coarse grained phenocrysts and lapilli-sized clasts (10 to 30%), slightly welded, fresh to slightly weathered (I - II), moderately weak to moderately strong (R2 - R3) rock, discontinuities are widely spaced and in good condition. [Ohanapecosh Formation]			
25								5		At 24.4 to 24.7 feet, discontinuity in very poor condition At 25.0 feet, healed discontinuities occur at 0 to 2 per foot			
8								6		At 27.8 to 28.2 feet, discontinuity in poor condition			
9								7	PLT - D	At 30.0 to 32.0 feet, becomes light olive gray to olive gray (5Y 5/2 - 5Y 4/1), slightly weathered (II), moderately weak to moderately strong (R2 - R3) rock			
30								8	R3 R3	At 34.0 becomes greenish gray to dark greenish gray (5G 6/1 - 5GY 4/1), fresh (I), moderately strong to strong (R3 - R4) rock			
10								9		At 40.0 feet, becomes moderately weak (R2) and discontinuities become moderately to closely spaced and in excellent to good condition			
35													
11													
40													
12													
45													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14		[Hatched pattern]					$\frac{100}{1.0}$	R4 R2	10	PLT - A PLT - D	<p>META-WELDED LAPILLI DACITE TUFF, greenish gray to dark greenish gray (5G 6/1 - 5GY 4/1), fine grained groundmass with fine to coarse grained phenocrysts and lapilli-sized clasts (10 to 30%), slightly welded, fresh to slightly weathered (I - II), extremely weak (R0) to very weak (R1) rock, discontinuities are closely spaced and in very poor condition. [Ohanapecosh Formation]</p> <p>At 48.0 feet, becomes fresh (I), moderately strong to strong (R3 - R4) rock, discontinuities become moderately to closely spaced and in poor to good condition, discontinuities in poor condition occur at a 5 to 10% frequency</p> <p>At 50.6 feet, becomes moderately weak (R2) rock</p> <p>At 52.0 to 52.8 feet, healed discontinuities become closely spaced</p>	[Vertical line]	[Vertical line]
50						$\frac{100}{3.4}$		11					
16													
55							$\frac{100}{1.2}$	R3	12	PLT - D			
18		[Hatched pattern]					$\frac{102}{0.8}$		13		[Vertical line]	[Vertical line]	
60													
19		[Hatched pattern]									[Vertical line]	[Vertical line]	
65							$\frac{102}{>2.7}$	R3	14	PLT - D			At 65.0 feet, becomes moderately strong (R3) rock
20		[Hatched pattern]									[Vertical line]	[Vertical line]	
21													At 67.2 to 68 feet bgs - becomes moderately weak (R2) rock
70		[Hatched pattern]									[Vertical line]	[Vertical line]	

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22								15		META-WELDED LAPILLI DACITE TUFF , greenish gray to dark greenish gray (5G 6/1 - 5GY 4/1), fine grained groundmass with fine to coarse grained phenocrysts and lapilli-sized clasts (10 to 30%), slightly welded, fresh to slightly weathered (I - II), moderately strong (R3) rock, discontinuities are closely spaced and in fair condition. [Ohanapecosh Formation]			
							R2		PLT - D				
75	23							16					
							R2		PLT - A				
										At 77.0 feet, discontinuities become moderately to very closely spaced and in good condition			
80								17					
							R3 R3		PLT - D PLT - A				
										At 81.0 feet, becomes moderately weak (R2) rock, discontinuities become very closely			
85	26							18					
										At 83.8 to 84.5 feet, becomes very weak (R1) rock, discontinuities in poor condition			
										At 85.0 feet, discontinuities become moderately to very closely spaced and in fair to good condition			
90								19					
										At 91.0 to 92.0 feet, becomes moderately weathered (III), very weak rock (R1) rock, discontinuities in very poor condition			
95													
							R2		PLT - D				

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument								
			20	40	60	80															
29								20		META-WELDED LAPILLI DACITE TUFF , greenish gray to dark greenish gray (5G 6/1 - 5GY 4/1), fine grained groundmass with fine to coarse grained phenocrysts and lapilli-sized clasts (10 to 30%), slightly welded, fresh (I), moderately weak (R2) to moderately strong (R3) rock, discontinuities are moderately to closely spaced and in poor to fair condition. [Ohanapecoh Formation]											
30																					
100																					
31								21	PLT - A												
32																					
105																					
33										<p>Borehole completed to 105.0 feet bgs on August 15, 2007. Borehole was flushed in preparation of optical and acoustical televiwer survey. Optical and acoustical televiwer survey completed on August 22, 2007. Borehole completed with two vibrating wire piezometers at 53.0 feet and 100.5 feet bgs on September 12, 2007. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at 83.4 feet on August 22, 2007 prior to beginning optical borehole survey.</p> <p>VWP #88219 = 51.5 to 53.0 feet bgs VWP #92271 = 99.0 to 100.5 feet bgs #10-20 silica sand filter pack from 88.0 to 105.0 feet bgs Grout mix from 0.0 to 88.0 feet bgs: 1 94 lb bag Type I-II Portland Cement 30 gallons water 25 lbs pure bentonite powder Well Tag # = APC 425</p>											
34																					
110																					
35																					
36																					
115																					
36																					
120																					

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Start Card RE02067

Job No. 03-2007 SR 90 Elevation 2620.3 ft (798.7 m)

HOLE No. RKS-09-07

Sheet 1 of 6

Project 2007 I-90 Geotechnical New Alignment Feasibility Investigation

Driller R. Gregory/S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector M. Hommeyer

Start August 20, 2007 Completion August 22, 2007 Well ID# RKS-09-07 Equipment Skid-Mounted Burley 5500-1

Station 1363+61 Offset 80 Feet Left Casing Stick-up Monument Method HQ3 Triple Tube Wireline

Northing 738097.98 Easting 1426001.89 Latitude 47°21'14.616"N Longitude 121°21'54.104"W

County Kittitas Subsection NE Quarter Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
0	0										<p>TOPSOIL/FOREST DUFF [TS], pedogenic soil, moss and root organics with fine to coarse sand and silt, very loose, moist. Advanced borehole using HWT with tri-cone advancer to approximately 6.1 feet bgs.</p> <p>SILTY SAND [SM], silty, fine to coarse SAND, some gravels and cobbles, loose, pale yellowish brown (10YR 6/2), moist. [Colluvium]</p> <p>META-WELDED LAPILLI DACITE TUFF, yellowish gray to pale olive to light olive gray (5Y 7/2 - 10Y 6/2 - 5Y 5/2), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (10 to 30%), slightly welded, slightly weathered (II), moderately weak (R2) rock, discontinuities are moderately to closely spaced at widely to moderately spaced intervals and in excellent to good condition. [Ohanapecoh Formation]</p>			
1	0.3								1					
5	1.5								2					
2	0.6						100	0.7						
3	0.9						98	1.0						
10	3.0						R2			PLT - D				
4	1.2						98	0.8		3				
15	4.5										At 12.5 feet, becomes light olive gray to moderate yellowish brown (5Y 5/2 - 10YR 5/4) rock			
5	1.5													
6	1.8						102	0.4		4				
20	6.1						R2			PLT - D PLT - A				

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								5		META-WELDED LAPILLI DACITE TUFF , yellowish gray to pale olive to light olive gray (5Y 7/2 - 10Y 6/2 - 5Y 5/2), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (10 to 30%), slightly welded, slightly weathered (II), moderately weak (R2) to moderately strong (R3) rock, discontinuities are moderately to closely spaced at widely to moderately spaced intervals and in excellent to good condition. [Ohanapecosh Formation]			
25										At 25.5 feet, discontinuity in very poor condition			
8								6		At 27.5 feet, becomes fresh (I) to slightly weathered (II) and moderately weak (R2) to moderately strong (R3) rock			
9									PLT - D PLT - A				
30													
10								7		At 34.0 feet, becomes pale olive to greenish gray to dark greenish gray (10Y 6/2 - 5GY 6/1 - 5GY 4/1), fresh (I) rock, and discontinuity in fair condition.			
35													
11								8		At 38.0 feet, becomes greenish gray to dark greenish gray (5GY 6/1 - 5GY 4/1) rock			
40									PLT - A PLT - D				
12													
13								9		At 43.5 to 43.9 feet, healed discontinuities become very closely spaced			
45									PLT - A PLT - D				

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14										<p>META-WELDED LAPILLI DACITE TUFF, greenish gray to dark greenish gray (5GY 6/1 - 5GY 4/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (10 to 30%), slightly welded, slightly weathered (II), moderately weak (R2) to moderately strong (R3) rock, discontinuities are moderately to closely spaced at widely to moderately spaced intervals and in good condition. [Ohanapcosh Formation]</p>			
						$\frac{100}{0.6}$		10					
15										<p>At 52.5 feet, becomes pale olive to light olive gray (10Y 6/2 - 5Y 5/2), slightly weathered (II), moderately weak (R2) rock, discontinuities are very closely to closely spaced and in poor to good condition, discontinuities in poor condition occur at a 3 to 8% frequency, discontinuities in fair condition occur at a 20 to 25% frequency</p>			
50						$\frac{100}{>3.2}$		11					
16										<p>At 58.6 feet, becomes greenish gray to dark greenish gray (5GY 6/1 - 5GY 4/1), fresh (I), moderately strong (R3) rock</p> <p>At 60.0 to 61.6 feet, becomes moderately weak (R2) rock, discontinuities become very closely spaced and in good to very poor condition, discontinuities in very poor condition occur at a 45 to 55% frequency</p>			
55						$\frac{98}{>3.3}$	R3 R2	12	PLT - A PLT - D				
17										<p>At 67.5 feet, healed discontinuities become closely to very closely spaced occurring at 4 to 10 per foot</p> <p>At 68.5 to 69.0 feet bgs - discontinuity in very poor condition</p>			
						$\frac{100}{>2.4}$	R3 R3	13	PLT - A PLT - D				
18													
60						$\frac{102}{>2.4}$		14					
19													
65													
20													
21													
70													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22								15		<p>META-WELDED LAPILLI DACITE TUFF, greenish gray to dark greenish gray (5GY 6/1 - 5GY 4/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (10 to 30%), slightly welded, fresh (I), moderately strong (R3) rock, discontinuities are moderately to closely spaced and in fair to good condition. [Ohanapecosh Formation]</p> <p>At 81.0 feet, healed discontinuities occur at 3 to 6 per foot</p> <p>At 83.6 feet, discontinuities become moderately to closely spaced and in good condition, healed discontinuities occur at 0 to 3 per foot</p>			
75								16					
23													
24								17					
80													
25													
85													
26													
27													
90													
28													
95													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29										<p>META-WELDED LAPILLI DACITE TUFF, greenish gray to dark greenish gray (5GY 6/1 - 5GY 4/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (10 to 30%), slightly welded, fresh (I), moderately strong (R3) rock, discontinuities are moderately to closely spaced and in good condition. [Ohanapecosh Formation]</p> <p>At 98.6 to 99.0 feet, discontinuities in fair condition</p>			
						$\frac{102}{0.6}$		21					
30													
						$\frac{100}{0.4}$	R3	22	PLT - D				
31													
100													
						$\frac{102}{1.2}$		23					
32													
105													
						$\frac{100}{1.4}$		24					
33													
110													
							R3 R2	25	PLT - A PLT - D				
34													
115						$\frac{100}{0.0}$							
35													
36													
120													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



LOG OF TEST BORING

Start Card RE02067

Job No. 03-2007

SR 90

Elevation 2620.3 ft (798.7 m)

HOLE No. RKS-09-07

Sheet 6 of 6

Project 2007 I-90 Geotechnical New Alignment Feasibility Investigation

Driller R. Gregory/S. Tunison Lic# 2628

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
37											<p>Borehole completed to 120.0 feet bgs on August 22, 2007. Borehole was flushed in preparation of optical and acoustical televiwer survey. Optical and acoustical televiwer survey completed on September 4, 2007. Borehole completed with one vibrating wire piezometer at 69.5 feet bgs on September 13, 2007. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at 87.8 feet on September 4, 2007 prior to beginning optical borehole survey.</p> <p>VWP #88131 = 68.0 to 69.5 feet bgs #10-20 silica sand filter pack was not used Grout mix from 0.0 to 120.0 feet bgs: 1.94 lb bag Type I-II Portland Cement 30 gallons water 25 to 30 lbs pure bentonite powder Well Tag # = APC 423</p>			
125	38													
39														
130	40													
41														
135	42													
43														
140	43													
44														
145	44													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										<p>TOPSOIL/FOREST DUFF [TS], pedogenic soil, moss and root organics with fine to coarse sand and silt, very loose, moist. Advanced borehole using HWT with tri-cone advancer to approximately 7.0 feet bgs.</p> <p>SILTY SAND [SM], silty fine to coarse SAND, some gravels and cobbles, loose, pale yellowish brown (10YR 6/2), moist. [Colluvium]</p>			
1										<p>META-WELDED LAPILLI DACITE TUFF, yellowish gray to light olive gray (5Y 7/2 - 5Y 6/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 45%), slightly welded, slightly to moderately weathered (II - III), very weak (R1) rock, discontinuities are moderately to closely spaced and in good condition. [Ohanapecoh Formation]</p>			
5								1		<p>$\frac{92}{1.2}$</p>			
10								2		<p>$\frac{102}{0.8}$</p> <p>At 10.7 feet, becomes slightly weathered (II), very weak to moderately weak (R1 - R2) rock</p>			
15										<p>At 13.7 to 14.0 feet, discontinuity in very poor condition</p>			
20								3		<p>$\frac{98}{0.8}$</p> <p>At 15.7 feet becomes moderately weak (R2) rock</p>			

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								4	PLT - D	META-WELDED LAPILLI DACITE TUFF , yellowish gray to light olive gray (5Y 7/2 - 5Y 6/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 45%), slightly welded, slightly weathered (II), moderately weak (R2) rock, discontinuities are moderately to closely spaced and in good condition. [Ohanapecoh Formation]			
25								5		At 25.7 feet, becomes greenish gray to pale olive (5GY 6/1 - 10Y 6/2) rock			
30								6		At 30.7 feet, becomes greenish gray (5GY 6/1), slightly to moderately weathered (II - III) rock			
35								7	PLT - D				
40								8					
41								9		At 40.7 feet, becomes greenish gray (5GY 6/1 - 5G 6/1), fresh (I) rock At 41.4 to 41.6 feet, discontinuity in poor condition			
45													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14								10		<p>META-WELDED LAPILLI DACITE TUFF, greenish gray to light olive gray (5GY 6/1 - 5Y 6/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 45%), slightly welded, fresh (I), moderately weak (R2) rock, discontinuities are moderately to closely spaced and in good condition. [Ohanapecosh Formation]</p> <p>At 52.0 feet, discontinuities become moderately to closely spaced at widely spaced intervals and in good to fair condition</p>			
15							R1	11					
50								12					
16								13					
55								14					
17								15					
18													
60													
19													
65													
20													
21													
70													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22								16		META-WELDED LAPILLI DACITE TUFF , greenish gray to light olive gray (5GY 6/1 - 5Y 6/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 45%), slightly welded, fresh (I), moderately weak (R2) rock, discontinuities are moderately to closely spaced and in good condition. [Ohanapecosh Formation]			
75						$\frac{102}{0.2}$	R2		PLT - A				
23							R2	17	PLT - D				
24						$\frac{100}{0.0}$							
80						$\frac{100}{0.4}$		18					
25													
85						$\frac{100}{0.2}$		19					
27							R3 R3		PLT - D PLT - A				
90						$\frac{96}{0.4}$		20					
28													
95													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument	
			20	40	60	80								
29		[Hatched pattern]					$\frac{102}{0.8}$	R2 R1	21	PLT - A PLT - D	META-WELDED LAPILLI DACITE TUFF , greenish gray to light olive gray (5GY 6/1 - 5Y 6/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 45%), slightly welded, fresh (I), moderately weak (R2) rock, discontinuities are moderately to closely spaced and in good condition. [Ohanapecosh Formation]	[Hatched pattern]	[Hatched pattern]	
30														
100							$\frac{102}{0.4}$		22					At 100.7 feet, becomes moderately weak to moderately strong (R2 - R3) rock and discontinuity in very poor condition
31														
105							$\frac{100}{0.4}$	R2 R2						PLT - D PLT - A
32		[Hatched pattern]							23					
33														
110							$\frac{98}{0.6}$			24				
34		[Hatched pattern]												
35							$\frac{100}{1.4}$	R2 R1						
115														
36		[Hatched pattern]												
120								R3				PLT - A		

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



LOG OF TEST BORING

Start Card RE02067

Job No. 03-2007

SR 90

Elevation 2653.3 ft (808.7 m)

HOLE No. RKS-10-07

Sheet 7 of 7

Project 2007 I-90 Geotechnical New Alignment Feasibility Investigation

Driller R. Gregory/S. Tunison Lic# 2628

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
45											VWP #92272 = 137.0 to 138.5 feet bgs #10-20 silica sand filter pack from 125.0 to 140.7 feet bgs Grout mix from 0.0 to 125.0 feet bgs: 1.94 lb bag Type I-II Portland Cement 30 gallons water 25 lbs pure bentonite powder Well Tag # = APC 424			
150														
46														
155														
47														
160														
48														
165														
49														
50														
51														
170														



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										<p>TOPSOIL/FOREST DUFF [TS], pedogenic soil, moss and root organics with fine to coarse sand and silt, very loose, moist. Advanced borehole using HWT with tri-cone advancer to approximately 1.4 feet bgs.</p>			
1						100		1		<p>SILTY SAND [SM], silty fine to coarse SAND, some gravels and cobbles, loose, pale yellowish brown (10YR 6/2), moist. [Colluvium]</p>			
5						96		2					
2						2.7		3		<p>META-WELDED LAPILLI DACITE TUFF, olive gray (5Y 4/1 - 5Y 3/2), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 50%), slightly welded, fresh to slightly weathered (I - II), moderately strong (R3) rock, discontinuities are moderately to closely spaced and in fair to good condition, discontinuities in fair condition occur at 10 to 50% frequency, healed discontinuities occur at 4 to 8 per foot. [Ohanapecosh Formation]</p>			
10						98		4			At 9.3 feet, discontinuity in very poor condition and discontinuities occur at 1 to 3 per foot		
4						0.8		5					
15						102				<p>At 15.4 feet, becomes slightly weathered (II) rock</p>			
5						0.6							
20													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument		
			20	40	60	80									
7		△△△△△	[Hatched Rock Quality Designation]				100 0.6	R2	6	PLT - D	<p>META-WELDED LAPILLI DACITE TUFF, olive gray (5Y 4/1 - 5Y 3/2), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 50%), slightly welded, slightly weathered (II), moderately strong (R3) rock, discontinuities are moderately to closely spaced and in poor to fair condition, discontinuities in fair condition occur at 10 to 50% frequency. [Ohanapecoh Formation]</p> <p>At 28.6 to 28.8 feet, discontinuity in poor to very poor condition</p> <p>At 40.4 feet becomes light olive gray to greenish gray (5Y 5/2 - 5GY 6/1) rock</p>				
25		△△△△△											102 2.0	7	
8		△△△△△													8
30		△△△△△											100 0.6		9
35		△△△△△						10							
10		△△△△△						11							
40		△△△△△						12							
11		△△△△△						13							
45		△△△△△						14							
		△△△△△						15							
		△△△△△						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							

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14		[Hatched pattern]					$\frac{96}{0.8}$	R2	11	PLT - D			
15													
50							$\frac{98}{0.0}$	12					
16													
55		[Hatched pattern]					$\frac{102}{1.6}$	R2	13	PLT - A			
17													
18													
60		[Hatched pattern]					$\frac{100}{0.6}$	14		At 60.4 feet, becomes dark greenish gray (5GY 4/1), fresh (I), strong (R4) rock			
19													
65		[Hatched pattern]					$\frac{98}{1.0}$	R3	15	PLT - D	At 65.4 feet, becomes dark greenish gray to medium dark gray (5GY 4/1 - N4) rock		
20													
21		[Dotted pattern]											
70													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22								16		META-WELDED LAPILLI DACITE TUFF , dark greenish gray to medium dark gray (5GY 4/1 - N4), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 50%), slightly welded, slightly weathered (II), fresh (I), strong (R4) rock, discontinuities are moderately to closely spaced and in poor to good condition, discontinuities in poor condition occur at 30 to 35% frequency, discontinuities in fair condition occur at 10 to 50% frequency. [Ohanapecosh Formation]			
75							R5	17	PLT - A	At 75.4 feet, becomes olive gray (5Y 4/1), strong to very strong (R4 - R5) rock			
24							R4	18	PLT - D	At 80.4 feet, becomes medium dark gray to dark gray (N4 - N3), discontinuities become moderately to closely spaced in fair condition	▼		
80							R4	19	PLT - D	At 85.4 to 86.0 feet, healed discontinuities are very closely spaced			
25								20					
85													
26													
27													
90													
28													
95							R5		PLT - D				

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29			[Hatched pattern]				$\frac{96}{2.3}$		21		<p>META-WELDED LAPILLI DACITE TUFF, medium dark gray to dark gray (N4 - N3), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 50%), slightly welded, slightly weathered (II), fresh (I), strong (R4) to very strong (R5) rock, discontinuities become moderately to closely spaced and in fair to very poor condition, discontinuities in poor to very poor condition occur at 30 to 35%. [Ohanapecosh Formation]</p> <p>At 98.0 feet, becomes dark gray (N3), slightly weathered (II), moderately strong (R3) rock</p> <p>At 99.4 feet, becomes fresh to slightly weathered (I - II), strong (R4) rock</p> <p>At 102.2 feet, becomes fresh (I), strong to very strong (R4 - R5) rock</p> <p>At 105.4 feet, becomes dark gray to olive gray (N3 - 5Y 5/2) rock and healed discontinuities occur very closely spaced</p>		
30			[Hatched pattern]										
100			[Hatched pattern]				$\frac{98}{1.4}$		22				
31			[Hatched pattern]										
105			[Hatched pattern]				$\frac{100}{1.6}$		23				
32			[Hatched pattern]										
33			[Hatched pattern]										
110			[Hatched pattern]				$\frac{102}{1.4}$		24				
34			[Hatched pattern]										
115			[Hatched pattern]				$\frac{98}{0.8}$		25				
35			[Hatched pattern]										
36			[Hatched pattern]										
120			[Hatched pattern]										

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument	
			20	40	60	80								
37							100 1.0	R5 R5	26	PLT - D PLT - A	<p>META-WELDED LAPILLI DACITE TUFF, dark gray to olive gray (N3 - 5Y 5/2), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 50%), slightly welded, slightly weathered (II), fresh (I), strong (R4) to very strong (R5) rock, discontinuities become moderately to closely spaced and in fair to very poor condition, discontinuities in poor to very poor condition occur at 30 to 35%. [Ohanapecosh Formation]</p>			
125	38					38 0.0		27						
						114 0.8		28				At 126.2 feet, becomes olive gray to medium dark gray (5Y 4/1 - N4) rock		
130	39							29				At 132.0 feet, discontinuities become moderately to closely spaced and in fair to good condition		
	40					94 0.6		30						
135	41					104 1.2	R4 R5	30	PLT - A PLT - D		At 135.4 feet, becomes very strong (R5) rock			
140	42													
	43					98 0.6	R4 R4	31	PLT - D PLT - A					
145	44													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
		△·△·	[Hatched Area]					[Hatched Area]			<p>Borehole completed to 145.4 feet bgs on July 29, 2007. Borehole was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on August 9, 2007. Groundwater was measured at approximately 11.2 feet bgs during drilling activities and at 82.5 feet on August 9, 2007 prior to beginning optical borehole survey. Borehole backfilled with cement grout on September 21, 2007.</p>		
45													
150													
46													
47													
155													
48													
160													
49													
50													
165													
51													
170													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0													
1							R3	1	PLT - D	META-WELDED LAPILLI DACITE TUFF , olive gray (5Y 4/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 50%), slightly welded, slightly weathered (II), moderately strong (R3) rock, discontinuities are moderately to closely spaced and in poor to good condition, discontinuities in poor condition occur at a 5 to 10% frequency. [Ohanapcosh Formation]			
5							R1	2	PLT - A				
2													
10							R4	3	PLT - D	At 8.0 feet, becomes medium dark gray to olive gray (N4 - 5Y 4/1), fresh to slightly weathered (I - II), strong (R4) rock, discontinuities become moderately to closely spaced and in good to very poor condition, discontinuities in poor to very poor condition occur at a 18 to 23% frequency			
15							R4	4	PLT - A				
4													
5							R5	5	PLT - A	At 18.0 feet, becomes fresh (I) rock			
20													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14										META-WELDED LAPILLI DACITE TUFF , medium dark gray to olive gray (N4 - 5Y 4/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 50%), slightly welded, slightly weathered (II), moderately weak to moderately strong (R2 - R3) rock, discontinuities become closely spaced and in poor to good condition, discontinuities in poor condition occur at a 10 to 15% frequency. [Ohanapecosh Formation]			
						$\frac{90}{0.0}$		12					
15													
						$\frac{104}{0.6}$	R3	13	PLT - D				
50													
16													
						$\frac{96}{1.0}$		14					
55										At 54.0 feet, discontinuities become moderately to closely spaced and in very poor to fair condition, discontinuities in poor to very poor condition occur at a 35 to 40% frequency			
17													
							R2		PLT - D				
18						$\frac{100}{1.2}$		15		At 59.0 feet, becomes moderately strong (R3) rock			
60													
19													
						$\frac{100}{2.4}$		16					
65													
20													
										At 67.0 feet, healed discontinuities decrease in occurrence			
21						$\frac{102}{1.4}$	R4	17	PLT - D				
70													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22										<p>META-WELDED LAPILLI DACITE TUFF, medium dark gray (N4), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 50%), slightly welded, fresh (I), very strong (R5) rock, discontinuities become moderately to closely spaced and in very poor to fair condition, discontinuities in poor to very poor condition occur at a 35 to 40% frequency. [Ohanapecoh Formation]</p>			
75						$\frac{98}{0.8}$		18					
23													
24						$\frac{102}{0.8}$		19					
80							R5		PLT - A				
25						$\frac{96}{1.3}$		20		At 84.0 feet, discontinuities become moderately to closely spaced and in fair to good condition, discontinuities in fair condition occur at a 15 to 45% frequency			
85													
27						$\frac{98}{>1.6}$		21		At 89.0 feet, becomes slightly weathered (II), strong (R4) rock			
90													
28						$\frac{98}{>1.6}$		22		At 94.0 feet, becomes fresh to slightly weathered (I - II) rock			
95													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29										<p>META-WELDED LAPILLI DACITE TUFF, medium dark gray (N4), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 50%), slightly welded, fresh to slightly weathered (I - II), strong (R4) rock, discontinuities become moderately to closely spaced and in very poor to good condition, discontinuities in poor to very poor condition occur at a 18 to 23% frequency. [Ohanapecosh Formation]</p>			
30								23					
100													
31													
105													
32													
33													
110													
34													
115													
35													
36													
120													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
37													
125	38					$\frac{114}{0.6}$		28			META-WELDED LAPILLI DACITE TUFF , medium dark gray (N4), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 50%), slightly welded, fresh (I), strong to very strong (R4 - R5) rock, discontinuities become moderately to closely spaced and in very poor to good condition, discontinuities in poor to very poor condition occur at a 18 to 23% frequency. [Ohanapecosh Formation]		
39						$\frac{115}{0.0}$		29			At 128.4 feet, becomes very strong (R5) rock		
130							R5		PLT - A				
40											Borehole completed to 130.4 feet bgs on September 4, 2007. Borehole was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on September 6, 2007. Borehole completed with one vibrating wire piezometer at 127.4 feet bgs on September 8, 2007. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at approximately 54.3 feet bgs during drilling activities and at 103.4 feet on September 6, 2007 prior to beginning optical borehole survey.		
41	135										VWP #92273 = 125.9 to 127.4 feet bgs #10-20 silica sand filter pack from 108.0 to 130.4 feet bgs Grout mix from 0.0 to 108.0 feet bgs: 1 94 lb bag Type I-II Portland Cement 30 gallons water 25 to 30 lbs pure bentonite powder Well Tag # = APC 420		
42													
140													
43													
44													
145													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										<p>TOPSOIL/FOREST DUFF [TS], pedogenic soil, moss and root organics with fine to coarse sand and silt, very loose, moist. Advanced borehole using HWT with tri-cone advancer to approximately 6.0 feet bgs.</p> <p>SILTY SAND [SM], silty, fine to coarse SAND, some gravels, trace organics, medium dense to dense, grayish orange to dark yellowish orange (10YR 7/4 - 10YR 6/6), dry. [Colluvium]</p> <p>Blow Counts/0.5' = 10, 25/0.1' [N = 25/0.1', Recovery = 0.6'/0.7']</p> <p>META-WELDED LAPILLI DACITE TUFF, pale olive to light olive gray (10Y 62 - 5y 5/2) with moderate yellowish brown to dark yellowish orange (10YR 5/4 - 10YR 6/6) staining, fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 45%), slightly welded, moderately to highly weathered (III - IV), very weak (R1) rock, discontinuities are moderately to closely spaced and in fair to poor condition. [Ohanapecossh Formation]</p> <p>At 6.5 feet, becomes moderately weathered (III), moderately weak (R2) rock</p> <p>At 8.0 feet, becomes highly weathered (IV), very weak (R1) rock</p> <p>At 8.5 feet becomes moderately weathered (III), very weak to moderately weak (R1 - R2) rock</p>			
1									SPT N=25/0.2				
5													
2								1					
10								2					
15								3					
4								4					
5								5					
6								6					
20													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14							R4 R1		PLT - A PLT - D	META-WELDED LAPILLI DACITE TUFF , light bluish gray to medium gray (5B 7/1 - N5) with moderate yellowish brown to dark yellowish orange (10YR 5/4 - 10YR 6/6) staining, fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 45%), slightly welded, fresh to slightly weathered (I - II), moderately weak to moderately strong (R2 - R3) rock enveloping discontinuities, discontinuities become moderately to closely spaced and in good to poor condition, discontinuities in poor condition occur at a 35 to 40% frequency. [Ohanapecoh Formation]			
15						$\frac{136}{0.6}$		13					
50										At 50.3 feet becomes moderately weathered (III) rock			
16						$\frac{68}{1.2}$	R3	14	PLT - A	At 52.3 feet, becomes grayish blue (5PB 5/2) when fresh (I) rock			
55						$\frac{100}{0.8}$		15		At 53.9 to 56.0 feet, becomes moderately weathered to highly weathered (III - IV), extremely weak to very weak (R0 - R1) rock			
17													
18						$\frac{100}{0.6}$	R3 R4	16	PLT - D PLT - A	At 59.0 feet, becomes grayish blue green (5BG 5/2) when fresh (I) rock, and moderate yellowish brown (10YR 5/4) when slightly weathered (II) rock			
60													
19													
65						$\frac{100}{2.2}$		17		At 63.7 to 63.9 feet, becomes highly weathered (IV), extremely weak (R0) rock, discontinuities become closely spaced and in very poor condition At 64.2 feet, becomes moderately weathered (III), very weak (R1) rock, discontinuity in very poor condition At 65.6 feet, becomes highly weathered (IV), extremely weak (R0) rock, discontinuities become very closely spaced and in poor to very poor condition			
20													
21						$\frac{98}{2.0}$		18					
70													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22										META-WELDED LAPILLI DACITE TUFF , grayish blue green (5BG 5/2), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 45%), slightly welded, fresh to slightly weathered (I - II), moderately strong (R3) rock, discontinuities become moderately to closely spaced and in fair to very poor condition, discontinuities in poor to very poor condition occur at a 15 to 20% frequency. [Ohanapecoh Formation]			
75	23					$\frac{108}{0.9}$	R3 R3	19	PLT - A PLT - D				
24						$\frac{96}{1.0}$		20		At 77.9 feet becomes slightly weathered (II), very weak (R1) rock			
80							R4		PLT - D	At 79.9 to 80.0 feet, discontinuity in good condition At 80.6 feet, becomes fresh (I), moderately strong (R3) rock			
25						$\frac{98}{1.0}$		21					
85	26												
27						$\frac{102}{1.0}$		22					
90							R4 R3		PLT - D PLT - A				
28						$\frac{69}{0.3}$		23		At 93.5 feet, becomes moderately strong to strong (R3 - R4) rock			
95													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
29		[Pattern: Triangles]	[Pattern: Diagonal Lines]									<p>META-WELDED LAPILLI DACITE TUFF, grayish green (5G 5/2), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 45%), slightly welded, moderately to highly weathered (III - IV), extremely weak to very weak (R0 - R1) rock, discontinuities become closely spaced and in good to very poor condition, discontinuities in poor to very poor condition occur at a 75 to 80% frequency. [Ohanapecosh Formation]</p>	[Pattern: Dotted]	[Pattern: Vertical Lines]
30						$\frac{76}{4.2}$		24						
100							$\frac{100}{1.2}$		25					
31							$\frac{96}{1.0}$	R3	26	PLT - D				
105		[Pattern: Triangles]	[Pattern: Diagonal Lines]									[Pattern: Dotted]	[Pattern: Vertical Lines]	
32											<p>At 102.2 feet, becomes moderately weathered (III), very weak (R1) rock</p> <p>At 103.5 feet, becomes fresh (I), moderately weak to moderately strong (R2 - R3) rock</p> <p>At 105.6 to 106.3 feet, becomes highly weathered (III), extremely weak (R0) rock, discontinuity in very poor condition</p>			
33							R3			PLT - A PLT - D				
110											<p>Borehole completed to 108.5 feet bgs on September 9, 2007. Borehole was flushed in preparation of optical and acoustical televiwer survey. Optical and acoustical televiwer survey completed on September 26, 2007. Borehole completed with two vibrating wire piezometers at 70.5 feet and 106.5 feet bgs on October 4, 2007. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at approximately 28.6 feet bgs during drilling activities and at 105.9 feet on September 26, 2007 prior to beginning optical borehole survey.</p> <p>VWP #92058 = 69.0 to 70.5 feet bgs VWP #92079 = 105.0 to 106.5 feet bgs #10-20 silica sand filter pack from 94.8 to 108.5 feet bgs Grout mix from 0.0 to 94.8 feet bgs: 1.94 lb bag Type I-II Portland Cement 30 gallons water 25 to 30 lbs pure bentonite powder Well Tag # = APC 418</p>			
34														
115														
35														
36														
120														

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											<p>TOPSOIL/FOREST DUFF [TS], pedogenic soil, moss and root organics with fine to coarse sand and silt, very loose, moist. Advanced borehole using HWT with tri-cone advancer to approximately 4.3 feet bgs.</p> <p>SANDY SILT [ML], sandy SILT, with coarse sand and gravels, trace organics, soft, pale yellowish brown to yellowish gray (10YR 6/2 - 5Y 7/2), dry. [Colluvium]</p> <p>META-WELDED LAPILLI DACITE TUFF, greenish gray to dusky yellow (5GY 6/1 - 5G 6/1 - 5GY 5/2), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 45%), slightly welded, slightly weathered (II), moderately strong to strong (R3 - R4) rock, discontinuities are moderately to closely spaced and in fair to good condition. [Ohanapecosh Formation]</p>			
1									1					
5														
2														
10									2					
3														
4														
15														
5									3					
6														
20														

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								4		META-WELDED LAPILLI DACITE TUFF , greenish gray to medium bluish gray (5G 6/1 - 5B 5/1) with dusky yellow (5GY 5/2) weathering envelopes, fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 45%), slightly welded, fresh (I), strong to very strong (R4 - R5) rock, discontinuities are moderately to closely spaced and in fair to good condition. [Ohanapecosh Formation]			
25										At 24.0 feet, discontinuities become very widely to moderately spaced and in fair to good condition			
8								5	R5 PLT - D	At 25.8 feet, becomes very strong (R5) rock			
9													
30								6	R5 PLT - A				
10									R4 PLT - D				
35													
11								7					
40									R4 PLT - D				
12													
45								8					
13													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14								9		<p>META-WELDED LAPILLI DACITE TUFF, greenish gray to medium bluish gray (5G 6/1 - 5B 5/1) with dusky yellow (5GY 5/2) weathering envelopes, fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 45%), slightly welded, fresh (I), strong (R4) rock, discontinuities are moderately to closely spaced and in fair to good condition. [Ohanapecoh Formation]</p> <p>At 60.0 feet, discontinuities become moderately to closely spaced at moderately spaced intervals and in very poor to good condition, discontinuities in poor to very poor condition occur at a 25 to 30% frequency</p> <p>At 65.8 feet, becomes light bluish to medium bluish gray to medium light gray (5B 7/1 - 5B 5/1 - N6), fresh (I), moderately weak to moderately strong (R2 - R3) rock, with dusky yellow (5GY 5/2), slightly weathered (II), moderately weak to moderately strong (R2- R3) rock enveloping discontinuities</p>			
						$\frac{98}{0.2}$	R4		PLT - D PLT - A				
15							R4						
50								10					
16						$\frac{98}{0.2}$							
55							R4		PLT - D				
17						$\frac{102}{0.4}$		11					
18							R4		PLT - D PLT - A				
60						$\frac{100}{1.0}$		12					
19						$\frac{100}{0.0}$		13					
65						$\frac{100}{1.1}$		14					
20						$\frac{96}{>1.5}$		15					
21													
70													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22								16	PLT - D	<p>META-WELDED LAPILLI DACITE TUFF, light bluish to medium bluish gray to medium light gray (5B 7/1 - 5B 5/1 - N6) with dusky yellow (5GY 5/2) weathering envelopes, fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 45%), slightly welded, fresh (I), moderately weak to moderately strong (R2 - R3) rock, discontinuities are moderately to closely spaced at moderately spaced intervals and in very poor to good condition, discontinuities in poor to very poor condition occur at a 25 to 30% frequency. [Ohanapecosh Formation]</p> <p>At 79.6 to 80.0 feet, becomes yellowish gray to light olive gray to olive gray (5GY 5/1 - 5GY 6/1 - 5Y 4/1), moderately weathered (III), very weak (R1) rock</p> <p>At 80.5 feet, becomes slightly to moderately weathered (II - III), very weak to moderately weak (R1 - R2) rock</p> <p>At 84.6 feet, becomes fresh (I), moderately strong (R3) rock</p>			
23								17					
24								18					
25								19					
26								20					
27									PLT - D PLT - A				
28													
95													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument	
			20	40	60	80								
29		[Hatched pattern]					$\frac{102}{1.2}$	R3	21	PLT - D	<p>META-WELDED LAPILLI DACITE TUFF, light bluish to medium bluish gray to medium light gray (5B 7/1 - 5B 5/1 - N6) with dusky yellow (5GY 5/2) weathering envelopes, fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 45%), slightly welded, slightly to moderately weathered (II - III), very weak to moderately weak (R1 - R2) rock, discontinuities are moderately to closely spaced at moderately spaced intervals and in very poor to good condition, discontinuities in poor to very poor condition occur at a 25 to 30% frequency. [Ohanapecosh Formation]</p> <p>At 97.3 feet, becomes medium bluish gray to medium light gray (5B 5/1 - N6), fresh (I), moderately strong (R3 - R4) rock, with dusky yellow (5GY 5/2), slightly weathered (II), moderately weak to moderately strong (R2 - R3) rock enveloping discontinuities, discontinuities become moderately to closely spaced at moderately spaced intervals and in very poor to good condition, discontinuities in poor to very poor condition occur at a 25 to 30% frequency</p>			
30														
100														
31							$\frac{98}{1.4}$	R3	22	PLT - D				
105														
32						$\frac{102}{1.0}$	R3	23	PLT - D					
110														
33														
110						$\frac{100}{1.2}$	R5	24	PLT - D					
34														
115						$\frac{104}{1.2}$	R5	25	PLT - D					
35														
120														
36														
120														

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
37								26		<p>META-WELDED LAPILLI DACITE TUFF, light bluish to medium bluish gray to medium light gray (5B 7/1 - 5B 5/1 - N6) with dusky yellow (5GY 5/2) weathering envelopes, fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 45%), slightly welded, fresh (I), very strong (R5) rock, with slightly weathered (II), moderately strong (R3) rock enveloping discontinuities, discontinuities are moderately to closely spaced and in good to poor condition, discontinuities in poor condition occur at a 38 to 43% frequency. [Ohanapecoh Formation]</p>			
125	38						R5	PLT - 1					
39									27				
130													
40										<p>Borehole completed to 130.0 feet bgs on September 5, 2007. Borehole was flushed in preparation of optical and acoustical televiwer survey. Optical and acoustical televiwer survey completed on September 7, 2007. Groundwater was measured at approximately 25.6 feet bgs during drilling activities and at 92.4 feet on September 7, 2007 prior to beginning optical borehole survey. Borehole backfilled with cement grout on October 5, 2007.</p>			
135													
42													
140													
43													
145													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0	0							1		<p>TOPSOIL/FOREST DUFF [TS], pedogenic soil, moss and root organics with fine to coarse sand and silt, very loose, moist.</p> <p>POORLY-GRADED GRAVEL [GP - GM], fine to coarse GRAVEL, with fine to coarse sand and silt, with organics, medium dense to dense, grayish orange to dark yellowish orange (10YR 7/4 - 10YR 6/6), moist. [Colluvium]</p>			
5	5					138	R1	2	PLT - D	<p>META-WELDED LAPILLI DACITE TUFF, dark yellowish orange to pale yellowish brown (10YR 6/6 - 10YR 6/2), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (20 to 50%), slightly welded, moderately weathered (III), very weak (R1) rock, discontinuities are moderately to closely spaced and in very poor to good condition, discontinuities in poor to very poor condition occur at 45 to 50% frequency. [Ohanapecoh Formation]</p>			
10	10				94	3							
15	15				>0.6	4							
20	20					98		5		At 13.0 feet, becomes moderately to highly weathered (III - IV) rock			



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14										META-WELDED LAPILLI DACITE TUFF , pale olive to dark yellowish orange (10Y 6/2 - 10YR 6/6), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (20 to 50%), slightly welded, fresh to slightly weathered (I - II), moderately strong to strong (R3 - R4) rock, discontinuities become closely to very closely spaced at moderately spaced intervals and in poor to good condition, discontinuities in fair condition occur at a 5 to 20% frequency, discontinuities in poor condition occur at 5 to 10% frequency. [Ohanapecoh Formation]			
15						100 >2.0		11					
50										At 51.7 feet, becomes moderately weathered (III), moderately weak (R2) rock			
16						102 0.8	R3	12	PLT - D				
55													
17						103 0.8	R4	13	PLT - D				
60													
18						107 0.0		14					
65													
19						102 0.4	R4	15	PLT - A				
70										At 66.8 feet, becomes greenish gray (5G 6/1), fresh (I), strong (R4) rock, with pale olive to dark yellowish orange (10Y 6/2 - 10YR 6/6), fresh to slightly weathered (I - II), moderately strong to strong (R3 - R4) rock enveloping discontinuities			
21						102 0.2		16					

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29													
							R2		PLT - A	<p>META-WELDED LAPILLI DACITE TUFF, pale blue to pale green to medium light gray (5B 6/2 - 10G 6/2 - N6), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (20 to 50%), slightly welded, fresh (I), strong (R4) rock, with pale olive to dark yellowish orange (10Y 6/2 - 10YR 6/6), fresh (I), strong (R4) rock, with light brown to pale yellowish brown (10YR 6/2 - 5YR 5/6), slightly weathered (II), moderately strong to strong (R3 - R4) rock enveloping discontinuities, discontinuities become closely to very closely spaced at widely to moderately spaced intervals and in good to very poor condition, discontinuities in good condition occur at a 5 to 20% frequency, discontinuities in poor to very poor condition occur at a 20 to 25% frequency. [Ohanapecoh Formation]</p> <p>At 101.7 feet, becomes medium gray to greenish gray (N5 - 5GY 6/1) when fresh (I) rock</p>			
30						$\frac{96}{0.6}$		22					
100							R4		PLT - D				
31						$\frac{100}{0.0}$		23					
105							R5		PLT - D				
32						$\frac{98}{0.0}$		24					
110													
33						$\frac{104}{1.0}$		25					
115													
34							R4		PLT - A				
35						$\frac{100}{2.2}$	R4	26	PLT - D				
36													
120													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
45										<p>META-WELDED LAPILLI DACITE TUFF, medium gray to medium bluish gray (N5 - 5B 5/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (20 to 50%), fresh (I), strong (R4) rock, discontinuities become moderately to closely spaced and in good to poor condition, discontinuities in poor condition occur at a 10 to 30% frequency. [Ohanapecoh Formation]</p> <p>At 149.2 feet, discontinuities becomes moderately spaced with slickensides observed</p>			
150						102/0.0		32					
46													
155						100/0.0		33					
47													
160													
48													
165													
49													
170													
50										<p>Borehole completed to 163.2 feet bgs on September 13, 2007. Borehole was advanced at an angle 80 degrees from horizontal with a direction of 029 degrees. Borehole was overcased with HWT casing to 6.9 feet bgs and was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on September 18, 2007. Borehole completed with two vibrating wire piezometers at 84.5 and 158.5 feet bgs on September 20, 2007. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at approximately 39.7 feet bgs during drilling activities and at 81.1 feet on September 18, 2007 prior to beginning optical borehole survey.</p> <p>VWP #88130 = 83.0 to 84.5 feet bgs VWP #92269 = 157.0 to 158.5 feet bgs #10-20 silica sand filter pack from 138.0 to 163.2 feet</p>			
165													
51													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



LOG OF TEST BORING

Start Card RE02069

Job No. 03-2007

SR 90

Elevation 2624.6 ft (800.0 m)

HOLE No. RKS-15-07

Sheet 8 of 8

Project 2007 I-90 Geotechnical New Alignment Feasibility Investigation

Driller S. Wilson/S. Tunison Lic# 2628

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
52											bgs Grout mix from 0.0 to 138.0 feet bgs: 1 94 lb bag Type I-II Portland Cement 30 gallons water 25 to 30 lbs pure bentonite powder Well Tag # = APC 422			
53														
175														
54														
180														
55														
56														
185														
57														
190														
58														
59														
195														



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0	0									<p>TOPSOIL/FOREST DUFF [TS], pedogenic soil, moss and root organics with fine to coarse sand and silt, very loose, moist. Advanced borehole using HWT with tri-cone advancer to approximately 8.4 feet bgs.</p> <p>SANDY SILT [ML], fine to coarse sandy SILT, some organics, trace gravels, medium stiff, dark yellowish orange to moderate yellowish brown (10YR 6/6 - 10Y 5/4), moist. [Colluvium]</p> <p>SPT N=5 Blow Counts/0.5' = 2, 2, 3 [N = 5, Recovery = 0.4'/1.5']</p>			
10	3					78 2.1		1		<p>META-WELDED LAPILLI DACITE TUFF, yellowish gray to pale olive (5Y 7/2 - 10Y 6/2), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 45%), slightly welded, slightly to moderately weathered (II - III), very weak (R1) rock, discontinuities are moderately to closely spaced and in good to fair condition, discontinuities in good condition occur at a 10 to 30% frequency. [Ohanapecosh Formation]</p>			
15	4					102 >3.0		2		<p>At 13.2 feet, discontinuity in poor condition</p>			
20	6					100 >1.6	R1	3	PLT - D	<p>At 16.0 feet, becomes slightly weathered (II), very weak to moderately weak (R1 - R2) rock</p> <p>At 18.9 feet, becomes moderately weathered (III), extremely weak to very weak (R0 - R1) rock, discontinuities in very poor to poor condition</p>			

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								4		<p>META-WELDED LAPILLI DACITE TUFF, dark yellowish orange to moderate yellowish brown (10YR 6/6 - 10Y 5/4), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 45%), slightly welded, slightly to moderately weathered (II - III), very weak (R1) rock, discontinuities in very poor to poor condition. [Ohanapecosh Formation]</p> <p>At 23.0 feet, becomes slightly weathered (II) and very weak (R1) rock</p>			
25							R3	5	PLT - D				
8										<p>At 27.0 feet, becomes light bluish gray to medium light gray (5B 7/1 - N6), fresh (I), moderately weak to moderately strong (R2 - R3) rock, with moderate brown (5YR 4/4 - 5YR 3/4), slightly weathered (II), very weak to moderately weak (R1 - R2) rock enveloping discontinuities</p>			
30								6					
10							R4		PLT - D				
35										<p>At 34.0 feet, becomes slightly weathered (II), moderately weak (R2) rock</p>			
11								7					
40										<p>At 37.4 feet, becomes slightly to moderately weathered (II - III), very weak (R1) rock, discontinuities in poor condition</p> <p>At 39.0 feet, discontinuities become moderately spaced and in poor condition</p>			
12										<p>At 40.2 feet, becomes slightly to moderately weathered (II - III), moderately weak (R2) rock, discontinuities in poor condition</p>			
13													
45													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14		[Hatched pattern]					100 0.0	R3 R3	9	PLT - D PLT - A	<p>META-WELDED LAPILLI DACITE TUFF, light bluish gray to medium gray (5B 7/1 - N5), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 45%), slightly welded, fresh (I), moderately strong (R3) rock, with moderate brown to light brown (5YR 4/4 - 5YR 5/6), slightly weathered (II), moderately strong (R3) rock enveloping discontinuities, discontinuities become moderately to closely spaced at widely spaced intervals and in very poor to good condition, discontinuities in poor to very poor condition occur at a 10 to 15% frequency, discontinuities in fair condition occur at a 5 to 20% frequency. [Ohanapecoh Formation]</p>		
15													
50							100 0.6		10				
16													
55		[Hatched pattern]					98 0.6	R4 R4	11	PLT - A PLT - D			
17													
18		[Hatched pattern]					100 0.2		12				
60													
19								R4		PLT - D			
65		[Hatched pattern]					100 >0.8		13				
20													
21		[Hatched pattern]						R5		PLT - A			
70													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22								14		<p>META-WELDED LAPILLI DACITE TUFF, medium bluish gray to greenish gray to dark greenish gray (5B 5/1 - 5G 6/1 - 5G 4/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 45%), slightly welded, fresh (I), strong (R4) rock, discontinuities become moderately to closely spaced at widely spaced intervals and in very poor to good condition, discontinuities in poor to very poor condition occur at a 10 to 15% frequency, discontinuities in fair condition occur at a 5 to 20% frequency. [Ohanapecosh Formation]</p>			
75	23						102 / 0.6	15	PLT - D PLT - A				
80	24						100 / 0.0	16					
85	25						100 / 0.0	17					
90	26						100 / 0.0	18	PLT - A				
95	28						100 / 0.4			<p>At 93.4 feet, becomes greenish gray to olive gray (5GY 6/1 - 5Y 4/1), slightly weathered (II), moderately strong (R3) rock</p>			

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
37							R5 R4	24	PLT - A PLT - D	<p>META-WELDED LAPILLI DACITE TUFF, greenish gray to olive gray (5GY 6/1 - 5Y 4/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 45%), slightly welded, slightly weathered (II), moderately strong to strong (R3 - R4) rock, Discontinuities become moderately to closely spaced at widely spaced intervals and in very poor to good condition, discontinuities in poor to very poor condition occur at a 10 to 15% frequency, discontinuities in fair condition occur at a 5 to 20% frequency. [Ohanapecosh Formation]</p> <p>At 128.2 feet, becomes light gray to medium gray to yellowish gray (N7 - N5 - 5Y 8/1), fresh (I), moderately strong to strong (R3 - R4) rock, with olive gray to dark greenish gray (5Y 4/1 - 5GY 4/1), slightly weathered (II), moderately weak to moderately strong (R2 - R3) rock enveloping discontinuities</p> <p>At 133.3 feet, becomes moderately strong (R3) when fresh (I) rock</p>			
125	38							25					
130	39						R4 R4	26	PLT - A PLT - D				
135	41						R3 R5 R3	27	PLT - D PLT - A PLT - D				
140	42												
143	43									<p>Borehole completed to 140.2 feet bgs on August 29, 2007. Borehole was flushed in preparation of optical and acoustical televiwer survey. Optical and acoustical televiwer survey completed on September 7, 2007. Groundwater was measured at approximately 59.9 feet bgs during drilling activities and at 58.5 feet on September 7, 2007 prior to beginning optical borehole survey. Borehole backfilled with cement grout on October 5, 2007.</p>			
145	44												

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Start Card SE01782

Job No. 03-2007 SR 90 Elevation 2650.7 ft (807.9 m)

HOLE No. RKS-17-07

Sheet 1 of 5

Project 2007 I-90 Geotechnical New Alignment Feasibility Investigation

Driller R. Gregory/S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector M. Hommeyer

Start August 23, 2007 Completion August 25, 2007 Well ID# Not Applicable Equipment Skid-Mounted Burley 5500-1

Station 1394+81 Offset 105 Feet Left Casing Not Applicable Method HQ3 Triple Tube Wireline

Northing 734999.95 Easting 1426313.65 Latitude 47°20'44.075"N Longitude 121°21'49.083"W

County Kittitas Subsection SE Quarter Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0	0									<p>TOPSOIL/FOREST DUFF [TS], pedogenic soil, moss and root organics with fine to coarse sand and silt, very loose, moist. Advanced borehole using HWT with tri-cone advancer to approximately 2.7 feet bgs.</p> <p>SANDY SILT [ML], fine to coarse sandy SILT, with gravels and boulders, some organics, trace gravels, medium stiff, dark yellowish orange to moderate yellowish brown (10YR 6/6 - 10Y 5/4), moist. [Colluvium]</p>			
1	0.3					$\frac{38}{N/A}$		1					
5	1.5					$\frac{50}{2.4}$		2					
10	3.0					$\frac{98}{2.0}$		3		<p>META-WELDED LAPILLI DACITE TUFF, light olive gray to light greenish gray (5Y 6/1 - 5GY 8/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 45%), slightly welded, slightly weathered (II), very weak to moderately weak (R1 - R2) rock, discontinuities are very closely to closely spaced and in poor to fair condition. [Ohanapecosh Formation]</p>			
15	4.5					$\frac{100}{2.2}$	R1	4	PLT - D	At 12.0 feet, becomes moderately weak (R2) rock			
20	6.0					$\frac{100}{0.2}$		5					

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7							R4		PLT - A	<p>META-WELDED LAPILLI DACITE TUFF, light gray to medium light gray (N7 - N6), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 45%), slightly welded, fresh (I), moderately strong (R3) rock, with yellowish gray to light olive gray (5Y 8/1 - 5Y 6/1), slightly weathered (II), moderately weak (R2) rock enveloping discontinuities, discontinuities become widely spaced and in good to very poor condition, discontinuities in poor to very poor condition occur at a 55 to 65% frequency. [Ohanapechosh Formation]</p>			
25						$\frac{98}{0.6}$		6					
8							R3		PLT - D	<p>At 26.6 feet, discontinuities become very closely to closely spaced and in very poor condition</p>			
9						$\frac{102}{0.2}$		7					
30										<p>At 30.7 feet, becomes light gray to medium gray (N7 - N5), moderately strong to strong (R3 - R4) when fresh (I) rock</p>			
10						$\frac{96}{0.2}$		8					
35													
11													
40						$\frac{100}{0.0}$	R3 R4	9	PLT - D PLT - A				
12													
13													
45						$\frac{104}{0.0}$		10					

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14										META-WELDED LAPILLI DACITE TUFF , light gray to medium light gray (N7 - N6), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 45%), slightly welded, fresh (I), moderately strong to strong (R3 - R4) rock, with yellowish gray to light olive gray (5Y 8/1 - 5Y 6/1), slightly weathered (II), moderately weak (R2) rock enveloping discontinuities, discontinuities become widely spaced and in good to very poor condition, discontinuities in poor to very poor condition occur at a 55 to 65% frequency. [Ohanapecosh Formation]			
15													
50													
16													
55													
17													
18													
60													
19													
65													
20													
21													
70													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
29		[Hatched pattern]					100	R4		21	PLT - D PLT - A	<p>META-WELDED LAPILLI DACITE TUFF, light gray to medium light gray (N7 - N6), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 45%), slightly welded, fresh (I), strong to very strong (R4 - R5) rock, with yellowish gray to light olive gray (5Y 8/1 - 5Y 6/1), slightly weathered (II), moderately strong (R3) rock, discontinuities become moderately to closely spaced at widely spaced intervals and in poor to good condition, discontinuities in poor condition occur at 12 to 17% frequency. [Ohanapecoh Formation]</p>		
30						98	R4		22					
100							102	R5		23	PLT - A PLT - D			
31							2.0	R4						
105		[Hatched pattern]					94			24		<p>At 106.2 feet, becomes yellowish gray to olive gray (5Y 8/1 - 5Y 4/1), slightly weathered (II), moderately weak to moderately strong (R2 - R3) rock and discontinuities are very closely to closely spaced and in poor condition</p> <p>At 107.6 feet, becomes very weak to moderately weak (R1 - R2) rock</p> <p>At 108.9 feet, becomes light gray to medium light gray (N7 - N6), fresh (I), strong to very strong (R4 - R5) rock</p>		
33							0.0							
110		[Hatched pattern]						R4			PLT - D			
34								R5			PLT - D PLT - A			
115											<p>Borehole completed to 114.0 feet bgs on August 25, 2007. Borehole was flushed in preparation of optical and acoustical televiwer survey. Optical and acoustical televiwer survey completed on September 5, 2007. Groundwater was measured at approximately 21.3 feet bgs during drilling activities and at 65.9 feet on September 5, 2007 prior to beginning optical borehole survey. Borehole backfilled with cement grout on October 6, 2007.</p>			
35														
36														
120														

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Start Card RE02072

Job No. 03-2007 SR 90 Elevation 2745.5 ft (836.8 m)

HOLE No. RKS-18-07

Sheet 1 of 8

Project 2007 I-90 Geotechnical New Alignment Feasibility Investigation

Driller S. Wilson/S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector A. Shriver

Start September 5, 2007 Completion September 8, 2007 Well ID# RKS-18-07 Equipment Skid-Mounted Burley 5500-2

Station 1372+11 Offset 170 Feet Left Casing Stick-up Monument Method HQ3 Triple Tube Wireline

Northing 737296.78 Easting 1426299.7 Latitude 47°21'06.741"N Longitude 121°21'49.651"W

County Kittitas Subsection NE Quarter Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
1								1		META-WELDED LAPILLI DACITE TUFF , olive gray (5Y 4/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 55%), slightly welded, slightly weathered (II), moderately strong (R3) rock, discontinuities are moderately to closely spaced and in poor to good condition, discontinuities in poor condition occur at a 3 to 8% frequency, discontinuities in fair condition occur at a 5 to 30% frequency. [Ohanapecoh Formation]			
5						94 2.4		2					
10						98 1.6		3					
15						98 1.0		4					
20						106 1.1							

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								5		META-WELDED LAPILLI DACITE TUFF , olive gray (5Y 4/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 55%), slightly welded, slightly weathered (II), moderately strong (R3) rock, discontinuities are moderately to closely spaced and in poor to good condition, discontinuities in poor condition occur at a 3 to 8% frequency, discontinuities in fair condition occur at a 5 to 30% frequency. [Ohanapecoh Formation]			
25								6					
8													
30								7		At 29.9 feet, becomes moderately weak to moderately strong (R2 - R3) rock			
10										At 33.0 feet, healed discontinuities occur from 4 to greater than 10 per foot			
35								8	PLT - A	At 34.9 feet, becomes medium dark gray to olive gray (N4 - 5Y 4/1), fresh (I), moderately weak to moderately strong (R2 - R3) rock			
11													
40								9					
12													
45													
13													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14		[Hatched pattern]					$\frac{100}{>1.6}$		10		META-WELDED LAPILLI DACITE TUFF , medium dark gray to olive gray (N4 - 5Y 4/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 55%), slightly welded, slightly weathered (II), moderately strong (R3) rock, discontinuities are moderately to closely spaced and in poor to good condition, discontinuities in poor condition occur at a 3 to 8% frequency, discontinuities in fair condition occur at a 5 to 30% frequency. [Ohanapecosh Formation]		
15													
50							$\frac{100}{1.2}$	R4	11	PLT - D			
16													
55		[Hatched pattern]					$\frac{98}{0.4}$	R5	12	PLT - A			
17													
18													
60		[Hatched pattern]					$\frac{98}{0.4}$	R1 R3	13	PLT - A PLT - D			
19													
65		[Hatched pattern]					$\frac{100}{1.6}$	R1 R3	14		At 64.9 feet, becomes slightly weathered (II), moderately weak to moderately strong (R2 - R3) rock At 65.5 feet, becomes moderately weathered (III) rock		
20										PLT - D PLT - A			
21		[Hatched pattern]											
70													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22								15		META-WELDED LAPILLI DACITE TUFF , medium dark gray to olive gray (N4 - 5Y 4/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 55%), slightly welded, slightly weathered (II), moderately weak to moderately strong (R2 - R3) rock, discontinuities are moderately to closely spaced and in poor to good condition, discontinuities in poor condition occur at a 3 to 8% frequency, discontinuities in fair condition occur at a 5 to 30% frequency. [Ohanapecosh Formation]			
						117 0.0		16					
75							R2 R3	17	PLT - D PLT - A	At 75.9 feet, becomes slightly to moderately weathered (II - III), moderately weak to moderately strong (R2 - R3) rock			
23						103 0.3		18					
24						105 1.2		19					
80						100 0.4		20					
25						100 0.6	R3 R3	21	PLT - A PLT - D				
85						87 0.0							
26						100 0.5							
27													
90													
28													
95													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29							100 0.6	R3	22	PLT - D	META-WELDED LAPILLI DACITE TUFF , medium dark gray to olive gray (N4 - 5Y 4/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 55%), slightly weathered (II), moderately weak to moderately strong (R2 - R3) rock, discontinuities become moderately to closely spaced at widely spaced interval and in poor to good condition, discontinuities in poor condition occur at a 10 to 15% frequency. [Ohanapecosh Formation]		
30													
100							102 0.4		23				
31								R3		PLT - D			
105							98 0.6		24				
33													
110							100 0.6	R3 R4	25	PLT - D PLT - A			
34													
115							100 0.0		26				
35													
36													
120													

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
37							88 0.5	R2	27	PLT - D	<p>META-WELDED LAPILLI DACITE TUFF, medium dark gray to olive gray (N4 - 5Y 4/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 55%), slightly weathered (II), moderately weak to moderately strong (R2 - R3) rock, discontinuities become moderately to closely spaced at widely spaced interval and in poor to good condition, discontinuities in poor condition occur at a 10 to 15% frequency. [Ohanapecoh Formation]</p>		
125	38						118 1.1		28				
39							70 0.0		29				
130	40						100 0.0		30				
41							98 0.2	R3	31	PLT - D			
42													
140	43						102 0.0	R2	32	PLT - A			
44													
145	44							R2		PLT - D			

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
45								33		META-WELDED LAPILLI DACITE TUFF , medium dark gray to olive gray (N4 - 5Y 4/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 55%), slightly weathered (II), moderately weak to moderately strong (R2 - R3) rock, discontinuities become moderately to closely spaced at widely spaced interval and in poor to good condition, discontinuities in poor condition occur at a 10 to 15% frequency. [Ohanapecosh Formation]			
150	46						R2	34	PLT - D	At 150.9 feet, discontinuities become very closely spaced and in poor condition			
155	47							35					
160	48							36					
165	49						R3	37	PLT - D	At 163.0 feet, becomes medium bluish gray to medium dark gray (5B 5/1 - N4), fresh (I), strong (R4) rock			
170	50						R4	38	PLT - D				
175	51						R5	39	PLT - D PLT - A	At 167.0 feet, becomes very strong (R5) rock			

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
52		[Hatched pattern]					97 0.0	R4	40	PLT - A	<p>META-WELDED LAPILLI DACITE TUFF, medium bluish gray to medium dark gray (5B 5/1 - N4), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (15 to 55%), fresh (I), very strong (R5) rock, discontinuities become moderately to closely spaced at widely spaced interval and in poor to good condition, discontinuities in poor condition occur at a 10 to 15% frequency. [Ohanapecoh Formation]</p>	[Groundwater symbol]	[Instrument symbol]
53						107 0.0	41						
175													
54		[Hatched pattern]					R5	43	PLT - D		[Groundwater symbol]	[Instrument symbol]	
180													96 1.0
56		[Hatched pattern]									[Groundwater symbol]	[Instrument symbol]	
185													
57		[Dashed pattern]								<p>Borehole completed to 185.0 feet bgs on September 8, 2007. Borehole was flushed in preparation of optical and acoustical televiwer survey. Optical and acoustical televiwer survey completed on September 22, 2007. Borehole completed with one vibrating wire piezometer at 183.5 feet bgs and TDR cable to 185.0 feet bgs on September 25, 2007. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at approximately 71.5 feet bgs during drilling activities and at 144.8 feet on September 22, 2007 prior to beginning optical borehole survey.</p> <p>VWP #92268 = 69.0 to 70.5 feet bgs TDR Cable installed to 185.0 bgs #10-20 silica sand filter pack from 158.0 to 185.0 feet bgs Grout mix from 0.0 to 158.0 feet bgs: 1 94 lb bag Type I-II Portland Cement 30 gallons water 5 to 10 lbs pure bentonite powder Well Tag # = APC 421</p>	[Groundwater symbol]	[Instrument symbol]	
190			58										
59				195									

ROCK NAF BOREHOLES_2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0 - 1	0 - 0.3						38 N/A	1		GRAVEL [GP] , fine to coarse, angular to subangular GRAVEL, cobbles and boulders, with fine to coarse sand, loose, dry. [Anthropogenic Fill]			
1 - 2	0.3 - 0.6						63 N/A	2	SPT N=27	Blow Counts/0.5' = 4, 2, 25 [N = 27, Recovery = 0.5'/1.5']			
2 - 3	0.6 - 0.9						100 1.2	3	SPT N=50/0.4	GRAVEL [GP - GM] , fine to coarse subangular to subrounded GRAVEL, with fine to coarse sand, trace silt, medium dense, pale yellowish brown to dark yellowish brown (10YR 6/2 - 10YR 4/2), moist. [Colluvium] Blow Counts/0.5' = 9, 50/0.4' [N = 50/0.4', Recovery = 0.6'/0.9']			
3 - 4	0.9 - 1.2						94 1.6	4		META-WELDED LAPILLI DACITE TUFF , pale yellowish brown to dark yellowish brown (10YR 6/2 - 10YR 4/2), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (20 to 45%), moderately weathered (III), very weak to moderately weak (R1 - R2) rock, discontinuities are closely spaced and in fair to very poor condition. [Ohanapecosh Formation] At 12.0 to 12.5 feet, becomes highly weathered (IV), extremely weak (R0) rock			
4 - 5	1.2 - 1.5									At 15.3 feet, becomes slightly to moderately weathered (II - III), moderately weak to moderately strong (R2 - R3) rock, discontinuities become moderately to closely spaced and in poor and good condition, discontinuities in poor condition occur at a 10 to 30% frequency			
5 - 6	1.5 - 1.8									At 17.6 to 17.9 feet, becomes highly weathered (IV), extremely weak (R0) rock			



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								5		<p>META-WELDED LAPILLI DACITE TUFF, medium light gray (N6), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (20 to 45%), fresh (I), moderately weak to moderately strong (R2 - R3) rock, with dark yellowish orange to pale yellowish brown (10YR 6/6 - 10YR 6/2) enveloping discontinuities, discontinuities become moderately to closely spaced and in poor to good condition, discontinuities in poor and fair condition occur at a 5 to 15% frequency. [Ohanapecosh Formation]</p>			
25						$\frac{104}{1.8}$	R2						
8						$\frac{98}{1.0}$		6					
9						$\frac{102}{1.4}$	R2	7	PLT - D				
10						$\frac{100}{3.0}$		8					
35						$\frac{100}{2.7}$		9					
11							R2		PLT - D				
12						$\frac{102}{1.4}$		9A		At 40.8 to 41.8 feet, becomes slightly to moderately weathered (II - III) rock, discontinuity in poor to very poor condition			
13													
45													

ROCK SCD BOREHOLES 2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14							$\frac{98}{1.0}$	R3	10	PLT - D	<p>META-WELDED LAPILLI DACITE TUFF, medium light gray (N6), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (20 to 45%), slightly weathered (I) to moderately weathered (II), moderately weak to moderately strong (R2 - R3) rock, with dark yellowish orange to pale yellowish brown (10YR 6/6 - 10YR 6/2) enveloping discontinuities, discontinuities become moderately to closely spaced and in poor to good condition, discontinuities in poor and fair condition occur at a 5 to 15% frequency. [Ohanapecosh Formation]</p> <p>At 51.3 feet, discontinuities become closely to very closely spaced at very widely spaced intervals and in good condition</p>		
15							R3		PLT - A				
50							$\frac{100}{0.6}$	R3	11	PLT - D			
16							R3 R4		PLT - D PLT - A				
55							$\frac{100}{0.0}$		12				
17								R4		PLT - D			
18													
60							$\frac{102}{0.0}$	R3 R4	13	PLT - D PLT - A			
19													
65							$\frac{96}{1.6}$		14				
20													
21													
70													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22								15	PLT - A	META-WELDED LAPILLI DACITE TUFF , medium light gray (N6), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (20 to 45%), slightly weathered (I) to moderately weathered (II), moderately weak to moderately strong (R2 - R3) rock, with dark yellowish orange to pale yellowish brown (10YR 6/6 - 10YR 6/2) enveloping discontinuities, discontinuities become closely to very closely spaced at very widely spaced intervals and in good condition. [Ohanapecoh Formation]			
							R3						
75	23							16	PLT - D	At 76.9 to 77.9 feet, becomes slightly weathered (II), very weak to moderately weak (R1 - R2), discontinuities become very closely spaced and in good condition			
24													
80	25							17	PLT - D	At 80.0 feet, becomes fresh (I), moderately strong (R3) rock, discontinuities become closely to very closely spaced at very widely spaced intervals and in good condition			
25													
85	26							18		At 85.9 feet, discontinuities become moderately to closely spaced and in fair to good condition			
27													
90	28							19	PLT - D PLT - A	At 90.2 to 90.6 feet, discontinuity in poor condition			
28													
95													

ROCK SCD BOREHOLES 2007.GPJ 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29								20		<p>META-WELDED LAPILLI DACITE TUFF, medium light gray (N6), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (20 to 45%), fresh (I), moderately strong (R3) rock, with dark yellowish orange to pale yellowish brown (10YR 6/6 - 10YR 6/2), slightly weathered (II), moderately weak (R2) rock enveloping discontinuities, discontinuities become very closely spaced at moderately spaced intervals and in good condition. [Ohanapecosh Formation]</p>			
30													
100													
31													
105													
32													
33										<p>Borehole completed to 105.1 feet bgs on September 20, 2007. Borehole was overcased with HWT casing to 11.5 feet bgs and was flushed in preparation of optical and acoustical televiwer survey. Optical and acoustical televiwer survey completed on September 20, 2007. Borehole completed with one vibrating wire piezometer at 103.1 feet bgs on September 21, 2007. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at approximately 5.4 feet bgs during drilling activities and at 65.0 feet on September 20, 2007 prior to beginning optical borehole survey.</p> <p>VWP #92270 = 101.6 to 103.1 feet bgs #10-20 silica sand filter pack from 90.0 to 105.1 feet bgs Grout mix from 0.0 to 90.0 feet bgs: 1 94 lb bag Type I-II Portland Cement 30 gallons water 25 to 35 lbs pure bentonite powder Well Tag # = APC 419</p>			
110													
34													
35													
115													
36													
120													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0 - 1	0 - 0.3							1		SILTY GRAVEL [GM] , fine to coarse, angular to subangular GRAVEL, cobbles and boulders, with fine to coarse sand, with silt and clay, medium dense, moist. [Colluvium and Anthropogenic Fill]			
1 - 5	0.3 - 1.5									GRAVEL [GP - GM] , fine to coarse, subangular to subrounded GRAVEL, with fine to coarse sand, trace silt and clay, medium dense, pale yellowish brown to dark yellowish brown (10YR 6/2 - 10YR 4/2), moist. [Colluvium and Anthropogenic Fill]			
5 - 2	1.5 - 1.8							2	SPT n=26	Blow Counts/0.5' = 27, 12, 14 [n = 26, Recovery = 0.0/1.5']			
2 - 10	1.8 - 3.0							3		META-WELDED LAPILLI DACITE TUFF , medium light gray to medium gray (N6 - N5), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized entrained clasts (20 to 45%), slightly welded, fresh (I), moderately weak to moderately strong (R2 - R3) rock, discontinuities are closely spaced and in fair to good condition. [Tuff member of Lake Keechelus, Ohanapecoh Formation]			
10 - 4	3.0 - 3.7							4	PLT - D				
4 - 15	3.7 - 4.6							5	PLT - D PLT - A	At 12.8 to 14.6 feet bgs - becomes slightly weathered (II) rock, discontinuities become closely spaced and in good to very poor condition Discontinuities become moderately to closely spaced at very widely spaced intervals and in good condition			
15 - 5	4.6 - 5.2												
5 - 20	5.2 - 6.1												



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14							R3		PLT - D				
						98		13					
						0.4				Discontinuities become moderately to closely spaced at very widely spaced intervals and in good condition			
15													
50													
						88		14		At 51.1 to 51.3 feet bgs - 0.2 feet core loss associated with driller mismatch			
						0.0				At 52.2 to 52.5 feet bgs - 0.3 feet core loss			
16													
55													
17						107		15					
						0.0							
18							R2		PLT - D				
60						95		16		At 59.2 to 59.3 feet bgs - discontinuity in good condition			
						0.5							
19						102		17					
						0.6							
65										At 62.6 to 64.0 feet bgs - becomes slightly to moderately weathered (II - III), extremely weak to very weak (R0 - R1) rock, discontinuities become closely spaced and in poor condition			
20						98		18					
						0.2							
21													
70													

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22							102 0.0	R3	19	PLT - D	Discontinuities become moderately to closely spaced at very widely spaced intervals and in good condition		
75	23												
24	80									Borehole completed to 76.1 feet bgs on September 21, 2007. Borehole was overcased with HWT casing to 7.3 feet bgs and was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on October 3, 2007. Groundwater was measured at approximately 16.1 feet bgs during drilling activities and at 61.3 feet on October 3, 2007 prior to beginning optical borehole survey. Borehole backfilled with cement grout on October 4, 2007.			
25													
85	26												
27													
90													
28													
95													



Start Card SE01978

Job No. 03-2007 SR 90 Elevation 2579.6 ft (786.3 m)

HOLE No. RKS-21-07

Sheet 1 of 4

Project 2007 I-90 Geotechnical Slide Curve Design Investigation

Driller R. Gregory/S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector K. Yang

Start October 11, 2007 Completion October 16, 2007 Well ID# Not Applicable Equipment Skid-Mounted Burley 5500-1

Station 1398+88 Offset 74 Feet Left Casing Not Applicable Method HQ3 Triple Tube Wireline

Northing 734613.39 Easting 1426246.11 Latitude 47°20'40.253"N Longitude 121°21'50.003"W

County Kittitas Subsection SE Quarter Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
								1		GRAVEL [GP] , fine to coarse, angular GRAVEL, with fine to coarse sand, cobbles, boulders, loose, pale brown (5YR 5/2), moist. [Colluvium and Anthropogenic Fill]			
1										META-WELDED LAPILLI DACITE TUFF , light bluish gray (5B 7/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized entrained clasts (20 to 50%), slightly welded, slightly weathered (II), moderately weak (R2) rock, discontinuities are moderately to closely spaced at very widely spaced intervals and in good condition. [Tuff member of Lake Keechelus, Ohanapecosh Formation]			
5							R2	2	PLT - D	At 4.5 to 4.8 feet bgs - discontinuity in poor condition At 5.3 feet bgs - becomes fresh (I), strong (R4) rock			
2													
10								3					
15							R3 R3	4	PLT - A PLT - D	Becomes moderately strong to strong (R3 - R4) rock			
5													
20										At 17.7 to 18.2 feet bgs - becomes slightly to moderately weathered (II - III), very weak to moderately weak (R1 - R2) rock, discontinuities become closely spaced in very poor to good condition			



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7													
25													
8													
9													
30													
10													
35													
11													
12													
40													
13													
45													

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14		[Hatched pattern]					102 / 0.0	R3	PLT - D	Discontinuities become very widely spaced and in fair to good condition			
15							90 / 0.2						
50													
16													
55													
17		[Hatched pattern]					120 / 0.0	R3	PLT - D				
18							100 / 0.0						
60													
19													
65		[Hatched pattern]					98 / 0.0	R3	PLT - D				
20							100 / 0.0						
21		[Hatched pattern]						R2	PLT - D				
70													

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



LOG OF TEST BORING

Start Card SE01978

Job No. 03-2007

SR 90

Elevation 2579.6 ft (786.3 m)

HOLE No. RKS-21-07

Sheet 4 of 4

Project 2007 I-90 Geotechnical Slide Curve Design Investigation

Driller R. Gregory/S. Tunison, Lic# 2628

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
22											Borehole completed to 70.0 feet bgs on October 16, 2007. Borehole was overcased with HWT casing to 3.5 feet bgs and was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on October 18, 2007. Groundwater was measured at approximately 33.2 feet bgs during drilling activities and at 34.5 feet on October 18, 2007 prior to beginning optical borehole survey. Borehole backfilled with cement grout on October 20, 2007.			
75														
23														
24														
80														
25														
85														
26														
27														
90														
28														
95														



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
1													
5													
2													
10													
3													
4													
15													
5													
20													

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								6		Becomes light gray to medium light gray (N7 - N6), fresh (I), moderately strong to strong (R3 - R4) rock, discontinuities become moderately spaced and in fair to good condition At 21.3 to 22.5 feet bgs - becomes moderate reddish brown (10R 4/6), slightly weathered (II), moderately weak to moderately strong (R2 - R3) rock, discontinuities become closely spaced and in poor to good condition			
25							R4	7	PLT - D	At 25.0 feet bgs - becomes strong (R4) rock At 25.3 to 25.5 feet bgs - becomes slightly weathered (II), moderately strong to strong (R3 - R4) rock			
8													
30								8		At 28.9 to 29.0 feet bgs - becomes slightly weathered (II), moderately strong to strong (R3 - R4) rock			
9													
35							R5	8		Becomes strong to very strong (R4 - R5) rock			
10													
35							R4	9	PLT - A PLT - D				
11													
40								10		At 37.5 to 38.1 feet bgs - becomes slightly weathered (II), moderately strong to strong (R3 - R4) rock, discontinuities become closely spaced and in fair to poor condition Discontinuities become moderately to closely spaced and in good condition			
12													
45													
13													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14							$\frac{100}{1.4}$	R5 R4	11	PLT - D PLT - A	Discontinuities become moderately to closely spaced and in good condition At 45.7 to 47.6 feet bgs - becomes slightly weathered (II), moderately strong to strong (R3 - R4) rock At 47.2 to 47.6 feet bgs - discontinuity in poor to very poor condition		
15											At 50.2 to 50.8 feet bgs - discontinuity in poor to very poor condition		
50									12		At 52.0 to 53.2 feet bgs - discontinuity in poor to very poor condition		
16													
55													
17									13	PLT - D	At 55.5 to 56.9 feet bgs - becomes slightly weathered (II), moderately strong to strong (R3 - R4) rock		
18										PLT - D			
60													
19											Borehole completed to 60.5 feet bgs on October 17, 2007. Borehole was overcased with HWT casing to 3.5 feet bgs and was flushed in preparation of optical and acoustical televiwer survey. Optical and acoustical televiwer survey completed on October 18, 2007. Groundwater was measured at 26.4 feet on October 18, 2007 prior to beginning optical borehole survey. Borehole backfilled with cement grout on October 20, 2007.		
65													
20													
21													
70													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
							$\frac{92}{0.9}$		1		GRAVEL [GP] , fine to coarse, angular GRAVEL, with fine to coarse sand, cobbles, boulders, loose to dense, pale brown (5YR 5/2), moist. [Colluvium and Anthropogenic Fill]		
1							$\frac{98}{0.2}$	R4	2	PLT - A	META-WELDED LAPILLI DACITE TUFF , greenish gray to medium bluish gray (5G 6/1 - 5B 5/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized entrained clasts (20 to 45%), slightly welded, fresh (I), strong (R4) rock, discontinuities are closely spaced and in poor condition. [Tuff member of Lake Keechelus, Ohanapecosh Formation]		
5							$\frac{95}{0.4}$	R5	3	PLT - D	Becomes medium bluish gray (5B 5/1) rock, discontinuities become widely spaced and in very poor to good condition, discontinuities in very poor condition occur at a 45 to 50% frequency		
10							$\frac{86}{1.6}$		4		Becomes strong to very strong (R4 - R5) rock, discontinuities becomes moderately to closely spaced and in fair to good condition At 13.9 to 14.1 feet bgs - 0.2 feet core loss at discontinuity in very poor condition		
15							$\frac{92}{1.1}$	R5	5	PLT - D	At 16.6 to 16.8 feet bgs - 0.4 feet core loss at discontinuity in very poor condition		
20													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
7											At 20.1 to 21.1 feet bgs - becomes slightly weathered (II), strong (R4) rock, 0.1 to 0.2 feet core loss at discontinuity in very poor condition			
25						$\frac{98}{3.3}$	R4		6	PLT - D PLT - A	Becomes light brown (5YR 6/4), slightly weathered (II), moderately strong to strong (R3 - R4) rock, discontinuities become closely to very closely spaced and in poor to good condition, discontinuities in poor condition occur at less than 10% frequency, discontinuities in fair condition occur at a 10 to 30% frequency At 23.4 to 23.5 feet bgs - 0.1 feet core loss At 24.2 to 24.8 feet bgs - discontinuity in very poor condition			
8							R4				At 27.0 to 27.7 feet bgs - discontinuities in poor to very poor condition At 27.7 to 28.1 feet bgs - becomes moderately weathered (III), very weak (R1) rock, discontinuity in very poor condition			
9						$\frac{90}{1.3}$			7		Becomes medium bluish gray (5B 5/1), fresh to slightly weathered (I - II), strong (R4) rock, discontinuities become closely to very closely spaced and in fair to good condition, discontinuities in poor condition occur at less than 10% frequency, discontinuities in fair condition occur at a 5 to 20% frequency At 28.6 to 29.1 feet bgs - 0.5 feet core loss, core break at top of run does not match core break of previous run			
10														
35						$\frac{98}{2.7}$			8		At 33.6 to 33.7 feet bgs - 0.1 feet core loss, core break at top of run does not match core break of previous run At 34.1 to 34.4 feet bgs - discontinuity in very poor condition			
11														
12						$\frac{99}{1.8}$	R4		9	PLT - D	At 37.5 to 37.6 feet bgs - discontinuity in very poor condition At 38.6 to 38.7 feet bgs - 0.1 feet core loss, core break at top of run does not match core break of previous run			
40														
13											Becomes pale blue (5B 6/2), fresh (I), strong to very strong (R4 - R5) rock, discontinuities become widely spaced and in good condition			
45						$\frac{102}{0.4}$			10					

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14										Discontinuities become widely spaced and in good condition			
							R3		PLT - D				
15						96		11					
						0.2							
50													
							R5		PLT - A				
16													
55						116		12					
						0.3							
17													
18						104		13					
						3.1				Becomes light bluish gray to light brown (5B 7/1 - 5YR 5/6), slightly weathered (II), moderately strong to strong (R3 - R4) rock, discontinuities become closely to very closely spaced and in good to very poor condition, discontinuities in poor and very poor condition occur at a 20 to 40% frequency, discontinuities in good condition occur at a 5 to 20% frequency			
60						101		14	PLT - D				
						2.8	R4						
19													
65						79		15	PLT - D				
						1.3	R3						
70													
							R4		PLT - D	Borehole completed to 65.4 feet bgs on October 19, 2007. Borehole was overcased with HWT casing to 1.8 feet bgs and was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on October 19, 2007. Borehole completed with one vibrating wire piezometer at 63.0 feet bgs on October 20, 2007. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at approximately 37.1 feet bgs during drilling activities and at 37.7 feet on October 19, 2007 prior to beginning optical borehole survey.			
21													

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



LOG OF TEST BORING

Start Card RE02073

Job No. 03-2007

SR 90

Elevation 2584.0 ft (787.6 m)

HOLE No. RKS-23-07

Sheet 4 of 4

Project 2007 I-90 Geotechnical Slide Curve Design Investigation

Driller R. Gregory/S. Tunison Lic# 2628

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
22											VWP #92089 = 61.5 to 63.0 feet bgs #10-20 silica sand filter pack from 55.0 to 65.4 feet bgs Grout mix from 0.0 to 55.0 feet bgs: 1 94 lb bag Type I-II Portland Cement 30 gallons water 25 lbs pure bentonite powder Well Tag # = APC 413			
75														
23														
24														
80														
25														
85														
26														
27														
90														
28														
95														



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0 - 1	0 - 0.3						$\frac{50}{0.0}$		1		GRAVEL [GM] , fine to coarse, angular to subangular GRAVEL, cobbles and boulders, with fine to coarse sand, trace silt and organics, medium dense, moist. [Colluvium and Anthropogenic Fill]		
1 - 2	0.3 - 0.6						$\frac{90}{1.1}$		2		META-WELDED LAPILLI DACITE TUFF , dark greenish gray (5G 4/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized entrained clasts (20 to 45%), slightly welded, fresh (I), very strong (R5) rock, discontinuities are closely spaced and in good to poor condition, discontinuities in poor condition occur at a 10 to 25% frequency, discontinuities in good condition occur at a 30 to 50% frequency. [Tuff member of Lake Keechelus, Ohanapecosh Formation]		
2 - 3	0.6 - 0.9						$\frac{102}{2.0}$	R4	3	PLT - D	At 10.9 to 11.4 feet bgs - discontinuity in very poor condition		
3 - 4	0.9 - 1.2						$\frac{89}{0.4}$		4		At 12.4 to 13.6 feet bgs - becomes fresh to slightly weathered (I - II), moderately weak to moderately strong (R2 - R3) rock		
4 - 5	1.2 - 1.5										Discontinuities become moderately to closely spaced at widely spaced intervals and in fair to good condition		
5 - 6	1.5 - 1.8							R5		PLT - D			

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14							$\frac{98}{0.0}$		12		Discontinuities become widely spaced and in fair to good condition		
15													
50							$\frac{98}{0.2}$	R5 R5	13	PLT - A PLT - D			
16													
55													
17						$\frac{105}{0.0}$			14				
18							R4			PLT - A			
60							R5 R5			PLT - A PLT - D			
19						$\frac{98}{0.2}$			15				
65													
20											Borehole completed to 65.1 feet bgs on November 2, 2007. Borehole was overcased with HWT casing to 5.2 feet bgs and was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on November 3, 2007. Groundwater was measured at 23.7 feet on November 3, 2007 prior to beginning optical borehole survey. Borehole backfilled with cement grout on November 7, 2007.		
21													
70													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0	0												
1	1							1		GRAVEL [GP] , fine to coarse, angular GRAVEL, with fine to coarse sand, cobbles, boulders, loose to dense, dark yellowish brown to grayish green (10YR 4/2 - 10G 4/2), moist. [Colluvium and Anthropogenic Fill]			
								2					
5	5							3					
								4					
								5					
10	10							6					
								7					
15	15							8	PLT - D	META-WELDED LAPILLI DACITE TUFF , grayish green (10GY 5/2), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized entrained clasts (20 to 45%), slightly welded, fresh to slightly weathered (I - II), moderately weak to moderately strong (R2 - R3) rock, discontinuities are moderately to closely spaced and in good to very poor condition. [Tuff member of Lake Keechelus, Ohanapecosh Formation] At 17.3 to 17.4 feet bgs - 0.1 feet core loss at location of discontinuity in poor to very poor condition Becomes fresh (I), strong (R4) rock. At 19.4 to 20.1 feet bgs - becomes fresh to slightly			
									PLT - D				
20	20												



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								9		weathered (I -II), moderately strong to strong (R3 - R4) rock At 20.1 to 20.3 feet bgs - 0.2 feet core loss at location of discontinuity in very poor condition	▽		
25								10		Discontinuities are moderately to closely spaced and in good to very poor condition, discontinuities in poor to very poor condition occur at a 30 to 35% frequency, discontinuities in fair condition occur at 30 to 35% frequency			
8													
9									PLT - D				
30								11	PLT - A	At 29.9 to 30.8 feet bgs - becomes dusky yellow green (5GY 5/1), slightly weathered (II), moderately strong to strong (R3 - R4) rock	▼		
10													
35								12		At 33.3 to 33.6 feet bgs - becomes dusky yellow green (5GY 5/1), slightly weathered (II), moderately strong to strong (R3 - R4) rock at location of discontinuity in very poor condition Discontinuities become moderately to closely spaced and in fair to good condition			
11													
12								13	PLT - D PLT - A				
40								14					
13													
45										Becomes pale green to grayish green (10G 6/2 - 10GY 5/2), fresh (I), strong (R4) rock, with dusky yellow green (5GY 5/2), fresh to slightly weathered (I - II), moderately strong to strong (R3 - R4) rock enveloping discontinuities, discontinuities become closely spaced at widely spaced intervals and in fair			

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14		[Hatched pattern]						15	PLT - D	to good condition			
15							R4			Discontinuities become closely spaced at widely spaced intervals and in fair to good condition			
50								16			At 48.3 to 50.0 feet bgs - discontinuity in very poor condition		
16		[Hatched pattern]								At 51.8 to 52.3 feet bgs - becomes slightly weathered to moderately weathered (II - III), moderately weak to moderately strong (R2 - R3) rock, discontinuity in very poor condition			
55								17			At 52.4 to 52.8 feet bgs - becomes moderately weathered to highly weathered (III - IV), extremely weak (R0) rock		
17										17	At 52.8 feet bgs - becomes grayish green (10GY 5/2), fresh (I), strong to very strong (R4 - R5) rock, discontinuities become very widely spaced and in fair to good condition		
18		[Hatched pattern]											
60							R4 R4	18		PLT - D PLT - A			
19													
65		[Hatched pattern]											
20							R5			PLT - D			
21													
70										Borehole completed to 64.9 feet bgs on November 8, 2007. Borehole was overcased with HWT casing to 6.1 feet bgs and was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on November 8, 2007. Groundwater was measured at approximately 21.9 feet bgs during drilling activities and at 28.7 feet on November 8, 2007 prior to beginning optical borehole survey. Borehole backfilled with cement grout on November 9, 2007.			

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



Start Card SE01979

Job No. 03-2007 SR 90 Elevation 2574.1 ft (784.6 m)

HOLE No. RKS-26-07

Sheet 1 of 3

Project 2007 I-90 Geotechnical Slide Curve Design Investigation

Driller R. Gregory/S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector K. Yang

Start November 3, 2007 Completion November 5, 2007 Well ID# Not Applicable Equipment Skid-Mounted Burley 5500-1

Station 1404+96 Offset 81 Feet Left Casing Not Applicable Method HQ3 Triple Tube Wireline

Northing 734060.35 Easting 1426388.1 Latitude 47°20'34.811"N Longitude 121°21'47.853"W

County Kittitas Subsection NE Quarter Section 02 Range 11E Township 21N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
1								1	SPT n=50/0.4'	GRAVEL [GM] , silty GRAVEL, with fine to coarse sand, cobbles, boulders, loose to dense, moderate yellow brown (10YR 5/4), moist. [Colluvium and Anthropogenic Fill]			
5								2		Blow Counts/0.5' = 50/0.4' [n = 50/0.4', Recovery = 0.1'/0.4']			
2										GRAVEL [GP] , angular GRAVEL, with cobbles, boulders, dense, light brown (5YR 5/6), moist. [Colluvium and Anthropogenic Fill]			
10								3	SPT n=28	SILTY SAND [SM] , silty SAND, with gravel, cobbles, boulders, loose to dense, dusky yellow brown (5Y 6/4), moist. [Colluvium and Anthropogenic Fill]			
3										Blow Counts/0.5' = 9, 15, 13 [n = 28, Recovery = 0.8'/1.5']			
4										GRAVEL [GP] , angular GRAVEL, with sand and cobbles, boulders, very dense, light brown (5YR 5/6), moist. [Colluvium]			
15								4	SPT n=50/0.3'	Blow Counts/0.5' = 21, 50/0.4' [n = 50/0.4', Recovery = 0.7'/0.8']			
5										META-WELDED LAPILLI DACITE TUFF , medium bluish gray (5B 5/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized entrained clasts (20 to 45%), slightly welded, fresh (I), strong (R4) rock, discontinuities are closely spaced and in good to poor condition. [Tuff member of Lake Keechelus, Ohanapecosh Formation]			
6								5	PLT - D				
								6					

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7										At 20.0 to 23.7 feet bgs - becomes fresh to slightly weathered (I - II), moderately strong (R3) rock, discontinuities become very closely spaced and in good to very poor condition			
						$\frac{100}{4.0}$		7		At 22.0 to 23.2 feet bgs - Becomes moderately weak (R2) rock			
25										Discontinuities become closely to very closely spaced and in good to fair condition			
8						$\frac{100}{1.5}$		8					
							R3		PLT - D				
9						$\frac{96}{1.7}$		9		At 29.2 to 30.4 feet bgs - becomes light olive gray (5Y 6/1), slightly weathered (II), moderately strong (R3) rock, discontinuities become closely spaced and in poor to very poor condition			
30							R4		PLT - D				
10													
						$\frac{104}{0.4}$	R5	10	PLT - A	Becomes strong to very strong (R4 - R5) rock, discontinuities become moderately to closely spaced and in fair to good condition			
35													
11						$\frac{96}{2.9}$		11					
12						$\frac{118}{0.0}$		12					
40										Becomes dark greenish gray (5G 4/1) rock			
						$\frac{91}{1.7}$	R4 R5	13	PLT - D PLT - A	At 41.6 to 42.2 feet bgs - discontinuity in poor condition			
13													
						$\frac{106}{0.5}$		14					
45													

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



Start Card RE02073

Job No. 03-2007 SR 90 Elevation 2585.6 ft (788.1 m)

HOLE No. RKS-27-07

Sheet 1 of 4

Project 2007 I-90 Geotechnical Slide Curve Design Investigation

Driller R. Gregory/S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector K. Yang

Start October 31, 2007 Completion November 2, 2007 Well ID# RKS-27-07 Equipment Skid-Mounted Burley 5500-1

Station 1405+98 Offset 74 Feet Left Casing Stick-up Monument Method HQ3 Triple Tube Wireline

Northing 733972.29 Easting 1426427.57 Latitude 47°20'33.946"N Longitude 121°21'47.266"W

County Kittitas Subsection NE Quarter Section 02 Range 11E Township 21N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
1								1		SILTY GRAVEL [GM] , silty, angular to subangular GRAVEL, with sand, cobbles, and boulders, trace organics, loose to dense, dark yellowish brown to medium light gray (10YR 4/2 - N6), moist. [Colluvium and Anthropogenic Fill]			
5								2		GRAVEL [GP] , angular to subrounded GRAVEL, with cobbles, boulders, and sand, medium dense to very dense, light brownish gray to medium bluish gray (5YR 6/1 - 5B 5/1), moist. [Colluvium and Anthropogenic Fill]			
10								3					
15								4					
20								5					
								6		GRAVEL [GP - GM] , angular to subrounded GRAVEL, with sand, cobbles, boulders, and silt, medium dense to very dense, light brown (5YR 5/6), moist. [Colluvium and Anthropogenic Fill]			
										META-WELDED LAPILLI DACITE TUFF , light			

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								7	PLT - D	brown to medium light gray (5YR 5/6 - N6), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized entrained clasts (20 to 50%), slightly welded, slightly weathered (II), moderately strong (R3) rock, discontinuities are closely spaced and in good to fair condition. [Tuff member of Lake Keechelus, Ohanapecosh Formation]			
25								8		At 22.5 to 23.0 feet bgs - discontinuity in very poor condition			
8									PLT - D	Becomes light gray (N7), fresh (I), strong (R4) rock, discontinuities become closely spaced and in good to poor condition			
30								9	PLT - D	At 25.5 to 28.2 feet bgs - becomes light brown (5YR 5/6), slightly weathered (II), moderately weak (R2) rock			
9										Becomes grayish green to light gray (10G 4/2 - N7), fresh (I), strong to very strong (R4 - R5) rock, discontinuities become moderately to closely spaced at widely spaced intervals and in good condition			
10										At 30.1 to 30.8 feet bgs - becomes light brown (5YR 5/6), slightly weathered (II), strong (R4) rock, discontinuity in very poor condition			
35								10	PLT - D	At 31.4 to 31.7 feet bgs - becomes light brown (5YR 5/6), slightly weathered (II), strong (R4) rock			
11										At 31.9 to 32.2 feet bgs - discontinuity in very poor condition			
40								11	PLT - A				
12													
45								12	PLT - D	Becomes grayish green to grayish olive green (10G 4/2 - 5GY 3/2), fresh (I), strong (R4) rock, discontinuities become moderately to closely spaced and in poor to good condition, discontinuities in poor			

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14										condition occur at a 5 to 15% frequency			
15													
50													
16													
55													
17													
18													
60													
19													
65													
20													
21													
70													

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
22							R5			PLT - A	Discontinuities become closely to very closely spaced and in good condition			
75						$\frac{113}{1.3}$	R5		19	PLT - D	At 73.2 to 73.4 feet bgs - discontinuity in poor condition			
23											Borehole completed to 75.1 feet bgs on November 2, 2007. Borehole was overcased with HWT casing to 8.0 feet bgs and was flushed in preparation of optical and acoustical televiwer survey. Optical and acoustical televiwer survey completed on November 3, 2007. Borehole completed with one vibrating wire piezometer at 73.1 feet bgs on November 7, 2007. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at approximately 32.3 feet bgs during drilling activities and at 21.2 feet on November 3, 2007 prior to beginning optical borehole survey.			
24											VWP #92946 = 71.6 to 73.1 feet bgs #10-20 silica sand filter pack from 60.0 to 75.1 feet bgs Grout mix from 0.0 to 60.0 feet bgs: 1 94 lb bag Type I-II Portland Cement 30 gallons water 25 lbs pure bentonite powder Well Tag # = APC 408			
25														
80														
26														
85														
27														
90														
28														
95														



Start Card SE01979

Job No. 03-2007 SR 90 Elevation 2631.0 ft (801.9 m)

HOLE No. RKS-28-07

Sheet 1 of 5

Project 2007 I-90 Geotechnical Slide Curve Design Investigation

Driller R. Gregory/S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector M. Hommeyer

Start October 23, 2007 Completion October 25, 2007 Well ID# Not Applicable Equipment Skid-Mounted Burley 5500-1

Station 1407+12 Offset 114 Feet Left Casing Not Applicable Method HQ3 Triple Tube Wireline

Northing 733904.14 Easting 1426518.35 Latitude 47°20'33.283"N Longitude 121°21'45.937"W

County Kittitas Subsection NE Quarter Section 02 Range 11E Township 21N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0	0												
1	0.3							1		SILTY GRAVEL [GM] , silty, angular to subangular GRAVEL, with sand, cobbles, and boulders, trace organics, loose to dense, dark yellowish brown to medium light gray (10YR 4/2 - N6), moist. [Colluvium and Anthropogenic Fill]			
5	1.5							2		META-WELDED LAPILLI DACITE TUFF , light brown to moderate yellow brown (5YR 4/6 - 10YR 5/4), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized entrained clasts (20 to 45%), slightly welded, highly weathered (IV), extremely weak (R0) rock. [Tuff member of Lake Keechelus, Ohanapecosh Formation]			
2	0.6							3		Becomes dusky yellow green to dark greenish gray (5GY 5/2 - 5GY 4/1), moderately weathered (III), very weak (R1) rock, discontinuities become very closely spaced and in fair to poor condition			
10	3.0							4		At 9.0 to 9.9 feet bgs - becomes olive gray to dark greenish gray (5Y 4/1 - 5GY 4/1), moderately to highly weathered (III - IV), extremely weak to very weak (R0 - R1) rock At 9.9 to 11.3 feet bgs - becomes pale yellowish green to grayish green (10GY 7/2 - 10GY 5/2), slightly weathered (II), moderately weak (R2) rock Becomes olive gray (5Y 4/1), slightly weathered (II), very weak (R1) rock, discontinuities become closely spaced and in poor to fair condition			
4	1.2							5		Becomes slightly to moderately weathered (II - III) rock			
15	4.5									Becomes moderately weathered (III) rock			
5	1.5												
20	6.0												



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7													
25													
8													
30													
9													
35													
10													
35													
11													
40													
12													
45													
13													
45													

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14							R2		PLT - D	Discontinuities become moderately to closely spaced and in poor to good condition, discontinuities in poor condition occur at a 5 to 15% frequency			
						$\frac{98}{>2.4}$		11		At 46.6 to 47.4 feet bgs - becomes yellowish gray to light olive gray (5Y 7/2 - 5Y 5/2), moderately to highly weathered (III - IV) extremely weak (R0) rock, discontinuity in very poor condition At 47.4 feet bgs - becomes moderately weathered (III), extremely weak to very weak (R0 - R1) rock, discontinuities become closely to very closely spaced and in good to poor condition At 49.9 feet bgs - becomes slightly weathered (II) very weak to moderately weak (R1 - R2) rock At 50.4 to 51.4 feet bgs - becomes light greenish gray to medium bluish gray (5G 8/1 - 5B 5/1), fresh (I), moderately strong (R3) rock			
15													
50													
16						$\frac{100}{2.6}$		12		At 51.6 to 52.0 feet bgs - becomes slightly to moderately weathered (II - III), extremely weak (R0) rock At 52.0 feet bgs - becomes yellowish gray to light olive gray (5Y 7/2 - 5Y 5/2), very weak to moderately weak (R1 - R2) rock			
55													
17							R4		PLT - D	Becomes light gray to medium gray (N7 - N5), fresh (I), moderately strong to strong (R3 - R4) rock, discontinuities become widely spaced and in good condition			
						$\frac{92}{0.0}$		13					
18													
60													
19						$\frac{88}{0.5}$		14					
65							R4	15	PLT - A				
20						$\frac{132}{0.0}$	R3	16	PLT - D	Becomes strong (R4) rock			
						$\frac{102}{0.2}$							
21													
70													

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22								17	PLT - D	Discontinuities become widely spaced and in fair to good condition	▼		
75								18	PLT - D				
24								19	PLT - A	Discontinuities become widely to very widely spaced and in fair to good condition			
80								20		Becomes greenish gray to dark greenish gray (5G 6/1 - 5G 4/1) rock			
25								21					
85								22					
26													
27													
90													
28													
95													

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29							$\frac{98}{0.0}$	R5 R5	23	PLT - D PLT - A	<p>Discontinuities become widely to very widely spaced and in fair to good condition</p> <p>Becomes strong to very strong (R4 - R5) rock</p> <p>Discontinuities become widely to very widely spaced and in fair to good condition, healed discontinuities occur as very closely spaced at widely spaced intervals.</p>		
30													
100													
31													
31													
105		$\frac{100}{0.6}$	25	PLT - D									
32													
33													
110													
34										<p>Borehole completed to 110.0 feet bgs on October 25, 2007. Borehole was overcased with HWT casing to 1.6 feet bgs and was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on October 31, 2007. Groundwater was measured at approximately 33.1 feet bgs during drilling activities and at 70.5 feet on October 25, 2007 prior to beginning optical borehole survey. Borehole backfilled with cement grout on November 2, 2007.</p>			
115													
35													
36													
120													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
							$\frac{94}{2.3}$	1		GRAVEL [GP] , angular GRAVEL, with sand and cobbles, boulders, trace organics, loose, pale brown (5YR 5/2), moist. [Colluvium and Anthropogenic Fill]			
1										META-WELDED LAPILLI DACITE TUFF , grayish olive (10Y 4/2), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized entrained clasts (20 to 50%), slightly welded, slightly weathered (II), moderately strong (R3) rock, discontinuities are closely spaced and in poor condition. [Tuff member of Lake Keechelus, Ohanapecoh Formation]			
5							$\frac{94}{1.1}$	2	PLT - D	Becomes fresh to slightly weathered (I - II) rock			
10							$\frac{112}{1.4}$	3	PLT - D	Becomes grayish olive to light olive gray (10Y 4/2 - 5Y 5/2), fresh (I), moderately strong to strong (R3 - R4) rock, discontinuities become closely spaced and in poor to good condition, discontinuities in poor condition occur at a 5 to 10% frequency			
15							$\frac{92}{1.7}$	4					
20							$\frac{102}{1.8}$	5		Flow boundary contact, no infilling, becomes grayish olive to grayish green (10Y 4/2 - 10GY 5/2) strong (R4) rock			



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument	
			20	40	60	80								
14							92 / 0.0	R4	12	PLT - D	Becomes grayish blue green (5BG 5/2) rock, discontinuities become very widely spaced and in good condition			
								124 / 0.0		13				
15														
50								98 / 0.6		14				
16												Becomes dusky yellow green to light olive gray (5Y 5/2 - 5GY 5/2), strong (R4) rock, discontinuities become moderately to closely spaced and in very poor to good condition, discontinuities in poor to very poor condition occur at a 38 to 43% frequency		
55									R4		PLT - D			
17								100 / 0.4		15				
18														
60									R5		PLT - A			
								100 / 0.8		16				
19														
65												At 63.5 to 64.0 feet bgs - becomes slightly weathered (II), moderately strong to strong (R3 - R4) rock		
20								98 / 0.6		17		At 64.5 to 65.1 feet bgs - becomes slightly weathered (II), moderately strong to strong (R3 - R4) rock		
21									R5		PLT - D	Becomes dusky yellow green to grayish green (5GY 5/2 - 10GY 5/2), strong to very strong (R4 - R5) rock, discontinuities are closely spaced at moderately spaced intervals and in fair to good condition		
70												At 68.4 to 69.2 feet bgs - discontinuity in very poor condition		

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument			
			20	40	60	80										
22							100	R4	18	PLT - D	At 70.1 to 72.0 feet bgs - becomes pale blue to light olive gray (5B 6/1 - 5Y 5/2), fresh to slightly weathered (I - II), moderately strong to strong (R3 - R4) rock					
																Becomes pale blue (5B 6/2) rock, discontinuities are closely spaced at moderately spaced intervals and in fair to good condition
75											R5	19	PLT - A	At 74.2 to 75.1 feet bgs - becomes fresh to slightly weathered (I - II), moderately strong to strong (R3 - R4) rock		
23										100						
											0.8					
24																
80							R5	20	PLT - D PLT - A	Becomes pale blue (5B 6/2), fresh (I), strong to very strong (R4 - R5) rock, with light olive brown (5Y 5/6), slightly weathered (II), moderately strong to strong (R3 - R4) rock enveloping discontinuities, discontinuities are closely spaced at moderately spaced intervals and in fair to good condition						
25																
						100										
						0.4										
85							R5	21	PLT - D PLT - A							
26																
						98										
						0.8										
27																
90							R5	22	PLT - D PLT - A	At 90.0 to 90.2 feet bgs - 0.2 feet core loss, core break at top of run does not match core break of previous run						
28												Becomes light brown to moderate brown (5YR 5/6 - 5YR 4/4), slightly to moderately weathered (II - III), moderately weak to moderately strong (R2 - R3) rock, discontinuities become very closely spaced and in very poor to very poor condition				
						98										
						3.9										
95																

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument	
			20	40	60	80								
29		[Hatched Profile]					$\frac{98}{5.5}$	R3	23	PLT - D	Becomes slightly weathered (II), moderately strong (R3) rock, discontinuities become very closely spaced and in good to fair condition			
30								R5		PLT - D	At 97.9 to 98.9 feet bgs - becomes fresh to slightly weathered (I- II), moderately strong to strong (R3 - R4) rock			
100							$\frac{102}{2.5}$		24		Becomes light bluish gray to medium light gray (5B 7/1 - N6), fresh (I), strong (R4) rock, discontinuities become closely spaced and in good condition			
31								R5		PLT - D				
105							$\frac{98}{3.7}$		25		Becomes light brown (5YR 5/6), slightly weathered (II) rock Becomes moderate brown (5YR 4/4), slightly weathered (II), moderately strong (R3) rock			
33												At 107.7 to 108.3 feet bgs - becomes light bluish gray (5B 7/1), fresh (I) rock		
110							$\frac{94}{0.4}$		26			At 109.0 to 109.8 feet bgs - discontinuities in fair to very poor condition, with 0.1 feet core loss at discontinuity in very poor condition At 110.0 feet bgs - becomes pale blue to grayish blue (5B 6/2 - 5B 5/2), fresh (I), strong to very strong (R4 - R5) rock, discontinuities become moderately to closely spaced at widely spaced intervals and in good condition		
34														
115							$\frac{112}{0.0}$		27			Becomes grayish green (10GY 5/2) rock		
36							$\frac{92}{1.3}$	R4 R4	28		PLT - D PLT - A	At 117.6 to 120.1 feet bgs - becomes dusky yellow green to grayish green (5GY 5/2 - 10GY 5/2), fresh to slightly weathered (I - II) rock		
120														

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
37							108 0.4	R4 R5	29	PLT - A PLT - D	Discontinuities become moderately to closely spaced at widely spaced intervals and in good condition		
38	125						96 0.0		30				
39										Borehole completed to 125.1 feet bgs on October 22, 2007. Borehole was overcased with HWT casing to 1.0 feet bgs and was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on October 30, 2007. Groundwater was measured at approximately 40.8 feet bgs during drilling activities and at 58.0 feet on October 30, 2007 prior to beginning optical borehole survey. Borehole backfilled with cement grout on November 2, 2007.			
40	130												
41	135												
42													
43	140												
44													
145													



Start Card SE01979

Job No. 03-2007 SR 90 Elevation 2645.9 ft (806.5 m)

HOLE No. RKS-30-07

Sheet 1 of 6

Project 2007 I-90 Geotechnical Slide Curve Design Investigation

Driller R. Gregory/S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector K. Yang

Start September 22, 2007 Completion September 25, 2007 Well ID# Not Applicable Equipment Skid-Mounted Burley 5500-1

Station 1408+98 Offset 84 Feet Left Casing Not Applicable Method HQ3 Triple Tube Wireline

Northing 733749.28 Easting 1426602.23 Latitude 47°20'31.764"N Longitude 121°21'44.695"W

County Kittitas Subsection NE Quarter Section 02 Range 11E Township 21N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
0	0										SILTY GRAVEL [GM] , silty coarse GRAVEL, with sand and boulders, trace organics, loose, medium dark gray to medium light gray (N4 - N6), dry. [Colluvium and Anthropogenic Fill]			
1	0.3					88 2.3	R1		1	PLT - D	META-WELDED LAPILLI DACITE TUFF , dusky yellow green (5GY 5/2), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized entrained clasts (20 to 50%), slightly welded, slightly weathered (I), moderately strong to strong (R3 - R4) rock, discontinuities are closely spaced and in good condition. [Tuff member of Lake Keechelus, Ohanapecosh Formation]			
5	1.5					100 0.4	R4		2	PLT - D	Becomes slightly to moderately weathered (II - III), strong (R4) rock, discontinuities become moderately to closely spaced and in very poor to good condition, discontinuities in very poor condition occur at a 15 to 30% frequency			
10	3.0					106 1.5			3		Becomes fresh to slightly weathered (I - II) rock			
15	4.5					94 1.1			4		Becomes moderately strong to strong (R3 - R4) rock			
20	6.0						R4			PLT - D				

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								5		Becomes dusky yellow green to grayish green (10GY 5/2 - 5GY 5/2), fresh (I), strong (R4) rock, discontinuities become widely spaced and in fair to good condition			
25						104 0.4							
8								6		Becomes grayish green (10GY 5/2)			
30						100 0.2	R5		PLT - D				
9								7		Becomes fresh (I), very strong (R5) rock			
35						100 0.4							
10								8		Becomes fresh (I), very strong (R5) rock			
40						101 0.0	R5 R5 R4		PLT - D PLT - A PLT - D				
11								9		Becomes fresh (I), very strong (R5) rock			
45						100 0.0							
12								10					
13						99 0.2							



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
14							100 0.0	R5		11	PLT - D PLT - A	<p>Becomes fresh (I), very strong (R5) rock, discontinuities become widely spaced and in fair to good condition</p>		
15							100 0.0	R5						
50							100 0.0			12				
16							100 1.2	R4		13	PLT - D	<p>At 51.3 to 53.1 feet bgs - becomes dusky yellow green (5GY 5/2), slightly weathered (II), strong (R4) rock, discontinuities become closely to very closely spaced and in fair to poor condition</p>		
55								R5			PLT - A PLT - D			
17							100 0.0	R5		14				
18														
60							100 0.6			15				
19												<p>At 62.5 to 68.5 feet bgs - becomes dusky yellow green (5GY 5/2), fresh to slightly weathered (I - II), very strong (R5) rock, discontinuities become moderately to closely spaced and in good to fair condition</p>	▼	
65								R5 R4			PLT - D PLT - A			
20							100 0.4			16				
21														
70														

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22								17		Becomes fresh (I), very strong (R5) rock, discontinuities become widely to very widely spaced and in fair to good condition			
75	23						R5 R5	18	PLT - D PLT - A				
								19					
80	24												
								20		Becomes fresh (I), very strong (R5) rock, discontinuities become very widely spaced and in good condition			
25								21					
							R5 R5	22	PLT - A PLT - D				
85	26							23					
								24		Becomes fresh (I), strong to very strong (R4 - R5) rock, discontinuities become very widely spaced and in good condition			
90													
28													
95							R4		PLT - D				

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29													
								25					
30													
100													
31													
								26		100 0.0			
105													
32													
110													
33													
110													
34													
115													
35													
115													
36													
120													

ROCK SCD BOREHOLES 2007.GPJ 3/5/08

Becomes fresh (I), very strong (R5) rock, discontinuities become very widely spaced and in good condition

At 110.3 to 111.5 feet bgs - healed discontinuities occur closely spaced

Becomes grayish green to dusky yellow green (10GY 5/2 - 5GY 5/2), fresh (I), strong to very strong (R4 - R5) rock, discontinuities become closely to very closely spaced and in poor to good condition, discontinuities in poor condition occur at a 10 to 15% frequency



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
37		[Hatched Pattern]					102 0.4	31		Becomes grayish green (10GY 5/2), fresh (I), strong to very strong (R4 - R5) rock, discontinuities become moderately spaced at widely spaced intervals and in good to fair condition			
125	38						100 0.0	32					
130	39								PLT - D PLT - A				
40		[Hatched Pattern]					102 0.4	33		At 132.7 to 133.9 feet bgs - becomes dusky yellow green (5GY 5/2), slightly weathered (II) rock			
135	41								R4 R5 PLT - A PLT - D				
42										Borehole completed to 135.9 feet bgs on September 25, 2007. Borehole was overcased with HWT casing to 2.5 feet bgs and was flushed in preparation of optical and acoustical televiwer survey. Optical and acoustical televiwer survey completed on October 3, 2007. Groundwater was measured at approximately 73.1 feet bgs during drilling activities and at 62.4 feet on October 3, 2007 prior to beginning optical borehole survey. Borehole backfilled with cement grout on October 3, 2007.			
140	43												
44													
145	44												



Start Card SE01979

Job No. 03-2007 SR 90 Elevation 2648.3 ft (807.2 m)

HOLE No. RKS-31-07

Sheet 1 of 6

Project 2007 I-90 Geotechnical Slide Curve Design Investigation

Driller R. Gregory/S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector K. Yang

Start September 10, 2007 Completion September 19, 2007 Well ID# Not Applicable Equipment Skid-Mounted Burley 5500-1

Station 1410+45 Offset 110 Feet Left Casing Not Applicable Method HQ3 Triple Tube Wireline

Northing 733670.41 Easting 1426717.43 Latitude 47°20'30.998"N Longitude 121°21'43.009"W

County Kittitas Subsection NE Quarter Section 02 Range 11E Township 21N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											SILTY GRAVEL [GM] , silty fine GRAVEL, with sand, cobbles, and boulders, trace organics, loose, grayish orange to grayish orange pink (10YR 7/4 - 5YR 7/2), dry. [Colluvium and Anthropogenic Fill]			
1											META-WELDED LAPILLI DACITE TUFF , grayish green (10GY 5/2), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized entrained clasts (20 to 50%), slightly welded, slightly weathered (II), strong (R4) rock, discontinuities are moderately to closely spaced and in good to fair condition. [Tuff member of Lake Keechelus, Ohanapecosh Formation]			
5							$\frac{83}{0.0}$	R5	1	PLT - D	Becomes fresh (I), very strong (R5) rock			
							$\frac{107}{0.4}$	R5	2	PLT - A	At 6.5 to 6.8 feet bgs - 0.3 feet core loss, discontinuities in very poor condition			
10							$\frac{96}{1.6}$		3		Becomes dusky yellow green (5GY 5/2) rock			
15							$\frac{102}{1.5}$		4					
							$\frac{64}{5.7}$		5					
							$\frac{105}{0.5}$		6					
								R5			PLT - A			
20								R5			PLT - D			

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14										At 44.8 to 45.8 feet bgs - discontinuities become closely spaced and in good condition			
						100		15		Becomes dusky yellow green (5GY 5/2), fresh (I), very strong (R5) rock, discontinuities become widely to moderately spaced and in fair to good condition			
						0.7							
15													
50						108		16					
						0.4							
16													
							R4		PLT - D				
							R5		PLT - A				
										At 53.0 to 53.6 feet bgs - discontinuity in poor condition			
55						52		17		Becomes strong (R4) rock, discontinuities become moderately to closely spaced and in fair to good condition			
						1.5							
17													
										Recovery and RQD percentages represented lower than appear worse than actual conditions associated with driller unable to break core off bottom of borehole			
18													
60						128		18		Becomes dusky yellow green (5GY 5/2), fresh (I), strong to very strong (R4 - R5) rock, discontinuities become moderately to closely spaced and in good condition			
						0.6							
19						66		19					
						1.8							
65						138		20		Becomes very strong (R5) rock, discontinuities become moderately to closely spaced and in fair to good condition			
						0.0							
20							R5		PLT - D				
							R4		PLT - A				
						88		21					
						0.9							
21													
70													

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29		[Hatched pattern]											
							$\frac{92}{0.2}$		29				
30													
							$\frac{104}{0.4}$	R4 R5	30	PLT - A PLT - D			
31													
105		[Hatched pattern]											
							$\frac{84}{0.0}$		31				
32													
							$\frac{103}{0.0}$		32				
33													
110		[Hatched pattern]											
								R4		PLT - A			
34													
							$\frac{96}{0.2}$	R5	33	PLT - D			
35													
115		[Hatched pattern]											
36													
120													

ROCK SCD BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
37							102 0.0	R5	34	PLT - D	Discontinuities become very widely spaced and in good condition		
125							98 0.2		35		At 125.2 to 125.4 feet bgs - 0.2 feet core loss, discontinuity in very poor condition		
130							100 0.0		36				
135							100 0.6	R5 R5	37	PLT - A PLT - D	Discontinuities become moderately to closely spaced and in fair to good condition		
140											Borehole completed to 139.8 feet bgs on September 19, 2007. Borehole was advanced at an angle 66 degrees from horizontal with a direction of 137 degrees. Borehole was overcased with HWT casing to 5.5 feet bgs and was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on September 21, 2007. Groundwater was measured at approximately 82.4 feet bgs during drilling activities and at 82.5 feet on September 21, 2007 prior to beginning optical borehole survey. Borehole backfilled with cement grout on October 3, 2007.		
145													



Start Card _____

Job No. 103-WA SR 90 Elevation 2582.2 ft (787.1 m)

HOLE No. RKS-32-08

Sheet 1 of 3

Project Interstate 90 Hyak Re-Alignment - 2008 Geotechnical Investigation

Driller J. Sauer Lic# _____

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector K. Yang

Start October 13, 2008 Completion October 16, 2008 Well ID# Not Installed Equipment 2800 SIMCO

Station 1313+51 Offset -78 Left Casing Not Installed Method HQ3 Triple Tube Wireline

Northing 742516.03 Easting 1424325.97 Latitude 47°21'58.036"N Longitude 121°22'19.152"W

County Kittitas Subsection SW Quarter Section 26 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
								0		The borehole collar elevation is approximately 2.5 feet below the existing ground surface due to rig platform preparation. There was approximately 1 foot of topsoil encountered.			
1										SILTY SAND WITH GRAVEL [SM] , angular to sub rounded, loose to very dense, light brownish gray (10YR 6/2), dry to moist, contains abundant roots and gravels and cobbles near ground surface. [Alpine Till] At 1.0 to 6.5 feet, sample becomes grayish brown (10 YR 5/2), trace of fine gravels.			
5								1	SPT	Standard Penetration Test using 30" drop and 140 pound hammer using a cathead mechanism. Values = 15, 19, 22; n= 41.			
2								2		At 6.5.0 feet, sample becomes blue gray (5B 5/1), poorly graded gravel with cobble.			
								3					
								3					
10								4	SPT	Standard Penetration Test using 30" drop and 140 pound hammer using a cathead mechanism. Values = 22, 50; n= 50 for 6".			
								5		At 10.0 feet, sample becomes grayish brown (10YR 5/2). At 11.0 feet, sample becomes blue gray (5B 5/1).			
								6					
								7		At 13.4 feet, sample becomes very dark bluish gray to blue gray (10B 3/1 to 10B 6/1), trace of sand and silt.			
15								8					
								8		At 17.0 feet, sample becomes reddish gray to green gray (2.5 YR 5/1 to 10BG 5/1).			
								9					
								9					
20								10					



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7													
25													
8													
9													
30													
10													
35													
11													
12													
40													
13													
45													

ROCK PHASE 1B.GPJ 1/26/09

SILTY SAND WITH GRAVEL, COBBLES, AND BOULDERS [SM/GM], reddish gray to green gray (2.5 YR 5/1 to 10BG 5/1), silty sand with gravel and occasional cobbles and boulders, angular to sub-rounded, medium dense to dense, moist to dry. [Alpine Till]

SILTY SANDSTONE. Medium gray (N5), fine grained, fresh (I), very weak (R1) to moderately weak (R2), discontinuities are moderately spaced, and in good to fair condition. 1 mm - 20 mm thick convoluted siltstone interbeds (grayish black (N2)). [Naches Formation]

At 30.6 feet, core becomes fresh (I) to slightly weathered (II), grayish black silt bedding at ~45 - 55 degrees.

At 32.2 feet, core is heavily fractured with clay infilling. Discontinuities become closely spaced and in poor condition.

SILTSTONE, Grayish black (N2), fine grained, fresh (I), very weak (R1), discontinuities are closely spaced and in poor condition. [Naches Formation]

SILTY SANDSTONE, Medium gray (N5), fine grained, fresh (I), very weak (R1) to moderately weak (R2), discontinuities are moderately spaced, and in good to fair condition. 1 mm - 20 mm thick convoluted siltstone interbeds (grayish black N2). [Naches Formation]

Most of rock mass from 40.0 feet to bottom of hole will crumble under hand pressure.

At 42.6 feet, observed polished surfaces and possible shear zone; fault; 0.3' thick clay gouge. Becomes extremely weak (R0) and completely weathered (V).

SILTSTONE, Grayish black (N2), fine grained, fresh



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14		XXXXXX XXXXXX XXXXXX								(I), very weak (R1), discontinuities are closely spaced and in poor condition. [Naches Formation]			
									SILTY SANDSTONE , Medium gray (N5), fine grained, fresh (I), moderately weak (R2), discontinuities are closely to moderately spaced, and in fair condition. 1 mm - 20 mm thick convoluted siltstone interbeds (grayish black (N2)). [Naches Formation]			
15		XXXXXX XXXXXX XXXXXX								SILTSTONE , Grayish black (N2), fine grained, fresh (I), very weak (R1), discontinuities are closely spaced and in poor condition. [Naches Formation]			
50		XXXXXX XXXXXX XXXXXX											
		XXXXXX XXXXXX XXXXXX											
16		XXXXXX XXXXXX XXXXXX											
												
55												
17												
												
												
18												
60												
19												
												
65												
20												
												
21												
70												

ROCK PHASE 1B.GPJ 1/26/09



Start Card _____

Job No. 103-WA SR 90 Elevation 2582.7 ft (787.2 m)

HOLE No. RKS-33-08

Sheet 1 of 4

Project Interstate 90 Hyak Re-Alignment - 2008 Geotechnical Investigation

Driller B. Williams Lic# _____

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector K. Yang

Start October 10, 2008 Completion October 12, 2008 Well ID# Not Installed Equipment 2800 SIMCO

Station 1316+98 Offset -77 Left Casing Not Installed Method HQ3 Triple Tube Wireline

Northing 742169.03 Easting 1424286.97 Latitude 47°21'54.607"N Longitude 121°22'19.662"W

County Kittitas Subsection SW Quarter Section 26 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
									0		The borehole collar elevation is approximately 1.8 feet below the existing ground surface due to rig platform preparation. There was approximately 1 foot of topsoil encountered.			
1							46		1		POORLY GRADED SILTY SAND WITH GRAVEL [SM/GM] , angular to rounded, loose to very dense, light brownish gray (10YR 6/2), dry to moist, contains abundant roots near ground surface. [Alpine Till] At 2.7 to 5.0 feet, sample becomes greenish gray (10Y 5/1), poorly graded gravels with cobbles, angular to sub-rounded.			
							100		2					
5							100		3					
							19		4					
2											At 5.0 to 8.0 feet, sample becomes blue gray (5B 5/1), fresh (I) to slightly weathered (II), poorly graded gravels with cobbles, sub-rounded.			
							89		5		META BASALT , dark greenish gray (5GY 4/1), massive aphanitic groundmass with 10-20% phenocrysts, 1-2% fine pyrite, fresh (I) to slightly weathered (II), moderately weak (R2) to moderately strong (R3). Discontinuities are closely spaced and in fair condition. [Ohanapecosh Formation]			
10							2.1							
							>200		6					
							95	R3	7	PLT-D				
							3.1							
4														
15											At 14.0 feet, observed possible flow boundary			
								R1		PLT-D	META AMYGDALOIDAL BASALT , green gray (10BG 5/1), massive aphanitic groundmass with 10-20% phenocrysts, slightly weathered (II), moderately weak (R2) to moderately strong (R3). Discontinuities are closely spaced and in fair condition. [Ohanapecosh Formation]			
5														
							96		8					
							1.2							
20								R1		PLT-D				

ROCK PHASE 1B.GPJ 1/26/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7							$\frac{110}{3}$		9		<p>META AMYGDALOIDAL BASALT, dark greenish gray (10BG 5/1), massive aphanitic groundmass with 10-20% phenocrysts, 1-2% fine pyrite, slightly weathered (II), moderately weak (R2). Discontinuities are moderately spaced and in fair condition. [Ohanapecosh Formation]</p> <p>At 22.0 feet, discontinuities become closely spaced and are in poor to fair condition.</p>		
25							$\frac{75}{2}$		10				
8							$\frac{98}{2.75}$	R1	11	PLT-D	<p>At 28.1 feet, core becomes fresh (I), moderately strong (R3), and discontinuities become moderately spaced and in fair to good condition.</p>		
30							$\frac{110}{3}$	R4	12	PLT-D			
10							$\frac{96}{3.4}$		13		<p>At 34.0 feet, core becomes slightly weathered (II), moderately weak (R2), and discontinuities become moderately spaced and in fair condition.</p>		
35							$\frac{70}{1.4}$		14				
11											<p>At 36.0 feet, observed possible flow boundary.</p>		
12							$\frac{67}{2.8}$	R5	15	PLT-D	<p>META BASALT, dark greenish gray (5GY 4/1), massive aphanitic groundmass with 10-20% phenocrysts, fresh (I) to slightly weathered (II), moderately weak (R2) to moderately strong (R3). Discontinuities are moderately spaced and in fair condition. [Ohanapecosh Formation]</p>		
40							$\frac{360}{3}$		16				
13							$\frac{100}{2.2}$	R4	17	PLT-D			
45													

ROCK PHASE 1B.GPJ 1/26/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument	
			20	40	60	80								
14							$\frac{111}{1}$	R4	18	PLT-D	<p>META BASALT, dark greenish gray (5GY 4/1), massive aphanitic groundmass with 10-20% phenocrysts, fresh (I), moderately strong (R3). Discontinuities are moderately spaced and in fair to good condition. [Ohanapecosh Formation] At 47.0 to 71.0 feet, core becomes 2 - 5% amygdules.</p>			
							$\frac{103}{1.1}$		19					
15								R4	20	PLT-D				
50							$\frac{100}{1.3}$		21					
16							$\frac{96}{1.2}$		22					
55								R3	23	PLT-D		At 60.5 feet, core becomes slightly weathered (II), moderately weak (R2), and discontinuities become closely spaced and in poor to fair condition. At 60.6' to 60.8' observed healed fault zone.		
17							$\frac{100}{2}$		24			At 63.5 to 63.7 feet, encounter likely fault, core becomes weak red (10R 4/2), completely weathered (V), and extremely weak (R0).		
18							$\frac{111}{4.4}$		25			At 65.5 feet, core becomes fresh (I) and moderately strong (R3).		
19								R4	26	PLT-D				
65							$\frac{75}{2.2}$		27					
20							R4	28	PLT-D					
21						$\frac{106}{2.3}$		29						
70														

ROCK PHASE 1B.GPJ 1/26/09



LOG OF TEST BORING

Start Card _____

Job No. 103-WA

SR 90

Elevation 2582.7 ft (787.2 m)

HOLE No. RKS-33-08

Sheet 4 of 4

Project Interstate 90 Hyak Re-Alignment - 2008 Geotechnical Investigation

Driller B. Williams

Lic# _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22							$\frac{110}{1.5}$ R4 R4	26	PLT-D PLT-A	META BASALT , dark greenish gray (5GY 4/1), massive aphanitic groundmass with 10-20% phenocrysts, fresh (I) to slightly weathered (II), moderately strong (R3). Discontinuities are moderately spaced and in fair to good condition. [Ohanapecosh Formation]			
75							$\frac{100}{3}$	27					
23										Borehole completed to 75.0 feet below ground surface (bgs) on October 12, 2008. Borehole was overcased to 8 feet bgs with HWT casing and flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer surveys were completed on October 13, 2008. Borehole backfilled with cement grout on October 29, 2008.			
24													
80													
25													
85													
26													
27													
90													
28													
95													



LOG OF TEST BORING

Start Card _____

Job No. 103-WA SR 90 Elevation 2613.9 ft (796.7 m)

HOLE No. RKS-34-08

Sheet 1 of 4

Project Interstate 90 Hyak Re-Alignment - 2008 Geotechnical Investigation

Driller B. Williams Lic# _____

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector K. Yang

Start October 7, 2008 Completion October 9, 2008 Well ID# RKS-34-08 Equipment 2800 SIMCO

Station 1319+56 Offset -135 Left Casing Stick-Up Monument Method HQ3 Triple Tube Wireline

Northing 741906.86 Easting 1424316.75 Latitude 47°21'52.023"N Longitude 121°22'19.188"W

County Kittitas Subsection SW Quarter Section 26 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
								0					
1													
5								47	1				
2													
3								63	2				
								43	3				
10								80	4				
								80	5				
								140	6				
								100	7				
4								110	8				
								3	9				
								100	10				
15								3.8	11				
								53	12				
								1.8	13				
5								80					
								122					
								4.4					
								50					
								1.25					
20													

ROCK PHASE 1B.GPJ 1/26/09

The borehole collar elevation is approximately 1.8 feet below the existing ground surface due to rig platform preparation. There was approximately 1 foot of topsoil encountered.

POORLY GRADED SILTY SAND WITH GRAVEL [SM/GM], angular to sub rounded, loose to very dense, brown (7.5YR 5/2), dry to moist, contains abundant roots, cobbles and boulders near ground surface. [Alpine Till]

At 5.0 to 8.0 feet, sample becomes blue gray (5B 5/1) to light red brown (2.5YR 6/3).

At 8.0 to 13.5 feet, sample becomes blue gray (5B 5/1).

META-BASALT, blue gray (5B 5/1), massive, aphanitic groundmass with 1-5% fine to medium grained phenocrysts, fresh (I) to slightly weathered (II), moderately strong (R3). Discontinuities are closely to moderately spaced and in fair condition. [Ohanapecoh Formation]

R4 PLT-D



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
						$\frac{27}{2}$		14		META-BASALT , dark green gray (10GY 4/1), massive, aphanitic groundmass with 1-5% fine to medium grained phenocrysts, fresh (I), moderately strong (R3). Discontinuities are closely spaced and in poor to fair condition. [Ohanapecosh Formation]			
						$\frac{157}{4.3}$	R3	15	PLT-D				
						$\frac{186}{4.3}$		16					
7						$\frac{100}{3.5}$		17					
25										At 24.9 feet, core becomes light yellow brown (2.5Y 6/3), slightly weathered (II), and moderately weak (R2).			
8													
						$\frac{100}{2}$	R5	18	PLT-D	At 27.2 feet, discontinuities become moderately spaced and in fair condition.			
30										At 29.4 feet, core becomes blue gray (10B 5/1) and slightly weathered (II).			
9													
						$\frac{96}{3}$	R4	19	PLT-D	At 33.5 feet, core becomes moderately weak (R2) to moderately strong (R3) and discontinuities become closely spaced and in poor to fair condition. At 35.2' observed fault with slickensides and polished surfaces.			
												At 35.5 feet, core becomes dark greenish gray (10GY 4/1), fresh (I), and moderately strong (R3).	
35													
10						$\frac{91}{2.3}$	R4	20	PLT-D				
40						$\frac{100}{0.8}$	R1	21	PLT-D	At 39.6 feet, core becomes fresh (I) to slightly weathered (II) and moderately weak (R2) to moderately strong (R3).			
12													
						$\frac{109}{4}$		22					
13													
						$\frac{56}{3.2}$		23		At 44.0 feet, core becomes iron stained with calcite healed joints.			
45													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14													
15													
50													
16													
55													
17													
18													
60													
19													
65													
20													
21													
70													

ROCK PHASE 1B.GPJ 1/26/09

META-BASALT, blue gray (10B 5/1) to greenish gray (10Y 1/5) to weak red (10R 4/2), massive, aphanitic groundmass with 1-5% fine to medium grained phenocrysts, fresh (I), moderately strong (R3). Discontinuities are moderately spaced and in good condition. [Ohanapecosh Formation]

At 52.5 feet, core becomes blue gray (10B 5/1).

At 62.2 feet, core becomes dark green gray (5G 4/1) to weak red (10R 4/2).

At 67.2 feet, core becomes slightly weathered (II), moderately weak (R2), and discontinuities become moderately spaced and in fair condition.

At 68.9 to 69.3 feet, observed flow boundary, core becomes completely weathered (V), and extremely weak (R0).



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22										<p>META-BASALT, dark blue gray (10B 4/1), massive, aphanitic groundmass with fine to medium grained phenocrysts (1-5%), fresh (I), moderately strong (R3). Discontinuities are closely spaced and in fair condition. [Ohanapecoh Formation]</p>			
						$\frac{95}{3.5}$	R5	31	PLT-D				
75						$\frac{76}{3.6}$		32					
23													
						$\frac{119}{4.8}$	R5	33	PLT-D				
24										<p>At 78.4 feet, core becomes weak red (5G 4/1), moderately weathered (III), extremely weak (R0) to very weak (R1), and discontinuities become closely spaced and in fair to poor condition. Encountered fault, possibly along flow boundary with polished and striated surfaces on discontinuity.</p> <p>At 79.2 feet, core becomes dark blue gray (10B 4/1), fresh (I), and moderately strong (R3).</p> <p>Borehole completed to 80.1 feet below ground surface (bgs) on October 09, 2008. Borehole was overcased with HWT casing to 11.5 feet bgs and was flushed in preparation of optical and acoustical televiwer survey. Optical and acoustical televiwer survey completed on October 12, 2008. Borehole completed with Time Domain Reflectometry Cable from ground surface to 80.0 feet bgs and one vibrating wire piezometer at 78.0 feet bgs to 79.5 feet bgs. Groundwater was measured at 24.8 ft. bgs on October 09, 2008 prior to beginning optical borehole survey. Borehole backfilled with cement grout on October 28, 2008.</p> <p>VWP # 94575 = 78.0 to 79.5 feet bgs.</p> <p>Grout mix from 0.0 to 80.1 feet bgs: One 94 pound bag of Type I-II Portland Cement 6 gallons of water</p> <p>Well Tag # = APA 651</p>			
80													
25													
85													
26													
27													
90													
28													
95													



LOG OF TEST BORING

Start Card _____

Job No. 103-WA SR 90 Elevation 2613.7 ft (796.6 m)

HOLE No. RKS-35-08

Sheet 1 of 4

Project Interstate 90 Hyak Re-Alignment - 2008 Geotechnical Investigation

Driller J. Sauer Lic# _____

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector K. Yang

Start October 2, 2008 Completion October 4, 2008 Well ID# Not Installed Equipment 2800 SIMCO

Station 1320+98 Offset -71 Left Casing Not Installed Method HQ3 Triple Tube Wireline

Northing 741771.8 Easting 1424237.75 Latitude 47°21'50.681"N Longitude 121°22'20.313"W

County Kittitas Subsection SW Quarter Section 26 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0								0		The borehole collar elevation is approximately 1 foot below the existing ground surface due to rig platform preparation. There was approximately 1 foot of topsoil encountered.			
1								1		POORLY GRADED SILTY SAND WITH GRAVEL [SM/GM] , angular to rounded, loose to very dense, light brownish gray (10YR 6/2), dry to moist, contains abundant roots and occasional cobble and boulders near ground surface. [Alpine Till]			
5								2					
2								3					
								4					
10								5		META BASALT , dark blue gray (5PB 4/1), massive aphanitic groundmass with 3-10% fine to medium sized phenocryst, fresh (I), moderately strong (R3). Discontinuities are closely spaced and in fair to good condition. Reddish staining on discontinuities to ~50.0 feet below ground surface. [Ohanapecoh Formation]			
4								6					
15								7					
5								8					
20													

ROCK PHASE 1B.GPJ 1/26/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14		[Hatched Profile]											
15		[Hatched Profile]											
50													
16		[Hatched Profile]											
55		[Hatched Profile]											
17													
18		[Hatched Profile]											
60													
19		[Hatched Profile]											
65		[Hatched Profile]											
20													
21		[Hatched Profile]											
70													

ROCK PHASE 1B.GPJ 1/26/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22								R5		PLT-D	<p>META BASALT, very dark greenish gray (5BG 3/1), massive aphanitic groundmass with fine to medium sized phenocrysts (3-5%), fresh (I), strong (R4). Discontinuities are moderately to widely spaced and in good to fair condition. [Ohanapecosh Formation]</p> <p>At 75.8 feet, discontinuities become closely spaced and in poor to fair condition. At 76.0 to 76.2 feet, observed fault and slickensides. Core becomes moderately weathered (III) and extremely weak (R0) to very weak (R1). At 76.2 feet, core becomes fresh (I) and moderately weak (R2) to moderately strong (R3). At 78.0 to 78.5 feet, observed broken core zone, core becomes moderately weathered (III) and extremely weak (R0) to very weak (R1).</p>		
75	23												
24													
80													
25											<p>Borehole completed to 80.3 feet below ground surface (bgs) on October 04, 2008. Borehole was overcased with HWT casing to 12.5 feet bgs and was flushed for optical and acoustical televiewer survey. Optical and acoustical televiewer surveys were completed on October 12, 2008. Borehole backfilled with cement grout on October 28, 2008.</p>		
85	26												
27													
90													
28													
95													



Start Card _____

Job No. 103-WA SR 90 Elevation 2609.1 ft (795.2 m)

HOLE No. RKS-36-08

Sheet 1 of 4

Project Interstate 90 Hyak Re-Alignment - 2008 Geotechnical Investigation

Driller B. Williams Lic# _____

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector K. Yang

Start September 29, 2008 Completion October 1, 2008 Well ID# Not Installed Equipment 2800 SIMCO

Station 1323+50 Offset -72 Left Casing Not Installed Method HQ3 Triple Tube Wireline

Northing 741521.48 Easting 1424210.14 Latitude 47°21'48.208"N Longitude 121°22'20.674"W

County Kittitas Subsection SW Quarter Section 26 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0								0		The borehole collar elevation is approximately 1.5 feet below the existing ground surface due to rig platform preparation. There was approximately 1 foot of topsoil encountered.			
1								1		SILTY SAND WITH GRAVEL [SM/GM] , angular to sub rounded, loose to very dense, light brownish gray (10YR 6/2), dry to moist, contains abundant roots, cobbles and boulders near ground surface. [Alpine Till]			
5								2					
2								3					
10								4		META BASALT , bluish gray (5B 5/1) to medium dark gray (N4), massive aphanitic groundmass with 3-10% fine to medium grained phenocrysts, fresh (I) to slightly weathered (II), moderately strong (R3) to strong (R4). Discontinuities are closely spaced and in fair condition. [Ohanapecosh Formation]			
15								5	PLT-D	At 13.0 feet, core becomes bluish gray (5B 5/1), fresh (I), strong (R4), and discontinuities become moderately spaced and in fair condition.			
4								6					
20													

ROCK PHASE 1B.GPJ 1/26/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7													
25													
8													
9													
30													
10													
35													
11													
40													
12													
40													
13													
45													

ROCK PHASE 1B.GPJ 1/26/09

META BASALT, bluish gray (5B 5/1) to medium dark gray (N4), massive aphanitic groundmass with 3-10% fine to medium grained phenocrysts, fresh (I), moderately strong (R3). Discontinuities are closely spaced and in poor condition. [Ohanapecosh Formation]

At 24.2 feet, discontinuities become moderately spaced and in fair condition.

At 25.8 feet, discontinuities become closely spaced and in poor to fair condition.

At 37.0 feet, rock mass is heavily disturbed with several faults present as shown by polished and slicken-sided surfaces.

At 40.0 feet, core becomes moderately weathered (III), extremely weak (R0) to moderately strong (R3). Fault zone with polished surfaces on discontinuities.

At 43.2 feet, core becomes slightly (II) to moderately (III) weathered and is very weak (R1) to moderately weak (R2).



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14		[Hexagonal pattern]											
15													
50													
16		[Diagonal hatching]											
17													
55		[Diagonal hatching]											
18													
60													
19		[Diagonal hatching]											
65													
20		[Diagonal hatching]											
21													
70		[Diagonal hatching]											

ROCK PHASE 1B.GPJ 1/26/09

META BASALT, bluish gray (5B 5/1) to medium dark gray (N4), massive aphanitic groundmass with 3-10% fine to medium grained phenocrysts, slightly (II) to moderately weathered (III), very weak (R1) to moderately weak (R2). Discontinuities are closely spaced and in poor to fair condition. [Ohanapecoh Formation]

At 50.2 feet, core becomes fresh (I) and very weak (R1) to moderately weak (R2).

At 53.8 feet, observed greater than 10 healed discontinuities per foot and several polished surfaces.

At 57.0 feet, observed possible lower fault contact. Core becomes weak red (10R 4/2), moderately weathered (III) and moderately strong (R3). Discontinuities become moderately spaced and in fair condition.

At 62.4 feet, discontinuities become closely spaced and in poor to fair condition.

R4 PLT-D

R4 PLT-D

R3 PLT-A



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
							0		8		<p>META WELDED LAPILLI DACITE TUFF, very dark gray (5YR 3/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized clasts (3-7%), moderately welded, fresh (I) to slightly weathered (II), strong (R4). Discontinuities are moderately spaced and in fair to good condition. [Ohanapecosh Formation]</p> <p>At 28.4 feet, discontinuities become closely to moderately spaced and in fair condition.</p> <p>Borehole completed to 36.3 feet below ground surface (bgs) on October 22, 2008. Borehole was overcased with HWT casing to 20.0 feet bgs and flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer surveys were completed on October 24, 2008. Borehole backfilled with cement grout on November 04, 2008.</p>		
						333	R5	9	SPT				
						114		10	PLT-D				
						2.1		11					
						100		12					
						0.7		13					
						0		14					
						0.0		15					
7						75		16					
						0.0		17					
						160	R5	18	PLT-D				
						1.0	R4	19	PLT-A				
						100		20					
						1.3		21					
8						130	R5	22	PLT-D				
						0.0		23					
						53		24					
						1.6		25					
						88	R5	26	PLT-D				
						1.9		27					
						121		28					
						0.8		29					
9								30					
								31					
								32					
								33					
								34					
								35					
								36					
								37					
								38					
								39					
								40					
								41					
								42					
								43					
								44					
								45					

ROCK PHASE 1B.GPJ 1/26/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
							31		1		The borehole collar elevation is approximately 1.2 feet below the existing ground surface due to rig platform preparation. There was approximately 1 foot of topsoil encountered.			
1											SILTY SAND, GRAVEL, COBBLE, AND BOULDERS [SM/GM] , sub-angular to sub-rounded, loose to very dense, medium gray (N4), moist, homogeneous. [Colluvium]			
5							98 3.4		2					
2								R5		PLT-D	META WELDED LAPILLI TUFF , medium gray (N5), massive aphanitic groundmass with fine to medium phenocrysts(10-20%), lapilli sized rock fragments (10-20%), lapilli sized pumice fragments (10-15%), slightly weathered (II), moderately strong (R3). Discontinuities are closely spaced and in fair condition. [Ohanapecosh Formation]			
10							108 7.6		3		At 7.8 feet, core becomes fresh (I) and moderately strong (R3) to strong (R4). At 9.5 feet, core becomes strong (R4).			
4							104 5.6		4					
15							108 2.8		5		PLT-D	At 14.5 feet, core becomes medium dark gray (N4).		
5														
							76 2.0		6					
20								R5		PLT-D				
							133		7					



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14										META WELDED LAPILLI TUFF , medium gray (N5) to dark gray (N4), massive aphanitic groundmass with fine to medium phenocrysts (10-20%), lapilli sized rock fragments (5-7%), lapilli sized pumice fragments (3-5%), slightly weathered (II) to moderately weathered (III), moderately strong (R3) to strong (R4). Discontinuities are closely spaced and in poor to fair condition. [Ohanapecoh Formation]			
15													
50													
16													
55													
17													
18													
60													
19													
65													
20													
21													
70													

ROCK PHASE C.GPJ - 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22							3.6	R2		PLT-D	META WELDED LAPILLI TUFF , greenish gray (5G 6/1), massive aphanitic groundmass with fine to medium phenocrysts (5-12%), lapilli sized rock fragments (10-12%), lapilli sized pumice fragments (5-10%), fresh (I), strong (R4) to very strong (R5). Discontinuities are closely to moderately spaced and in fair condition. [Ohanapecoh Formation]		
75	23						$\frac{98}{1.2}$	R2	23	PLT-A	At 74.5 feet, core becomes strong (R4) and discontinuities become moderately spaced and in fair condition.		
80	24						$\frac{100}{0.6}$	R1	24	PLT-D	At 79.5 feet, core becomes greenish gray (5B 6/1) and moderately strong (R3).		
85	26						$\frac{106}{0.6}$		25				
27								R3		PLT-D			
90	28						$\frac{98}{0.8}$	R2	26	PLT-A			
95							$\frac{102}{0.6}$		27				
											At 92.0 feet, discontinuities become closely spaced and in fair condition.		



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29							0.4	R2		PLT-D	<p>META WELDED LAPILLI TUFF, greenish gray (5G 6/1), massive aphanitic groundmass with fine to medium phenocrysts (5-15%), lapilli sized rock fragments (7-15%), lapilli pumice fragments (3-5%), fresh (I), moderately strong (R3). Discontinuities are moderately to widely spaced and in fair to good condition. [Ohanapecosh Formation]</p>		
30													
100							$\frac{104}{0.4}$		28		At 99.5 feet, core becomes medium gray (N5) to greenish gray (5G 6/1).		
31													
105							$\frac{100}{0.4}$	R2	29	PLT-D	At 104.5 feet, core becomes greenish gray (5G 6/1) and moderately strong (R3) to strong (R4).		
33								R3		PLT-A			
110							$\frac{100}{0.6}$		30		At 109.5 feet, core becomes strong (R4).		
34													
115							$\frac{100}{0}$		31				
35								R4		PLT-D			
120							$\frac{98}{0.2}$		32				



LOG OF TEST BORING

Start Card SE03294

Job No. 103-WA

SR 90

Elevation 2636.3 ft (803.5 m)

HOLE No. RKS-38-08

Sheet 6 of 6

Project Interstate 90 Hyak Re-Alignment - 2008 Geotechnical Investigation

Driller M. Starling/ S. Tunison Lic# 2628

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
37											<p>Borehole completed to 119.5 feet below ground surface (bgs) on October 15, 2008. Borehole was overcased with HWT casing to 7.1 feet bgs and was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on October 12, 2008. Borehole completed with time domain reflectometry cable from ground surface to 119.5 feet bgs. Groundwater was measured at 46.5 ft. bgs on October 15, 2008 prior to beginning optical borehole survey. Borehole backfilled with cement grout on October 30, 2008.</p> <p>Grout mix from 0.0 to 119.5 feet bgs: One 94 pound bag of Type I-II Portland Cement 6 gallons of water</p> <p>Well Tag # = APA 653</p>			
125														
39														
130														
40														
41														
135														
42														
140														
43														
44														
145														



Start Card SE03294

Job No. 103-WA SR 90 Elevation 2618.9 ft (798.2 m)

HOLE No. RKS-39-08

Sheet 1 of 5

Project Interstate 90 Hyak Re-Alignment - 2008 Geotechnical Investigation

Driller B. Kotzian/ S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector D. Meier

Start October 14, 2008 Completion October 21, 2008 Well ID# Not Installed Equipment Burley 5500

Station 1383+52 Offset -98 Left Casing Not Installed Method HQ3 Triple Tube Wireline

Northing 736141.26 Easting 1426446.62 Latitude 47°20'55.353"N Longitude 121°21'47.334"W

County Kittitas Subsection SE Quarter Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
								1		The borehole collar elevation is approximately 3 feet below the existing ground surface due to rig platform preparation. There was approximately 1 foot of topsoil encountered.			
1								2		SILTY SAND WITH GRAVEL, COBBLES, AND BOULDERS [SM/GM] , sub-angular to sub-rounded, loose to very dense, medium gray (N4), moist, homogeneous. [Colluvium]			
5								3					
2								4		META WELDED LAPILLI TUFF , greenish gray (5G 6/1), massive aphanitic groundmass with fine to medium phenocrysts (10-20%), lapilli sized rock fragments (10-20%), lapilli sized pumice fragments (10-15%), fresh (I) to slightly weathered (II), moderately weak (R2). Discontinuities are closely spaced and in poor to fair condition. [Ohanapecosh Formation]			
10								5					
4							R2		PLT-D				
15							R3		PLT-D				
5										At 16.0 feet, core becomes moderately strong (R3).			
20										At 18.6 feet, discontinuities become very closely spaced and in poor to fair condition.			



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								6		META WELDED LAPILLI TUFF , greenish gray (5G 6/1), massive aphanitic groundmass with fine to medium phenocrysts, lapilli sized rock fragments, lapilli sized pumice fragments, fresh (I) to slightly weathered (II), moderately strong (R3) to strong (R4). Discontinuities are closely to moderately spaced and in poor to fair condition. [Ohanapecosh Formation]			
25							R4		PLT-D				
8								7		At 26.0 feet, core becomes moderately strong (R3).			
30							R4		PLT-D				
9								8		At 30.2 feet, core becomes moderately strong (R3) to strong (R4) and discontinuities become moderately spaced and in fair condition.			
35							R4		PLT-D				
11								9		At 36.0 feet, discontinuities become widely spaced and in good condition.			
40							R4		PLT-D				
12								10					
45													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14		[Hatched pattern]					$\frac{102}{0}$		11		<p>META WELDED LAPILLI TUFF, greenish gray (5G 6/1), massive aphanitic groundmass with fine to medium phenocrysts (10-20%), lapilli sized rock fragments (10-20%), lapilli sized pumice fragments (10-15%), fresh (I), moderately strong (R3) to strong (R4). Discontinuities are widely spaced and in good condition. [Ohanapecosh Formation]</p>		
15													
50													
16							$\frac{100}{0.5}$	R4	12	PLT-D			
55							$\frac{59}{1.8}$		13			At 53.6 feet, core becomes moderately weathered (III) to highly weathered (IV), extremely weak (R1), and discontinuities become closely spaced and in poor condition. Observed crushed rock with clay infilling.	
17							$\frac{90}{4.4}$		14			At 55.3 feet, core becomes fresh (I) and moderately strong (R3).	
18		[Hatched pattern]											
60							$\frac{94}{4.8}$	R3	15	PLT-D	At 61.0 feet, discontinuities become closely to very closely spaced and in poor condition.		
19													
65							$\frac{100}{2.4}$		16		At 66.0 feet, core becomes moderately strong (R3) to strong (R4) and discontinuities become closely to moderately spaced and in fair condition.		
20		[Hatched pattern]											
21								R3		PLT-D			
70													

ROCK PHASE C.G.F.J. 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
								R1		PLT-D			
	22								17				
	75								18				
	23												
									19				
	24								20				
									21				
	80												
									22				
	25												
									23				
									24				
	85								25				
	26												
									26				
									27				
									28				
									29				
									30				
									31				
									32				
									33				
									34				
									35				
	95												

ROCK PHASE C.GPJ - 2/13/09

META WELDED LAPILLI TUFF, greenish gray (5G 6/1), massive aphanitic groundmass with fine to medium phenocrysts (10-20%), lapilli sized rock fragments (10-20%), lapilli sized pumice fragments (10-15%), fresh (I) to slightly weathered (II), moderately strong (R3) to strong (R4). Discontinuities are closely spaced and in poor to fair condition. [Ohanapecosh Formation]

At 73.8 feet, core becomes highly weathered (IV) and extremely weak (R0). Observed possible shear zone with sandy gouge and slicken-sides.

At 74.4 feet, core becomes fresh (I) to slightly weathered (II) and very weak (R1) to moderately weak (R2). Observed 4 to 8 healed fractures per foot.

At 77.5 to 81.0 feet core becomes highly weathered (IV) and extremely weak (R0) to moderately weak (R2), and discontinuities become close to very close and in poor to fair condition. Area of poor core recovery.

At 81.0 to 82.6 feet, core becomes fresh (I) to slightly weathered (II), moderately weak (R2) to moderately strong (R3), and discontinuities become closely spaced and in poor to fair condition.

At 83.0 to 92.0 feet, core becomes highly weathered (IV) and extremely weak (R0) to moderately weak (R2), and discontinuities become close to very close and in poor to fair condition. Area of poor core recovery.

At 92.0 feet, core becomes fresh (I), moderately strong (R3), and discontinuities are closely spaced and in fair condition.



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
29							100			36		<p>META WELDED LAPILLI TUFF, greenish gray (5G 6/1), massive aphanitic groundmass with fine to medium phenocrysts (10-20%), lapilli sized rock fragments (10-20%), lapilli sized pumice fragments (15-20%), fresh (I), moderately strong (R3). Discontinuities are very closely to closely spaced and in poor to fair condition. [Ohanapecosh Formation]</p>		
30			100	4.0	37									
100														
31											<p>Borehole completed to 101.0 feet below ground surface (bgs) on October 21, 2008. Borehole was flushed in preparation of optical and acoustical televiwer survey. Optical and acoustical televiwer survey completed on November 07, 2008. Groundwater was measured at approximately 10.0 feet bgs during drilling activities and at 54.5 feet on November 7, 2007 prior to beginning optical borehole survey. Borehole backfilled with cement grout on November 7, 2007.</p>			
105														
33														
110														
34														
115														
35														
36														
120														



LOG OF TEST BORING

Start Card RE02930

Job No. 103-WA SR 90 Elevation 2660.6 ft (811.0 m)

HOLE No. RKS-40-08

Sheet 1 of 7

Project Interstate 90 Hyak Re-Alignment - 2008 Geotechnical Investigation

Driller B. Kotzian/ S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector D. Meier

Start October 9, 2008 Completion October 11, 2008 Well ID# RKS-40-08 Equipment Burley 5500

Station 1385+23 Offset -128 Left Casing Stick-Up Monument Method HQ3 Triple Tube Wireline

Northing 735963.62 Easting 1426476.86 Latitude 47°20'53.604"N Longitude 121°21'46.867"W

County Kittitas Subsection SE Quarter Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
									1		The borehole collar elevation is approximately 1.5 feet below the existing ground surface due to rig platform preparation. There was approximately 1 foot of topsoil encountered.			
1									2		SILTY SAND WITH GRAVEL, COBBLES, AND BOULDERS [SM/GM] , sub-angular to sub-rounded, loose to dense, medium gray (N4) to light bluish gray (5B 7/1) to grayish orange (10YR 7/4), dry to moist. [Colluvium]			
5									3		META WELDED LAPILLI TUFF , light bluish gray (5B 7/1) with pale yellowish orange (10YR 7/6) staining on discontinuity surfaces and pumice fragments, massive aphanitic groundmass with fine to medium phenocrysts (10-15%), lapilli sized rock and pumice fragments (10-20%), moderately weathered (III), very weak (R1) to moderately weak (R2). Discontinuities are closely spaced and in poor to fair condition. [Ohanapecosh Formation]			
2									4		At 6.0 feet, core becomes slightly weathered (II) to moderately weathered (III) and moderately weak (R2).			
									5					
10									6		At 9.0 feet, core becomes pale blue (5PB 7/2), fresh (I) to moderately weathered (II) and discontinuities become closely spaced and in poor to fair condition.			
								R1		PLT-D				
4											At 11.8 feet, core becomes extremely weak (R0) and highly weathered (IV).			
15									7		At 13.6 feet, core becomes slightly (II) to moderately weathered (III) and moderately weak (R2) to moderately strong (R3).			
								R2		PLT-D				
5														
20									8		At 18.8 feet, core becomes completely weathered (V) and extremely weak (R0).			



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7													
25													
8													
9													
30													
10													
35													
11													
40													
12													
42													
13													
45													

ROCK PHASE C.GPJ 2/13/09

META WELDED LAPILLI TUFF, pale blue (5PB 7/2) with pale yellowish orange (10YR 8/6) staining on discontinuity surfaces and pumice fragments, massive aphanitic groundmass with fine to medium phenocrysts (10-15%), lapilli sized rock and pumice fragments (10-20%), slightly weathered (II) to moderately weathered (III), very weak (R1) to moderately weak (R2). Discontinuities are closely spaced and in fair condition. [Ohanapecosh Formation]
At 23.4 feet, core becomes extremely weak (R0) and highly weathered (IV).

At 25.8 feet, core becomes light blue gray (5B 7/1), slightly weathered (II), moderately weak (R2) and discontinuities become moderately spaced and in fair condition.

At 28.5 feet, core becomes fresh (I) to slightly weathered (II).

At 32.4 feet, core becomes pale blue (5PB 7/2), fresh (I) to slightly weathered (II), and discontinuities become moderately to widely spaced and in fair to good condition.

At 42.0 feet, core becomes moderately weak (R2) to moderately strong (R3).



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14										<p>META WELDED LAPILLI TUFF, pale blue (5PB 7/2) with pale yellow orange (10YR 8/6) staining on discontinuity surfaces and pumice fragments, massive aphanitic groundmass with fine to medium phenocrysts (10-15%), lapilli sized rock and pumice fragments (10-20%), fresh (I) to slightly weathered (II), moderately weak (R2) to moderately strong (R3). Discontinuities are moderately spaced and in fair to good condition. [Ohanapecosh Formation]</p> <p>At 46.9 feet, core becomes fresh (I) to slightly weathering (II) and discontinuities become widely spaced and in fair condition.</p>			
15						1.0	R3	14	PLT-D				
50													
16													
55													
17													
18													
60													
19													
65													
20													
21													
70													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22							1.0	R3		PLT-D	META WELDED LAPILLI TUFF , pale blue (5PB 7/2) to light blue gray (5B 7/1) with pale yellow orange (10YR 6/6) staining on discontinuity surfaces and pumice fragments, massive aphanitic groundmass with fine to medium phenocrysts (10-15%), lapilli sized rock and pumice fragments (10-15%), fresh (I) to slightly (II) weathered, moderately weak (R2) to moderately strong (R3). Discontinuities are moderately to widely spaced and in fair to good condition. [Ohanapecoh Formation]		
75	23						$\frac{100}{0.8}$		19		At 74.5 feet, core becomes fresh (I), moderately strong (R3), and discontinuities become moderately spaced and in fair condition. At 75.4 feet, core becomes fresh (I) to slightly weathered (II) and moderately weak (R2) to moderately strong (R3).		
80	24						$\frac{100}{0.8}$	R3	20	PLT-D	At 79.5 feet, core becomes light blue gray (5B 7/1), fresh (I), moderately strong (R3) to strong (R4), and discontinuities become moderately to widely spaced and in fair condition.		
25								R3		PLT-D			
85	26						$\frac{100}{0.7}$		21 22		At 84.5 feet, core becomes slightly weathered (II), moderately weak (R2) to moderately strong (R3), and discontinuities become closely spaced and in poor to fair condition.		
27								R4		PLT-D	At 87.2 feet, core becomes fresh (I), moderately strong (R3) to strong (R4), and discontinuities become moderately to widely spaced and in fair condition.		
90	28						$\frac{82}{0.4}$		23				
95							96	R4	24	PLT-D	At 92.5 feet, core becomes strong (R4).		



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29										<p>META WELDED LAPILLI TUFF, pale blue (5PB 7/2) to light blue gray (5B 7/1), massive aphanitic groundmass with fine to medium phenocrysts (10-15%), lapilli sized rock and pumice fragments (10-20%), fresh (I), strong (R4). Discontinuities are moderately spaced and in fair condition. [Ohanapecosh Formation]</p>			
30						1.4	R4		PLT-D				
100								25		<p>At 98.5 feet, core becomes moderately strong (R3) to strong (R4) and discontinuities become closely spaced and in poor to fair condition.</p>			
31						$\frac{92}{4.4}$							
105								26		<p>At 106.9 feet, core becomes greenish gray (5G 6/1) and discontinuities become moderately spaced and in fair condition.</p>			
32						$\frac{96}{2.4}$							
33													
110								27		<p>At 112.9 feet, discontinuities become closely spaced and in poor to fair condition.</p>			
34						$\frac{100}{3.4}$	R3		PLT-D				
35													
115								28		<p>At 116.5 feet, discontinuities become closely to moderately spaced and in poor to fair condition.</p>			
36						$\frac{96}{3.4}$	R4		PLT-D				
120						100		29					

ROCK PHASE C.GPJ - 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
37													
125	38							30		<p>META WELDED LAPILLI TUFF, pale blue (5PB 7/2) to light blue gray (5B 7/1), massive aphanitic groundmass with fine to medium phenocrysts (10-15%), lapilli sized rock and pumice fragments (10-20%), fresh (I), moderately strong (R3) to strong (R4). Discontinuities are closely spaced and in fair condition. [Ohanapechosh Formation]</p>			
39										<p>At 126.5 feet, discontinuities become closely spaced and in poor to fair condition.</p>			
130	40							31		<p>At 130.0 feet, core becomes greenish gray (5G 6/1), fresh (I), moderately strong (R3) to strong (R4), and discontinuities become closely to moderately spaced and in fair condition.</p>			
41										<p>At 134.5 feet, discontinuities become moderately to widely spaced and in fair condition.</p>			
135	42												
140	43									<p>Borehole completed to 139.5 feet below ground surface (bgs) on October 15, 2008. Borehole was overcased with HWT casing and was flushed in preparation of optical and acoustical televiwer survey. Optical and acoustical televiwer survey completed on October 17, 2008. Borehole completed with two vibrating wire piezometers at 100.0 feet and 138.0 feet bgs. Borehole completed with time domain reflectometry cable from ground surface to 75.0 feet bgs. Borehole installation completed on November 07, 2008.</p>			
145	44									<p>VWP# 92732 (98.5 - 100.0 feet bgs) VWP# 92734 (136.5 - 138.0 feet bgs)</p>			



LOG OF TEST BORING

Start Card RE02930

Job No. 103-WA

SR 90

Elevation 2660.6 ft (811.0 m)

HOLE No. RKS-40-08

Sheet 7 of 7

Project Interstate 90 Hyak Re-Alignment - 2008 Geotechnical Investigation

Driller B. Kotzian/ S. Tunison Lic# 2628

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
45											#10-20 silica sand filter pack from 124.0 feet to 139.5 feet bgs. Grout mix from 0.0 to 124.0 feet bgs: One 94 pound bag of Type I-II Portland Cement 30 gallons of water 25 pounds of bentonite powder Well Tag # = APA 654			
150														
155														
160														
165														
170														



LOG OF TEST BORING

Start Card SE03294

Job No. 103-WA SR 90 Elevation 2628.0 ft (801.0 m)

HOLE No. RKS-41-08

Sheet 1 of 4

Project Interstate 90 Hyak Re-Alignment - 2008 Geotechnical Investigation

Driller B. Kotzian/ S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector D. Meier

Start October 12, 2008 Completion October 14, 2008 Well ID# RKS-41-08 Equipment Burley 5500

Station 1386+73 Offset -96 Left Casing Stick-Up Monument Method HQ3 Triple Tube Wireline

Northing 735809.04 Easting 1426436.02 Latitude 47°20'52.073"N Longitude 121°21'47.435"W

County Kittitas Subsection SE Quarter Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
1													
5													
2													
3													
10													
4													
15													
5													
6													
20													

ROCK PHASE C.GPJ - 2/13/09

The borehole collar elevation is approximately 1.5 feet below the existing ground surface due to rig platform preparation. There was approximately 1 foot of topsoil encountered.

SILTY SAND WITH GRAVEL, COBBLES, AND BOULDERS [SM/GM], sub-angular to sub-rounded, loose to dense, pale yellowish orange (10YR 8/6) to medium reddish brown (10R 4/6), dry to moist. [Colluvium]

META WELDED LAPILLI TUFF, pale blue (5PB 7/2) to pale yellowish orange (10YR 8/6), massive, aphanitic groundmass with fine to medium phenocrysts, lapilli sized rock and pumice fragments, slightly weathered (II) to moderately weathered (III), moderately weak (R2) to moderately strong (R3). Discontinuities are closely spaced and in fair condition. [Ohanapecos Formation]

At 9.5 feet, core becomes slightly weathered (II) and moderately weak (R2).

At 11.3 feet, core becomes grayish orange (10YR 7/4), moderately weathered (III) to completely weathered (V), very weak (R0) to moderately weak (R2), and discontinuities become closely spaced and in poor condition. Observed clay zones.

At 14.0 feet, core becomes light bluish gray (5B 7/1) to pale yellow orange (10YR 8/6), slightly weathered (II) to moderately weathered (III), and moderately weak (R2).

At 17.3 feet, discontinuities become closely to moderately spaced and in fair condition.

R3 PLT-D



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7						2.6	R3		PLT-D	META WELDED LAPILLI TUFF , light bluish gray (5B 7/1) to pale yellowish orange (10YR 8/6), massive, aphanitic groundmass with fine to medium phenocrysts, lapilli sized rock and pumice fragments, slightly weathered (II) to moderately weathered (III), moderately weak (R2). Discontinuities are closely to moderately spaced and in fair condition. [Ohanapocosh Formation]			
25						$\frac{100}{2.8}$	R3	7	PLT-D	At 24.5 feet, core becomes moderately weak (R2) to moderately strong (R3).			
8													
30						$\frac{100}{1.8}$		8		At 29.5 feet, core becomes slightly weathered (II), moderately weak (R2), and discontinuities become moderately spaced and in fair condition.			
9													
35						$\frac{100}{1.2}$		9		At 32.9 feet, discontinuities become closely spaced and in poor to fair condition.			
10													
40						$\frac{100}{1.2}$		10		At 40.0 feet, core becomes bluish gray (5B 7/1) to dark gray (N4), fresh (I) to slightly weathered (II), and moderately weak (R2) to moderately strong (R3). Observed pale yellowish orange (10YR 8/6) weathering envelopes around discontinuities.			
11													
45						100	R3	11	PLT-D				
12													
13													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14										META WELDED LAPILLI TUFF , bluish gray (5B 7/1) to medium bluish gray (5B 5/1), pale yellowish orange (10YR 8/6) staining on slightly weathered surfaces, massive, aphanitic groundmass with lapilli sized rock and pumice fragments, fresh (I) to slightly (II) weathered, moderately weak (R2) to moderately strong (R3). Discontinuities are closely to moderately spaced and in poor to fair condition. [Ohanapecoh Formation]			
15							R3	12	PLT-D				
50													
16													
55							R4	13	PLT-D	At 53.1 feet, core becomes fresh (I) to slightly weathered (II), moderately strong (R3), and discontinuities become moderately spaced and in fair condition.			
17													
55													
18							R4	14	PLT-D	At 56.5 feet, core becomes slightly weathered (II) and discontinuities become closely to moderately spaced and in fair condition.			
60													
19													
65													
20													
65													
21													
70													

ROCK PHASE C.GPJ - 2/13/09



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22								19		<p>META WELDED LAPILLI TUFF, bluish gray (5B 7/1) to medium bluish gray (5B 5/1), pale yellowish orange (10YR 8/6) staining on slightly weathered surfaces, massive, aphanitic groundmass with lapilli sized rock and pumice fragments, fresh (I) to slightly (II) weathered, moderately weak (R2) to moderately strong (R3). Discontinuities are closely spaced and in poor to fair condition. [Ohanapecosh Formation]</p>			
75								20		<p>At 73.8 feet, core becomes grayish orange (10YR 7/4) to pale yellow (10YR 8/6), moderately weathered (III), and extremely weak (R0) to very weak (R1).</p> <p>At 75.5 feet, core becomes completely weathered (V) and extremely weak (R0). Clay filled fault zone with mylonite present.</p> <p>At 76.5 feet, core becomes pale purple (5P 6/2) to light bluish gray (5B 7/1), fresh (I), and moderately strong (R3). Observed no weathering envelopes around discontinuities. Numerous mylonite filled faults with gouge up to 5 millimeters thick and slicken-sides along shears.</p>			
80								21		<p>At 79.5 feet, core becomes light bluish gray (5B 7/1), fresh (I) to slightly weathered (II), and moderately weak (R2) to moderately strong (R3).</p>			
85								22					
90										<p>Borehole completed to 89.5 feet below ground surface (bgs) on October 14, 2008. Borehole was overcased with HWT casing and flushed in preparation of optical and acoustical televiewer survey. Optical and televiewer surveys were completed on October 17, 2008. Borehole completed with time domain reflectometry cable from ground surface to 89.5 feet bgs. Borehole backfilled with cement grout on November 06, 2008.</p> <p>Grout mix from 0.0 to 89.5 feet bgs: One 94 pound bag of Type I-II Portland Cement 6 gallons of water Well Tag# = APA 655</p>			
95													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0	0						34	1		The borehole collar elevation is approximately 0.5 feet below the existing ground surface due to rig platform preparation. There was approximately 1 foot of topsoil encountered.			
1	0.3												
5	1.5						100		SPT	At 5.7 feet, Standard Penetration Test using 30" drop and 140 pound hammer using a cathead mechanism. Values = 13, 16, 25; N = 41.			
2	0.6						82	2					
10	3.0						100		SPT	At 10.7 feet, Standard Penetration Test using 30" drop and 140 pound hammer using a cathead mechanism. Values = 25; N = 25 for 2 inches.			
4	1.2						98	3	PLT-D	SANDSTONE , salt and pepper, medium light gray (N6) to light gray (N7) and grayish black (N2), massive, fine to medium grained with 15-25% rock fragments, moderately weathered (III), and moderately weak (R2). Discontinuities are moderately spaced and in fair condition. [Naches Formation] At 12.2 feet, core becomes fresh (I) to slightly weathered (II) and moderately strong (R3). At 14.5 feet, core becomes moderately weathered (III) and moderately weak (R2). Observed clay filled discontinuity. At 15.9 feet, core becomes fresh (I), moderately strong (R3), and discontinuities become widely spaced and in fair condition.			
15	4.6						102	4	PLT-D				
5	1.5						0.2						
20	6.1												



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument							
			20	40	60	80														
7			[Hatched pattern]				$\frac{100}{0.2}$	R3	5	PLT-D	SANDSTONE, salt and pepper, medium light gray (N6) to light gray (N7) and grayish black (N2), massive, fine to medium grained with 15-25% rock fragments, fresh (I), and moderately strong (R3). Discontinuities are widely spaced and in fair condition. [Naches Formation]									
25																				
8																				
30			[Hatched pattern]				$\frac{98}{0.4}$	R3	6	PLT-D	At 26.9 to 27.1 feet, observed clay filled discontinuity.									
9																				
35																				
11			[Dashed pattern]				$\frac{98}{0.2}$	R3	7	PLT-D	Borehole completed to 35.5 feet below ground surface (bgs) on October 25, 2008. Borehole was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on November 07, 2008. Borehole backfilled with cement grout on November 9, 2008.									
40																				
12																				
13			[Dashed pattern]																	
45																				



Start Card SE03680

Job No. 103-WA SR 90 Elevation 2562.4 ft (781.0 m)

HOLE No. RKS-43-08

Sheet 1 of 2

Project Interstate 90 Hyak Re-Alignment - 2008 Geotechnical Investigation

Driller B. Kotzian/ S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector R. Beyer

Start November 6, 2008 Completion November 7, 2008 Well ID# Not Installed Equipment Burley 5500

Station 1452+27 Offset -96 Left Casing Not Installed Method HQ3 Triple Tube Wireline

Northing 731748.99 Easting 1430181.16 Latitude 47°20'12.406"N Longitude 121°20'52.419"W

County Kittitas Subsection SE Quarter Section 1 Range 11E Township 21N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument	
			20	40	60	80								
							<u>13</u>		1		The borehole collar elevation is approximately 0.5 feet below the existing ground surface due to rig platform preparation. There was approximately 1 foot of topsoil encountered.			
1							<u>50</u>		2		SILTY SAND WITH GRAVEL [SM/GM] , angular to rounded, hard, dense, dark yellowish brown (10YR 4/6), moist. [Alpine Till]			
5							<u>50</u>		3	SPT		At 6.5 feet, Standard Penetration Test using 30" drop and 140 pound hammer using a cathead mechanism. Values = 6, 6, 6; N = 12.		
2							<u>50</u>		4					
10							<u>73</u>		5					
							<u>80</u>		6					
4							<u>67</u>		7					
15							<u>80</u>		8					
5							<u>80</u>		9					
20							<u>84</u> <u>4.4</u>							



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
7											<p>META WELDED LAPILLI TUFF, medium bluish gray (5B 5/1) to medium gray (N6) to medium light gray (N7), massive aphanitic groundmass with fine to medium phenocrysts (10-15%), lapilli sized rock fragments (5-7%), lapilli sized pumice fragments (5-7%), fresh (I) to slightly (II) weathered, moderately weak (R2) to moderately strong (R3). Discontinuities are moderately spaced and in fair condition. [Naches Formation] At 22.5 feet, core becomes medium dark gray (N4), fresh (I) and moderately strong (R3). Observed weakly welded and rounded pumice fragments.</p>			
25							R2		10	PLT-D				
8										11			At 26.5 feet, core becomes moderately weak (R2) to moderately strong (R3).	
30							R1		12	PLT-D				
10											At 31.5 feet, core becomes moderately strong (R3) and discontinuities become closely spaced and in fair to good condition.			
35														
11											Borehole completed to 35.0 feet below ground surface (bgs) on November 07, 2008. Borehole was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on November 09, 2008. Borehole backfilled with cement grout on November 09, 2008.			
12														
40														
13														
45														



Job No. 103-WA SR 90 Elevation 2574.3 ft (784.6 m)

HOLE No. RKS-44-08

Sheet 1 of 3

Project Interstate 90 Hyak Re-Alignment - 2008 Geotechnical Investigation

Driller B. Kotzian/ S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector D. Meier

Start October 27, 2008 Completion October 29, 2008 Well ID# RKS-44-08 Equipment Burley 5500

Station 1462+00 Offset -108 Left Casing Stick-Up Monument Method HQ3 Triple Tube Wireline

Northing 730919.68 Easting 1430721 Latitude 47°20'04.278"N Longitude 121°20'44.452"W

County Kittitas Subsection SE Quarter Section 1 Range 11E Township 21N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0	0									The borehole collar elevation is approximately 1.5 feet below the existing ground surface due to rig platform preparation. There was approximately 1 foot of topsoil encountered.			
1	0.3									POORLY GRADED GRAVEL AND SILTY SAND [GM/SM] , sub-angular to sub-rounded, dense, dark gray (N4) to medium dark gray (N5) to yellowish orange (10YR 8/6), dry to moist. [Alpine Till]			
5	1.5					33		1	SPT	At 4.5 feet, Standard Penetration Test using 30" drop and 140 pound hammer using a cathead mechanism. Values = 50; N = 50 for 3 inches.			
2	0.6					0		2					
3	0.9					100		3					
10	3.0					80		4					
						70		5					
						0		6	SPT	At 11.5 feet, Standard Penetration Test using 30" drop and 140 pound hammer using a cathead mechanism. Values = 50; N = 50 for 6 inches.			
						79							
4	1.2					60		7					
15	4.5					14		8					
5	1.5												
6	1.8					40		9					
20	6.1												



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7							$\frac{75}{100}$		10	SPT	At 21.5 feet, Standard Penetration Test using 30" drop and 140 pound hammer using a cathead mechanism. Values = 50; N = 50 for 4 inches.		
25							$\frac{0}{100}$		11				
8							$\frac{100}{100}$		12				
9							$\frac{100}{0.5}$		13	SPT	At 26.5 feet, Standard Penetration Test using 30" drop and 140 pound hammer using a cathead mechanism. Values = 50; N = 50 for 9 inches.		
30							$\frac{100}{3.0}$		14		BASALT , light bluish gray (5B 7/1), massive aphanitic groundmass with light greenish gray (5G 8/1) phenocrysts with 3-5% sulfides present, fresh (I), moderately weak (R2). Strong hydrothermal alterations. Discontinuities are closely spaced and in fair condition. [Naches Formation]		
10							$\frac{100}{2.0}$		15		At 31.5 feet, core becomes light gray (N6) to light greenish gray (5GY 8/1) and discontinuities become closely to moderately spaced and in fair condition.		
35							$\frac{100}{2.0}$		16		At 33.5 feet, core becomes light greenish gray (5GY 8/1).		
11							$\frac{100}{2.0}$		17				
40							$\frac{100}{57}$		18		At 39.5 feet, discontinuities become moderately spaced and in fair condition.		
12													
13													
45													



LOG OF TEST BORING

Start Card RE02737

Job No. 103-WA

SR 90

Elevation 2574.3 ft (784.6 m)

HOLE No. RKS-44-08

Sheet 3 of 3

Project Interstate 90 Hyak Re-Alignment - 2008 Geotechnical Investigation

Driller B. Kotzian/ S. Tunison Lic# 2628

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
14											<p>Borehole completed to 45.0 feet below ground surface (bgs) on October 28, 2008. Borehole was overcased with HWT casing and flushed for optical and acoustical televiewer survey. Borehole completed with two vibrating wire piezometers at 25.0 feet and 40.5 feet bgs. Borehole installation completed on November 07, 2008.</p> <p>VWP# 94879 (23.5' - 25.0') VWP# 92939 (39.0' - 40.5')</p> <p>#10 -20 silica sand filter pack was used from 33.0 feet to 45.0 feet bgs. Grout mix from 0.0 feet to 33.0 feet bgs One 94 pound bag of Type I-II Portland Cement 30 gallons of water 25 to 30 pounds of pure bentonite powder</p> <p>Well Tag# = APA 656</p>			
15														
50														
16														
55														
17														
18														
60														
19														
65														
20														
21														
70														



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
							<u>0</u>				The borehole collar elevation is approximately 1.5 feet below the existing ground surface due to rig platform preparation. There was approximately 1 foot of topsoil encountered.		
1											POORLY GRADED SILTY SAND WITH GRAVEL AND COBBLES [SM/GM] , sub-angular to sub-rounded, dense, light gray, moist. Gravels and cobbles consist of meta-volcanics and intrusives. [Alpine Till]		
5							<u>100</u> <u>66</u>	1	SPT	At 4.7 feet, Standard Penetration Test using 30" drop and 140 pound hammer using a cathead mechanism. Values = 50; N = 50 for 3 inches.			
2							<u>35</u>	2					
							<u>53</u>	3					
10													
							<u>61</u>	4	SPT	At 11.0 feet, Standard Penetration Test using 30" drop and 140 pound hammer using a cathead mechanism. Values = 50; N = 50 for 2 inches.			
4													
15													
							<u>50</u> <u>40</u>	5 6	SPT	At 16.0 feet, Standard Penetration Test using 30" drop and 140 pound hammer using a cathead mechanism. Values = 50; N = 50 for 3 inches.			
20													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7													
							60		7	SPT	At 22.0 feet, Standard Penetration Test using 30" drop and 140 pound hammer using a cathead mechanism. Values = 50; N = 50 for 5 inches.		
25							80		8				
8													
							90		9	SPT	At 26.5 feet, Standard Penetration Test using 30" drop and 140 pound hammer using a cathead mechanism. Values = 50; N = 50 for 3 inches.		
							5.8						
30											META VOLCANICS , greenish gray (5G 6/1) to yellowish brown (10YR 6/2) to light olive gray (5Y 5/2), massive aphanitic groundmass with fine to medium phenocrysts, slightly (II) to moderately (III) weathered, weak (R1) to moderately strong (R3). Locally brecciated or sheared and has been healed. Discontinuities are closely spaced and in fair condition. [Naches Formation]		
							89		10		At 32.5 feet, core becomes very light gray (N8) to greenish gray (5G 6/1), slightly weathered (II) to moderately weathered (III) and discontinuities become moderately to widely spaced and in fair condition.		
							2.0				At 34.0 feet, core becomes slightly weathered (II) and moderately weak (R2) to moderately strong (R3).		
35							100		11				
							0.0						
11							100		12		At 36.5 feet, discontinuities become closely spaced and in poor to fair condition.		
							2.4						
40													
12													
							100		13				
							1.5						
45													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14								14		<p>META VOLCANICS, light greenish gray (5GY 8/1) to pale olive (10Y 6/2) to very light gray (N8) to medium light gray (N5) with localized dark yellowish orange (10YR 6/8) staining near discontinuities, massive aphanitic groundmass with fine to medium phenocrysts, fresh (I) to slightly (II) weathered, moderately weak (R2) to moderately strong (R3). Discontinuities are moderately spaced and in fair to good condition. [Naches Formation]</p>			
15						$\frac{100}{3.2}$	R3		PLT-D				
50										<p>Borehole completed to 50.0 feet below ground surface (bgs) on October 27, 2008. Borehole was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on November 10, 2008. Borehole backfilled with cement grout on November 11, 2008.</p>			
16													
55													
17													
18													
60													
19													
65													
20													
21													
70													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
								1		The borehole collar elevation is approximately 1.5 feet below the existing ground surface due to rig platform preparation. There was approximately 1 foot of topsoil encountered.			
1										SILTY SAND WITH GRAVEL [SM/GM] , angular to rounded, dense, dark gray (N4) to light brownish gray (10YR 6/2), dry to moist. [Alpine Till]			
5								2		META BASALT , medium light gray (N6) with dark yellowish orange (10YR 6/6) and dark gray (N3) staining, massive aphanitic groundmass, slightly weathered (II), moderately weak (R2). Discontinuities are closely spaced and in fair condition. [Naches Formation]			
2								3		At 4.5 feet, core becomes fresh (I) to slightly weathered (II) and moderately strong (R3).			
10								4		At 8.0 feet, core becomes fresh (I) and moderately strong (R3) to strong (R4).			
15								5		At 15.7 feet, core becomes moderately strong (R3).			
5													
20													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7													
25													
8													
30													
9													
35													
10													
40													
11													
42													
12													
44													
13													
45													

ROCK PHASE C.GPJ - 2/13/09

META BASALT, medium dark gray (N4), massive, aphanitic groundmass with fine phenocrysts, fresh (I), moderately strong (R3). Discontinuities are moderately spaced and in fair condition. [Naches Formation]

At 26.0 feet, RQD value is discounted due to verticle joint from 27.2 feet to 30.0 feet below ground surface. Observed iron staining along sub-verticle joint. At 27.2 feet, discontinuities become closely spaced and in poor to fair condition. RQD value affected by sub-verticle joint from 27.2 ft. to 30.0 ft. bgs.

At 31.0 feet, core becomes moderately strong (R3) to strong (R4) and discontinuities become moderately spaced and in fair condition.

At 36.0 feet, core becomes strong (R4) to very strong (R5).

At 41.0 feet, discontinuities become closely spaced and in fair condition.



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14							$\frac{100}{1.3}$	R5	12	PLT-D	META BASALT , medium dark gray (N4), massive aphanitic groundmass with fine phenocrysts, fresh (I), strong (R4) to very strong (R5). Discontinuities are closely to moderately spaced and in good condition. [Naches Formation]		
15	50						$\frac{100}{4.4}$		13				
16							$\frac{100}{1.8}$	R5	14 15	PLT-D	At 51.7 feet, core becomes medium dark gray (N4) to medium light gray (N6), fresh (I) to slightly weathered (II), moderately strong (R3) to strong (R4), and discontinuities become closely spaced and in poor to fair condition. At 54.5 feet, core becomes fresh (I) and strong (R4). At 56.0 feet, discontinuities become closely to moderately spaced and in fair condition.		
55	17						$\frac{100}{2.2}$		16				
18	60						$\frac{102}{1.2}$	R5	17	PLT-D	At 61.0 feet, discontinuities become closely spaced and in fair condition. At 64.2 feet, core becomes dark greenish gray (5G 4/1) and discontinuities become moderately spaced and in fair condition.		
19	65								20				
21	70												



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22							$\frac{100}{2.9}$		18		META BASALT , medium dark gray (N4) to dark dark greenish gray (5G 6/1) to light gray (N7), massive aphanitic groundmass, fresh (I), moderately strong (R3) to strong (R4). Discontinuities are closely spaced and in fair condition. [Naches Formation]		
75	23						$\frac{100}{3.0}$	R3	19 20	PLT-D			
80	24												
25							$\frac{100}{1.75}$		21				
85	26										<p>Borehole completed to 85.0 feet below ground surface (bgs) on November 5, 2008. Borehole was overcased with HWT casing to 4.5 feet bgs and was flushed for optical and acoustical televiewer survey. Borehole completed with two vibrating wire piezometers at 56 feet and 84 feet bgs. Borehole backfilled with cement grout on 11/08/2008.</p> <p>VWP# 94577 (54.5 - 56.0 feet bgs) VWP# 92938 (82.5 - 84.0 feet bgs)</p> <p>#10-20 silica sand filter pack from 73.0 feet to 85.0 feet bgs. Grout mix from 0.0 to 85.0 feet bgs: One 94 pound bag Type I-II Portland Cement 30 gallons of water 25 to 30 pounds of pure bentonite powder</p> <p>Well Tag# = APA 657</p>		
90	27												
28													
95	28												



LOG OF TEST BORING

Start Card _____

Job No. 33758654.00009 SR 90 Elevation 2497.1 ft (761.1 m)

HOLE No. SCB-001-09

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Richard Cooper Lic# 2964T

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start May 19, 2009 Completion May 21, 2009 Well ID# Not Applicable Equipment CME 45 (Barge rig) with auto hammer

Station 1375+99 (Oct. 2008) Offset 14.7 R Casing HWT, HQ Method Wet Rotary

Northing 1064889.78 Easting 1754426.93 Latitude _____ Longitude _____

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0									R-4 GP(C/B)		0 to 26 feet: Poorly graded GRAVEL with cobbles and boulders, subangular, bluish gray, wet, homogenous, no HCl reaction. 0 feet: Poorly graded GRAVEL with boulders. Maximum size of the boulders encountered is 17 inches.			
1														
5														
2														
10														
3														
4														
15							85		R-5 GP(C)		Maximum size of the boulders encountered is 16 inches. grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 6 inches.			
5							97		R-6 GP(C/B)		grades to poorly graded GRAVEL with boulders. Maximum size of the cobbles encountered is 22 inches.			
20							90		R-7 GP(C)		grades to poorly graded GRAVEL with cobbles.			

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
											Maximum size of the cobbles encountered is 11 inches. Maximum size of the cobbles encountered is 7 inches.			
7									R-8 GP(C)					
25														
8									R-9 GW		26 to 37.3 feet: Well graded to poorly graded GRAVEL, subrounded to angular, bluish gray, wet, homogenous, no HCl reaction. 26 feet: Well graded GRAVEL.			
30														
9									R-10 GP		grades to poorly graded GRAVEL.			
35														
10														
35														
11									R-11A GP					
40														
11									R-11B		37.3 to 66.0 feet: Meta Welded Lapilli Tuff, greenish gray, fine to medium grained, fresh, very weak (R1) to moderately weak (R2). Discontinuities are very closely to closely spaced and in poor to fair condition. No HCl reaction. (CR = 80 to 100%, RQD = 0 to 90%, FF = 1.8 to 3.2) 37.3 feet: very weak (R1) rock. Discontinuities are very closely to closely spaced and in fair condition. 39.1 feet: PLT - very weak (R1) rock			
45									R-12					
45														

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14									R-13		PLT-moderately strong (R3) rock. grades to very weak (R1) to moderately weak (R2) rock. Discontinuities are very closely spaced and in fair condition.			
15									R-14		Discontinuities are very closely to closely spaced and in fair condition.			
50									R-15		PLT - moderately strong (R3) rock.			
16									R-16					
55									R-17		PLT - moderately strong (R3) rock.			
17									R-18					
18									R-19		grades to very weak (R1) to moderately weak (R2) rock. Discontinuities are in poor to fair condition.			
60									R-20					
19									R-21		PLT - moderately weak (R2) rock.			
65									R-22		Bottom of the boring at 66 feet depth below the mudline. Backfilled to ground surface with bentonite chips.			
20									R-23		Lake water level measurements (above the mudline): 5/19/09 at 12:45: 17.2 feet above the mudline. 5/20/09 at 10:00: 17.3 feet above the mudline. 5/20/09 at 18:45: 17.2 feet above the mudline. 5/21/09 at 08:30: 17.2 feet above the mudline.			
21									R-24					
70									R-25					

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2535.0 ft (772.7 m)

HOLE No. SCB-002-08

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Jamie Wilson Lic# 2941T

Drilling Contractor WSDOT Field Exploration Unit

Inspector Xiangdong Han

Start September 22, 2008 Completion September 25, 2008 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto-hammer

Station 1376+15.10 Offset 28.83'L Casing HWT, HQ, NQ Method Wet Rotary

Northing 1064896.776 Easting 1754476.111 Latitude 47°21'01.107"N Longitude 121°21'50.647"W

County Kittitas Subsection NE1/4 of SE1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 13 feet: Well graded SAND with gravel, angular, medium dense, brownish gray, wet, homogenous, no HCl reaction.			
1														
5						33		D-1 SW		5 6 6 (12)				
2														
10														
3														
4						33		D-2 SW		5 7 10 (17)				
4						86		C-3 GP(C)			13 to 37.3 feet: Poorly to well graded GRAVEL with or without cobbles, occasionally silty GRAVEL with sand, subangular to angular, loose to very dense, gray to brownish gray, wet, homogenous, no HCl reaction.			
15											13 feet: Medium dense, poorly graded GRAVEL with cobbles.			
5						0		D-4 GP		3 7 11 (18)	No recovery. Material is probably poorly graded GRAVEL.			
6						100		C-5 GP(C)			grades to poorly graded GRAVEL with cobbles.			
20														

DRAFT ROCKN BORINGS I-90-2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
							100		C-6 GP(C)					
							10		D-7 GP	4 7 9 (16)	grades to poorly graded GRAVEL.			
7							29		C-8 GP					
25							10		D-9 GP	3 8 12 (20)				
8							71		C-10 GP					
30							10		D-11 GW	4 4 3 (7)	grades to loose, well graded GRAVEL.			
10							29		C-12 GW					
35							100		D-13 GW	27	grades to very dense.			
11							100		C-14A GM	50 for 4" (>50)	37.3 feet: grades to silty GRAVEL.			
40							100		C-14B		38.6 to 61.5 feet: Metawelded lapilli tuff, bluish gray, fine to medium grained, fresh to slightly weathered, moderately strong (R3) to strong (R4) rock. Discontinuities are very closely to closely spaced and in poor to fair condition. No HCl reaction. (CR=100%, RQD=10 to 52%, FF=2.4 to 3.2)			
12							100		C-15		38.6 feet: fresh, moderately strong (R3) to strong (R4) rock. 39.5 feet: PLT - Very strong (R5) rock. 41.5 feet: grades to slightly weathered, moderately strong (R3) rock.			
13							100							
45														

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2535.0 ft (772.7 m)

HOLE No. SCB-002-08

Sheet 3 of 3

Project I-90 Snoqualmie Pass East

Driller Jamie Wilson

Lic# 2941T

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14											45.8 feet: PLT - Very strong (R5) rock.			
15														
50														
16												grades to fresh rock.		
55												54.0 feet: PLT - Very strong (R5) rock.		
17														
60														
18														
65														
19														
65														
20														
21														
70												Bottom of boring at 61.5 feet depth below ground surface (bgs). Backfilled with bentonite chips from 2 to 61.5 feet bgs. Backfilled with on-site gravel from 0 to 2 feet bgs.		

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2492.0 ft (759.6 m)

HOLE No. SCB-004-08

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start June 26, 2008 Completion June 27, 2008 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto-hammer

Station 1379+32.96 Offset 22.22'R Casing HWT 3', HQ 52' Method Wet Rotary

Northing 1064582.428 Easting 1754479.153 Latitude _____ Longitude _____

County Kittitas Subsection NE1/4 of SE1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
						16		C-1 GP			0 to 27.5 feet: Poorly to well graded GRAVEL with or without sand, occasional well graded SAND, occasional cobbles and boulders, subangular to angular, loose to dense, brown to gray, wet, homogenous, no HCl reaction. 0 feet: Poorly graded GRAVEL.		
1						80		D-2 SW	3 4 1 (5)	grades to loose, well graded SAND.			
5						89		C-3 GP(C/B)		grades to poorly graded GRAVEL with cobbles and boulders. Maximum size of the boulders encountered is 14 inches.			
2						0		D-4 SM/SP	8 12 9 (21)	grades to medium dense. No recovery. Material is probably washed away. Material is probably poorly graded SAND or silty SAND.			
10						57		C-5 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 6.5 inches.			
4						0		D-6 SM/SP	18 7 11 (18)	No recovery. Material is probably washed away. Material is probably poorly graded SAND or silty SAND.			
15						37		C-7 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 9.5 inches.			
5						50		D-8 GW	3 6 9 (15)	grades to well graded GRAVEL with sand.			
20						66		C-9 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 10.5			

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7							$\frac{50}{58}$	D-10 GW GP(C/B)	50 for 4" (>50)	inches. grades to very dense, well graded GRAVEL with sand. 22.9 feet: grades to poorly graded GRAVEL with cobbles and boulders.			
25							$\frac{73}{34}$	D-12 SM	6 7 19 (26)	27.5 to 35.4 feet: Poorly to well graded GRAVEL, occasional silty SAND with fine gravel and silty GRAVEL with sand, subangular to angular, dense to very dense, brown to gray to greenish gray, wet, homogenous, no HCl reaction. 27.5 feet: Dense, silty SAND with fine gravel. 29.0 feet: grades to well graded GRAVEL with sand.			
30							$\frac{67}{36}$	D-14 SM-GM	18 35 24 (59)	grades to very dense, silty SAND with gravel or silty GRAVEL with sand.			
35							$\frac{100}{0.5}$	C-15A GP		grades to poorly graded GRAVEL with sand.			
11							$\frac{98}{1.0}$	C-16		35.4 to 51.8 feet: Meta welded Lapilli Tuff, greenish gray, fine to medium grained, fresh, strong to very strong rock. Discontinuities are closely to medium spaced and in fair condition. (CR = 98-100%, RQD = 90-100%, FF = 0 to 1.0) 35.4 feet: Discontinuities are closely to medium spaced. 37.1 feet: PLT - Strong (R4) rock.			
12							$\frac{100}{0}$	C-17		42.1 feet: PLT - Very strong (R5) rock. Discontinuities are medium spaced.			
13													
45													

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14							100 0.5		C-18		49.4 feet: PLT - Very strong (R5) rock.			
15														
50														
16											Bottom of boring at 51.8 feet below mud line. Backfilled the hole to mud line with bentonite chips.			
55											Water level measurements: 6/26/08 at 11:15: 27.0 feet above the mud line. 6/26/08 at 21:00: 25.0 feet above the mud line.			
17														
18														
60														
19														
65														
20														
21														
70														

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2534.1 ft (772.4 m)

HOLE No. SCB-005-08

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Jamie Wilson Lic# 2941T

Drilling Contractor WSDOT Field Exploration Unit

Inspector Pam Craig

Start September 26, 2008 Completion September 29, 2008 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto-hammer

Station 1377+71.33 Offset 39.3'L Casing HWT, HQ 31.5', NQ 59.5' Method Wet Rotary

Northing 1064743.64 Easting 1754516.54 Latitude 47°20'59.601"N Longitude 121°21'50.035"W

County Kittitas Subsection NE1/4 of SE1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 31.5 feet: Poorly to well graded GRAVEL with sand, occasional cobbles and boulders, subangular to angular, loose to very dense, brown to dark gray, wet, homogenous, HCl not tested. 0 feet: Medium dense, poorly graded GRAVEL with sand.			
1														
5							17		D-1 GP	3 5 6 (11)				
2														
10							11		D-2 GP(C)	50 for 2" (>50)	grades to very dense, poorly graded GRAVEL with cobbles and boulders. Maximum size of the boulders encountered is 3 feet.			
							55		C-3 GP(C/B)					
4														
15														
5							28		D-4 GW	3 3 5 (8)	grades to loose, well graded GRAVEL with sand.			
20							29		C-5 GW					

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0													
7						0		D-6 GW	6 6 5 (11)	No recovery. Material is probably well graded GRAVEL with sand.			
25						57		C-7 GW(C)		grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 3.5 inches.			
8						5		D-8 GP	4 5 3 (8)	grades to loose, poorly graded GRAVEL.			
30						54		C-8 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 3 inches.			
10						56		D-9 GW	19 20 26 (46)	31.5 to 40.0 feet: Poorly to well graded GRAVEL with sand, occasionally silty SAND with gravel, occasional cobbles and boulders, subrounded to subangular, dense to very dense, brown to greenish gray, wet, homogenous, HCl not tested.			
35						80		C-10 GW(B)		31.5 feet: Dense, well graded GRAVEL with sand. Note: Core barrel size was changed from HQ to NQ. 33.8 feet: grades to well graded GRAVEL with boulders. Maximum size of the boulders encountered is 1.6 feet.			
11						78		D-11 SM	19 24 31 (55)	grades to dense, silty SAND with gravel. Note: A 1-3/4" OD split spoon sampler was used.			
40						36		C-12A GP		37.5 feet: grades to poorly graded GRAVEL with sand.			
12						100		C-12B					
40						0		D-13 C-14	50 for 2" (>50)	40.0 to 59.5 feet: Meta welded Lapilli Tuff, greenish gray, fine to medium grained, fresh, moderately strong (R3) to strong (R4) rock. Discontinuities are very closely to closely spaced and in poor to very poor condition, no HCl reaction. (CR=67-100%, RQD=0-88%, FF=1.3 ->6.5) 40.0 feet: moderately strong (R3) rock.			
13						100							
45						88 3.8		C-15					

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14							$\frac{66}{1.7}$		C-16					
15							$\frac{100}{2.6}$		C-17					
16							$\frac{100}{>6.5}$		C-18					
17							$\frac{94}{2.0}$		C-19					
18							$\frac{100}{1.3}$		C-20					
18							$\frac{79}{2.1}$		C-21					
60											grades to strong (R4) rock. PLT - strong (R4) rock.			
65											Bottom of boring at 59.5 feet depth below ground surface (bgs). Backfilled with bentonite chips from 2 to 59.5 feet depth bgs and with on-site sandy gravel from 0 to 2 feet depth bgs.			
70														



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2502.5 ft (762.8 m)

HOLE No. SCB-006-08

Sheet 1 of 5

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start June 24, 2008 Completion June 26, 2008 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto-hammer

Station 1380+94.22 Offset 22.63'R Casing HWT 11.5', HQ 125' Method Wet Rotary

Northing 1064424.286 Easting 1754499.777 Latitude _____ Longitude _____

County Kittitas Subsection NE1/4 of SE1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0													
1						27		C-1 GP			0 to 41.0 feet: Well graded to poorly graded GRAVEL, occasional well graded SAND with gravel, occasional cobbles and boulders, subrounded to angular, medium dense to very dense, brown to gray, wet, homogenous, no HCl reaction.		
5						67		D-2 SW	4 5 14 (19)		0 feet: Poorly graded GRAVEL. 1.5 feet: grades to medium dense, well graded SAND with gravel. 3.0 feet: grades to well graded GRAVEL.		
2						40		C-3 GW					
10						20		D-4 GP	12 14 9 (23)		grades to poorly graded GRAVEL.		
15						35		C-5 GW			grades to well graded GRAVEL.		
20						75 63		D-6 GW(C/B)	50 for 2" (>50)		grades to very dense. grades to well graded GRAVEL with cobbles and boulders. Maximum size of the boulders encountered is 25 inches.		
25						52		C-8 GW			grades to well graded GRAVEL.		

DRAFT ROCKN BORINGS I-90-2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								C-9 GW(C)		grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 10 inches.			
25								D-10 GW(C)	50 for 2" (>50)	Maximum size of the cobbles encountered is 8 inches.			
30								C-12 GW(C)		Maximum size of the cobbles encountered is 3.25 inches.			
35								C-13 GW(C/B)		grades to well graded GRAVEL with cobbles and boulders. Maximum size of the boulders encountered is 13 inches.			
40								D-14 SW	5	41.0 to 53.2 feet: Poorly to well graded GRAVEL, occasional well graded SAND with gravel or silty SAND with gravel and silty GRAVEL with sand, subrounded to angular, dense to very dense, brown to gray to greenish gray, wet, homogenous, no HCl reaction. 41.0 feet: Dense, well graded SAND with gravel. 43.0 feet: grades to well graded GRAVEL with sand.			
45								C-15 GW	12 16 (28)				

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14									D-16 C-17 GP(C)	50 for 5" (>50)	grades to very dense, silty GRAVEL with sand. grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 3.25 inches.			
15									D-18 C-19A GP	50 for 5" (>50)	grades to silty SAND with fine gravel. grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 3.25 inches.			
50									C-19B		53.2 to 107.5 feet: Meta welded lapilli tuff, greenish gray, fine to medium grained, fresh, very weak (R1) to moderately strong (R3) rock. Discontinuities are very closely to closely spaced and in poor to fair condition. none to weak HCl reaction. (CR = 64-100%, RQD = 0 -54%, FF = 1.2-4.2)			
55									C-20		53.2 feet: very weak (R1) rock. No HCl reaction. Discontinuities are very closely to closely spaced, and in poor to fair condition. 56.5 feet: Weak HCl reaction. Discontinuities are very closely spaced, and in poor condition.			
17									C-21		grades to moderately weak (R2) to moderately strong (R3) rock. Discontinuities are closely spaced, and in poor to fair condition. 62.9 feet: PLT - Moderately strong (R3) rock.			
18									C-22		grades to very weak (R1) to moderately strong (R3) rock. Discontinuities are very closely to closely spaced.			
60														
19														
65														
20														
21														
70														

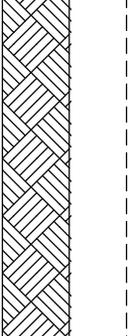
DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22									C-23		Rock fractures consisted of sand or silt infilling which is 2 to 5 inches thick in this core sample.			
75											74.1 feet: PLT - Very weak (R1) rock.			
23									C-24					
24														
80														
25									C-25		grades to moderately weak (R2) to moderately strong (R3) rock.			
85											85.1 feet: PLT - Very weak (R1) rock.			
26														
27									C-26					
90														
28									C-27		90.4 feet: PLT - Moderately weak (R2) rock.			
95														

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
29														
														
30														
100														
31														
														
105														
32														
														
33														
110														
34														
115														
35														
36														
120														

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10

grades to very weak (R1) to moderately weak (R2) rock.

103.1 feet: PLT - Very weak (R1) rock.

Bottom of boring at 107.5 feet below the mud line.
Backfilled the hole to mud line with bentonite chips.

Water level measurements:
6/24/08 at 13:30: 12 feet above the mud line.
6/26/08 at 08:00: 14.5 feet above the mud line.
6/26/08 at 08:45: 14.5 feet above the mud line.



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2532.4 ft (771.9 m)

HOLE No. SCB-007-08

Sheet 1 of 4

Project I-90 Snoqualmie Pass East

Driller Jamie Wilson Lic# 2941T

Drilling Contractor WSDOT Field Exploration Unit

Inspector Pam Craig

Start September 30, 2008 Completion October 1, 2008 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto-hammer

Station 1379+51.32 Offset 37.57'L Casing HWT 6', HQ 91.5' Method Wet Rotary

Northing 1064562.7 Easting 1754539.2 Latitude 47°20'57.818"N Longitude 121°21'49.678"W

County Kittitas Subsection NE1/4 of SE1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 51.5 feet: Poorly to well graded GRAVEL with sand, cobbles and boulders, subangular to angular, generally loose to very dense, brown to dark greenish gray, moist to wet, homogenous, HCl not tested.			
5						<u>17</u>			D-1 GW	3 3 5 (8)	5 feet: Loose, well graded GRAVEL, with sand.			
2						<u>36</u>			C-2 GW(C)		grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 5.25 inches.			
10						<u>66</u>			C-3 GP(B)		grades to poorly graded GRAVEL with boulders. Maximum size of the boulders encountered is 16 inches.			
4						<u>76</u>			C-4 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 0.7 feet.			
15														
5														
20														

DRAFT ROCKN BORINGS I-90-2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7									C-5 GP(B)		grades to poorly graded GRAVEL with boulders. Maximum size of the boulders encountered is 2.2 feet.			
25														
8									D-6 GW	4 6 10 (16)	grades to medium dense, well graded GRAVEL with sand.			
9									C-7 GW(C)		grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 0.9 feet.			
30														
10									C-8 GP(C)		Maximum size of the cobbles encountered is 5 inches.			
35														
11									C-9 GP(C/B)		grades to poorly graded GRAVEL with cobbles and boulders. Maximum size of the boulders encountered is 1.5 feet.			
40														
12														
13									C-10 GP(C/B)		Maximum size of the boulders encountered is 1.2 feet.			
45														

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
14													
15													
50													
16													
55													
17													
18													
60													
19													
65													
20													
21													
70													

DRAFT ROCKN BORINGS I-90-2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22							60		C-18a GP(C)		Maximum size of the cobbles encountered is 5 inches.			
75	23						$\frac{100}{>10}$		C-18b		74.0 to 91.5 feet: Meta Welded lapilli tuff to ash tuff, greenish gray, fine to medium grained, moderately weathered to fresh, moderately strong (R3) to strong (R4) rock. Discontinuities are very closely to medium spaced and in poor to fair condition. HCl not tested. (CR = 96-100%, RQD =18-76%, FF =0.2 to >10.0). 74 feet: highly to moderately weathered, moderately strong (R3) rock. Discontinuities are very closely to closely spaced and in poor to fair condition.			
24							$\frac{100}{2.0}$		C-19		grades to fresh, moderately strong (R3) to strong (R4) rock. Discontinuities are closely to medium spaced and in fair condition.			
80											79.75 feet: PLT - Moderately strong (R3) rock.			
25							$\frac{96}{1.6}$		C-20		grades to meta welded ash Tuff. 81.75 feet: PLT - Strong (R4) rock.			
85	26										86.25 feet: PLT - Strong (R4) rock.			
27											88.0 feet: grades to moderately weathered, moderately strong (R3) rock. Discontinuities are very closely to closely spaced and in poor to fair condition.			
90							$\frac{100}{1.2}$		C-21		90.5 feet: PLT - Moderately weak (R2) rock.			
28											Bottom of boring at 91.5 feet depth below ground surface (bgs). Backfilled the hole from 0 to 91.5 feet depth bgs with bentonite chips and from 0 to 2 feet depth bgs with on-site gravel with sand.			
95														

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2490.0 ft (759.0 m)

HOLE No. SCB-009-08

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start July 22, 2008 Completion July 22, 2008 Well ID# Not Applicable Equipment CME 45 (barge rig) w/ Auto-hammer

Station 1378+91.43 Offset 15'R Casing HQ 44' Method Wet Rotary

Northing 1064606.525 Easting 1754471.138 Latitude _____ Longitude _____

County Kittitas Subsection NE1/4 of SE1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0									C-1 SM/SP		0 to 24 feet: Poorly graded to well graded GRAVEL, occasional cobbles, subrounded to angular, brown to gray, wet, homogenous, no HCl reaction. 0 feet: No recovery. Material was washed away. Material is probably silty SAND or poorly graded SAND.			
1														
5									C-2 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 4.5 inches.			
2														
10									C-3 GW		grades to well graded GRAVEL.			
3														
4														
15									C-4 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 8.5 inches.			
5														
20									C-5 GP(C)		Maximum size of the cobbles encountered is 7 inches.			
6														

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7														
25	8						50		C-6A GW(C)		24 to 28 feet: Well graded GRAVEL with sand and cobbles, subrounded to angular, greenish gray, wet, homogenous, no HCl reaction. Maximum size of the cobbles encountered is 7 inches.			
30	9						50 2.0		C-6B		28 to 44 feet: Meta welded lapilli tuff, light greenish gray, fine to medium grained, fresh, moderately weak (R2) to strong (R4) rock. Discontinuities are very closely to medium spaced and in poor to fair condition. no HCl reaction.			
							100 1.8		C-7		(CR=50-100%, RQD=0-88%, FF=1.2-2) 28 feet: Moderately weak (R2) rock. Discontinuities are closely spaced and in poor condition. 29 feet: Strong (R4) rock. Discontinuities are closely to medium spaced and in fair condition. PLT - Moderately weak (R2) rock.			
							100 1.2		C-8		33.1 feet: PLT - Very strong (R5) rock.			
							100 1.5		C-9		38.3 feet: PLT - Strong (R4) rock. 40.1 feet: PLT - Very strong (R5) rock. 43.2 feet: PLT - Very strong (R5) rock.			
45											Bottom of boring at 44 feet below the mud line. Backfilled the hole to mud line with bentonite chips.			

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2490.0 ft (759.0 m)

HOLE No. SCB-009-08

Sheet 3 of 3

Project I-90 Snoqualmie Pass East

Driller Robert Haller

Lic# 2779

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14											Water level measurements: 7/22/08 at 08:00: 16.8 feet above the mud line. 7/22/08 at 13:25: 19 feet above the mud line.			
15														
50														
16														
55														
17														
18														
60														
19														
65														
20														
21														
70														



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2497.0 ft (761.1 m)

HOLE No. SCB-010-08

Sheet 1 of 4

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start July 16, 2008 Completion July 17, 2008 Well ID# Not Applicable Equipment CME 45 (barge rig) w/ Auto-hammer

Station 1381+31.43 Offset 15'R Casing HQ 72.5' Method Wet Rotary

Northing 1064380.72 Easting 1754496.554 Latitude _____ Longitude _____

County Kittitas Subsection NE1/4 of SE1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0									C-1 M/SP/SW		0 to 7.5 feet: Poorly graded GRAVEL with cobbles, angular to subrounded, brown to bluish gray, wet, homogenous, no HCl reaction. 0 feet: No recovery. Material was probably washed away. Material was probably silty SAND or poorly to well graded SAND.			
1						16			C-2 GP(C)		Poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 3.75 inches.			
5									C-3 SW		7.5 to 50 feet: Well graded SAND with gravel to poorly graded GRAVEL with sand, silty SAND/poorly graded SAND, occasional cobbles, subrounded to angular, gray to greenish gray, wet, homogenous, no HCl reaction. 7.5 feet: Well graded SAND with gravel.			
2									C-4 SP/SM?		No recovery. Material was probably washed away. Material is probably silty SAND or poorly graded to well graded SAND.			
10									C-5 SP/SM?		No recovery. Material was probably washed away. Material is probably silty SAND or poorly graded to well graded SAND.			
4						0								
15														
5														
6						0								
20														

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7									C-6 SP/SM?		No recovery. Material was probably washed away. Material is probably silty SAND or poorly graded to well graded SAND.			
25									C-7 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 9 inches.			
30									C-8 GP(C)		Maximum size of the cobbles encountered is 10 inches.			
35									C-9 GP		grades to poorly graded GRAVEL with sand. There was a 0.5 inch thick, soft, medium plasticity lean clay in the sample.			
40									C-10 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 6 inches.			
45														

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14														
15														
50									C-11A GP		grades to poorly graded GRAVEL.			
16									C-11B		50 to 72.5 feet: Meta welded Lapilli Tuff, greenish gray, fine to medium grained, fresh, very weak (R1) to strong (R4). Discontinuities are very closely to medium spaced and in poor to fair condition. None to weak HCl reaction. (CR=96-100%, RQD=20-80%, FF=1.4-3)			
55									C-12		50 feet: Very weak (R1) to moderately weak (R2) rock. Discontinuities are closely spaced and in poor condition. no HCl reaction.			
17									C-13		52.5 feet: grades to moderately strong (R3) rock. Discontinuities are closely to medium spaced and in fair condition.			
18									C-14		53.2 feet: PLT - Very weak (R1) rock.			
60									C-15		57.1 feet: PLT - Strong (R4) rock.			
19									C-16		grades to moderately weak (R2) rock. Discontinuities are in fair to poor condition. There is a thin clay infilling in one of the fractures.			
65									C-17		58.5 feet: PLT - Moderately strong (R3) rock.			
20									C-18		57.1 feet: PLT - Strong (R4) rock.			
21									C-19		grades to strong (R4) to moderately strong (R3) rock. Discontinuities are closely to very closely spaced and in fair to poor condition. Weak HCl reaction. There is a thin clay infilling in some of the fractures.			
70									C-20		62.9 feet: PLT - Very weak (R1) rock.			
									C-21		62.9 feet: PLT - Very weak (R1) rock.			
									C-22		62.9 feet: PLT - Very weak (R1) rock.			
									C-23		62.9 feet: PLT - Very weak (R1) rock.			
									C-24		62.9 feet: PLT - Very weak (R1) rock.			
									C-25		62.9 feet: PLT - Very weak (R1) rock.			
									C-26		62.9 feet: PLT - Very weak (R1) rock.			
									C-27		62.9 feet: PLT - Very weak (R1) rock.			
									C-28		62.9 feet: PLT - Very weak (R1) rock.			
									C-29		62.9 feet: PLT - Very weak (R1) rock.			
									C-30		62.9 feet: PLT - Very weak (R1) rock.			
									C-31		62.9 feet: PLT - Very weak (R1) rock.			
									C-32		62.9 feet: PLT - Very weak (R1) rock.			
									C-33		62.9 feet: PLT - Very weak (R1) rock.			
									C-34		62.9 feet: PLT - Very weak (R1) rock.			
									C-35		62.9 feet: PLT - Very weak (R1) rock.			
									C-36		62.9 feet: PLT - Very weak (R1) rock.			
									C-37		62.9 feet: PLT - Very weak (R1) rock.			
									C-38		62.9 feet: PLT - Very weak (R1) rock.			
									C-39		62.9 feet: PLT - Very weak (R1) rock.			
									C-40		62.9 feet: PLT - Very weak (R1) rock.			
									C-41		62.9 feet: PLT - Very weak (R1) rock.			
									C-42		62.9 feet: PLT - Very weak (R1) rock.			
									C-43		62.9 feet: PLT - Very weak (R1) rock.			
									C-44		62.9 feet: PLT - Very weak (R1) rock.			
									C-45		62.9 feet: PLT - Very weak (R1) rock.			
									C-46		62.9 feet: PLT - Very weak (R1) rock.			
									C-47		62.9 feet: PLT - Very weak (R1) rock.			
									C-48		62.9 feet: PLT - Very weak (R1) rock.			
									C-49		62.9 feet: PLT - Very weak (R1) rock.			
									C-50		62.9 feet: PLT - Very weak (R1) rock.			
									C-51		62.9 feet: PLT - Very weak (R1) rock.			
									C-52		62.9 feet: PLT - Very weak (R1) rock.			
									C-53		62.9 feet: PLT - Very weak (R1) rock.			
									C-54		62.9 feet: PLT - Very weak (R1) rock.			
									C-55		62.9 feet: PLT - Very weak (R1) rock.			
									C-56		62.9 feet: PLT - Very weak (R1) rock.			
									C-57		62.9 feet: PLT - Very weak (R1) rock.			
									C-58		62.9 feet: PLT - Very weak (R1) rock.			
									C-59		62.9 feet: PLT - Very weak (R1) rock.			
									C-60		62.9 feet: PLT - Very weak (R1) rock.			
									C-61		62.9 feet: PLT - Very weak (R1) rock.			
									C-62		62.9 feet: PLT - Very weak (R1) rock.			
									C-63		62.9 feet: PLT - Very weak (R1) rock.			
									C-64		62.9 feet: PLT - Very weak (R1) rock.			
									C-65		62.9 feet: PLT - Very weak (R1) rock.			
									C-66		62.9 feet: PLT - Very weak (R1) rock.			
									C-67		62.9 feet: PLT - Very weak (R1) rock.			
									C-68		62.9 feet: PLT - Very weak (R1) rock.			
									C-69		62.9 feet: PLT - Very weak (R1) rock.			
									C-70		62.9 feet: PLT - Very weak (R1) rock.			
									C-71		62.9 feet: PLT - Very weak (R1) rock.			
									C-72		62.9 feet: PLT - Very weak (R1) rock.			
									C-73		62.9 feet: PLT - Very weak (R1) rock.			
									C-74		62.9 feet: PLT - Very weak (R1) rock.			
									C-75		62.9 feet: PLT - Very weak (R1) rock.			
									C-76		62.9 feet: PLT - Very weak (R1) rock.			
									C-77		62.9 feet: PLT - Very weak (R1) rock.			
									C-78		62.9 feet: PLT - Very weak (R1) rock.			
									C-79		62.9 feet: PLT - Very weak (R1) rock.			
									C-80		62.9 feet: PLT - Very weak (R1) rock.			
									C-81		62.9 feet: PLT - Very weak (R1) rock.			
									C-82		62.9 feet: PLT - Very weak (R1) rock.			
									C-83		62.9 feet: PLT - Very weak (R1) rock.			
									C-84		62.9 feet: PLT - Very weak (R1) rock.			
									C-85		62.9 feet: PLT - Very weak (R1) rock.			
									C-86		62.9 feet: PLT - Very weak (R1) rock.			
									C-87		62.9 feet: PLT - Very weak (R1) rock.			
									C-88		62.9 feet: PLT - Very weak (R1) rock.			
									C-89		62.9 feet: PLT - Very weak (R1) rock.			
									C-90		62.9 feet: PLT - Very weak (R1) rock.			
									C-91		62.9 feet: PLT - Very weak (R1) rock.			
									C-92		62.9 feet: PLT - Very weak (R1) rock.			
									C-93		62.9 feet: PLT - Very weak (R1) rock.			
									C-94		62.9 feet: PLT - Very weak (R1) rock.			
									C-95		62.9 feet: PLT - Very weak (R1) rock.			
									C-96		62.9 feet: PLT - Very weak (R1) rock.			
									C-97		62.9 feet: PLT - Very weak (R1) rock.			
									C-98		62.9 feet: PLT - Very weak (R1) rock.			
									C-99		62.9 feet: PLT - Very weak (R1) rock.			
									C-100		62.9 feet: PLT - Very weak (R1) rock.			

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2497.0 ft (761.1 m)

HOLE No. SCB-010-08

Sheet 4 of 4

Project I-90 Snoqualmie Pass East

Driller Robert Haller

Lic# 2779

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22														
											72.2 feet: PLT - Very weak (R1) rock. Bottom of boring at 72.5 feet below the mud line. Backfilled the hole to mud line with bentonite chips.			
75	23										Water level measurements: 7/16/08 at 15:12: 12 feet above the mud line. 7/16/08 at 17:30: 14 feet above the mud line. 7/17/08 at 08:30: 14.3 feet above the mud line. 7/17/08 at 15:00: 13 feet above the mud line.			
24														
80														
25														
85	26													
27														
90														
28														
95														



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2532.1 ft (771.8 m)

HOLE No. SCB-011-08

Sheet 1 of 4

Project I-90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Xiangdong Han

Start October 1, 2008 Completion October 2, 2008 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto-hammer

Station 1380+93.54 Offset 26.93'L Casing HWT, HQ Method Wet Rotary

Northing 1064418.52 Easting 1754539.87 Latitude 47°20'56.395"N Longitude 121°21'49.645"W

County Kittitas Subsection NE1/4 of SE1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0								C-1 GM(C)		0 to 30 feet: Silty GRAVEL to poorly graded GRAVEL with sand, occasional cobbles and boulders, subangular, loose to very dense, gray to bluish gray, dry to wet, homogenous, no HCl reaction. 0 feet: Medium dense, silty GRAVEL with sand and cobbles. Maximum size of the cobbles encountered is 4 inches.			
1													
5													
2													
3								D-2 GW	5 7 8 (15)	grades to well graded GRAVEL with sand.			
10								C-3 GM(C)		grades to silty GRAVEL with cobbles. Maximum size of the cobbles encountered is 3 inches.			
3													
4								D-4 GP	2 2 3 (5)	No recovery. Material is probably poorly graded fine GRAVEL.			
15								C-5 GP(C/B)		grades to poorly graded GRAVEL with cobbles and boulders. Maximum size of the cobbles encountered is 12 inches.			
5													
20								D-6 GP(C/B)	50 for 5" (>50)	grades to poorly graded GRAVEL. grades to poorly graded GRAVEL with cobbles and boulders. Maximum size of the boulders encountered is 18 inches.			
6													

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2532.1 ft (771.8 m)

HOLE No. SCB-011-08

Sheet 2 of 4

Project I-90 Snoqualmie Pass East

Driller Kerry Cooper

Lic# 2552

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								D-8 GP	25	grades to poorly graded GRAVEL.			
								C-9 GP(C)	50 for 5" (>50)	grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 7 inches.			
25								D-10 GP	20	grades to poorly graded GRAVEL.			
8								C-11 GP(C/B)	24	grades to poorly graded GRAVEL with cobbles and boulders. Maximum size of the boulders encountered is 12 inches.			
									27 (>50)				
30								D-12 GP	5	30.0 to 52.0 feet: Poorly graded GRAVEL with sand, occasional silty GRAVEL with sand, cobbles and boulders, subangular, loose to dense, brown to brownish gray, wet, homogenous, HCl not tested. 30.0 feet: Loose, poorly graded GRAVEL with sand.			
								C-13 GM(C)	5	grades to silty GRAVEL with sand and cobbles. Maximum size of the cobbles encountered is 4 inches.			
10									5 (10)				
35								D-14 GP	2	Note: A 0.5-foot thick CLAY layer was encountered between gravel layers. grades to loose, poorly graded GRAVEL with sand.			
11								C-15 GP(C/B)	3				
									4 (7)				
40								C-16 GP(C/B)	43	grades to dense, poorly graded GRAVEL with sand, cobbles and boulders. Maximum size of the boulders encountered is 13 inches.			
12													
45									40				
13													

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14														
15														
50														
16														
55														
17														
18														
60														
19														
65														
20														
21														
70														

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22							$\frac{40}{>10.0}$		C-22		grades to moderately weathered, moderately weak (R2) rock.			
75	23						$\frac{40}{>10.0}$		C-23		grades to very weak (R1) to moderately weak (R2) rock.			
24											80.5 feet: PLT - Strong (R4) rock.			
80							$\frac{60}{>10.0}$		C-24		grades to slightly weathered to fresh, moderately strong (R3) rock.			
25							$\frac{70}{>10.0}$		C-25		88.5 feet: PLT - Very weak (R1) rock.			
85	26													
27														
90														
28											Bottom of boring at 92.0 feet depth below ground surface (bgs). Backfilled with bentonite chips from 2 to 92 feet depth bgs and with on-site gravel from 0 to 2 feet depth bgs.			
95														

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10



Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2349.2 ft (716.0 m)

HOLE No. SCB-014-08

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start September 2, 2008 Completion September 3, 2008 Well ID# Not Applicable Equipment CME 45 (barge rig) w/ Auto-hammer

Station 1380+56.73 Offset 229.18' R Casing HWT 15', HQ 49' Method Wet rotary

Northing 1064448.052 Easting 1754291.371 Latitude _____ Longitude _____

County Kittitas Subsection NE1/4 of SE1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0	0												
1	0.3												
5	1.5												
2	0.6												
10	3.0												
3	0.9												
4	1.2												
15	4.5												
5	1.5												
6	1.8												
20	6.1												

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
										8 12 (20)	sand and trace silt.			
									C-6 GW(C)		grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 7 inches.			
7														
25														
8														
9														
30									D-7 C-7A GW	50 for 4" (>50)	grades to very dense, well graded GRAVEL with sand.			
10									C-8B					
35									D-9 C-10	50 for 1"	33.0 to 49.0 feet: Metawelded lapilli tuff, greenish gray, fine to coarse grained, fresh, very weak (R1) to moderately weak (R2) rock. Discontinuities are very closely spaced and in poor condition. No HCl reaction. (CR=22 to 98%, RQD=0 to 10%, FF=2 to 4.9) 33 feet: moderately weak (R2) rock.			
11														
12														
40									C-11		grades to very weak (R1) rock.			
13														
45									C-12		41.9 feet: PLT - Very weak (R1) rock.			

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2349.2 ft (716.0 m)

HOLE No. SCB-014-08

Sheet 3 of 3

Project I-90 Snoqualmie Pass East

Driller Kerry Cooper

Lic# 2552

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14														
15											Bottom of boring at 49 feet below the mudline.			
50											Lake level measurements (above mudline): -9/2/2008 at 16:30 : 118 feet above mudline -9/3/2008 at 09:25: 119 feet above mudline			
16														
55														
17														
18														
60														
19														
65														
20														
21														
70														



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2447.8 ft (746.1 m)

HOLE No. SCB-016-08

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start August 26, 2008 Completion August 26, 2008 Well ID# Not Applicable Equipment CME 45 (barge rig) w/ Auto-hammer

Station _____ Offset _____ Casing HQ 65' Method _____

Northing 1064521.27 Easting 1754430.26 Latitude _____ Longitude _____

County Kittitas Subsection NE 1/4 of SE 1/4 Section 35 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0									C-1 GP(C)		0 to 10.5 feet: Poorly to well graded GRAVEL with cobbles and boulders, subangular to subrounded, gray to greenish gray to brown, wet, homogenous, no HCl reaction. 0 feet: Poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 6 inches.			
1														
5														
2														
3									C-2 GP(C/B)		grades to poorly graded GRAVEL with cobbles and boulders. Maximum size of the boulders encountered is 14 inches.			
10														
4														
15									C-3 GP(C)		10.5 to 51.4 feet: Poorly to well graded GRAVEL, occasional cobbles and boulders, subangular to subrounded, gray to greenish gray to brown, wet, homogenous, no HCl reaction. 12.0 feet: poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 7 inches. grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 7 inches.			
5														
6														
20									C-4 GP(C)		Maximum size of the cobbles encountered is 8 inches.			

DRAFT ROCKN BORINGS I-90-2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7									C-5 GW		grades to well graded GRAVEL.			
25									C-6 GW					
8														
30														
9														
35														
10									C-7 GP?		No recovery. Material is probably washed away. Material is probably poorly graded GRAVEL (fine).			
35														
11														
40														
12														
45									C-8 GW(C)		grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 3.5 inches.			
13														
45														

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14							$\frac{36}{}$				Maximum size of the cobbles encountered is 8 inches.			
15														
50							$\frac{82}{}$		C-10A GW		grades to well graded GRAVEL.			
16							$\frac{100}{5}$		C-10B		51.4 to 65 feet: Metawelded lapilli tuff, greenish gray, fine to medium grained, fresh, very weak (R1). Discontinuities are very closely spaced and in poor to very poor condition. No HCl reaction. (CR=38 to 80%, RQD=0%, FF=1.6 to 5)			
55							$\frac{38}{1.6}$		C-11					
17														
18														
60							$\frac{80}{4}$		C-12					
19														
65														
20											Bottom of boring at 65 feet below the mudline. Lake level measurements (above mudline): -8/26/08 at 11:20: 22 feet above mudline -8/26/08 at 17:15: 22.5 feet above mudline			
21														
70														

DRAFT ROCKN BORINGS I-90-2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2450.1 ft (746.8 m)

HOLE No. SCB-017-08

Sheet 1 of 4

Project I-90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start August 27, 2008 Completion August 28, 2008 Well ID# Not Applicable Equipment CME 45 (barge rig) w/ Auto-hammer

Station _____ Offset _____ Casing HQ Method Wet rotary

Northing 1064470.984 Easting 1754424.239 Latitude _____ Longitude _____

County Kittitas Subsection NE 1/4 of SE 1/4 Section 35 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 48.8 feet: Poorly graded GRAVEL with or without cobbles and boulders, subrounded to subangular, greenish gray to light brown, wet, homogenous, no HCl reaction			
1														
5														
2														
10											grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 16 inches.			
3														
4														
15														
5														
20														
6											grades to poorly graded GRAVEL with cobbles and boulders. Maximum size of the boulders encountered is			

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7											17 inches.			
25														
8														
9														
30							<u>25</u>		C-4 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 4 inches.			
10														
35														
11														
12							<u>28</u>		C-5 GP		grades to poorly graded GRAVEL.			
40							<u>40</u>		C-6 GP		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 5 inches.			
13														
45							<u>27</u>		C-7A GP		grades to poorly graded GRAVEL.			

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
14													
15								C-7B			<p>48.8 to 70.0 feet: Metawelded lapilli tuff, greenish gray, fine to coarse grained, fresh, extremely weak (R0) to moderately weak (R2) rock. Discontinuities are very closely to closely spaced and in poor to fair condition, no HCl reaction. (CR=30 to 80%, RQD=0 to 15%, FF= 1.4 to 6)</p> <p>48.8 feet: Very weak (R1) rock. Discontinuities are very closely spaced and in poor to fair condition. 49.5 feet: Moderately weak (R2) rock. Discontinuities are very closely to closely spaced.</p>		
50								C-8					
16													
55								C-9					
17										55 feet: Very weak (R1) to extremely weak (R0) rock.			
18													
60									C-10		Discontinuities are very closely to closely spaced and in poor condition.		
19													
65									C-11				
20													
21													
70													

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2450.1 ft (746.8 m)

HOLE No. SCB-017-08

Sheet 4 of 4

Project I-90 Snoqualmie Pass East

Driller Kerry Cooper

Lic# 2552

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22											Bottom of boring at 70 feet below the mudline. Backfilled the hole with bentonite chips.			
23											Lake level measurements (above mudline): -8/27/08 at 12:05: 19 feet above mud line -8/28/08 at 09:30: 21.5 feet above mudline			
24														
25														
26														
27														
28														
29														
30														
31														
32														
33														
34														
35														
36														
37														
38														
39														
40														
41														
42														
43														
44														
45														
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														
76														
77														
78														
79														
80														
81														
82														
83														
84														
85														
86														
87														
88														
89														
90														
91														
92														
93														
94														
95														

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2536.5 ft (773.1 m)

HOLE No. SCB-018-08

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Xiangdong Han

Start September 30, 2008 Completion October 1, 2008 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto-hammer

Station 1375+07.09 Offset 22.22'L Casing HWT, HQ Method Wet Rotary

Northing 1065001.03 Easting 1754444.1 Latitude 47°21'02.133"N Longitude 121°21'51.128"W

County Kittitas Subsection NE1/4 of SE1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0								C-1 GP(C/B)		0 to 35.0 feet: Poorly graded GRAVEL with sand, occasional cobbles and boulders, subangular, loose to very dense, brown to gray, dry to wet, homogenous, no HCl reaction. 0 feet: Poorly graded GRAVEL with sand, cobbles and boulders. Maximum size of the boulders encountered is 12 inches.			
1													
5													
2													
3								D-2 GP	7 9 3 (12)	No recovery. Material is probably poorly graded GRAVEL.			
10								C-3 GP		No recovery. Material is probably poorly graded GRAVEL (fine).			
4								D-4 GP(C/B)	50 for 1" (>50)	No recovery. Material is probably poorly graded GRAVEL with cobbles and boulders. 12.1 feet: Maximum size of the boulders encountered is 14 inches.			
15													
5								D-6 GP	10	No recovery. Material is probably poorly graded GRAVEL.			
6								C-7 GP(C)	50 for 4" (>50)	grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 5 inches.			
20													

DRAFT ROCKN BORINGS I-90-2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								D-8 GP	7 5 5 (10)	No recovery. Material is probably poorly graded GRAVEL (fine).			
25								C-9 GP(C/B)		grades to poorly graded GRAVEL with cobbles and boulders. Maximum size of the boulders encountered is 12 inches.			
8								D-10 GP(C)	50 for 1" (>50)	No recovery. Material is probably poorly graded GRAVEL with cobbles. 27.1 feet: Maximum size of the cobbles encountered is 4 inches.			
9								D-12 GP		grades to loose, poorly graded GRAVEL with sand.			
30								C-13A GP					
10								C-13B					
35								C-14		35.0 to 52.0 feet: Metawelded lapilli tuff, brownish to greenish gray, fine to medium grained, highly weathered to fresh, very weak (R1) to very strong (R5) rock. Discontinuities are very closely to medium spaced and in fair condition, some HCl reaction. (CR=100%, RQD=30-90%, FF=1.6 to 3.0)			
11								C-15		35.0 feet: Slightly weathered to fresh rock, strong (R4) to very strong (R5) rock. Discontinuities are closely spaced and in fair condition. PLT - Very strong (R5) rock.			
40										41.5 feet: PLT - Very strong (R5) rock.			
12										grades to highly weathered, very weak (R1) rock. Discontinuities are very closely to medium spaced and in poor condition.			
13										grades to fresh, strong (R4) rock. Discontinuities are closely to medium spaced and in fair condition.			
45										Note: A half-inch thick soft clay infilling was observed.			

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14											grades to highly weathered, very weak (R1) rock. Discontinuities are medium spaced. 49.3 feet: PLT - Strong (R4) rock.			
15														
50														
16											Bottom of boring at 52 feet depth below ground surface (bgs). Backfilled with bentonite chips from 2 to 52 feet depth bgs and with on-site gravel from 0 to 2 feet depth bgs.			
55														
17														
18														
60														
19														
65														
20														
21														
70														



LOG OF TEST BORING

Start Card _____

Job No. 33758654.00009 SR 90

Elevation 2503.7 ft (763.1 m)

HOLE No. SCB-019-09

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Richard Cooper Lic# 2964T

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start May 27, 2009 Completion May 27, 2009 Well ID# Not applicable Equipment CME 45 (Barge rig) with auto hammer

Station 1374+44 (Oct. 2008) Offset 25.2 R Casing HQ 33', NQ 47' Method Wet Rotary

Northing 1065038.59 Easting 1754382.29 Latitude _____ Longitude _____

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 15.0 feet: Poorly graded GRAVEL with cobbles and boulders, subangular, gray to brown, wet, homogenous, no HCl reaction. 0 feet: Poorly graded GRAVEL.			
1														
5														
2														
3														
10														
3														
4														
4														
15														
5														
5														
6														
20														

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7							60		C-5 GP(C)		Maximum size of the cobbles encountered is 5 inches.			
25							40		C-6 GP(C)		Maximum size of the cobbles encountered is 7 inches.			
30							98		C-7A GP(C)		Maximum size of the cobbles encountered is 3.5 inches.			
10							98/2		C-7B		33.0 to 47.0 feet: Meta welded Lapilli Tuff, bluish gray, fine to medium grained, fresh, moderately strong (R3) to very strong (R5). Discontinuities are very closely to widely spaced and in poor to fair condition. Weak HCl reaction. (CR = 98 to 99%, RQD = 60 to 99%, FF=0 to 2) 33.0 feet: Moderately strong (R3) to strong (R4) rock. Discontinuities are very closely to closely spaced and in poor to fair condition. 34.3 feet: PLT - very strong (R5) rock.			
35							98/1.2		C-8			grades to strong (R4) rock. Discontinuities are closely to widely spaced and in fair condition. PLT - very strong (R5) rock.		
11							98				PLT - strong (R4) rock.			
40							99/0		C-9		grades to strong (R4) to very strong (R5) rock. No discontinuities. 42.2 feet: PLT - strong (R4) rock. PLT - strong (R4) rock.			
12														
13														
45														

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



LOG OF TEST BORING

Start Card _____

Job No. 33758654.00009 SR 90

Elevation 2503.7 ft (763.1 m)

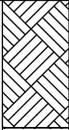
HOLE No. SCB-019-09

Sheet 3 of 3

Project I-90 Snoqualmie Pass East

Driller Richard Cooper

Lic# 2964T

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14											PLT - very strong (R5) rock.			
15											Bottom of boring at 47.0 feet below the mudline. Backfilled to ground surface with bentonite chips.			
50											Lake water level measurements: 05/27/09 at 15:15: 11 feet above the mudline. 05/28/09 at 09:45: 11.2 feet above the mudline.			
16														
55														
17														
18														
60														
19														
65														
20														
21														
70														



LOG OF TEST BORING

Start Card _____

Job No. 33758654.00009 SR 90 Elevation 2505.3 ft (763.6 m)

HOLE No. SCB-020-09

Sheet 1 of 5

Project I-90 Snoqualmie Pass East

Driller Richard Cooper Lic# 2964T

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start May 26, 2009 Completion May 27, 2009 Well ID# Not applicable Equipment CME 45 (Barge rig) with auto hammer

Station 1382+43 (Oct. 2008) Offset 18.6 R Casing HQ, NQ Method Wet Rotary

Northing 1064254.07 Easting 1754488.52 Latitude _____ Longitude _____

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0							18		C-1 GP(C)		0 to 11.5 feet: Poorly graded GRAVEL with cobbles and boulders, angular to subangular, gray, brown or greenish blue, wet, homogenous, no HCl reaction. 0 feet: Poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 4.25 inches.			
1														
5														
2														
10							90		C-2 GP(C/B)		grades to poorly graded GRAVEL with cobbles and boulders. Maximum size of the boulders encountered is 3.8 feet.			
3														
4							56		C-3 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 9 inches.			
15														
5											11.5 to 18.5 feet: Poorly graded GRAVEL?, occasional cobbles and boulders, subrounded to angular, greenish blue, wet, homogenous, no HCl reaction. 11.5 feet: Poorly graded GRAVEL with cobbles and boulders. Maximum size of th boulders encountered is 3.8 feet.			
6							0		C-4 GP?		18.5 to 43.5 feet: No recovery. Material was washed away. Material is probably poorly graded fine gravel?.			
20														

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
14										HCl reaction. (CR=43 to 200%, RQD=0 to 100%, FF=0.6 to 6.0) 43.5 feet: Moderately strong (R3) rock.			
15								C-10		grades to moderately weak (R2) rock. Discontinuities are very closely spaced and in poor condition.			
50								C-11		grades to moderately strong (R3) rock. Discontinuities are very closely to closely spaced and in fair condition.			
16								C-12		PLT - moderately strong (R3) rock. grades to moderately weak (R2) to moderately strong (R3) rock. Discontinuities are in poor to fair condition.			
55								C-13		PLT - strong (R4) rock.			
17								C-14		grades to very weak (R1) rock. Discontinuities are very closely spaced.			
18								C-15		grades to moderately weak (R2) to moderately strong (R3) rock. Discontinuities are very closely spaced and in poor to fair condition.			
60								C-16		Discontinuities are in fair condition.			
19								C-17		PLT - very strong (R5) rock.			
65								C-18		grades to moderately strong (R3) rock. Discontinuities are closely spaced and in fair condition.			
20								C-19		Discontinuities are very closely spaced.			
21								C-20					
70													



LOG OF TEST BORING

Start Card _____

Job No. 33758654.00009 SR 90

Elevation 2505.3 ft (763.6 m)

HOLE No. SCB-020-09

Sheet 5 of 5

Project I-90 Snoqualmie Pass East

Driller Richard Cooper

Lic# 2964T

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
29											-05/26/09 at 15:40: 9.5 feet above the mudline. -05/27/09 at 08:00: 10.0 feet above the mudline. -05/27/09 at 13:45: 10.0 feet above the mudline.			
30														
100														
31														
105														
32														
33														
110														
34														
35														
115														
36														
120														



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2533.0 ft (772.1 m)

HOLE No. SCB-021-08

Sheet 1 of 4

Project I-90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Pam Craig

Start October 2, 2008 Completion October 3, 2008 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto-hammer

Station 1382+41.74 Offset 10.61'L Casing HQ Method Wet Rotary

Northing 1064268.97 Easting 1754527.79 Latitude 47°20'54.918"N Longitude 121°21'49.796"W

County Kittitas Subsection NE1/4 of SE1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0									C-1 GP(C)		0 to 17 feet: Poorly to well graded GRAVEL with sand, occasional cobbles, boulders and silt, subrounded to subangular, loose, brownish gray to greenish gray, homogenous, moist to wet, HCl not tested. 0 feet: Poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 4 inches. Note: Fines are probably washed away.			
1														
5														
2									D-2 GW	4 5 5 (10)	grades to well graded GRAVEL with sand, trace of silt.			
3									C-3 GP(B)		grades to poorly graded GRAVEL with boulders.			
10														
4									C-4 GP(B)		A boulder was encountered. Maximum size of the boulder is 2.7 feet.			
15														
5									D-5 GP	2 3 3 (6)	17 to 25 feet: Poorly graded GRAVEL or silty GRAVEL with sand, subrounded to subangular, loose to very dense, greenish gray to brownish gray, wet, homogenous, HCl not tested. 17 feet: Poorly graded GRAVEL with sand, trace of silt. 18.5 feet: grades to poorly graded GRAVEL with cobbles.			
6									C-6 GP(C)					
20														

DRAFT ROCKN BORINGS I-90-2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7									D-7 GM	2 2 50 for 5" (>50)	grades to silty GRAVEL with sand.			
25									C-8A GM					
8									C-8B		25.0 to 69.5 feet: Metawelded lapilli tuff, brownish to greenish gray, fine to medium grained, fresh to moderately weathered, very weak (R1) to strong (R4) rock. Discontinuities are very closely to closely spaced and in very poor to fair condition, HCl not tested.			
9									C-9		25 feet: Moderately weathered, moderately weak (R2) to moderately strong (R3) rock. Discontinuities are very closely to closely spaced and in poor to fair condition.			
30									C-10		30.2 feet: PLT - Moderately weak (R2) rock.			
10									C-10					
35									C-11					
11									C-11		grades to moderately strong (R3) to strong (R4) rock.			
40									C-12					
12									C-12		39.5 feet: PLT - Moderately strong (R3) rock.			
13									C-12					
45									C-12					

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2533.0 ft (772.1 m)

HOLE No. SCB-021-08

Sheet 4 of 4

Project I-90 Snoqualmie Pass East

Driller Kerry Cooper

Lic# 2552

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22											(bgs). Backfilled with bentonite chips from the bottom of the hole to 2 feet depth bgs and with gravel from ground surface to 2 feet depth bgs.			
75														
23														
24														
80														
25														
85														
26														
27														
90														
28														
95														



LOG OF TEST BORING

Start Card _____

Job No. 33758654.00009 SR 90

Elevation 2537.7 ft (773.5 m)

HOLE No. SCB-022-09

Sheet 1 of 4

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Pam Craig

Start June 12, 2009 Completion June 15, 2009 Well ID# Not applicable Equipment CME 45 (Skid rig) with auto hammer

Station 1373+40 (Oct. 2008) Offset 10.9 L Casing _____ Method Wet Rotary

Northing 1065148.34 Easting 1754391.7 Latitude _____ Longitude _____

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0								D-1 GP	2 1 1 (2)	0 to 22.0 feet: Poorly to well graded GRAVEL with sand, cobbles and boulders, very loose to very dense, subrounded to angular, brown, moist to wet, homogenous, HCl not tested. 0 feet: Very loose, poorly graded GRAVEL with sand.			
5								D-2 GW	8 11 8 (19)	grades to medium dense, well graded GRAVEL with sand.			
2								C-3 GW(C/B)		grades to well graded GRAVEL with sand, cobbles and boulders.			
10								C-4 GW(C/B)		grades to very dense, well graded GRAVEL with boulders. Maximum size of the boulders encountered is 1.8 feet.			
4								D-5 GW	4 10 26 (36)	grades to dense, well graded GRAVEL with sand.			
15								C-6 GW(C)		grades to well graded GRAVEL with cobbles, Maximum size of the cobbles encountered is 0.4 feet. Note: Woody debris was encountered at the bottom of the core.			
20													

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7													
25													
8													
30													
9													
35													
10													
35													
11													
40													
12													
40													
13													
45													

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10

22.0 to 51.7 feet: Well graded GRAVEL with sand, cobbles and boulders, occasional poorly to well graded medium SAND with or without gravel, loose to very dense, subrounded to angular, brown, brownish gray or gray, wet, homogenous, no HCl reaction.
 22.0 feet: Loose, well graded GRAVEL with sand. Note: Woody debris was observed in the sample.
 23.5 feet: grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 0.7 feet.

grades to well graded GRAVEL with boulders. Maximum size of the boulders encountered is 1.3 feet.

grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 0.5 feet.

grades to loose to medium dense, poorly graded medium SAND.

grades to well graded GRAVEL.

grades to dense, well graded GRAVEL with sand.

grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 0.6 feet.



LOG OF TEST BORING

Start Card _____

Job No. 33758654.00009 SR 90

Elevation 2537.7 ft (773.5 m)

HOLE No. SCB-022-09

Sheet 4 of 4

Project I-90 Snoqualmie Pass East

Driller Robert Haller

Lic# 2779

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22											grades to moderately strong (R3) rock. (PLT - moderately strong (R3) rock.) Bottom of boring at 71.9 feet below the ground surface. Backfilled to ground surface with bentonite chips.			
75	23													
80	24													
85	25													
90	26													
95	27													
	28													



LOG OF TEST BORING

Start Card _____

Job No. 33758654.00009 SR 90 Elevation 2502.7 ft (762.8 m)

HOLE No. SCB-023-09

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Richard Cooper Lic# 2964T

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start May 28, 2009 Completion May 29, 2009 Well ID# Not applicable Equipment CME 45 (Barge rig) with auto hammer

Station 1373+31 (Oct. 2008) Offset 33.3 R Casing HWT 15', HQ, NQ Method Wet Rotary

Northing 1065146.27 Easting 1754346.56 Latitude _____ Longitude _____

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0									C-1 GP(C)		0 to 37.2 feet: Poorly to well graded GRAVEL with or without cobbles and boulders, subrounded to angular, brown to gray, wet, homogenous, no HCl reaction. 0 feet: Poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 4.5 inches.			
1														
5														
2									C-2 GP(C)		Maximum size of the cobbles encountered is 8.5 inches.			
10														
3									C-3 GP(C/B)		grades to poorly graded GRAVEL with cobbles and boulders. Maximum size of the boulders encountered is 13 inches.			
4														
15														
5									C-4 GW		grades to well graded GRAVEL.			
6														
20														

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7							25	C-5 GW					
25							0	C-6 GP?		No recovery. Material was washed away. Material probably is poorly graded GRAVEL.			
8													
30							0	C-7 GP?		No recovery. Material was washed away. Material probably is poorly graded GRAVEL.			
9													
35													
10													
37.2							90	C-8A GW		grades to well graded GRAVEL.			
11							90 2.1	C-8B		37.2 to 56.0 feet: Meta welded Lapilli Tuff, brown to light gray, fine to medium grained, fresh to slightly weathered, moderately weak (R2) to strong (R4). Discontinuities are very closely to widely spaced and in poor to fair condition. No HCl reaction. (CR=67 to 100%, RQD=30 to 90%, FF=0.6 to 2.2)			
40							93 1.3	C-9		37.2 feet: Brown, slightly weathered, moderately weak (R2) to moderately strong (R3) rock. Discontinuities are very closely to closely spaced and in poor condition. PLT - strong (R4) rock.			
12										40.2 feet: grades to light gray, fresh, moderately strong (R3) rock.			
13							67 2.0	C-10		41.0 feet: grades to brown to light gray, fresh to slightly weathered rock, moderately strong (R3) to strong (R4) rock. Discontinuities are very closely to closely spaced and in poor condition.			
45										PLT - very strong (R5) rock.			

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)	% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
14				$\frac{92}{0.6}$			C-11		grades to fresh (slightly weathered near joints) rock. Discontinuities are widely spaced and in fair condition.		
15											
50				$\frac{100}{2.2}$			C-12		grades to fresh to slightly weathered rock. Discontinuities are closely to medium spaced.		
16									PLT - moderately strong (R3) rock.		
55									Bottom of boring at 56.0 feet below the mudline. Backfilled to ground surface with bentonite chips.		
17									Lake level measurements: -05/28/09 at 14:30: 12.0 feet above the mudline. -05/29/09 at 09:15: 12.7 feet above the mudline.		
18											
60											
19											
65											
20											
21											
70											



LOG OF TEST BORING

Start Card _____

Job No. 33758654.00009 SR 90 Elevation 2523.4 ft (769.1 m)

HOLE No. SCB-024-09

Sheet 1 of 4

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Pam Craig

Start June 9, 2009 Completion June 11, 2009 Well ID# Not applicable Equipment CME 45 (Skid rig) with auto hammer

Station 1383+38 (Oct. 2008) Offset 15.4 R Casing HWT 38', HQ 85.5' Method Wet Rotary

Northing 1064159.8 Easting 1754490.89 Latitude _____ Longitude _____

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 36.5 feet: Well graded GRAVEL with sand with or without cobbles and boulders, occasional silty GRAVEL with sand, subangular to angular, medium dense to very dense, light brown, light gray or brownish gray, wet, homogenous, no HCl reaction.			
4.5									D-1 GM	5 15 5 (20)	4.5 feet: Medium dense, silty GRAVEL with sand.			
10									D-2 GW	24	grades to very dense, well graded GRAVEL with sand.			
10									C-3 GW(B)	50 for 4" (>50)	grades to well graded GRAVEL with boulders. Maximum size of the boulders encountered is 2.5 feet.			
15.5											Note: 0.5-foot thick Silt bedding was encountered between 15.5 and 16.0 feet.			
16									C-5 GW(C/B)		grades to well graded GRAVEL with boulders. Maximum size of the boulders encountered is 1.4 feet.			
20														

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14			[Hatched pattern]				$\frac{74}{>10}$			C-15		grades to fresh, very weak (R1) rock. Discontinuities are very closely spaced and in very poor condition. PLT - very weak (R1) rock.		
15			[Hatched pattern]											
50			[Hatched pattern]				$\frac{94}{1}$			C-16		PLT - very weak (R1) rock.		
16			[Hatched pattern]											
55			[Hatched pattern]				$\frac{98}{}$			C-17		Note: Calcite infilling in joints. PLT - very weak (R1) rock.		
17			[Hatched pattern]											
18			[Hatched pattern]											
60			[Hatched pattern]				$\frac{100}{>5}$			C-18		grades to moderately strong (R3) rock. Calcite infilling in joints. PLT - moderately strong (R3) rock.		
19			[Hatched pattern]											
65			[Hatched pattern]				$\frac{90}{>5}$			C-19		grades to very weak (R1) rock. Calcite infilling in joints. PLT - very weak (R1) rock.		
20			[Hatched pattern]											
21			[Hatched pattern]											
70			[Hatched pattern]											

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)	% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
22				$\frac{100}{<0.2}$			C-20		grades to moderately weak (R2) rock. Discontinuities are closely spaced and in very poor to good condition. Calcite infilling in joints. Strong HCl reaction. PLT - moderately weak (R2) rock. PLT - very weak (R1) rock.		
75				$\frac{100}{1}$			C-21		PLT - very weak (R1) rock. grades to very weak (R1) rock. Discontinuities are in very poor to poor condition. Calcite infilling in joints. Strong HCl reaction.		
24									PLT - very weak (R1) rock.		
80				$\frac{100}{5}$			C-22		grades to very weak (R1) to moderately weak (R2) rock. Calcium infilling in joints. Strong HCl reaction. PLT - moderately weak (R2) rock.		
25											
85									Bottom of boring at 85.5 feet below the ground surface. Backfilled to ground surface with bentonite chips.		
26											
27											
90											
28											
95											



LOG OF TEST BORING

Start Card _____

Job No. 33758654.00009 SR 90

Elevation 2536.8 ft (773.2 m)

HOLE No. SCB-025-09

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Pam Craig

Start June 2, 2009 Completion June 4, 2009 Well ID# Not Applicable Equipment CME 45 (Skid rig) with auto hammer

Station 1374+64 Offset 24.6 R Casing HWT 22', HQ 55.6' Method Wet Rotary

Northing 1065031.01 Easting 1754435.55 Latitude _____ Longitude _____

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0													
1						50		D-1 SW	3 3 3 (6)	0 to 27.5 feet: Poorly graded to well graded GRAVEL with sand, with occasional cobbles and boulders, occasional well graded SAND and silty GRAVEL with sand, subangular to angular, loose to very dense, brown, brownish gray or dark gray, moist to wet, homogenous, no HCl reaction. 0 feet: Loose, well graded SAND.			
5						22		D-2 GP	2 4 8 (12)	grades to medium dense, poorly graded GRAVEL with sand.			
10						0 77		D-3 GP(B) C-4	20 50 for 2" (>50)	No recovery. Material probably is a cobble or a boulder. Boulder. Maximum size of the boulder encountered is 1 foot.			
15						28 29		D-5 GW C-6 GW	5 8 7 (15)	grades to medium dense, well graded GRAVEL with sand.			
20						17 79		D-7 GM C-8 GP(C/B)	4 3 2 (5)	grades to loose, silty GRAVEL with sand. grades to poorly graded GRAVEL with cobbles and boulders. Maximum size of the boulder encountered is 1 feet.			

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7							90		C-9 GP(C/B)					
25							77		C-10 GW(C/B)			grades to well graded GRAVEL with boulders and cobbles. Maximum size of the boulders encountered is 1.6 feet.		
8							98		C-11 GW(C/B)			Maximum size of the boulders encountered is 1.1 feet.		
9												27.5 to 37.5 feet: Well graded GRAVEL with or without boulders, angular, dark gray, wet, homogenous, no HCl reaction. 27.5 feet: Well graded GRAVEL with boulders. Maximum size of the boulders encountered is 1.1 feet.		
30							20		C-12 GW			grades to well graded GRAVEL.		
10														
35														
11							100		D-13 GW	16 37 26 (63)		grades to well graded GRAVEL with sand.		
12							80		C-14A CL-ML			37.5 to 38.7 feet: Clayey GRAVEL with sand, subangular, very dense, light brown, wet.		
40							80 0.6		C-14B			38.7 to 55.6 feet: Meta Welded Lapilli Tuff, dark greenish gray to orangish brown, medium grained, fresh to slightly weathered, moderately weak (R2) to strong (R4) rock. Discontinuities are closely spaced to medium spaced and in fair to poor condition. (CR = 80 to 100%, RQD = 62 to 100%, FF = 0 to >4) 38.7 feet: fresh, strong (R4), rock.		
13							100 >1.5		C-15			PLT - strong (R4) rock.		
45														

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14									C-16					
15									C-17		PLT - strong (R4) rock.			
50							$\frac{100}{0}$		C-18		grades to slightly weathered, moderately weak (R2) to moderately strong (R3) rock.			
16						$\frac{100}{>4}$								
55											PLT - moderately weak (R2)/moderately strong (R3) rock.			
17											Bottom of boring at 55.6 feet depth below ground surface (bgs). Backfilled to ground surface with bentonite chips.			
18											Water level measurements (below existing ground surface): -06/04/09 at 08:00: 18.5 feet.			
60														
19														
65														
20														
21														
70														



LOG OF TEST BORING

Start Card SE03680

Job No. 33758654.00009 SR 90 Elevation 2525.4 ft (769.7 m)

HOLE No. SCB-026-09

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Tommy Fisher Lic# _____

Drilling Contractor CRUX subsurface Inc.

Inspector Ken Yang

Start October 9, 2009 Completion October 10, 2009 Well ID# Not applicable Equipment Burley 5500-1 (Skid rig) with autohammer

Station 1372+81 (Oct. 2008) Offset 19.0 R Casing HW, HQ Method Wet Rotary

Northing 1065198.47 Easting 1754348.01 Latitude 47°1'03.41"N Longitude 121°1'54.95"W

County Kittitas Subsection SW1/4 of NE1/4 Section 1 Range 11E Township 21

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 17.1 feet: No samples were collected from 0 to 17.1 feet below the ground surface.			
1														
5														
2														
10														
3														
4														
15														
5														
6														
20														
											17.1 to 26.4 feet: Poorly to well graded GRAVEL with occasional boulders, angular to subangular, bluish gray to greenish gray, wet, homogenous, no HCl reaction. 17.1 feet: Poorly graded GRAVEL with boulders. Maximum size of the boulders encountered is 12 inches.			

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7											grades to well graded GRAVEL.			
25														
8														
30														
9														
35														
10														
40														
11														
42														
12														
44														
13														
45														

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14											condition. No HCl reaction. 42.6 feet: grades to fresh, strong (R4) rock. Discontinuities are medium spaced and in fair to good condition. 46.4 feet: grades to fresh to slightly weathered, moderately strong (R3) to strong (R4) rock. Discontinuities are closely to medium spaced and in poor to fair condition. No HCl reaction.			
15														
50														
16												grades to fresh rock. No HCl reaction.		
55												grades to slightly weathered, very weak (R1) to moderately weak (R2) rock. Discontinuities are closely spaced and in very poor to poor condition. No HCl reaction. 54.3 feet: A 2.5-inch thick silty sand, angular to subangular, dense infilling was encountered. 56.4 feet: grades to fresh, strong (R4) rock. Discontinuities are medium spaced and in good condition. None to weak HCl reaction.		
17														
18														
60														
19											grades to moderately strong (R3) to strong (R4) rock. Discontinuities are closely to medium spaced and in poor to fair condition. None to weak HCl reaction.			
65												Bottom of boring at 66.4 feet depth below the ground surface. Performed oriented optical and acoustic borehole logging from 37.0 to 66.4 feet depth. Backfilled to ground surface with bentonite chips.		
21												Water Level Measurements: 10/10/2009 at 07:20: 14 feet depth below the ground surface.		
70														

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



LOG OF TEST BORING

Start Card SE03680

Job No. 33758654.00009 SR 90 Elevation 2523.3 ft (769.1 m)

HOLE No. SCB-027-09

Sheet 1 of 4

Project I-90 Snoqualmie Pass East

Driller Tommy Fisher Lic# _____

Drilling Contractor CRUX subsurface Inc.

Inspector Ken Yang

Start October 12, 2009 Completion October 14, 2009 Well ID# Not applicable Equipment Burley 5500-1 (Skid rig) with autohammer

Station 1373+88 (Oct. 2008) Offset 2.9 R Casing HW, HQ Method Wet Rotary

Northing 1065098.73 Easting 1754390.09 Latitude 47°1'02.43"N Longitude 121°1'54.34"W

County Kittitas Subsection SW1/4 of NE1/4 Section 1 Range 11E Township 21

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											Note: No samples were collected from 0 to 18.0 feet depth below ground surface.			
1														
5														
2														
10														
3														
4														
15														
5														
6														
20								<u>79</u>	<u>C-1</u> <u>GP(C)</u>		18.0 to 27.4 feet: Poorly graded GRAVEL with cobbles, angular, dark gray to bluish gray, wet, homogenous, no HCl reaction. 18.0 feet: Maximum size of the cobbles encountered is 3.5 inches.			



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7							100	C-2 GP(C)		Maximum size of the cobbles encountered is 5 inches.			
8							78	C-3 GP(C)		Maximum size of the cobbles encountered is 10 inches.			
25													
8							61	C-4 GM(C)		27.4 to 36.4 feet: Silty GRAVEL with sand and cobbles or poorly graded GRAVEL, angular to subangular, brown to bluish gray, wet, homogenous to stratified, no HCl reaction. 27.4 feet: Silty GRAVEL with sand, stratified.			
9							67	C-5 GP		grades to poorly graded GRAVEL, homogenous.			
30							75	C-6 GM(C)		grades to silty GRAVEL with sand and cobbles. Maximum size of the cobbles encountered is 8.5 inches.			
10													
35							0	C-7 ML		36.4 to 40.8 feet: No recovery. Material is probably sandy silt.			
11							0	C-8					
40							0	C-9A					
12							100	C-9B		40.8 to 72.4 feet: Metawelded Lapilli Tuff, bluish gray to brown, fine to coarse grained, fresh to slightly weathered, moderately weak (R2) to strong (R4). Discontinuities are very closely to medium spaced and in very poor to fair condition. None to weak HCl reaction. (CR- 98 to 100%, RQD - 44 to 92%, FF - 0.8 to 2.0)			
13							0	D-10 C-11	50/2" (>50)	40.8 feet: Fresh to slightly weathered, moderately strong (R3) rock. Discontinuities are closely spaced and in very poor condition. No HCl reaction. Note: 41.4 feet: A 0.6-foot stiff, brown, sandy SILT infilling was encountered within bedrock. PP = 1.5 to 3			
45							100						

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14											tsf. 42.0 feet: grades to fresh to slightly weathered, moderately strong (R3) rock. Discontinuities are closely to medium spaced and in very poor condition, no HCl reaction.			
						$\frac{100}{1.4}$			C-12		47.4 feet: grades to slightly weathered, strong (R4) to moderately strong (R3) rock. None to weak HCl reaction.			
15														
50														
16						$\frac{100}{1.2}$			C-13		grades to moderately weak (R2) to moderately strong (R3) rock. Discontinuities are very closely to closely spaced. No HCl reaction. 53.6 feet: grades to strong (R4) rock. Discontinuities are medium spaced and in poor to fair condition.			
55														
17											54.8 feet: grades to moderately weak (R2) to moderately strong (R3) rock. Discontinuities are very closely to closely spaced.			
						$\frac{98}{1.2}$			C-14		grades to fresh to slightly weathered, strong (R4) rock.			
18														
60														
19						$\frac{98}{0.6}$			C-15					
65														
20											grades to slightly weathered, moderately weak (R2) to moderately strong (R3) rock. Discontinuities are closely to medium spaced and in poor to fair condition. 66.3 feet: A 1 mm to 2 mm thick, brown, soft, clay infilling was encountered within bedrock. 66.9 feet: A 1 mm to 2 mm thick, brown, soft, clay infilling was encountered within bedrock.			
						$\frac{100}{2.0}$			C-16		grades to fresh to slightly weathered, moderately strong (R3) to strong (R4) rock. Discontinuities are closely to medium spaced and in poor to fair condition. None to weak HCl reaction.			
21														
70														

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



LOG OF TEST BORING

Start Card SE03680

Job No. 33758654.00009 SR 90

Elevation 2523.3 ft (769.1 m)

HOLE No. SCB-027-09

Sheet 4 of 4

Project I-90 Snoqualmie Pass East

Driller Tommy Fisher Lic# _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22														
75	23										Bottom of boring at 72.4 feet depth below ground surface. Performed oriented optical and acoustic borehole logging from 42.1 to 72.4 feet depth. Backfilled to ground surface with bentonite chips.			
80	24													
85	25													
90	26													
95	27													
	28													



LOG OF TEST BORING

Start Card SE03680

Job No. 33758654.00009 SR 90 Elevation 2499.1 ft (761.7 m)

HOLE No. SCB-028-09

Sheet 1 of 4

Project I-90 Snoqualmie Pass East

Driller Tommy Fisher Lic# _____

Drilling Contractor CRUX subsurface Inc.

Inspector Ken Yang

Start October 16, 2009 Completion October 21, 2009 Well ID# Not applicable Equipment Burley 5500-1 (Skid rig) with autohammer

Station 1382+52 (Oct. 2008) Offset 33.7 R Casing HW, HQ Method Wet Rotary

Northing 1064244.65 Easting 1754473.42 Latitude 47°0'54.00"N Longitude 121°1'53.13"W

County Kittitas Subsection SW1/4 of NE1/4 Section 1 Range 11E Township 21

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 13.1 feet: Samples were not collected from 0 to 13.1 feet. Material is poorly graded GRAVEL with cobbles, boulders based on the drilling observations. Maximum size of the cobbles encountered is 3.5 feet.			
1														
5														
2														
10														
3														
4														
15											13.1 to 31.5 feet: Poorly graded GRAVEL or silty GRAVEL with sand and cobbles and occasional silty SAND with gravel, angular to subangular, medium dense to dense, bluish gray to brown, wet, homogenous, no HCl reaction. 13.1 feet: Poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 7 inches.			
5														
6														
20											grades to silty GRAVEL with sand.			

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14											45.5 feet: A 0.1 to 0.2-inch thick clay infillings were encountered within bedrock.			
									C-9		grades to moderately strong (R3) to strong (R4) rock. Discontinuities are very closely to closely spaced and in very poor to poor condition.			
15											50.1 feet: A 2-inch thick, very loose, sandy silt infilling was encountered within bedrock. 50.5 feet: A 3-inch thick, loose, silty sand infilling was encountered within bedrock.			
50														
16									C-10		Discontinuities are in poor condition.			
100														
17									C-11		54.8 feet: A 2-3mm thick, soft, clay infilling was encountered within bedrock. grades to fresh, very weak (R1) to moderately weak (R2) rock. Discontinuities are very closely to closely spaced and in poor to fair condition. 56.3 feet: A 2-inch thick silty sand infilling was encountered within bedrock.			
100														
18									C-12		59.2 and 59.7 feet: A 0.4 to 0.6 mm thick soft gray clay infilling was encountered within bedrock.			
60														
19									C-13		61.2 feet: A 2mm thick, soft clay infilling was encountered within bedrock. grades to moderately strong (R3) to strong (R4) rock. Discontinuities are closely spaced.			
100														
20									C-14		64.6 feet: A 0.5-inch thick silty sand infilling was encountered within bedrock.			
65														
21											grades to moderately weak (R2) to moderately strong (R3) rock. Discontinuities are very closely to closely spaced.			
70														

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22							$\frac{100}{3.2}$		C-15		72.0 feet: A 0.5-inch thick, medium dense, silty sand infilling was encountered within bedrock. 73.0 feet: A 1-2mm thick, soft clay infilling was encountered within bedrock.			
75	23						$\frac{96}{2.0}$		C-16		grades to moderately strong (R3) to strong (R4) rock.			
24	80										79.2 feet: A 0.5-inch thick, loose, silty sand infilling was encountered within bedrock.			
25											Bottom of boring at 82.5 feet below the ground surface. Performed oriented optical and acoustic borehole logging from 35.0 to 81.0 feet depth. Backfilled to ground surface with bentonite chips.			
85	26													
27	90													
28														
95														



LOG OF TEST BORING

Start Card SE03680

Job No. 33758654.00009 SR 90 Elevation 2515.4 ft (766.7 m)

HOLE No. SCB-029-09

Sheet 1 of 4

Project I-90 Snoqualmie Pass East

Driller Tommy Fisher Lic# _____

Drilling Contractor CRUX subsurface Inc.

Inspector Ken Yang

Start October 23, 2009 Completion October 23, 2009 Well ID# Not applicable Equipment Burley 5500-1 (Skid rig) with autohammer

Station 1383+07 (Oct. 2008) Offset 19.5 R Casing HW, HQ Method Wet Rotary

Northing 1064190.07 Easting 1754487.32 Latitude 47°0'53.46"N Longitude 121°1'52.93"W

County Kittitas Subsection SW1/4 of NE1/4 Section 1 Range 11E Township 21

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 11.1 feet: No samples were collected between 0 and 11.1 feet below the existing ground surface.			
11									C-1 GP					
20									D-2 GM	6 3 16 (19)	11.1 to 27.0 feet: Silty GRAVEL with sand or poorly graded GRAVEL with occasional cobbles, subangular to angular, loose to medium dense, brown to brownish gray or gray, moist to wet, homogenous, No HCl reaction. 11.1 feet: Poorly graded GRAVEL. 13.0 feet: grades to medium dense, silty GRAVEL with sand.			
21									C-3 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 4.5 inches.			
7									D-4 GP	0 1 4 (5)	grades to loose, silty GRAVEL with sand.			
31									C-5 GM					

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7							40	D-6 GM	10	grades to medium dense.			
25							100	C-7A GM	10 9 (19)				
8							100 3.0	c-7B		27.0 to 73.0 feet: Metawelded Lapilli Tuff, brownish gray to greenish gray, fine to medium grained, slightly weathered to fresh, very weak (R1) to strong (R4). Discontinuities are closely to medium spaced and in fair to good condition. 27.0 feet: Slightly weathered to fresh, very weak (R1) to moderately weak (R2) rock. Discontinuities are closely spaced and in poor to fair condition. 28.8 feet: A 0.5-inch thick near vertical, soft, clay infilling was encountered within bedrock.			
9							94 2.2	c-8					
10							94 2.5	C-9		32.5 feet: A 1.5-inch thick soft, sandy silt infilling was encountered within bedrock. 33.0 feet: grades to moderately weak (R2) rock.			
11													
12							96 0.8	C-10		37.2 feet: A 0.5-inch soft sandy silt infilling was encountered within bedrock. 37.7 feet: grades to fresh, strong (R4) rock. Discontinuities are closely to medium spaced and in fair condition.			
13							100 0.8	c-11		43.5 feet: A 2-inch thick, loose, silty sand infilling was encountered within bedrock.			
45													

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14											45.7 feet: A 2mm thick, soft, clay infilling was encountered within bedrock.			
							$\frac{100}{0.98}$		C-12			Discontinuities are closely to medium spaced and in poor to fair condition.		
15												49.7 and 49.9 feet: A 0.5 to 0.7-inch thick, soft clay infilling were encountered within bedrock.		
50														
16							$\frac{100}{2.0}$		C-13			Discontinuities are in fair condition.		
55														
17														
18							$\frac{100}{2.2}$		C-14			57.3 feet: A 1-inch thick, dense, silty sand layer infilling was encountered within bedrock.		
60														
19							$\frac{92}{2.9}$		C-15			62.3 feet: A 0.5 inch thick, dense, silty sand infilling was encountered within bedrock.		
65														
20														
21							$\frac{100}{2.2}$		C-16					
70														

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



LOG OF TEST BORING

Start Card SE03680

Job No. 33758654.00009 SR 90

Elevation 2515.4 ft (766.7 m)

HOLE No. SCB-029-09

Sheet 4 of 4

Project I-90 Snoqualmie Pass East

Driller Tommy Fisher Lic# _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22														
75	23										Bottom of boring at 73.0 feet below the ground surface. Performed oriented optical and acoustic borehole logging from 26.3 to 72.5 feet depth. Backfilled to ground surface with bentonite chips.			
80	24													
85	25													
90	26													
95	27													
	28													



LOG OF TEST BORING

Start Card SE03680

Job No. 33758654.00009 SR 90 Elevation 2527.8 ft (770.5 m)

HOLE No. SCB-030-09

Sheet 1 of 4

Project I-90 Snoqualmie Pass East

Driller Tommy Fisher Lic# _____

Drilling Contractor CRUX subsurface Inc.

Inspector Ken Yang

Start October 24, 2009 Completion October 25, 2009 Well ID# Not applicable Equipment Burley 5500-1 (Skid rig) with autohammer

Station 1383+64 (Oct. 2008) Offset 12.0 R Casing HW, HQ Method Wet Rotary

Northing 1064133.58 Easting 1754493.58 Latitude 47°0'52.90"N Longitude 121°1'52.84"W

County Kittitas Subsection SW1/4 of NE1/4 Section 1 Range 11E Township 21

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 16.0 feet: No samples were collected between 0 and 16 feet below the ground surface. Based on the field observations, the material was silty SAND with gravel from 0 to 4 feet depth below the ground surface and poorly graded GRAVEL with cobbles and boulders from 4 to 16 feet depth below the ground surface.			
1														
5														
2														
10														
3														
4														
15														
5							<u>48</u>		<u>C-1</u>	<u>GW(C)</u>	16.0 to 29.3 feet: Poorly to well graded GRAVEL with cobbles or silty GRAVEL with sand, angular to subangular, very dense, brownish gray to brown or gray, wet, homogenous, no HCl reaction. 16.0 feet: Well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 6 inches.			
6														
20														



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7							14		C-2 GM		grades to silty GRAVEL.			
25														
8							22		D-3 GM	5	grades to very dense, silty GRAVEL with sand.			
							32		C-4A GP(C)	(>50)				
9							100 1.8		C-4B		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 4 inches.			
30											29.3 to 87.7 feet: Metawelded Lapilli Tuff, fine to medium grained, brownish gray to light bluish gray, fresh to slightly weathered, moderately weak (R2) to strong (R4). Discontinuities are very closely to medium spaced and in very poor to fair condition. No HCl reaction. (CR - 98 to 100%, RQD - 13 to 90%, FF - 0.8 to 3.3)			
10							98 3.3		C-5		29.3 feet: Slightly weathered, moderately weak (R2) rock. Discontinuities are very closely to medium spaced and in very poor to fair condition.			
35											31.3 feet: A 1 to 1.5-inch thick, loose, sandy silt infilling was encountered within bedrock.			
11											32.7 feet: A 0.2-inch thick, loose, sandy silt infilling was encountered within bedrock.			
40							100 1.2		C-6		34.1 feet: A 0.5-inch thick, loose, sandy silt infilling was encountered within bedrock.			
12											34.6 feet: A 1-inch thick silty sand infilling was encountered within bedrock.			
45							100 1.6		C-7		37.9 feet: A 0.5-inch thick silty sand infilling was encountered within bedrock. grades to fresh, strong (R4) rock.			
											Discontinuities are closely to medium spaced and in poor to fair condition.			
											44.2 feet: A 0.5 to 0.8-inch thick silty sand was encountered within bedrock.			

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
14													
								C-8					
							100 1.8				48.7 feet: A 0.3-inch thick, silty SAND infilling was encountered within bedrock.		
15													
50													
								C-9					
							100 0.8				Discontinuities are in fair to good condition.		
16													
55													
								C-10					
							98 2.0				Discontinuities are very closely to medium spaced and in very poor to fair condition.		
17													
18													
60													
								C-11					
							98 1.2				60.2, 60.5, 60.8 and 61.2 feet: A 0.2 to 1.0-inch thick silty sand infilling was encountered within bedrock.		
19													
65													
								C-12					
							98 3.2				64.2 feet: A 2-inch thick silty sand infilling was encountered within bedrock.		
20													
21													
70							100				grades to moderately strong (R2) rock. Discontinuities are very closely to closely spaced.		
								C-13			69.2 feet: A 1.5 to 2.0-inch thick, medium dense, silty sand with fine gravel infilling was encountered within		

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22							1.3				bedrock. grades to strong (R4) rock. Discontinuities are closely spaced and in fair to good condition.			
75							$\frac{100}{1.2}$		c-14		Discontinuities are closely to medium spaced and in poor to fair condition.			
23														
24							$\frac{98}{2.8}$		c-15		grades to moderately strong (R3) to strong (R4) rock.			
80											80.5 feet: A 2mm thick, loose, sandy silt infilling was encountered within bedrock.			
25							$\frac{98}{2.8}$		c-16		82.0 feet: A 0.4-inch thick, loose, sandy silt infilling was encountered within bedrock. 83.4 feet: A 1-inch thick, loose, sandy silt infilling was encountered within bedrock.			
85														
26														
27											87.5 feet: A 2mm thick, soft, silt infilling was encountered within bedrock.			
90											Bottom of boring at 87.7 feet depth below the ground surface. Performed oriented optical and acoustic borehole logging from 29.6 to 87 feet depth. Backfilled to ground surface with bentonite chips.			
28														
95														

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90

Elevation 2539.1 ft (773.9 m)

HOLE No. SCB-031-10

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Dennis Dunn

Start July 13, 2010 Completion July 13, 2010 Well ID# Not applicable Equipment CME 45 (Skid rig) with auto hammer

Station _____ Offset _____ Casing _____ Method Wet Rotary

Northing 1065276.76 Easting 1754386.82 Latitude 47°21'04.85"N Longitude 121°21'52.00"W

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0	0										0 to 0.3 feet: Asphalt. 0.3 to 8.8 feet: Well graded GRAVEL with cobbles, subangular, greenish gray.			
1	0.3					36			C-1 GW(C)					
5	1.5					64			C-2A GW(C)					
2	0.6					64			C-2B					
3	0.9					100			C-3		8.8 to 35.0 feet: Lapilli Tuff, greenish gray, coarse grained, fresh, strong (R4). Discontinuities are medium to closely spaced and in fair to good condition. No Hcl reaction. (CR - 90 to 100%, RQD - 30 to 88%, FF - 0.8 to 2.0) 8.8 feet: Discontinuities are medium spaced and in good condition. Note: Thin layer of silt was observed in fractures. 9.8 feet: PLT - Moderately strong (R3) rock.			
10	3.0					100			C-4		Discontinuities are medium spaced and in good condition. Note: Thin layer of silt was observed in fractures. 1 to 2-inch thick fracture zones were encountered. 16.3 feet: PLT - Moderately strong (R3) rock. PLT - Very strong (R5) rock.			
15	4.5					100								
20	6.0													

DRAFT ROCKN BORINGS & TESTPITS 2010.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7														
25														
8														
9														
30														
10														
35														
11														
12														
40														
13														
45														

DRAFT ROCKN BORINGS & TESTPITS 2010.GPJ 9/14/10



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90 Elevation 2537.8 ft (773.5 m)

HOLE No. SCB-032-10

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Dennis Dunn

Start July 14, 2010 Completion July 14, 2010 Well ID# Not applicable Equipment CME 45 (Skid rig) with auto hammer

Station _____ Offset _____ Casing _____ Method Wet Rotary

Northing 1065283.31 Easting 1754330.37 Latitude 47°21'04.91"N Longitude 121°21'82.00"W

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0									C-1 GW		0 to 25.3 feet: Poorly to well graded GRAVEL with sand, cobbles and boulders, occasionally silty GRAVEL with sand, subrounded to angular, gray, greenish gray, yellowish brown, moist to wet, homogenous, no HCl reaction. 0 feet: Well graded GRAVEL.			
5									C-2 GP(C/B)		grades to poorly graded GRAVEL with cobbles.			
10									C-3 GP(C/B)		grades to poorly graded GRAVEL with cobbles and boulders.			
15									C-4 GM		Note: Very soft soil was encountered between 14 and 15 feet depth based on driller's observation. grades to silty GRAVEL with sand.			
20														

DRAFT ROCKN BORINGS & TESTPITS 2010.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
							56							
7														
25							100		C-6A GW(B)					
8							100				25.3 to 45.0 feet: Lapilli Tuff, greenish gray to gray, coarse grained, fresh, strong (R4). Discontinuities are closely to medium spaced and in fair to good condition. No HCl reaction. (CR - 100%, RQD - 72 to 88%, FF - 1 to 2) 25.3 feet: Discontinuities are medium spaced and in fair condition. (Note: Silt interbedding within fractures less than 0.2 inches thick was observed). PLT - Very strong (R5) rock. PLT - Strong (R4) rock.			
9							100		C-7		Discontinuities are closely spaced and in fair condition. (Note: Silt interbedding within fractures less than 0.25 inches thick was observed). PLT - Strong (R4) rock.			
10							100				PLT - Very strong (R5) rock.			
35							100		C-8		Discontinuities are medium spaced and in fair condition.			
11							100							
12							100		C-9		Discontinuities are medium spaced and in good condition.			
40							100							
13							100				PLT - Very strong (R5) rock.			
45							100							

DRAFT ROCKN BORINGS & TESTPITS 2010.GPJ 9/14/10



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90

Elevation 2537.8 ft (773.5 m)

HOLE No. SCB-032-10

Sheet 3 of 3

Project I-90 Snoqualmie Pass East

Driller Robert Haller

Lic# 2779

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14											Bottom of boring at 45.0 feet depth below ground surface. Backfilled to ground surface with bentonite chips.			
15														
50														
16														
55														
17														
18														
60														
19														
65														
20														
21														
70														

Depth (ft)	Sketch of West Test Pit Side Horizontal Distance in Feet				Remarks	Ground Water	Samples	WSDOT Symbol	Approximate Depth (ft)	Soil Profile Description
										Surface Elevation: Approximately 2,536.85 ft
0					<p>A can from the 1970s was found at 7'</p> <p>A little caving in the east side of the pit</p>					
5							S-1 2.0-2.2'		2.5	① Silty SAND, with gravel and roots, rounded to angular, loose to medium dense, brownish gray, moist, homogenous, no Hcl reaction. [SM] [FILL]
10						S-2 5.0-5.2'		8.0	② Silty GRAVEL with sand, occasional cobbles and boulders, rounded to angular, medium dense, light brownish gray to brown, moist, max. particle size = 1.3 feet, homogenous, no Hcl reaction. [GM] [FILL]	
15									Bottom of test pit at 8.0 ft below ground surface. Backfilled with native soil on 7/9/2008.	
20										
25										

NOTES

- The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
- Refer to Soil Classification and Log Key for explanation of "Symbols" and definitions.
- WSDOT designation is based on visual-manual classification.

LEGEND

- Roots
- Seepage
- Cobble or boulder
- Log

TEST PIT LOCATION

Northing 1065000.96 Subsection NE
 Easting 1754444.13 Section SE
 Latitude 47° 21' 01.460" N Range 11E
 Longitude 121° 21' 53.552" W Township 22N
 Station 1376 + 37 County Kittitas
 (April 2008)

I-90 Snoqualmie Pass East

Log of Test Pit SCB-TP-003-08

Job No. 33758632

July 2008



1501 4th Avenue, Suite 1400
Seattle, Washington, 98101-1616

Figure X.X



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2533.8 ft (772.3 m)

HOLE No. SCW-001-08

Sheet 1 of 1

Project I-90 Snoqualmie Pass East

Driller Christian Nead Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Abhijit Bathe

Start May 19, 2008 Completion May 20, 2008 Well ID# Not Applicable Equipment 5500-1(Skid-rig) w/ manual-hammer

Station 1384+11.83 Offset 47.16'L Casing HWT, HQ Method Wet Rotary

Northing 1064096.31 Easting 1754559.77 Latitude 47°20'53.218"N Longitude 121°21'49.305"W

County Kittitas Subsection NE1/4 of SE1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0							46					0 to 0.2 feet: Asphalt concrete pavement. 0.2 to 5.3 feet : Silty GRAVEL with sand and cobbles, subrounded, brown to dark gray, wet, homogenous, HCl reaction not tested. 0.2 feet: Silty GRAVEL with sand and cobbles.		
1														
5							66 100 1.08				50 for 3"	4.0 feet: loss of drilling water circulation.		
2												5.3 to 19.0 feet: Metawelded lapilli tuff, reddish brown to brown to greenish gray, medium grained, highly weathered to fresh, moderately weak (R2) to strong rock (R4), HCl reaction not tested. Discontinuities are closely to moderately spaced, and in poor to fair condition. CR= 46% - 100%, RQD= 76% - 100%, FF= 0.6 - 1.08. 5.3 feet: Discontinuities are closely spaced and in fair condition.		
3							100 0.6					6.0 feet: PLT - Moderately strong (R3) rock. 7.2 feet: Discontinuities are medium spaced and in fair condition.		
10														
4												12.4 feet: PLT - Moderately strong (R3) rock.		
15							100 1.4							
5														
6												Bottom of boring at 19 feet below ground surface (bgs). Backfilled to ground surface with bentonite chips.		
20														

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2532.5 ft (771.9 m)

HOLE No. SCW-002-08

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller Robert Grocery Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Ken Yang

Start May 6, 2008 Completion May 7, 2008 Well ID# Not Applicable Equipment 5500-1(Skid-rig) w/ manual-hammer

Station 1386+80.75 Offset 30.13'L Casing HW, HQ Method Wet Rotary

Northing 1063827.05 Easting 1754515.07 Latitude 47°20'50.556"N Longitude 121°21'49.911"W

County Kittitas Subsection NE1/4 of SE1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 0.5 feet: Asphalt concrete pavement 0.5 to 21.2 feet : Poorly to well graded GRAVEL with sand, occasional silty SAND with gravel, occasional cobbles and boulders, subrounded to angular, loose to very dense, brown to greenish gray, moist, homogenous, no HCl reaction. 0.5 feet: Loose, silty SAND with gravel.			
1														
5														
2														
3														
10														
4														
15														
5														
6														
20														

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7									C-7					
25									C-8					
8														
9									C-9					
30														
10														
35									C-10					
11														
40														
12														
45														

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10

21.2 to 38.7 feet : Metawelded lapilli tuff, reddish brown to brown to light greenish gray, fine to medium grained, highly weathered to fresh, moderately weak (R2) to strong rock (R4), no HCl reaction. Discontinuities are very closely to moderately spaced, and in poor to fair condition.
 CR= 80% - 100%, RQD= 20% - 100%, FF= 0.4 - 2.4
 21.2 feet: highly weathered, moderately weak (R2) rock. Discontinuities are very closely to closely spaced, and in poor condition.
 22.15 feet: PLT - Moderately strong (R3) rock.
 23.7 feet: grades to slightly weathered, moderately strong (R3) rock. Discontinuities are moderately spaced, and in poor to fair condition.
 24.1 feet: grades to fresh, strong (R4) rock.
 24.75 feet: Strong (R4) rock.
 25.25 feet: PLT - Strong (R4) rock.
 26.5 feet: grades to slightly weathered, moderately strong (R3) rock.
 26.9 feet: PLT - Strong (R4) rock.
 28.7 feet: Discontinuities are closely to moderately spaced, and in fair condition.

31.7 feet: grades to fresh, strong (R4) rock.

33.05 feet: PLT - Moderately strong (R3) rock.
 33.4 feet: PLT - Strong (R4) rock.

34.1 feet: grades to brown, slightly weathered, moderately strong (R3) rock.
 34.6 feet: grades to fresh, strong (R4) rock.

36.1 feet: grades to brown, slightly weathered, moderately strong (R3) rock.

Bottom of boring at 38.7 feet below ground surface (bgs). Backfilled to ground surface with bentonite chips.



Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2532.1 ft (771.8 m)

HOLE No. SCW-002A-08

Sheet 1 of 1

Project I-90 Snoqualmie Pass East

Driller Christian Nead Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Abhijit Bathe

Start May 28, 2008 Completion May 28, 2008 Well ID# Not Applicable Equipment 5500-1(Skid-rig) w/ manual-hammer

Station 1386+81.14 Offset 51.03'L Casing _____ Method Wet Rotary

Northing 1063823.57 Easting 1754535.68 Latitude 47°20'50.524"N Longitude 121°21'49.611"W

County Kittitas Subsection NE1/4 of SE1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0							80		C-1 GP		0 to 0.75 feet: concrete pavement.			
0.75							100		D-2 GM C-3 GP(C)	50 for 5" (>50)	0.75 to 5.7 feet: Poorly graded to well graded GRAVEL with sand to silty GRAVEL with sand, occasional cobbles, angular, brownish yellow to gray, wet, homogenous, no HCl reaction.			
5.7							100		C-4A GW C-4B		0.75 feet: Poorly graded GRAVEL with sand. grades to very dense, silty GRAVEL with sand (probably highly weathered rock). grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 9 inches.			
5.7							100/2.6		C-5		grades to well graded GRAVEL with sand.			
5.7							100/1.8				5.7 to 13.8 feet: Metawelded lapilli tuff, reddish brown to dark greenish gray, medium grained, slightly weathered, moderately weak (R2) to moderately strong rock (R3), none to strong HCl reaction. Discontinuities are closely spaced, and in poor to fair condition. CR= 100%, RQD= 50% - 65%, FF= 1.8 - 2.6. 5.7 feet: light brown, slightly weathered, moderately weak rock (R2), no HCl reaction.			
11.9											grades to dark greenish gray, moderately strong rock (R3), weak HCl reaction.			
13.8											11.9 feet: PLT - Strong (R4) rock.			
13.8											Bottom of boring at 13.8 feet below ground surface (bgs). Backfilled to ground surface with bentonite chips.			

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2531.7 ft (771.6 m)

HOLE No. SCW-003-08

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller Robert Grocery Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Ken Yang

Start May 7, 2008 Completion May 8, 2008 Well ID# Not Applicable Equipment 5500-1(Skid-rig) w/ manual-hammer

Station 1389+22.20 Offset 29.29'L Casing HW, HQ Method Wet Rotary

Northing 1063588.48 Easting 1754473.71 Latitude 47°20'48.197"N Longitude 121°21'50.474"W

County Kittitas Subsection SE1/4 of SE1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										0 to 0.5 feet: Asphalt concrete pavement. 0.5 to 24.9 feet : Poorly graded GRAVEL with sand, occasionally silty GRAVEL and silty SAND, occasional cobbles, subrounded to angular, medium dense to very dense, brown to greenish gray, moist, homogenous, no HCl reaction. 6 feet: Poorly graded GRAVEL with sand.			
1													
5													
2						37		C-1 GP					
3						33		D-2 GP	1 5 15 (20)	8.7 feet: traces of silt were observed.			
10						57		C-3 GP(C)		grades to poorly graded GRAVEL with sand and cobbles. Maximum size of the cobbles encountered is 4.5 inches.			
4						100		D-4 SM	50 for 5"	grades to very dense, silty SAND with gravel.			
15						100		C-5 GP(C)		14.2 feet: grades to poorly graded GRAVEL with sand and cobbles. Maximum size of the cobbles encountered is 11 inches.			
5						100		C-6 GP(C)		15.7 feet: Maximum size of the cobbles encountered is 11.5 inches.			
6						86		D-7 GM	14 35 50 for 5"	grades to very dense, silty GRAVEL with sand.			
20													

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2531.5 ft (771.6 m)

HOLE No. SCW-004-08

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller Robert Grocery Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Ken Yang

Start May 9, 2008 Completion May 9, 2008 Well ID# Not Applicable

Equipment 5500-1(Skid-rig) w/ manual-hammer

Station 1392+17.67 Offset 28.62'L Casing HW, HQ

Method Wet Rotary

Northing 1063297.45 Easting 1754422.67 Latitude 47°20'45.320"N

Longitude 121°21'51.168"W

County Kittitas Subsection SE1/4 of SE1/4

Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0	0									0 to 0.6 feet: Asphalt concrete pavement.			
0.6	0.6									0.6 to 9.5 feet: Well graded gravel with sand to silty GRAVEL, occasional silty SAND with gravel, subangular to angular, medium dense to very dense, brown, moist, homogenous, no HCl reaction.			
5.0	5.0									5.0 feet: Loose, silty SAND with gravel..			
1	1												
2	2					50		D-1 GM	5				
2	2					100		C-2 GW(C)	5		grades to well graded GRAVEL with sand, occasional cobbles. Maximum size of the cobbles encountered is 4.5 inches.		
2	2					100		D-3 GM	5		grades to very dense, silty GRAVEL with sand.		
3	3					100/3.3		C-4	8	50 for 4"			
3	3					90/0.3		C-5			9.5 to 28.7 feet: Metawelded lapilli tuff, brown to bluish gray, fine to medium grained, highly to slightly weathered, moderately weak (R2) to moderately strong (R3) rock, no HCl reaction. Discontinuities are closely to moderately spaced, and in poor to fair condition. CR=90% - 100%, RQD=33% - 100%, FF=0.3 - 3.3.		
3	3					90/0.3		C-5			9.5 feet: highly weathered, moderately weak (R2) rock. Discontinuities are closely spaced and in fair condition.		
3	3					90/0.3		C-6			10.7 feet: grades to slightly weathered, moderately strong (R3) rock. Discontinuities are closely to moderately spaced and in fair condition.		
3	3					90/0.3		C-6					
3	3					100/1.2		C-6			17.8 feet: grades to fresh, strong (R4) rock. Discontinuities are in poor to fair condition.		
3	3					100/1.2		C-7					
3	3					100/1.4		C-7			19.0 feet: PLT - Moderately strong (R3) rock.		
3	3					100/1.4		C-7			19.5 feet: grades to slightly weathered, moderately		

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7							100 0.6	C-8			strong (R3) rock. Discontinuities are closely to moderately spaced, and in poor to fair condition. 19.55 feet: PLT - Very weak (R1) rock. 21.3 feet: PLT - Moderately weak (R2) rock.			
25											23.7 feet: grades to slightly weathered, moderately strong (R3) rock. 23.95 feet: PLT - Moderately strong (R3) rock.			
8														
9											Bottom of boring at 28.7 feet below ground surface (bgs). Backfilled with asphalt concrete patching material from 0 to 0.5 ft bgs, with silty SAND with gravel from 0.5 to 6 ft bgs, and with bentonite chips from 6.0 to 28.7 ft bgs.			
30														
10														
35														
11														
40														
12														
45														
13														



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2531.0 ft (771.4 m)

HOLE No. SCW-004A-08

Sheet 1 of 1

Project I-90 Snoqualmie Pass East

Driller Christian Nead Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Abhijit Bathe

Start May 28, 2008 Completion May 28, 2008 Well ID# Not Applicable Equipment 5500-1(Skid-rig) w/ manual-hammer

Station 1392+18.54 Offset 50.9'L Casing _____ Method Wet Rotary

Northing 1063292.8 Easting 1754444.47 Latitude 47°20'45.276"N Longitude 121°21'50.851"W

County Kittitas Subsection SE1/4 of SE1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
									C-1 GM(C)		0 to 0.7 feet: Concrete Pavement. 0.7 feet to 5.3 feet: Silty GRAVEL with sand, occasional cobbles, subrounded to subangular, very dense, brownish yellow to gray, wet, homogenous, no HCl reaction. 0.7 feet: Silty GRAVEL with sand and cobbles.			
1									C-2 GM(C)					
5									D-3 C-4	50 for 4" (>50)	grades to silty GRAVEL with sand (probably highly-weathered rock).			
2											5.3 to 16.0 feet : Metawelded lapilli tuff, fine to medium grained, light gray to reddish brown, medium to coarse grained, fresh to moderately weathered, moderately strong rock (R3), none to weak HCl reaction. Discontinuities are closely to medium spaced, and in poor to fair condition. (CR= 80% - 100%, RQD= 78% - 100%, FF= 0 - 1.6)			
3									C-5		5.3 feet: Light gray, moderately weathered rock. No HCl reaction. 5.7 feet: grades to slightly weathered to fresh. 8.0 feet: PLT - Strong (R4) rock.			
10														
4														
15									C-6		grades to fresh rock, weak HCl reaction. grades to slightly weathered rock.			
5														
Bottom											Bottom of boring at 16.0 feet below ground surface (bgs). Backfilled with asphalt from 0 to 0.8 ft bgs, with silty sand with gravel from 0.8 to 3.5 ft bgs and with bentonite chips from 3.5 to 16.0 ft bgs.			
20														

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2531.4 ft (771.6 m)

HOLE No. SCW-005-08

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller Christian Nead Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Abhijit Bathe

Start May 6, 2008 Completion May 7, 2008 Well ID# Not Applicable Equipment 5500-1(Skid-rig) w/ manual-hammer

Station 1395+08.88 Offset 28.01'L Casing HW, HQ Method Wet Rotary

Northing 1063011.59 Easting 1754374 Latitude 47°20'42.494"N Longitude 121°21'51.829"W

County Kittitas Subsection SE1/4 of SE1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0	0										0 to 0.3 feet: Asphalt concrete pavement. 0.3 to 13 feet : Poorly graded GRAVEL with sand, occasional cobbles, subrounded to angular, brown to greenish gray, moist to wet, homogenous, no HCl reaction. 0.3 feet: Poorly graded GRAVEL with sand.			
1	0.3					54			C-1 GP					
5	1.5					42			C-2 GP(C)		grades to poorly graded GRAVEL with cobbles (metawelded lapilli tuff).			
10	3.0					40			C-3A GP(C)		Loss of drilling water circulation.			
15	4.5					40/5			C-3B		13.0 to 39.0 feet: Metawelded lapilli tuff, brown to greenish gray, fine to medium grained, highly weathered to fresh, very weak (R1) to strong (R4) rock, none to weak HCl reaction. Discontinuities are very closely to moderately spaced, and in poor to fair condition. CR=40% - 100%, RQD=0 - 54%, FF= 1.2 to 5.			
20	6.0					40/1.4			C-4		13.0 feet : greenish gray, highly weathered, very weak (R1) rock, no HCl reaction. Discontinuities are closely spaced and in fair condition. 14.0 feet: grades to fine grained, fresh, strong (R4) rock.			
20	6.0					100/2			C-5		17.65 feet: PLT - Very strong (R5) rock.			

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7											grades to fresh to highly weathered, weak (R1) to strong (R4) rock. Discontinuities are very closely to closely spaced, and in very poor condition.			
25							100 1.8		C-6		grades to brown to greenish gray, fine to medium grained, moderately weathered, moderately weak rock (R2), weak HCl reaction. Discontinuities are very closely to closely spaced, and in poor condition (fractures incline at about 30 degrees to vertical axis).			
30							100 1.6		C-7		28.7 feet: PLT - Very strong (R5) rock. grades to slightly weathered rock. Discontinuities are closely spaced, and in fair condition.			
35							100 1.2		C-8		33.8 feet: PLT - Very strong (R5) rock. grades to slightly weathered to fresh rock.			
40											38.7 feet: PLT - Very strong (R5) rock. Bottom of boring at 39.0 feet below ground surface (bgs). Backfilled to ground surface with bentonite chips.			
45														

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2532.6 ft (771.9 m)

HOLE No. SCW-006-08

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller Christian Nead Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Abhijit Bathe

Start May 7, 2008 Completion May 8, 2008 Well ID# Not Applicable Equipment 5500-1(Skid-rig) w/ manual-hammer

Station 1397+57.82 Offset 27.93'L Casing HW, HQ Method Wet Rotary

Northing 1062767.76 Easting 1754362.66 Latitude 47°20'40.086"N Longitude 121°21'51.955"W

County Kittitas Subsection SE1/4 of SE1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0 to 0.3											Asphalt concrete pavement.			
0.3 to 16.0											Poorly graded GRAVEL with sand, subangular, very loose to medium dense, brown to gray, wet, homogenous, HCl reaction not tested.			
5.0						6		D-1 GP	6 4 7 (11)		5.0 feet: medium dense. Loss of drilling water circulation at 5.5 feet.			
10.0						6		D-2 GP	3 2 1 (3)		grades to very loose.			
15.0						50		D-3 GP	5 3 5 (8)		grades to loose.			
16.0 to 19.0											Poorly graded GRAVEL with sand, locally slightly silty, subangular, very dense, brown to gray, wet, homogenous, HCl reaction not tested.			
19.0 to 23.5						50		D-4	32 50 for 3" (>50)		Meta welded lapilli tuff, brown to gray, fine to medium grained, slightly to moderately weathered,			

DRAFT ROCKN BORINGS I-90-2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7														
25														
8														
30														
10														
35														
11														
40														
13														
45														

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10

moderately weak (R2) to strong (R4) rock, HCl reaction not tested. Discontinuities are closely spaced, and in fair to good condition.
(CR - 61 to 100%, RQD - 38 - 100%, FF - 0.7 - 1.8)
19 feet: moderately weathered, moderately weak (R2) rock. Discontinuities are in fair condition.

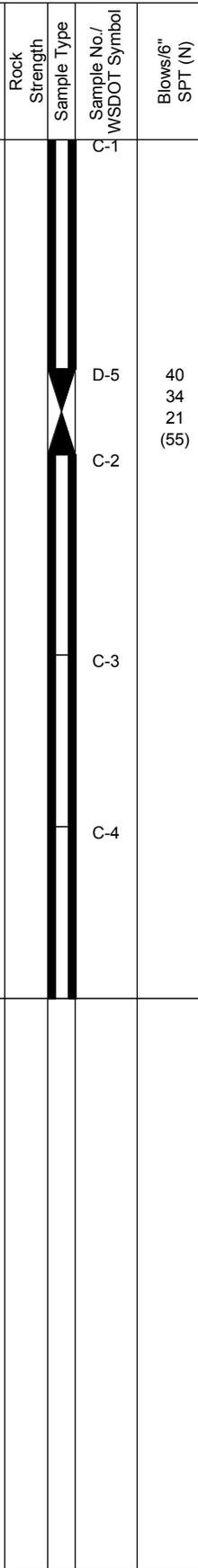
23.3 feet: PLT - Extremely weak (R0) rock.
23.5 feet: grades to highly weathered rock.

grades to slightly weathered to fresh, moderately strong (R3) rock.

28.75 feet: PLT - Moderately strong (R3) rock.
grades to moderately strong (R3) rock. Discontinuities are closely spaced and in good condition.

grades to slightly weathered to fresh rock, moderately strong (R3) rock.

34.75 feet: PLT - Moderately strong (R3) rock.
Bottom of boring at 35.0 feet below ground surface (bgs). Backfilled to ground surface with bentonite chips.





LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2530.4 ft (771.3 m)

HOLE No. SCW-006A-08

Sheet 1 of 1

Project I-90 Snoqualmie Pass East

Driller Christian Nead Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Abhijit Bathe

Start May 27, 2008 Completion May 28, 2008 Well ID# Not Applicable Equipment 5500-1(Skid-rig) w/ manual-hammer

Station 1397+58.47 Offset 50.79'L Casing HW, HQ Method Wet Rotary

Northing 1062767.95 Easting 1754385.52 Latitude 47°20'40.091"N Longitude 121°21'51.623"W

County Kittitas Subsection SE1/4 of SE1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0						80			C-1 GP		0 to 0.7 feet: Concrete pavement			
1						60			D-2 GM	35 25 10 (35)	0.7 to 4.5 feet: Poorly graded GRAVEL or silty GRAVEL with sand, occasional cobbles, subangular, dense to very dense, dark brown to reddish yellow to dark gray, wet, homogenous, no HCl reaction. 0.7 feet: poorly graded GRAVEL 2.5 feet: grades to dense, silty GRAVEL.			
5						100			C-3A GM(C) C-3B		grades to silty GRAVEL with cobbles.			
2						100 2.0 100			D-4	16 34 50 for 5" (>50)	4.5 to 16.6 feet : Metawelded lapilli tuff, reddish brown to greenish gray, medium grained, highly to moderately weathered, moderately weak (R2) to moderately strong (R3) rock, no HCl reaction. Discontinuities are closely spaced, and in poor to fair condition. 4.5 feet: moderately to highly weathered, moderately weak (R2) to moderately strong (R3) rock. Discontinuities are in poor to fair condition. 7.65 feet: PLT - Weak (R1) rock.			
3						96 1.2			C-5					
4						100 2.3			C-6		8.6 feet: grades to moderately weathered, moderately strong (R3) rock. Discontinuities are in fair condition.			
15									C-7		12.25 feet: PLT - Moderately weak (R2) rock. grades to moderately to highly weathered rock.			
5											16.15 feet: PLT - Strong (R4) rock.			
6											Bottom of boring at 16.6 feet below ground surface (bgs). Backfilled to ground surface with bentonite chips.			

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2533.6 ft (772.2 m)

HOLE No. SCW-007-08

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller Christian Nead Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Abhijit Bathe

Start May 8, 2008 Completion May 9, 2008 Well ID# Not Applicable Equipment 5500-1(Skid-rig) w/ manual-hammer

Station 1399+30.40 Offset 27.87'L Casing HW, HQ Method Wet Rotary

Northing 1062599.16 Easting 1754378.22 Latitude 47°20'38.424"N Longitude 121°21'51.702"W

County Kittitas Subsection SE1/4 of SE1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 0.3 feet: Asphalt concrete pavement.			
0.3											0.3 to 5.2 feet: Poorly graded GRAVEL with sand, subrounded to subangular, medium dense to very dense, brown to gray, moist to wet, homogenous, no HCl reaction.			
5						71			D-1 GP	18	loss of drilling water circulation.			
5.2						87 1.3			C-1	50 for 2" (>50)	5.2 to 23.2 feet: Metawelded lapilli tuff, brown to greenish gray, fine to medium grained, fresh, strong (R4) rock, weak HCl reaction. Discontinuities are closely spaced, and in fair condition. CR=87% - 100%, RQD=53% - 100%, FF=0.5 - 1.3.			
7.95						100 0.7			C-2		7.95 feet: PLT - Very strong (R5) rock.			
10						93 0.7			C-3					
15						100 0.5			C-4					
18.3						100 1.3			C-5					
20						100 0.5			C-6		18.3 feet: PLT - Strong (R4) rock.			

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2533.6 ft (772.2 m)

HOLE No. SCW-007-08

Sheet 2 of 2

Project I-90 Snoqualmie Pass East

Driller Christian Nead Lic# N/A

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7														
25											Bottom of boring at 23.2 feet below existing ground surface. Backfilled to ground surface with bentonite chips.			
8														
9														
30														
10														
35														
11														
40														
12														
45														
13														



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2534.6 ft (772.5 m)

HOLE No. SCW-008-08

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller Christian Nead Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Abhijit Bathe

Start May 9, 2008 Completion May 12, 2008 Well ID# Not Applicable Equipment 5500-1(Skid-rig) w/ manual-hammer

Station 1401+17.92 (Nov. 2007) Offset 28.43'L Casing HW, HQ Method Wet Rotary

Northing 1062419.41 Easting 1754417.24 Latitude 47°20'36.655"N Longitude 121°21'51.107"W

County Kittitas Subsection SE1/4 of SE1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 0.3 feet: Asphalt concrete pavement 0.3 to 7.9 feet: Well graded GRAVEL with sand to silty GRAVEL, subrounded to subangular, very dense, brown to gray, moist to wet, homogenous, HCl not tested.			
5						44		D-1 GM		6 20 39 (59)	5 feet: Very dense, silty GRAVEL with sand.			
2						87		C-2A GW			grades to well graded GRAVEL with sand.			
3						100 3.6		C-2B			7.9 to 24.0 feet: Metawelded lapilli tuff, gray, fine to medium grained, fresh to slightly weathered, strong (R4) rock, no HCl reaction. Discontinuities are closely spaced, and in fair condition. CR=31 to 100%, RQD=40 to 100%, FF=1.2 to 3.6.			
10						100 2		C-3			7.9 feet: fresh to slightly weathered rock. 8.75 feet: PLT - Moderately strong (R3) rock.			
4						100 1.8		C-4			9.0 feet: grades to fresh rock.			
15						100 1.8		C-5			15.4 feet: PLT - Moderately strong (R3) rock.			
5						100 1.8		C-6						
6						100 1.8		C-7						
20						100 1.8		C-8			Note: Drilling bit was broken and changed. grades to fresh to slightly weathered rock.			

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

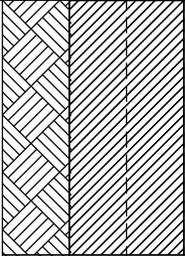
Elevation 2534.6 ft (772.5 m)

HOLE No. SCW-008-08

Sheet 2 of 2

Project I-90 Snoqualmie Pass East

Driller Christian Nead Lic# N/A

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7							1.2					Fractures inclined at about 10 to 15 degrees to the vertical axis were observed between 22 and 23 feet depth.		
25												Bottom of boring at 24.0 feet below ground surface (bgs). Backfilled with asphalt concrete patching material from 0 to 0.7 ft bgs, with silty sand with gravel from 0.7 to 3.7 ft bgs, and with bentonite chips from 3.7 to 24.0 ft bgs.		
8														
9														
30														
10														
35														
11														
12														
40														
13														
45														



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2532.3 ft (771.8 m)

HOLE No. SCW-008A-08

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller Christian Nead Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Abhijit Bathe

Start May 27, 2008 Completion May 27, 2008 Well ID# Not Applicable

Equipment 5500-1(Skid-rig) w/ manual-hammer

Station 1401+17.10 (Nov. 2007) Offset 51.72'L Casing HW, HQ

Method Wet Rotary

Northing 1062426.44 Easting 1754439.46 Latitude 47°20'36.727"N

Longitude 121°21'50.786"W

County Kittitas Subsection SE1/4 of SE1/4

Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0	0										0 to 0.6 feet: Concrete pavement.			
1	1					33			D-1 SM	3 14 28 (42)	0.6 to 6.8 feet: Poorly graded GRAVEL with sand, occasionally poorly graded SAND or silty SAND with gravel, occasional cobbles, subangular to angular, medium dense to dense, reddish brown to dark gray, wet, homogenous, no HCl reaction. 2.5 feet: Dense, silty SAND with gravel.			
5	5					100			C-2 GP(C)		grades to poorly graded GRAVEL with sand and cobbles.			
2	2					47			D-3 SP	11 10 7 (17)	grades to medium dense, poorly graded SAND with gravel.			
10	10					100 100 3.0			C-4A C-4B		grades to poorly graded GRAVEL with sand.			
3	3					100 2.0			C-5		6.8 to 18.8 feet: Metawelded lapilli tuff, greenish gray, fine to medium grained, slightly to moderately weathered, moderately weak (R2) to moderately strong (R3) rock, none or weak HCl reaction. Discontinuities are very closely to closely spaced, and in very poor to fair condition. (CR= 100%, RQD= 25% - 68%, FF= 1.2 - 3.0) 6.8 feet: Dark greenish gray, moderately weathered, moderately weak (R2) rock, no HCl reaction. Discontinuities are very closely spaced and in very poor condition. 8.8 feet: grades to moderately strong (R3) rock, weak HCl reaction. Discontinuities are closely spaced and in fair condition.			
4	4					100 1.2			C-6		13.2 feet: PLT - Strong (R4) rock. grades to slightly weathered rock.			
15	15													
5	5													
6	6										18.65 feet: PLT - Very strong (R5) rock. Bottom of boring at 18.8 feet below ground surface (bgs). Backfilled with asphalt patching material from 0 to			
20	20													

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2532.3 ft (771.8 m)

HOLE No. SCW-008A-08

Sheet 2 of 2

Project I-90 Snoqualmie Pass East

Driller Christian Nead Lic# N/A

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7											0.8 feet depth bgs, with silty sand with gravel from 0.8 to 4.0 feet depth bgs and with bentonite chips from 4.0 feet depth bgs to bottom of boring.			
25														
8														
9														
30														
10														
35														
11														
12														
40														
13														
45														



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2535.6 ft (772.8 m)

HOLE No. SCW-009-08

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Christian Nead Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Abhijit Bathe

Start May 12, 2008 Completion May 13, 2008 Well ID# Not Applicable Equipment 5500-1(Skid-rig) w/ manual-hammer

Station 1403+14.05 (Nov. 2007) Offset 28.44'L Casing HW, HQ Method Wet Rotary

Northing 1062237.89 Easting 1754480.83 Latitude 47°20'34.870"N Longitude 121°21'50.155"W

County Kittitas Subsection NE1/4 of NE1/4 Section 2 Range 11E Township 21N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0	0								C-1 GP		0 to 0.2 feet: Asphalt concrete pavement. 0.2 to 17.5 feet : Poorly graded GRAVEL with sand, occasional cobbles and boulders, subrounded to subangular, medium dense to dense, brown to greenish gray, moist to wet, homogenous, no HCl reaction. 0.2 feet: Poorly graded GRAVEL with sand.			
1	0.3					22								
5	1.5													
2	0.6					40			D-2 GP	14 9 8 (17)				
3	0.9					87			C-3 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 2.4 inches.			
10	3.0					47			D-4 GM	9 23 10 (33)	grades to silty GRAVEL with sand.			
15	4.5					77			C-5 GP(C)		grades to poorly graded GRAVEL with cobbles.			
20	6.0					76			C-6 GP(C/B)GC		grades to poorly graded GRAVEL with cobbles and boulders.			
											17.5 to 18.5 feet: CLAY with sand and gravel, soft, brown, wet, homogeneous, no HCl reaction.			
						100			C-7 GP(C/B)		18.5 to 26.5 feet: Poorly graded GRAVEL with cobbles and boulders. subangular, gray to brown, homogenous, HCl not tested.			

DRAFT ROCKN BORINGS I-90-2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2535.6 ft (772.8 m)

HOLE No. SCW-009-08

Sheet 3 of 3

Project I-90 Snoqualmie Pass East

Driller Christian Nead Lic# N/A

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14											bgs, with silty sand with gravel from 0.7 to 3.7 ft bgs and with bentonite chips from 3.7 to 44 ft bgs.			
15														
50														
16														
55														
17														
18														
60														
19														
65														
20														
21														
70														



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2533.7 ft (772.3 m)

HOLE No. SCW-010-08

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller Christian Nead Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Abhijit Bathe

Start May 14, 2008 Completion May 14, 2008 Well ID# Not Applicable

Equipment 5500-1(Skid-rig) w/ manual-hammer

Station 1411+01.51 Offset 57.62'L Casing HW, HQ

Method Wet Rotary

Northing 1061657.54 Easting 1754967.17 Latitude 47°20'29.196"N

Longitude 121°21'43.003"W

County Kittitas Subsection NE1/4 of NE1/4

Section 2 Range 11E Township 21N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
							<u>24</u>							
0 to 0.2									C-1A GP		Asphalt concrete pavement.			
0.2 to 4.3											Poorly to well graded GRAVEL with sand, occasional cobbles, subrounded to subangular, brown to gray, moist, homogenous. No HCl reaction.			
0.2											Poorly graded GRAVEL with sand.			
grades to 5											grades to well graded GRAVEL with sand and cobbles. Maximum size of the cobbles encountered is 6.5 inches.			
5 to 4.3							<u>64</u> <u>2.5</u>		C-1B		Basalt to metawelded lapilli tuff to metawelded ash tuff, brown to gray, fine to medium grained, fresh to moderately weathered, moderately strong (R3) to strong (R4) rock, HCl reaction not tested. Discontinuities are very closely to closely spaced, and in poor to good condition.			
4.3 to 6.73							<u>85</u> <u>1.5</u>		C-2		(CR=64% - 100%, RQD=20% - 100%, FF=0 - 3.0)			
6.73 to 7.5							<u>100</u> <u>1.8</u>		C-3		Basalt, gray, fresh, moderately strong (R3) rock. Discontinuities are closely spaced and in fair condition.			
7.5 to 11.9							<u>100</u> <u>3</u>		C-4		PLT - Moderately strong (R3) rock. grades to slightly weathered rock.			
11.9 to 14.8							<u>100</u> <u>1.6</u>		C-5		grades to metawelded ash tuff, moderately weathered, moderately weak (R2) rock. Discontinuities are very closely spaced, and in good to poor condition.			
14.8 to 15											11.9 feet: grades to metawelded lapilli tuff, very weak (R1) rock. Discontinuities are very closely spaced and in fair condition.			
15 to 14.8											grades to basalt, gray, highly to slightly weathered, moderately strong (R3) rock. Discontinuities are closely spaced, and in fair condition.			
14.8 to 15											14.8 feet: grades to metawelded lapilli tuff, gray, slightly weathered to fresh.			
15 to 20											grades to fresh rock.			
20							<u>100</u> <u>0.8</u>		C-6					

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7											23.3 feet: PLT - Strong (R4) rock.			
25														
8									C-7					
9											Bottom of boring at 28.7 feet below ground surface (bgs). Backfilled with asphalt concrete patching material from 0 to 0.7 ft bgs, with silty SAND with gravel from 0.7 to 3.7 ft bgs, and with bentonite chips from 3.7 to 28.7 ft bgs.			
30														
10														
35														
11														
12														
40														
13														
45														



Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2530.9 ft (771.4 m)

HOLE No. SCW-011-08

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller Robert Grocery Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Ken Yang

Start May 14, 2008 Completion May 14, 2008 Well ID# Not Applicable Equipment 5500-1(Skid-rig) w/ manual-hammer

Station 1414+79.87 Offset 55.73'L Casing HW, HQ Method Wet Rotary

Northing 1061473.08 Easting 1755280.19 Latitude 47°20'27.410"N Longitude 121°21'38.429"W

County Kittitas Subsection NE1/4 of NE1/4 Section 2 Range 11E Township 21N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
							12		C-1 GM(C)		0 to 0.2 feet: Asphalt concrete pavement			
							50		C-2 GM(C)		0.2 to 4 feet: Silty GRAVEL with sand, occasional cobbles, subangular to angular, medium dense to very dense, brown to gray, moist to wet, homogenous, no HCl reaction.			
1							20		D-3	50 for 4"				
5							91		C-4 SM(C)		4 to 6.2 feet: Poorly graded silty SAND with gravel and cobbles with trace of organic soil or decayed wood, occasional cobbles, subangular to angular, gray to dark gray, moist to wet, homogenous to locally stratified, no HCl reaction.			
2							100		C-5		6.2 to 18.7 feet: Metawelded lapilli tuff, bluish gray to gray, fine to medium grained, fresh, strong rock, no HCl reaction. Discontinuities are closely to medium spaced, and in fair condition.			
							82		C-6		6.2 feet: Discontinuities are closely spaced and in fair condition.			
10							1.4				9.7 feet: PLT - Very strong (R5) rock.			
							100		C-7		Discontinuities are closely to medium spaced.			
4							1.4							
							100		C-8		Discontinuities are closely spaced.			
							1.6							
15							0.9		C-9					
											17.8 feet: PLT - Strong (R4) rock.			
											Bottom of boring at 18.7 ft below ground surface (bgs). Backfilled with asphalt from 0 to 0.5 ft bgs, with silty sand with gravel from 0.5 to 5 ft bgs and with bentonite			
20														

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2530.9 ft (771.4 m)

HOLE No. SCW-011-08

Sheet 2 of 2

Project I-90 Snoqualmie Pass East

Driller Robert Grocery Lic# N/A

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7											chips from 5 to 18 ft bgs.			
25														
8														
9														
30														
10														
35														
11														
40														
12														
13														
45														



Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2527.2 ft (770.3 m)

HOLE No. SCW-012-08

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller Robert Grocery Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Ken Yang

Start May 14, 2008 Completion May 14, 2008 Well ID# Not Applicable Equipment 5500-1(Skid-rig) w/ manual-hammer

Station 1418+12.96 Offset 56.48'L Casing HW, HQ Method Wet Rotary

Northing 1061381.18 Easting 1755586.88 Latitude 47°20'26.536"N Longitude 121°21'33.962"W

County Kittitas Subsection NW1/4 of NW1/4 Section 1 Range 11E Township 21N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 0.3 feet: Asphalt concrete pavement			
0.3										14 50 for 4"	0.3 to 3.3 feet : Silty GRAVEL with sand, subrounded to angular, medium dense to very dense, brown to gray, moist, homogenous, no HCl reaction.			
3.3									D-1 GM		3.3 to 18.7 feet: Meta welded lapilli tuff, brown to reddish brown to gray, fine to medium grained, moderately weathered to fresh, moderately weak (R2) to strong (R4) rock. Discontinuities are generally closely to widely spaced, and in poor to fair condition. No HCl reaction.	▽		
4.5									C-2		CR=98% - 100%, RQD=45% - 98%, FF=0.2 to 2.1. 4.5 feet : fresh, moderately strong (R2) rock. Discontinuities are closely spaced, and in poor to fair condition.			
5.7									C-3		5.7 feet : grades to moderately to slightly weathered, moderately weak (R2) to moderately strong (R3) rock.			
10									C-4		grades to moderately strong (R3) rock.			
15									C-3		grades to gray, fresh, strong (R4) rock. Discontinuities are closely to widely spaced, and in fair condition.			
18.7									C-4		Discontinuities are widely spaced and in fair condition.			
Bottom											Bottom of boring at 18.7 ft below ground surface (bgs). Backfilled with asphalt from 0 to 0.4 ft bgs, with silty sand with gravel from 0.4 to 5.0 ft bgs, and with			

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2527.2 ft (770.3 m)

HOLE No. SCW-012-08

Sheet 2 of 2

Project I-90 Snoqualmie Pass East

Driller Robert Grocery Lic# N/A

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7											bentonite chips from 5.0 to 18.7 ft bgs.			
25														
8														
9														
30														
10														
35														
11														
12														
40														
13														
45														



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2525.6 ft (769.8 m)

HOLE No. SCW-013-08

Sheet 1 of 4

Project I-90 Snoqualmie Pass East

Driller Robert Grocery Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Ken Yang

Start May 9, 2008 Completion May 13, 2008 Well ID# Not Applicable Equipment 5500-1(Skid-rig) w/ manual-hammer

Station 1422+85.31 Offset 43.3'L Casing HW, HQ Method Wet Rotary

Northing 1061326.75 Easting 1756049.65 Latitude 47°20'26.048"N Longitude 121°21'27.235"W

County Kittitas Subsection NW1/4 of NW1/4 Section 1 Range 11E Township 21N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 0.3 feet: Asphalt Concrete Pavement. 0.3 to 15.2 feet: Silty GRAVEL with sand, occasional cobbles, subangular to angular, loose to very dense, grayish brown to brown, moist to wet, homogenous, no HCl reaction. 6 feet: Very dense, silty GRAVEL with sand.			
1														
5														
2							50		D-1 GM	15 15 44 (64)				
10							100		C-2 GM(C)		grades to silty GRAVEL with cobbles.			
3									D-3 GM	5 8 16 (24)	grades to medium dense, silty GRAVEL.			
15							100		C-4 GM(C)		grades to silty GRAVEL with cobbles.	▽		
4							60		C-5 GM(C)					
15							67		D-6 GM	7 5 9 (14)	grades to silty GRAVEL with sand.			
5							43		C-7 GM		15.2 to 53.0 feet: Silty GRAVEL with sand or poorly graded GRAVEL, occasional cobbles and boulders, subangular to angular, loose to very dense, grayish brown to gray, moist to wet, homogenous, no HCl reaction. 15.2 feet: Silty GRAVEL with sand.			
6							50		D-8 GM	17 17 18	grades to dense.			
20														

DRAFT ROCKN BORINGS I-90-2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
									(35)				
7								C-9 GM					
25								D-10 GP	5 5 6 (11)	grades to medium dense, poorly graded GRAVEL.			
8								C-11 GP(B)		grades to poorly graded GRAVEL with boulders. Maximum size of the boulders encountered is 12 inches.			
30								C-12 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 4.5 inches.			
10								C-13 GP(C)		Maximum size of the cobbles encountered is 4 inches.			
35								D-14 GP	33 3 2 (5)	grades to loose, poorly graded GRAVEL with sand.			
11								C-15 GP					
								C-16 GP(B)		grades to poorly graded GRAVEL with boulders. Maximum size of the boulders encountered is 12 inches.			
40								D-17 GP(B)	50 for 1"	grades to poorly graded GRAVEL with cobbles and boulders. Maximum size of the boulders encountered is 13 inches.			
12													
45								D-19 GM	13 10 5	grades to silty GRAVEL with sand.			

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
14							100	C-20 GM	(15)				
							100	C-21 GM					
15							40	D-22 GM(C)	1	grades to silty GRAVEL with cobbles. Maximum size of the cobbles encountered is 3.25 inches.			
50							71	C-23 GM	11	grades to silty GRAVEL with sand.			
16									10				
									(21)				
55							100	D-24 SM	1	53.0 to 70.2 feet : Silty SAND, locally trace of gravel, occasional poorly graded SAND, rounded to subangular, very loose to loose, reddish brown to brown, moist to wet, homogenous, no HCl reaction.			
17							43	C-25 SM	2	53.0 feet : Very loose, silty SAND with trace of fine gravel.			
									2				
18							100	D-26 SP	1	grades to loose, poorly graded SAND.			
60						100	C-27 SM	2	grades to silty SAND.				
						88	C-28 SM	5					
19								(6)					
65						67	D-29 SM	4					
								5					
20						86	C-30 SM	5					
								(10)					
21						67	D-31 SM	3					
70								3					
								5					

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/12/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2525.6 ft (769.8 m)

HOLE No. SCW-013-08

Sheet 4 of 4

Project I-90 Snoqualmie Pass East

Driller Robert Grocery Lic# N/A

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22										(8)	Bottom of boring at 70.2 ft below ground surface (bgs). Backfilled with asphalt concrete patching material from 0 to 0.5 ft bgs, with silty SAND with gravel from 0.5 to 5.5 ft bgs, and with bentonite chips from 5.5 to 70.2 ft bgs.			
75														
23														
24														
80														
25														
85														
26														
27														
90														
28														
95														



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0							$\frac{82}{2.3}$		1		GRAVEL [GP] , fine to coarse, angular GRAVEL, some cobbles and boulders, with yellowish gray (5Y 7/2) fine to coarse sand, trace silt and organics, medium dense, medium gray (N5), moist. [Colluvium and Anthropogenic Fill]		
1											META-WELDED LAPILLI DACITE TUFF , medium dark gray to olive gray (N4 - 5Y 4/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized entrained clasts (10 to 60%), slightly welded, slightly weathered (I), moderately strong to strong (R3 - R4) rock, discontinuities are closely spaced and in good to fair condition. [Tuff member of Lake Keechelus, Ohanapechosh Formation]		
5							$\frac{100}{0.4}$		2		At 2.6 to 3.1 feet bgs - discontinuity in poor to very poor condition		
2											At 5.0 feet bgs - becomes medium dark gray to medium bluish gray to olive gray (N4 - 5B 5/1 - 5Y 4/1), fresh (I), very strong (R5) rock, with moderate yellowish brown to medium dark gray (10YR 5/4 - N4) rock enveloping discontinuities, discontinuities become moderately to closely spaced and in good to fair condition		
10							$\frac{102}{0.2}$	R5 R5	3	PLT - A PLT - D			
4													
15							$\frac{96}{1.0}$		4				
5								R4 R5		PLT - A PLT - D			
20											Becomes medium gray to olive gray (N5 - 5Y 4/1), fresh to slightly weathered (I - II), strong (R4) rock		



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								5	PLT - A PLT - D	Becomes medium gray to olive gray (N5 - 5Y 4/1), fresh to slightly weathered (I - II), strong (R4) rock, discontinuities become moderately to closely spaced and in good to fair condition			
25								6	PLT - D	At 24.9 to 25.9 feet bgs - becomes dark yellowish orange to moderate yellowish brown (10YR 6/6 - 10YR 5/4), slightly weathered (II), moderately weak to moderately strong (R2 - R3) rock At 25.2 to 25.4 feet bgs - 0.2 feet core loss At 26.9 to 27.3 feet bgs - becomes dark yellowish orange to moderate yellowish brown (10YR 6/6 - 10YR 5/4), slightly weathered (II), moderately weak (R2) rock Becomes dark yellowish orange to moderate yellowish brown (10YR 6/6 - 10YR 5/4), moderately weathered (III), very weak to moderately weak (R1 - R2) rock At 29.5 to 29.9 feet bgs - 0.4 feet core loss At 29.9 feet bgs - becomes slightly to moderately weathered (II - III), very weak to moderately weak (R1 - R2) rock, discontinuities become closely spaced and in fair to very poor condition, discontinuities in fair condition occur at a 15 to 25% frequency At 30.2 to 30.3 feet bgs - 0.1 feet core loss At 30.6 to 30.7 feet bgs - 0.1 feet core loss At 31.0 to 31.2 feet bgs - 0.2 feet core loss At 33.9 to 34.8 feet bgs - 0.9 feet core loss			
30								7					
35								8					
40								9					
45								10	PLT - D	At 39.4 to 40.5 feet bgs - 1.1 feet core loss At 40.1 feet bgs - becomes moderately weak to moderately strong (R2 - R3), discontinuities become closely spaced and in poor to very poor condition At 41.5 feet bgs - becomes slightly weathered (II) rock, discontinuities in poor to good condition, discontinuities in poor condition occur at a 10 to 15% frequency Becomes medium gray to olive gray (N5 - 5Y 4/1), fresh (I), strong (R4) rock			

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14								11					
15										Becomes medium bluish gray to dark greenish gray (5B 5/1 - 5G 4/1), fresh(I), very strong (R5) rock, discontinuities becomes moderately to closely spaced at widely to moderately spaced intervals and in fair to good condition, discontinuities in fair condition occur at a 10 to 15% frequency			
50								12	PLT - A PLT - D				
16										At 51.2 to 51.4 feet bgs - becomes slightly weathered (II), discontinuity in poor condition			
55								13		At 53.2 to 53.7 feet bgs - 0.5 feet core loss associated with redrill of slipped core			
17													
18													
60								14					
19									PLT - D PLT - A				
65								15					
20										At 66.2 to 66.7 feet bgs - discontinuity in very poor condition			
21								16					
70													

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22							R5	17	PLT - A	Becomes dark greenish gray (5G 4/1), fresh(I), very strong (R5) rock, discontinuities becomes moderately to closely spaced and in poor to good condition, discontinuities in poor condition occur at a 20 to 30% frequency, discontinuities in fair condition occur at a 20 to 30% frequency			
							R5		PLT - D				
75	23												
24													
80													
25													
85	26												
27													
90													
28													
95													

ROCK SCS BOREHOLES 2007.GPJ 3/5/08

At 77.4 to 79.2 feet bgs - becomes olive gray (5Y 4/1), slightly weathered (II), strong (R4), discontinuities are closely spaced and in very poor to poor condition

At 84.0 to 84.3 feet bgs - discontinuity in very poor condition

Discontinuities become closely to very closely spaced and in poor to good condition, discontinuities in poor condition occur at a 3 to 7% frequency, discontinuities in fair condition occur at a 40 to 45% frequency



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29							$\frac{88}{2.6}$	R5 R5	24	PLT - A PLT - D			
30													
100										<p>Borehole completed to 99.6 feet bgs on September 27, 2007. Borehole was overcased with HWT casing to 1.3 feet bgs and was flushed in preparation of optical and acoustical televiwer survey. Optical and acoustical televiwer survey completed on September 27, 2007. Borehole completed with slope inclinometer casing to 99.6 feet bgs on September 27, 2007. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at approximately 49.3 feet bgs during drilling activities and at 41.5 feet on September 27, 2007 prior to beginning optical borehole survey.</p> <p>Slope inclinometer casing = 0.0 to 99.6 feet bgs: RocTest casing type A+ Azimuth = 288 degrees Grout mix from 0.0 to 99.6 feet bgs: 1 94 lb bag Type I-II Portland Cement 30 gallons water 25 to 30 lbs pure bentonite powder Well Tag # = APC 416</p>			
31													
105													
32													
33													
110													
34													
35													
115													
36													
120													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7										Discontinuities become moderately to closely spaced and in poor to good condition, discontinuities in poor condition occur at a 10 to 15% frequency, discontinuities in fair condition occur at a 30 to 40% frequency			
25							R4	9	PLT - D	At 23.3 to 24.8 feet bgs - becomes moderate yellowish brown to light brown (10YR 5/4 - 5YR 5/6), slightly weathered (II), strong (R4) rock			
8							R5	10	PLT - D	At 24.8 feet bgs - becomes light bluish gray (5B 7/1) rock			
30							R4	11	PLT - D	Becomes moderate yellowish brown to light brown (10YR 5/4 - 5YR 5/6), slightly to moderately weathered (II - III), very weak to moderately weak (R1 - R2) rock			
9								12		Becomes slightly weathered (II), moderately strong to strong (R3 - R4) rock, discontinuities become moderately to closely spaced and in very poor to good condition, discontinuities in poor to very poor condition occur at a 25 to 30% frequency			
10								13					
35							R5	14	PLT - D	Becomes grayish green (5G 5/2), fresh (I), strong to very strong (R4 - R5) rock, discontinuities become moderately to closely spaced and in good condition			
11								15					
40								16		At 38.3 to 40.4 - becomes moderate yellowish brown to light brown (10YR 5/4 - 5YR 5/6), slightly weathered (II), strong (R4) rock At 38.5 feet bgs - discontinuities become moderately to closely spaced and in very poor to good condition, discontinuities in poor to very poor condition occur at a 40 to 50% frequency Becomes moderate yellowish brown to light brown (10YR 5/4 - 5YR 5/6), slightly to moderately weathered (II - III), moderately weak (R2) rock			
12													
13													
45										At 43.4 to 44.2 feet bgs - becomes moderately weathered (III), very weak to moderately weak (R1 - R2) rock, discontinuities become closely spaced and in poor to very poor condition			

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14													
15							R4	17	PLT - D	At 44.2 feet bgs - becomes moderate yellowish brown to light brown (10YR 5/4 - 5YR 5/6), slightly weathered (II), moderately weak to moderately strong (R2 - R3) rock, discontinuities become fair to very poor condition, discontinuities in poor to very poor condition occur at a 70 to 80% frequency, discontinuities in fair condition occur at a 20 to 25% frequency Becomes pale blue (5PB 7/2), fresh (I), strong (R4) rock, discontinuities become closely spaced and in very poor to good condition, discontinuities in poor to very poor condition occur at a 13 to 18% frequency			
50													
16													
55													
17							R3 R1	18	PLT - D PLT - D	At 53.4 to 58.4 feet bgs - healed discontinuities occur greater than 15 per foot			
18													
60													
19													
65													
20							R5	20 21	PLT - D	At 62.2 to 62.6 feet bgs - becomes moderately weathered (III), moderately weak (R2), discontinuities in poor to very poor condition Becomes pale blue (5PB 7/2), fresh (I), strong to very strong (R4 - R5) rock, discontinuities become moderately to closely spaced and in very poor to good condition, discontinuities in very poor condition occur at a 15 to 20% frequency			
21													
70													

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22										Discontinuities become moderately to closely spaced and in very poor to good condition, discontinuities in very poor condition occur at a 15 to 20% frequency			
75						100		23					
23						100	R4	24	PLT - D	Becomes moderate yellowish brown to light brown (10YR 5/4 - 5YR 5/6), slightly weathered (II), moderately weak to moderately strong (R2 - R3) rock, with moderately weathered (III) rock envelopes discontinuities, discontinuities become closely to very closely spaced and in poor to good condition			
24						100		25		Becomes slightly weathered (II), moderately strong to strong (R3 - R4) rock			
80						100	R4	26	PLT - D	Becomes pale blue (5B 6/2), fresh (I), strong to very strong (R4 - R5) rock, discontinuities become moderately to closely spaced and in very poor to good condition, discontinuities in poor to very poor condition occur at a 13 to 18% frequency			
25						98		26					
85						100		27		Becomes strong (R4) rock, discontinuities become closely to very closely spaced and in poor to very poor condition			
27						100		27					
90						100		28		Discontinuities become closely to very closely spaced and in very poor to good condition, discontinuities in poor to very poor condition occur at a 30 to 35%			
28						100		28					
95						100							

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29								R4		PLT - D	frequency		
30							100/1.8	R4	29	PLT - D			
100													
31										Borehole completed to 100.1 feet bgs on October 3, 2007. Borehole was overcased with HWT casing to 1.7 feet bgs and was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on October 4, 2007. Borehole completed with slope inclinometer casing to 100.1 feet bgs on October 4, 2007. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at approximately 63.4 feet bgs during drilling activities and at 28.0 feet on October 4, 2007 prior to beginning optical borehole survey.			
105										Slope inclinometer casing = 0.0 to 100.1 feet bgs: RocTest casing type A+ Azimuth = 295 degrees Grout mix from 0.0 to 100.1 feet bgs: 1 94 lb bag Type I-II Portland Cement 30 gallons water 30 lbs pure bentonite powder Well Tag # = APC 415			
33													
110													
34													
35													
115													
36													
120													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0	0												
1	0.3							1		GRAVEL [GP - GM] , fine to coarse, angular GRAVEL, some cobbles and boulders, with fine to coarse sand and silt, medium dense, pale yellowish brown to grayish green (10YR 6/2 - 10GY 5/2), moist. [Colluvium and Anthropogenic Fill]			
5	1.5							2		META-WELDED LAPILLI DACITE TUFF , pale yellowish brown (10YR 6/2), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized entrained clasts (20 to 45%), slightly welded, slightly weathered (I), moderately weak (R2) rock, discontinuities are closely spaced and in very poor to good condition, discontinuities in poor to very poor condition occur at a 25 to 30% frequency. [Tuff member of Lake Keechelus, Ohanapecosh Formation]			
2	0.6									At 3.4 feet bgs - becomes greenish gray (5G 6/1), fresh to slightly weathered (I - II), moderately strong (R3) rock, with olive gray (5Y 4/1) rock enveloping discontinuities			
10	3.0							3		At 5.9 feet bgs - becomes medium bluish gray to greenish gray (5B 5/1 - 5G 6/1), fresh (I), strong (R4) rock, discontinuities become closely to very closely spaced and in poor to good condition, discontinuities in poor condition occur at a 13 to 18% frequency			
4	1.2												
15	4.5							4					
5	1.5									Discontinuities become closely to very closely spaced and in good to very poor condition, discontinuities in poor to very poor condition occur at a 35 to 45% frequency			
6	1.8							5					
20	6.1												



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7								6		Becomes dark greenish gray to medium dark gray (5G 4/1 - N4), strong to very strong (R4 - R5) rock, discontinuities become closely to very closely spaced and in good to very poor condition, discontinuities in poor to very poor condition occur at a 35 to 45% frequency			
25								7		Becomes very strong (R5) rock			
8									PLT - D	At 26.8 to 27.1 feet bgs - 0.3 feet core loss			
9								8					
30										At 32.3 to 32.5 feet bgs - 0.2 feet core loss			
10													
35													
11								9	PLT - A	Discontinuities become moderately to closely spaced and in very poor to good condition, discontinuities in poor to very poor condition occur at a 30 to 40% frequency			
12								10	PLT - D				
40													
13								11					
45								12		Becomes medium bluish gray to greenish gray (5B 5/1 - 5G 4/1), fresh (I), very strong (R5) rock, with olive gray (5Y 4/1) rock enveloping discontinuities			

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14		[Hatched Pattern]					106 / 1.1	R5 R5	13	PLT - D PLT - D			
15													
50							98 / 1.2	14					
16													
55							100 / 1.0	15					
17													
18							R5	16	PLT - A				
60						86 / 0.7							
19							R5	17	PLT - D				
65						132 / 1.2							
20							R5 R5	18	PLT - D PLT - A				
21						72 / 0.0							
70													

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22								19		Becomes medium bluish gray to greenish gray (5B 5/1 - 5G 4/1), fresh (I), very strong (R5) rock, with olive gray (5Y 4/1) rock enveloping most discontinuities, discontinuities become moderately to closely spaced and in good condition			
								20					
75								21					
23								22					
								23	PLT - D	At 77.8 to 78.8 feet bgs - becomes fresh to slightly weathered (I - II) rock			
24								24	PLT - A	Discontinuities become moderately to closely spaced and in poor to good condition, discontinuities in poor condition occur at a 10 to 15% frequency			
80								25					
								26		At 85.3 to 85.4 feet bgs - discontinuity in poor condition			
85								27					
								28	PLT - D PLT - A				
90													
95													

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
1													
5													
2													
10													
3													
4													
15													
5													
6													
20													

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7							R5		PLT - D	Discontinuities become moderately to closely spaced and in good condition			
25						156 / 0.4		9					
8						99 / 0.3	R5 R5	10	PLT - D PLT - A				
9						99 / 0.8		11					
10													
35						94 / 0.4		12		Becomes medium bluish gray to dark greenish gray (5B 5/1 - 5G 4/1) rock			
11													
12						112 / 0.7	R5 R5 R4	13	PLT - A PLT - D PLT - D				
40													
13						96 / 2.9		14		At 41.8 to 44.3 feet bgs - becomes fresh to slightly weathered (I - II) rock			
45						100 / 1.0		15					

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14										Discontinuities become closely spaced and in fair to good condition			
15										Becomes medium bluish gray to dark greenish gray (5B 5/1 - 5G 4/1), fresh (I), very strong (R5) rock, with dark yellowish orange to light brown to pale yellowish brown (10YR 6/6 - 5YR 5/6 - 10YR 6/2), slightly weathered (II) rock			
50							R5	16	PLT - D				
16										Becomes dark yellowish orange to light brown to pale yellowish brown (10YR 6/6 - 5YR 5/6 - 10YR 6/2), slightly to moderately weathered (II - III), moderately weak to strong (R2 - R4) rock, discontinuities become closely to very closely spaced and in very poor to good condition, discontinuities in poor to very poor condition occur at a 12 to 17% frequency, discontinuities in fair condition occur at a 12 to 17% frequency			
55										At 53.0 to 53.9 feet bgs - discontinuities become very closely spaced and in good condition			
17							R4	17					
18													
60										At 58.9 to 59.4 feet bgs - 0.5 feet core loss			
18										Becomes medium bluish gray to dark greenish gray (5B 5/1 - 5G 4/1), fresh (I), strong (R4) rock, with dark yellowish orange to light brown to pale yellowish brown (10YR 6/6 - 5YR 5/6 - 10YR 6/2), slightly weathered (II), moderately weathered (R3) rock			
19										At 61.7 to 63.7 feet bgs - 0.2 feet core loss associated with drilling activities			
65													
20										Becomes medium bluish gray to dark greenish gray (5B 5/1 - 5G 4/1), fresh (I), very strong (R5) rock, discontinuities become moderately to closely spaced at widely spaced intervals and in good condition			
21							R5	19	PLT - D				
21													
70													

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22										Discontinuities become moderately to closely spaced at widely spaced intervals and in good condition			
75													
23						$\frac{112}{2.1}$	R5	23	PLT - D				
24						$\frac{112}{0.5}$		24					
80						$\frac{90}{0.0}$		25					
25													
85						$\frac{112}{0.0}$		26					
26													
27						$\frac{104}{0.0}$		27					
90						$\frac{98}{0.2}$	R4 R5	28	PLT - D PLT - A				
28													
95						$\frac{105}{1.0}$	R5	29	PLT - D				

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument	
			20	40	60	80								
29														
30							87 0.9		30					
100										Borehole completed to 99.8 feet bgs on October 10, 2007. Borehole was overcased with HWT casing to 4.2 feet bgs and was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on October 10, 2007. Borehole completed with slope inclinometer casing to 99.8 feet bgs on October 11, 2007. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at approximately 32.3 feet bgs during drilling activities and at 48.8 feet on October 10, 2007 prior to beginning optical borehole survey.				
31										Slope inclinometer casing = 0.0 to 99.8 feet bgs: RocTest casing type A+ Azimuth = 274 degrees Grout mix from 0.0 to 99.8 feet bgs: 1 94 lb bag Type I-II Portland Cement 30 gallons water 30 lbs pure bentonite powder Well Tag # = APC 414				
105														
32														
33														
110														
34														
35														
115														
36														
120														



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength	Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80								
							$\frac{53}{1.8}$		1		GRAVEL [GP] , fine to coarse, angular GRAVEL, some cobbles and boulders, with fine to coarse sand, loose to dense, pale yellowish brown to grayish green (10YR 6/2 - 10GY 5/2), moist. [Colluvium and Anthropogenic Fill]			
1							$\frac{90}{1.3}$		2		META-WELDED LAPILLI DACITE TUFF , pale blue (5B 6/2), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized entrained clasts (20 to 45%), slightly welded, fresh (I), strong (R4) rock, discontinuities are moderately to closely spaced and in very poor to good condition, discontinuities in poor to very poor condition occur at a 30 to 35% frequency. [Tuff member of Lake Keechelus, Ohanapecosh Formation]			
5								R2		PLT - D	At 3.4 to 4.2 feet bgs - becomes pale yellowish brown (10YR 6/2), highly weathered (IV), very weak (R1) rock			
2								R4		PLT - D	At 5.3 to 6.2 feet bgs - becomes moderate reddish orange (10R 6/6), slightly weathered (II) moderately weak (R2) rock			
10							$\frac{102}{0.4}$		3		Becomes grayish green (5G 5/2), fresh (I), strong (R4) rock, discontinuities become widely spaced and in fair to good condition			
4							$\frac{100}{0.0}$		4		Becomes strong to very strong (R4 - R5) rock			
15								R4 R5		PLT - A PLT - D				
5									5					
20							$\frac{100}{0.8}$							



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7										Becomes grayish green (5G 5/2), fresh (I), strong to very strong (R4 - R5) rock, with dusky yellow green (5GY 5/2), slightly weathered (II), moderately strong to strong (R3 - R4) rock enveloping discontinuities, discontinuities become moderately to closely spaced and in good condition			
25						$\frac{100}{1.0}$	R5	6	PLT - D				
8													
30						$\frac{100}{0.6}$		7					
10						$\frac{100}{0.8}$		8					
35													
11							R5		PLT - D				
40						$\frac{100}{0.6}$		9		Becomes pale blue (5PB 7/2) where fresh (I) rock, with moderate reddish brown (10R 4/6) where slightly weathered (II) rock			
13							R5 R5		PLT - A PLT - D				
45						$\frac{100}{0.8}$		10					

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14										Discontinuities become moderately to closely spaced and in good condition			
15						$\frac{100}{0.6}$		11					
50													
16						$\frac{100}{0.8}$		12					
55							R5		PLT - D				
17						$\frac{112}{1.1}$	R5	13	PLT - A				
18						$\frac{90}{3.1}$		14		Becomes moderate reddish brown (10R 4/6), slightly weathered (II), moderately weak to moderately strong (R2 - R3) rock, discontinuities become closely to very closely spaced and in very poor to good condition, discontinuities in poor to very poor condition occur at a 18 to 23% frequency At 57.0 to 69.0 feet bgs - healed discontinuities occur greater than 10 per foot			
60													
19						$\frac{100}{2.2}$	R3	15	PLT - D				
65													
20										At 66.0 to 66.6 feet bgs - becomes moderately weathered (III), very weak (R1) rock			
21						$\frac{98}{1.0}$		16		At 68.2 to 70.0 feet bgs - becomes moderate reddish brown (10R 4/6), slightly to moderately weathered (II - III), very weak to moderately weak (R1 - R2) rock			
70													

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22										<p>Becomes yellowish gray to medium bluish gray (5Y 8/1 - 5B 5/1), fresh (I), strong to very strong (R4 - R5) rock, with moderate reddish brown (10R 4/6), slightly weathered (II), moderately strong to strong (R3 - R4) rock enveloping discontinuities, discontinuities become moderately to closely spaced and in good condition</p> <p>Becomes greenish gray to medium bluish gray (5Y 6/1 - 5B 5/1) where fresh (I) rock</p> <p>Becomes greenish gray to medium bluish gray (5G 6/1 - 5B 5/1), fresh (I), strong to very strong (R4 - R5) rock, discontinuities become widely to moderately spaced and in good to poor condition</p> <p>Becomes very strong (R5) rock</p>			
						$\frac{100}{1.2}$	R4	17	PLT - D				
75													
23						$\frac{100}{0.6}$		18					
24													
80						$\frac{100}{0.0}$		19					
25													
85						$\frac{100}{0.0}$	R4		PLT - D				
27						$\frac{98}{0.2}$		20					
90													
28						$\frac{100}{0.0}$		21					
95							R5		PLT - D				

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument	
			20	40	60	80								
29														
30							$\frac{100}{0.0}$		22					
100														
31														
105														
32														
33														
110														
34														
35														
115														
36														
120														

ROCK SCS BOREHOLES 2007.GPJ 3/5/08

Borehole completed to 99.8 feet bgs on October 6, 2007. Borehole was overcased with HWT casing to 5.0 feet bgs and was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on October 10, 2007. Borehole completed with one vibrating wire piezometer at 98.0 feet bgs on October 18, 2007. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at approximately 23.9 feet bgs during drilling activities and at 82.1 feet on October 10, 2007 prior to beginning optical borehole survey.

VWP #92082 = 96.5 to 98.0 feet bgs
 #10-20 silica sand filter pack from 88.0 to 99.8 feet bgs
 Grout mix from 0.0 to 88.0 feet bgs:
 1 94 lb bag Type I-II Portland Cement
 30 gallons water
 25 to 30 lbs pure bentonite powder
 Well Tag # = APC 412



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
							$\frac{82}{0.9}$	1		GRAVEL [GP] , fine to coarse, angular GRAVEL, some cobbles and boulders, with fine to coarse sand, loose to dense, medium light gray (N6), moist. [Colluvium and Anthropogenic Fill]			
1							$\frac{96}{0.6}$	2		META-WELDED LAPILLI DACITE TUFF , pale blue (5B 6/2), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized entrained clasts (20 to 45%), slightly welded, fresh (I), strong to very strong (R4 - R5) rock, discontinuities are widely to moderately spaced and in fair to good condition. [Tuff member of Lake Keechelus, Ohanapecosh Formation]			
5										At 4.3 to 5.1 feet bgs - becomes dusky yellow green (5GY 5/2), slightly weathered (II), moderately strong to strong (R3 - R4) rock, discontinuities in poor to very poor condition			
2								R5	PLT - A				
								R5	PLT - D				
10							$\frac{104}{0.0}$	3					
4													
								R5	PLT - A				
4							$\frac{98}{0.0}$	4					
15													
								R4	PLT - D				
5													
20							$\frac{100}{0.4}$	5					

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
										Discontinuities become moderately to closely spaced and in very poor to good condition, discontinuity in poor to very poor condition occur at a 10 to 15% frequency			
7						100 1.0	R4	6	PLT - D				
25										Becomes moderately strong to strong (R3 - R4) rock			
8													
						102 1.8		7		At 27.8 feet bgs - becomes grayish gray (5G 5/2), fresh (I), strong (R4) rock			
										At 29.0 to 29.5 feet bgs - becomes dusky yellow green (5GY 5/2), slightly weathered (II), moderately weak to moderately strong (R2 - R3) rock			
9													
30													
						102 0.6	R4 R3	8	PLT - D PLT - A	Becomes grayish green to medium bluish gray (5G 5/2 - 5B 5/1), fresh (I), strong to very strong (R4 - R5) rock, discontinuities become moderately to closely spaced and in fair to good condition			
10							R4		PLT - A				
35													
11													
						98 1.2		9					
12													
40													
13						100 0.0	R4	10	PLT - D	Discontinuities become very widely to moderately spaced and in fair to good condition			
45						100		11					

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument					
			20	40	60	80												
14							0.3	R5	12	PLT - A	Discontinuities become very widely to moderately spaced and in fair to good condition							
							$\frac{98}{0.6}$											
15																		
50																		
16													R4 R5	13	PLT - A PLT - D			
												$\frac{102}{0.2}$						
55																		
17																		
												$\frac{100}{0.2}$		14				
18																		
60																		
19																		
												$\frac{100}{0.4}$		15				
65																		
20																		
												$\frac{100}{0.2}$	R4 R4	16	PLT - D PLT - D			
21																		
70																		

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22		[Hatched pattern]								Discontinuities become very widely to moderately spaced and in fair to good condition			
75													
23													
24		[Hatched pattern]								Discontinuities become very widely to moderately spaced and in fair to good condition			
80													
24													
25		[Hatched pattern]								Discontinuities become very widely to moderately spaced and in fair to good condition			
85													
26													
27		[Hatched pattern]								Discontinuities become very widely to moderately spaced and in fair to good condition			
90													
28													
21		[Hatched pattern]								Discontinuities become very widely to moderately spaced and in fair to good condition			
95													

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29									22				
30													
100										Borehole completed to 100.0 feet bgs on October 10, 2007. Borehole was overcased with HWT casing to 2.9 feet bgs and was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on October 11, 2007. Groundwater was measured at approximately 16.9 feet bgs during drilling activities and at 16.9 feet on October 11, 2007 prior to beginning optical borehole survey. Borehole backfilled with bentonite chips on October 19, 2007.			
31													
105													
32													
33													
110													
34													
35													
115													
36													
120													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
										<p>GRAVEL [GP - GM], fine to coarse, angular GRAVEL, some cobbles and boulders, with fine to coarse sand and silt, trace organics, loose to dense, medium light gray (N6), moist. [Colluvium and Anthropogenic Fill]</p> <p>META-WELDED LAPILLI DACITE TUFF, dark yellowish orange to moderate yellowish brown to pale yellowish brown (10YR 6/6 - 10YR 6/2 - 10YR 5/4), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized entrained clasts (20 to 45%), slightly welded, moderately to highly weathered (III - IV), very weak to moderately strong (R1 - R3) rock, discontinuities are closely spaced and in poor to good condition, discontinuities in poor condition occur at a 13 to 18% frequency. [Tuff member of Lake Keechelus, Ohanapechosh Formation]</p> <p>At 3.5 feet bgs - becomes slightly to moderately weathered (II - III), moderately weak to moderately strong (R2 - R3) rock</p> <p>Becomes medium bluish gray (5B 5/1), fresh (I), moderately strong (R3) rock, with light brown to medium dark gray (5YR 5/6 - N4), slightly weathered (II), moderately strong (R3) rock, enveloping discontinuities, discontinuities become closely to very closely spaced and in poor to good condition, discontinuities in fair condition occur at a 15 to 20% frequency, discontinuities in poor condition occur at a 5 to 10% frequency</p> <p>Becomes very strong (R5) where fresh (I) rock, with strong (R4) where slightly weathered (II) rock enveloping discontinuities</p> <p>At 16.6 to 18.5 feet bgs - 0.4 feet core loss, discontinuity in very poor condition</p>			
						84		1					
1						>1.9							
5						88		2					
2						3.2							
						33		3					
						2.5							
10						108		4					
3						2.1							
						100		5					
						2.4							
4									PLT - D				
15							R5						
5						94		6					
						>1.7							
20													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
7						$\frac{104}{1.7}$	R5 R5	7	PLT - D PLT - A	Discontinuities become closely to very closely spaced and in poor to good condition, discontinuities in fair condition occur at a 15 to 20% frequency, discontinuities in poor condition occur at a 5 to 10% frequency Becomes light brown to medium dark gray (5YR 5/6 - N4), fresh to slightly weathered (I - II), strong to very strong (R4 - R5) rock enveloping discontinuities			
25						$\frac{94}{1.7}$		8					
30						$\frac{104}{1.3}$	R4 R5	9	PLT - A PLT - D	Becomes medium bluish gray (5B 5/1), fresh (I), very strong (R5) rock with light brown (5YR 5/6), fresh to slightly weathered (I - II), very strong (R5) rock enveloping discontinuities, discontinuities become moderately to closely spaced and in poor to good condition, discontinuities in poor condition occur at a 15 to 20% frequency			
35						$\frac{96}{2.1}$		10					
40						$\frac{100}{0.8}$	R5 R4	11	PLT - A PLT - D				
45													

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14										Discontinuities become moderately to closely spaced and in poor to good condition, discontinuities in poor condition occur at a 15 to 20% frequency			
						$\frac{90}{2.0}$		12					
15							R5		PLT - D				
50													
16						$\frac{112}{1.8}$		13		Becomes light brown to medium gray (5YR 5/6 - N5), fresh to slightly weathered (I - II), strong (R4) rock			
55						$\frac{113}{5.0}$		14					
17						$\frac{94}{1.2}$		15		Discontinuities become moderately to closely spaced and in good condition			
18						$\frac{113}{0.7}$		16		Becomes medium bluish gray (5B 5/1), fresh (I), very strong (R5) rock with light brown (5YR 5/6), fresh to slightly weathered (I - II), very strong (R5) rock enveloping discontinuities			
60						$\frac{100}{1.2}$		17					
19							R5		PLT - D				
65													
20						$\frac{100}{0.8}$		18					
21							R5		PLT - D				
70													

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
										Discontinuities become moderately to closely spaced and in good condition			
22						$\frac{98}{1.2}$		19					
75													
23													
						$\frac{100}{1.0}$	R4	20	PLT - D	Becomes light brown to medium dark gray (5YR 5/6 - N4), fresh to slightly weathered (I - II), strong to very strong (R4 - R5) rock			
24													
80													
						$\frac{98}{1.6}$		21					
25													
85													
						$\frac{100}{>2.2}$	R5	22	PLT - D				
27													
90										At 90.5 to 91.0 feet bgs - discontinuity in very poor condition			
						$\frac{100}{0.8}$	R5	23	PLT - D	At 91.5 to 91.6 feet bgs - 0.1 feet core loss At 91.8 to 92.8 feet bgs - discontinuity in poor condition			
28													
95													

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29													
						$\frac{97}{>2.7}$		24		At 96.6 to 96.7 feet bgs - 0.1 feet core loss			
30													
100													
31										Borehole completed to 100.2 feet bgs on October 17, 2007. Borehole was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on October 19, 2007. Borehole completed with two vibrating wire piezometers at 41.5 feet and 98.0 feet bgs on October 22, 2007. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at approximately 47.3 feet bgs during drilling activities and at 47.9 feet on October 19, 2007 prior to beginning optical borehole survey.			
105										VWP #92274 = 40.0 to 41.5 feet bgs VWP #92081 = 96.5 to 98.0 feet bgs #10-20 silica sand filter pack from 88.0 to 100.2 feet bgs Grout mix from 0.0 to 88.0 feet bgs: 1 94 lb bag Type I-II Portland Cement 30 gallons water 30 to 35 lbs pure bentonite powder Well Tag # = APC 410			
33													
110													
34													
115													
35													
36													
120													



LOG OF TEST BORING

Start Card RE02062

Job No. 03-2007 SR 90 Elevation 2655.1 ft (809.3 m)

HOLE No. SI-08-07

Sheet 1 of 5

Project 2007 I-90 Geotechnical Slide Curve Scarp Investigation

Driller S. Wilson/S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector A. Shriver

Start October 18, 2007 Completion October 20, 2007 Well ID# SI-08-07 Equipment Skid-Mounted Burley 5500-2

Station 1399+01 Offset 192 Feet Left Casing Stick-up Monument Method HQ3 Triple Tube Wireline

Northing 734605.24 Easting 1426364.62 Latitude 47°20'40.186"N Longitude 121°21'48.281"W

County Kittitas Subsection SE Quarter Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0	0												
1	0.3							1		GRAVEL [GP] , fine to coarse, angular GRAVEL, some cobbles and boulders, with fine to coarse sand, trace silt and clay, trace organics, loose to dense, moist. [Colluvium and Anthropogenic Fill]			
5	1.5							2		META-WELDED LAPILLI DACITE TUFF , medium bluish gray (5B 5/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized entrained clasts (20 to 45%), slightly welded, fresh (I), strong to very strong (R4 - R5) rock, with light brown to dusky yellowish green (5YR 5/6 - 5GY 5/2), fresh to slightly weathered (I - II), strong to very strong (R4 - R5) rock enveloping discontinuities, discontinuities are closely spaced and in very poor to good condition, discontinuities in poor to very poor condition occur at a 15 to 20% frequency, discontinuities in fair condition occur at a 10 to 15% frequency. [Tuff member of Lake Keechelus, Ohanapechosh Formation]			
10	3.0							3					
15	4.5							4					
16.8	5.1							5					
17.3	5.3												
17.4	5.3												
19.55	5.9												
20	6.1												

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14								15		Becomes light brown to moderate yellowish brown (5YR 5/6 - 10YR 5/4), slightly weathered (II), moderately weak to moderately strong (R2) rock, discontinuities become closely to very closely spaced and in poor to good condition, discontinuities in poor condition occur at a 25 to 30% frequency, discontinuities in fair condition occur at a 25 to 30% frequency			
								16		At 47.8 to 49.9 feet bgs - healed discontinuities at greater than 10 per foot			
15								17		Becomes dusky yellowish green to light olive gray to light brown (5GY 5/2 - 5Y 5/2 - 5YR 5/6), fresh to slightly weathered (I - II), moderately strong to strong (R3 - R4) rock			
								18		At 50.6 to 51.2 feet bgs - discontinuity in very poor condition			
16										At 52.5 to 53.9 feet bgs - discontinuities in poor condition			
										At 53.8 to 54.8 feet bgs - 1.0 feet core loss associated with driller mismatch			
55								19	PLT - D	Becomes medium bluish gray (5B 5/1), fresh (I), strong to very strong (R4 - R5) rock, with light brown to dusky yellowish green (5YR 5/6 - 5GY 5/2), slightly weathered (II), strong to very strong (R4 - R5) rock enveloping discontinuities			
17													
18								20		At 59.3 to 59.4 feet bgs - 0.1 feet core loss Becomes dusky yellowish green to light olive gray to light brown (5GY 5/2 - 5Y 5/2 - 5YR 5/6), fresh to slightly weathered (I - II), strong to very strong (R4 - R5) rock, discontinuities become closely to very closely spaced and in poor to good condition, discontinuities in poor condition occur at a 3 to 8% frequency, discontinuities in fair condition occur at a 10 to 15% frequency			
60													
19								21	PLT - D				
65								22					
20													
								23		Becomes medium bluish gray to dark greenish gray (5B 5/1 - 5G 4/1), fresh (I), very strong (R5) rock, discontinuities become widely to moderately spaced and in fair to good condition			
21													
70													

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22							R5 R5	24	PLT - A PLT - D	Discontinuities become widely to moderately spaced and in fair to good condition			
						0 0.0		25		No recovery, driller unable to break core off bottom of borehole			
75	23					261 0.0		26					
						114 0.0		27					
24							R5 R4	28	PLT - D PLT - A				
80						82 0.5		29					
25								30					
85	26					69 0.6		31					
						150 0.3	R5 R5	32	PLT - A PLT - D				
90						110 1.1							
28										Discontinuities become closely to very closely spaced and in good condition			
						100 1.4							
95													

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29													
30								33					
100													
31										Borehole completed to 100.1 feet bgs on October 20, 2007. Borehole was overcased with HWT casing to 5.5 feet bgs and was flushed in preparation of optical and acoustical televiwer survey. Optical and acoustical televiwer survey completed on October 21, 2007. Borehole completed with slope inclinometer casing to 100.1 feet bgs on October 21, 2007. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at approximately 47.4 feet bgs during drilling activities and at 11.4 feet on October 21, 2007 prior to beginning optical borehole survey.			
105										Slope inclinometer casing = 0.0 to 100.1 feet bgs: RocTest casing type A+ Azimuth = 270 degrees Grout mix from 0.0 to 100.1 feet bgs: 1 94 lb bag Type I-II Portland Cement 30 gallons water 25 to 30 lbs pure bentonite powder Well Tag # = APC 411			
33													
110													
34													
115													
35													
36													
120													



LOG OF TEST BORING

Start Card RE02062

Job No. 03-2007 SR 90 Elevation 2658.3 ft (810.3 m)

HOLE No. SI-09-07

Sheet 1 of 5

Project 2007 I-90 Geotechnical Slide Curve Scarp Investigation

Driller S. Wilson/S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector A. Shriver

Start October 22, 2007 Completion October 23, 2007 Well ID# SI-09-07 Equipment Skid-Mounted Burley 5500-2

Station 1399+77 Offset 198 Feet Left Casing Stick-up Monument Method HQ3 Triple Tube Wireline

Northing 734540.16 Easting 1426374.45 Latitude 47°20'39.544"N Longitude 121°21'48.127"W

County Kittitas Subsection SE Quarter Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
1								1		GRAVEL [GP] , fine to coarse, angular GRAVEL, some cobbles and boulders, with fine to coarse sand, trace silt and clay, trace organics, loose to dense, moist. [Colluvium and Anthropogenic Fill]			
5								2		META-WELDED LAPILLI DACITE TUFF , medium bluish gray (5B 5/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized entrained clasts (20 to 45%), slightly welded, fresh (I), very strong (R5) rock, discontinuities are moderately to closely spaced and in poor to good condition, discontinuities in poor to very poor condition occur at a 18 to 23% frequency. [Tuff member of Lake Keechelus, Ohanapecosh Formation]			
10								3					
15								4		Becomes light olive gray to moderate yellowish brown (5Y 5/2 - 10YR 5/4), fresh to slightly weathered (I - II), strong (R4) rock			
20								5		Becomes light brown to moderate yellowish brown (5YR 5/6 - 10YR 5/4), slightly weathered (II), moderately strong (R3) rock At 15.5 to 15.9 feet bgs - discontinuity in very poor condition At 15.6 to 16.7 feet bgs - becomes moderately to highly weathered (III - IV), extremely weak to very weak (R0 - R1) rock At 16.7 to 17.3 feet bgs - becomes slightly to moderately weathered (II - III), moderately weak (R2) rock Becomes moderate yellowish brown to medium dark gray (10YR 5/4 - N4), slightly weathered (II), moderately weak (R2) rock, discontinuities become moderately to closely spaced and in poor to good			

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
			[Hatched pattern]				$\frac{33}{>10.0}$		6		condition, discontinuities in poor condition occur at a 30 to 40% frequency		
			[Hatched pattern]				$\frac{80}{>10.0}$		7		Becomes light brown to moderate yellowish brown (5YR 5/6 - 10YR 5/4), slightly weathered (II), moderately weak to moderately strong (R2 -R3) rock		
7			[Hatched pattern]								At 20.9 to 22.3 feet bgs - 2.1 feet core loss		
			[Hatched pattern]				$\frac{90}{2.8}$		8		At 22.3 feet bgs - becomes moderately to highly weathered (III - IV), extremely weak to very weak (R0 - R1) rock		
25			[Hatched pattern]								At 24.7 to 24.9 feet bgs - 0.2 feet core loss		
8			[Hatched pattern]				$\frac{84}{>10.0}$		9		At 24.9 to 26.7 and 29.4 to 31.1 feet bgs - becomes slightly to moderately weathered (II - III), very weak to moderately weak (R1 - R2) rock		
			[Hatched pattern]										
			[Hatched pattern]				$\frac{100}{11.1}$		10		At 29.4 to 29.9 feet bgs - 0.4 feet core loss		
30			[Hatched pattern]								Discontinuities become very closely spaced and in good condition, occur greater than 10 per foot		
			[Hatched pattern]				$\frac{70}{>13.0}$		11				
			[Hatched pattern]										
			[Hatched pattern]				$\frac{109}{1.6}$		12		At 33.6 to 35.0 feet bgs - becomes slightly to moderately weathered (II - III), very weak to moderately weak (R1 - R2) rock		
35			[Hatched pattern]								At 33.0 to 35.0 feet bgs - 1.0 feet core loss		
11			[Hatched pattern]				$\frac{79}{>9.5}$		13		Becomes slightly to moderately weathered (II - III), moderately weak (R2) rock, discontinuities become closely spaced and in good condition		
			[Hatched pattern]										
			[Hatched pattern]				$\frac{82}{0.9}$		14		Becomes highly weathered (IV), extremely weak (R0) rock, discontinuity in poor condition		
40			[Hatched pattern]								At 38.9 to 39.9 feet bgs - 1.0 feet core loss		
12			[Hatched pattern]				$\frac{98}{0.7}$		15		Becomes moderately weathered (III), very weak (R1) rock, discontinuities become closely spaced and in poor to very poor condition, healed discontinuities occur greater than 20 per foot		
			[Hatched pattern]										
			[Hatched pattern]								Becomes light brown to pale moderate yellowish brown to moderate yellowish brown (5YR 5/6 - 10YR 6/2 - 10YR 5/4), moderately weathered (III), moderately weak (R2) rock, discontinuities become moderately to closely spaced and in good condition		
45			[Hatched pattern]								At 44.5 to 44.8 feet bgs - becomes highly weathered		

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14										(IV), extremely weak (R0) rock			
						$\frac{92}{0.9}$		16		At 45.9 feet bgs - becomes light brown (5YR 5/6), slightly weathered (II), moderately weak to moderately strong (R2 - R3) rock, discontinuities become closely spaced and in good to poor condition, healed discontinuities occur greater than 10 per foot			
						$\frac{67}{2.8}$		17					
15													
50						$\frac{147}{107}$		18					
16						$\frac{93}{1.2}$		19					
55													
17						$\frac{100}{1.9}$		20		At 55.0 to 55.1 feet bgs - 0.15 feet core loss			
						$\frac{100}{3.0}$	R4	21	PLT - D	Becomes medium bluish gray (5B 5/1), fresh (I), strong to very strong (R4 - R5) rock, with light brown (5YR 5/6), slightly weathered (II), strong to very strong (R4 - R5) rock enveloping discontinuities, discontinuities are closely to very closely spaced and in good condition			
18													
60													
19						$\frac{100}{2.1}$		22		Becomes dusky yellow green (5GY 5/2) where fresh (I) rock			
						$\frac{100}{1.9}$		23					
65													
20						$\frac{98}{1.8}$		24		Becomes medium bluish gray to dusky yellow green (5B 5/1 - 5GY 5/2), fresh to slightly weathered (I - II), very strong (R5) rock			
							R5		PLT - D				
21													
70													

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29							113 0.8		31		associated with driller unable to break core off bottom of borehole		
							95 1.4		32				
100										<p>Borehole completed to 100.05 feet bgs on October 23, 2007. Borehole was overcased with HWT casing to 4.2 feet bgs and was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on November 1, 2007. Borehole completed with slope inclinometer casing to 100.05 feet bgs on November 7, 2007. Refer to well construction diagram and below for as-built construction details. Groundwater was measured at approximately 33.1 feet bgs during drilling activities and at 32.3 feet on November 1, 2007 prior to beginning optical borehole survey.</p> <p>Slope inclinometer casing = 0.0 to 100.05 feet bgs: RocTest casing type A+ Azimuth = 274 degrees Grout mix from 0.0 to 100.05 feet bgs: 1 94 lb bag Type I-II Portland Cement 30 gallons water 25 to 30 lbs pure bentonite powder Well Tag # = APC 409</p>			
31													
105													
32													
33													
110													
34													
115													
35													
36													
120													



Start Card SE01976

Job No. 03-2007 SR 90 Elevation 2664.3 ft (812.1 m)

HOLE No. SI-10-07

Sheet 1 of 5

Project 2007 I-90 Geotechnical Slide Curve Scarp Investigation

Driller S. Wilson/S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector A. Shriver

Start October 24, 2007 Completion October 31, 2007 Well ID# Not Applicable Equipment Skid-Mounted Burley 5500-2

Station 1400+52 Offset 203 Feet Left Casing Not Applicable Method HQ3 Triple Tube Wireline

Northing 734476.68 Easting 1426386.79 Latitude 47°20'38.919"N Longitude 121°21'47.938"W

County Kittitas Subsection SE Quarter Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
1							$\frac{68}{N/A}$		1		GRAVEL [GP] , fine to coarse, angular GRAVEL, some cobbles and boulders, with fine to coarse sand, trace silt and clay, trace organics, loose to dense, moist. [Colluvium and Anthropogenic Fill]		
5							$\frac{67}{0.3}$		2		At 4.7 to 6.1 feet bgs - 1.4 feet core loss		
10							$\frac{121}{0.0}$		3		META-WELDED LAPILLI DACITE TUFF , dark greenish gray to medium dark gray (5G 4/1 - N4), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized entrained clasts (20 to 45%), slightly welded, fresh (I), very strong (R5) rock, discontinuities are moderately to very closely spaced and in good condition. [Tuff member of Lake Keechelus, Ohanapecosh Formation]		
15							$\frac{72}{1.1}$		4		At 12.8 to 14.1 feet bgs - 1.3 feet core loss		
20							$\frac{75}{0.8}$	R5 R5	5	PLT - D PLT - A	At 18.9 to 19.5 feet bgs - discontinuity in very poor condition		

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument				
			20	40	60	80											
14							0.6										
							$\frac{100}{2.3}$						15				
15							$\frac{103}{2.6}$						16				
50							$\frac{100}{1.4}$						17				
16							$\frac{98}{1.0}$						R4	18	PLT - D		
55							$\frac{102}{1.3}$							19			
17							$\frac{89}{1.8}$							20			
18							$\frac{102}{0.8}$						R5	21	PLT - D		
60							$\frac{88}{0.5}$							22			
19							$\frac{108}{0.4}$							23			
65																	
20																	
21																	
70																	

ROCK SCS BOREHOLES 2007.GPJ 3/5/08

At 44.4 to 49.1 feet bgs - becomes strong to very strong (R4 - R5) rock, discontinuities become closely to very closely spaced and in good to very poor condition, discontinuities in very poor condition occur at a 55 to 60% frequency, healed discontinuities occur greater than 10 per foot

Discontinuities become moderately to closely spaced and in very poor to good condition, discontinuities in poor to very poor condition occur at a 15 to 20% frequency, discontinuities in fair condition occur at a 10 to 20 % frequency



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22								24		Becomes medium bluish gray (5B 5/1), fresh (I), strong to very strong (R4 - R5) rock, with light brown (5YR 5/6), slightly weathered (II), strong to very strong (R4 - R5) rock enveloping discontinuities, discontinuities become closely to very closely spaced and in good condition			
23								25	PLT - A PLT - D	Becomes strong (R4) rock			
25								26		Discontinuities become closely and very closely spaced and in poor to good condition, discontinuities in poor condition occur at a 10 to 15% frequency, discontinuities in fair condition occur at a 20 to 25% frequency			
26								27		At 84.2 to 84.5 feet bgs - discontinuity in very poor condition, observed as fault infilled with clay, silt, and rock fragments as zone of highly to completely weathered (IV - V), extremely weak (R0) rock			
27								28		At 84.5 to 85.4 feet bgs - Becomes moderately to highly weathered (III - IV), extremely weak to very weak (R0 - R1) rock, healed discontinuities occur greater than 25 per foot			
28								29		At 85.4 to 88.0 feet bgs - becomes light brown to pale yellowish brown (5YR 5/6 - 10YR 6/2), slightly to moderately weathered (II - III), moderately weak to moderately strong (R2 - R3) rock			
28								30		At 90.4 to 91.9 feet bgs - 1.4 feet core loss			
28										Becomes strong to very strong (R4 - R5) rock			
28										At 92.5 to 94.8 feet bgs - 3.7 feet core loss associated with driller mismatch			
95													

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29													
							$\frac{95}{1.8}$	31		Becomes moderately strong (R3) rock			
30													
100							$\frac{67}{0.0}$	32		At 99.8 to 100.5 feet bgs - 0.7 feet core loss Becomes dark greenish gray (5G 4/1), fresh (I), very strong (R5) rock			
31						$\frac{97}{0.0}$	33			At 102 to 105.5 feet bgs - becomes moderately strong (R3) rock, healed discontinuities occur at 5 to 10 per foot			
105							R5		PLT-D				
33										Borehole completed to 106.0 feet bgs on October 31, 2007. Borehole was overcased with HWT casing to 3.0 feet bgs and was flushed in preparation of optical and acoustical televiewer survey. Optical and acoustical televiewer survey completed on November 1, 2007. Groundwater was measured at approximately 24.0 feet bgs during drilling activities and at 33.4 feet on November 1, 2007 prior to beginning optical borehole survey. Borehole backfilled with bentonite chips on November 3, 2007.			
110													
34													
115													
35													
36													
120													



Start Card SE01976

Job No. 03-2007 SR 90 Elevation 2659.5 ft (810.6 m)

HOLE No. SI-11-07

Sheet 1 of 5

Project 2007 I-90 Geotechnical Slide Curve Scarp Investigation

Driller S. Wilson/S. Tunison Lic# 2628

Site Address Interstate 90, Milepost 56.5 to 59.0

Inspector A. Shriver

Start November 3, 2007 Completion November 5, 2007 Well ID# Not Applicable Equipment Skid-Mounted Burley 5500-2

Station 1401+33 Offset 192 Feet Left Casing Not Applicable Method HQ3 Triple Tube Wireline

Northing 734405.78 Easting 1426387.82 Latitude 47°20'38.220"N Longitude 121°21'47.912"W

County Kittitas Subsection SE Quarter Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0	0						$\frac{79}{1.0}$	1		GRAVEL [GP] , fine to coarse, angular GRAVEL, some cobbles and boulders, with fine to coarse sand, trace silt and clay, trace organics, loose to dense, moist. [Colluvium and Anthropogenic Fill]			
1	0.3									META-WELDED LAPILLI DACITE TUFF , dark greenish gray (5G 4/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized entrained clasts (20 to 45%), slightly welded, fresh (I), strong (R4) rock, discontinuities are closely spaced and in fair to poor condition. [Tuff member of Lake Keechelus, Ohanapecoh Formation] Becomes fresh to slightly weathered (I - II) rock			
5	1.5						$\frac{98}{2.1}$	2		Healed discontinuities occur greater than 2 per foot			
10	3.0						$\frac{94}{0.6}$	3		Becomes olive gray to moderate olive brown (5Y 4/1 - 5Y 4/4), strong to very strong (R4 - R5) rock, discontinuities become moderately to closely spaced and in good condition, healed discontinuities occur 8 to 10 per foot			
15	4.5							R5	PLT - D				
20	6.0						$\frac{111}{1.0}$	4		Becomes olive gray to moderate olive brown (5Y 4/1 - 5Y 4/4), fresh (I), very strong (R5) rock, discontinuities become moderately to very closely spaced and in good condition, healed discontinuities occur 6 to 10 per foot			
								R5	PLT - D				

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
14		[Hatched pattern]					$\frac{103}{0.0}$		11		Becomes medium bluish gray (5B 5/1), fresh (I), very strong (R5) rock, discontinuities become moderately spaced at widely spaced intervals and in poor to good condition, discontinuities in poor condition occur at a 5 to 10% frequency, discontinuities in fair condition occur at a 10 to 15% frequency		
15			$\frac{111}{0.5}$						12				
50			$\frac{102}{0.4}$				R5		13	PLT - D			
16							R5 R5			PLT - A PLT - D			
55			$\frac{98}{0.0}$						14				
17													
18			$\frac{99}{1.2}$				R5		15	PLT - A			
60							R4			PLT - D			
19													
65			$\frac{85}{0.2}$				R4			PLT - D			
20									16				
21													
70													

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22							$\frac{110}{0.4}$	17		Becomes dark greenish gray (5G 4/1), fresh (I), very strong (R5) rock, discontinuities become moderately spaced at widely spaced intervals and in fair to good condition, discontinuities in fair condition occur at a 8 to 13% frequency			
							R5	18	PLT - D PLT - A				
							$\frac{123}{0.3}$						
75							R5						
							$\frac{86}{0.5}$	19					
23													
							$\frac{88}{0.0}$	20	PLT - D PLT - A				
24							R4 R3						
							$\frac{155}{0.0}$	21					
80													
							$\frac{92}{0.4}$	22					
25													
							$\frac{106}{0.0}$	23	PLT - D PLT - A				
85							R5 R4						
26													
27													
90													
28													
95													

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
29							$\frac{99}{0.2}$		24				
30													
100							R4 R4		PLT - D PLT - A	Borehole completed to 100.3 feet bgs on November 5, 2007. Borehole was overcased with HWT casing to 2.8 feet bgs and was flushed in preparation of optical and acoustical televiwer survey. Optical and acoustical televiwer survey completed on November 7, 2007. Groundwater was measured at approximately 53.8 feet bgs during drilling activities and at 53.7 feet on November 7, 2007 prior to beginning optical borehole survey. Borehole backfilled with bentonite chips on November 7, 2007.			
31													
105													
32													
33													
110													
34													
35													
115													
36													
120													



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
0								1		GRAVEL [GP] , fine to coarse, angular GRAVEL, some cobbles and boulders, with fine to coarse sand, trace silt and clay, trace organics, loose to dense, moist. [Colluvium and Anthropogenic Fill]			
1								2		META-WELDED LAPILLI DACITE TUFF , dark greenish gray (5G 4/1), fine grained groundmass with fine to medium grained phenocrysts and lapilli-sized entrained clasts (20 to 50%), slightly welded, fresh (I), very strong (R5) rock, discontinuities are moderately to closely spaced and in good to very poor condition, discontinuities in poor to very poor condition occur at a 60 to 65% frequency. [Tuff member of Lake Keechelus, Ohanapechosh Formation] At 5.0 to 5.3 feet bgs - 0.3 feet core loss			
5								3		At 7.7 to 9.1 feet bgs - becomes light olive gray to greenish gray (5Y 5/2 - 5GY 6/1), slightly weathered (II), moderately weak (R2) rock			
10								4	PLT - A PLT - D	Becomes fresh to slightly weathered (I - II), moderately weak to strong (R2 - R4) rock	▼		
15								5		Becomes dark greenish gray (5G 4/1), fresh (I), very strong (R5) rock, discontinuities become moderately spaced and in good condition	▼		
20								6	PLT - A				

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
							$\frac{96}{0.8}$	R5	7	PLT - D	Discontinuities become moderately to closely spaced and in poor to good condition, discontinuities in poor condition occur at a 12 to 17% frequency, discontinuities in fair condition occur at a 10 to 15% frequency		
7													
25							$\frac{102}{1.0}$		8				
8													
30							$\frac{98}{0.8}$	R5 R5	9	PLT - D PLT - A			
10													
35							$\frac{94}{1.3}$		10				
11													
40							$\frac{100}{1.3}$	R4 R5	11	PLT - A PLT - D			
12													
45							110		12				

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FPF	Rock Strength Sample Type	Sample No.	Lab Tests	Description of Material	Groundwater	Instrument
			20	40	60	80							
22								20		Discontinuities become moderately to very closely spaced and in poor to good condition, discontinuities in poor condition occur at a 5 to 10% frequency			
75	23							21					
80	24							22	PLT - A PLT - D				
85	26							23		At 84.7 to 86.0 feet bgs - discontinuities becomes very closely spaced and in poor condition			
								24	PLT - D	At 86.4 feet bgs - becomes dusky yellowish green (5GY 5/2), fresh to slightly weathered (I - II), strong to very strong (R4 - R5) rock			
								25		At 86.8 feet bgs - discontinuities become closely to very closely spaced and in good to poor condition			
								26		At 87.4 feet bgs - becomes pale yellowish brown to light brown (10YR 6/2 - 5YR 5/6), slightly to moderately weathered (II - III), moderately weak (R2) rock			
								27		At 88.0 feet bgs - becomes moderately to highly weathered (III - IV), extremely weak (R0) rock			
								28		At 88.4 to 90.15 feet bgs - 0.75 feet core loss Becomes slightly to moderately weathered (II - III), moderately weak (R2) rock			
								29		At 90.4 feet bgs - becomes slightly weathered (II), very weak to moderately weak (R1 - R2) rock			
								30		At 90.8 feet bgs - becomes dusky yellowish green (5GY 5/2), fresh to slightly weathered (I - II), strong (R4) rock			
95								26		At 92.2 feet bgs - becomes dark greenish gray (5G 4/1), fresh (I), very strong (R5) rock, discontinuities become moderately to closely spaced at widely			

ROCK SCS BOREHOLES 2007.GPJ 3/5/08



Start Card _____

Job No. 33758613.04000 SR 90 Elevation 2542.8 ft (775.0 m)

HOLE No. SSD-001-07

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller James Fetterly Lic# 2507

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start September 5, 2007 Completion September 5, 2007 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto-hammer

Station 1349+44.25 Offset 123.01 'L Casing HQ 20' Method Wet Rotary

Northing 1067507.416 Easting 1753679.336 Latitude 47°21'26.782"N Longitude 121°22'02.633"W

County Kittitas Subsection NW 1/4 of NE 1/4 Section 35 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0														
1						80			C-1		Meta Welded Lapilli Tuff, greenish gray, fine to medium grained, 0 to 0.8 feet: completely weathered, moderately weak, 0.8 to 5.5 feet: moderately weathered, moderately strong. No HCl reaction. Discontinuities are moderately spaced to widely spaced and in poor to fair condition. CR = 80 - 100%, RQD = 80 - 100%, FF = 0.2 - 1.0.			
5						100			C-2		5.5 to 20.5 feet: fresh, moderately strong rock.			
10						100			C-3					
15						100			C-4					
20														

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90

Elevation 2542.8 ft (775.0 m)

HOLE No. SSD-001-07

Sheet 2 of 2

Project I-90 Snoqualmie Pass East

Driller James Fetterly

Lic# 2507

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
												Bottom of boring at 20.5 feet depth below ground surface. No groundwater encountered in the hole. Backfilled from 20.5 feet to ground surface with bentonite chips.		
7														
25														
8														
9														
30														
10														
35														
11														
12														
40														
13														
45														

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90 Elevation 2566.0 ft (782.1 m)

HOLE No. SSD-002-07

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Scottie Wilson Lic# _____

Drilling Contractor CRUX Subsurface, Inc.

Inspector Andy Shriver

Start August 24, 2007 Completion August 26, 2007 Well ID# Not Applicable Equipment Plat-form Burley 5500-2 skid mounted

Station 1354+33.59 Offset 128.01 'L Casing HW Method HWT Mud Rotary, HQ# Tripple Tube Wireline

Northing 1067039.21 Easting 1753976.75 Latitude 47°21'22.195"N Longitude 121°21'58.239"W

County Kittitas Subsection NE 1/4 of NE 1/4 Section 35 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0	0						25		C-1 GP		0 to 8.0 feet: Poorly graded to well graded GRAVEL with sand, cobbles, boulders, angular to subrounded, loose to very dense, gray to brown, moist, homogeneous, HCl not tested (Colluvium).			
8	8						0 100 0.9		D-2 GP3	20 for 0"	8 to 60 feet: Meta Welded Lapilli Tuff, greenish gray, fine to medium grained, slightly weathered to fresh, moderately strong rock. No HCl reaction. Discontinuities are closely to moderately spaced and in poor to fair condition. CR = 76 - 100%, RQD = 36 - 100%, FF = 0.4 - 3.6.			
12.2	12.2						0 100 3.6		C-4 C-5		12.2 to 27.2 feet: fresh, moderately strong rock. Discontinuities are closely spaced.			
15	15						100 3.6		C-6					
20	20						100 3		C-7					

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14														
							$\frac{100}{0.4}$		C-14					
15							$\frac{100}{1.2}$		C-15					
50							$\frac{100}{3}$		C-16					
16														
55														
17							$\frac{93}{1.1}$		C-17					
18														
60											Bottom of boring at 60.0 feet depth below ground surface. Groundwater level not reliably measured due to drilling water in the hole. Cement grout from 60.0 feet to ground surface.			
19														
65														
20														
21														
70														

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90 Elevation 2567.8 ft (782.7 m)

HOLE No. SSD-003-07

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Scottie Wilson Lic# _____

Drilling Contractor CRUX Subsurface, Inc.

Inspector Andy Shriver

Start August 27, 2007 Completion August 27, 2007 Well ID# Not Applicable Equipment Plat-form Burley 5500-2 skid mounted

Station 1356+15.05 Offset 143.46'L Casing HW7.1',HQ60.4' Method HWT Mud Rotary,HQ# Tripple Tube Wireline

Northing 1066807.47 Easting 1754064.15 Latitude 47°21'19.917"N Longitude 121°21'56.933"W

County Kittitas Subsection NE 1/4 of NE 1/4 Section 35 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0	0							C-1 GW		0 to 21.0 feet: Well graded GRAVEL with sand, cobbles, boulders, angular to subrounded, loose to very dense, gray to brown, moist, homogeneous, HCl not tested (Colluvium).			
1	0.3												
5	1.5							D-2 GW	5 3 3 (6)				
2	0.6							C-3 GW					
3	0.9												
10	3.0							D-4 GW	50 for 4"				
4	1.2							C-5 GW					
15	4.5												
5	1.5							D-6 GW	9 3 2 (5)				
20	6.0							C-7 GW					

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14							$\frac{96}{1.4}$	C-13						
15														
50														
16							$\frac{100}{0.4}$	C-14						
17														
55														
18							$\frac{94}{0}$	C-15						
18														
60														
19											Bottom of boring at 60.8 feet depth below ground surface. Groundwater level not reliably measured due to drilling water in the hole. Cement grout from 60.8 feet to ground surface.			
65														
20														
21														
70														

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90

Elevation 2532.0 ft (771.8 m)

HOLE No. SSD-004-07

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller James Fetterly Lic# 2507

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start September 5, 2007 Completion September 5, 2007 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto-hammer

Station 1359+45.99 Offset 76.19'L Casing HQ 30' Method Wet Rotary

Northing 1066522.69 Easting 1754104.96 Latitude 47°21'17.112"N Longitude 121°21'56.295"W

County Kittitas Subsection SE 1/4 of NE 1/4 Section 35 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
							100		D-1 SM	4	Top 2.0 feet - Topsoil.			
						90	1.2		C-2	6 7 (13)	Meta Welded Lapilli Tuff, greenish gray, fine to medium grained, 2.0 to 5.5 feet: moderately weathered, moderately strong rock. No HCl reaction. Discontinuities are closely to moderately spaced and in poor to fair condition. CR = 84 - 100%, RQD = 70 - 90%, FF = 1.2 - 1.8.			
1														
5									C-3		5.5 to 30.5 feet: fresh, moderately strong rock			
2														
10									C-4					
3														
4														
15									C-5					
5														
20														

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90

Elevation 2532.0 ft (771.8 m)

HOLE No. SSD-004-07

Sheet 2 of 2

Project I-90 Snoqualmie Pass East

Driller James Fetterly

Lic# 2507

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)	% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
				$\frac{84}{1.5}$			C-6				
7											
25				$\frac{100}{1.2}$			C-7				
8											
9											
30											
									Bottom of boring at 30.5 feet depth below ground surface. No groundwater encountered in the hole. Backfilled from 30.5 feet to ground surface with bentonite chips.		
10											
35											
11											
12											
40											
13											
45											

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90 Elevation 2530.9 ft (771.4 m)

HOLE No. SSD-005-07

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller James Fetterly Lic# 2507

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start September 4, 2007 Completion September 4, 2007 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto-hammer

Station 1362+19.97 Offset 125.18'L Casing HQ 30' Method Wet Rotary

Northing 1066273.246 Easting 1754162.947 Latitude 47°21'14.656"N Longitude 121°21'55.413"W

County Kittitas Subsection SE 1/4 of NE 1/4 Section 35 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0	0										Top to 0.5 feet - Topsoil.			
1	0.3					78 1.3			C-1		Meta Welded Lapilli Tuff, greenish gray, medium to coarse grained, 0.5 to 6.0 feet: moderately weathered, moderately strong rock. No HCl reaction. Discontinuities are closely to widely spaced and in poor to fair condition. CR = 78 - 100%, RQD = 70 - 100%, FF = 0.2 - 1.0.			
5	1.5					100 6			C-2					
10	3.0					100 4			C-3					
15	4.5					100 4			C-4					
20	6.0													

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7							100		C-5					
25							100		C-6					
8														
9														
30														
10											Bottom of boring at 30.7 feet depth below ground surface. No groundwater encountered in the hole. Backfilled from 30.7 feet to ground surface with bentonite chips.			
35														
11														
12														
40														
13														
45														

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758654.00009 SR 90

Elevation 2497.5 ft (761.2 m)

HOLE No. SSD-006-09

Sheet 1 of 4

Project I-90 Snoqualmie Pass East

Driller Richard Cooper Lic# 2964T

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start June 2, 2009 Completion June 4, 2009 Well ID# Not applicable Equipment Burley 5500-1 (Skid rig) with autohammer

Station 1353+71 Offset 31.4 R Casing HWT 44', HQ 67', NQ 79' Method Wet Rotary

Northing 1067029.14 Easting 1753805.38 Latitude _____ Longitude _____

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0	0						23		C-1 GP(C)		0 to 6 feet: Poorly graded GRAVEL with cobbles, angular, gray, wet, homogenous, no HCl reaction. Maximum size of the cobbles encountered is 7.5 inches.			
6	2						40		C-2 GW(C)		6 to 54 feet: Poorly to well graded GRAVEL with cobbles and occasional boulders, subrounded to angular, light brown to gray, wet, homogenous, no HCl reaction. 6 feet: Well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 6.5 inches.			
13	4						34		C-3 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 6 inches.			
20	6						52		C-4 GW(C/B)		grades to well graded GRAVEL with cobbles and boulders. Maximum size of the boulders encountered is 13 inches.			

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7														
25														
8														
30														
9														
35														
10														
35														
11														
40														
12														
40														
13														
45														

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10

grades to poorly graded GRAVEL with cobbles.
Maximum size of the cobbles encountered is 10 inches.

Maximum size of the cobbles encountered is 3.5 inches.

Maximum size of the cobbles encountered is 8.5 inches.
Two pieces of wood were encountered.



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14									C-10 GP(C)		No recovery. Material was washed away. Material is probably poorly graded GRAVEL.			
15									C-11 GW		grades to well graded GRAVEL.			
50									C-12A GW		grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 10.5 inches.			
16									C-12B					
55									C-13		54 to 79 feet: Meta Welded Lapilli Tuff, bluish gray, fine to medium grained, fresh, strong (R4) to very strong (R5). Discontinuities are closely to widely spaced and in poor to good condition. None to weak HCl reaction. (CR= 80 to 100%, RQD = 40 to 100%, FF = 0 to 2.0)			
17									C-14		54 feet: Strong (R4) rock. Discontinuities are closely to medium spaced and in fair condition. No HCl reaction.			
18									C-15		54.7 feet: PLT - very strong (R5) rock. 55 feet: Discontinuities are closely spaced. 56 feet: Discontinuities are in fair to poor condition. 58 feet: Discontinuities are medium to closely spaced.			
60									C-16		PLT - very strong (R5) rock. PLT - very strong (R5) rock.			
19									C-17		grades to strong (R4) to very strong (R5) rock. No discontinuities.			
65														
20											Discontinuities are closely to medium spaced and in good condition. Weak HCl reaction.			
21											PLT - very strong (R5) rock.			
70														

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22									C-18		PLT - strong (R4) rock. No HCl reaction.			
75									C-19 35		PLT - moderately strong (R3) rock.			
24									C-20		PLT - strong (R4) rock.			
80											Bottom of boring at 79 feet depth below the mudline. Backfilled to mudline with bentonite chips.			
25											Lake level measurements: -06/02/09 at 08:30: 18 feet above the mudline -06/03/09 at 08:00: 18 feet above the mudline -06/04/09 at 06:00: 18 feet above the mudline			
85														
27														
90														
28														
95														



LOG OF TEST BORING

Start Card _____

Job No. 33758654.00009 SR 90 Elevation 2497.0 ft (761.1 m)

HOLE No. SSD-007-09

Sheet 1 of 5

Project I-90 Snoqualmie Pass East

Driller Richard Cooper Lic# 2964T

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start May 30, 2009 Completion June 1, 2009 Well ID# Not applicable Equipment CME 45 (Barge rig) with auto hammer

Station 1356+29 Offset 29.1 R Casing HWT 26', HQ 77', NQ Method Wet Rotary

Northing 1066795.63 Easting 1753908.13 Latitude _____ Longitude _____

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0	0										0 to 9.0 feet: Poorly graded GRAVEL, angular, gray to dark gray, wet, homogenous, no HCl reaction.			
9	9								C-1 GP		9.0 to 61.0 feet: Poorly to well graded GRAVEL with cobbles, subrounded to angular, greenish gray, bluish gray or gray, wet, homogenous, no HCl reaction. 9.0 feet: Well graded GRAVEL with cobbles and trace of wood. Maximum size of the cobbles encountered is 4 inches.			
30	30								C-2 GW(C)		grades to well graded GRAVEL without wood. Maximum size of the cobbles encountered is 3.75 inches.			
28	28								C-3 GW(C)					
48	48								C-4 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 9 inches.			

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7													
25							<u>34</u>	<u>C-5</u> GP(C)		Maximum size of the cobbles encountered is 6 inches.			
8													
30							<u>60</u>	<u>C-6</u> GP(C)		Maximum size of the cobbles encountered is 7 inches.			
9													
35							<u>36</u>	<u>C-7</u> GP(C)		Maximum size of the cobbles encountered is 9.5 inches.			
10													
40							<u>0</u>	<u>C-8</u> GP?		No Recovery. Material is washed away. Material is probably poorly graded GRAVEL.			
11													
45							<u>10</u>	<u>C-9</u> GP		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 3 inches.			

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
14													
15													
50													
16													
55													
17													
18													
60													
19													
65													
20													
21													
70													

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10

grades to poorly graded GRAVEL.

61.0 to 100.0 feet: Meta welded Lapilli Tuff, greenish gray, fine to medium grained, fresh, very weak (R1) to moderately strong (R3). Discontinuities are very closely to closely spaced and in poor to fair condition. No HCl reaction.
(CR= 70 to 100%, RQD = 12 to 60%, FF= 1.4 to 5.0)
61.0 feet: Very weak (R1) rock. Discontinuities are very closely spaced and in poor to fair condition.
64.0 feet: Discontinuities are in fair condition.
64.2 feet: PLT - very weak (R1) rock.

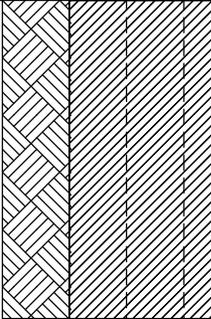
PLT - Moderately weak (R2) rock.



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22							$\frac{85}{3.9}$		C-13		PLT - moderately strong (R3) rock.			
75	23						$\frac{90}{3.6}$		C-14		Discontinuities are very closely spaced and in poor condition. PLT - moderately strong (R3) rock.			
24							$\frac{90}{5.0}$		C-15		Discontinuities are very closely to closely spaced and in poor to fair condition.			
80	25						$\frac{96}{3.0}$		C-16		PLT - Moderately weak (R2) rock. grades to moderately strong (R3) rock. Discontinuities are very closely to closely spaced and in fair condition.			
27							$\frac{84}{1.4}$		C-17		PLT - strong (R4) rock. Discontinuities are closely spaced and in fair condition.			
90	28										PLT - moderately strong (R3) rock.			
95									23					

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
29							$\frac{98}{2.8}$		C-18					
30									$\frac{27}{}$					
100											PLT - very weak (R1) rock. Bottom of boring at 100.0 feet below the mudline. Backfilled to mudline with bentonite chips.			
31											Lake level measurements: -5/30/09 at 08:00: 18.5 feet above the mudline -5/31/09 at 08:45: 17.5 feet above the mudline -6/01/09 at 07:45: 18.5 feet above the mudline			
105														
33														
110														
34														
115														
35														
36														
120														



LOG OF TEST BORING

Start Card _____

Job No. 33758654.00009 SR 90 Elevation 2499.6 ft (761.9 m)

HOLE No. SSD-008-09

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Richard Cooper Lic# 2964T

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start June 9, 2009 Completion June 11, 2009 Well ID# Not applicable Equipment CME 45 (Barge rig) with auto hammer

Station 1358+86 Offset 29.3 R Casing HWT, HQ Method Wet Rotary

Northing 1066553.62 Easting 1753987.41 Latitude _____ Longitude _____

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0									C-1 GP(C)		0 to 4 feet: Poorly graded GRAVEL with cobbles, angular, dark gray to gray, wet, homogenous, no HCl reaction. 0 feet: Poorly graded GRAVEL with cobbles. Maximum size of the cobbles is 3.25 inches.			
4									C-2 GP(C)		4 to 42 feet: Poorly to well graded GRAVEL with cobbles and boulders, angular to subrounded, dark gray, gray or greenish gray, wet, homogenous, no HCl reaction. 4 feet: Poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 3.25 inches.			
7									C-3 GP(C)		7 feet: Maximum size of the cobbles encountered is 4.5 inches.			
14									C-4 GP(C/B)		Maximum size of the cobbles encountered is 9 inches.			
20											grades to poorly graded GRAVEL with cobbles and boulders. Maximum size of the boulders encountered is 14 inches.			

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7							<u>62</u>	C-5 GP(C/B)		Maximum size of the boulders encountered is 12 inches.			
25							<u>30</u>	C-6 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 8 inches. Note: Drilling rod dropped about 8 inches at about 29 feet per driller.			
30							<u>36</u>	C-7 GW(C)		grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 9.5 inches.			
35							<u>24</u>	C-8 GW		grades to well graded GRAVEL.			
40							<u>96</u> 1.6	C-9		42.0 to 67.0 feet: Meta welded Lapilli Tuff, greenish gray, fine to medium grained, fresh, moderately weak (R2) to moderately strong (R3) rock. Discontinuities are closely to medium spaced and in poor to fair condition. No HCl reaction. (CR=83 to 96%, RQD = 40 to 81%, FF = 1.3 to 4.0) 42.0 feet: Moderately weak (R2) to moderately strong (R3) rock. Discontinuities are closely to medium spaced			
45													

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14									16		and in poor to fair condition. 43.7 feet: PLT - very weak (R1) rock.			
							$\frac{94}{1.3}$		C-10			PLT - moderately strong (R3) rock.		
15												PLT - moderately weak (R3) rock.		
50														
16							$\frac{86}{2.7}$		C-11			Discontinuities are closely spaced and in fair condition.		
55							$\frac{83}{4.0}$		C-12					
17														
18							$\frac{92}{2.2}$		C-13			PLT - moderately weak (R3) rock. Discontinuities are in poor to fair condition.		
60														
19							$\frac{96}{1.6}$		C-14	23 22		PLT - moderately weak (R3) rock. Discontinuities are closely to medium spaced and in fair condition. 62.4 feet: PLT - moderately strong (R3) rock.		
65												PLT - very weak (R1) rock.		
20														
21											Bottom of boring at 67 feet below the mudline. Backfilled to mudline with bentonite chips.			
70											Lake level measurements: -06/09/09 at 08:15: 16.4 feet above the mudline -06/10/09 at 07:45: 19.6 feet above the mudline -06/11/09 at 08:30: 16.8 feet above the mudline			

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



LOG OF TEST BORING

Start Card _____

Job No. 33758654.00009 SR 90 Elevation 2507.2 ft (764.2 m)

HOLE No. SSD-009-09

Sheet 1 of 4

Project I-90 Snoqualmie Pass East

Driller Richard Cooper Lic# 2964T

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start June 12, 2009 Completion June 13, 2009 Well ID# Not applicable Equipment CME 45 (Barge rig) with auto hammer

Station 1355+01 Offset 20.8 R Casing HWT 62', HQ 89' Method Wet Rotary

Northing 1066915.92 Easting 1753868.59 Latitude _____ Longitude _____

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0									C-1 GP(C/B)		0 to 11 feet: Poorly graded GRAVEL with cobbles and boulders, angular, bluish gray to dark gray, wet, homogenous, no HCl reaction. 0 feet: Poorly graded GRAVEL with cobbles and boulders. Maximum size of the boulders encountered is 16 inches.			
11									C-2 GW		11 to 61.5 feet: Poorly to well graded GRAVEL with cobbles and occasional boulders, subrounded to angular, gray to brown, wet, homogenous, no HCl reaction. 0 feet: Poorly graded GRAVEL with cobbles and boulders. Maximum size of the boulders encountered is 16 inches. grades to well graded GRAVEL with sand.			
61.5									C-3 GW(C)		grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 4 inches.			



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7														
25														
8														
9														
30														
							<u>16</u>		<u>C-4</u> GW(C)		Maximum size of the cobbles encountered is 3.5 inches.			
10														
35														
11														
							<u>55</u>		<u>C-5</u> GW(C/B)		grades to well graded GRAVEL with boulders. Maximum size of the boulders encountered is 15 inches.			
12														
40														
							<u>50</u>		<u>C-6</u> GW(C)		grades to well graded GRAVEL with sand and cobbles. Maximum size of the cobbles encountered is 7.5 inches.			
13														
							<u>18</u>		<u>C-7</u> GW		grades to well graded GRAVEL.			
45														



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
14													
15								C-8 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 9 inches.			
50													
16													
55								C-9 GP(C)		Maximum size of the cobbles encountered is 11.5 inches.			
17													
18								C-10 GW(C)		grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 8 inches.			
60													
19								C-11		61.5 to 89.0 feet: Meta welded Lapilli Tuff, bluish gray, fine to medium grained, fresh, very weak (R1) to moderately strong (R3). Discontinuities are very closely to closely spaced and in poor to fair condition. No HCl reaction. (CR=72 to 100%, RQD=14 to 60%, FF=1.6 to 5.0)			
65								C-12 14		61.5 feet: Moderately strong (R3) rock. Discontinuities are closely spaced and in fair condition. 61.7 feet: PLT - moderately weak (R2) rock. 63 feet: PLT - moderately weak (R2) rock. 64.0 feet: Discontinuities are in poor to fair condition.			
20													
21								C-13		PLT - moderately strong (R3) rock.			
70													

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22										22	PLT - moderately strong (R3) rock.			
75							$\frac{100}{5}$		C-14		grades to very weak (R1) to moderately weak (R2) rock. Discontinuities are very closely to closely spaced and in poor to fair condition.			
23											PLT - very weak (R1) rock.			
80							$\frac{98}{3.2}$		C-15		grades to moderately weak (R2) to moderately strong (R3) rock. Discontinuities are very closely to closely spaced and in fair condition.			
24										25	PLT - moderately strong (R3) rock.			
25											PLT - strong (R4) rock.			
85										C-16		PLT - moderately strong (R3) rock.		
26							$\frac{100}{3.0}$							
27														
90											Bottom of boring at 89.0 feet above the mudline. Backfilled to mudline with bentonite chips.			
28											Lake level measurements: -06/12/09 at 08:30: 9 feet above the mudline -06/13/09 at 08:30: 9.5 feet above the mudline			
95														

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



LOG OF TEST BORING

Start Card _____

Job No. 33758654.00009 SR 90 Elevation 2498.9 ft (761.7 m)

HOLE No. SSD-010-09

Sheet 1 of 4

Project I-90 Snoqualmie Pass East

Driller Richard Cooper Lic# 2964T

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start June 14, 2009 Completion June 16, 2009 Well ID# Not applicable Equipment CME 45 (Barge rig) with auto hammer

Station 1357+55 Offset 24.7 R Casing HWT, HQ Method Wet Rotary

Northing 1066679.3 Easting 1753953.92 Latitude _____ Longitude _____

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0							47		C-1 GP(C)		0 to 18.0 feet: Poorly graded GRAVEL with cobbles, angular, gray, greenish gray or bluish gray, wet, homogenous, no HCl reaction. 0 feet: Poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 7 inches.			
1														
5														
2							50		C-2 GP(C)					
10														
3							40		C-3 GP(C)		Maximum size of the cobbles encountered is 6 inches.			
4														
15														
5							20		C-4 GP(C)		Maximum size of the cobbles encountered is 3.5 inches.			
6														
20							47		C-5 GP(C)		18.0 to 54.7 feet: Poorly to well graded GRAVEL with cobbles, subrounded to angular, gray, greenish gray or bluish gray, wet, homogenous, no HCl reaction. 18.0 feet: Poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 11 inches.			



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7														
25														
8														
							<u>40</u>		<u>C-6</u> GW(C)		grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 9.5 inches.			
9														
30														
							<u>50</u>		<u>C-7</u> GW(C)		Maximum size of the cobbles encountered is 4.5 inches.			
10														
35														
11														
							<u>48</u>		<u>C-8</u> GW(C)		Maximum size of the cobbles encountered is 7.5 inches.			
12														
40														
							<u>58</u>		<u>C-9</u> GP(C)		grades to poorly GRAVEL with cobbles. Maximum size of the cobbles encountered is 11 inches.			
13														
45														



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14									C-10 GP(C)		Maximum size of the cobbles encountered is 9 inches.			
15														
50														
16									C-11A GP		grades to poorly graded GRAVEL.			
55									C-11B		54.7 to 81.0 feet: Meta welded Lapilli Tuff, bluish gray, fine to medium grained, fresh, very weak (R1) to strong (R4). Discontinuities are very closely to medium spaced and in poor to fair condition. No HCl reaction. (CR = 88 to 100%, RQD = 31 to 98%, FF=1.1 to 3.8)			
17									C-12		54.7 feet: Very weak (R1) rock. Discontinuities are very closely to closely spaced and in poor to fair condition.			
									14		55.8 feet: PLT - Very weak (R1) rock.			
18											grades to moderately weak (R2) to moderately strong (R3) rock. Discontinuities are closely to medium spaced.			
60											57.3 feet: PLT - moderately strong (R3) rock.			
											58.5 feet: PLT - moderately strong (R3) rock.			
19									C-13		grades to moderately strong (R3) to strong (R4) rock. Discontinuities are medium spaced and in fair condition.			
											PLT - strong (R4) rock.			
65											PLT - moderately strong (R3) rock.			
20									C-14		Discontinuities are closely to medium spaced.			
											PLT - moderately strong (R3) rock.			
21														
70														

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22							100 1.2		C-15		PLT - moderately weak (R2) rock.			
75									16		PLT - moderately strong (R3) rock.			
23							100 2.0		C-16		PLT - moderately weak (R2) rock.			
24									15		PLT - moderately strong (R3) rock.			
80														
25											Bottom of boring at 81 feet below the mudline. Backfilled to ground surface with bentonite chips.			
85											Lake level measurements: -06/14/09 at 09:30: 17 feet above the mudline -06/15/09 at 08:45: 17.3 feet above the mudline -06/16/09 at 08:00: 17.7 feet above the mudline			
26														
27														
90														
28														
95														



LOG OF TEST BORING

Start Card _____

Job No. 33758654.00009 SR 90 Elevation 2538.1 ft (773.6 m)

HOLE No. SSD-011-09

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start June 25, 2009 Completion June 29, 2009 Well ID# Not applicable Equipment CME 45 (Skid rig) with auto hammer

Station 1351+36 Offset 7.4 R Casing HWT, HQ Method Wet Rotary

Northing 1067246.28 Easting 1753716.6 Latitude _____ Longitude _____

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 18.0 feet: Poorly to well graded GRAVEL with or without cobbles, angular to subangular, gray, bluish gray or brownish gray, wet, homogenous, no HCl reaction.			
1														
5														
2														
3														
10											8.5 feet: Well graded GRAVEL.			
4														
15														
5														
4											grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 7 inches.			
5														
6														
20														
18.0											18.0 to 32.7 feet: Poorly to well graded GRAVEL with or without cobbles, angular to subangular, bluish gray to brownish gray, wet, homogenous, no HCl reaction. 18.0 feet: Poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 7.5 inches.			
20														

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7							44	C-4 GW(C)		grades to well graded GRAVEL with sand and cobbles. Maximum size of the cobbles encountered is 3.5 inches.	▽		
25							48	C-5 GW		grades to well graded GRAVEL with sand.			
30							25	C-6A GW					
10							100 1.8	C-6B 11		32.7 to 58.0 feet: Meta welded Lapilli Tuff, greenish gray to gray, fine to medium grained, fresh to slightly weathered, moderately strong (R3) to strong (R4). Discontinuities are closely to medium spaced and in poor to fair condition. No HCl reaction. (CR =98 to 100%, RQD=50 to 100%, FF= 0 to 2.2) 32.7 feet: Slightly weathered to fresh, moderately strong (R3) rock. Discontinuities are closely to medium spaced and in poor to fair condition. 33.7 feet: PLT - very weak (R1) rock.			
35							100 1.2	C-7		PLT - moderately weak (R2) rock.			
11							100 1.2	C-8 17		grades to fresh, moderately strong (R3) to strong (R4) rock. Discontinuities are closely to medium spaced and in fair condition. PLT - moderately strong (R3) rock. PLT - moderately strong (R3) rock.			
12													
40													
13													
45													

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14											PLT - moderately strong (R3) rock.			
									C-9					
15										14		PLT - moderately strong (R3) rock.		
50														
16											PLT - moderately strong (R3) rock. Discontinuities are in poor to fair condition.			
									C-10					
55														
17											PLT - moderately strong (R3) rock.			
									C-11					
									19					
18											PLT - moderately strong (R3) rock.			
											Bottom of boring at 58.0 feet below the ground surface. Backfilled to ground surface with bentonite chips.			
60											Water level measurements:			
											-06/29/09 at 12:40: 20.6 feet below the ground surface.			
19														
65														
20														
21														
70														



LOG OF TEST BORING

Start Card _____

Job No. 33758654.00009 SR 90 Elevation 2533.4 ft (772.2 m)

HOLE No. SSD-012-09

Sheet 1 of 4

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start June 23, 2009 Completion June 23, 2009 Well ID# Not applicable Equipment CME 45 (track rig) with auto hammer

Station 1362+10 Offset 19.1 R Casing HWT 38', HQ 81' Method Wet Rotary

Northing 1066243.33 Easting 1754078.27 Latitude _____ Longitude _____

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										0 to 15 feet: Silty SAND with gravel (fine), angular, loose to very dense, brownish gray, wet, homogenous, no HCl reaction. 5 feet: Loose.			
1													
5						50		D-1 SM	5 4 4 (8)				
2													
10						43		D-2 SM	4 6 4 (10)				
3													
15						0 98		D-3 GC(G)	50 for 4" (>50)	15 to 36 feet: Poorly to well graded GRAVEL with cobbles and boulders, angular to subangular, greenish gray to gray, wet, homogenous, no HCl reaction. 15 feet: Poorly graded GRAVEL with boulders. Maximum size of the boulders encountered is 13 inches. 16.5 feet: grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 7 inches.			
5						51		C-5 GW(C)					
6													
20													

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7							18		C-6 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 4 inches.			
25							26		C-7 GP(C)		Maximum size of the cobbles encountered is 3 inches.			
30							50		C-8 GW(C)		grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 4.5 inches.			
35							100 2.0		C-9		36 to 81 feet: Meta welded Lapilli Tuff, greenish gray, brownish gray to bluish gray, fine to coarse grained, fresh to slightly weathered, very weak (R1) to strong (R4). Discontinuities are very closely to medium spaced and in poor to fair condition. None to weak HCl reaction. (CR =88 to 100%, RQD = 22 to 96%, FF= 0 to 3.0) 36 feet: Greenish gray, fine to medium grained, slightly weathered, moderately weak (R2) to moderately strong (R3) rock. Discontinuities are closely to medium spaced and in poor to fair condition. No HCl reaction 37 feet: PLT - Strong (R4) rock.			
40							100 1.8		C-10		grades to gray, fine to coarse grained, slightly weathered to fresh, moderately weak (R2) to moderately strong (R3). Discontinuities are closely to medium spaced and in fair condition. 41.2 feet: PLT - very weak (R1) rock. 42.3 feet: PLT - very weak (R1) rock.			
45														

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14									C-11		PLT - very weak (R1) rock.			
15											PLT - very weak (R1) rock.			
50									C-12		grades to greenish gray, moderately weak (R2) rock. Discontinuities are in poor to fair condition. 51.5 feet: PLT - very weak (R1) rock.			
16														
55									C-13		grades to brownish gray, very weak (R1) to moderately weak (R2) rock.			
17														
18											PLT - very weak (R1) rock.			
60									C-14		grades to brownish gray to bluish gray, fine to medium grained, moderately weak (R2) to moderately strong (R3) rock. Discontinuities are very closely to closely spaced and in poor to fair condition. Note: 2-inch thick clay was encountered at 62.6 feet. 61.4 feet: PLT - moderately weak (R2) rock.			
19														
65									C-15		grades to bluish gray, moderately strong (R2) rock.			
20														
21										10	PLT - strong (R4) rock.			
70														

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22							$\frac{96}{0}$		C-16		PLT - very weak (R1) rock. grades to fresh, moderately strong (R2) to strong (R4) rock. No discontinuities. PLT - moderately strong (R3) rock.			
75									13		PLT - moderately weak (R2) rock.			
23							$\frac{98}{0.6}$		C-17		Discontinuities are closely to medium spaced and in fair condition. None to weak HCl reaction.			
24											PLT - moderately weak (R1) rock.			
80											Bottom of boring at 81.0 feet depth below the ground surface. Backfilled to ground surface with bentonite chips. Water level measurements: -06/24/09 at 07:45: 18.4 feet below the ground surface.			
25														
85														
26														
27														
90														
28														
95														



LOG OF TEST BORING

Start Card S26175

Job No. 33758654.00009 SR 90

Elevation 2539.6 ft (774.1 m)

HOLE No. SSD-013-09

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start November 5, 2009 Completion November 5, 2009 Well ID# Not applicable Equipment CME 45 (Skid rig) with auto hammer

Station 1351+55 (Nov. 2007) Offset 110.5 L Casing HQ Method Wet Rotary

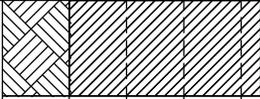
Northing 1067289.16 Easting 1753828.1 Latitude 47°1'24.64"N Longitude 121°2'00.44"W

County Kittitas Subsection NW1/4 of NE1/4 Section 35 Range 11 Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 7.5 feet: Silty SAND with fine gravel or poorly graded GRAVEL with cobbles, angular, very dense, gray, moist to wet, homogenous, no HCl reaction. 0 feet: Silty SAND with gravel.			
5						0			D-1 GC(2)	50 for 4"	grades to very dense, poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 7.5 inches.			
2						100			D-3 SM	13 50 for 2"	grades to silty SAND with gravel.			
3						100			C-4A CB		grades to poorly graded GRAVEL.			
10						92			C-5		7.5 to 21.5 feet: Metawelded Lapilli Tuff, greenish gray to bluish gray, fine to medium grained, fresh to slightly weathered, moderately weak (R2) to strong (R4) rock. Discontinuities are very closely to medium spaced and in very poor to good condition. (CR-73 to 127%, RQD - 23 to 69%, FF - 1.3 to 2.8) 7.5 feet: fresh to slightly weathered, moderately weak (R2) to strong (R4) rock. Discontinuities are very closely to closely spaced and in very poor to poor condition. 8.3 feet - PLT: Moderately weak (R2) rock. Note: A 1 to 2 mm thick brown clay filling at dip angles 65 deg., 30 deg. and 30 deg. was encountered within bedrock at 8.7 feet, 10.0 feet and 11.0 feet depth, respectively. 8.8 feet: PLT: Very weak (R1) rock. 9.0 feet: Very weak (R1) rock. 9.5 feet: Note: A 2-inch thick silty sand infilling at a dip angle of 70 deg. was encountered within bedrock. 11.5 feet: grades to fresh, strong (R4) rock. Note: A 0.5 to 1 inch thick, soft, brown, clay filling with 75 deg. dip angle was encountered within bedrock at 11.5 feet depth. 14.2 feet: PLT: Very strong (R5) rock. 15.7 feet: Note: A 2 mm thick, soft, clay filling at dip angle 70 deg. was encountered within bedrock. 16.5 feet: Discontinuities are closely to medium spaced and in fair to good condition. 17.7 feet: PLT: very strong (R5) rock.			
4						100			C-6					
15						127			C-7					
5						100			C-8					
20														

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
							$\frac{73}{1.3}$					Discontinuities are very closely to closely spaced.		
												PLT: Very strong (R5) rock.		
												Bottom of the boring at 21.5 feet depth below ground surface. Backfilled to ground surface with bentonite chips.		
7														
25														
8														
9														
30														
10														
35														
11														
12														
40														
13														
45														



LOG OF TEST BORING

Start Card R72794

Job No. 33758654.00009 SR 90

Elevation 2539.4 ft (774.0 m)

HOLE No. SSD-014-09

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start November 3, 2009 Completion November 4, 2009 Well ID# SSD-014-09 (OW) Equipment CME 45 (Skid rig) with auto hammer

Station 1352+24 (Nov. 2007) Offset 112.0 L Casing HQ Method Wet Rotary

Northing 1067226.92 Easting 1753864.74 Latitude 47°1'24.03"N Longitude 121°1'59.90"W

County Kittitas Subsection NW1/4 of NE1/4 Section 35 Range 11 Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0							10		C-1 SM		0 to 8.2 feet: Silty SAND with gravel to poorly graded GRAVEL, angular to rounded, gray to reddish brown, very dense, moist to wet, homogenous, no HCl reaction. 0 feet: Silty SAND with gravel (based on field observations).			
1														
5							50		C-2 SM					
2							33		D-3 SM					
3							100 1.0		C-4A C-4B		grades to poorly graded GRAVEL.			
10							76 3.0		C-5		8.2 to 26.0 feet: Metawelded Lapilli tuff, greenish gray to gray, fine to coarse grained, fresh, moderately strong (R3) to strong (R4). Discontinuities are very closely to medium spaced and in poor to fair condition. (CR - 76 to 100%, RQD - 24 to 90%, FF - 1.0 to 3.0) 8.2 feet: Moderately strong (R3) to strong (R4) rock. Discontinuities are closely to medium spaced and in fair condition. 8.7 feet: Note: A 1mm thick, soft, brown clay infilling at 60 deg. dip angle was encountered within bedrock at 8.7 feet depth. 8.9 feet: PLT: Moderately weak (R2) rock. 11.0 feet: Discontinuities are very closely to medium spaced and in poor to fair condition. 11.2 feet: PLT: Moderately weak (R2) rock. 12.5 feet: A 1-inch thick silty sand infilling at a dip angle of 75 degrees was encountered within bedrock.			
4														
15														
5							98 1.8		C-6		16.7 feet: PLT: Strong (R4) rock. 17.0 feet: A 1 to 2 mm thick sandy clay at a dip angle of 50 deg. was encountered within bedrock.			
6														
20														

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7											grades to strong (R4) rock. Discontinuities are in fair to poor condition. PLT: very weak (R1) rock.			
25									C-7		PLT: Moderately strong (R3) rock.			
8											Bottom of boring at 26.0 feet depth below ground surface (bgs). A 1-inch diameter observation well was installed. Water level measurements: -11/4/2009 at 12:30 : 7.0 feet depth bgs before observation well installation.			
9														
30														
10														
35														
11														
40														
12														
45														
13														



LOG OF TEST BORING

Start Card S26175

Job No. 33758654.00009 SR 90

Elevation 2537.9 ft (773.6 m)

HOLE No. SSD-015-09

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start November 3, 2009 Completion November 3, 2009 Well ID# Not applicable

Equipment CME 45 (Skid rig) with auto hammer

Station 1353+12 (Nov. 2007) Offset 110.5 L Casing HQ

Method Wet Rotary

Northing 1067145.46 Easting 1753906.11 Latitude 47°1'23.24"N

Longitude 121°1'59.28"W

County Kittitas Subsection NW1/4 of NE1/4 Section 35 Range 11 Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0							0							
1														
5							80			16 for 6"				
							0		D-2					
							100		C-3A					
							0		C-3B					
2							100		C-4					
							0							
							98		C-5					
							2							
10							100		C-6					
							2							
							100							
							2							
4							96		C-7					
							1.2							
15							96							
							1.2							
5							96							
							1.2							
20							96							
							1.2							

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
												PLT: Strong (R4) rock. Bottom of boring at 21.5 feet depth below ground surface.		
7														
25														
8														
9														
30														
10														
35														
11														
12														
40														
13														
45														



Start Card _____

Job No. 33761951.00008 SR 90

Elevation 2542.4 ft (774.9 m)

HOLE No. SSD-016-10

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Dennis Dunn

Start July 27, 2010 Completion July 27, 2010 Well ID# Not applicable

Equipment CME 45 (Skid rig) with auto hammer

Station _____ Offset _____ Casing _____ Method Wet Rotary

Northing 1067427.88 Easting 1753725.47 Latitude 47°21'26.00"N Longitude 121°22'01.95"W

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0	0						20		C-1 GP		0 to 0.67: Asphalt surface. 0.67 to 6.0 feet: Poorly graded GRAVEL, subangular, brownish gray.			
5	5								C-2A GP					
2	2					84	1		C-2B		6.0 to 20.0 feet: Lapilli Tuff, greenish gray, coarse grained, fresh to slightly weathered, strong (R4). Discontinuities are closely spaced and in poor to good condition. (CR - 84 to 100%, RQD - 52 to 78%, FF - 1 to 2) 6.0 feet: Slightly weathered rock. Discontinuities are closely spaced and in poor to good condition. 8.8 feet: PLT - Moderately weak (R2) rock.			
10	10					100	1.6		C-3		9.9 feet: PLT - Very weak (R1) rock. 10 feet: grades to fresh rock. Discontinuities are closely spaced and in fair condition.			
4	4										PLT - Moderately strong (R3) rock.			
15	15					100	2		C-4		PLT - Moderately weak (R2) rock. grades to fresh to slightly weathered rock. Discontinuities are closely spaced and in fair condition.			
5	5													
20	20										PLT - Moderately weak (R2) rock.			

DRAFT ROCKN BORINGS & TESTPITS 2010.GPJ 9/14/10



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90

Elevation 2542.4 ft (774.9 m)

HOLE No. SSD-016-10

Sheet 2 of 2

Project I-90 Snoqualmie Pass East

Driller Robert Haller

Lic# 2779

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7											PLT - Moderately strong (R3) rock. Borrom of boring at 20.0 feet. Backfilled to ground surface with bentonite chips. Asphalt was patched upon completion.			
25														
8														
9														
30														
10														
35														
11														
12														
40														
13														
45														



Start Card _____

Job No. 33761951.00008 SR 90

Elevation 2540.4 ft (774.3 m)

HOLE No. SSD-017-10

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Dennis Dunn

Start July 26, 2010 Completion July 1, 2010 Well ID# Not applicable Equipment CME 45 (Skid rig) with auto hammer

Station _____ Offset _____ Casing _____ Method Wet Rotary

Northing 1067347.37 Easting 1753779.06 Latitude 47°21'25.21"N Longitude 121°22'01.16"W

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0							40				0 to 0.7 feet: Asphalt 0.7 to 4.8 feet: Poory graded GRAVEL with cobbles., subangular, gray to brown. Maximum size of the cobbles encountered is 6 inches.			
5							$\frac{96}{96}$ 1		C-1A GP(C) C-1B C-2		4.8 to 20 feet: Lapilli Tuff, greenish gray, coarse grained, fresh, strong (R4). Discontinuities are closely spaced and in fair to good condition. (CR - 96 to 100%, RQD - 76 to 100%, FF- 1 to 2) 4.8 feet: Discontinuities are closely spaced and in fair condition. PLT - Very strong (R5) rock. PLT - Very strong (R5) rock.			
10							$\frac{88}{2}$		C-3		PLT - Strong (R4) rock. PLT - Very strong (R5) rock.			
15							$\frac{100}{12}$		C-4		Discontinuities are closely spaced and in good condition. PLT - Very strong (R5) rock. PLT - Very strong (R5) rock.			
20														



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90

Elevation 2540.4 ft (774.3 m)

HOLE No. SSD-017-10

Sheet 2 of 2

Project I-90 Snoqualmie Pass East

Driller Robert Haller

Lic# 2779

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7														
25														
8														
9														
30														
10														
35														
11														
12														
40														
13														
45														

Bottom of boring at 20 feet depth below the ground surface. Backfilled to ground surface with bentonite chips. Asphalt was patched at completion.



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90 Elevation 2630.3 ft (801.7 m)

HOLE No. SSD-018-10

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Dennis Dunn

Start July 20, 2010 Completion July 20, 2010 Well ID# Not applicable Equipment CME 45 (Skid rig) with auto hammer

Station _____ Offset _____ Casing _____ Method Wet Rotary

Northing 1067398.25 Easting 1753891.93 Latitude 47°21'25.73"N Longitude 121°21'59.53"W

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0									C-1 GP(C)		0 to 35.0 feet: Poorly to well graded GRAVEL with cobbles and occasional boulders, subangular, loose to very dense, brown to gray, moist, no HCl reaction. 0 feet: Poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 6 inches.			
1														
5									D-2 GP	6 4 5 (9)	grades to loose, poorly graded GRAVEL with sand.			
2									C-3 GP(C)		6.5 feet: grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 6 inches.			
10									D-4 GP	6 5 9 (14)	grades to medium dense, poorly graded GRAVEL with sand.			
4									C-5 GP(C)		grades to poorly graded GRAVEL with cobbles. Note: Trace organics were observed.			
15									D-6 GP	20 35 50/3" (>50)	grades to very dense, poorly graded GRAVEL with sand and silt.			
5									C-7 GP(C/B)		16.3 feet: grades to poorly graded GRAVEL with cobbles.			
20														

DRAFT ROCKN BORINGS & TESTPITS 2010.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
						53			D-8 GP	16 28 16 (44)	grades to dense, poorly graded GRAVEL with sand.			
						69			C-9 GP(C)		21.5 feet: grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 6 inches.			
7														
25						80			C-10 GP(C/B)		grades to poorly graded GRAVEL with cobbles and boulders.			
8														
30						66			C-11 GP(C/B)					
9														
35						88			C-12		35.0 to 55.0 feet: Lapilli Tuff, greenish gray, coarse grained, fresh, strong (R4). Discontinuities are medium to widely spaced and in fair to good condition. No HCl reaction (CR- 88 to 100%, RQD - 72 to 100%, FF - 0 to 1.2)			
11											35.0 feet: Discontinuities are widely spaced and in good condition.			
40						100			C-13		40.2 feet: PLT - Strong (R4) rock.			
12														
45											PLT - Strong (R4) rock.			
13														

DRAFT ROCKN BORINGS & TESTPITS 2010.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14							$\frac{100}{1.2}$		C-14		Discontinuities are medium spaced and in fair condition.			
15												PLT - Strong (R4) rock.		
50							$\frac{100}{0.6}$		C-15		Discontinuities are medium spaced and in good condition.			
16												PLT - Strong (R4) rock. PLT - Strong (R4) rock.		
55											Bottom of boring at 55 feet depth below ground surface. Backfilled to ground surface with bentonite chips.			
17														
18														
60														
19														
65														
20														
21														
70														



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90 Elevation 2634.1 ft (802.9 m)

HOLE No. SSD-019-10

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Dennis Dunn

Start July 21, 2010 Completion July 22, 2010 Well ID# Not applicable Equipment CME 45 (Skid rig) with auto hammer

Station _____ Offset _____ Casing _____ Method Wet Rotary

Northing 1067406.61 Easting 1753896.56 Latitude 47°21'25.81"N Longitude 121°21'59.46"W

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											Note: This boring was drilled at a 45 degree angle into the rock slope. 0 to 35.0 feet: Poorly graded GRAVEL with cobbles and boulders, subangular, brown to gray.			
1														
5														
2							<u>50</u>		<u>C-1</u> GP(C)		6 feet: Poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 3 inches.			
10							<u>52</u>		<u>C-2</u> GP(C)		Maximum size of the cobbles encountered is 6 inches.			
4														
15							<u>68</u>		<u>C-3</u> GP(C/B)		grades to poorly graded GRAVEL with cobbles and boulders. Maximum size of the boulders encountered is 14 inches.			
5														
6														
20														



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
							<u>56</u>		C-4 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 10 inches.			
7														
25							<u>76</u>		C-5 GP(C)					
8														
30							<u>68</u>		C-6 GP(C/B)		grades to poorly graded GRAVEL with cobbles and boulders.			
9														
35							<u>94</u> 2		C-7		35.0 to 50.0 feet: Lapilli Tuff, greenish gray, coarse grained, fresh to slightly weathered, moderately strong (R3) to strong (R4). Discontinuities are moderately spaced and in fair to good condition. No HCl reaction. (CR - 84 to 100%, RQD - 40 to 94%, FF - 0.4 to 2.0) 35.0 feet: Slightly weathered, moderately strong (R3) rock. Discontinuities are closely spaced and in fair condition.			
10														
35							<u>84</u> 1		C-8		grades to fresh, strong (R4) rock. Discontinuities are medium spaced and in good condition.			
11														
40														
12														
45														
13														

DRAFT ROCKN BORINGS & TESTPITS 2010.GPJ 9/14/10



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90

Elevation 2634.1 ft (802.9 m)

HOLE No. SSD-019-10

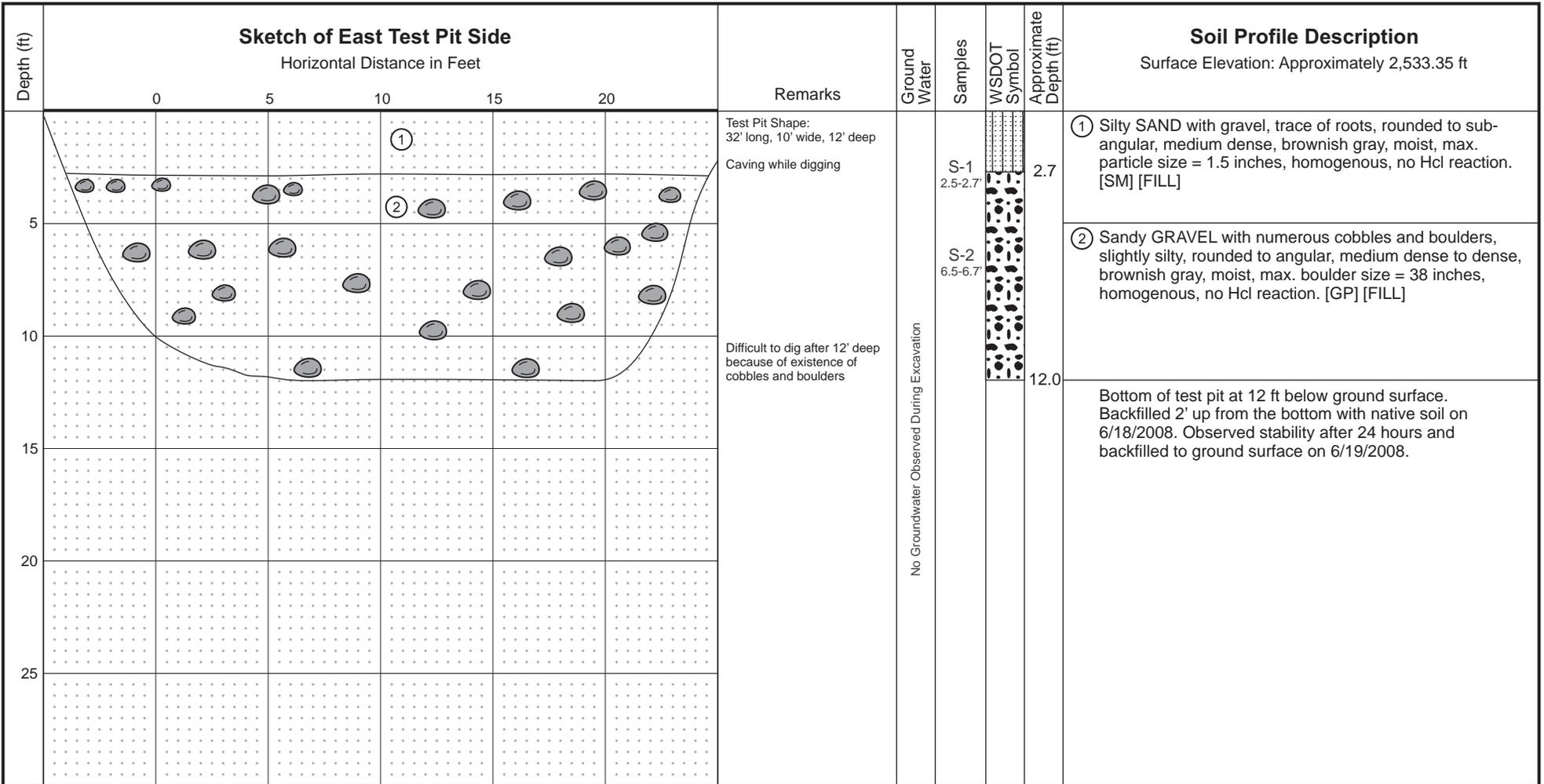
Sheet 3 of 3

Project I-90 Snoqualmie Pass East

Driller Robert Haller

Lic# 2779

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14							100							
15							0.4							
50											Bottom of boring at 50.0 feet depth below ground surface. Backfilled to ground surface with bentonite chips.			
16														
55														
17														
18														
60														
19														
65														
20														
21														
70														



NOTES

- The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
- Refer to Soil Classification and Log Key for explanation of "Symbols" and definitions.
- WSDOT designation is based on visual-manual classification.

LEGEND

- Roots
- Seepage
- Cobble or boulder
- Log

TEST PIT LOCATION

Northing 1067054.35 Subsection NW
 Easting 1753851.50 Section NE
 Latitude 47° 21' 22.330" N Range 11E
 Longitude 121° 22' 00.060" W Township 22N
 Station 1354 + 85.627 County Kittitas
 (April 2008)

I-90 Snoqualmie Pass East

Log of Test Pit SSD-TP-001-08

Job No. 33758632

June 2008

URS 1501 4th Avenue, Suite 1400
Seattle, Washington, 98101-1616

Figure X.X



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2543.9 ft (775.4 m)

HOLE No. SSE-004-08

Sheet 1 of 1

Project I-90 Snoqualmie Pass East

Driller Christian Nead Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Abhijit Bathe

Start May 19, 2008 Completion May 19, 2008 Well ID# Not Applicable Equipment 5500-1 (Skid rig) w/ manual-hammer

Station 1333+79.51 Offset 3.28'L Casing HW, HQ Method Wet Rotary

Northing 1068571.97 Easting 1752574.48 Latitude 47°21'37.167"N Longitude 121°22'18.848"W

County Kittitas Subsection SE1/4 of SW1/4 Section 26 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
									C-1 GP(C/B)		0 to 0.3 feet: Asphalt concrete pavement. 0.3 to 13.6 feet: Poorly graded GRAVEL with or without sand, occasional cobbles and boulders, subangular, dense to very dense, brown to gray, wet, homogeneous, HCl reaction not tested. 0.3 feet: Poorly graded GRAVEL with cobbles and boulders. 2.5 feet: grades to poorly graded GRAVEL.			
1						68			D-2 GP	13 34 24 (58)				
5						90			C-3 GP					
						46			C-4 GP(C/B)		grades to poorly graded GRAVEL with occasional cobbles and boulders.			
2											7 feet: loss of drilling circulation.			
10						48			C-5A GP(C/B)					
4									C-5B C-6		13.6 to 17.5 feet: Meta welded lapilli tuff, dark greenish gray, medium grained, fresh, strong (R4) rock. Discontinuities are closely spaced and in fair condition. (CR=94-100%, 44-100%, FF=2.28-2.5)			
15						100 94 2.28								
5														
6											Bottom of boring at 17.5 feet below ground surface (bgs). Backfilled with asphalt material from 0 to 0.8 ft bgs, with silty sand with gravel from 0.8 to 3.8 ft bgs and with bentonite chips from 3.8 to 17.5 ft bgs.			
20														

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/14/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2545.7 ft (775.9 m)

HOLE No. SSE-005-08

Sheet 1 of 1

Project I-90 Snoqualmie Pass East

Driller Robert Grocery Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Ken Yang

Start May 15, 2008 Completion May 15, 2008 Well ID# Not Applicable Equipment 5500-1 (Skid rig) w/ manual-hammer

Station 1333+99.62 Offset 25.61'R Casing HW, HQ Method Wet Rotary

Northing 1068553.67 Easting 1752549.96 Latitude 47°21'36.984"N Longitude 121°22'19.201"W

County Kittitas Subsection SE1/4 of SW1/4 Section 26 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										0 to 0.3 feet: Asphalt concrete pavement. 0.3 to 6.5 feet: Silty SAND with gravel to silty GRAVEL with sand, subangular, medium dense to dense, brown to gray, moist to wet, homogenous, no HCl reaction.			
1						67		D-1 SM	14 18 19 (37)	2.0 feet : Dense, silty SAND with gravel.			
5						27		D-2 GM	5 6 6 (12)	grades to medium dense, silty GRAVEL with sand.			
2						20		D-3 SP	5 3 5 (8)	6.5 to 13.7 feet: Poorly graded SAND with gravel, subangular, loose, gray, wet, homogenous, no HCl reaction. 7 feet: Poorly graded SAND with gravel.			
10						0		D-4 SP/SM	9 4 3 (7)	No recovery. Material was probably washed away. Material is probably poorly graded SAND or silty SAND.			
4						18		C-5 SP		grades to poorly graded SAND with gravel.			
15						54		C-6 GP(C)		13.7 to 18 feet: Poorly graded GRAVEL with sand and cobbles, angular, very dense, gray, moist, homogenous, no HCl reaction.			
5						0		D-7 GP(C)	50 for 4" (>50)				
6						85		C-8 GP(C)					
20										Bottom of boring at 18.0 feet below ground surface (bgs). Backfilled with asphalt material from 0 to 0.4 ft bgs, with silty sand with gravel from 0.4 to 6.0 ft bgs and with bentonite chips from 6 ft to 18 ft bgs.			

DRAFT ROCKN BORINGS I-90-2008-KM.GPJ 9/14/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2539.3 ft (774.0 m)

HOLE No. SSE-006-08

Sheet 1 of 1

Project I-90 Snoqualmie Pass East

Driller Christian Nead Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Abhijit Bathe

Start May 15, 2008 Completion May 15, 2008 Well ID# Not Applicable Equipment 5500-1 (Skid rig) w/ manual-hammer

Station 1368+15.88 Offset 39.82'R Casing HW, HQ Method Wet Rotary

Northing 1065655.09 Easting 1754212.1 Latitude 47°21'08.562"N Longitude 121°21'54.601"W

County Kittitas Subsection SE1/4 of NE1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0	0										0 to 0.2 feet: Asphalt concrete pavement.			
0.2	0.2										0.2 to 4.5 feet: Poorly graded to well graded GRAVEL with sand, subrounded to angular, very dense, gray, wet, homogenous, HCl reaction not tested.			
1	1								D-1 GW	50 for 6" (>50)	2.5 feet: Well graded GRAVEL with sand.			
5	5						82 1.1		D-2 GP C-3	50 for 5.5" (>50)	grades to poorly graded GRAVEL with sand.			
9	9										4.5 to 9.0 feet: Meta welded Lapilli Tuff, gray, fine to medium grained, fresh, strong (R4) rock, Discontinuities are closely spaced, and in fair condition. CR= 82%, RQD= 60%, FF= 1.1			
10	10										Bottom of boring at 9.0 feet below ground surface (bgs). Backfilled with asphalt material from 0 to 0.7 feet, with silty sand with gravel from 0.7 to 3.7 ft bgs and with bentonite chips from 3.7 to 9.0 ft bgs.			

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/14/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2535.7 ft (772.9 m)

HOLE No. SSE-009-08

Sheet 1 of 1

Project I-90 Snoqualmie Pass East

Driller Robert Grocery Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Ken Yang

Start May 15, 2008 Completion May 15, 2008 Well ID# Not Applicable Equipment 5500-1 (Skid rig) w/ manual-hammer

Station 1438+90.59 Offset 156.61'L Casing HW, HQ Method Wet Rotary

Northing 1060905.38 Easting 1757638.51 Latitude 47°20'22.060"N Longitude 121°21'04.104"W

County Kittitas Subsection NE1/4 of NW1/4 Section 1 Range 12E Township 21N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										0 to 4.0 feet: Silty SAND with gravel, subangular, dense, brownish gray, moist, homogenous, no HCl reaction.			
1								D-1 SM	17 25 22 (47)				
5								D-2 SC	8 21 50 for 5.5" (>50)	4.0 to 6.5 feet : Clayey SAND, subangular to angular (for coarse granular particles), very dense, reddish brown, moist, medium plasticity, no HCl reaction.			
2								D-3 SM	16 26 21 (47)	6.5 to 8.5 feet: Silty SAND with gravel, subangular, dense, brownish gray, moist, homogenous, no HCl reaction.			
10										Bottom of boring at 8.5 feet below ground surface (bgs). Backfilled to ground surface with bentonite chips.			
15													
20													

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/14/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2533.5 ft (772.2 m)

HOLE No. SSE-010-08

Sheet 1 of 1

Project I-90 Snoqualmie Pass East

Driller Christian Nead Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Abhijit Bathe

Start May 8, 2008 Completion May 8, 2008 Well ID# Not Applicable Equipment 5500-1 (Skid rig) w/ manual-hammer

Station 1384+03.92 Offset 89.46'L Casing HW, HQ Method Wet Rotary

Northing 1064103 Easting 1754598.28 Latitude 47°20'53.288"N Longitude 121°21'48.747"W

County Kittitas Subsection NE1/4 of SE1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0	0									0 to 0.5 feet: Asphalt concrete pavement. 0.5 to 6.5 feet : Silty GRAVEL to well graded GRAVEL with sand, subrounded, medium dense, brown, moist, homogenous, no HCl reaction.			
1	0						<u>50</u>		D-1 GM	7 13 9 (21)			
5	1.5						<u>33</u>		D-2 GW	5 10 6 (16)	grades to well graded GRAVEL with sand.		
2	1.5					<u>40</u>		D-3 SM	1 1 0 (1)	6.5 to 8.5 feet: Silty SAND with gravel, subrounded, very loose, brown, moist, homogenous, no HCl reaction.			
10	3									Bottom of boring at 8.5 feet below ground surface (bgs). Backfilled with asphalt patching material from 0 to 0.6 ft bgs and with silty SAND with gravel from 0.6 to 8.5 ft bgs.			
4	1.2												
15	4.5												
5	1.5												
6	1.8												
20	6												

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/14/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90 Elevation 2533.5 ft (772.2 m)

HOLE No. SSE-011-08

Sheet 1 of 1

Project I-90 Snoqualmie Pass East

Driller Christian Nead Lic# N/A

Drilling Contractor CRUX Subsurface, Inc.

Inspector Abhijit Bathe

Start May 14, 2008 Completion May 14, 2008 Well ID# Not Applicable Equipment 5500-1 (Skid rig) w/ manual-hammer

Station 1390+60.39 Offset 68.91'L Casing HW, HQ Method Wet Rotary

Northing 1064102.09 Easting 1754602.45 Latitude 47°20'53.279"N Longitude 121°21'48.686"W

County Kittitas Subsection NE1/4 of SE1/4 Section 35 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 6.5 feet: Poorly graded GRAVEL to silty GRAVEL with sand, angular, dense to very dense, brown to gray, wet, homogenous, HCl reaction not tested. 2.5 feet: Dense, poorly graded GRAVEL with sand.			
1						47			D-1 GP	18 14 24 (38)				
5						100			C-2 GP					
						80			D-3 GM	12	grades to very dense, silty GRAVEL with sand.			
2						0			C-4a GM C-4b	50 for 6" (>50)				
						100 0.8					6.5 to 13.5 feet: Metawelded lapilli tuff, gray to brown, fine to medium grained, slightly to moderately weathered, moderately weak (R2) to moderately strong (R3) rock. Discontinuities are closely spaced, and in poor to fair condition. CR=100%, RQD= 54%-80%, FF= 0.8 to 2.2			
						100 2.2			C-5		6.5 feet: Slightly weathered, moderately strong (R3) rock. Discontinuities are in fair condition. 9.7 feet: grades to moderately weathered, moderately weak (R2) rock. Discontinuities are in poor to fair condition.			
15											Bottom of boring at 13.5 feet below ground surface. Backfilled to ground surface with bentonite chips.			
20														

DRAFT ROCKN BORINGS I-90.2008-KM.GPJ 9/14/10



LOG OF TEST BORING

Start Card S32596

Job No. 33758654.00009 SR 90

Elevation 2543.6 ft (775.3 m)

HOLE No. SSE-021-09

Sheet 1 of 1

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Pam Craig

Start June 15, 2009 Completion June 15, 2009 Well ID# Not applicable Equipment CME 45 (Skid rig) with auto hammer

Station 1310+90 (Nov. 2007) Offset 114 L Casing HQ Method Wet Rotary

Northing 1070795.88 Easting 1752523.44 Latitude 47°1'58.66"N Longitude 121°2'21.43"W

County Kittitas Subsection SE1/4 of NW1/4 Section 26 Range 11 Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0							100		D-1 SM	6 7 8 (15)	0 to 16.75 feet: Silty GRAVEL with sand, silty SAND with gravel or well graded GRAVEL with sand and cobbles, medium dense to very dense, angular to subrounded, moist to wet, brown to medium gray, homogenous, no HCl reaction. 0 feet: Medium dense, silty SAND with gravel. Note: Grass at the ground surface. 1.5 feet: grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 6 inches.			
1							30		C-2 GW(C)					
5														
2							67		D-3 GM	9 17 15 (32)	grades to dense, silty GRAVEL with sand.			
3							29		C-4 GW(C)		grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 4 inches.			
10														
4							89		D-5 SM	19 29 39 (68)	grades to very dense, medium gray with brownish red stained (weathering) silty SAND with gravel.			
4							100		C-6 GW		grades to well graded GRAVEL with sand.			
15														
5							100		D-7 GM	50 for 3"	grades to silty GRAVEL with sand.			
6											Bottom of boring at 16.75 feet depth below the existing ground surface. Backfilled to ground surface with bentonite chips.			
20														

DRAFT ROCKN BORINGS & TESTPITS 2009.GPJ 9/14/10



LOG OF TEST BORING

Start Card _____

Job No. 33758654.00009 SR 90

Elevation 2534.0 ft (772.4 m)

HOLE No. SSE-022-09

Sheet 1 of 1

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Pam Craig

Start June 17, 2009 Completion June 17, 2009 Well ID# Not applicable Equipment CME 45 (Skid rig) with auto hammer

Station 1383+58 (Nov. 2007) Offset 95.5 L Casing HQ Method Wet Rotary

Northing 1064145.37 Easting 1754609 Latitude 47°0'53.02"N Longitude 121°1'51.16"W

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0							67		D-1 SW	2	0 to 7.0 feet: Well graded GRAVEL, silty GRAVEL with sand or well graded SAND with gravel, angular to subangular, medium dense to dense, reddish brown, brownish gray or greenish gray, homogenous, moist, no HCl reaction.			
0.5						29		C-3 GW	8	9		0 feet: Medium dense, well graded SAND with gravel. 1.5 feet: grades to well graded GRAVEL.		
1														
5							60		D-2 GM	30	grades to dense, silty GRAVEL with sand.			
5.5						80		C-4A GW	28	14		grades to well graded GRAVEL.		
2														
7							80		C-4B		7.0 to 10.5 feet: Meta welded Lapilli Tuff, greenish gray, fine to medium grained, fresh, moderately weak (R2) to strong (R4). Discontinuities are closely spaced and in fair to poor condition. weak HCl reaction. (CR = 80 to 100%, RQD = 71 to 81%, FF = 1 to 2) 7.0 feet: Strong (R4) rock.			
10						100	1.4							
3														
10							100		C-5		PLT: strong (R4) rock.			
4														
15							100		C-6		grades to moderately weak (R2) rock. PLT: moderately strong (R3) rock.			
5														
18											Bottom of boring at 18.0 feet below the existing ground surface. Backfilled to ground surface with bentonite chips.			
20														



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90 Elevation 2524.7 ft (769.5 m)

HOLE No. SSE-025-10

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller Richard Cooper Lic# 2964T

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start April 29, 2010 Completion April 29, 2010 Well ID# Not applicable Equipment CME 45 (Skid rig) with auto hammer

Station _____ Offset _____ Casing HQ Method Wet Rotary

Northing 1060275.51 Easting 1757906.28 Latitude 47°20'15.87"N Longitude 121°21'00.12"W

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0							67	D-1 SM	1 2 13 (15)	0 to 21.5 feet: Silty SAND with gravel or silty GRAVEL or poorly graded GRAVEL with sand, occasional cobbles, angular to subrounded, medium dense to very dense, gray to yellowish to reddish brown, wet, homogenous, no HCl reaction. 0 feet: Medium dense, silty SAND with gravel.			
5							80	D-2 SM	3 5 29 (34)	8 feet: grades to medium dense, silty GRAVEL with sand.			
10							33	D-3 GM	5 6 11 (17)				
15							100 23	D-4 CB GP (C)	50/3" (>50)	grades to very dense, poorly graded GRAVEL with sand with occasional cobbles. Maximum size of the cobbles encountered is 3.5 inches.			
16.5							34	C-5B GM (C)		16.5 feet: grades to silty GRAVEL with sand and cobbles.			
20													

DRAFT ROCKN BORINGS & TESTPITS 2010.GPJ 9/14/10



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90

Elevation 2524.7 ft (769.5 m)

HOLE No. SSE-025-10

Sheet 2 of 2

Project I-90 Snoqualmie Pass East

Driller Richard Cooper Lic# 2964T

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
							<u>100</u>			9 24 50 (74)	20.0 feet: Very dense, silty SAND with fine gravel.			
7											Bottom of boring at 21.5 feet depth below the existing ground surface. Backfilled to ground surface with bentonite chips.			
25														
8														
9														
30														
10														
35														
11														
12														
40														
13														
45														



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90 Elevation 2534.3 ft (772.5 m)

HOLE No. SSE-026-10

Sheet 1 of 1

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start May 13, 2010 Completion May 13, 2010 Well ID# Not applicable Equipment CME 45 (Skid rig) with auto hammer

Station _____ Offset _____ Casing HQ Method Wet Rotary

Northing 1066156.43 Easting 1754183.67 Latitude 47°21'13.51"N Longitude 121°21'55.09"W

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0	0						25				0 to 4.0 feet: Well graded GRAVEL with sand, angular to subangular, brownish gray to gray, wet, homogenous, no HCl reaction.			
1	1													
5	5						80 3.0		C-2		4.0 to 13.0 feet: Meta Welded Lapilli Tuff, gray, fine to medium grained, fresh, moderately strong (R3) to strong (R4). Discontinuities are closely to medium spaced and in good condition. Weak HCl reaction. (CR = 80 to 100%, RQD = 30 to 97%, FF = 1.0 to 3.0) Discontinuities are closely to medium spaced. 5.5 feet: PLT - strong (R4) rock			
10	10						88 1.4		C-3					
10	10										9.8 feet: PLT - strong (R4) rock			
12.4	12.4								C-4		12.4 feet: PLT - strong (R4) rock			
13.0	13.0										Bottom of the boring at 13.0 feet below the existing ground surface. Backfilled to ground surface with bentonite chips.			
15	15													
20	20													



LOG OF TEST BORING

Start Card _____

Job No. 33761951.00008 SR 90 Elevation 2535.1 ft (772.7 m)

HOLE No. SSE-027-10

Sheet 1 of 1

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start May 12, 2010 Completion May 12, 2010 Well ID# Not applicable Equipment CME 45 (Skid rig) with auto hammer

Station _____ Offset _____ Casing HQ Method Wet Rotary

Northing 1065929.36 Easting 1754220.23 Latitude 47°21'11.27"N Longitude 121°21'54.53"W

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
							47			C-1A GP		0 to 0.3 feet: Asphalt 0.3 to 2.1 feet: Poorly graded GRAVEL, angular, gray, wet, homogenous, no HCl reaction.		
1							100 3.6			C-1B		2.1 to 9.0 feet: Meta Welded Lapilli Tuff, gray to brownish gray, fine to medium grained, slightly weathered, moderately weak (R2) to very strong (R5). Discontinuities are very closely to closely spaced and in poor to fair condition. No HCl reaction. (CR = 60 to 100%, RQD = 0 to 44%, FF = 1.6 to 3.5) 3.5 feet: grades to strong (R4) rock. Discontinuities are closely spaced. PLT - very strong (R5) rock 6.0 feet: grades to moderately strong (R3) to strong (R4) rock. Discontinuities are in poor to fair condition. 6.6 feet: PLT - very strong (R5) rock		
5						60 1.6				C-2				
2						90 2.7				C-3				
10												Bottom of boring at 9.0 feet below the existing ground surface. Backfilled to ground surface with bentonite chips.		
4														
15														
5														
20														



Start Card _____

Job No. 33761951.00008 SR 90 Elevation 2534.6 ft (772.5 m)

HOLE No. SSE-028-10

Sheet 1 of 1

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang

Start May 12, 2010 Completion May 12, 2010 Well ID# Not applicable Equipment CME 45 (Skid rig) with auto hammer

Station _____ Offset _____ Casing HQ Method Wet Rotary

Northing 1065705.15 Easting 1754278.75 Latitude 47°21'09.06"N Longitude 121°21'53.64"W

County Kittitas Subsection _____ Section _____ Range _____ Township _____

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0							25		C-1 GP		0 to 3.4 feet: Poorly graded GRAVEL with sand, angular to subrounded, gray to brown, wet, homogenous, no HCl reaction.			
1							14		C-2A					
5							100/2.5		C-2B		3.4 to 14.5 feet: Meta Welded Lapilli Tuff, gray, fine to medium grained, fresh, strong (R4) to very strong (R5). Discontinuities are closely to medium spaced and in fair to good condition. Weak HCl reaction.			
							35/0		C-3		(CR = 35 to 100%, RQD = 35% to 80%, FF = 0.0 to 2.5)			
2							100/1.0		C-4		3.4 feet: Meta Welded Lapilli Tuff, gray, fine to medium grained, fresh, strong (R4) to very strong (R5). Discontinuities are closely spaced and in good condition.			
											4.3 feet: PLT - very strong (R5) rock			
											7.0 feet: grades to strong (R4) rock. Discontinuities are closely to medium spaced and in fair to good condition.			
10											PLT - very strong (R5) rock			
4							100/1.6		C-5					
15											Bottom of boring at 14.5 feet depth below the existing ground surface. Backfilled to ground surface with bentonite chips.			
5														
20														

DRAFT ROCKN BORINGS & TESTPITS 2010.GPJ 9/14/10



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90 Elevation 2539.1 ft (773.9 m)

HOLE No. SW1-001-07

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller Mike Harvey Lic# 2599

Drilling Contractor WSDOT Field Exploration Unit

Inspector Suren Balendra

Start September 11, 2007 Completion September 11, 2007 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto-hammer

Station 1371+49.62 Offset 16.15 'R Casing HW3', HQ32.5' Method Wet Rotary

Northing 1065333.833 Easting 1754314.897 Latitude 47°21'05.403"N Longitude 121°21'53.057"W

County Kittitas Subsection SE 1/4 of NE 1/4 Section 35 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0									SM		0 to 3 feet: Topsoil - Silty SAND with gravel, dark gray to black.			
1						67			C-1 GP(C)		3 to 18.5 feet: Well graded to poorly graded GRAVEL with occasional cobbles and boulders, subangular, very loose to loose, dark gray to black, wet, homogenous, HCl not tested. 3 feet: Poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 12 inches.			
5						62			C-2 GP(C/B)		grades to poorly graded GRAVEL with cobbles and boulders. Maximum size of the boulders encountered is 14 inches.			
2														
10						13			D-3 GM	3 1 1 (2)	grades to very loose, silty GRAVEL.			
4						51			C-4 GW(C)		grades to well graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 4 inches.			
15						30			D-5 GW	4 2 6 (8)	grades to loose well graded GRAVEL.			
5						100			C-6A					
6						100 2.8			C-6B		18.5 to 32.5 feet: Andesite, light green to light gray, fine to medium grained, fresh to slightly weathered, moderately weak to moderately strong rock. No HCl reaction. Discontinuities are closely spaced and in poor			

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7										to fair condition. CR = 87-100%, RQD = 53-74%, FF = 1.6 to 2.8.			
25										18.5 feet: slightly weathered, moderately weak rock. Discontinuities are closely spaced and in poor condition. grades to slightly weathered to fresh rock, moderately weak to moderately strong rock. Discontinuities are closely spaced and in fair condition.			
8											grades to slightly weathered rock.		
9													
30													
10													
35													
11													
40													
12													
13													
45													

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90 Elevation 2536.6 ft (773.2 m)

HOLE No. SW1-002-07

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Mike Harvey Lic# 2599

Drilling Contractor WSDOT Field Exploration Unit

Inspector Suren Balendra

Start September 12, 2007 Completion September 13, 2007 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto-hammer

Station 1375+04.15 Offset 27.15'L Casing HW 41.5' Method Wet Rotary

Northing 1065001.215 Easting 1754445.015 Latitude 47°21'02.135"N Longitude 121°21'51.115"W

County Kittitas Subsection SE 1/4 of NE 1/4 Section 35 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0								SM		0 to 2 feet: Topsoil - Silty SAND, dark gray to black.			
1										2 to 36.5 feet: Poorly graded GRAVEL, occasional silty GRAVEL, occasional cobbles and boulders, subangular, medium dense to very dense, dark brown to gray, wet, homogenous, No HCl reaction. 2 feet: Medium dense silty GRAVEL with sand.			
5						28		D-1 GM	3 5 6 (11)				
2													
10						19		D-2 GP	16 4 8 (12)	grades to poorly graded GRAVEL with sand.			
3													
4						68		C-3 GP(B)		grades to GRAVEL with boulders. Maximum size of the boulders encountered is 2.7 feet.			
15													
5						0		D-4 GP(B)	24 24 14 (38)	grades to very dense.			
						100		C-5 GP(B)		Maximum size of the boulders encountered is 1.2 feet.			
6													
20													

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7							<u>60</u>				grades to GRAVEL with cobbles. Maximum size of the cobbles encountered is 7 inches.		
25							<u>80</u>				grades to GRAVEL with cobbles and boulders.		
8							<u>80</u>				grades to GRAVEL with cobbles and boulders.		
30							<u>44</u>				Maximum size of the cobbles encountered is 12 inches.		
9							<u>44</u>				Maximum size of the cobbles encountered is 12 inches.		
35							<u>26</u>				36.5 to 41.5 feet: Well graded GRAVEL, subangular, dark greenish gray, wet, homogenous, No HCl reaction.		
10							<u>26</u>				36.5 to 41.5 feet: Well graded GRAVEL, subangular, dark greenish gray, wet, homogenous, No HCl reaction.		
11							<u>26</u>				36.5 to 41.5 feet: Well graded GRAVEL, subangular, dark greenish gray, wet, homogenous, No HCl reaction.		
40							<u>89</u>				41.5 to 46 feet: Andesite, light green to bluish gray, fine to medium grained, slightly weathered, moderately weak rock. No HCl reaction. Discontinuities are closely spaced and in poor condition.		
12							<u>89</u>				41.5 to 46 feet: Andesite, light green to bluish gray, fine to medium grained, slightly weathered, moderately weak rock. No HCl reaction. Discontinuities are closely spaced and in poor condition.		
13							<u>89</u>				41.5 to 46 feet: Andesite, light green to bluish gray, fine to medium grained, slightly weathered, moderately weak rock. No HCl reaction. Discontinuities are closely spaced and in poor condition.		
45							<u>89</u>				41.5 to 46 feet: Andesite, light green to bluish gray, fine to medium grained, slightly weathered, moderately weak rock. No HCl reaction. Discontinuities are closely spaced and in poor condition.		

DRAFT ROCKN BORINGS I-90-10082007.GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90

Elevation 2536.6 ft (773.2 m)

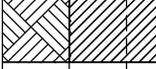
HOLE No. SW1-002-07

Sheet 3 of 3

Project I-90 Snoqualmie Pass East

Driller Mike Harvey

Lic# 2599

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14														
											Bottom of boring at 46 feet depth below ground surface. Backfilled to ground surface with bentonite chips.			
15														
50														
16														
55														
17														
18														
60														
19														
65														
20														
21														
70														



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90

Elevation 2481.9 ft (756.5 m)

HOLE No. SW1-003-07

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller Kerry Cooper Lic# 2552

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang, Cleo Andrews

Start July 18, 2007 Completion July 19, 2007 Well ID# Not Applicable Equipment CME45 Skid-Mounted w/Autohammer

Station 1377+69.84 Offset 22.88'R Casing HW 60' Method Wet Rotary on Barge

Northing 1064731.029 Easting 1754452.203 Latitude 47° 20' 59.4708"N Longitude 121° 21' 50.9652"W

County Kittitas Subsection NE 1/4 of SE 1/4 Section 35 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0	0						50	C-1 GP		0 to 9 feet: Well graded to poorly graded GRAVEL, with or without sand, occasional silty sand, subangular to angular, loose to dense, generally brown to bluish gray, wet, homogenous, no HCL reaction. 0 feet: Medium dense poorly graded GRAVEL.			
1	1						33	D-2 GP	30 8 5 (13)				
5	5						67	C-2A					
2	2						53	D-3 GW	4 7 2 (9)	grades to loose well graded GRAVEL with sand.			
10	10						33	D-4	5 10 34 (44)	grades to dense.			
3	3						80	D-5 GW	20 30 40 (70)	9 to 26.5 feet: Poorly graded GRAVEL with or without cobbles, occasional silty gravel, angular to subrounded, very dense, grayish brown to greenish gray, wet, homogenous, No HCL reaction. 9 feet: Well graded GRAVEL with sand.			
4	4						60	D-6	50 for 6"				
15	15						40 61	D-7 GB	50 for 2.4"	grades to poorly graded GRAVEL. grades to GRAVEL with cobbles. Maximum size of the cobbles encountered is 6 inches.			
5	5						0 100	D-9 GM	50 for 0"	grades to silty GRAVEL with sand and cobbles. Maximum size of the cobbles encountered is approximately 10 inches.			
20	20												

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
							44		C-11 GP(C)		grades to poorly graded GRAVEL with cobbles.			
7														
25							$\frac{0}{70}$		C-12A GP(C)	50 for 0"				
8							$\frac{70}{3}$		C-12B		26.5 to 40 feet: Andesite, greenish gray, coarse grained, slightly weathered, moderately weak. No HCl reaction. Discontinuities are closely spaced and in fair to poor condition. CR = 70 to 100%, RQD = 31 to 44%, FF = 2.2 to 3. 26.5 feet: slightly weathered rock. Discontinuities are closely spaced and in poor condition.			
9														
30							$\frac{0}{100}$		C-13	50 for 1.2"	grades to fresh.			
10														
35														
11							$\frac{100}{2.4}$		C-14		Discontinuities are closely spaced and in fair condition.			
12														
40											Bottom of boring at 40 feet depth below Keechelus Lake surface. Backfilled to lake bottom with bentonite chips. Lake level was 16 feet above the lake surface at 09:10 on 7/18/07.			
13														
45														

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90 Elevation 2478.4 ft (755.4 m)

HOLE No. SW1-004-07

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Mike Harvey Lic# 2599

Drilling Contractor WSDOT Field Exploration Unit

Inspector Ken Yang, Bob Featherstone

Start July 14, 2007 Completion July 15, 2007 Well ID# Not Applicable Equipment CME45 Skid-Mounted w/Autohammer

Station 1379+98.69 Offset 29.76'R Casing HQ 56', NQ 53.5' Method Wet Rotary on Barge

Northing 1064505.233 Easting 1754474.235 Latitude 47° 20' 57.2424"N Longitude 121° 21' 50.6082"W

County Kittitas Subsection NE 1/4 of SE 1/4 Section 35 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 10 feet: Well graded SAND with or without gravel very loose to dense, subrounded, grayish brown, wet, homogenous, no HCL reaction. 0 feet: Very loose well graded SAND.			
1						27		D-1 SW		3 2 2 (4)				
5														
2						67		D-2 SP		2 2 15 (17)	grades to medium dense SAND with gravel.			
10						0 10		SW D-3		50 for 6" 34 7 (41)	grades to dense SAND.			
3														
4						10		D-4 GP		12 4 2 (6)	10 to 19.5 feet: Poorly to well graded GRAVEL with sand, occasional cobbles, subrounded to angular, loose, pale green to gray to brown, wet, homogenous, no HCL reaction. 10 feet: Loose poorly graded GRAVEL with sand.			
15						10		D-5		2 2 4 (6)	grades to well graded GRAVEL with sand.			
5						56		C-6			grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 9 inches.			
6						14		C-7 GP(C)						
20											19.5 to 56.33 feet: Poorly graded to well graded			

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7										GRAVEL with sand, with or without cobbles, subrounded to angular, medium dense to very dense, pale green to gray, wet, homogenous, no HCl reaction.			
25								C-8 GP(C)		19.5 feet: Poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 8.5 inches.			
8										Maximum size of the cobbles encountered is 11 inches.			
30								C-9 GP		grades to poorly graded GRAVEL.			
9													
35								D-10 GW	6 8 13 (21)	grades to medium dense well graded GRAVEL with sand.			
10													
40								D-11 GM	9 6 13 (19)				
11													
45								D-12 GW	8	grades to very dense.			
12													
13													

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
14								C-13	8 50 for 3" (>50)	grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is approximately 8 inches.			
15								D-14 GW	35 50 for 3" (>50)	grades to well graded GRAVEL with sand.			
16								C-15 GP		grades to poorly graded GRAVEL.			
55								D-16	25 50 for 4" (>50)				
17										Bottom of boring at 56.33 feet depth below Keechelus Lake surface. Backfilled to lake bottom with bentonite chips.			
18										Lake level was 22 feet above the lake surface at 12:30 on 7/14/07.			
60													
19													
65													
20													
21													
70													

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90

Elevation 2532.7 ft (772.0 m)

HOLE No. SW1-005-07

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller Mike Harvey Lic# 2599

Drilling Contractor WSDOT Field Exploration Unit

Inspector Suren Balendra

Start September 17, 2007 Completion September 18, 2007 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto-hammer

Station 1382+97.00 Offset 5.02'R Casing HW, HQ Method Wet Rotary

Northing 1064209.872 Easting 1754520.094 Latitude 47°20'54.334"N Longitude 121°21'49.899"W

County Kittitas Subsection NE 1/4 of SE 1/4 Section 35 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										0 to 2 feet: Topsoil - Silty SAND.			
1													
5						56		D1 GM	5 5 4 (9)	2 to 27.17 feet: Silty GRAVEL with sand to poorly graded GRAVEL with sand, occasional cobbles, subangular, loose to very dense, gray, brown, wet, no HCl reaction. 5 feet: Loose silty GRAVEL with sand.			
2													
10						100		C2 GM(C)		grades to silty GRAVEL with cobbles. Maximum size of the cobbles is 9 inches.			
4						14		D3	4 6 2 (8)	grades to poorly graded GRAVEL with sand.			
4						63		C4 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 4 inches.			
15													
5						39		D5 GM	2 3 16 (19)	grades to medium dense silty GRAVEL with sand.			
6						100		C6 GP(C)		grades to poorly graded GRAVEL with cobbles.			
20													

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
7							$\frac{100}{6}$	D7 GM	17 40 46 (86)	grades to very dense silty GRAVEL with sand.			
25							$\frac{100}{6}$	C8		grades to poorly graded GRAVEL with cobbles.			
8							$\frac{88}{6}$	D9 SM	30 50 for 3"	grades to very dense silty SAND with gravel.			
9							$\frac{100}{6}$	C10	(>50)	27.17 to 41.5 feet: Andesite, light green, fine to medium grained, fresh to moderately weathered, moderately weak to moderately strong. No HCl reaction. Discontinuities are very closely to closely spaced and in very poor to good condition. CR = 90-100%, RQD = 23-60%, FF = 3 to 6. 27.17 feet: moderately weathered, very weak to moderately weak rock. Discontinuities are very closely spaced and in very poor to poor condition.			
30							$\frac{100}{6}$	C11		grades to slightly weathered, moderately weak to moderately strong rock.			
10							$\frac{90}{3}$	C12		grades to fresh, moderately strong rock. Discontinuities are closely spaced and in good condition.			
35													
11													
40													
12													
41.5										Bottom of boring at 41.5 feet depth below ground surface. Backfilled to ground surface with bentonite chips.			
13													
45													

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90

Elevation 2531.9 ft (771.7 m)

HOLE No. SW1-006-07

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Bobby Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Tom Jackson

Start June 27, 2007 Completion June 27, 2007 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto-hammer

Station 1386+00.15 Offset 37.91'R Casing HW, HQ Method Wet Rotary

Northing 1063906.616 Easting 1754471.463 Latitude 47°20'51.336"N Longitude 121°21'50.557"W

County Kittitas Subsection NE 1/4 of SE 1/4 Section 35 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										0 to 30 feet: Poorly graded GRAVEL with sand to silty GRAVEL with sand, occasional cobbles, angular to subangular, loose to very dense, brown, moist to wet, HCl not tested.			
1						39		D-1 GP(C)	10 12 12 (24)	2.5 feet: medium dense poorly graded GRAVEL with sand and cobbles.			
5						86		D-2 GM	7 50 for 1" (>50)	grades to very dense silty GRAVEL with sand.			
2						95		C-3					
						33		D4 GP	7 8 16 (24)	grades to medium dense poorly graded GRAVEL.			
10						100		C-5 GP					
						22		D-6 GP	12 7 11 (18)				
						0		C-7					
								D-8 GP	6 7 7 (14)				
								C-9					
15						22		D-10 GP	9 15 19 (34)	grades to dense GRAVEL with sand.			
						0		C-11 GM					
						11		D-12 GM	2 4 3 (7)	grades to loose silty GRAVEL with sand.			
20								C-13					

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
							<u>33</u>		D-14 GM	4 13 16 (29)	grades to dense.		
							<u>0</u>		C-15 GM				
7													
25							<u>44</u>		D-16 GM	8 20 28 (48)			
8									C-17				
9													
30									C-19		30 to 60 feet: Andesite, moderately weathered, strong rock. CR = 50-90%, RQD = 83-90%		
10													
35							<u>90</u>		C-20				
11													
40							<u>85</u>		C-21				
12													
45													
13													

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14							<u>82</u>		C-22					
15														
50							<u>87</u>							C-23
16									C-24					
55							<u>48</u>							
17														
18														
60														
19														
65	20										Bottom of boring at 60 feet depth below ground surface. Backfilled to ground surface with bentonite chips.			
21														
70														

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90

Elevation 2530.5 ft (771.3 m)

HOLE No. SW1-007-07

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Mike Harvey Lic# 2599

Drilling Contractor WSDOT Field Exploration Unit

Inspector Suren Balendra

Start September 19, 2007 Completion September 19, 2007 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto-hammer

Station 1389+02.99 Offset 33.88'R Casing HW, HQ Method Wet Rotary

Northing 1063603.995 Easting 1754418.573 Latitude 47°20'48.344"N Longitude 121°21'51.276"W

County Kittitas Subsection SE 1/4 of SE 1/4 Section 35 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
0											0 to 2 feet: Silty SAND (Topsoil).			
1											2 to 53 feet: Poorly graded GRAVEL to silty GRAVEL with sand, with occasional silty SAND, occasional cobbles, subangular to subrounded, medium dense to dense, gray to brown, wet to moist, homogenous, No HCl reaction.			
5											2 feet: Poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 4 inches.			
2											grades to medium dense silty GRAVEL with sand.			
3											grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 4 inches.			
10											grades to dense GRAVEL with sand.			
4											grades to GRAVEL with cobbles. Maximum size of the cobbles encountered is 11 inches.			
15														
5														
6														
20														

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7									C-8 GP(C)		Maximum size of the cobbles encountered is 8 inches.			
25									C-9 GP(C)		Maximum size of the cobbles encountered is 6 inches.			
8									C-10 SM	8 12 34 (46)	grades to dense silty SAND with gravel.			
9									C-11 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 12 inches.			
30									C-12 GP(C)		Maximum size of the cobbles encountered is 11 inches.			
10									C-13 SM-GP(C)		grades to silty GRAVEL with sand. grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 7 inches.			
35														
11														
40														
12														
45														

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14							<u>32</u>			C-14 GW		grades to well graded GRAVEL.		
15														
50							<u>33</u>			C-15A GW				
16							<u>100</u>			C-15B		53 to 60 feet: Andesite, light green, fine to medium grained, slightly weathered, moderately strong rock. No HCl reaction. Discontinuities are closely spaced and in good condition. CR=100%, RQD=100%		
55														
17							<u>100</u>			C-16				
18														
60											Bottom of boring at 60 feet depth below ground surface. Backfilled to ground surface with bentonite chips.			
19														
65														
20														
21														
70														

DRAFT ROCKN BORINGS I-90-10082007.GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90 Elevation 2532.4 ft (771.9 m)

HOLE No. SW2-001-07

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller Bobby Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Tom Jackson

Start August 30, 2007 Completion September 4, 2007 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto-hammer

Station 1406+25.19 Offset 72.57'L Casing HW, HQ Method Wet Rotary

Northing 1061993.043 Easting 1754666.312 Latitude 47°20'32.474"N Longitude 121°21'47.424"W

County Kittitas Subsection NE 1/4 of NE 1/4 Section 2 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										0 to 10.5 feet: Well graded silty GRAVEL with sand to poorly graded GRAVEL, subrounded to subangular, medium dense to dense, gray, dry to moist, homogenous, HCl not tested. 5 feet: Medium dense, dry, silty GRAVEL with sand.			
1													
5								D-1 GM	7 5 12 (17)				
2													
10								D-2 GM	8 17 14 (31)	grades to dense, moist.			
3								C-3A GF C-3B		grades to poorly graded GRAVEL.			
10.5								C-4		10.5 to 26.5 feet: Andesite, olive gray, medium grained, slightly to highly weathered, strong rock (R4). No HCl reaction. CR = 50-100%, RQD = 58-98%.			
4													
15													
5								C-5					
20													

DRAFT ROCKN BORINGS I-90-10082007.GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90 Elevation 2541.5 ft (774.6 m)

HOLE No. SW2-002-07(OW)

Sheet 1 of 4

Project I-90 Snoqualmie Pass East

Driller Bobby Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Tom Jackson

Start July 26, 2007 Completion July 31, 2007 Well ID# _____ Equipment CME 45 (skid rig) w/auto-hammer

Station 1405+89.63 Offset 12.71'L Casing HW, HQ Method Wet Rotary

Northing 1061928.086 Easting 1754589.054 Latitude 47°20'31.825"N Longitude 121°21'48.535"W

County Kittitas Subsection NE 1/4 of NE 1/4 Section 2 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										0 to 50.5 feet: Well graded GRAVEL with or without sand, occasional cobbles and boulders, subangular to angular, loose to very dense, gray to grayish brown, dry to wet, homogenous, HCl not tested. 2.5 feet: Well graded GRAVEL.			
1						100		C-1 GW					
5						33		D-2 GP(C)	16 6 9 (15)	grades to medium dense, well graded GRAVEL with sand and cobbles.			
2						33		D-3 GP	22 15 9 (24)	grades to well graded GRAVEL with sand.			
10						22		D-4 GP	3 3 4 (7)	grades to loose.			
4						11		D-5 GP	4 4 5 (9)				
15						22		D-6 GW	6 28	grades to very dense.			
5						100		C-7 GW(C)	50 for 3" (50)	grades to well graded GRAVEL with cobbles.			
						22		D-8 GP	11 26 24 (50)	grades to well graded GRAVEL with sand.			
20						19		C-9 GW(C)		grades to GRAVEL with cobbles.			

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
14								D-19 GW(C/B)	1 1 2 (3)	grades to very loose well graded GRAVEL with boulders and cobbles.			
50								C-20 GW(C/B)					
55								C-21 GW(C)		50.5 to 86 feet: Well graded GRAVEL with cobbles or boulders, very dense, bluish gray, none to slight HCl reaction. 50.5 feet: Well graded GRAVEL with cobbles. No HCl reaction.			
60								C-22 GW(C/B)		grades to well graded GRAVEL with boulders and cobbles.			
65								C-23					
70								C-24 GW(C)		grades to well graded GRAVEL with cobbles. Slight HCl reaction.			

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22									C-25 GW(C/B)		grades to well graded GRAVEL with boulders and cobbles. No HCl reaction.			
75									C-26 GW(C/B)		grades to slight HCl reaction.			
23														
24														
80									C-27 GW(C/B)					
25									C-28 GW(C/B)					
85									C-29 GW(C/B)					
26														
27											Bottom of boring at 86 feet depth below ground surface. Installed following observation well: Backfilled from 86.0 feet to 70.0 feet with bentonite chips. Installed 1-inch dia. observation well: PVC screen interval with 0.010" slots: 20.0 - 70.0 feet; PVC riser: 1.2 feet above ground surface to 20.0 feet; Sand filter pack: 70.0 to 20.0 feet. Backfilled from 20.0 to 2.0 feet with bentonite chips. Installed quickcrete surface seal (0-2.0 feet) and stick-up monument steel casing (2.5-inch I.D., approx. 3.0 feet long). Water level measurements (below existing ground surface): 8/9/07 at 09:00: 67.4 feet in observation well. From 8/22/07 to 12/12/07 lower than the bottom of the well (>70.0 feet) in observation well.			
90														
28														
95														

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



Start Card _____

Job No. 33758613.04000 SR 90 Elevation 2532.6 ft (771.9 m)

HOLE No. SW2-003-07

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller Bobby Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Tom Jackson

Start September 5, 2007 Completion September 5, 2007 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto-hammer

Station 1407+69.14 Offset 70.94'L Casing HW, HQ Method Wet Rotary

Northing 1061883.379 Easting 1754748.634 Latitude 47°20'31.401"N Longitude 121°21'46.211"W

County Kittitas Subsection NE 1/4 of NE 1/4 Section 2 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
											0 to 1.5 feet: Well graded GRAVEL.			
											1.5 to 20 feet: Lapilli Tuff, olive gray, medium grained, fresh to slightly weathered, strong rock (R4), No HCl reaction. CR=100%, RQD = 28-100%			
1														
5														
2														
10														
3														
4														
15														
5														
6														
20														

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90

Elevation 2532.6 ft (771.9 m)

HOLE No. SW2-003-07

Sheet 2 of 2

Project I-90 Snoqualmie Pass East

Driller Bobby Haller

Lic# 2779

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7											Bottom of boring at 20 feet depth below ground surface. Backfilled to ground surface with bentonite chips.			
25														
8														
9														
30														
10														
35														
11														
12														
40														
13														
45														

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90 Elevation 2543.5 ft (775.3 m)

HOLE No. SW2-004-07

Sheet 1 of 3

Project I-90 Snoqualmie Pass East

Driller Bobby Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Tom Jackson

Start September 7, 2007 Completion September 10, 2007 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto-hammer

Station 1408+62.97 Offset 27.46'R Casing HW, HQ Method Wet Rotary

Northing 1061748.84 Easting 1754737.54 Latitude 47°20'30.072"N Longitude 121°21'46.351"W

County Kittitas Subsection NE 1/4 of NE 1/4 Section 2 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80							
0										0 to 26.17 feet: Poorly graded GRAVEL to silty GRAVEL, occasional cobbles and boulders, subangular, loose to very dense, gray, dry to moist, homogenous, HCl not tested. 5 feet: Loose poorly graded GRAVEL.			
1													
5						28		D-1 GP	3 3 4 (7)				
2													
10						100		C-2 GP(C)		grades to poorly graded GRAVEL with cobbles.			
3						6		D-3 GP	8 7 4 (11)	grades to medium dense poorly graded GRAVEL.			
4						62		C-4 GP(C)		grades to poorly graded GRAVEL with cobbles.			
15						0		D-5	3 3 2 (5)	grades to loose.			
5						48		C-6 GP		grades to poorly graded GRAVEL.			
6													
20													

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90

Elevation 2543.5 ft (775.3 m)

HOLE No. SW2-004-07

Sheet 3 of 3

Project I-90 Snoqualmie Pass East

Driller Bobby Haller

Lic# 2779

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14							100		C-14					
15														
50							100		C-15					
16											Bottom of boring at 51.5 feet depth below ground surface. Backfilled to ground surface with bentonite chips.			
55														
17														
18														
60														
19														
65														
20														
21														
70														

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



Start Card _____

Job No. 33758613.04000 SR 90

Elevation 2532.7 ft (772.0 m)

HOLE No. SW2-005-07

Sheet 1 of 2

Project I-90 Snoqualmie Pass East

Driller Bobby Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Tom Jackson

Start September 6, 2007 Completion September 6, 2007 Well ID# Not Applicable Equipment CME 45 (skid rig) w/auto-hammer

Station 1408+94.29 Offset 70.78'L Casing HW, HQ Method Wet Rotary

Northing 1061795.524 Easting 1754829.322 Latitude 47°20'30.543"N Longitude 121°21'45.026"W

County Kittitas Subsection NE 1/4 of NE 1/4 Section 2 Range 11E Township 22

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
							80		C-1A		0 to 1 feet: Well graded GRAVEL.			
							80		C-1B		1 to 25 feet: Lapilli Tuff, olive gray, medium grained, slightly weathered, strong rock (R4). Discontinuities are widely spaced and in good condition. No HCl reaction. □ CR = 80% - 100%, RQD = 38% - 100%			
1							100		C-2					
5							100		C-3					
10							100		C-4					
15							100							
20														

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



LOG OF TEST BORING

Start Card _____

Job No. 33758613.04000 SR 90

Elevation 2532.7 ft (772.0 m)

HOLE No. SW2-005-07

Sheet 2 of 2

Project I-90 Snoqualmie Pass East

Driller Bobby Haller

Lic# 2779

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7							100							
25														
8											Bottom of boring at 25 feet depth below ground surface. Backfilled to ground surface with bentonite chips.			
9														
30														
10														
35														
11														
40														
12														
45														
13														

DRAFT ROCKN BORINGS I-90 10082007.GPJ 9/10/08



LOG OF TEST BORING

Start Card R-72626

Job No. 33758632.13000 SR 90 Elevation 2540.9 ft (774.5 m)

HOLE No. SW2-006-08(1)

Sheet 1 of 4

Project I-90 Snoqualmie Pass East

Driller Robert Haller Lic# 2779

Drilling Contractor WSDOT Field Exploration Unit

Inspector Kerry Cooper

Start October 21, 2008 Completion October 22, 2008 Well ID# Not Applicable Equipment CME 45 (skid-rig) w/auto-hammer

Station _____ Offset _____ Casing _____ Method Wet rotary

Northing 1061806.28 Easting 1754681.83 Latitude _____ Longitude _____

County Kittitas Subsection NE 1/4 of NE 1/4 Section 2 Range 11E Township 22N

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
1											Samples were not collected at this boring location. URS did not inspect this boring. Stratigraphical information was provided by WSDOT Field Exploration Unit.			
5														
2														
10														
4														
15														
6														
20														



LOG OF TEST BORING

Start Card R-72626

Job No. 33758632.13000 SR 90

Elevation 2540.9 ft (774.5 m)

HOLE No. SW2-006-08(1)

Sheet 2 of 4

Project I-90 Snoqualmie Pass East

Driller Robert Haller

Lic# 2779

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
7														
25														
8														
9														
30														
10														
35														
11														
12														
40														
13														
45														



LOG OF TEST BORING

Start Card R-72626

Job No. 33758632.13000 SR 90

Elevation 2540.9 ft (774.5 m)

HOLE No. SW2-006-08(1)

Sheet 3 of 4

Project I-90 Snoqualmie Pass East

Driller Robert Haller

Lic# 2779

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14														
15														
50														
16														
55														
17														
18														
60														
19														
65														
20														
21														
70														

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/14/10



LOG OF TEST BORING

Start Card R-72626

Job No. 33758632.13000 SR 90

Elevation 2540.9 ft (774.5 m)

HOLE No. SW2-006-08(1)

Sheet 4 of 4

Project I-90 Snoqualmie Pass East

Driller Robert Haller

Lic# 2779

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22														
75	23													
24														
80														
25														
85	26													
27														
90														
28														
95														



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2401.2 ft (731.9 m)

HOLE No. SW2-007-08

Sheet 3 of 5

Project I-90 Snoqualmie Pass East

Driller Kerry Cooper

Lic# 2552

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
14														
15														
50														
16														
							<u>31</u>		C-11 GP		grades to poorly graded GRAVEL.			
55														
17														
18														
60														
19														
							<u>25</u>		C-12 GP(C)		grades to poorly graded GRAVEL with cobbles. Maximum size of the cobbles encountered is 6 inches.			
65														
20														
21														
70														

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/14/10



Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
22														
75														
23														
24														
80							$\frac{93}{0}$		C-13			79 to 96 feet: Metawelded lapilli tuff, greenish dark gray, medium grained, fresh, strong (R4) to very strong (R5) rock. Discontinuities are very closely to widely spaced and in excellent condition. No HCl reaction. (CR=70 to 100%, RQD=0 to 100%, FF= 0 to 2)		
25							$\frac{87}{0.7}$		C-14			grades to very strong (R5) rock. Discontinuities are closely spaced and in excellent condition.		
85							$\frac{70}{2}$		C-15			Discontinuities are very closely spaced.		
27							$\frac{100}{0.2}$		C-16			Discontinuities are widely spaced and in excellent condition.		
90												88.8 feet: PLT - Very strong (R5) rock.		
28							$\frac{100}{0.8}$		C-17			Discontinuities are closely spaced.		
95														

DRAFT ROCKN BORINGS I-90 2008-KM.GPJ 9/14/10



LOG OF TEST BORING

Start Card _____

Job No. 33758632.13000 SR 90

Elevation 2401.2 ft (731.9 m)

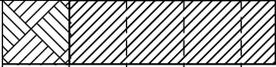
HOLE No. SW2-007-08

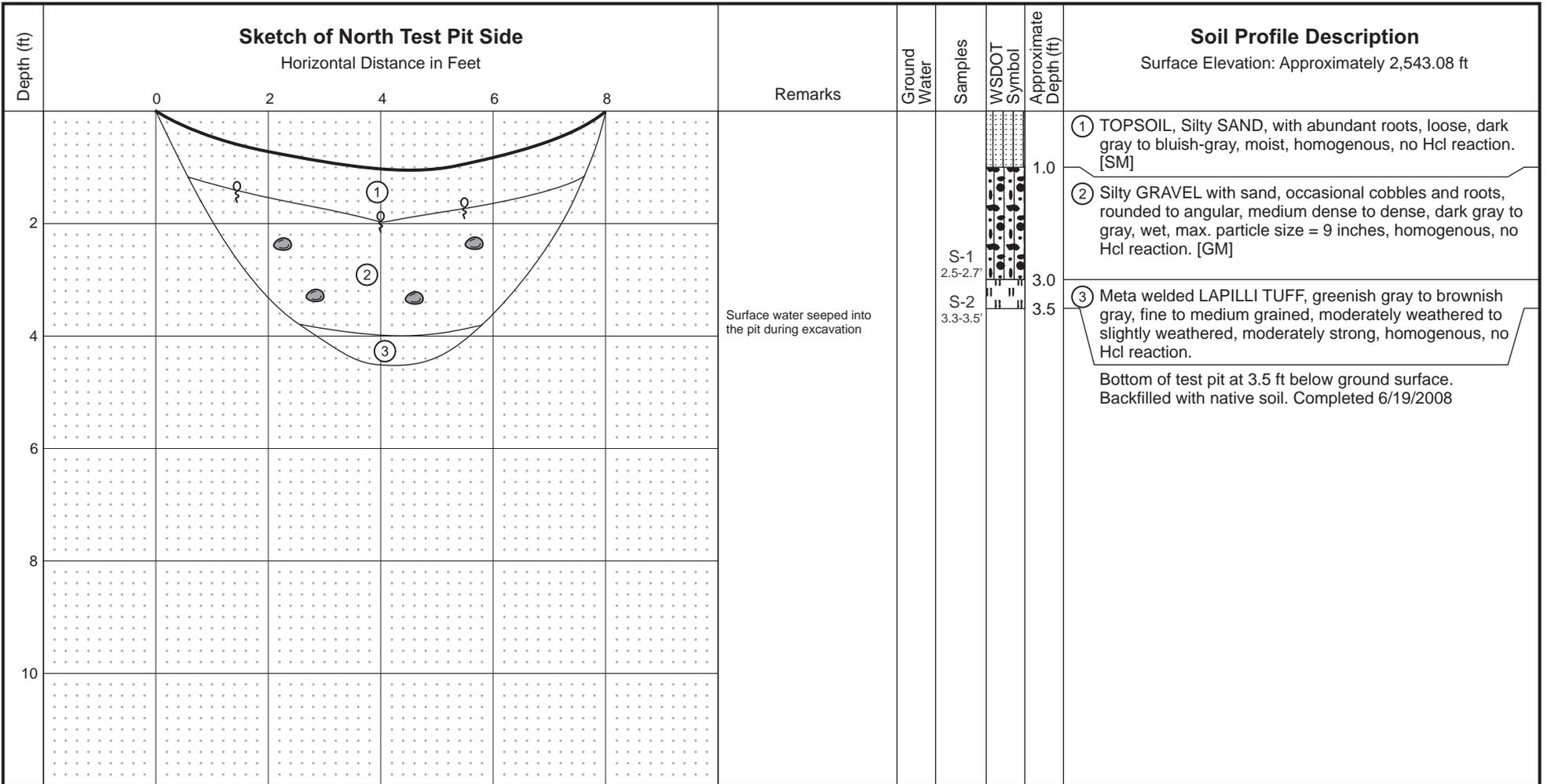
Sheet 5 of 5

Project I-90 Snoqualmie Pass East

Driller Kerry Cooper

Lic# 2552

Depth (ft)	Meters (m)	Profile	Rock Quality Designation (%)				% Rec. FF	Rock Strength	Sample Type	Sample No./ WSDOT Symbol	Blows/6" SPT (N)	Description of Material	Groundwater	Instrument
			20	40	60	80								
29											95.5 feet: PLT - Very strong (R5) rock.			
											Bottom of boring at 96 feet below the mudline.			
											Lake level measurements (above mudline):			
											-9/9/08 at 13:50: 66 feet above mudline			
											-9/10/08 at 09:05: 65 feet above mudline			
											-9/11/08 at 09:15: 63 feet above mudline			
30														
100														
31														
105														
32														
33														
110														
34														
35														
115														
36														
120														



NOTES

1. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
2. Refer to Soil Classification and Log Key for explanation of "Symbols" and definitions.
3. WSDOT designation is based on visual-manual classification.

LEGEND

-  Roots
-  Seepage
-  Cobble or boulder
-  Log

TEST PIT LOCATION

Northing 1070671.38 Subsection SE
 Easting 1752520.41 Section NW
 Latitude 47° 21' 57.878" N Range 11E
 Longitude 121° 22' 19.970" W Township 22N
 Station 1313 + 71.035 County Kittitas
 (April 2008)

I-90 Snoqualmie Pass East

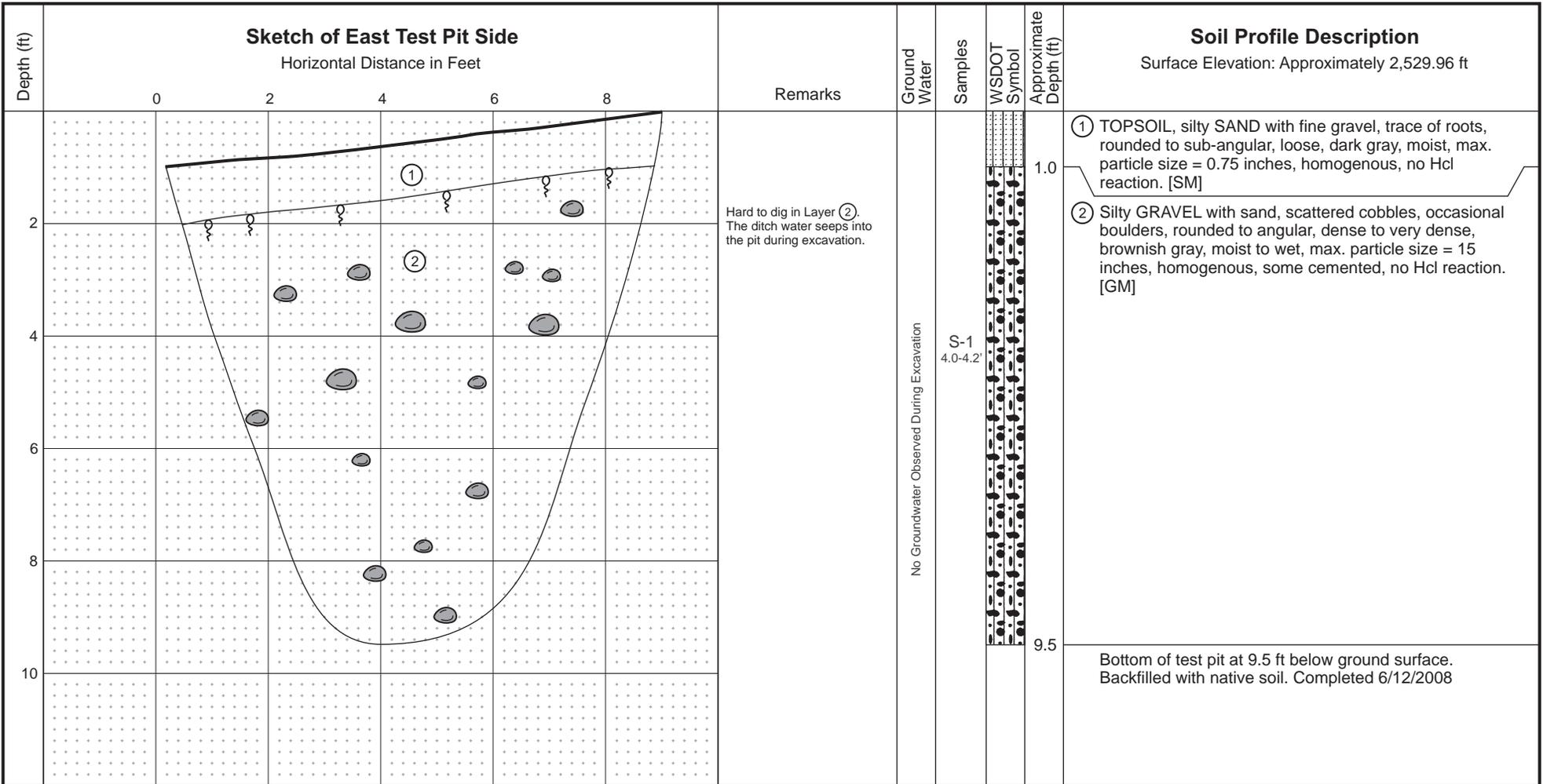
Log of Test Pit TP-016-08

Job No. 33758632

June 2008

URS 1501 4th Avenue, Suite 1400
Seattle, Washington, 98101-1616

Figure X.X



NOTES

1. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
2. Refer to Soil Classification and Log Key for explanation of "Symbols" and definitions.
3. WSDOT designation is based on visual-manual classification.

LEGEND

- Roots
- Seepage
- Cobble or boulder
- Log

TEST PIT LOCATION

Northing 1058436.52 Subsection SW
 Easting 1759098.46 Section SE
 Latitude 47° 19' 57.853" N Range 11E
 Longitude 121° 20' 42.526" W Township 21N
 Station 1468 + 47.620 County Kittitas
 (April 2008)

I-90 Snoqualmie Pass East

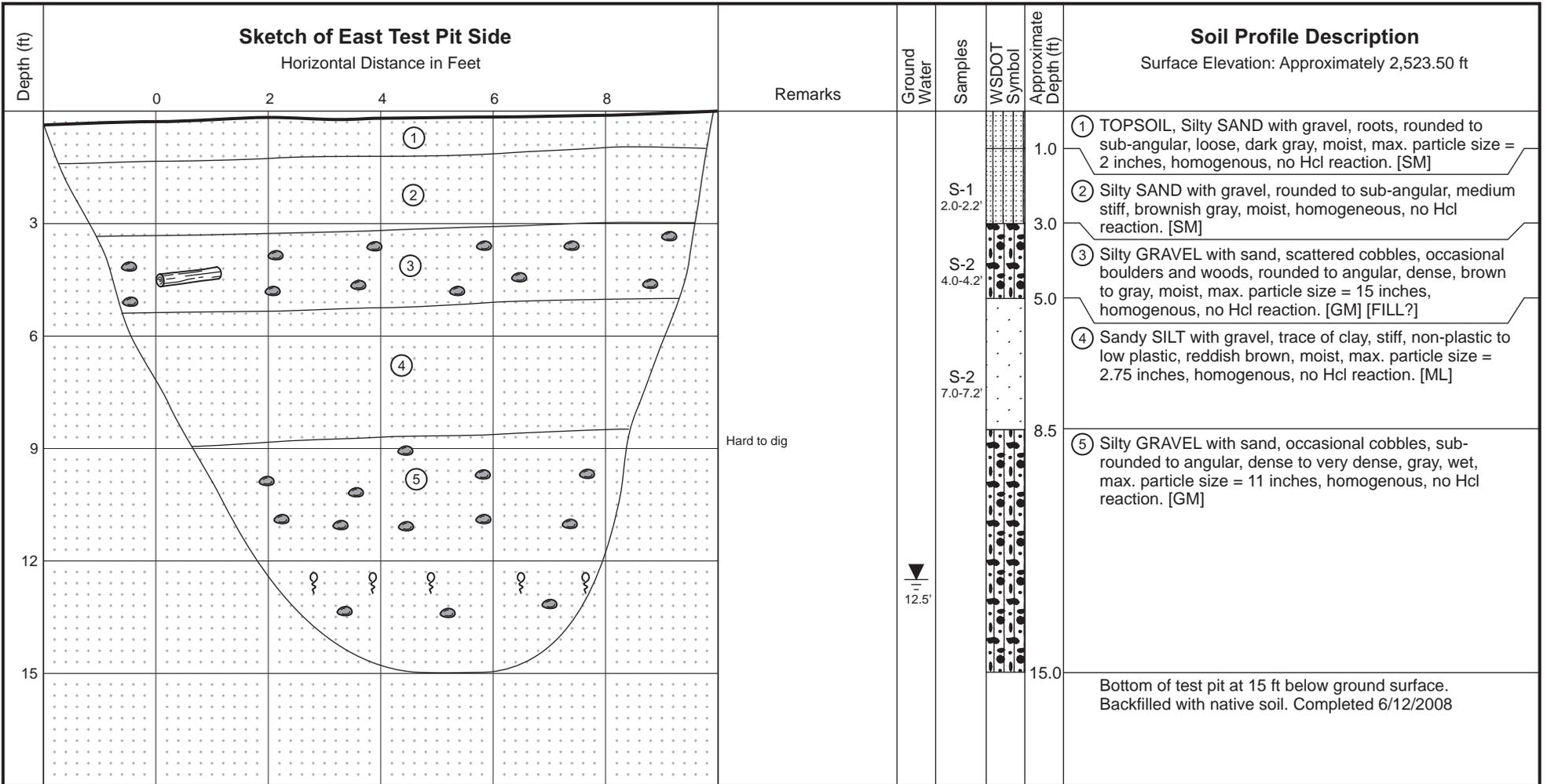
Log of Test Pit TP-017-08

Job No. 33758632

June 2008

URS 1501 4th Avenue, Suite 1400
Seattle, Washington, 98101-1616

Figure X.X



NOTES

- The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
- Refer to Soil Classification and Log Key for explanation of "Symbols" and definitions.
- WSDOT designation is based on visual-manual classification.

LEGEND

- Roots
- Seepage
- Cobble or boulder
- Log

TEST PIT LOCATION

Northing 1058418.64 Subsection NW
 Easting 1759004.88 Section SE
 Latitude 47° 19' 57.666" N Range 11E
 Longitude 121° 20' 43.881" W Township 21N
 Station 1468 + 34.159 County Kittitas
 (April 2008)

I-90 Snoqualmie Pass East

Log of Test Pit TP-018-08

Job No. 33758632

June 2008



1501 4th Avenue, Suite 1400
Seattle, Washington, 98101-1616

Figure X.X