Soil Classification System

MAJOR DIVISIONS			GRAPHIC SYMBOL	USCS LETTER SYMBOL[1]	TYPICAL DESCRIPTIONS [2][3]
COARSE-GRAINED SOIL (More than 50% of material is larger than No. 200 sieve size)	GRAVEL AND GRAVELLY SOIL (More than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (Little or no fines)		GW	Well-graded gravel; gravel/sand mixture(s); little or no fines
				GP	Poorly graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)		GM	Silty gravel; gravel/sand/silt mixture(s)
				GC	Clayey gravel; gravel/sand/clay mixture(s)
	SAND AND SANDY SOIL (More than 50% of coarse fraction passed through No. 4 sieve)	CLEAN SAND (Little or no fines)		SW	Well-graded sand; gravelly sand; little or no fines
				SP	Poorly graded sand; gravelly sand; little or no fines
		SAND WITH FINES (Appreciable amount of fines)		SM	Silty sand; sand/silt mixture(s)
				SC	Clayey sand; sand/clay mixture(s)
FINE-GRAINED SOIL (More than 50% of material is smaller than No. 200 sieve size)	SILT AND CLAY (Liquid limit less than 50)			ML	Inorganic silt and very fine sand; rock flour; silty or clayey fine sand or clayey silt with slight plasticity
				CL	Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay
				OL	Organic silt; organic, silty clay of low plasticity
	SILT AND CLAY (Liquid limit greater than 50)			MH	Inorganic silt; micaceous or diatomaceous fine sand
				CH	Inorganic clay of high plasticity; fat clay
				OH	Organic clay of medium to high plasticity; organic silt
	HIGHLY ORGANIC SOIL			PT	Peat; humus; swamp soil with high organic content

OTHER MATERIALS	GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
PAVEMENT		AC or PC	Asphalt concrete pavement or Portland cement pavement
ROCK		RK	Rock (See Rock Classification)
WOOD		WD	Wood, lumber, wood chips
DEBRIS		DB	Construction debris, garbage

Notes:
1. USCS letter symbols correspond to symbols used by the Unified Soil Classification System and ASTM classification methods. Dual letter symbols (e.g., SP-SM for sand or gravel) indicate soil with an estimated 5-15% fines. Multiple letter symbols (e.g., ML/CL) indicate borderline or multiple soil classifications.
2. Soil descriptions are based on the general approach presented in the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), outlined in ASTM D 2488. Where laboratory index testing has been conducted, soil classifications are based on the Standard Test Method for Classification of Soils for Engineering Purposes, as outlined in ASTM D 2487.
3. Soil description terminology is based on visual estimates (in the absence of laboratory test data) of the percentages of each soil type and is defined as follows:

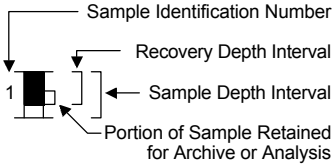
Primary Constituent:	> 50% - "GRAVEL," "SAND," "SILT," "CLAY," etc.
Secondary Constituents:	> 30% and ≤ 50% - "very gravelly," "very sandy," "very silty," etc.
	> 15% and ≤ 30% - "gravelly," "sandy," "silty," etc.
Additional Constituents:	> 5% and ≤ 15% - "with gravel," "with sand," "with silt," etc.
	≤ 5% - "trace gravel," "trace sand," "trace silt," etc., or not noted.

Drilling and Sampling Key

SAMPLER TYPE

Code	Description
a	3.25-inch O.D., 2.42-inch I.D. Split Spoon
b	2.00-inch O.D., 1.50-inch I.D. Split Spoon
c	Shelby Tube
d	Grab Sample
e	Single-Tube Core Barrel
f	Double-Tube Core Barrel
g	Other - See text if applicable
1	300-lb Hammer, 30-inch Drop
2	140-lb Hammer, 30-inch Drop
3	Pushed
4	Rotosonic
5	Air Rotary (Rock)
6	Wash Rotary (Rock)
7	Other - See text if applicable

SAMPLE NUMBER & INTERVAL



Field and Lab Test Data

Code	Description
PP = 1.0	Pocket Penetrometer, tsf
TV = 0.5	Torvane, tsf
PID = 100	Photoionization Detector VOC screening, ppm
W = 10	Moisture Content, %
D = 120	Dry Density, pcf
-200 = 60	Material smaller than No. 200 sieve, %
GS	Grain Size - See separate figure for data
AL	Atterberg Limits - See separate figure for data
GT	Other Geotechnical Testing
CA	Chemical Analysis

Groundwater

▽ Approximate water level at time of drilling (ATD)

▼ Approximate water level at time other than ATD

7/21/08 \\EDMDATA\GINT\GINT7\PROJECTS\193043.020.GPJ SOIL CLASS SHEET GEOTECH

LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Soil Classification System and Key

Figure A-1

ST-B1-08

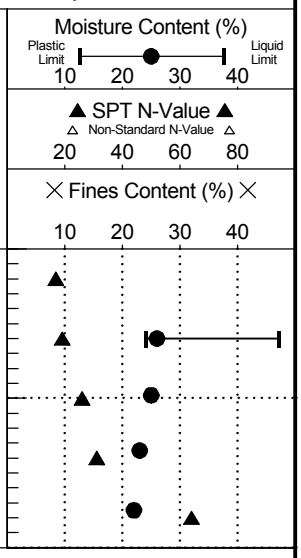
LAI Project No: 0193043.020

SAMPLE DATA / SOIL PROFILE

Drilling Method: Mud Rotary
Ground Elevation (ft): 88.93 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: CTM Date: 05/16/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Soil Description
0		S-1	b2	17			GP	Gray, sandy, GRAVEL with trace silt (medium dense, moist)
							CL	**(FILL)**
	85	S-2	b2	19	W = 26 AL			Mottled gray and brown, interbedded sandy, CLAY and CLAY with fine sand (very stiff to hard, moist)
5		S-3	b2	26	W = 25			**(GLACIAL MARINE DRIFT)**
		S-4	b2	31	W = 23			- From 4.2 to 4.3 ft with silty coarse sand pocket
								- Below 6 ft with trace fine gravel
	80	S-5	b2	64	W = 22		SM	Grayish brown, silty, fine SAND (moist, very dense)
10								
15								
20								
25								
30								
35								
40								
45								

Groundwater: Groundwater Not Encountered



Boring Completed 05/16/08
Total Depth of Boring = 10.0 ft.

Point located at:
Station: 290+63 Offset: 344.4 ft left of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

193043.02 7/21/08 \\EDMDATA\GINT\GINT7\PROJECTS\193043.020.GPJ SOIL BORING LOG WITH GRAPH

LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring ST-B1-08

Figure A-2

ST-B2-08

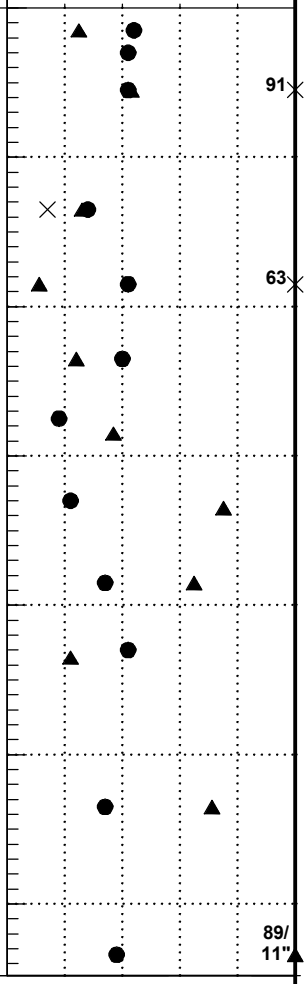
LAI Project No: 0193043.020

Drilling Method: Mud Rotary
Ground Elevation (ft): 55.06 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: EGN Date: 05/21/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Description
0	55	S-1A	b2	25	W = 22		SM	Topsoil (12 inches)
		S-1B			W = 21		ML	Gray, SILT with sand (very stiff to hard, damp) **(GLACIAL MARINE DRIFT)**
		S-2	b2	43	W = 21 GS			
5	50	S-3	b2	26	W = 14 GS		SP-SM	Gray, fine to coarse SAND with silt and gravel (medium dense, moist)
		S-4	b2	11	W = 21 GS		ML	Gray spotted orange, very sandy, SILT with trace fine gravel (stiff to very stiff, moist)
10	45	S-5	b2	24	W = 20			
		S-6	b2	37	W = 9		GP-GM	Gray, sandy, fine GRAVEL with silt (dense, wet)
15	40	S-7	b2	75	W = 11		SM	Gray, silty, fine to medium SAND with gravel (very dense, wet)
		S-8	b2	65	W = 17			
20	35	S-9	b2	22	W = 21		SM	Gray, silty to very silty, fine SAND with trace organics (medium dense to very dense, wet)
25	30	S-10	b2	71	W = 17		SM	Gray, silty silty, fine SAND (very dense, wet) **(GLACIAL TILL)**
30	25	S-11	b2	89/ 11"	W = 19			
35								
40								
45								

Groundwater: 13.5 ft ATD

Moisture Content (%) — Plastic Limit 10 20 30 40 Liquid Limit
▲ SPT N-Value ▲ △ Non-Standard N-Value △ 20 40 60 80
× Fines Content (%) × 10 20 30 40



Boring Completed 05/21/08
Total Depth of Boring = 32.4 ft.

Point located at:
Station: 289+91 Offset: 53.0 ft right of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring ST-B2-08

Figure A-3

ST-B3-08

LAI Project No: 0193043.020

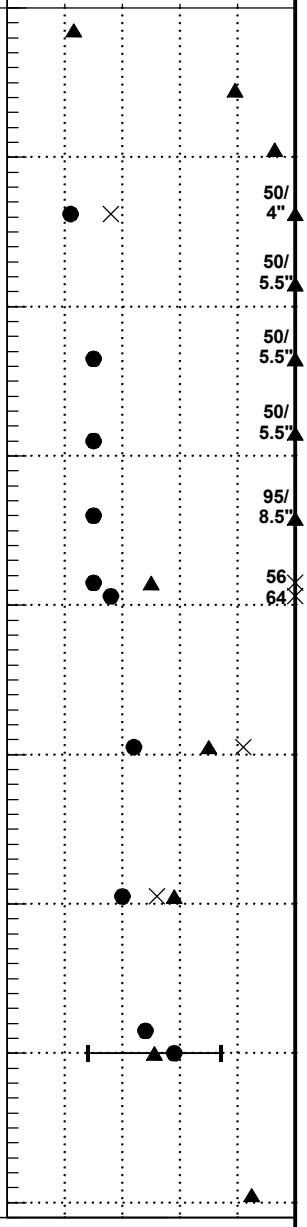
Drilling Method: Mud Rotary
Ground Elevation (ft): 107.63 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: EGN Date: 06/03/08

Sample Number & Interval	Sampler Type	Blows/Foot	Test Data
S-1	b2	23	
S-2	b2	79	
S-3	b2	93	
S-4	b2	50/ 4"	W = 11 GS
S-5	b2	50/ 5.5"	
S-6	b2	50/ 5.5"	W = 15
S-7	b2	50/ 5.5"	W = 15
S-8	b2	95/ 8.5"	W = 15
S-9A S-9B	b2	50	W = 15 GS W = 18 GS
S-10	b2	70	W = 22 GS
S-11	b2	58	W = 20 GS
S-12A S-12B	b2 b2	51	W = 24 W = 29 AL
S-13	b2	85	

USCS Symbol	Soil Profile
SM	Topsoil (4 inches)
SM/ CL	Grayish brown, gravelly, silty, fine to coarse SAND with trace organics and orange iron-oxidized sand with seams of gray, silty CLAY (medium dense, damp)
SM	**(DISTURBED GLACIAL MARINE DRIFT)**
GP-GM	Gray, silty, fine to medium SAND with gravel trace orange iron-oxidized sand (very dense, damp)
SM	**(GLACIAL TILL)**
	Gray, very sandy, GRAVEL with silt (very dense, moist)
	Gray, silty, gravelly, fine to coarse SAND (very dense, wet)
	- Below 8 ft grades to light brown
	- Below 14.5 ft with trace gravel
SM/ ML	Gray, very silty, fine SAND to very sandy, SILT with trace gravel (very dense to hard, wet)
ML	Brown, very sandy SILT with trace gravel (hard, wet)
SM	Grayish brown spotted orange, very silty, fine SAND with trace gravel (very dense, wet)
SM	Yellowish brown mottled orange, silty, fine SAND (very dense, wet)
CL	Gray, slickensided CLAY with stratified partings of fine sand and lenses of iron-oxidized sand (hard, wet)
SM	Gray striped orange, silty, fine to medium SAND (very dense, wet)

Groundwater: 21.0 ft ATD

Moisture Content (%) — Plastic Limit 10, 20, 30, 40, Liquid Limit
▲ SPT N-Value ▲ △ Non-Standard N-Value △ 20, 40, 60, 80
× Fines Content (%) × 10, 20, 30, 40



Boring Completed 06/03/08
Total Depth of Boring = 40.5 ft.

Point located at:
Station: 298+06 Offset: 78.3 ft right of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring ST-B3-08

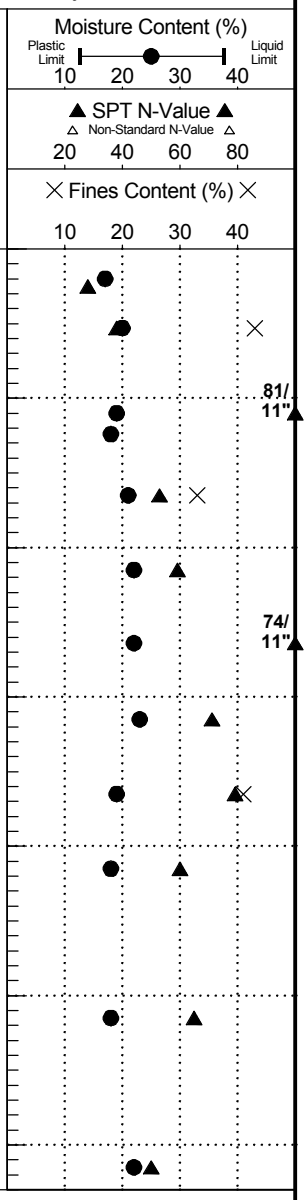
Figure A-4

ST-B4-08

LAI Project No: 0193043.020

Drilling Method: Mud Rotary
Ground Elevation (ft): 99.80 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: EGN Date: 05/22/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Soil Profile	Groundwater
0							SM	Topsoil (5 inches)	Groundwater Not Encountered
		S-1	b2	28	W = 17		SM	Grayish brown mottled orange, very silty, fine SAND with trace organics (medium dense to dense, damp) **(WEATHERED GLACIAL TILL)**	
		S-2A, S-2B	b2	38	W = 20, GS				
5	95	S-3A, S-3B	b2	81/11"	W = 19, W = 18		SM, SM	Blue gray, silty, fine SAND (very dense, moist)	
		S-4	b2	53	W = 21, GS			Brown mottled orange, very silty, fine SAND with lenses of sandy SILT (very dense, moist) **(GLACIAL TILL)**	
10	90	S-5	b2	59	W = 22				
		S-6	b2	74/11"	W = 22				
15	85	S-7	b2	71	W = 23			- Below 15 ft grades to fine to medium SAND	
		S-8	b2	79	W = 19, GS			- Below 18 ft grades to grayish brown	
20	80	S-9	b2	60	W = 18				
25	75	S-10	b2	65	W = 18				
30	70	S-11	b2	50	W = 22				
35									
40									
45									



Boring Completed 05/22/08
Total Depth of Boring = 31.5 ft.

Point located at:
Station: 300+27 Offset: 47.7 ft right of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring ST-B4-08

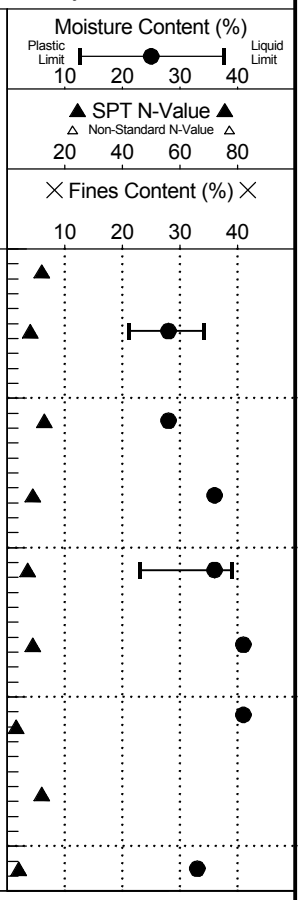
Figure A-5

ST-B5-08

LAI Project No: 0193043.020

Drilling Method: Mud Rotary
Ground Elevation (ft): 98.34 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: CTM Date: 05/14/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Soil Profile	Groundwater
0		S-1	b2	12			SP	Brown, gravelly, SAND with trace silt (loose to medium dense, wet) **(FILL)**	4.0 ft ATD
		S-2A S-2B	b2	8	W = 28 AL		CL	Mottled grayish brown, sandy, CLAY with fine gravel and occasional organics (stiff, moist to wet) **(GLACIAL MARINE DRIFT)**	
	95								
5		S-3	b2	13	W = 28				
	90	S-4	b2	9	W = 36				
10		S-5	b2	7	W = 36 AL			- At 10 ft medium stiff	
	85	S-6	b2	9	W = 41			- Below 12.8 ft becomes gray	
15		S-7	b2	3	W = 41				
	80	S-8	b2	12					
20		S-9	b2	4	W = 33				
25									
30									
35									
40									
45									



Boring Completed 05/14/08
Total Depth of Boring = 21.5 ft.

Point located at:
Station: 321+71 Offset: 36.2 ft left of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring ST-B5-08

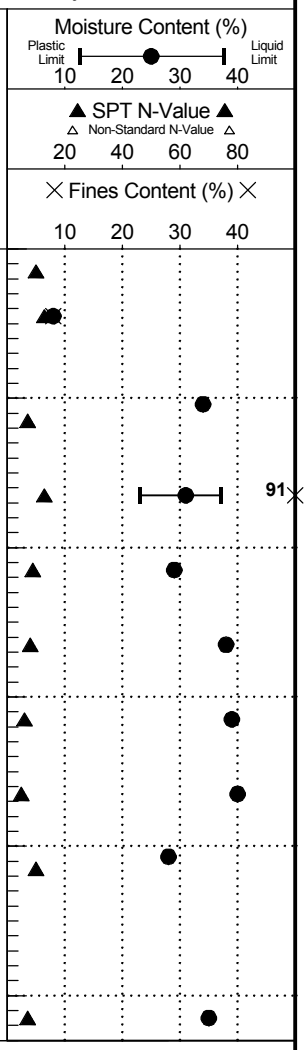
Figure A-6

ST-B6-08

LAI Project No: 0193043.020

Drilling Method: Mud Rotary
Ground Elevation (ft): 96.87 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: CTM Date: 05/14/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Soil Profile	Groundwater
0		S-1	b2	10			SP-SM	Brown to gray, very gravelly, fine to coarse SAND with silt (medium dense, wet) **(FILL)**	4.4 ft ATD
	95	S-2	b2	13	W = 8 GS				
5		S-3	b2	7	W = 34		ML	Mottled brown, gray, and dark brown, clayey, sandy, SILT with fine gravel and scattered fine organics (medium stiff, moist) **(DISTURBED GLACIAL MARINE DRIFT)**	
	90	S-4	b2	13	W = 31 GS AL		CL	Light grayish brown, CLAY with sand and occasional fine organics (medium stiff to stiff, moist) **(GLACIAL MARINE DRIFT)**	
10		S-5	b2	9	W = 29				
	85	S-6	b2	8	W = 38				
15		S-7	b2	6	W = 39				
	80	S-8	b2	5	W = 40				
20		S-9	b2	10	W = 28				
	75								
25		S-10	b2	7	W = 35				
30									
35									
40									
45									



Boring Completed 05/14/08
Total Depth of Boring = 26.5 ft.

Point located at:
Station: 326+25 Offset: 136.9 ft left of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring ST-B6-08

Figure
A-7

ST-B7-08

LAI Project No: 0193043.020

SAMPLE DATA

Sample Number & Interval	Sampler Type	Blows/Foot	Test Data
S-1	d		
S-2	b2	5	
S-3	b2	11	
S-4	b2	10	
S-5A / S-5B	b2	3	
S-6	b2	0	

SOIL PROFILE

Drilling Method: Mud Rotary

Ground Elevation (ft): 11.40 (MSL)

Drilled By: WSDOT Northwest Region

Logged By: DMN Date: 05/27/08

USCS Symbol	Description
SM	Topsoil (4 inches)
SM	Mottled gray and brown, silty, fine to medium SAND with trace gravel and trace wood debris (loose, moist to wet) **(FILL)**
SM/ ML	Mottled gray and brown, very silty, fine to coarse SAND to sandy, SILT (medium dense to stiff, moist to wet)
SP-SM	Gray mottled gray and brown, fine to medium SAND with silt and trace gravel (loose to medium dense, moist to wet)
SP	Gray to dark gray, medium to coarse SAND with trace silt and trace gravel (very loose, wet)
ML	Gray, SILT with trace fine sand, trace clay, and trace wood fragments (soft to very soft, wet) **(ALLUVIUM)**

Groundwater: 8.5 ft ATD

Moisture Content (%): Plastic Limit 10 20 30 40 Liquid Limit

▲ SPT N-Value ▲ △ Non-Standard N-Value △: 20 40 60 80

× Fines Content (%) ×: 10 20 30 40

Boring Completed 05/27/08
Total Depth of Boring = 15.5 ft.

Point located at:
Station: 246+13 Offset: 36.3 ft left of centerline

City of Stanwood sanitary sewer force main encountered below ground surface.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

193043.02 7/21/08 \\EDMDATA\GINT\GINT7\PROJECTS\193043.020.GPJ SOIL BORING LOG WITH GRAPH

LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring ST-B7-08

Figure A-8

ST-P1-08

LAI Project No: 0193043.020

Drilling Method: Mud Rotary
Ground Elevation (ft): 48.64 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: EGN Date: 05/29/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Description
0							SM	Topsoil (4 inches)
		S-1	b2	24	W = 24 AL		CL	Gray, CLAY with sand (very stiff, moist) **(GLACIAL MARINE DRIFT)**
		S-2	b2	25	W = 20		ML	Gray, very sandy, SILT with gravel (very stiff, moist)
5	45	S-3	b2	27	W = 19 GS		ML	Gray, sandy, SILT with trace gravel (very stiff, wet)
10	40	S-4	b2	19	W = 15			
		S-5	b2	33	W = 12 GS		SW	Black and white, fine to coarse SAND with gravel and trace silt (dense, wet)
15	35	S-6	b2	16	W = 25		SM	Gray, silty to very silty, fine SAND (medium dense, wet)
		S-7	b2	21	W = 19 -200 = 20		SM	Brownish gray, silty, fine SAND with spots of dark brown organics (medium dense to dense, wet)
20	30	S-8	b2	37	W = 17			- Below 19 ft with gravel
		S-9	b2	50/ 3"	W = 7		GP-GM	Gray, sandy, fine GRAVEL with silt (very dense, wet) **(GLACIAL TILL)**
25	25						SP-SM	Gray, gravelly, coarse SAND with silt (very dense, wet)
		S-10	b2	50/ 5"	W = 9			
		S-11	b2	50/ 2"				
30								
35								
40								
45								

WELL DETAIL (DOE#: APP953): 22.5 ft 7/7/08

Moisture Content (%): Plastic Limit 10 — 20 — 30 — 40 Liquid Limit

▲ SPT N-Value ▲ △ Non-Standard N-Value △: 20 40 60 80

× Fines Content (%) ×: 10 20 30 40

Boring Completed 05/29/08
Total Depth of Boring = 28.3 ft.

Point located at:
Station: 288+30 Offset: 48.7 ft left of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

193043.02 7/21/08 \\EDMDATA\GINT\GINT7\PROJECTS\193043.020.GPJ SOIL BORING LOG WITH GRAPH

LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring ST-P1-08

Figure A-9

ST-P2-08

LAI Project No: 0193043.020

Drilling Method: Mud Rotary
Ground Elevation (ft): 69.86 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: EGN Date: 06/04/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	USCS Symbol	Soil Description
0		S-1	b2	27		SM	Topsoil (3 inches)
		S-2	b2	39	W = 18	SM/ ML / SM	Brown, silty to very silty, fine SAND with trace gravel and rootlets (medium dense, damp) **(WEATHERED GLACIAL TILL)**
5	65	S-3	b2	50	W = 6	SP-SM	Brown, silty, fine SAND (dense, damp)
		S-4	b2	65	W = 6 GS		Gray, very gravelly, fine to coarse SAND with silt (very dense, moist)
10	60	S-5	b2	43	W = 23	SM/ ML	Brown, silty, fine SAND, with gravel and lenses of very sandy, SILT (dense and hard, moist)
		S-6	b2	30	W = 17		
15	55	S-7	b2	49	W = 18 GS	ML	Brown, very sandy SILT with trace gravel (hard, moist)
		S-8	b2	37	W = 15 GS	SM	Brown, very silty, fine SAND with gravel (dense, moist)
20	50	S-9	b2	57	W = 12 GS	SM	Grayish brown mottled orange, silty, fine to medium SAND (very dense, moist) **(GLACIAL TILL)**
25	45	S-10	b2	50	W = 18		
30	40	S-11A	b2	59			

WELL DETAIL (DOE#: APP954): 27.8 ft 7/7/08

Moisture Content (%): Plastic Limit 10 20 30 40 Liquid Limit
▲ SPT N-Value ▲ △ Non-Standard N-Value △: 20 40 60 80
× Fines Content (%) ×: 10 20 30 40

66

Boring Completed 06/04/08
Total Depth of Boring = 30.3 ft.

Point located at:
Station: 291+33 Offset: 70.8 ft right of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

193043.02 7/21/08 \\EDMDATA\GINT\GINT7\PROJECTS\193043.020.GPJ SOIL BORING LOG WITH GRAPH

LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring ST-P2-08

Figure A-10

ST-P3-08

LAI Project No: 0193043.020

SAMPLE DATA / SOIL PROFILE

Drilling Method: Mud Rotary
Ground Elevation (ft): 118.87 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: EGN Date: 05/27/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Description
0							SM	Topsoil (2 inches)
		S-1	b2	1	W = 20		SM	Brown, very silty, fine to coarse SAND with gravel and trace rootlets (very loose, moist) **(FILL)**
		S-2	b2	2	W = 16 GS			
	115						ML	Grayish brown, sandy, SILT with wood fragments (medium stiff, wet)
5		S-3	b2	6	W = 44 AL			
		S-4	b2	10	W = 21		SM	Light brown, silty, fine SAND with gravel and trace rootlets (loose to medium dense, wet)
	110							
10		S-5	b2	30	W = 16 GS		SM	Gray, very silty, fine to medium SAND with trace gravel (dense, wet) **(WEATHERED GLACIAL TILL)**
		S-6	b2	72	W = 19		ML	Brownish gray, very sandy, SILT with lenses of orange, iron-oxidized silt (hard, wet) **(GLACIAL TILL)**
	105							
15		S-7	b2	50/ 3"				- Refusal at 16 ft

Boring Completed 05/27/08
Total Depth of Boring = 16.0 ft.

Point located at:
Station: 307+63 Offset: 27.5 ft right of centerline

WELL DETAIL (DOE#: APP951)

4.8 ft 5/27/08

13.5 ft 7/7/08

Moisture Content (%)
Plastic Limit — Liquid Limit
10 20 30 40

▲ SPT N-Value ▲
△ Non-Standard N-Value △
20 40 60 80

× Fines Content (%) ×
10 20 30 40

50/ 3"

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

193043.02 7/21/08 \\EDMDATA\GINT\GINT7\PROJECTS\193043.020.GPJ SOIL BORING LOG WITH GRAPH

LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring ST-P3-08

Figure A-11

ST-P4-08

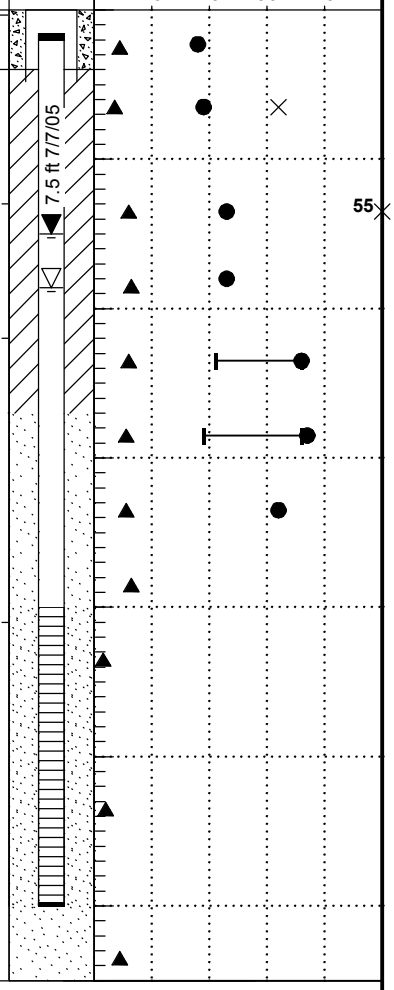
LAI Project No: 0193043.020

SAMPLE DATA | **SOIL PROFILE** | **WELL DETAIL** (DOE#: APP952)

Drilling Method: Mud Rotary
Ground Elevation (ft): 128.78 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: EGN Date: 06/05/08

Sample Number & Interval	Sampler Type	Blows/Foot	Test Data
S-1	b2	9	W = 18
S-2	b2	7	W = 19 GS
S-3	b2	12	W = 23 GS
S-4	b2	13	W = 23
S-5	b2	12	W = 36 AL
S-6	b2	11	W = 37 AL
S-7	b2	11	W = 32
S-8	b2	13	
S-9	b2	3	
S-10	b2	4	
S-11	b2	9	

USCS Symbol	Description
SM	Topsoil (2 inches)
SP-SM, SM	Brown, fine SAND with silt and trace rootlets in the upper 6 inches (loose, damp) **(FILL)**
	Brown, very silty, fine SAND (loose, damp) **(GLACIAL MARINE DRIFT)**
CL	Brown mottled orange, sandy, CLAY with trace wood and organic fragments (stiff, wet)
	- Below 9.5 ft grades to brownish gray
CL	Brown, CLAY (stiff, wet)
CL	Gray, silty, CLAY (soft to stiff, wet) with fine sand and trace organics



Boring Completed 06/05/08
Total Depth of Boring = 32.5 ft.

Point located at:
Station: 309+24 Offset: 42.2 ft right of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring ST-P4-08

Figure A-12

ST-P5-08

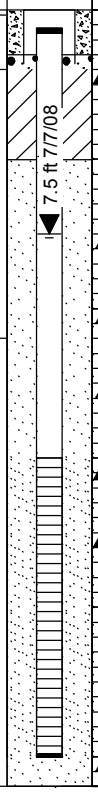
LAI Project No: 0193043.020

SAMPLE DATA / SOIL PROFILE

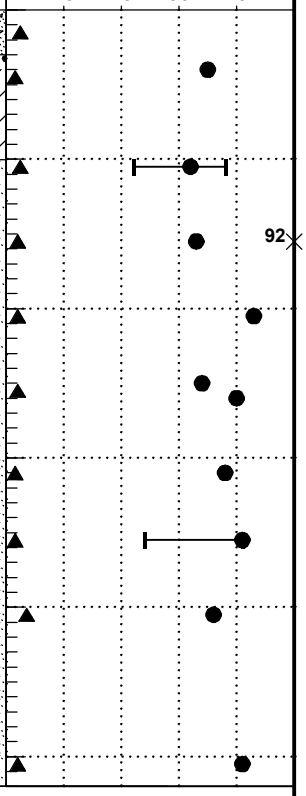
Drilling Method: Mud Rotary
Ground Elevation (ft): 90.14 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: CTM Date: 05/14/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Description
0	90	S-1	b2	5			SP-SM	Topsoil (2 inches)
		S-2	b2	3	W = 35		SP-SM	Gray, gravelly, fine to coarse SAND with silt (loose, wet) **(FILL)**
5	85	S-3	b2	5	W = 32 AL		CL	Mottled grayish brown, CLAY with sand and trace gravel (medium stiff, wet) **(GLACIAL MARINE DRIFT)**
		S-4	b2	4	W = 33 GS			- Below 4.5 ft with trace sand
10	80	S-5	b2	4	W = 43		CL	Gray, CLAY (soft, wet)
		S-6	b2	4	W = 34 W = 40			
15	75	S-7	b2	3	W = 38			
		S-8	b2	3	W = 41 AL			- Below 17 ft with trace sand and gravel
20	70	S-9	b2	7	W = 36			
25	65	S-10	b2	4	W = 41			

WELL DETAIL (DOE#: APP248)



Moisture Content (%) — Plastic Limit 10, 20, 30, 40 Liquid Limit
▲ SPT N-Value ▲ △ Non-Standard N-Value △ — 20, 40, 60, 80
× Fines Content (%) × — 10, 20, 30, 40



Boring Completed 05/14/08
Total Depth of Boring = 26.0 ft.

Point located at:
Station: 327+95 Offset: 69.5 ft left of centerline

Standpipe Piezometer Completed 05/14/08
Total Depth of Standpipe Piezometer = 25.0 ft.

Notes:
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2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

193043.02 7/21/08 \\EDMDATA\GINT\GINT7\PROJECTS\193043.020.GPJ SOIL BORING LOG WITH GRAPH

LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring ST-P5-08

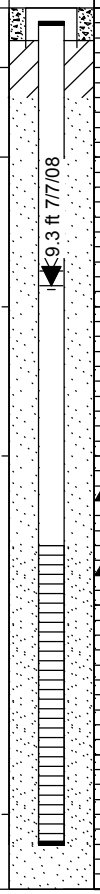
Figure A-13

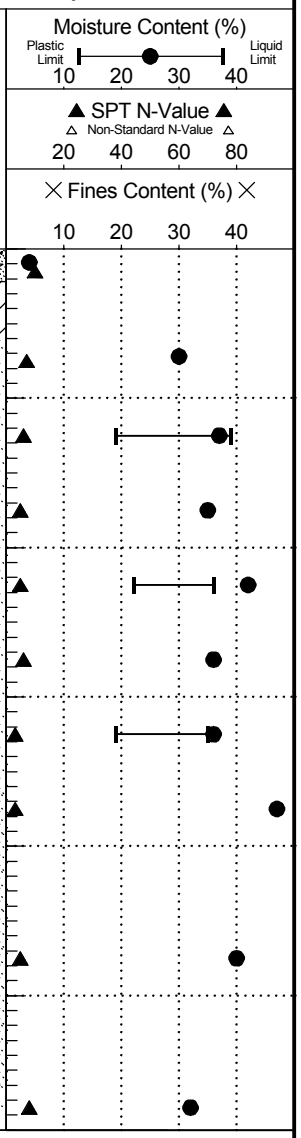
ST-P6-08

LAI Project No: 0193043.020

Drilling Method: Mud Rotary
Ground Elevation (ft): 91.92 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: MBB Date: 06/24/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Soil Profile
0		S-1	b2	10	W = 4		SM	Topsoil (2 ft)
	90	S-2	b2	7	W = 30		SM/ CL	Brown, silty, fine to medium SAND interbedded with silty CLAY (loose to medium stiff, moist) **(DISTURBED GLACIAL MARINE DRIFT)**
5	85	S-3	b2	6	W = 37 AL		CL	Mottled light gray to brown, CLAY with trace sand (medium stiff, moist) **(GLACIAL MARINE DRIFT)**
		S-4	b2	5	W = 35			
10	80	S-5	b2	5	W = 42 AL		CL	Olive brown mottled dark brown and orange, CLAY with trace sand (medium stiff, moist)
		S-6	b2	6	W = 36			
15	75	S-7	b2	3	W = 36 AL		CL	Gray, CLAY with trace sand to sand (soft to medium stiff, moist to wet)
		S-8	b2	3	W = 47			
20	70							
25		S-9	b2	5	W = 40			
	65	S-10	b2	8	W = 32		SM/ CL	Dark gray, very silty, fine SAND interbedded with sandy, CLAY (loose to medium stiff, moist)
30								
35								
40								
45								





Boring Completed 06/24/08
Total Depth of Boring = 29.5 ft.

Point located at:
Station: 327+91 Offset: 107.9 ft left of centerline

Standpipe Piezometer Completed 06/24/08
Total Depth of Standpipe Piezometer = 28.0 ft.

Notes:
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193043.02 7/21/08 \\EDMDATA\GINT\GINT7\PROJECTS\193043.020.GPJ SOIL BORING LOG WITH GRAPH

LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring ST-P6-08

Figure
A-14

ST-P7-08

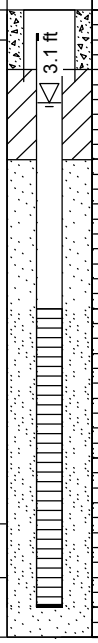
LAI Project No: 0193043.020

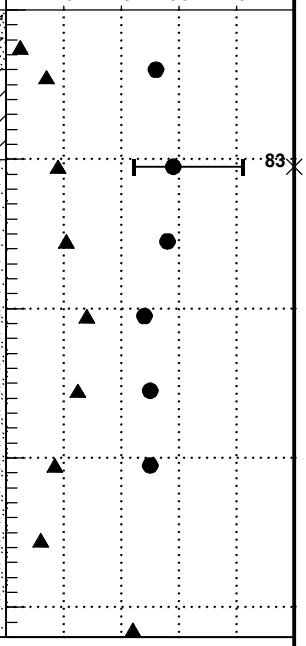
SAMPLE DATA / SOIL PROFILE

Drilling Method: Mud Rotary
Ground Elevation (ft): 89.41 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: CTM Date: 05/16/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Description
0		S-1A, S-1B	b2	5			SP-SM	Brown, gravelly, fine to medium SAND with silt, crushed road subgrade (loose, moist) **(FILL)**
		S-2	b2	14	W = 26		CL	Mottled light gray and light brown, sandy, CLAY with trace gravel (stiff to very stiff, moist) **(GLACIAL MARINE DRIFT)**
5	85	S-3	b2	18	W = 29 GS AL			
		S-4	b2	21	W = 28			
10	80	S-5	b2	28	W = 24			
		S-6	b2	25	W = 25			
15	75	S-7	b2	17	W = 25			
		S-8	b2	12			SM	Light grayish brown, silty, fine SAND with trace clay and fine gravel (medium dense, moist)
20	70	S-9A, S-9B	b2	44			SP-SM	Grayish brown, fine to medium SAND with silt to silty, fine to medium SAND with fine gravel (dense, damp to wet)
25								
30								
35								
40								
45								

WELL DETAIL (DOE#: APP244)





Boring Completed 05/16/08
Total Depth of Boring = 21.0 ft.

Point located at:
Station: 290+43 Offset: 369.3 ft left of centerline

Standpipe Piezometer Completed 05/16/08
Total Depth of Standpipe Piezometer = 20.0 ft.

Notes:
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2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

193043.02 7/21/08 \\EDMDATA\GINT\GINT7\PROJECTS\193043.020.GPJ SOIL BORING LOG WITH GRAPH

LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring ST-P7-08

Figure A-15

ST-TP3-08

SAMPLE DATA			SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): 65.13 (MSL) Excavated By: WSDOT Northwest Region View Direction: North Logged By: EGN	
0					SM	Topsoil (4 inches)	Groundwater not encountered.
					CL	Blue gray to brown, CLAY (medium stiff, moist) **(GLACIAL MARINE DRIFT)**	
2	S-1	d	W = 27 AL				
4							
6							
8	S-2	d	W = 7 GS		GM	Gray, very sandy, silty fine GRAVEL (medium dense, damp) **(GLACIAL TILL)**	
10							
12							

Test Pit Completed 05/14/08
Total Depth of Test Pit = 9.0 ft.

Point located at:
Station: 293+18 Offset: 46.6 ft right of centerline

ST-TP4-08

SAMPLE DATA			SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): 94.99 (MSL) Excavated By: WSDOT Northwest Region View Direction: North Logged By: EGN	
0					SM	Topsoil (4 inches)	Slight Seepage
					SM	Brown, silty, SAND (loose, moist) **(FILL)**	
2	S-1	d	W = 6 GS		GM	Gray, very sandy, silty fine GRAVEL with cobbles (medium dense to dense, damp) **(GLACIAL TILL)**	
4							
6	S-2	d	W = 7		SP-SM	Brown, fine to medium SAND with silt (very dense, moist)	
8							
10							
12							

Test Pit Completed 05/14/08
Total Depth of Test Pit = 10.0 ft.

Point located at:
Station: 299+18 Offset: 44.9 ft right of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

193043.02 7/21/08 \\EDMDATA\GINT\GINT7\PROJECTS\193043.020.GPJ TEST PIT LOG

LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Test Pits

Figure
A-16

ST-TP5-08

SAMPLE DATA			SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): 112.69 (MSL) Excavated By: WSDOT Northwest Region View Direction: North Logged By: EGN
0					SM	Topsoil (5 inches)
					SM	Gray, very silty, fine to medium SAND with gravel (dense, damp) **(GLACIAL TILL)** - Below 2 ft minor sloughing
2						Slight Seepage
4						
6	S-1	d	W = 9 GS			
8						
10						
12						

Test Pit Completed 05/14/08
Total Depth of Test Pit = 6.5 ft.

Point located at:
Station: 302+46 Offset: 40.9 ft right of centerline

ST-TP6-08

SAMPLE DATA			SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): 121.21 (MSL) Excavated By: WSDOT Northwest Region View Direction: North Logged By: EGN
0					SM	Topsoil (5 inches)
					SM	Gray, very silty, fine to medium SAND with gravel to gravelly, very silty, fine to medium SAND (very dense, moist) **(GLACIAL TILL)**
2						Groundwater not encountered.
4						
6						
8						
10						
12						

Test Pit Completed 05/14/08
Total Depth of Test Pit = 4.5 ft.

Point located at:
Station: 306+17 Offset: 47.4 ft right of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

193043.02 7/21/08 \\EDMDATA\GINT\GINT7\PROJECTS\193043.020.GPJ TEST PIT LOG

LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Test Pits

Figure
A-17

ST-TP7-08

SAMPLE DATA			SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): 127.55 (MSL) Excavated By: WSDOT Northwest Region View Direction: North Logged By: EGN
0					SM	Topsoil (4 inches)
					SM	Brown mottled orange, silty, fine SAND with trace roots and rootlets in the upper 2 ft (loose, damp) **(GLACIAL MARINE DRIFT)**
2	S-1	d	W = 20 GS			ATD
4						
6						
8						
10						
12						

Test Pit Completed 05/14/08
Total Depth of Test Pit = 7.0 ft.

Point located at:
Station: 310+27 Offset: 38.3 ft right of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

193043.02 7/21/08 \\EDMDATA\GINT\GINT7\PROJECTS\193043.020.GPJ TEST PIT LOG

LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Test Pits

Figure
A-18

SN-B1-08

LAI Project No: 0193043.020

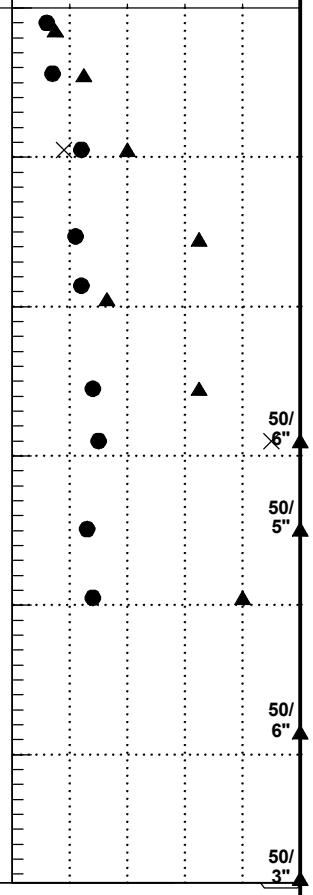
Drilling Method: Mud Rotary
Ground Elevation (ft): 205.65 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: CTM Date: 05/13/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Soil Profile	Groundwater
0	205	S-1	b2	15	W = 6		GP	Gray, sandy, fine GRAVEL (medium dense, moist) **(FILL)**	
		S-2	b2	25	W = 7		SP-SM		
5	200	S-3	b2	40	W = 12 GS			Brown, gravelly, fine to coarse SAND with silt (medium dense to very dense, moist) **(RECESSIONAL OUTWASH)**	
		S-4	b2	65	W = 11				
10	195	S-5	b2	33	W = 12				11.0 ft ATD
		S-6	b2	65	W = 14		SM	Gray, very silty, fine to coarse SAND with gravel (very dense, moist to wet) **(GLACIAL TILL)**	
15	190	S-7	b2	50/6"	W = 15 GS				
		S-8	b2	50/5"	W = 13				
20	185	S-9	b2	80	W = 14				
25	180	S-10	b2	50/6"					
30		S-11	b2	50/3"					
35									
40									
45									

Moisture Content (%) — Plastic Limit 10, 20, 30, 40 Liquid Limit

▲ SPT N-Value ▲ △ Non-Standard N-Value △ — 20, 40, 60, 80

× Fines Content (%) × — 10, 20, 30, 40



Boring Completed 05/13/08
Total Depth of Boring = 29.3 ft.

Point located at:
Station: 455+96 Offset: 35.5 ft left of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

193043.02 7/21/08 \\EDMDATA\GINT\GINT7\PROJECTS\193043.020.GPJ SOIL BORING LOG WITH GRAPH

LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring SN-B1-08

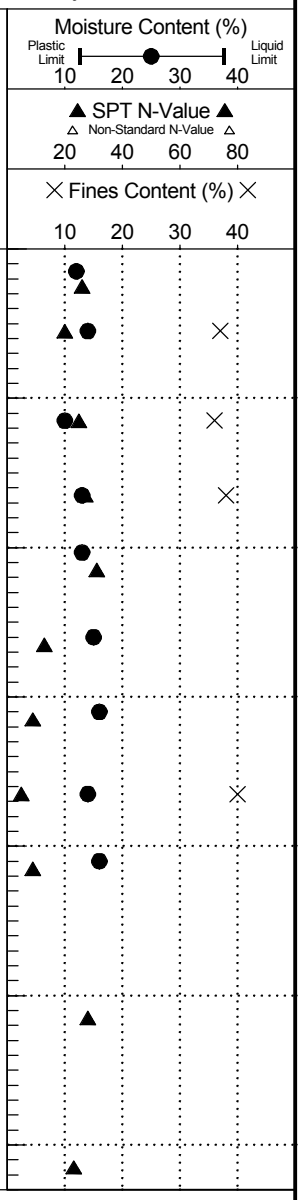
Figure A-19

SN-B2-08

LAI Project No: 0193043.020

Drilling Method: Mud Rotary
Ground Elevation (ft): 293.63 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: EGN Date: 06/06/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	USCS Symbol	Soil Profile	Groundwater
0		S-1	b2	26	W = 12	SM	Gray, very silty, fine to medium SAND with gravel (medium dense, damp) **(FILL)**	Groundwater Not Encountered
	290	S-2	b2	20	W = 14 GS			
5		S-3	b2	25	W = 10 GS	SM	Gray, very silty, gravelly, fine to medium SAND (medium dense to dense, damp)	
	285	S-4	b2	27	W = 13 GS			
10		S-5	b2	31	W = 13	SM	Brownish gray, silty, fine to coarse SAND with gravel and trace wood (medium dense, damp)	
	280	S-6	b2	13	W = 15			
15		S-7	b2	9	W = 16	SM	Brown to gray, very silty, gravelly, fine to medium SAND (loose, damp)	
	275	S-8	b2	5	W = 14 GS			
20		S-9	b2	9	W = 16			
	270					SM	Gray, silty, fine to medium SAND with gravel (medium dense, damp) **(GLACIAL TILL)**	
25		S-10	b2	28				
	265							
30		S-11	b2	23			- Below 30 ft becomes gravelly	
35								
40								
45								



Boring Completed 06/06/08
Total Depth of Boring = 31.5 ft.

Point located at:
Station: 483+58 Offset: 28.0 ft right of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

193043.02 7/21/08 \\EDMDATA\GINT\GINT7\PROJECTS\193043.020.GPJ SOIL BORING LOG WITH GRAPH

LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring SN-B2-08

Figure A-20

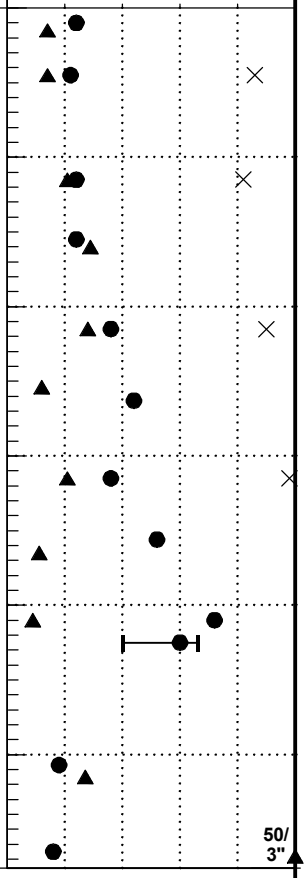
SN-B3-08

LAI Project No: 0193043.020

Drilling Method: Mud Rotary
Ground Elevation (ft): 261.42 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: EGN Date: 05/19/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Soil Profile	Groundwater
0		S-1	b2	14	W = 12		SM	Topsoil (2 inches)	Groundwater Not Encountered
	260	S-2	b2	14	W = 11 GS		SM	Gray, very silty, fine to coarse SAND with gravel (medium dense, damp) **(FILL)**	
5		S-3	b2	21	W = 12 GS		SM	Gray to grayish brown, very silty, gravelly, fine to medium SAND with trace dark brown organics (medium dense, moist)	
	255	S-4A S-4B	b2	29	W = 12			- Below 8.5 ft with seams of organics	
10		S-5	b2	28	W = 18 GS		SM/ ML	Gray, very silty, gravelly, fine to medium SAND with interbeds of brown to gray, sandy, SILT, increasing gravel at depth (medium dense to very stiff, moist)	
	250	S-6A S-6B	b2	12	W = 22		GP SM	Gray, sandy, fine GRAVEL with organics (medium dense, moist)	
15		S-7	b2	21	W = 18 GS			Gray, very silty, fine to coarse SAND with gravel and trace dark brown wood (loose to medium dense, moist)	
	245	S-8	b2	11	W = 26			- Below 17.5 ft becomes grayish brown	
20		S-9A S-9B	b2	9	W = 36 W = 30 AL		CL	Gray, sandy CLAY to CLAY with sand (stiff, wet) **(GLACIAL MARINE DRIFT)**	
25		S-10	b2	27	W = 9		GM/ SM	Gray, sandy, silty, fine GRAVEL to silty, gravelly, SAND (medium dense, wet) **(ADVANCE OUTWASH)**	
	235	S-11	b2	50/ 3"	W = 8		SM	Gray, silty to very silty, fine to medium SAND with gravel (very dense, wet)	
30									
35									
40									
45									

Moisture Content (%): Plastic Limit 10 20 30 40 Liquid Limit
▲ SPT N-Value ▲ △ Non-Standard N-Value △: 20 40 60 80
× Fines Content (%) ×: 10 20 30 40



Boring Completed 05/19/08
Total Depth of Boring = 28.8 ft.

Point located at:
Station: 587+90 Offset: 27.0 ft left of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring SN-B3-08

Figure
A-21

SN-B4-08

LAI Project No: 0193043.020

SAMPLE DATA / SOIL PROFILE

Drilling Method: Mud Rotary
Ground Elevation (ft): 298.14 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: DMN Date: 06/10/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Soil Description
0		S-1A	b2		W = 13		SM	Gray, silty, fine to medium SAND with trace gravel (dense, moist)
		S-1B		36	W = 9		SM	
		S-2	b2	37	W = 9			**(FILL)**
	295	S-3	b2	48	W = 8 GS			Gray to light brown, very silty, gravelly, fine to medium SAND (dense to very dense, moist)
5		S-4	b2	38	W = 10			
		S-5	b2	68	W = 9 GS			
	290	S-6	b2	38	W = 10		SP	Brown, fine SAND with gravel and trace silt (dense, moist)
10		S-7	b2	48	W = 11 GS		SM	Brown-gray, very silty, gravelly, fine to medium SAND (dense, moist)

Groundwater: Groundwater Not Encountered

Moisture Content (%): Plastic Limit 10 20 30 40 Liquid Limit
▲ SPT N-Value ▲ △ Non-Standard N-Value △: 20 40 60 80
× Fines Content (%) ×: 10 20 30 40

Boring Completed 06/10/08
Total Depth of Boring = 10.5 ft.

Point located at:
Station: 485+59 Offset: 25.9 ft right of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring SN-B4-08

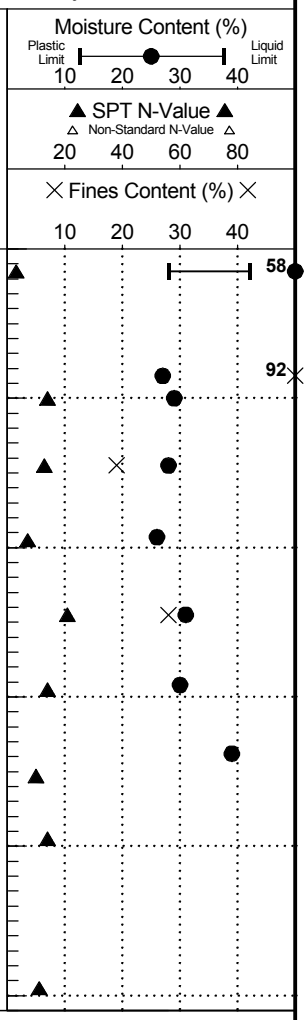
Figure A-22

SN-B5-08

LAI Project No: 0193043.020

Drilling Method: Mud Rotary
Ground Elevation (ft): 130.05 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: CTM Date: 06/25/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Soil Profile	Groundwater
0	130	S-1	b2	3	W = 58 AL		SM	Topsoil (12 inches)	
							ML	Gray to grayish brown, clayey, SILT with fine sand (soft, moist) **(GLACIAL MARINE DRIFT)**	
5	125	S-2A S-2B	b2	14	W = 27 GS W = 29		SM	Brown, silty, fine SAND (loose to medium dense, moist) **(RECESSIONAL OUTWASH)**	
		S-3	b2	13	W = 28 GS				
10	120	S-4	b2	7	W = 26				
		S-5	b2	21	W = 31 GS				
15	115	S-6A	b2	14	W = 30				
							ML	Gray, clayey, fine sandy SILT (soft, damp)	17.3 ft ATD
		S-7A S-7B	b2	10	W = 39		SP-SM	Gray, fine SAND with silt (medium dense, wet)	
20	110	S-8	b2	14					
25	105	S-9	b2	11					



Boring Completed 06/25/08
Total Depth of Boring = 25.5 ft.

Point located at:
Station: 436+19 Offset: 42.6 ft right of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring SN-B5-08

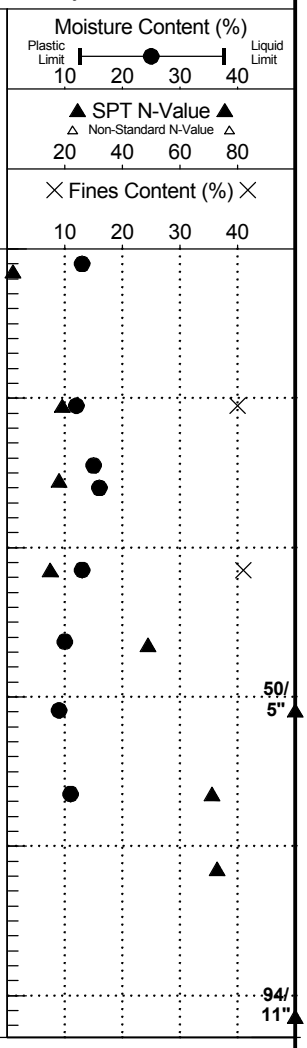
Figure A-23

SN-B6-08

LAI Project No: 0193043.020

Drilling Method: Mud Rotary
Ground Elevation (ft): 290.30 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: CTM Date: 06/25/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Soil Profile	Groundwater
0	290	S-1	b2	2	W = 13		SM / SM	Topsoil (6 inches); Gray, very silty, fine to medium SAND with gravel (loose to medium dense, moist) **(FILL)**	Groundwater Not Encountered
5	285	S-2	b2	19	W = 12 GS				
		S-3A S-3B	b2	18	W = 15 W = 16			- From 7.5 to 8.5 with organics	
10	280	S-4	b2	15	W = 13 GS				
		S-5	b2	49	W = 10		SM	Gray to mottled gray and brown, gravelly, silty to very silty, fine to medium SAND (dense to very dense, moist) **(GLACIAL TILL)**	
15	275	S-6	b2	50/ 5"	W = 9				
		S-7	b2	71	W = 11				
20	270	S-8	b2	73					
25	265	S-9	b2	94/ 11"					



Boring Completed 06/25/08
Total Depth of Boring = 26.4 ft.

Point located at:
Station: 482+44 Offset: 38.2 ft right of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring SN-B6-08

Figure A-24

SN-B7-08

LAI Project No: 0193043.020

Drilling Method: Mud Rotary
Ground Elevation (ft): 301.12 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: AES Date: 06/11/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Soil Profile	Groundwater
0		S-1	d				SP	Brown, medium to coarse SAND with gravel and abundant roots (loose, wet to moist)	Groundwater Not Encountered
	300	S-2	b2	8	W = 7				
		S-3	b2	6	W = 35		OL	**(FILL)**	
							SM	Dark brown to black, fine sandy, organic SILT with peat (medium stiff, damp)	
5	295	S-4	b2	38	W = 9 GS			Mottled grayish brown and orange, silty, very gravelly, fine to coarse SAND (dense, moist)	
		S-5	b2	14	W = 11		SM	Grayish brown, silty, fine SAND with gravel and silt (medium dense, wet)	
10	290	S-6	b2	28	W = 12 GS		ML	Light grayish tan to grayish brown, sandy SILT with gravel (medium dense to very dense, damp)	
		S-7	b2	23	W = 12				
15	285	S-8	b2	39	W = 12				
							ML	Gray, sandy, SILT with gravel (very dense, damp) **(WEATHERED GLACIAL TILL)**	
		S-9	b2	67	W = 12				
20	280	S-10	b2	55	W = 12		SM	Brown, silty, fine to medium SAND with gravel (very dense, damp)	
25		S-11	b2	50/1"					

Moisture Content (%) — Plastic Limit 10, 20, 30, 40 Liquid Limit
▲ SPT N-Value ▲ — △ Non-Standard N-Value △ — 20, 40, 60, 80
× Fines Content (%) × — 10, 20, 30, 40

Boring Completed 06/11/08
Total Depth of Boring = 25.1 ft.

Point located at:
Station: 497+30 Offset: 57.9 ft right of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring SN-B7-08

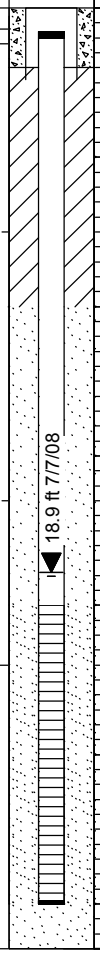
Figure A-25

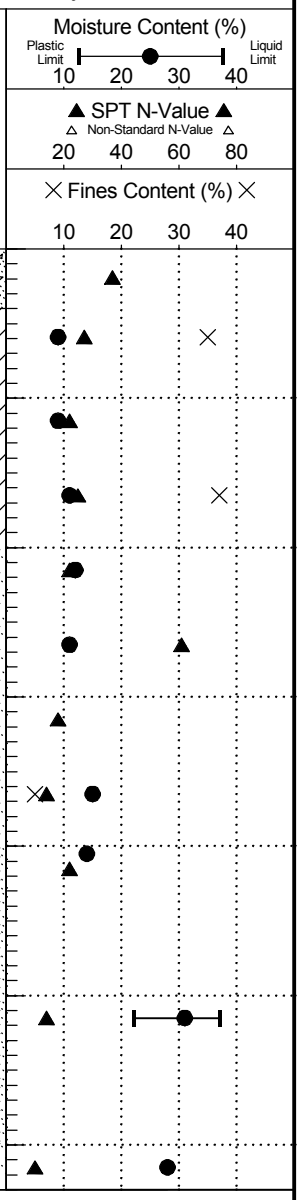
SN-P1-08

LAI Project No: 0193043.020

Drilling Method: Mud Rotary
Ground Elevation (ft): 179.81 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: CTM Date: 05/13/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Soil Profile
0		S-1A, S-1B	b2	37			AC	ASPHALT CEMENT CONCRETE (8-inches)
		S-2	b2	27	W = 9 GS		SP SM	Brown, gravelly, fine to coarse SAND with trace silt (dense, moist) **(FILL)**
5	175	S-3	b2	22	W = 9			Gray, very silty, gravelly, fine to coarse SAND, embankment fill (medium dense, moist)
		S-4	b2	25	W = 11 GS		SM	Gray, very silty, fine to coarse SAND with gravel (medium dense to very dense, moist)
10	170	S-5	b2	22	W = 12			
		S-6	b2	61	W = 11			
15	165	S-7	b2	18				
		S-8	b2	14	W = 15 GS		SP-SM	Grayish brown to gray, gravelly, fine to coarse SAND with silt (medium dense, wet)
20	160	S-9	b2	22	W = 14			
25	155	S-10	b2	14	W = 31 AL		CL	Light grayish brown to gray, CLAY with trace sand (stiff, moist) **(GLACIAL MARINE DRIFT)**
30	150	S-11	b2	10	W = 28			
35								
40								
45								





Boring Completed 05/13/08
Total Depth of Boring = 31.5 ft.

Point located at:
Station: 449+93 Offset: 16.8 ft left of centerline

Standpipe Piezometer Completed 05/13/08
Total Depth of Standpipe Piezometer = 30.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

193043.02 7/21/08 \\EDMDATA\GINT\GINT7\PROJECTS\193043.020.GPJ SOIL BORING LOG WITH GRAPH

LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring SN-P1-08

Figure A-26

SN-P2-08

LAI Project No: 0193043.020

Drilling Method: Mud Rotary
Ground Elevation (ft): 300.48 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: AES Date: 06/10/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Soil Profile
0	300	S-1	d				SP-SM	Gray, fine SAND with trace silt, gravel, and rootlets (medium dense, damp) **(FILL)**
		S-2	b2	18	W = 15			
		S-3	b2	27	W = 10			
5	295	S-4	b2	41	W = 11 GS		SM	Gray, silty, very gravelly, fine to coarse SAND (dense, moist)
		S-5A S-5B	b2	24	W = 14		SP	Light brown fine to medium SAND with gravel (medium dense, moist)
10	290	S-6	b2	39	W = 10 GS		SM	Light gray, very silty, gravelly, fine to medium SAND (dense, moist)
		S-7	b2	7			SM	Brown, silty, fine SAND with interbeds of peat (loose, damp)
15	285	S-8	b2	30	W = 17 GS		ML	Light gray, very sandy SILT with trace gravel (hard, moist) **(WEATHERED GLACIAL TILL)**
20	280	S-9	b2	62	W = 14		ML	Mottled gray brown, very sandy SILT with gravel (hard, damp)
		S-10	b2	37	W = 13 GS			
25	275	S-11	b2	50/7"			SP	Gray, fine SAND with trace organics and gravel (dense, damp) **(GLACIAL TILL)**
30	270	S-12	b2	94/11"			ML	Gray, sandy, SILT with gravel (very dense, moist)

WELL DETAIL (DOE#: APP246): Groundwater Not Encountered

Moisture Content (%): Plastic Limit 10 20 30 40 Liquid Limit

▲ SPT N-Value ▲ △ Non-Standard N-Value △ 20 40 60 80

× Fines Content (%) × 10 20 30 40

Fines Content (%): 57, 51, 50/7", 94/11"

Boring Completed 06/10/08
Total Depth of Boring = 32.5 ft.

Point located at:
Station: 487+09 Offset: 28.3 ft right of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

193043.02 7/21/08 \\EDMDATA\GINT\GINT7\PROJECTS\193043.020.GPJ SOIL BORING LOG WITH GRAPH

LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring SN-P2-08

Figure A-27

SN-P3-08

LAI Project No: 0193043.020

Drilling Method: Mud Rotary
Ground Elevation (ft): 308.35 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: AES Date: 06/11/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	USCS Symbol	Soil Description
0		S-1	d		W = 14	SM	Grayish brown with some color mottling, silty to very silty, fine SAND with gravel (medium dense to dense, moist) **(FILL)**
		S-2	b2	19	W = 14		
	305	S-3	b2	28	W = 10		
5		S-4	b2	39	W = 10 GS		
	300	S-5	b2	23	W = 12	SP-SM	Grayish brown, fine SAND with silt and gravel (medium dense, damp)
10		S-6	b2	23	W = 12		
	295	S-7	b2	46	W = 10 GS	SM/ML	Grayish brown, very silty, gravelly, fine to medium SAND (medium dense to very dense, damp) - At 15 ft with trace, fine gravel-sized black, decayed organics
15		S-8	b2	50/5"			
	290	S-9	b2	35	W = 11 GS	SM	Dark grayish brown, silty to very silty, fine SAND with abundant wood fragments (medium dense, damp) **(WEATHERED GLACIAL TILL)**
20		S-10A S-10B	b2	19	W = 10		
	285					SM	Gray, silty, fine to coarse SAND with trace gravel and organics and some oxidation (very dense, wet) **(GLACIAL TILL)**
25		S-11	b2	88/8"			
	280						
30		S-12	b2	84			
35							
40							
45							

WELL DETAIL (DOE#: APP245): 17.5 ft 7/7/08; 28.5 ft ATD

Moisture Content (%): Plastic Limit 10, 20, 30, 40 Liquid Limit
▲ SPT N-Value ▲ △ Non-Standard N-Value △: 20, 40, 60, 80
× Fines Content (%) ×: 10, 20, 30, 40

50/5"
88/8"

Boring Completed 06/11/08
Total Depth of Boring = 31.5 ft.

Point located at:
Station: 493+08 Offset: 30.8 ft right of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring SN-P3-08

Figure A-28

SN-P4-08

LAI Project No: 0193043.020

Drilling Method: Mud Rotary
Ground Elevation (ft): 349.95 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: EGN Date: 05/20/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	USCS Symbol	Soil Description
0						SM	Topsoil (2 inches)
		S-1	b2	42	W = 12	SM	Gray mottled orange, very silty, fine to coarse SAND with gravel and trace organics (dense to very dense, moist) **(WEATHERED GLACIAL TILL)**
		S-2	b2	75	W = 10 GS		
5	345	S-3	b2	50/ 5.5"	W = 13	SM	Gray, very silty, fine to coarse SAND with gravel (very dense, moist) **(GLACIAL TILL)**
		S-4	b2	50/ 4"	W = 11	SM	Gray, very silty, fine SAND with trace gravel (very dense, moist)
10	340	S-5	b2	50/ 5.5"			
		S-6	b2	50/ 5.5"	W = 9		- Below 13 ft becomes with gravel
15	335	S-7	b2	50/ 6"	W = 10		
		S-8	b2	50/ 6"	W = 10 GS	SP-SM	Gray, very gravelly, fine to coarse SAND with silt (very dense, moist)
20	330	S-9	b2	50/ 3"	W = 12	SP-SM	Gray, medium to coarse SAND with silt (very dense, moist)
25	325	S-10	b2	50/ 6"	W = 6	GP/GM	Gray, silty, sandy, fine GRAVEL to silty, fine GRAVEL with sand (very dense, wet)
30	320	S-11	b2	50/ 2.5"		SM	Gray, silty, very gravelly, medium to coarse SAND (very dense, wet)

Boring Completed 05/20/08
Total Depth of Boring = 30.7 ft.

Point located at:
Station: 564+78 Offset: 39.7 ft left of centerline

WELL DETAIL (DOE#: APP241)

11.2 ft 7/7/08

24.0 ft ATD

Moisture Content (%) — Plastic Limit 10, 20, 30, 40 Liquid Limit

▲ SPT N-Value ▲ △ Non-Standard N-Value △ 20, 40, 60, 80

× Fines Content (%) × 10, 20, 30, 40

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

193043.02 7/21/08 \\EDMDATA\GINT\GINT7\PROJECTS\193043.020.GPJ SOIL BORING LOG WITH GRAPH

LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring SN-P4-08

Figure A-29

SN-P5-08

LAI Project No: 0193043.020

Drilling Method: Mud Rotary
Ground Elevation (ft): 248.13 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: CTM Date: 05/12/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Description
0							AC	ASPHALT CEMENT CONCRETE (13 inches)
		S-1A, S-1B	b2	15			SP	Brown, gravelly, fine to medium SAND with trace silt (medium dense, moist) **(FILL)**
	245	S-2B, S-2A	b2	10			SM	
5		S-3	b2	16	W = 12			Gray to grayish brown silty, fine to medium SAND with gravel (medium dense, moist)
	240	S-4	b2	9	W = 8, GS, AL		GP-GM	Gray, sandy, fine GRAVEL with silt (loose to medium dense, moist) - At 8 ft 1/2-inch to 1-inch light brown zone with organics
10		S-5	b2	20	W = 10			
	235	S-6	b2	15	W = 38, AL		CL	Mottled light gray and light brown, CLAY with fine sand and trace organics (stiff to very stiff, moist) **(GLACIAL MARINE DRIFT)**
15		S-7A, S-7B	b2	11	W = 26, W = 18			
	230	S-8	b2	8	W = 27			
20		S-9	b2	10	W = 22			
	225						SP	Gray, gravelly, medium to coarse SAND with trace silt (dense, wet) **(ADVANCE OUTWASH)**
25		S-10	b2	48				
	220							
30		S-11	b2	47				
35								
40								
45								

WELL DETAIL (DOE#: APP242)

16.8 ft 7/7/08

Moisture Content (%): Plastic Limit 10, 20, 30, 40 Liquid Limit

▲ SPT N-Value ▲ △ Non-Standard N-Value △: 20, 40, 60, 80

× Fines Content (%) ×: 10, 20, 30, 40

Boring Completed 05/12/08
Total Depth of Boring = 31.0 ft.

Point located at:
Station: 592+90 Offset: 22.4 ft left of centerline

Standpipe Piezometer Completed 05/12/08
Total Depth of Standpipe Piezometer = 24.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring SN-P5-08

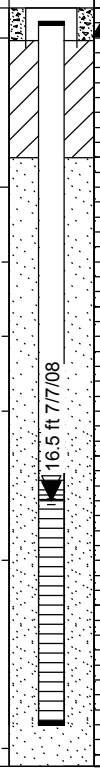
Figure A-30

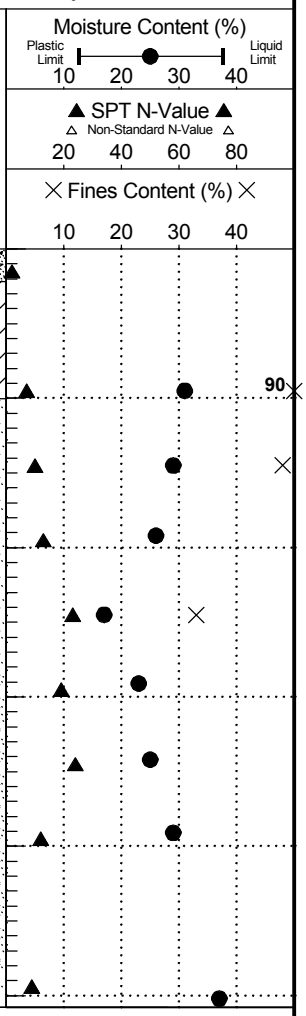
SN-P6-08

LAI Project No: 0193043.020

Drilling Method: Mud Rotary
Ground Elevation (ft): 129.27 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: MBB Date: 06/24/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	USCS Symbol	Soil Description
0		S-1	b2	2		ML	Topsoil (12 inches)
						ML	Mottled brown and gray, SILT with fine sand (medium stiff, moist) **(GLACIAL MARINE DRIFT)**
5	125	S-2	b2	7	W = 31 GS		
		S-3	b2	10	W = 29 GS	SM	Dark brown, very silty, fine SAND (loose, wet) **(RECESSIONAL OUTWASH)**
10	120	S-4	b2	13	W = 26	SM/ CL	Brown to light brown, silty, fine SAND interbedded with light brown CLAY (medium dense to stiff, moist)
		S-5	b2	23	W = 17 GS	SM	Brown at the top, gray at the bottom, very silty, fine SAND (medium dense, moist)
15	115	S-6	b2	19	W = 23	SM	Dark gray, silty, fine SAND (medium dense, moist)
		S-7	b2	24	W = 25		
20	110	S-8	b2	12	W = 29	SM	Grayish brown silty, fine to medium SAND (medium dense, wet)
25	105	S-9A S-9B	b2	9	W = 37	CL	Dark gray, CLAY with trace sand (stiff, moist)
30							
35							
40							
45							





Boring Completed 06/24/08
Total Depth of Boring = 25.4 ft.

Point located at:
Station: 434+48 Offset: 45.5 ft right of centerline

Standpipe Piezometer Completed 06/24/08
Total Depth of Standpipe Piezometer = 24.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring SN-P6-08

Figure A-31

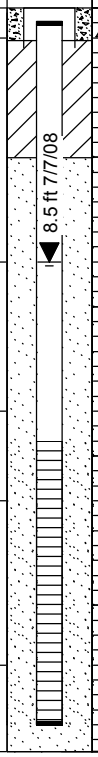
SN-P7-08

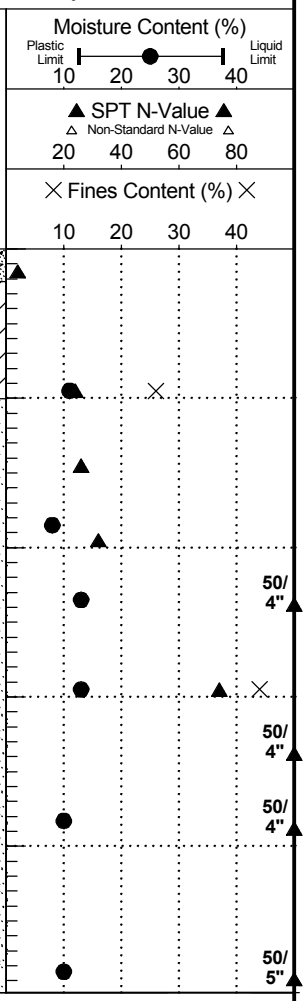
LAI Project No: 0193043.020

Drilling Method: Mud Rotary
Ground Elevation (ft): 321.98 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: MBB Date: 06/30/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Description
0		S-1	b2	4			SM	Topsoil (12 inches)
	320						GM	Light brown, silty, very sandy, fine GRAVEL (medium dense, moist) **(FILL)**
5		S-2	b2	24	W = 11 GS			
	315	S-3	b2	26				
10		S-4	b2	32	W = 8		SM	Brown, very silty, gravelly, SAND (dense to very dense, wet) **(GLACIAL TILL)**
	310	S-5	b2	50/ 4"	W = 13			
15		S-6	b2	74	W = 13 GS		SM	Grayish brown, very silty, fine to medium SAND with gravel (very dense, wet)
	305	S-7	b2	50/ 4"			GP	Black and dark gray, fine GRAVEL with sand (very dense, wet)
20		S-8	b2	50/ 4"	W = 10			- Below 20 ft becomes sandy
	300						SM	Gray, very gravelly, silty, fine-to-medium SAND (very dense, wet)
25		S-9	b2	50/ 5"	W = 10			

WELL DETAIL (DOE#: APP917)





Boring Completed 06/30/08
Total Depth of Boring = 24.9 ft.

Point located at:
Station: 541+17 Offset: 110.7 ft right of centerline

Standpipe Piezometer Completed 06/30/08
Total Depth of Standpipe Piezometer = 24.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring SN-P7-08

Figure A-32

SN-P8-08

LAI Project No: 0193043.020

Drilling Method: Mud Rotary
Ground Elevation (ft): 348.12 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: MBB Date: 06/26/08

Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Description
0		S-1	b2	6			SM	Topsoil (12 inches)
	345						GP-GM	Brownish black, very sandy, fine GRAVEL with silt (very dense, wet) **(FILL)**
5		S-2	b2	68	W = 10			
	340	S-3	b2	32	W = 14 GS		SW-SM	Dark brown and black, gravelly, fine to coarse SAND with silt (dense, wet) **(RECESSIONAL OUTWASH)**
10		S-4	b2	57	W = 10		GW-GM	Light brown to brown, very sandy, fine GRAVEL with silt (dense to very dense, wet)
	335	S-5	b2	36	W = 12 GS			
15		S-6	b2	35	W = 21			
	330	S-7	b2	90/11"	W = 11			
20		S-8A S-8B	b2	26	W = 24 W = 26		SM	Grayish brown, silty, fine to coarse SAND (medium dense, wet)
							ML	Light brown mottled orange, fine sandy SILT (stiff, wet)
	325						GP/SP	Grayish brown, very sandy, fine GRAVEL with silt to very gravelly, SAND with silt (very dense, very wet) **(GLACIAL TILL)**
25		S-9	b2	67	W = 13			

WELL DETAIL (DOE#: APP918): 9.0 ft 7/7/08

Moisture Content (%): Plastic Limit 10 20 30 40 Liquid Limit
▲ SPT N-Value ▲ △ Non-Standard N-Value △: 20 40 60 80
× Fines Content (%) ×: 10 20 30 40

90/11"

Boring Completed 06/26/08
Total Depth of Boring = 25.5 ft.

Point located at:
Station: 566+64 Offset: 47.7 ft right of centerline

Standpipe Piezometer Completed 06/26/08
Total Depth of Standpipe Piezometer = 24.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

193043.02 7/21/08 \\EDMDATA\GINT\GINT7\PROJECTS\193043.020.GPJ SOIL BORING LOG WITH GRAPH

LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring SN-P8-08

Figure A-33

SN-P9-08

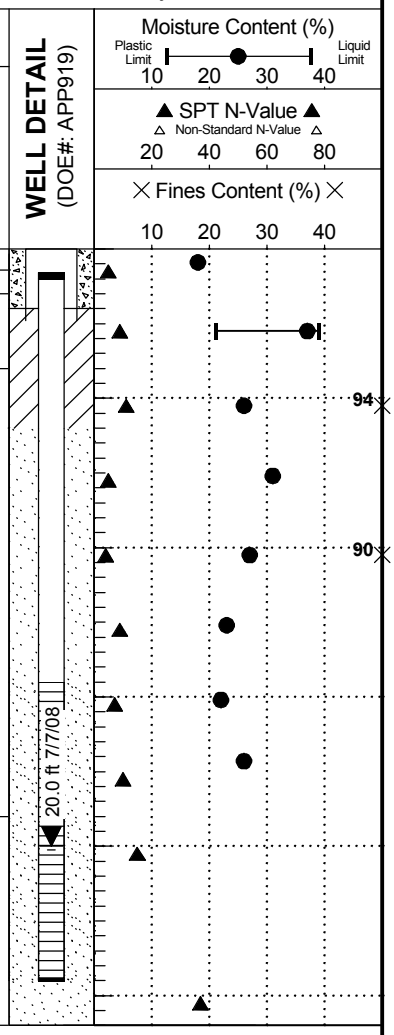
LAI Project No: 0193043.020

SAMPLE DATA / SOIL PROFILE

Drilling Method: Mud Rotary
Ground Elevation (ft): 238.08 (MSL)
Drilled By: WSDOT Northwest Region
Logged By: MBB Date: 06/23/08

Sample Number & Interval	Sampler Type	Blows/Foot	Test Data
S-1	b2	5	W = 18
S-2	b2	9	W = 37 AL
S-3	b2	11	W = 26 GS
S-4	b2	5	W = 31
S-5	b2	4	W = 27 GS
S-6	b2	9	W = 23
S-7	b2	7	W = 22
S-8	b2	10	W = 26
S-9	b2	15	
S-10	b2	37	

USCS Symbol	Description
SM	Topsoil (8 inches)
SM/ ML	Brown, very silty, SAND with gravel to very sandy, SILT (loose to medium stiff, moist) **(FILL)**
CL	Light brown mottled orange, sandy, CLAY with trace roots (stiff, moist) **(GLACIAL MARINE DRIFT)**
CL	Light brown to gray mottled orange, CLAY with sand (soft to stiff, wet)
GM	Dark gray, silty, sandy, fine GRAVEL (medium dense to dense, wet) **(ADVANCE OUTWASH)**



Boring Completed 06/23/08
Total Depth of Boring = 26.0 ft.

Point located at:
Station: 591+69 Offset: 71.3 ft left of centerline

Standpipe Piezometer Completed 06/23/08
Total Depth of Standpipe Piezometer = 24.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

193043.02 7/21/08 \\EDMDATA\GINT\GINT7\PROJECTS\193043.020.GPJ SOIL BORING LOG WITH GRAPH

LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Boring SN-P9-08

Figure A-34

SN-TP1-08

SAMPLE DATA			SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): 194.49 (MSL) Excavated By: WSDOT Northwest Region View Direction: North Logged By: EGN	
0					SM	Topsoil (6 inches)	ATD
2	S-1	d	W = 22 GS		SP-SM	Brown, fine to coarse SAND with silt and gravel (very loose, wet) **(FILL)**	
4							
6							
8							
10							
12							

Test Pit Completed 05/14/08
Total Depth of Test Pit = 4.0 ft.

Point located at:
Station: 453+89 Offset: 33.2 ft left of centerline

SN-TP2-08

SAMPLE DATA			SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): 218.00 (MSL) Excavated By: WSDOT Northwest Region View Direction: North Logged By: EGN	
0					SM	Topsoil (2 inches)	
2	S-1	d	W = 9 GS		GM	Gray, very sandy, silty, fine GRAVEL with trace roots and rootlets in the upper 1 ft (medium dense to dense, moist) **(GLACIAL TILL)**	Slight Seepage
4						- Below 3.5 ft becomes wet	
6						- Below 6 ft becomes very dense	
8							
10							
12							

Test Pit Completed 05/13/08
Total Depth of Test Pit = 7.5 ft.

Point located at:
Station: 458+43 Offset: 39.0 ft left of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

193043.02 7/21/08 \\EDMDATA\GINT\GINT\PROJECTS\193043.020.GPJ TEST PIT LOG

LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Test Pits

Figure
A-35

SN-TP4-08

SAMPLE DATA			SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): 322.01 (MSL) Excavated By: WSDOT Northwest Region View Direction: North Logged By: EGN	
0					SM	Topsoil (2 inches)	Groundwater not encountered.
					SM	Gray spotted orange, very silty, fine to coarse SAND with gravel trace roots and rootlets (loose to medium dense, damp)	
2					SM	**(WEATHERED GLACIAL TILL)**	
4	S-1	d				Gray, very silty, fine to coarse SAND with gravel and seams of SAND (medium dense to dense, moist) **(GLACIAL TILL)**	
6							
8						- Below 8 ft with cobbles	
10							
12							

Test Pit Completed 05/13/08
Total Depth of Test Pit = 9.0 ft.

Point located at:
Station: 510+06 Offset: 40.3 ft left of centerline

SN-TP5-08

SAMPLE DATA			SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): 323.25 (MSL) Excavated By: WSDOT Northwest Region View Direction: North Logged By: EGN	
0					SM	Topsoil (6 inches)	
					SM	Grayish brown, silty, fine to coarse SAND with roots and rootlets and abundant organics (medium dense, damp)	
2	S-1	d	W = 11 GS		SM	**(WEATHERED GLACIAL TILL)**	
4						Gray, silty, gravelly, fine to coarse SAND with seams of sand (medium dense to dense, damp) **(GLACIAL TILL)**	▽ Moderate Seepage
6						- From 5 to 6 ft minor sloughing	
8	S-2	d	W = 8			- Below 7 ft becomes very dense	
10							
12							

Test Pit Completed 05/13/08
Total Depth of Test Pit = 9.0 ft.

Point located at:
Station: 511+40 Offset: 46.5 ft left of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

193043.02 7/21/08 \\EDMDATA\GINT\GINT\PROJECTS\193043.020.GPJ TEST PIT LOG

LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Test Pits

Figure
A-36

SN-TP6-08

SAMPLE DATA			SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): 351.91 (MSL) Excavated By: WSDOT Northwest Region View Direction: North Logged By: EGN	
0					SM	Topsoil (2.5 inches)	
					SM	Gray, very silty, fine to medium SAND with gravel and cobbles (very dense, damp) **(GLACIAL TILL)**	Groundwater not encountered.
2	S-1	d	W = 7 GS				
4							
6							
8							
10							
12							

Test Pit Completed 05/13/08
Total Depth of Test Pit = 4.5 ft.

Point located at:
Station: 563+61 Offset: 39.4 ft left of centerline

SN-TP7-08

SAMPLE DATA			SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): 261.05 (MSL) Excavated By: WSDOT Northwest Region View Direction: North Logged By: EGN	
0					SM	Topsoil (4 inches)	
	S-1	d	W = 22		GM	Brown, very sandy, silty, fine GRAVEL with organics, asphalt pavement fragment, roots and rootlets up to 2 inches thick (medium dense, damp) **(FILL)**	Groundwater not encountered.
2							
	S-2	d	W = 12 GS				
4							
6	S-3	d	W = 22 GS		SM	Brown, very silty, gravelly, fine to coarse SAND (medium dense, damp)	
					SM	Brownish gray to gray, gravelly, very silty, medium to coarse SAND with cobbles (dense, moist)	
8							
10							
12							

Test Pit Completed 05/13/08
Total Depth of Test Pit = 10.0 ft.

Point located at:
Station: 586+79 Offset: 37.0 ft left of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

193043.02 7/21/08 \\EDMDATA\GINT\GINT\PROJECTS\193043.020.GPJ TEST PIT LOG

LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Test Pits

Figure
A-37

SN-TP8-08

SAMPLE DATA			SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): 252.00 (MSL) Excavated By: WSDOT Northwest Region View Direction: North Logged By: EGN	
0						Topsoil (4 inches)	
	S-1	d	W = 5 GS		SP-SM	Black and white, very gravelly, fine to coarse SAND with silt (loose, damp) **(FILL)**	Groundwater not encountered.
2							
	S-2	d	W = 13 AL		CL	Grayish brown spotted orange, sandy, silty, CLAY (soft, damp)	
4							
	S-3	d	W = 8 GS		GM	Grayish blue, silty, sandy, fine GRAVEL (dense, damp)	
6	S-4	d	W = 8 GS		SM	Gray, very silty, gravelly, fine to coarse SAND, interbeds of blue, very silty, fine SAND (dense, damp)	
8							
10							
12							

Test Pit Completed 05/13/08
Total Depth of Test Pit = 10.0 ft.

Point located at:
Station: 590+05 Offset: 32.5 ft left of centerline

ST-TP1-08

SAMPLE DATA			SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): 51.16 (MSL) Excavated By: WSDOT Northwest Region View Direction: North Logged By: EGN	
0					SM	Topsoil (3 inches)	
					SM	Brown, very gravelly, silty, fine to coarse SAND (loose to medium dense, damp) **(GLACIAL MARINE DRIFT)** - Roots at 2 ft	Groundwater not encountered.
2							
4							
6	S-1	d	W = 10 GS				
	S-2	d	W = 9		SM	Grayish brown, gravelly, very silty, medium to coarse SAND (dense to very dense, damp)	
8							
	S-3	d	W = 19		SP-SM	Grayish brown, fine to medium SAND with silt (medium dense to dense, damp)	
10							
12							

Test Pit Completed 05/13/08
Total Depth of Test Pit = 10.0 ft.

Point located at:
Station: 289+92 Offset: 43.0 ft left of centerline

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

193043.02 7/21/08 \\EDMDATA\GINT\GINT7\PROJECTS\193043.020.GPJ TEST PIT LOG

LANDAU ASSOCIATES

SR 532 Corridor Improvements
Camano Isd to I-5, East Sec
270th St NW to 12th Ave NW
Stanwood and Snohomish Co.

Log of Test Pits

Figure A-38

DRAFT

Date(s) Drilled	06/17/08	Logged By	SH	Checked By	ASR
Drilling Contractor	WSDOT	Drilling Method	Mud Rotary	Sampling Methods	SPT/Shelby
Auger Data	3½-inch O.D.	Hammer Data	140 lb hammer/30 in drop Automatic	Drilling Equipment	CME-45 Truck-mounted
Total Depth (ft)	71.5	Surface Elevation (ft)		Groundwater Level (ft. bgs)	7
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Depth feet	SAMPLES Interval Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
0						AC	8 inches asphalt concrete			
						SP	Gray fine to coarse sand with occasional gravel and shell fragments (medium dense, wet) (fill?)			
5	1	13	1							
						CL	Gray lean clay with occasional fine sand, gravel and organic matter (medium stiff, wet)			
	12	7	2					23		AL LL=31% PI=11%
10	12	12	3					45		
	24	15	4							Shelby Tube
15	13	7	5			SP-SM	Gray fine to medium sand with silt (loose, wet)			
20	10	10	6					20		SA; %F=6.4
25	9	4	7					18		%F=7.6
						SM	Gray silty sand stratified with silty fine sand with occasional shell fragments and occasional decayed wood (loose, wet)			
30										

Note: See Figure A-1 for explanation of symbols.

V6_GTBORING P:\0\0180199\01\FINALS\018019901_SET A_1_3_6_9.GPJ GEIV6_1.GDT 7/15/08

LOG OF BORING B-1-08

GEOENGINEERS

Project: WSDOT/SR 532 Corridor Improvements
Project Location: Stanwood, Washington
Project Number: 0180-199-01

Figure A-2
Sheet 1 of 3

Depth feet	Interval Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
30	18	7	8							
35	18	4	9					33		
						SM	Gray silty sand with fragments			
40	18	3	10							
							Gray silt with fragments (soft, wet)			
45	18	2	11					33		%F=34.7
							Gray silty sand with shells			
50	18	3	12					31		%F=27.3
55	18	6	13					34		%F=34
60	10	12	14				Grades to medium dense			
						ML	Gray sandy silt with occasional shell fragments (medium stiff, wet)			
65	18	7	15					52		%F=56

LOG OF BORING B-1-08 (continued)

GEOENGINEERS

Project: WSDOT/SR 532 Corridor Improvements
Project Location: Stanwood, Washington
Project Number: 0180-199-01

Figure A-2
Sheet 2 of 3

Depth feet	SAMPLES: Interval Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
						ML	Gray sandy silt (very stiff, wet)			AL; LL=27, PI=3; %F=12.2
70	18	18	16			SP-SM	Gray fine to medium sand with silt (medium dense, wet)	23		
75										
80										
85										
90										
95										
100										

LOG OF BORING B-1-08 (continued)

GEOENGINEERS

Project: WSDOT/SR 532 Corridor Improvements
Project Location: Stanwood, Washington
Project Number: 0180-199-01

Figure A-2
Sheet 3 of 3

DRAFT

Date(s) Drilled	05/28/08	Logged By	SH	Checked By	ASR
Drilling Contractor	WSDOT	Drilling Method	Mud Rotary	Sampling Methods	SPT/Shelby
Auger Data	3½-inch O.D.	Hammer Data	140 lb hammer/30 in drop Automatic	Drilling Equipment	CME-850 Track-mounted
Total Depth (ft)	90.5	Surface Elevation (ft)		Groundwater Level (ft. bgs)	6
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Depth feet	SAMPLES Interval Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
0						SOD	4 inches sod zone			
						ML	Gray silt with occasional fine sand and trace organics (soft, moist)	38		AL; L=38% PI=12%
5	15	4	1							
						ML	Gray silt with fine sand (soft to medium stiff, wet)			
10	9	2	2					39		%F=59.2
	11	5	3							
							Sand becomes coarser			
						SP-SM	Gray fine to medium sand with silt (loose, wet)			
15	10	8	4					22		SA; %F=5.3
20	10	8	5				with partially decayed wood chips			
25	18	18	6				(medium dense, wet)	22		%F=5.8
						SP-SM	Gray fine to medium sand with silt and gravel and occasional shell fragments (medium dense, wet)			
30	14	16	7					25		%F=10.5

Note: See Figure A-1 for explanation of symbols.

LOG OF BORING B-2-08

GEOENGINEERS

Project: WSDOT/SR 532 Corridor Improvements
Project Location: Stanwood, Washington
Project Number: 0180-199-01

Figure A-3
Sheet 1 of 3

V6_GTBORING P:\0\0180199\01\FINALS\018019901_SET B_2_5_7_8.GPJ GEIV6_1.GDT 7/15/08

Depth feet	Interval Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
30						SM	Gray silty fine to medium sand with shell fragments and occasional decayed wood fragments (loose, wet)			
	12	4	8					34		%F=15.5
35										
	18	2	9							
40	0		10					33		%F=28.3
	15	16	11					26		%F=16.5
45							Grades to medium dense			
	18	26	12					20		%F=13.2
50										
	14	6	13				Grades to loose	31		
55										
						ML	Gray silt with fine sand (soft, wet)			
	18	3	14					33		%F=51.9
60			15							
						SM	Gray silty fine to medium sand stratified with sandy silt (loose, wet) (alluvial)			
	18	5	16					26		%F=44
65										
						ML	Gray silt (soft, wet)			

LOG OF BORING B-2-08 (continued)

GEOENGINEERS

Project: WSDOT/SR 532 Corridor Improvements
Project Location: Stanwood, Washington
Project Number: 0180-199-01

Figure A-3
Sheet 2 of 3

Depth feet	SAMPLES Interval Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
	18	4	17							
70	24		18					29		AL; LL=29% PI=3%
	18	3	19					41		AL; LL=39% PI=9%
75										
						ML	Gray silt with fine sand (medium stiff to stiff, wet)			
	18	15	20							
80										
	18	7	21					27		%F=60.4
85										
	16	14	22							
90										
95										
100										

V6_GTBORING P:\0\0180199\01\FINALS\018019901_SET B_2_5_7_8.GPJ GEIV6_1.GDT 7/15/08

LOG OF BORING B-2-08 (continued)

GEOENGINEERS

Project: WSDOT/SR 532 Corridor Improvements
Project Location: Stanwood, Washington
Project Number: 0180-199-01

Figure A-3
Sheet 3 of 3

DRAFT

Date(s) Drilled	06/16/08	Logged By	SH	Checked By	ASR
Drilling Contractor	WSDOT	Drilling Method	Mud Rotary	Sampling Methods	SPT/Shelby
Auger Data	3½-inch O.D.	Hammer Data	140 lb hammer/30 in drop Automatic	Drilling Equipment	CME-45 Truck-mounted
Total Depth (ft)	71.5	Surface Elevation (ft)		Groundwater Level (ft. bgs)	21
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Depth feet	SAMPLES Interval Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
0						AC	8 inches asphalt concrete			
						CL	Light brown/gray lean clay intermixed with fine to medium sand and occasional gravel and organic matter (medium stiff, moist)			
5	15	5	1					27		AL; LL=38%; PI=16%
10	10	4	2					25		
						MH	Gray elastic silt with sand and organic matter (soft to medium stiff, moist)			
15	15	4	3					33		AL; LL=53%; PI=21%
						SM	Gray silty fine sand lensed with silt (loose, wet)			
20	16	8	4	▼						
						SM	Gray silty fine to medium sand with occasional decayed wood fragments (medium dense, wet)			
25	13	10	5					25		SA; %F=16.5
30										

Note: See Figure A-1 for explanation of symbols.

LOG OF BORING B-3-08

GEOENGINEERS

Project: WSDOT/SR 532 Corridor Improvements
Project Location: Stanwood, Washington
Project Number: 0180-199-01

Figure A-3
Sheet 1 of 3

V6_GTBORING P:\0\0180199\01\FINALS\018019901_SET A_1_3_6_9.GPJ GEIV6_1.GDT 7/15/08

Depth feet	Interval Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
30	10	11	6							
						SP-SM	Gray fine to medium sand with silt lensed with light brown silt (dense, wet)			
35	18	34	7					16		SA; %F=6.3 5-inch heave
40	10	9	8			SM	Gray silty fine to medium sand with trace of silt with shell fragments and occasional decayed wood (loose, wet)	25		%F=43.3
45	12	20	9				Grades to medium dense			
50	18	5	10				Grades to loose	31		%F=23.5
55	18	5	11					34		
60	18	5	12					39		
65	18	8	13					26		%F=24.9

LOG OF BORING B-3-08 (continued)

GEOENGINEERS

Project: WSDOT/SR 532 Corridor Improvements
Project Location: Stanwood, Washington
Project Number: 0180-199-01

Figure A-3
Sheet 2 of 3

Depth feet	SAMPLES: Interval Recovered (in)	SAMPLES: Blows/foot	SAMPLES: Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
70	18	22	14			SP-SM	Gray fine to medium sand with silt and shell fragments (medium dense, wet)	19		SA; %F=10.6
75										
80										
85										
90										
95										
100										

LOG OF BORING B-3-08 (continued)

GEOENGINEERS

Project: WSDOT/SR 532 Corridor Improvements
Project Location: Stanwood, Washington
Project Number: 0180-199-01

Figure A-3
Sheet 3 of 3

DRAFT

Date(s) Drilled	05/21/08	Logged By	SH	Checked By	ASR
Drilling Contractor	WSDOT	Drilling Method	Mud Rotary	Sampling Methods	SPT/Shelby
Auger Data	3½-inch O.D.	Hammer Data	140 lb hammer/30 in drop Automatic	Drilling Equipment	CME-850 Track-mounted
Total Depth (ft)	90.5	Surface Elevation (ft)	2	Groundwater Elevation (ft)	-9
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES Interval	Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
	0							AC	Asphalt pavement			
								OH	Brown organic silt (very soft, moist)	51		AL; LL=70% PI=31%
0												
			15	0	1							
	5		18	0	2					68		
-5			21		3							
			18	2	4			SM	Gray silty fine sand (very loose, wet)	45		%F=42.6
	10					▽						
-10												
								SP-SM	Gray fine to medium sand with silt (loose, wet)			
			15	8	5					29		%F=11.6
	15											
-15												
			15	9	6				Trace of partially decayed wood			SA; %F=9.1 (5-inch heave)
	20											
-20												
								SP	Gray fine to medium sand with traces of silt and occasional gravel (medium dense, wet)			
			15	14	7					21		%F=5.4
	25											
-25												
								SP-SM	Gray fine to medium sand with silt and traces of organics (medium dense, wet)			
			14	19	8					21		%F=9.7
	30											

Note: See Figure A-1 for explanation of symbols.

LOG OF BORING B-5-08

GEOENGINEERS

Project: WSDOT/SR 532 Corridor Improvements
Project Location: Stanwood, Washington
Project Number: 0180-199-01

Figure A-4
Sheet 1 of 3

V6_GTBORING P:\0\0180199\01\FINALS\018019901_SET B_2_5_7_8.GPJ GEIV6_1.GDT 7/15/08

Elevation feet	Depth feet	SAMPLES Interval Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
	30										
-30											
	35	18	13	9				Fragments of shells (medium dense, wet)			
-35							SM	Gray silty fine to medium sand (medium dense, wet)			
	40	16	19	10					27		SA; %F=13.8
-40											
	45	14	10	11					26		%F=11.6
-45											
	50	18	5	12				occasional shell fragments	34		%F=47.9
-50											
	55	16	19	13				Grades to medium dense	26		%F=17.7
-55							SP-SM	Gray fine to medium sand with silt and occasional partially decayed wood chips and silt and shell fragments (medium dense, wet)			
	60	18	21	14					20		%F=7.1
-60							ML	Gray silt with fine sand and occasional gravel (soft, wet)			
	65	14	3	15					25		AL; LL=26% PI=2%
-65		12		16							

V6_GTBORING P:\0\0180199\01\FINALS\018019901_SET B_2_5_7_8.GPJ GEIV6_1.GDT 7/15/08

LOG OF BORING B-5-08 (continued)

GEOENGINEERS

Project: WSDOT/SR 532 Corridor Improvements
Project Location: Stanwood, Washington
Project Number: 0180-199-01

Figure A-4
Sheet 2 of 3

Elevation feet	Depth feet	SAMPLES Interval Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
	70	15	5	17			OH	Gray organic silt with fine sand (medium stiff, wet)	59		AL; LL=57% PI=16%
-70											
	75	18	17	18					32		%F=83.6
-75											
							SP-SM	Gray fine to medium sand with silt (dense, wet)			
	80	8	44	19					23		
-80											
	85	0.5	53	20				Grades to very dense			
-85											
								occasional gravel			
	90	13	59	21					25		%F=10.1
-90											
	95										
-95											
	100										
-100											

V6_GTBORING P:\0\0180199\01\FINALS\018019901_SET B_2_5_7_8.GPJ GEIV6_1.GDT 7/15/08

LOG OF BORING B-5-08 (continued)

GEOENGINEERS

Project: WSDOT/SR 532 Corridor Improvements
Project Location: Stanwood, Washington
Project Number: 0180-199-01

Figure A-4
Sheet 3 of 3

DRAFT

Date(s) Drilled	06/19/08	Logged By	SH	Checked By	ASR
Drilling Contractor	WSDOT	Drilling Method	Mud Rotary	Sampling Methods	SPT/Shelby
Auger Data	3½-inch O.D.	Hammer Data	140 lb hammer/30 in drop Automatic	Drilling Equipment	CME-45 Truck-mounted
Total Depth (ft)	86.5	Surface Elevation (ft)		Groundwater Level (ft. bgs)	Not Encountered
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Depth feet	SAMPLES Interval Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
0						SOD	Light brown topsoil with grass roots			
						SM	Light brown silty fine to medium sand (fill)			
						CL	Light brown lean clay with occasional coarse sand and gravel and organic matter (stiff, moist)			
5	16	14	1					19		AL; LL=32%; PI=16%
						SP-SM	Gray fine to coarse sand with silt and occasional gravel with trace of silt (loose, wet)			
10	9	10	2							
						CL	Light brown gray lean clay with occasional sand (medium stiff to stiff, wet)			
15	14	18	3					18		AL; LL=32%; PI=11%
20	12	9	4					17		AL; LL=33%; PI=12
						CL	Greenish gray lean clay with occasional sand, gravel and organic matter (medium stiff, wet)			
25	12	12	5					20		
30										

Note: See Figure A-1 for explanation of symbols.

LOG OF BORING B-6-08

GEOENGINEERS

Project: WSDOT/SR 532 Corridor Improvements
Project Location: Stanwood, Washington
Project Number: 0180-199-01

Figure A-4
Sheet 1 of 3

V6_GTBORING P:\0\0180199\01\FINALS\018019901_SET A_1_3_6_9.GPJ GEIV6_1.GDT 7/15/08

Depth feet	SAMPLES Interval Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
30	13	10	6					20		AL; LL=30%; PI=10%
						MH	Gray elastic silt with occasional sand, gravel and organic matter (stiff, wet)			
35	15	15	7					21		AL; LL=57%; PI=22%
						SM	Gray silty fine to medium sand (medium dense, wet)			
40	10	13	8					27		%F=36.8
45	8	11	9					20		%F=14
						SP-SM	Gray fine to medium sand with silt with shell fragments and occasional decayed wood (medium dense, wet)			
50	10	26	10					19		%F=11
55	10	13	11							
60	15	18	12					25		
65	7	11	13							

LOG OF BORING B-6-08 (continued)

GEOENGINEERS

Project: WSDOT/SR 532 Corridor Improvements
Project Location: Stanwood, Washington
Project Number: 0180-199-01

Figure A-4
Sheet 2 of 3

Depth feet	SAMPLES: Interval Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
70	18	25	14					22		%F=14.5
75	6	21	15					25		%F=9.2
						ML	Gray sandy silt with organics (medium stiff, wet)			
80	18	6	16					31		AL; LL=36%; PI=11%
						SM	Gray silty fine to medium sand and lensed with decayed wood (dense, wet)			
85	12	32	17					20		SA; %F=12.6
90										
95										
100										

LOG OF BORING B-6-08 (continued)

GEOENGINEERS

Project: WSDOT/SR 532 Corridor Improvements
Project Location: Stanwood, Washington
Project Number: 0180-199-01

Figure A-4
Sheet 3 of 3

DRAFT

Date(s) Drilled	05/20/08	Logged By	SH	Checked By	ASR
Drilling Contractor	WSDOT	Drilling Method	Mud Rotary	Sampling Methods	SPT/Shelby
Auger Data	3½-inch O.D.	Hammer Data	140 lb hammer/30 in drop Automatic	Drilling Equipment	CME-850 Track-mounted
Total Depth (ft)	70.5	Surface Elevation (ft)		Groundwater Level (ft. bgs)	7
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Depth feet	SAMPLES Interval Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
0						AC	6 inch thick asphalt pavement			
						ML	Brown sandy silt with oxidation stains and occasional gravel (medium stiff, wet)	29		AL; LL=36% PI=10%
5	14	6	1							
						SM	Gray silty fine sand (loose, wet)			
10	18	3	2					32		%F=43.5
	18	3	3							
						SP-SM	Gray fine to medium sand with silt (loose, wet)			
15	14	8	4					28		%F=9.4
20	13	6	5							
	18	10	6				occasional gravel (medium dense, wet)	20		%F=10.1
25	14	13	7				occasional partially decayed wood chips			
30	14	16	8				no organics	25		%F=9.2

Note: See Figure A-1 for explanation of symbols.

LOG OF BORING B-7-08

GEOENGINEERS

Project: WSDOT/SR 532 Corridor Improvements
Project Location: Stanwood, Washington
Project Number: 0180-199-01

Figure A-5
Sheet 1 of 3

V6_GTBORING P:\0\0180199\01\FINALS\018019901_SET B_2_5_7_8.GPJ GEIV6_1.GDT 7/15/08

Depth feet	SAMPLES Interval Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
30										
						SM	Gray silty fine to medium sand stratified with silt with occasional shell fragments (medium dense, wet)			
	14	11	9					29		%F=27.2
35										
	18	23	10							
40						SP-SM	Gray fine to medium sand with silt and occasional shell fragments (medium dense, wet)			
	15	22	11					20		%F=8.0
45										
						SM	Gray silty fine to medium sand with shell fragments (medium dense, wet)			
	18	26	12					30		%F=44.5
50										
	18	11	13					40		
55							decayed wood fragments			
	18	6	14					27		%F=28.3
60							Grades to loose			
	18	10	15					31		
65							Grades to medium dense			

V6_GTBORING P:\0\0180199\01\FINALS\018019901_SET B_2_5_7_8.GPJ GEIV6_1.GDT 7/15/08

LOG OF BORING B-7-08 (continued)

GEOENGINEERS

Project: WSDOT/SR 532 Corridor Improvements
Project Location: Stanwood, Washington
Project Number: 0180-199-01

Figure A-5
Sheet 2 of 3

Depth feet	SAMPLES Interval Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
70	18	7	16					30		%F=53.2
75										
80										
85										
90										
95										
100										

LOG OF BORING B-7-08 (continued)

GEOENGINEERS

Project: WSDOT/SR 532 Corridor Improvements
Project Location: Stanwood, Washington
Project Number: 0180-199-01

Figure A-5
Sheet 3 of 3

DRAFT

Date(s) Drilled	05/29/08	Logged By	SH	Checked By	ASR
Drilling Contractor	WSDOT	Drilling Method	Mud Rotary	Sampling Methods	SPT/Shelby
Auger Data	3½-inch O.D.	Hammer Data	140 lb hammer/30 in drop Automatic	Drilling Equipment	CME-850 Track-mounted
Total Depth (ft)	50.5	Surface Elevation (ft)		Groundwater Level (ft. bgs)	36
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Depth feet	SAMPLES Interval Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
0						TS	Topsoil			
						SM	Brown silty fine to medium sand with gravel (very dense, moist) (glacial till)			
5	18	60	1					12		%F=47.8
10	3	50/6"	2							
15	6	50/6"	3				Reduced gravel content	16		
20	8	50/5"	4					11		%F=43.2
25	9		5				occasional gravel (very dense, moist)			
30	5	50/5"	6					11		%F=35.9

Note: See Figure A-1 for explanation of symbols.

LOG OF BORING B-8-08

GEOENGINEERS

Project: WSDOT/SR 532 Corridor Improvements
Project Location: Stanwood, Washington
Project Number: 0180-199-01

Figure A-6
Sheet 1 of 2

V6_GTBORING P:\0\0180199\01\FINALS\018019901_SET B_2_5_7_8.GPJ GEIV6_1.GDT 7/15/08

Depth feet	SAMPLES: Interval Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
30										
35	5	50/5"	7					14		%F=41.3
						CL	Gray lean sandy clay (hard, wet)			
40	8	50/5"	8					31		AL; LL=26% PI=8%
						SM	Yellowish-gray silty fine sand with occasional gravel stratified with silt layers (very dense to hard, wet)			
45	12	50/5"	9					21		%F=18.2
50	12	50/6"	10			ML	Gray silt with fine sand (hard, wet)	18		%F=77.9
55										
60										
65										

V6_GTBORING P:\0\0180199\01\FINALS\018019901_SET B_2_5_7_8.GPJ GEIV6_1.GDT 7/15/08

LOG OF BORING B-8-08 (continued)

GEOENGINEERS

Project: WSDOT/SR 532 Corridor Improvements
Project Location: Stanwood, Washington
Project Number: 0180-199-01

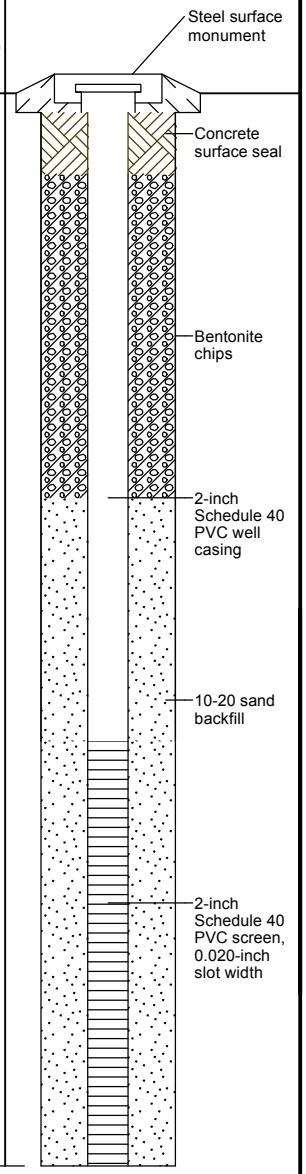
Figure A-6
Sheet 2 of 2

DRAFT

Date(s) Drilled	06/18/08	Logged By	SH	Checked By	ASR
Drilling Contractor	WSDOT	Drilling Method	Mud Rotary	Sampling Methods	SPT/Shelby
Auger Data	3½-inch O.D.	Hammer Data	140 lb hammer/30 in drop Automatic	Drilling Equipment	CME-45 Truck-mounted
Total Well Depth (ft)	26.5	Ground Surface Elevation (ft)		Groundwater Level (ft. bgs)	Not Encountered
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Depth feet	SAMPLES Interval Recovered (in)	Blows/foot	Sub-Sample Sample Number	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³
0					SM	Light brown silty fine to medium sand with occasional gravel (loose to medium dense, moist) (fill)		
					CL	Gray lean clay lensed with partially decayed wood chips (soft, wet)		
5	18	3	1			AL; LL=47%, PI=21%	45	
					SP-SM	Gray fine to medium sand with silt (loose, wet)		
10	12	6	2					
15	12	9	3					
20	12	11	4		SM	Gray silty fine to medium sand with shell fragments (loose to medium dense, wet)	21	
						SA; %F=19.2		
25	18	3	5			(increased silt content)		
30								

WELL CONSTRUCTION



Note: See Figure A-1 for explanation of symbols.

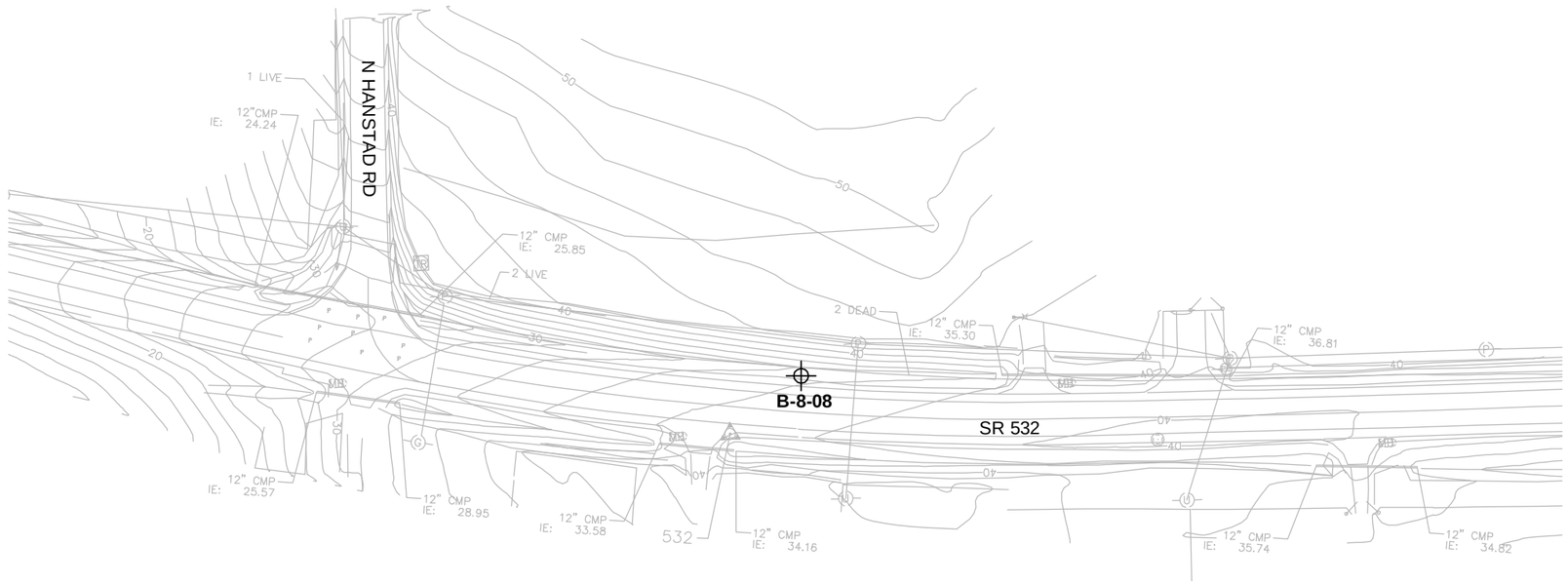
LOG OF BORING B-9-08

GEOENGINEERS

Project: WSDOT/SR 532 Corridor Improvements
Project Location: Stanwood, Washington
Project Number: 0180-199-01

Figure A-5
Sheet 1 of 1

V6_GTWELL P:\0\0180199\01\FINALS\018019901_SET A_1_3_6_9.GPJ GEIV6_1.GDT 7/15/08



NOTES:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Reference: CAD drawing file named "Y9272_BP_EXCI.dwg" provided by Berger-ABAM via email on 7/11/08.

LEGEND:

B-1-07 Boring completed by WSDOT, 2007

B-1-08 Proposed boring

N W E S

100 0 100
FEET

Site Plan

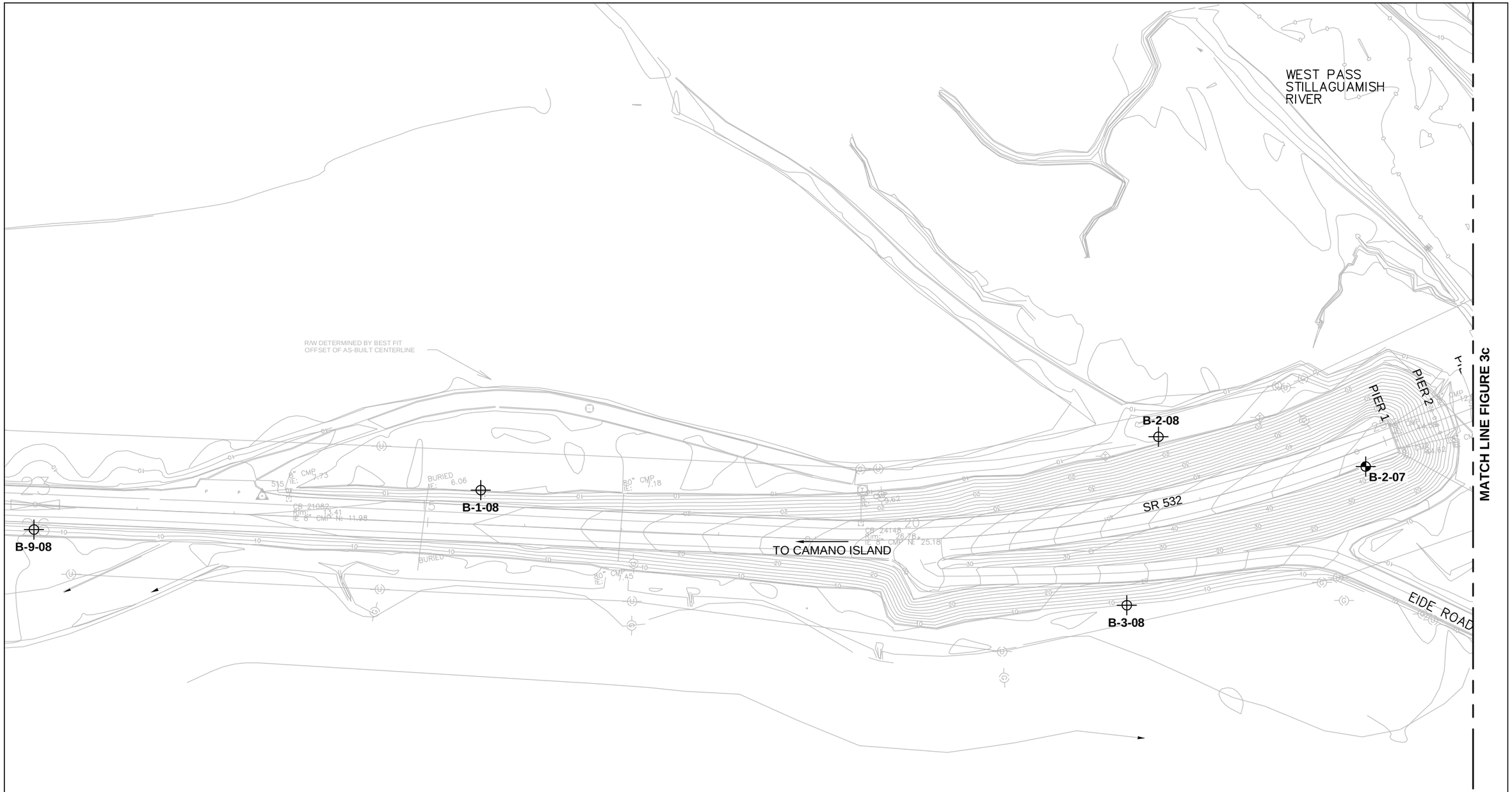
SR 532 Corridor Improvements (MP 0.00 to MP 3.72)
Camano Island, Washington

GEOENGINEERS

Figure 3a

P:\01\80\99\00\CAD\01\80\9900F3ABC.DWG\TAB:F3A MODIFIED BY LKNOWLTON ON JUL 11, 2008 - 14:30

DRAFT



NOTES:

1. The locations of all features shown are approximate.
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Reference: CAD drawing file named "Y9272_BP_EX.dwg" provided by Berger-ABAM via email on 8/2/07.

LEGEND:

B-1-07 Boring completed by WSDOT, 2007

B-1-08 Proposed boring

N W E S

100 0 100
FEET

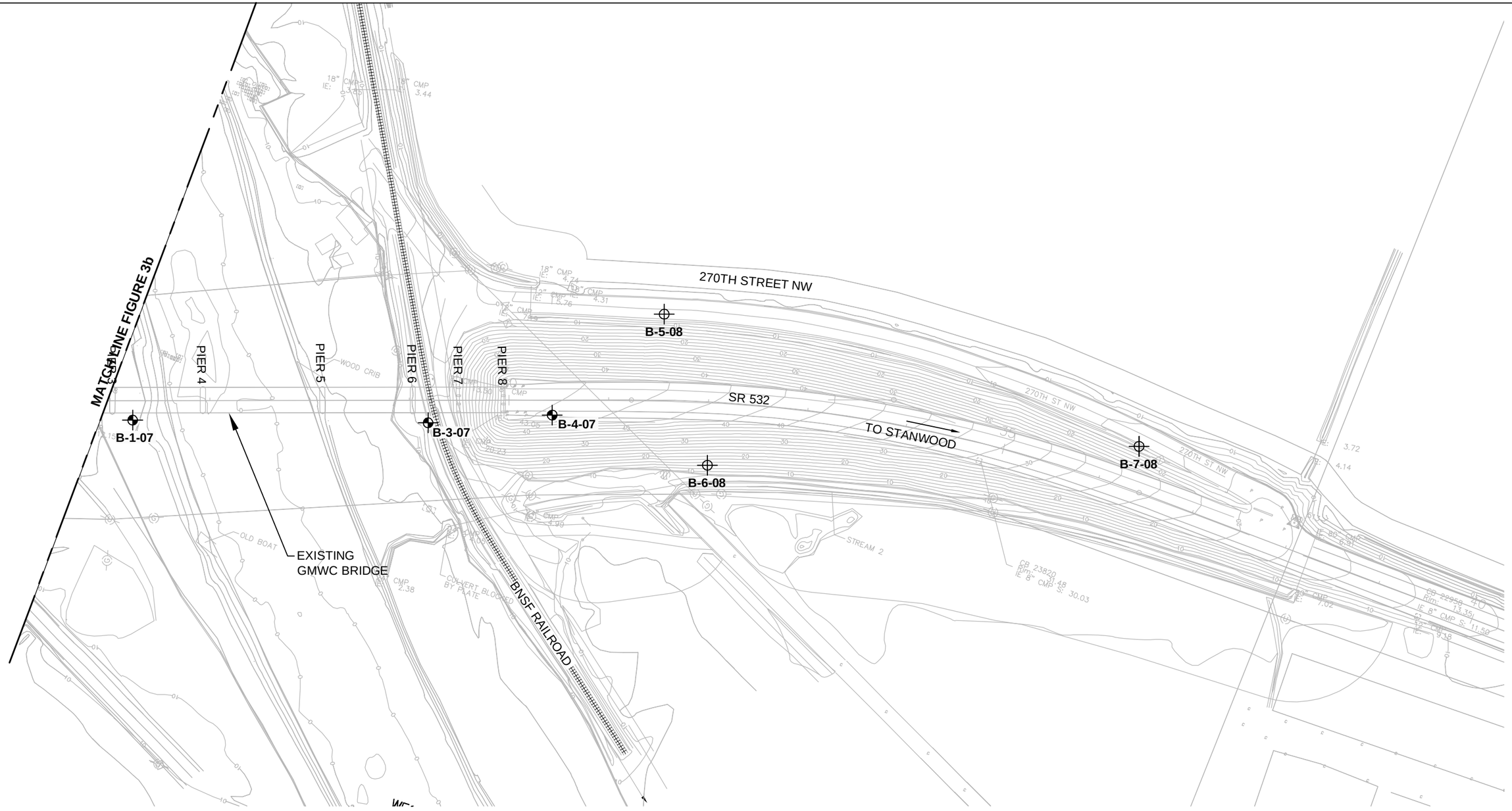
Site Plan

SR 532 Corridor Improvements (MP 0.00 to MP 3.72)
Camano Island, Washington

GEOENGINEERS

Figure 3b

P:\0\0180199\00\CAD\0180199OOF3ABC.DWG\TAB:F3B MODIFIED BY LKNOWLTON ON JUL 11, 2008 - 14:27



NOTES:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Reference: CAD drawing file named "Y9272_BP_EX.dwg" provided by Berger-ABAM via email on 8/2/07.

LEGEND:

B-1-07 Boring completed by WSDOT, 2007

B-1-08 Proposed boring

N W E S

100 0 100
FEET

Site Plan

SR 532 Corridor Improvements (MP 0.00 to MP 3.72)
Camano Island, Washington

GEOENGINEERS

Figure 3c

P:\0\0180199\00\CAD\0180199OOF3ABC.DWG\TAB:F3C MODIFIED BY LKNOWLTON ON JUL 11, 2008 - 14:25