Washington State Department of Transportation

Memorandum

DATE: November 13, 2009

TO: Duke Do/Soth Kov NB82-125

FROM: Chris Johnson/Nabil Dbaibo/Hon Hua NB82-29

SUBJECT: SR-522 XL-3591
SR-522 / US-2 Interchange Vicinity – Phase I
Widening, SR 522 - MP 24.20 to 24.68, and US 2 - MP 14.13 to 14.83
Foundations Report

As requested by your office, the NW Region Materials Lab has completed the geotechnical investigation for the design and construction of SR-522 / US-2 Interchange Vicinity – Phase I Project. This project proposes to construct a sign bridge and camera pole along US-2 / SR 522 interchange corridor from MP 24.20 to MP 24.68. The project also proposes to install thirty nine (39) standard luminaires and relocate four (4) standard signal poles on US-2 mainline from MP 14.13 to MP 14.83 in Monroe, Washington.

The conclusions and recommendations contained in this memorandum are based upon the project description, and site conditions, as they existed at the time of the field investigation. It is further assumed that the subsurface conditions as interpreted from the boring logs are representative of the subsurface conditions throughout the project area. If during construction, subsurface conditions are different from those encountered in the exploratory borings, we should be advised so we can assist you and reevaluate our recommendations.

Field Investigation

The field exploration program for the project consisted of drilling eighteen (18) exploratory borings at selected locations of the sign bridge, luminaire, and signal standard foundations. Additional soil information was also obtained from two (2) borings (P-4-08 and H-80p-08) previously drilled for the pond and bridge as part of the investigation for the subject project. The exploratory borings for this investigation were drilled utilizing a CME 45 skid mounted drilling rigs using an automatic hammer for the SPT tests. The borings were advanced to depths varying between 15.5 ft and 27 feet below the ground surface using the wet rotary drilling method. At the boring locations, soil samples were obtained using a 2-inch OD, 1.4-inch ID split-spoon sampler. Standard Penetration Tests (SPT) were performed at approximately 2.5 and 5 ft intervals in the boring in general accordance with ASTM Test Method D-1586. SPT values are obtained by driving the split-spoon sampler 18-inches into the soil with a 140-pound hammer using 30-inch drops. The number of blows required to achieve each 6 inches of penetration are recorded. The soil's SPT resistance, or N-value, is calculated as the number of blows required to achieve the final 12 inches of penetration. Disturbed soil samples were recovered and visually classified in the field using the Unified Soil Classification System (USCS) in general

accordance with ASTM Test Method D-2488. The approximate boring locations are shown on attached the Boring Location Plan Sheets.

Subsurface Conditions

The soil conditions within the project limits were interpreted from the exploratory borings drilled along SR-522 / US-2 Interchange vicinity phase I Project. The borings indicate that the site is underlain by very loose to very dense silty sand with gravel, very loose medium to dense sandy silt with gravel, medium dense to very dense silty gravel with sand, loose to dense well graded sand with gravel, and poorly graded sand with gravel. Detailed descriptions of the soil conditions encountered during the field exploration are included in the attached boring logs and should be included in the contract documents.

Groundwater was encountered during the time of drilling of the exploratory borings at depths deeper 5.0 ft below existing grade at the location of the exploratory borings. The depths to groundwater are shown on the boring logs.

Luminaire Foundations Design

The subsurface soils encountered in the exploratory borings (refer to the boring logs as shown on table 1) at the approximate standard luminaire foundation locations can provide the minimum lateral bearing pressures required for standard luminaire foundation Type A and Type B (3-foot diameter shaft with 4.5-foot or 8-foot embedment, respectively) as shown on Light Standard Foundation Plan Sheet J-28.30.00 (see attached copy). We recommend that the standard foundation type for each proposed luminaire design be based on the allowable lateral bearing pressures and corresponding shaft diameters and depths presented in Table 1 below.

Table 1: Boring Locations & Luminaire Foundation Design Recommendations

Pole No.	Test Boring No.	Boring Location		Allowable Lateral Bearing Pressure	Foundation Type, diameter & Depth (ft)	Depth to Ground Water
		Station (ft)	Offset (ft)			
1, 2	L-2-09	U line 13+25	30' Lt.	1,500 psf	Standard Foundation Type B (3' x 8')	11.0'
3, 4	L-4-09	U line 16+67	37'Lt.	2,000 psf	Standard Foundation Type A (3' x 4.5')	13.0'
5, 6	L-6-09	U line 20+65	40' Lt.	2,000 psf	Standard Foundation Type A (3' x 4.5')	11.5'
7	L-7-09	U line 23+34	37.2' Lt.	2,000 psf	Standard Foundation Type A (3' x 4.5')	10.0'
10, 11 & 30	L-11-09	U line 29+77	46.9' Lt.	2,000 psf	Standard Foundation Type A (3' x 4.5)	11.0'
18	P-4-08 (L-18-09)	U line 30+35	100' Rt.	1,500 psf	Standard Foundation Type B (3' x 8')	14.0'

Pole No.	Test Boring No.	Boring Location		Allowable Lateral Bearing Pressure	Foundation Type, diameter & Depth (ft)	Depth to Ground Water
		Station (ft)	Offset (ft)			
19, 20	L-19-09	U line 34+54	79.2' Rt.	2,000 psf	Standard Foundation Type A (3' x 4.5')	11.0'
22, 23	L-22-09	U line 40+29	68.1' Rt.	2,000 psf	Standard Foundation Type A (3' x 4.5')	14.5'
24, 25 & 26	L-25-09	U line 46+07	65.7' Rt.	2,000 psf	Standard Foundation Type A (3' x 4.5')	8.0'
27, 28 & 29	L-28-09	U line 52+44	65.3' Rt.	2,000 psf	Standard Foundation Type A (3' x 4.5')	13.0'
31, 32	L-32-09	U line 35+77	49.8' Lt.	2,000 psf	Standard Foundation Type A (3' x 4.5')	9.5'
33, 34	L-33-09	U line 41+27	34.9' Lt.	1,500 psf	Standard Foundation Type B (3' x 8')	11.0'
35, 36	L-36-09	U line 47+95	25.4' Lt.	2,000 psf	Standard Foundation Type A (3' x 4.5')	15.0'
37, 38 & 39	L-38-09	U line 52+61	31' Lt.	1,500 psf	Standard Foundation Type B (3' x 8')	14.5'

* **Note:** Luminaire poles No. 12, 13, 14, 15, 16, 17, 40 and 41 (see Luminaire Schedule Plan Sheet) will be constructed and mounted on the retaining walls and bridge rail along the US-2 / SR 522 interchange corridor, and will not be addressed by this report. Contact the Bridge and Structure Offices for the design recommendation.
- Luminaire 8 will be installed on signal pole. Luminaires 9 and 21 are existing luminaires to remain.

Signal Foundations Design

Based on the soil conditions encountered, we recommend the construction of a 3 or 4-foot diameter shaft using the design allowable lateral bearing pressures shown in Table 2. The depths for the Type II and III standard foundations should be determined based on the geometry of the pole, wind area and moment arm, (XYZ, ft^3) correlated to the allowable bearing pressure, as shown on Signal Standard Foundation Details Plan Sheet (see attached).

TABLE 2: Boring Locations & Signal Foundation Design Recommendations

STD No.	Signal Type	Test Boring No.	Boring Location		Allowable Lateral Bearing Pressure (psf)	Depth to Ground Water (ft)
			Station (ft)	Offset (ft)		
US-2 / SR-522 ramps intersection						
3	III	S-1-09	U line 26+43	49' Lt.	1,500	5.0'
1	III	S-2-09	U line 27+37	53' Rt.	1,500	16.5'

STD No.	Signal Type	Test Boring No.	Boring Location		Allowable Lateral Bearing Pressure (psf)	Depth to Ground Water (ft)
			Station (ft)	Offset (ft)		
US-2 / Kelsey Street Intersection						
1 & 3	II	S-4-09	U line 38+77	77' Rt.	1,000	16.0'

- Note: All signal poles will be constructed on existing ground elevation.

Sign Structure Foundation

The new sign bridge structure will be installed on SR-522 at station LR 877+65. Based on the subsurface soil encountered in the exploratory borings (SB-1-09 and SB-2-09) at the proposed monotube sign structure location, the soil can provide a minimum allowable lateral pressure of 2,500 psf. Therefore, a Type I monotube sign structure foundation as shown on Standard Sign Bridges Plan 10.1-A4-1 (see attached copy) of the Bridge Standard Drawings can be used.

Camera (CCTV) Foundation

The new camera pole will be constructed on SR-522 off-ramp to US-2 at Sta. 18+36 on W line. Soil information (H-80p-08) was obtained from a previous boring drilled by the Headquarter's Geotechnical Section as part of the investigation for the subject project. Based on the soil condition encountered in the exploratory boring (H-80p-08) and existing embankment fill at the location of the CCTV camera pole foundation vicinity, the soil can provide a minimum allowable lateral bearing pressure of 1,500 psf. Therefore a WSDOT Standard foundation (3.5-foot diameter shaft with a depth of foundation based on the ground slope ratio and pole height) as shown on Camera Pole Standard Foundation Plan Sheet can be used (see attached copy).

Construction Considerations

Groundwater will be encountered during construction of the drilled shafts. Stabilization measures will be required during shaft excavation. Stabilization measures such as temporary casing or slurry will be required during shaft excavation and the concrete may have to be placed using the tremie method. The base of the shaft borings should be cleaned from any loose soil before concrete placement. Excessive loose material left in the bottom of the shaft borings may increase the amount of settlement that occurs, affecting the performance of the structures.

Closure

We trust the information contained in this memorandum is sufficient so you can complete the design of your project. If you have any questions or require additional information, contact Nabil Dbaibo at 206-768-5905 or Hon Hua at 206-768-5921.

CJJ/NTD/HTH:hth

File No.: XL-3591
Serial File: 09-219

Cc: Jim Cuthbertson/MS 47365
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CHRISTOPHER JAY JOHNSON
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11/19/09

Washington State
Department of Transportation

Test Boring Legend

Sampler Symbols

	Standard Penetration Test
	Oversized Penetration Test (Dames & Moore, California)
	Shelby Tube
P	Piston Sample
	Washington Undisturbed
	Vane Shear Test
	Core
	Becker Hammer
B	Bag Sample

Well Symbols

	Cement Surface Seal
	Piezometer Pipe in Granular Bentonite Seal
	Piezometer Pipe in Sand
	Well Screen in Sand
	Granular Bentonite Bottom Seal
	Inclinometer Casing in Concrete Bentonite Grout

Laboratory Testing Codes

UU	Unconsolidated Undrained Triaxial
CU	Consolidated Undrained Triaxial
CD	Consolidated Drained Triaxial
UC	Unconfined Compression Test
DS	Direct Shear Test
CN	Consolidation Test
GS	Grain Size Distribution
MC	Moisture Content
SG	Specific Gravity
OR	Organic Content
DN	Density
AL	Atterberg Limits
PT	Point Load Compressive Test
SL	Slake Test
DG	Degradation
LA	LA Abrasion
HT	Hydrometer Test

Soil Density Modifiers

Gravel, Sand & Non-plastic Silt		Elastic Silts and Clay	
SPT Blows/ft	Density	SPT Blows/ft	Consistency
0-4	Very Loose	0-1	Very Soft
5-10	Loose	2-4	Soft
11-24	Medium Dense	5-8	Medium Stiff
25-50	Dense	9-15	Stiff
>50	Very Dense	16-30	Very Stiff
		31-60	Hard
		>60	Very Hard

Angularity of Gravel & Cobbles

Angular	Coarse particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Coarse grained particles are similar to angular but have rounded edges.
Subrounded	Coarse grained particles have nearly plane sides but have well rounded corners and edges.
Rounded	Coarse grained particles have smoothly curved sides and no edges.

Soil Moisture Modifiers

Dry	Absence of moisture; dusty, dry to touch
Moist	Damp but no visible water
Wet	Visible free water

Soil Structure

Stratified	Alternating layers of varying material or color at least 6mm thick; note thickness and inclination.
Laminated	Alternating layers of varying material or color less than 6mm thick; note thickness and inclination.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, somtimes striated.
Blocky	Cohesive soil that can be broken down into smaller angular lumps which resist further breakdown.
Disrupted	Soil structure is broken and mixed. Infers that material has moved substantially - landslide debris.
Homogeneous	Same color and appearance throughout.

HCL Reaction

No HCL Reaction	No visible reaction.
Weak HCL Reaction	Some reaction with bubbles forming slowly.
Strong HCL Reaction	Violent reaction with bubbles forming imediately.

Degree of Vesicularity of Pyroclastic Rocks

Slightly Vesicular	5 to 10 percent of total
Moderately Vesicular	10 to 25 percent of total
Highly Vesicular	25 to 50 percent of total
Scoriaceous	Greater than 50 percent of total

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Washington State
Department of Transportation

Test Boring Legend

Grain Size

Fine Grained	< 1mm	Few crystal boundaries/grains are distinguishable in the field or with hand lens.
Medium Grained	1mm to 5mm	Most crystal boundaries/grains are distinguishable with the aid of a hand lens.
Coarse Grained	> 5mm	Most crystal boundaries/grains are distinguishable with the naked eye.

Weathered State

Term	Description	Grade
Fresh	No visible sign of rock material weathering; perhaps slight discoloration in major discontinuity surfaces.	I
Slightly Weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than its fresh condition.	II
Moderately Weathered	Less than half of the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as a continuous framework or as core stones.	III
Highly Weathered	More than half of the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as discontinuous framework or as core stone.	IV
Completely Weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.	V
Residual Soil	All rock material is converted to soil. The mass structure and material fabric is destroyed. There is a large change in volume, but the soil has not been significantly transported.	VI

Relative Rock Strength

Grade	Description	Field Identification	Uniaxial Compressive Strength approx
R1	Very Weak	Specimen crumbles under sharp blow from point of geological hammer, and can be cut with a pocket knife.	1 to 25 MPa
R2	Moderately Weak	Shallow cuts or scrapes can be made in a specimen with a pocket knife. Geological hammer point indents deeply with firm blow.	25 to 50 MPa
R3	Moderately Strong	Specimen cannot be scraped or cut with a pocket knife, shallow indentation can be made under firm blows from a hammer.	50 to 100 MPa
R4	Strong	Specimen breaks with one firm blow from the hammer end of a geological hammer.	100 to 200 MPa
R5	Very Strong	Specimen requires many blows of a geological hammer to break intact sample.	Greater than 200 MPa

Spacing	
Very Widely	Greater than 3 m
Widely	1 m to 3 m
Moderately	0.3 m to 1 m
Closely	50 mm to 300 mm
Very Closely	Less than 50 mm

RQD (%)

$$\frac{100(\text{length of core in pieces} > 100\text{mm})}{\text{Length of core run}}$$

Condition	
Excellent	Very rough surfaces, no separation, hard discontinuity wall
Good	Slightly rough surfaces, separation less than 1 mm, hard discontinuity wall.
Fair	Slightly rough surfaces, separation greater than 1 mm, soft discontinuity wall.
Poor	Slickensided surfaces, or soft gouge less than 5 mm thick, or open discontinuities 1 to 5 mm.
Very Poor	Soft gouge greater than 5 mm thick, or open discontinuities greater than 5 mm.

Fracture Frequency (FF) is the average number of fractures per 300 mm of core.
Does not include mechanical breaks caused by drilling or handling.

Washington State Department of Transportation

LOG OF TEST BORING

Start Card SE05433

HOLE No. L-2-09

Sheet 1 of 1

Job No. XL-3591 SR 522 & 2 Elevation ft (m)

Project SR-522 & US-2 Interchange Improvements

Driller Dickson, Jody Lic# 2637

Site Address Vic. Of SR 522 and US 2

Inspector Donny Henderson

Start October 1, 2009 Completion October 1, 2009 Well ID# Equipment CME 45 with Autohammer

Station U line 13+25 Offset 30' LT Casing 0 Method Wet Rotary

Northing Easting Latitude Longitude

County Snohomish Subsection SW1/4 of SW1/4 Section 36 Range 6E Township 28

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
								Asphalt		
				28 7 2 2 (9)		D-1		Silty SAND with gravel, loose, brown, moist, stratified, HCl not tested. Length Recovered:1.1 ft. Length Retained:1.1 ft. from 2.6' to 2.7' sandy silt with gravel		
	1			1 2 6 9 (8)		D-2		Sandy SILT with gravel, trace organics , loose, brown, wet, stratified, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft. from 4.8' to 5.0' silty gravel with sand		
5				10 14 29 37 (43)		D-3		Well graded GRAVEL with sand, angular, slightly silty, dense, brown, moist, homogenous, HCl not tested. Length Recovered:1.3 ft. Length Retained:1.3 ft. with large gravel as indicated by drilling		
	2		>>	33 30 30 39 (60)		D-4		Well graded GRAVEL with sand, angular, slightly silty, very dense, brown, moist, homogenous, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft. with large gravel as indicated by drilling		
10	3		>>	40 33 42 39 (75)		D-5		Silty GRAVEL with sand, angular, very dense, brown/gray, moist, homogenous, HCl not tested. Length Recovered:1.6 ft. Length Retained:1.6 ft. with large gravel as indicated by drilling 10/1/2009	▽	
	4									
15	5		>>	26 39 29 30 (68)		D-6		Silty GRAVEL with sand, angular, very dense, brown, wet, homogenous, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft. with large gravel as indicated by drilling		
20	6							End of test hole boring at 17 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal		

SOIL XL-3591.GPJ SOIL.GDT 10/26/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card SE05433

HOLE No. L-4-09

Sheet 1 of 1

Job No. XL-3591 SR 522 & 2 Elevation ft (m)

Project SR-522 & US-2 Interchange Improvements

Driller Dickson, Jody Lic# 2637

Site Address Vic. Of SR 522 and US 2

Inspector Donny Henderson

Start October 5, 2009 Completion October 5, 2009 Well ID# Equipment CME 45 with Autohammer

Station U line 16+67 Offset 37' LT Casing 0 Method Wet Rotary

Northing Easting Latitude Longitude

County Snohomish Subsection SW1/4 of SW1/4 Section 36 Range 6E Township 28

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
								Asphalt		
				21 21 15 6 (36)		D-1		Silty SAND with gravel, dense, brown, moist, homogenous, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft.		
	1			5 5 8 15 (13)		D-2		Silty SAND with gravel, medium dense, brown, moist, homogenous, HCl not tested. Length Recovered:0.6 ft. Length Retained:0.6 ft. with large gravel as indicated by drilling		
5			>>	12 27 34 50 (61)		D-3		Silty SAND with gravel, very dense, brown, moist, homogenous, HCl not tested. Length Recovered:1.1 ft. Length Retained:1.1 ft. with large gravel as indicated by drilling		
	2			11 18 23 22 (41)		D-4		Silty GRAVEL with sand, angular, dense, brown, moist, stratified, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft. layers of silty sand with gravel, with large gravel as indicated by drilling		
10	3			14 18 29 29 (47)		D-5		Silty GRAVEL with sand, angular, dense, brown, wet, homogenous, HCl not tested. Length Recovered:1.3 ft. Length Retained:1.3 ft. with large gravel as indicated by drilling		
	4							10/5/2009	▽	
15			>>	21 36 26 29 (62)		D-6		Silty GRAVEL with sand, angular, very dense, brown, wet, stratified, HCl not tested. Length Recovered:1.4 ft. Length Retained:1.4 ft. poorly graded sand with gravel layers, with large gravel as indicated by drilling		
	5									
								End of test hole boring at 17 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal		
20	6									

SOIL XL-3591.GPJ SOIL.GDT 10/26/09

Washington State
Department of Transportation

LOG OF TEST BORING

Start Card SE05433

HOLE No. L-6-09

Sheet 1 of 1

Job No. XL-3591 SR 522 & 2 Elevation ft (m)

Project SR-522 & US-2 Interchange Improvements

Driller Dickson, Jody Lic# 2637

Site Address Vic. Of SR 522 and US 2

Inspector Donny Henderson

Start October 1, 2009 Completion October 1, 2009 Well ID# Equipment CME 45 with Autohammer

Station U line 20+65 Offset 40' LT Casing 0 Method Wet Rotary

Northing Easting Latitude Longitude

County Snohomish Subsection SW1/4 of SW1/4 Section 36 Range 6E Township 28

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				20 20 10 6 (30)		D-1		Asphalt Silty GRAVEL with sand, angular, dense, brown, wet, stratified, HCl not tested. Length Recovered:1.6 ft. Length Retained:1.6 ft. from 1.8' to 2.3' sandy silt with gravel, trace organics		
	1			6 11 13 16 (24)		D-2		Sandy SILT with gravel, trace organics , medium dense, brown, wet, stratified, HCl not tested. Length Recovered:1.1 ft. Length Retained:1.1 ft. from 4.7' to 5.0' silty gravel with sand		
5			>>	17 28 30 35 (58)		D-3		Silty GRAVEL with sand, angular, very dense, brown, moist, homogenous, HCl not tested. Length Recovered:1.4 ft. Length Retained:1.4 ft. with large gravel as indicated by drilling		
	2			17 20 24 40 (44)		D-4		Silty GRAVEL with sand, angular, dense, brown, wet, homogenous, HCl not tested. Length Recovered:1.2 ft. Length Retained:1.2 ft. with large gravel as indicated by drilling		
10	3		>>	37 32 35 32 (67)		D-5		Silty GRAVEL with sand, angular, very dense, brown, wet, homogenous, HCl not tested. Length Recovered:1.6 ft. Length Retained:1.6 ft. with large gravel as indicated by drilling 10/1/2009	▽	
	4									
15			>>	32 33 38 32 (71)		D-6		Silty GRAVEL with sand, angular, very dense, brown, wet, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft. with large gravel as indicated by drilling		
	5									
								End of test hole boring at 17 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal		
20	6									

SOIL XL-3591.GPJ SOIL.GDT 10/26/09

Washington State
Department of Transportation

LOG OF TEST BORING

Start Card SE05434

Job No. XL-3591 SR 522 & 2 Elevation ft (m)

HOLE No. L-7-09

Sheet 1 of 1

Project SR-522 & US-2 Interchange Improvements

Driller Dickson, Jody Lic# 2637

Site Address Vic. Of SR 522 and US 2

Inspector Donny Henderson

Start September 30, 2009 Completion September 30, 2009 Well ID# Equipment CME 45 with Autohammer

Station U line 23+34 Offset 37.2' LT Casing 0 Method Wet Rotary

Northing Easting Latitude Longitude

County Snohomish Subsection NE1/4 of NW1/4 Section 1 Range 6E Township 27

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				19 12 17 10 (29)		D-1		Asphalt Sandy SILT with gravel, dense, brown, moist, stratified, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft. layers of sandy silt, trace organics		
	1			5 5 6 10 (11)		D-2		Sandy SILT with gravel, trace organics, medium dense, brown, moist, homogenous, HCl not tested. Length Recovered:0.8 ft. Length Retained:0.8 ft.		
5			>>	18 30 27 50 (57)		D-3		Silty GRAVEL with sand, angular, very dense, brown, moist, stratified, HCl not tested. Length Recovered:1.3 ft. Length Retained:1.3 ft. layers of poorly graded sand, with large gravel as indicated by drilling		
	2		>>	49 36 40 29 (76)		D-4		Well graded GRAVEL with sand, angular, slightly silty, very dense, brown, moist, stratified, HCl not tested. Length Recovered:1.4 ft. Length Retained:1.4 ft. layers of silty sand with gravel, with large gravel as indicated by drilling		
10	3			22 19 24 18 (43)		D-5		Silty SAND with gravel, dense, brown, wet, homogenous, HCl not tested. Length Recovered:1.3 ft. Length Retained:1.3 ft. with large gravel as indicated by drilling 9/30/2009	▽	
	4									
15	5			17 16 24 29 (40)		D-6		Silty SAND with gravel, dense, brown, moist, homogenous, HCl not tested. Length Recovered:0.7 ft. Length Retained:0.7 ft. with large gravel as indicated by drilling		
20	6							End of test hole boring at 17 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal		

SOIL XL-3591.GPJ SOIL.GDT 10/26/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card SE05434

HOLE No. L-11-09

Sheet 1 of 1

Job No. XL-3591 SR 522 & 2 Elevation ft (m)

Project SR-522 & US-2 Interchange Improvements

Driller Dickson, Jody Lic# 2637

Site Address Vic. Of SR 522 and US 2

Inspector Donny Henderson

Start September 29, 2009 Completion September 29, 2009 Well ID# Equipment CME 45 with Autohammer

Station U line 29+77 Offset 46.9' LT Casing 0 Method Wet Rotary

Northing Easting Latitude Longitude

County Snohomish Subsection NE1/4 of NW1/4 Section 1 Range 6E Township 27

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				10 14 10 9 (24)		D-1		Sandy SILT with gravel, trace organics, medium dense, brown, dry, stratified, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft. from 1.5' to 2.0' silty sand with gravel		
	1			7 4 3 5 (7)		D-2		Silty SAND with gravel, loose, brown, moist, homogenous, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft.		
5				4 6 7 8 (13)		D-3		Silty GRAVEL with sand, sub-angular, medium dense, brown, wet, homogenous, HCl not tested. Length Recovered:0.4 ft. Length Retained:0.4 ft.		
	2			3 2 4 4 (6)		D-4		Silty SAND with gravel, trace organics, loose, brown/gray, wet, stratified, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft.		
10	3			7 11 16 23 (27)		D-5		Well graded SAND with gravel, slightly silty, dense, brown, wet, homogenous, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft. with large gravel as indicated by drilling 9/29/2009	▽	
15	4									
	5			10 14 15 22 (29)		D-6		Silty SAND with gravel, dense, brown, wet, homogenous, HCl not tested. Length Recovered:1.4 ft. Length Retained:1.4 ft. with large gravel as indicated by drilling		
20	6							End of test hole boring at 17 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal		

SOIL XL-3591.GPJ SOIL.GDT 10/26/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card RE02244

HOLE No. P-4-08 (use for L-18-09)

Sheet 1 of 2

Job No. XL-3591 SR 522 Elevation ft (m)

Project Snohomish River to US 2 Driller Verlo, Sean Lic# 2615

Site Address Vic. Of SR 522 and US 2 Inspector Donny Henderson

Start April 21, 2008 Completion April 21, 2008 Well ID# APP-234 Equipment CME 45 with Autohammer

Station U line 30+35 Offset 100' RT Casing 4 Method Wet Rotary

Northing 644450 Easting 1686985 Latitude Longitude

County Snohomish Subsection NW1/4 of NE1/4 Section 1 Range 6 E Township 27

Depth (ft)	Meters (m)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
		3, 3, 16, 19 (19)		D-1		Sandy SILT with gravel, trace organics, medium dense, brown, moist, stratified, HCl not tested. Length Recovered:2.0 ft. Length Retained:2.0 ft. from 1.0' to 2.0' silty sand with gravel		
	1	6, 3, 4, 3 (7)		D-2		Silty SAND with gravel, trace organics, loose, brown, moist, stratified, HCl not tested. Length Recovered:1.7 ft. Length Retained:1.7 ft. sandy silt layers		
5		2, 3, 3, 4 (6)		D-3		Silty SAND, loose, brown, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
	2	5, 13, 36, 27 (49)		D-4		Silty SAND with gravel, dense, brown to gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
		10, 14, 17, 17 (31)		D-5		Silty SAND with gravel, dense, brown, moist, stratified, HCl not tested. Length Recovered:1.3 ft. Length Retained:1.3 ft. layers of silty gravel with sand		
10	3	21, 17, 22, 40 (39)		D-6		Silty SAND with gravel, dense, brown, moist, homogenous, HCl not tested. Length Recovered:1.1 ft. Length Retained:1.1 ft. with large gravel as indicated by drilling		
		23, 25, 20, 18 (45)		D-7		Silty SAND with gravel, dense, brown, moist, stratified, HCl not tested. Length Recovered:1.4 ft. Length Retained:1.4 ft. layers of silty gravel with sand, with large gravel as indicated by drilling		
	4	>>, 17, 22, 36, 29 (58)		D-8		Silty SAND with gravel, very dense, brown, moist, homogenous, HCl not tested. Length Recovered:1.1 ft. Length Retained:1.1 ft. with large gravel as indicated by drilling	▽ 04/21/2008	
15		22, 20, 24, 22 (44)		D-9		Silty SAND with gravel, dense, brown, moist, homogenous, HCl not tested. Length Recovered:1.1 ft. Length Retained:1.1 ft. with large gravel as indicated by drilling		
	5	15, 16, 14, 14 (30)		D-10		Silty SAND with gravel, dense, brown, wet, homogenous, HCl not tested. Length Recovered:1.2 ft. Length Retained:1.2 ft. with large gravel as indicated by drilling		
20	6							

Standard Penetration Blows/ft: 10, 20, 30, 40

SOIL XL-2042 SR-522 SNOHOMISH RIVER BRIDGE.GPJ SOIL.GDT 10/29/09

Washington State
Department of Transportation

LOG OF TEST BORING

Start Card RE02244

HOLE No. P-4-08 (use for L-18-09)

Job No. XL-3591 SR 522 Elevation ft (m)

Sheet 2 of 2

Project Snohomish River to US 2

Driller Verlo, Sean Lic# 2615

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				13 8 6 4 (14)		D-11		Silty SAND with gravel, medium dense, brown, wet, homogenous, HCl not tested. Length Recovered:1.1 ft. Length Retained:1.1 ft.		
	7							End of test hole boring at 22 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal		
25										
	8							WATER LEVEL READINGS DATE DEPTH 05/05/2008 -16.20 Initial Reading 06/02/2008 -15.90 07/01/2008 -15.80 08/01/2008 -17.40 09/04/2008 -17.50		
	9									
30										
	10									
35										
	11									
	12									
40										
	13									
45										

SOIL XL-2042 SR-522 SNOHOMISH RIVER BRIDGE.GPJ SOIL.GDT 10/29/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card SE05435

HOLE No. L-19-09

Sheet 1 of 1

Job No. XL-3591 SR 522 & 2 Elevation ft (m)

Project SR-522 & US-2 Interchange Improvements

Driller Dickson, Jody Lic# 2637

Site Address Vic. Of SR 522 and US 2

Inspector Donny Henderson

Start October 5, 2009 Completion October 5, 2009 Well ID# Equipment CME 45 with Autohammer

Station U line 34+54 Offset 79.2' RT Casing 0 Method Wet Rotary

Northing Easting Latitude Longitude

County Snohomish Subsection NW1/4 of NE1/4 Section 1 Range 6E Township 27

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				8 14 11 8 (25)		D-1		Silty SAND with gravel, trace organics, dense, brown, moist, homogenous, HCl not tested. Length Recovered:1.8 ft. Length Retained:1.8 ft.		
	1			9 7 4 2 (11)		D-2		Silty SAND with gravel, medium dense, brown/gray, moist, stratified, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft. layers of sandy silt with gravel, trace organics		
5				3 3 7 10 (10)		D-3		Sandy SILT with gravel, medium dense, brown, moist, stratified, HCl not tested. Length Recovered:1.6 ft. Length Retained:1.6 ft. from 5.0' to 6.0' silty sand with gravel		
	2			5 6 7 6 (13)		D-4		Silty SAND with gravel, medium dense, brown, moist, homogenous, HCl not tested. Length Recovered:0.9 ft. Length Retained:0.9 ft.		
10	3			18 17 13 12 (30)		D-5		Silty GRAVEL with sand, angular, dense, brown, wet, homogenous, HCl not tested. Length Recovered:0.5 ft. Length Retained:0.5 ft. with large gravel as indicated by drilling 10/5/2009	▽	
	4									
15	5			13 19 19 20 (38)		D-6		Silty GRAVEL with sand, angular, dense, brown, wet, homogenous, HCl not tested. Length Recovered:1.4 ft. Length Retained:1.4 ft. with large gravel as indicated by drilling		
20	6							End of test hole boring at 17 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal		

SOIL XL-3591.GPJ SOIL.GDT 10/26/09

Washington State
Department of Transportation

LOG OF TEST BORING

Start Card SE05435

HOLE No. L-22-09

Sheet 1 of 1

Job No. XL-3591 SR 522 & 2 Elevation ft (m)

Project SR-522 & US-2 Interchange Improvements

Driller Dickson, Jody Lic# 2637

Site Address Vic. Of SR 522 and US 2

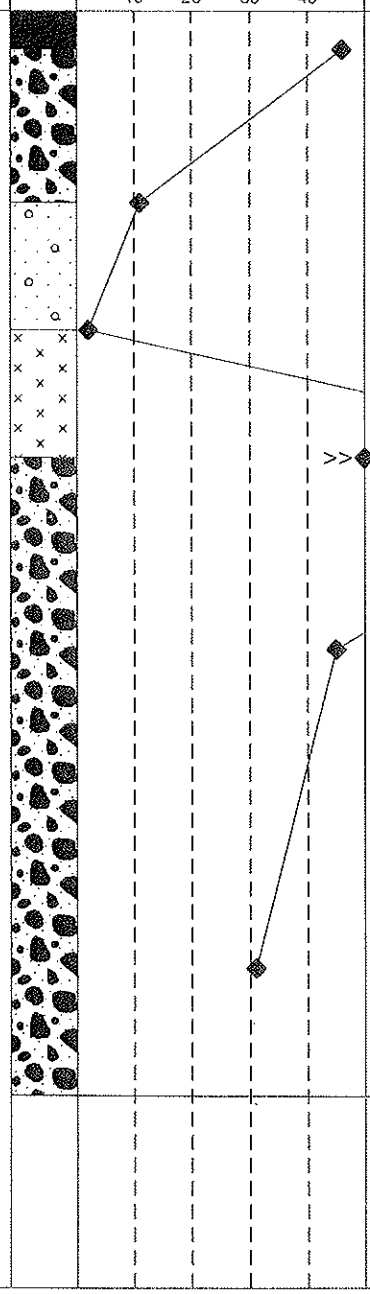
Inspector Donny Henderson

Start October 21, 2009 Completion October 21, 2009 Well ID# Equipment CME 45 with Autohammer

Station U line 40+29 Offset 68.1' RT Casing 0 Method Wet Rotary

Northing Easting Latitude Longitude

County Snohomish Subsection NW1/4 of NE1/4 Section 1 Range 6E Township 27



Depth (ft)	Meters (m)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
						Asphalt		
		11 24 22 13 (46)		D-1		Silty GRAVEL with sand, angular, dense, brown, moist, stratified, HCl not tested. Length Recovered:1.4 ft. Length Retained:1.4 ft. layers of silty sand with gravel		
1		11 7 4 3 (11)		D-2		Poorly graded SAND with gravel, slightly silty, medium dense, brown, moist, homogenous, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft.		
5		2 1 1 1 (2)		D-3		Sandy SILT with gravel, very loose, brown, wet, homogenous, HCl not tested. Length Recovered:0.7 ft. Length Retained:0.7 ft.		
2		>> 22 50/5 (101)		D-4		Silty GRAVEL with sand, angular, very dense, brown, wet, homogenous, HCl not tested. Length Recovered:0.4 ft. Length Retained:0.4 ft. with large gravel as indicated by drilling		
10 3		32 27 18 18 (45)		D-5		Silty GRAVEL with sand, angular, dense, brown, wet, homogenous, HCl not tested. Length Recovered:0.7 ft. Length Retained:0.7 ft. with large gravel as indicated by drilling		
4								
15		12 17 14 16 (31)		D-6		10/21/2009 Silty GRAVEL with sand, angular, dense, brown, wet, homogenous, HCl not tested. Length Recovered:0.6 ft. Length Retained:0.6 ft. with large gravel as indicated by drilling	▽	
5								
						End of test hole boring at 17 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal		
20 6								

SOIL XL-3591.GPJ SOIL.GDT 10/26/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card SE05435

HOLE No. L-25-09

Sheet 1 of 1

Job No. XL-3591 SR 522 & 2 Elevation ft (m)

Project SR-522 & US-2 Interchange Improvements

Driller Dickson, Jody Lic# 2637

Site Address Vic. Of SR 522 and US 2

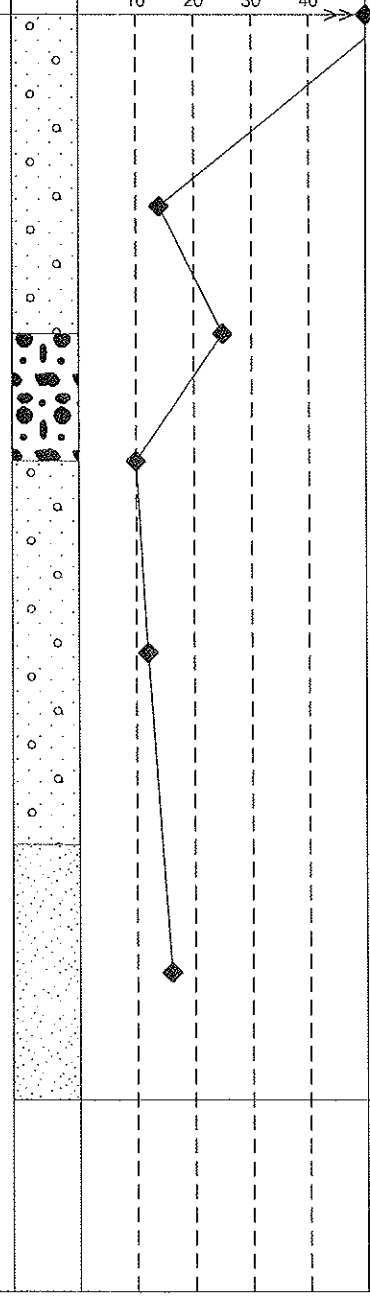
Inspector Donny Henderson

Start October 15, 2009 Completion October 15, 2009 Well ID# Equipment CME 45 with Autohammer

Station U line 46+07 Offset 65.7' RT Casing 0 Method Wet Rotary

Northing Easting Latitude Longitude

County Snohomish Subsection NW1/4 of NE1/4 Section 1 Range 6E Township 27



Depth (ft)	Meters (m)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
		26 24 31 22 (55)		D-1		Silty SAND with gravel, trace organics, pieces of asphalt, very dense, brown, moist, stratified, HCl not tested. Length Recovered:1.3 ft. Length Retained:1.3 ft.		
	1	14 7 7 10 (14)		D-2		Silty SAND with gravel, medium dense, brown, moist, homogenous, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft.		
5		9 12 13 12 (25)		D-3		Well graded GRAVEL with sand, angular, dense, brown, wet, homogenous, HCl not tested. Length Recovered:0.3 ft. Length Retained:0.3 ft.		
	2	7 5 5 4 (10)		D-4		Poorly graded SAND with gravel, slightly silty, medium dense, brown, wet, homogenous, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft. 10/15/2009	▽	
10	3	4 6 6 6 (12)		D-5		Poorly graded SAND with gravel, slightly silty, medium dense, brown, wet, homogenous, HCl not tested. Length Recovered:1.1 ft. Length Retained:1.1 ft.		
	4							
15	5	6 8 8 8 (16)		D-6		Poorly graded SAND, slightly silty, medium dense, brown, wet, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
20	6					End of test hole boring at 17 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal		

SOIL XL-3591.GPJ SOIL.GDT 10/26/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card SE05435

HOLE No. L-28-09

Sheet 1 of 1

Job No. XL-3591 SR 522 & 2 Elevation ft (m)

Project SR-522 & US-2 Interchange Improvements

Driller Dickson, Jody Lic# 2637

Site Address Vic. Of SR 522 and US 2

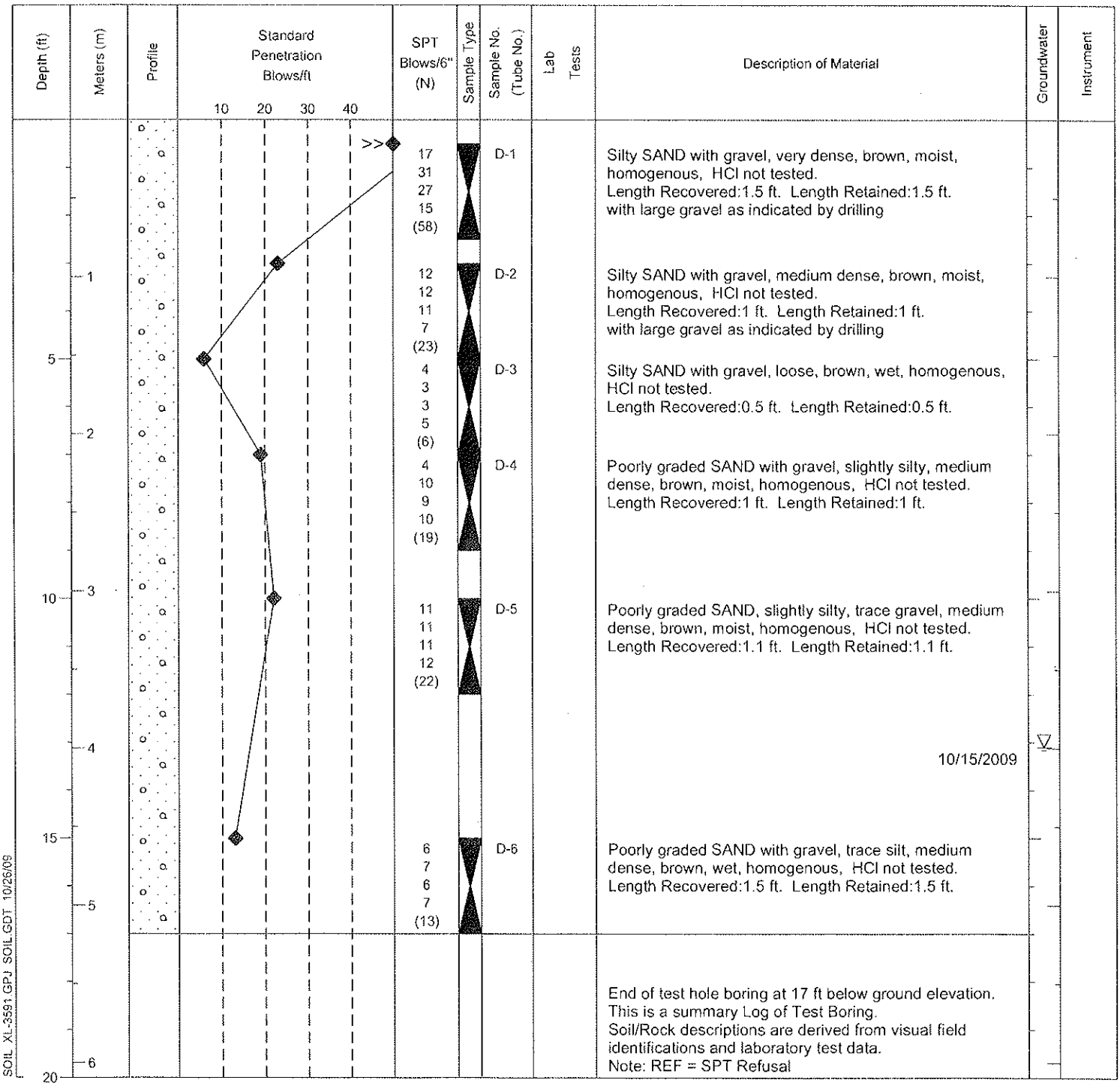
Inspector Donny Henderson

Start October 15, 2009 Completion October 15, 2009 Well ID# Equipment CME 45 with Autohammer

Station U line 52+44 Offset 65.3' RT Casing 0 Method Wet Rotary

Northing Easting Latitude Longitude

County Snohomish Subsection NW1/4 of NE1/4 Section 1 Range 6E Township 27



SOIL XL-3591.GPJ SOIL.GDT 10/26/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card SE05435

HOLE No. L-32-09

Sheet 1 of 1

Job No. XL-3591 SR 522 & 2 Elevation ft (m)

Project SR-522 & US-2 Interchange Improvements

Driller Dickson, Jody Lic# 2637

Site Address Vic. Of SR 522 and US 2

Inspector Donny Henderson

Start September 30, 2009 Completion September 30, 2009 Well ID# Equipment CME 45 with Autohammer

Station U line 35+77 Offset 49.8' LT Casing 0 Method Wet Rotary

Northing Easting Latitude Longitude

County Snohomish Subsection NW1/4 of NE1/4 Section 1 Range 6E Township 27

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				4 9 8 6 (17)		D-1		Poorly graded SAND with gravel, slightly silty, medium dense, brown, moist, homogenous, HCl not tested. Length Recovered:1.1 ft. Length Retained:1.1 ft.		
	1			4 8 11 12 (19)		D-2		Poorly graded SAND with gravel, medium dense, brown, wet, stratified, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft. layers of sandy silt with gravel, trace organics, gray, layers of silty sand with gravel		
5				4 3 4 5 (7)		D-3		Silty SAND with gravel, loose, gray, wet, homogenous, HCl not tested. Length Recovered:0.6 ft. Length Retained:0.6 ft. with large gravel as indicated by drilling		
	2			6 7 12 19 (19)		D-4		Silty SAND with gravel, trace organics (wood), medium dense, gray, wet, homogenous, HCl not tested. Length Recovered:1.2 ft. Length Retained:1.2 ft. with large gravel as indicated by drilling		
10	3			18 14 17 16 (31)		D-5		9/30/2009 Silty GRAVEL with sand, angular, dense, brown, wet, homogenous, HCl not tested. Length Recovered:1.4 ft. Length Retained:1.4 ft. with large gravel as indicated by drilling	▽	
	4									
15			>>	50/5" (101)		D-6		Well graded GRAVEL, angular, very dense, gray, wet, homogenous, HCl not tested. Length Recovered:0.1 ft. Length Retained:0.1 ft. with large gravel as indicated by drilling		
	5							End of test hole boring at 15.5 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal		
20	6									

SOIL XL-3591.GPJ SOIL.GDT 10/26/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card SE05435

HOLE No. L-33-09

Sheet 1 of 1

Job No. XL-3591 SR 522 & 2 Elevation ft (m)

Project SR-522 & US-2 Interchange Improvements

Driller Dickson, Jody Lic# 2637

Site Address Vic. Of SR 522 and US 2

Inspector Donny Henderson

Start September 29, 2009 Completion September 29, 2009 Well ID# Equipment CME 45 with Autohammer

Station U line 41+27 Offset 34.9' LT Casing 0 Method Wet Rotary

Northing Easting Latitude Longitude

County Snohomish Subsection NW1/4 of NE1/4 Section 1 Range 6E Township 27

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				3 4 6 7 (10)		D-1		Sandy SILT with gravel, trace organics, medium dense, brown, moist, stratified, HCl not tested. Length Recovered:2 ft. Length Retained:2 ft. from 1.4' to 2.0' poorly graded sand with gravel		
	1			3 4 2 2 (6)		D-2		Poorly graded SAND with gravel, loose, brown, moist, homogenous, HCl not tested. Length Recovered:1.4 ft. Length Retained:1.4 ft.		
5			>>	15 "50/3" (101)		D-3		Well graded SAND with gravel, slightly silty, very dense, brown, wet, homogenous, HCl not tested. Length Recovered:0.4 ft. Length Retained:0.4 ft. with large gravel as indicated by drilling		
	2			19 23 27 16 (50)		D-4		Well graded GRAVEL with sand, angular, very dense, brown, wet, homogenous, HCl not tested. Length Recovered:0.1 ft. Length Retained:0.1 ft. with large gravel and cobbles as indicated by drilling		
10	3			6 10 9 9 (19)		D-5		Sandy SILT with gravel, medium dense, brown, moist, stratified, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft. from 11.0' to 12.0' poorly graded sand with gravel, slightly silty, wet	▽	
	4									
15	5			9 8 8 9 (16)		D-6		Poorly graded SAND with gravel, trace silt, medium dense, brown, wet, homogenous, HCl not tested. Length Recovered:1.2 ft. Length Retained:1.2 ft.		
20	6							End of test hole boring at 17 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal		

SOIL XL-3591.GPJ SOIL.GDT 10/26/09

Washington State
Department of Transportation

LOG OF TEST BORING

Start Card SE05435

HOLE No. L-36-09

Sheet 1 of 1

Job No. XL-3591 SR 522 & 2 Elevation ft (m)

Project SR-522 & US-2 Interchange Improvements

Driller Dickson, Jody Lic# 2637

Site Address Vic. Of SR 522 and US 2

Inspector Donny Henderson

Start September 28, 2009 Completion September 28, 2009 Well ID# Equipment CME 45 with Autohammer

Station U line 47+95 Offset 25.4' LT Casing 0 Method Wet Rotary

Northing Easting Latitude Longitude

County Snohomish Subsection NW1/4 of NE1/4 Section 1 Range 6E Township 27

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				3 16 23 22 (39)		D-1		Silty SAND with gravel, trace organics, dense, brown, moist, homogenous, HCl not tested. Length Recovered:1.6 ft. Length Retained:1.6 ft.		
	1		>>	14 50/5 (101)		D-2		Poorly graded SAND with gravel, slightly silty, very dense, brown, moist, homogenous, HCl not tested. Length Recovered:0.7 ft. Length Retained:0.7 ft. with large gravel as indicated by drilling		
5				11 14 14 13 (28)		D-3		Silty SAND with gravel, dense, brown, moist, homogenous, HCl not tested. Length Recovered:0.8 ft. Length Retained:0.8 ft. with large gravel as indicated by drilling		
	2			7 10 12 12 (22)		D-4		Poorly graded SAND with gravel, slightly silty, medium dense, brown, moist, homogenous, HCl not tested. Length Recovered:1.4 ft. Length Retained:1.4 ft.		
10	3			10 11 10 11 (21)		D-5		Poorly graded SAND with gravel, slightly silty, medium dense, brown, moist, homogenous, HCl not tested. Length Recovered:1.6 ft. Length Retained:1.6 ft.		
	4									
15	5			11 11 12 12 (23)		D-6		Poorly graded SAND with gravel, slightly silty, medium dense, brown, wet, homogenous, HCl not tested. Length Recovered:2 ft. Length Retained:2 ft. 9/28/2009 with large gravel as indicated by drilling	▽	
20	6							End of test hole boring at 17 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal		

SOIL XL-3591.GPJ SOIL.GDT 10/26/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card SE05435

HOLE No. L-38-09

Sheet 1 of 1

Job No. XL-3591 SR 522 & 2 Elevation ft (m)

Project SR-522 & US-2 Interchange Improvements

Driller Dickson, Jody Lic# 2637

Site Address Vic. Of SR 522 and US 2

Inspector Donny Henderson

Start September 28, 2009 Completion September 28, 2009 Well ID# Equipment CME 45 with Autohammer

Station U line 52+61 Offset 31' LT Casing 0 Method Wet Rotary

Northing Easting Latitude Longitude

County Snohomish Subsection NW1/4 of NE1/4 Section 1 Range 6E Township 27

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				3 4 2 2 (6)		D-1		Poorly graded SAND with gravel, trace organics, slightly silty, loose, brown, moist, homogenous, HCl not tested. Length Recovered:0.9 ft. Length Retained:0.9 ft.		
5	1			2 2 7 10 (9)		D-2		Poorly graded SAND with gravel, slightly silty, loose, brown, moist, homogenous, HCl not tested. Length Recovered:0.8 ft. Length Retained:0.8 ft.		
	2			10 7 8 9 (15)		D-3		Poorly graded SAND with gravel, medium dense, brown, moist, homogenous, HCl not tested. Length Recovered:1.2 ft. Length Retained:1.2 ft.		
				5 5 7 7 (12)		D-4		Poorly graded SAND, medium dense, brown, wet, homogenous, HCl not tested. Length Recovered:1.2 ft. Length Retained:1.2 ft.		
10	3			5 6 8 8 (14)		D-5		Poorly graded SAND, trace gravel, medium dense, brown, moist, homogenous, HCl not tested. Length Recovered:1.4 ft. Length Retained:1.4 ft.		
	4								▽ 9/28/2009	
15	5			43 16 11 11 (27)		D-6		Poorly graded SAND with gravel, slightly silty, dense, brown, wet, homogenous, HCl not tested. Length Recovered:0.7 ft. Length Retained:0.7 ft. with large gravel as indicated by drilling, encountered large gravel at 14.0'		
20	6							End of test hole boring at 17 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal		

SOIL XL-3591.GPJ SOIL.GDT 10/26/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card SE05434

HOLE No. S-1-09

Sheet 1 of 2

Job No. XL-3591 SR 522 & 2 Elevation ft (m)

Project SR-522 & US-2 Interchange Improvements

Driller Dickson, Jody Lic# 2637

Site Address Vic. Of SR 522 and US 2

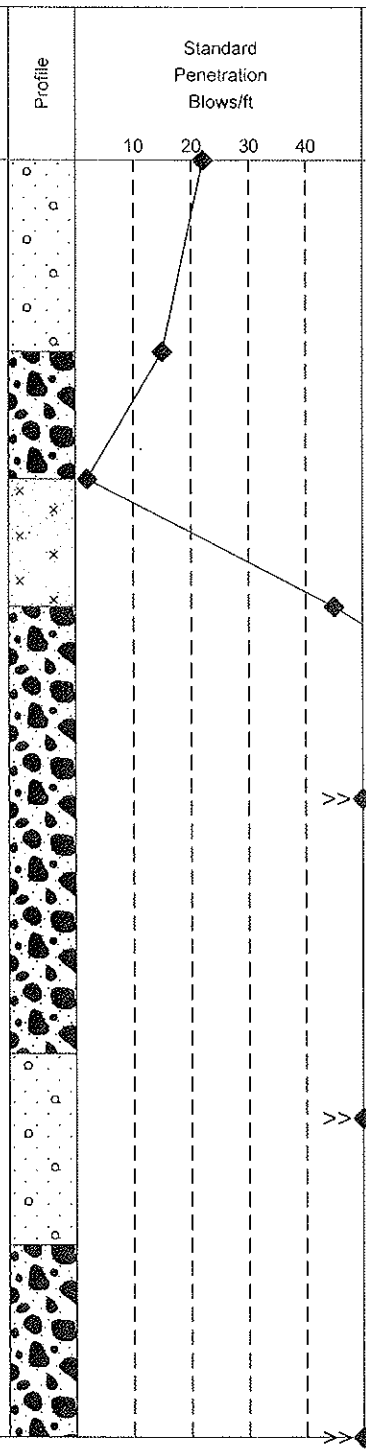
Inspector Donny Henderson

Start October 7, 2009 Completion October 7, 2009 Well ID# Equipment CME 45 with Autohammer

Station U line 26+43 Offset 49' LT Casing 0 Method Wet Rotary

Northing Easting Latitude Longitude

County Snohomish Subsection NE1/4 of NW1/4 Section 1 Range 6E Township 27



Depth (ft)	Meters (m)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
		4 9 13 17 (22)		D-1		Silty SAND with gravel, trace organics , medium dense, brown, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
	1	18 11 4 4 (15)		D-2		Silty GRAVEL with sand, angular, medium dense, brown, wet, homogenous, HCl not tested. Length Recovered:0.1 ft. Length Retained:0.1 ft. with large gravel as indicated by drilling		
5		0 1 1 0 (2)		D-3		Silty SAND, very loose, brown, wet, homogenous, HCl not tested. Length Recovered:1.1 ft. Length Retained:1.1 ft.	▽	
	2	8 20 25 31 (45)		D-4		Silty GRAVEL with sand, angular, dense, gray, wet, stratified, HCl not tested. Length Recovered:1.1 ft. Length Retained:1.1 ft. with large gravel as indicated by drilling		
10	3	>> 34 50/5 (101)		D-5		Silty GRAVEL with sand, angular, very dense, brown, wet, homogenous, HCl not tested. Length Recovered:0.2 ft. Length Retained:0.2 ft. with large gravel as indicated by drilling		
	4							
15		>> 33 35 30 50/3 (101)		D-6		Silty SAND with gravel, very dense, brown, wet, homogenous, HCl not tested. Length Recovered:1.2 ft. Length Retained:1.2 ft. with large gravel as indicated by drilling		
	5							
20	6	>>						

SOIL XL-3591.GPJ SOIL.GDT 10/26/09

Washington State
Department of Transportation

LOG OF TEST BORING

Start Card SE05434

HOLE No. S-1-09

Job No. XL-3591 SR 522 & 2 Elevation ft (m)

Sheet 2 of 2

Project SR-522 & US-2 Interchange Improvements

Driller Dickson, Jody Lic# 2637

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			>>	50/4 (101)		D-7		Well graded GRAVEL with sand, angular, very dense, gray, wet, homogenous, HCl not tested. Length Recovered:0.3 ft. Length Retained:0.3 ft. with large gravel and cobbles indicated by drilling		
	7									
25			>>	39 48 49 47 (97)		D-8		Silty GRAVEL with sand, angular, very dense, brown, wet, homogenous, HCl not tested. Length Recovered:0.8 ft. Length Retained:0.8 ft. with large gravel and cobbles indicated by drilling		
	8									
								End of test hole boring at 27 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal		
	9									
30										
	10									
35										
	11									
	12									
40										
	13									
45										

SOIL XL-3591.GPJ SOIL.GDT 10/26/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card SE05626

HOLE No. S-2-09

Sheet 1 of 2

Job No. XL-3591 SR 522 & 2 Elevation ft (m)

Project SR-522 & US-2 Interchange Improvements

Driller Dickson, Jody Lic# 2637

Site Address Vic. Of SR 522 and US 2

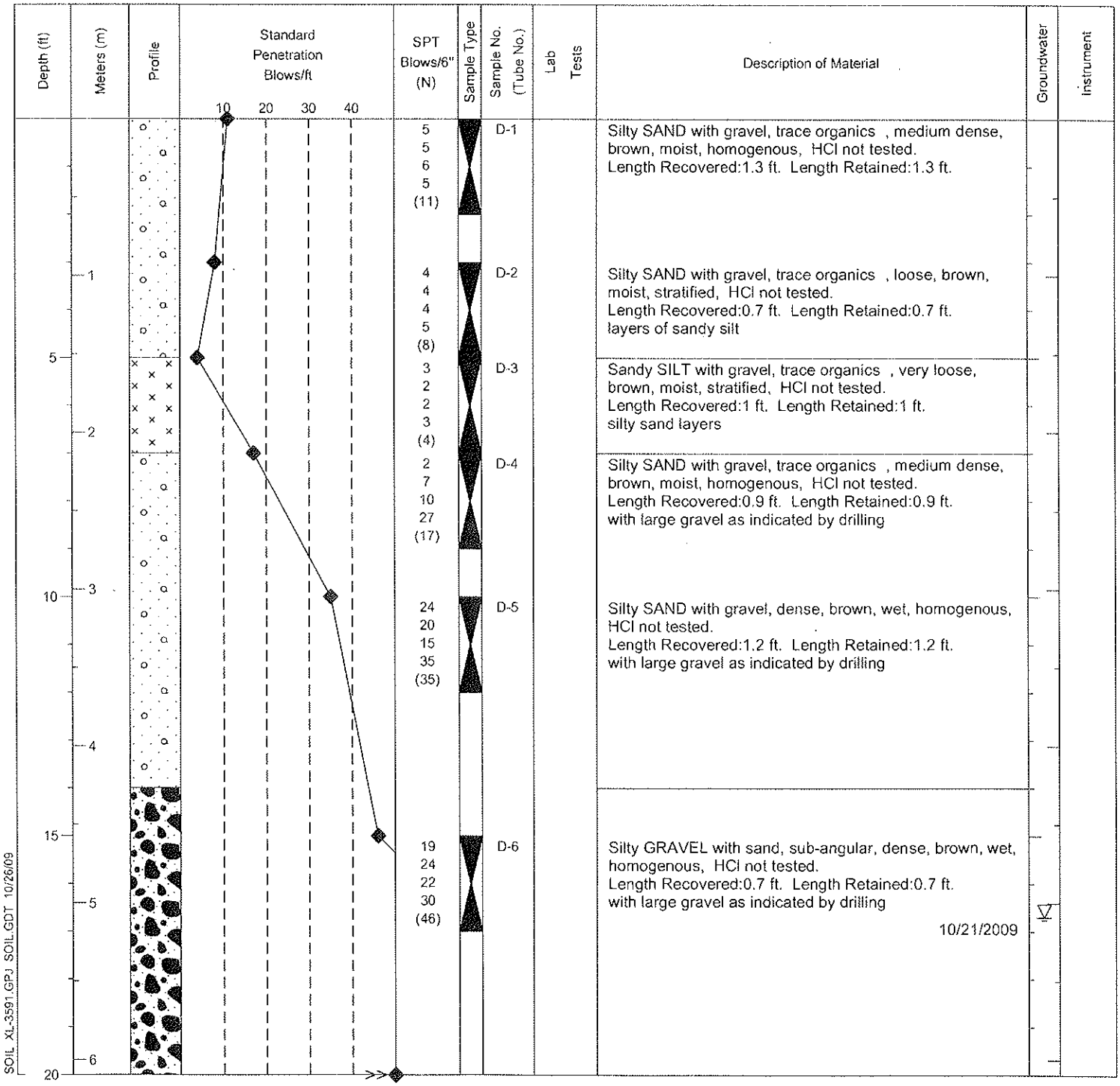
Inspector Donny Henderson

Start October 21, 2009 Completion October 21, 2009 Well ID# Equipment CME 45 with Autohammer

Station U line 27+37 Offset 53' RT Casing 0 Method Wet Rotary

Northing Easting Latitude Longitude

County Snohomish Subsection NE1/4 of NW1/4 Section 1 Range 6E Township 27



SOIL XL-3591.GPJ SOIL.GDT 10/26/09

Washington State
Department of Transportation

LOG OF TEST BORING

Start Card SE05626

HOLE No. S-2-09

Job No. XL-3591 SR 522 & 2 Elevation ft (m)

Sheet 2 of 2

Project SR-522 & US-2 Interchange Improvements

Driller Dickson, Jody Lic# 2637

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			>>	33 "50/5" (101)		D-7		Silty GRAVEL with sand, sub-angular, very dense, brown, wet, homogenous, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft. with large gravel as indicated by drilling		
	7									
25			>>	25 30 37 38 (67)		D-8		Silty GRAVEL with sand, sub-angular, very dense, brown, wet, homogenous, HCl not tested. Length Recovered:0.8 ft. Length Retained:0.8 ft. with large gravel as indicated by drilling		
	8									
								End of test hole boring at 27 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal		
	9									
30										
	10									
35										
	11									
	12									
40										
	13									
45										

SOIL XL-3591.GPJ SOIL.GDT 10/26/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card SE05433

HOLE No. S-4-09

Sheet 1 of 2

Job No. XL-3591 SR 522 & 2 Elevation ft (m)

Project SR-522 & US-2 Interchange Improvements

Driller Dickson, Jody Lic# 2637

Site Address Vic. Of SR 522 and US 2

Inspector Donny Henderson

Start October 19, 2009 Completion October 19, 2009 Well ID# Equipment CME 45 with Autohammer

Station U line 38+77 Offset 77' RT Casing 0 Method Wet Rotary

Northing Easting Latitude Longitude

County Snohomish Subsection SW1/4 of SW1/4 Section 36 Range 6E Township 28

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				3 7 7 7 (14)		D-1		Silty SAND with gravel, trace organics , medium dense, brown, moist, homogenous, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft.		
	1			3 2 1 2 (3)		D-2		Poorly graded SAND with gravel, slightly silty, very loose, brown, moist, homogenous, HCl not tested. Length Recovered:0.8 ft. Length Retained:0.8 ft.		
5				2 2 1 2 (3)		D-3		Poorly graded SAND with gravel, slightly silty, very loose, brown, wet, homogenous, HCl not tested. Length Recovered:0.4 ft. Length Retained:0.4 ft.		
	2			1 1 1 1 (2)		D-4		Poorly graded SAND with gravel, slightly silty, very loose, brown, wet, homogenous, HCl not tested. Length Recovered:0.5 ft. Length Retained:0.5 ft.		
10	3		>>	27 41 50/4 (101)		D-5		Silty GRAVEL with sand, angular, very dense, brown, wet, homogenous, HCl not tested. Length Recovered:1.1 ft. Length Retained:1.1 ft. with large gravel as indicated by drilling		
	4									
15	5			22 17 13 13 (30)		D-6		Silty SAND with gravel, dense, brown, wet, homogenous, HCl not tested. Length Recovered:1.3 ft. Length Retained:1.3 ft. with large gravel as indicated by drilling 10/19/2009	▽	
20	6									

SOIL XL-3591.GPJ SOIL.GDT 10/26/09

Washington State
Department of Transportation

LOG OF TEST BORING

Start Card SE05433

HOLE No. S-4-09

Job No. XL-3591 SR 522 & 2 Elevation ft (m)

Sheet 2 of 2

Project SR-522 & US-2 Interchange Improvements

Driller Dickson, Jody Lic# 2637

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				13 12 14 14 (26)		D-7		Silty GRAVEL with sand, angular, dense, brown, wet, homogenous, HCl not tested. Length Recovered:1.1 ft. Length Retained:1.1 ft. with large gravel as indicated by drilling		
	7									
25				9 11 15 14 (26)		D-8		Silty GRAVEL with sand, angular, dense, brown, wet, homogenous, HCl not tested. Length Recovered:0.2 ft. Length Retained:0.2 ft. with large gravel as indicated by drilling		
	8									
								End of test hole boring at 27 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal		
	9									
30										
	10									
35										
	11									
	12									
40										
	13									
45										

SOIL XL-3591.GPJ SOIL.GDT 10/26/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card SE05572

HOLE No. SB-1-09

Sheet 1 of 2

Job No. XL-3591 SR 522 & 2 Elevation ft (m)

Project SR-522 & US-2 Interchange Improvements

Driller Henderson, Ted Lic# 2902

Site Address Vic. Of SR 522 and US 2

Inspector Jody Dickson

Start October 14, 2009 Completion October 14, 2009 Well ID# Equipment CME 45 with Autohammer

Station LR line 872+12 Offset C/L Casing 0 Method Wet Rotary

Northing Easting Latitude Longitude

County Snohomish Subsection SW1/4 of NW1/4 Section 1 Range 6E Township 27

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
								Asphalt		
				17 24 23 27 (47)		D-1		Silty SAND with gravel, dense, brown/gray, moist, homogenous, HCl not tested. Length Recovered:1.4 ft. Length Retained:1.4 ft.		
	1		>>	29 50/5 (101)		D-2		Silty SAND with gravel, very dense, brown/gray, moist, homogenous, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft.		
5			>>	23 50/5 (101)		D-3		Silty SAND with gravel, very dense, brown, moist, homogenous, HCl not tested. Length Recovered:0.7 ft. Length Retained:0.7 ft. with large gravel as indicated by drilling action		
	2		>>	23 42 39 41 (81)		D-4		Silty SAND with gravel, very dense, brown, moist, homogenous, HCl not tested. Length Recovered:1.3 ft. Length Retained:1.3 ft. with large gravel as indicated by drilling action		
10	3		>>	23 50/5 (101)		D-5		Silty SAND with gravel, very dense, brown, moist, homogenous, HCl not tested. Length Recovered:0.5 ft. Length Retained:0.5 ft. with large gravel as indicated by drilling action		
	4									
15	5		>>	37 50/5 (101)		D-6		Silty SAND with gravel, very dense, brown/gray, moist, homogenous, HCl not tested. Length Recovered:0.4 ft. Length Retained:0.4 ft. with large gravel as indicated by drilling action		
20	6		>>							

SOIL XL-3591.GPJ SOIL.GDT 10/26/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card SE05572

HOLE No. SB-1-09

Job No. XL-3591 SR 522 & 2 Elevation ft (m)

Sheet 2 of 2

Project SR-522 & US-2 Interchange Improvements

Driller Henderson, Ted Lic# 2902

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			>>	37 50/5 (101)		D-7		Silty SAND with gravel, very dense, gray, moist, homogenous, HCl not tested. Length Recovered:0.4 ft. Length Retained:0.4 ft. with large gravel as indicated by drilling action		
25	7		>>	41 50/5 (101)		D-8		Silty SAND with gravel, very dense, gray, moist, homogenous, HCl not tested. Length Recovered:0.5 ft. Length Retained:0.5 ft. with large gravel as indicated by drilling action, No Free Water		
	8							End of test hole boring at 26 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal		
30	9									
	10									
35	11									
40	12									
	13									
45										

SOIL XL-3591.GPJ SOIL.GDT 10/26/09

Washington State
Department of Transportation

LOG OF TEST BORING

Start Card SE05572

HOLE No. SB-2-09

Sheet 1 of 2

Job No. XL-3591 SR 522 & 2 Elevation ft (m)

Project SR-522 & US-2 Interchange Improvements

Driller Henderson, Ted Lic# 2902

Site Address Vic. Of SR 522 and US 2

Inspector Jody Dickson

Start October 13, 2009 Completion October 13, 2009 Well ID# Equipment CME 45 with Autohammer

Station LR line 872+12 Offset 45' RT Casing 0 Method Wet Rotary

Northing Easting Latitude Longitude

County Snohomish Subsection SW1/4 of NW1/4 Section 1 Range 6E Township 27

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
								Asphalt		
			>>	15 26 30 35 (56)		D-1		Silty SAND with gravel, very dense, brown/gray, moist, homogenous, HCl not tested. Length Recovered:1.2 ft. Length Retained:1.2 ft.		
	1		>>	34 30 27 36 (57)		D-2		Silty SAND with gravel, changing to poorly graded sand, slightly silty, very dense, brown, moist, stratified, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
5			>>	18 40 50/5" (101)		D-3		Silty SAND with gravel, very dense, brown/gray, moist, homogenous, HCl not tested. Length Recovered:0.5 ft. Length Retained:0.5 ft. with large gravel as indicated by drilling action		
	2									
			>>	32 45 50/5" (101)		D-4		Silty SAND with gravel, very dense, brown/gray, moist, homogenous, HCl not tested. Length Recovered:1 ft. Length Retained:1 ft. with large gravel as indicated by drilling action		
10	3		>>	27 "50/5" (101)		D-5		Silty SAND with gravel, very dense, brown/gray, moist, homogenous, HCl not tested. Length Recovered:0.6 ft. Length Retained:0.6 ft. with large gravel as indicated by drilling action		
	4									
15			>>	13 33 50/3" (101)		D-6		Silty SAND with gravel, very dense, gray, moist, homogenous, HCl not tested. Length Recovered:0.6 ft. Length Retained:0.6 ft. with large gravel as indicated by drilling action		
	5									
20	6		>>							

SOIL XL-3591.GPJ SOIL.GDT 10/26/09

Washington State
Department of Transportation

LOG OF TEST BORING

Start Card SE05572

HOLE No. SB-2-09

Job No. XL-3591 SR 522 & 2 Elevation ft (m)

Sheet 2 of 2

Project SR-522 & US-2 Interchange Improvements

Driller Henderson, Ted Lic# 2902

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			>>	22 28 50/5" (101)		D-7		Silty SAND with gravel, very dense, brown/gray, moist, homogenous, HCl not tested. Length Recovered:1.3 ft. Length Retained:1.3 ft. with large gravel as indicated by drilling action		
	7									
25			>>	43 "50/5" (101)		D-8		Silty SAND with gravel, very dense, brown/gray, moist, homogenous, HCl not tested. Length Recovered:0.7 ft. Length Retained:0.7 ft. with large gravel as indicated by drilling action, No Free Water		
	8									
								End of test hole boring at 26 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal		
	9									
30										
	10									
35										
	11									
	12									
40										
	13									
45										

SOIL XL-3591.GPJ SOIL.GDT 10/26/09

Washington State
Department of Transportation

LOG OF TEST BORING

Start Card R-72842

HOLE No. H-80p-08

Sheet 1 of 4

Job No. XL-3591 SR 522 Elevation 89.4 ft (27.2 m)

Project Snohomish River to US 2 Driller Walker, Robert Lic# 2864T

Site Address SR-522 Vic. US-2 (Wall 18) Inspector Dave Nelson # 1678

Start October 1, 2008 Completion October 7, 2008 Well ID# APJ-631 Equipment CME 45 with Autohammer

Station U Line 22+65 Offset 115 ft. Lt. Casing 5 Method Mud Rotary

Northing 316898.3 Easting 1358249.2 Latitude Longitude

County Snohomish Subsection NW1/4 of NW1/4 Section 1 Range 6 EWM Township 27 N

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
5	1			9 5 8 (13)		D-1		Well graded GRAVEL with silt and gravel, fill, medium dense, brown, moist, homogenous, HCl not tested. Length Recovered:0.9 ft. Length Retained:0.9 ft.		
10	2			14 14 16 (30)		D-2		Well graded GRAVEL with silt and gravel, fill, dense, brown, moist, homogenous, HCl not tested. Length Recovered:1.0 ft. Length Retained:1.0 ft.		
15	3			12 8 10 (18)		D-3	GS MC	GW-GM, MC=7% Well graded GRAVEL with silt and gravel, fill, medium dense, brown, moist, homogenous, HCl not tested. Length Recovered:0.6 ft. Length Retained:0.6 ft.		
20	4									
	5									
	6									

SOIL XL-2042 SR-522 SNOHOMISH RIVER BRIDGE.GPJ SOIL.GDT 10/26/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card R-72842

HOLE No. H-80p-08

Job No. XL-3591 SR 522 Elevation 89.4 ft (27.2 m)

Sheet 2 of 4

Project Snohomish River to US 2

Driller Walker, Robert Lic# 2864T

Depth (ft)	Meters (m)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
		15 21 22 (43)		D-4	GS MC	GW-GM, MC=7% Well graded GRAVEL with silt and gravel, sub-rounded, fill, dense, brown, wet, homogenous, HCl not tested. Length Recovered:1.0 ft. Length Retained:1.0 ft.		
25	7	10 19 15 (34)		D-5		Well graded GRAVEL with silt and gravel, fill, dense, brown, wet, homogenous, HCl not tested. Length Recovered:0.8 ft. Length Retained:0.8 ft.		
30	8 9	3 2 3 (5)		D-6	GS MC AL	ML, MC=24%, LL=28 Sandy SILT with gravel, 30.0 original ground, mottled, stratified with sand, loose, gray, wet, stratified, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
	10			S-7	GS MC AL	SILT with sand, mottled, gray, stratified, ML, M.C. = 28%, PI = 3 SILT with sand	10/07/2008	
35	11	5 3 2 (5)		D-8	GS MC AL	SM, MC=25%, LL=37 Silty SAND with gravel, stratified with sand, total drilling fluid loss at 35.0, loose, gray, wet, stratified, HCl not tested. Length Recovered:0.6 ft. Length Retained:0.6 ft.		
40	12 13	4 4 3 (7)		D-9	GS MC	SM, MC=24% Silty SAND, mottled, staining, stratified with sand, loose, brown, wet, stratified, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft.		
45								

Standard Penetration Blows/ft: 10 20 30 40

SOIL XL-2042 SR-522 SNOHOMISH RIVER BRIDGE.GPJ SOIL.GDT 10/26/09

Washington State Department of Transportation

LOG OF TEST BORING

Start Card R-72842

Job No. XL-3591 SR 522 Elevation 89.4 ft (27.2 m) HOLE No. H-80p-08

Sheet 3 of 4

Project Snohomish River to US 2 Driller Walker, Robert Lic# 2864T

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
	14		>>	28 40 50 (90)		D-10		Well graded SAND with silt and gravel, very dense, brown, wet, stratified, HCl not tested. Length Recovered:1.0 ft. Length Retained:1.0 ft. over reamed HWT to 47.0 ft.		
	15									
50			>>	19 21 31 (52)		D-11		Well graded SAND with silt and gravel, bad rust staining, very dense, brown, wet, homogenous, HCl not tested. Length Recovered:1.0 ft. Length Retained:1.0 ft. new water at 50.5 ft.		
	16									
55			>>	24 36 36 (72)		D-12		Well graded SAND with silt and gravel, very dense, brown, wet, homogenous, HCl not tested. Length Recovered:1.0 ft. Length Retained:1.0 ft.		
	17									
	18									
60			>>	33 28 30 (58)		D-13	GS MC	SW-SM, MC=11% Well graded SAND with silt and gravel, very dense, brown, wet, homogenous, HCl not tested. Length Recovered:1.0 ft. Length Retained:1.0 ft.		
	19									
65				40 22 24 (46)		D-14		Well graded SAND with silt and gravel, dense, brown, wet, homogenous, HCl not tested. Length Recovered:1.0 ft. Length Retained:1.0 ft.		
	20									
								A standpipe monument was installed on this boring.		
	21							The implied accuracy of the borehole location information displayed on this boring log is typically sub-meter in (X,Y) when collected by the HQ Geotech Division and sub-centimeter in (X,Y,Z) when collected by the Region Survey Crew.")		
70										

SOIL XL-2042 SR-522 SNOHOMISH RIVER BRIDGE.GPJ SOIL.GDT 10/26/09

Washington State
Department of Transportation

LOG OF TEST BORING

Start Card R-72842

Job No. XL-3591 SR 522 Elevation 89.4 ft (27.2 m)

HOLE No. H-80p-08

Sheet 4 of 4

Project Snohomish River to US 2

Driller Walker, Robert Lic# 2864T

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
								End of test hole boring at 66.5 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal		
	22									
								Water level before bailing: 33.5' Bailed bore hole water level to 51.5' Recharge after 5 minutes :51' Recharge after 10 minutes :50.6' Recharge after 15 minutes :50.2' Recharge after 20 minutes :49.6' Recharge after 25 minutes :49.1' Recharge after 30 minutes :48.6' Recharge after 35 minutes :48.5'		
75										
	23									
	24									
80										
	25									
85										
	26									
	27									
90										
	28									
95										

SOIL XL-2042 SR-522 SNOHOMISH RIVER BRIDGE.GPJ SOIL.GDT 10/26/09

SPT vs Friction Angle & Lateral Bearing Capacity

Ver: 4-09a

SR 522 / US-2 Interchange Vicinity - Phase I
Snohomish County, Washington
XL-3591

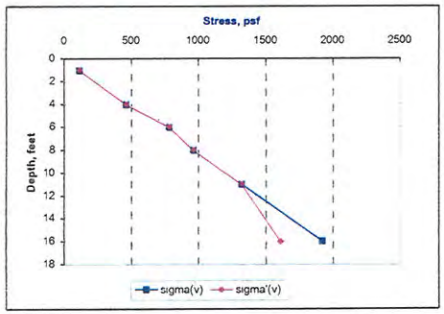
Luminaires # 1 & 2

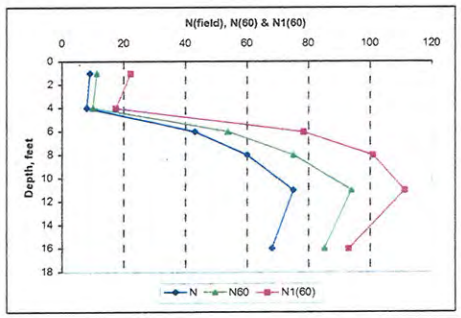
Boring No.	L-2-09
Water Depth (ft)	11

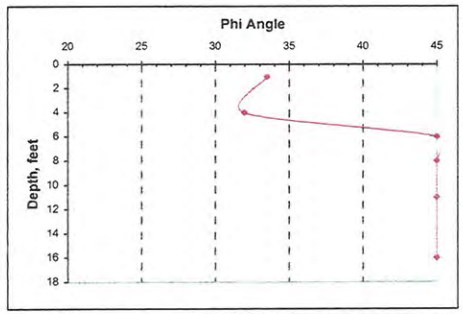
Station	U line 13+25
Offset	30' Lt.

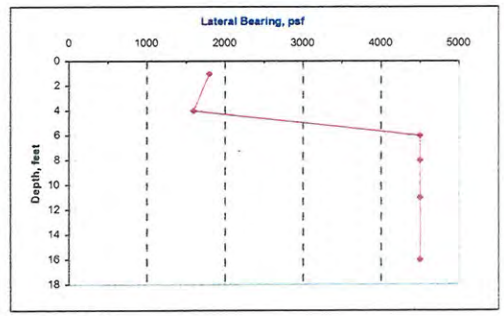
Hammer Efficiency (%)	75
Correction Factor	1.25

Layer No.	Depth (ft)	layer Thickness (ft)	γ (total) (pcf)	N (field)	σ(v) (psf)	γ (water) (pcf)	Water Head (ft)	Pore Pressure (psf)	σ' (v) (psf)	σ' (v) (tsf)	σ' (v) (kN/m²)	C_n	C_n (GDM)	N_{60} Energy Corrected	$N_{1(60)}$ Energy & Overburden Corrected	ϕ (Peck)	ϕ	ϕ (average)	Lateral Bearing (psf)	Harmonic Average Lateral Bearing (psf)
1	1.0	3.0	115	9	115.0				115.0	0.1	5.5	2	2	11	22	34	34	34	1,800	1,750
2	4.0	2.0	115	8	460.0				460.0	0.2	22.0	2	1	10	17	32	32	32	1,600	6
3	6.0	2.0	130	43	780.0				780.0	0.4	37.3	2	1	54	78	45	45	45	4,500	
4	8.0	2.0	120	60	960.0				960.0	0.5	46.0	1	1	75	101	45	45	45	4,500	# Layers
5	11.0	3.0	120	75	1,320.0	62.4			1,320.0	0.7	63.2	1	1	94	111	45	45	45	4,500	2
6	16.0	5.0	120	68	1,920.0	62.4	5.0	312.0	1,608.0	0.8	77.0	1	1	85	93	45	45	45	4,500	
7																				∑ Layers Thickness
8																				5.0
9																				
10																				
11																				
12																				
13																				
14																				
15																				
16																				
17																				
18																				
19																				
20																				
	∑ Layers Thickness	17.0																		









$$C_N = \sqrt{\frac{1}{\sigma'_v\,(tsf)}} = 9.78\sqrt{\frac{1}{\sigma'_v\,(kN/m^2)}}$$

$$C_N(GDM) = 0.77 \times \log\left(\frac{20}{\sigma'_v\,(tsf)}\right)$$

if σ'(v)<500psf, C_n=2.0

if σ'(v)>5500psf, C_n=0.6

$$\phi = 2.71 + 0.30N_{corr} - 5.4 \times 10^{-3} \times N_{corr}^2$$

Peck(1974), *Wolff* (1989)

$$\phi = 25 \times \left[0.15 \times 150 \times \sin(N_{corr})\right]$$

SPT vs Friction Angle & Lateral Bearing Capacity

Ver: 4-09a

SR 522 / US-2 Interchange Vicinity - Phase I
Snohomish County, Washington
XL-3591

Luminaires # 3 & 4

Boring No.	L-4-09
Water Depth (ft)	13

Station	U line 16+67
Offset	37' Lt

Hammer Efficiency (%)	75
Correction Factor	1.25

Layer No.	Depth (ft)	layer Thickness (ft)	γ (total) (pcf)	N (field)	σ(v) (psf)	γ (water) (pcf)	Water Head (ft)	Pore Pressure (psf)	σ' (v) (psf)	σ' (v) (tsf)	σ' (v) (kN/m²)	C_n	C_n (GDM)	N_{60} Energy Corrected	$N_{1(60)}$ Energy & Overburden Corrected	ϕ (Peck)	ϕ	ϕ (average)	Lateral Bearing (psf)	Harmonic Average Lateral Bearing (psf)
1	2.0	3.0	120	36	240.0				240.0	0.1	11.5	2	2	45	83	45	45	45	4,500	3,650
2	4.0	2.0	120	13	480.0				480.0	0.2	23.0	2	1	16	28	35	36	35	2,800	6
3	6.0	2.0	135	61	810.0				810.0	0.4	38.8	2	1	76	110	45	45	45	4,500	
4	8.0	3.0	120	41	960.0				960.0	0.5	46.0	1	1	51	69	45	45	45	4,500	# Layers
5	11.0	2.0	125	47	1,375.0				1,375.0	0.7	65.8	1	1	59	69	45	45	45	4,500	2
6	16.0	5.0	135	62	2,160.0	62.4	3.0	187.2	1,972.8	1.0	94.5	1	1	78	78	45	45	45	4,500	
7																				∑ Layers Thickness
8																				5.0
9																				
10																				
11																				
12																				
13																				
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16																				
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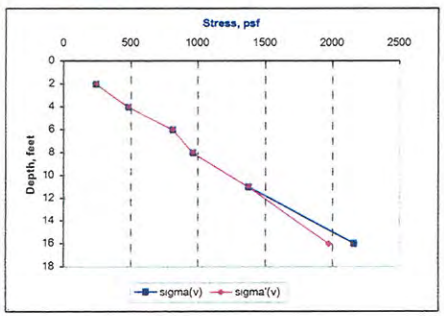
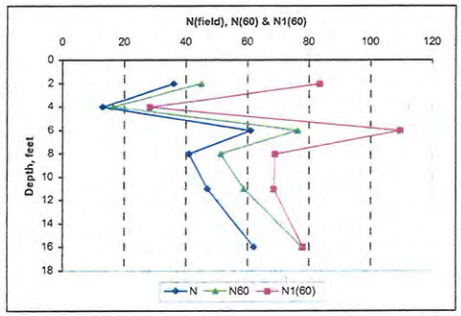
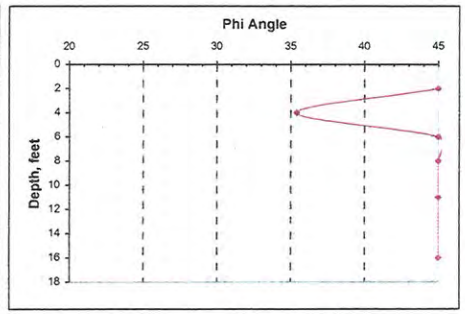
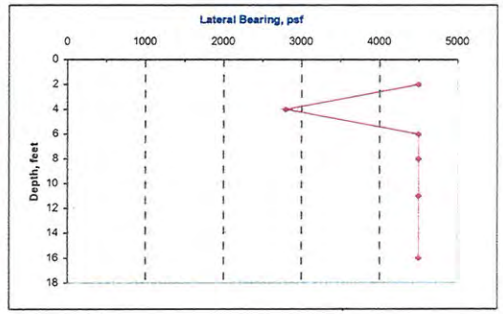
	∑ Layers Thickness	17.0																		









$$C_N = \sqrt{\frac{1}{\sigma'_{v(tsf)}}} = 9.78\sqrt{\frac{1}{\sigma'_{v(kN/m^2)}}}$$

$$C_N(GDM) = 0.77 \times \log\left(\frac{20}{\sigma'_{v(tsf)}}\right)$$

if σ'(v)<500psf, C_n=2.0
if σ'(v)>5500psf, C_n=0.6

$$\phi = 2.71 + 0.30N_{corr} - 5.4 \times 10^{-3} \times N_{corr}^2$$

Peck(1974), *Wolff*(1989)

$$\phi = 25 \times [0.15 \times 150 \times \sin(N_{corr})]$$

SPT vs Friction Angle & Lateral Bearing Capacity

Ver: 4-09a

SR 522 / US-2 Interchange Vicinity - Phase I
Snohomish County, Washington
XL-3591

Luminaires # 5 & 6

Boring No.	L-6-09
Water Depth (ft)	11.5

Station	U line 20+65
Offset	40' Lt

Hammer Efficiency (%)	75
Correction Factor	1.25

Layer No.	Depth (ft)	layer Thickness (ft)	γ (total) (pcf)	N (field)	σ(v) (psf)	γ (water) (pcf)	Water Head (ft)	Pore Pressure (psf)	σ' (v) (psf)	σ' (v) (tsf)	σ' (v) (kN/m²)	C_n	C_n (GDM)	N_{60} Energy Corrected	$N_{1(60)}$ Energy & Overburden Corrected	ϕ (Peck)	ϕ	ϕ (average)	Lateral Bearing (psf)	Harmonic Average Lateral Bearing (psf)
1	1.0	2.0	120	30	120.0				120.0	0.1	5.7	2	2	38	74	45	45	45	4,500	4,500
2	4.0	3.0	120	24	480.0				480.0	0.2	23.0	2	1	30	52	41	43	42	4,500	6
3	6.0	2.0	130	58	780.0				780.0	0.4	37.3	2	1	73	106	45	45	45	4,500	
4	8.0	3.0	120	44	960.0				960.0	0.5	46.0	1	1	55	74	45	45	45	4,500	# Layers
5	11.0	2.0	125	67	1,375.0				1,375.0	0.7	65.8	1	1	84	98	45	45	45	4,500	2
6	16.0	5.0	130	71	2,080.0	62.4	4.5	280.8	1,799.2	0.9	86.1	1	1	89	93	45	45	45	4,500	∑ Layers Thickness
7																				5.0
8																				
9																				
10																				
11																				
12																				
13																				
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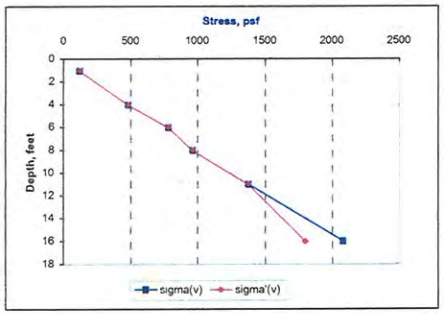
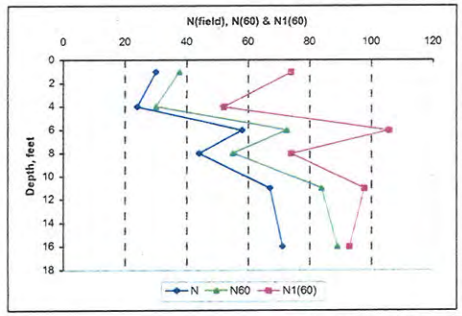
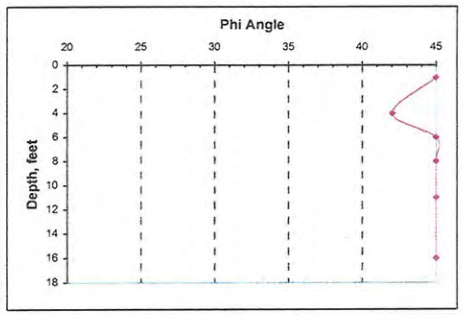
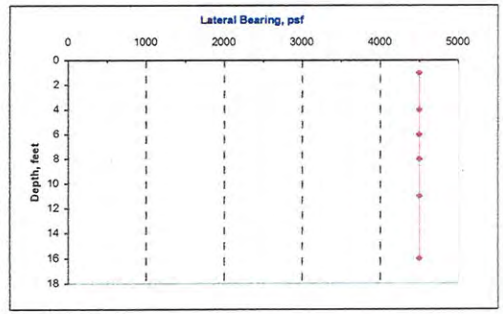
17																				
18																				
19																				
20																				
∑ Layers Thickness	17.0																			









$$C_N = \sqrt{\frac{1}{\sigma'_v\,(tsf)}} = 9.78\sqrt{\frac{1}{\sigma'_v\,(kN/m^2)}}$$

$$C_N(GDM) = 0.77 \times \log\left(\frac{20}{\sigma'_v\,(tsf)}\right)$$

if σ'(v)<500psf, C_n=2.0
if σ'(v)>5500psf, C_n=0.6

$$\phi = 2.71 + 0.30N_{corr} - 5.4 \times 10^{-3} \times N_{corr}^2$$

Peck(1974), *Wolff*(1989)

$$\phi = 25 \times \left[0.15 \times 150 \times \sin(N_{corr})\right]$$

SPT vs Friction Angle & Lateral Bearing Capacity

Ver: 4-09a

SR 522 / US-2 Interchange Vicinity - Phase I
Snohomish County, Washington
XL-3591

Luminaires # 7

Boring No.	L-7-09
Water Depth (ft)	10

Station	U line 23+34
Offset	37.2' Lt

Hammer Efficiency (%)	75
Correction Factor	1.25

Layer No.	Depth (ft)	layer Thickness (ft)	γ (total) (pcf)	N (field)	σ(v) (psf)	γ (water) (pcf)	Water Head (ft)	Pore Pressure (psf)	σ' (v) (psf)	σ' (v) (tsf)	σ' (v) (kN/m²)	C_n	C_n (GDM)	N_{60} Energy Corrected	$N_{1(60)}$ Energy & Overburden Corrected	ϕ (Peck)	ϕ	ϕ (average)	Lateral Bearing (psf)	Harmonic Average Lateral Bearing (psf)
1	2.0	3.0	120	29	240.0				240.0	0.1	11.5	2	2	36	67	45	45	45	4,500	3,300
2	4.0	2.0	120	11	480.0				480.0	0.2	23.0	2	1	14	24	34	34	34	2,300	5
3	6.0	2.0	130	57	780.0				780.0	0.4	37.3	2	1	71	104	45	45	45	4,500	
4	8.0	3.0	135	76	1,080.0				1,080.0	0.5	51.7	1	1	95	122	45	44	45	4,500	# Layers
5	11.0	7.0	120	42	1,320.0	62.4	1.0	62.4	1,257.6	0.6	60.2	1	1	53	63	44	45	44	4,500	2
6																				
7																				∑ Layers Thickness
8																				5.0
9																				
10																				
11																				
12																				
13																				
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16																				
17																				
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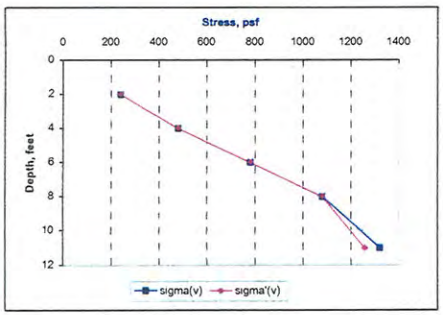
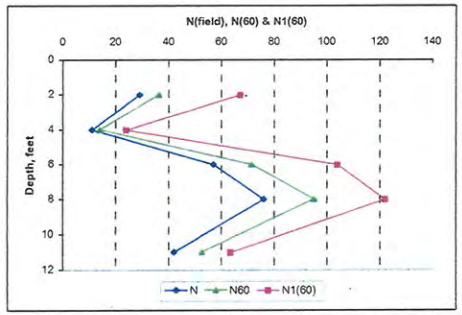
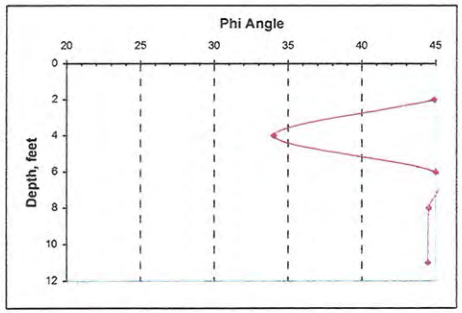
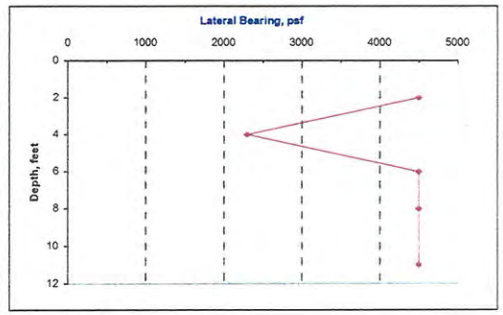
19																				
20																				
	∑ Layers Thickness	17.0																		









$$C_N = \sqrt{\frac{1}{\sigma'_{v\,(tsf)}}} = 9.78\sqrt{\frac{1}{\sigma'_{v\,(kN/m^2)}}}$$

$$C_N(GDM) = 0.77 \times \log\left(\frac{20}{\sigma'_{v\,(tsf)}}\right)$$

if σ'(v)<500psf, C_n=2.0
if σ'(v)>5500psf, C_n=0.6

$$\phi = 2.71 + 0.30N_{corr} - 5.4 \times 10^{-3} \times N_{corr}^2$$

Peck(1974), *Wolff*(1989)

$$\phi = 25 \times \left[0.15 \times 150 \times \sin(N_{corr})\right]$$

SPT vs Friction Angle & Lateral Bearing Capacity

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SR 522 / US-2 Interchange Vicinity - Phase I
Snohomish County, Washington
XL-3591

Luminaires # 10, 11, & 30

Boring No.	L-11-09
Water Depth (ft)	11

Station	U line 29+77
Offset	46.9' Lt.

Hammer Efficiency (%)	75
Correction Factor	1.25

Layer No.	Depth (ft)	layer Thickness (ft)	γ (total) (pcf)	N (field)	σ(v) (psf)	γ (water) (pcf)	Water Head (ft)	Pore Pressure (psf)	σ' (v) (psf)	σ' (v) (tsf)	σ' (v) (kN/m²)	C_n	C_n (GDM)	N_{60} Energy Corrected	$N_{1(60)}$ Energy & Overburden Corrected	ϕ (Peck)	ϕ	ϕ (average)	Lateral Bearing (psf)	Harmonic Average Lateral Bearing (psf)
1	1.0	3.0	120	24	120.0				120.0	0.1	5.7	2	2	30	59	43	44	44	4,500	2,400
2	4.0	2.0	115	7	460.0				460.0	0.2	22.0	2	1	9	15	32	31	31	1,400	6
3	6.0	2.0	120	13	720.0				720.0	0.4	34.5	2	1	16	24	34	34	34	2,800	
4	8.0	2.0	115	6	920.0				920.0	0.5	44.0	1	1	8	10	30	29	30	1,200	# Layers
5	11.0	3.0	120	27	1,320.0	62.4			1,320.0	0.7	63.2	1	1	34	40	38	39	39	4,500	2
6	16.0	5.0	120	29	1,920.0	62.4	5.0	312.0	1,608.0	0.8	77.0	1	1	36	40	38	39	39	4,500	
7																				∑ Layers Thickness
8																				5.0
9																				
10																				
11																				
12																				
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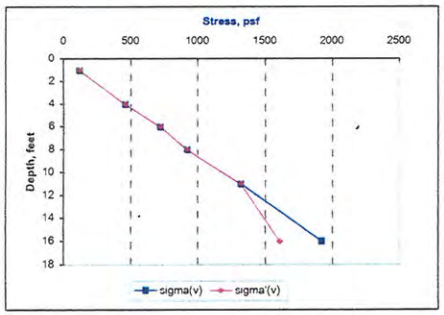
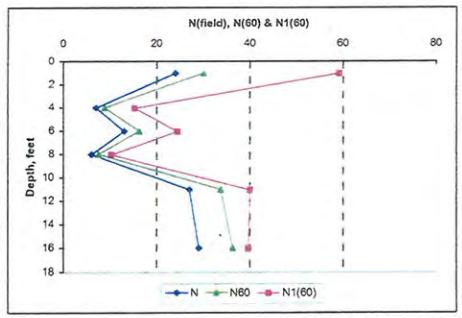
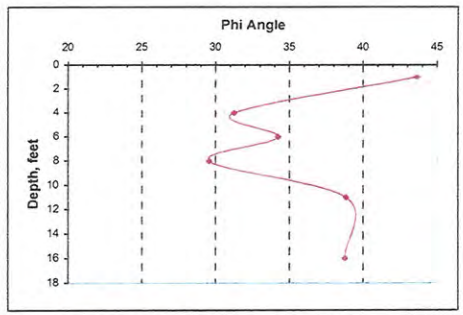
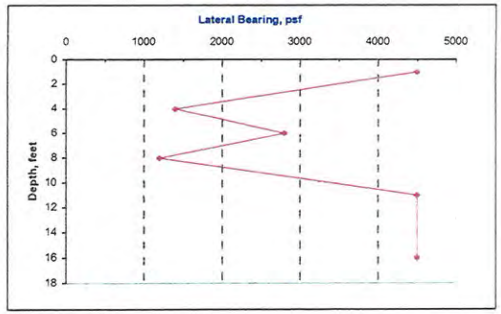
19																				
20																				
	∑ Layers Thickness	17.0																		









$$C_N = \sqrt{\frac{1}{\sigma'_v\,(tsf)}} = 9.78\sqrt{\frac{1}{\sigma'_v\,(kN/m^2)}}$$

$$C_N(GDM) = 0.77 \times \log\left(\frac{20}{\sigma'_v\,(tsf)}\right)$$

if σ'(v)<500psf, C_n=2.0

if σ'(v)>5500psf, C_n=0.6

$$\phi = 2.71 + 0.30N_{corr} - 5.4 \times 10^{-3} \times N_{corr}^2$$

Peck(1974), *Wolff*(1989)

$$\phi = 25 \times [0.15 \times 150 \times \sin(N_{corr})]$$

SPT vs Friction Angle & Lateral Bearing Capacity

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SR 522 / US-2 Interchange Vicinity - Phase I
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Luminaire # 18 (use L-18-09)

Boring No.	P-4-09
Water Depth (ft)	14

Station	U line 30+35
Offset	100' Rt

Hammer Efficiency (%)	75
Correction Factor	1.25

Layer No.	Depth (ft)	layer Thickness (ft)	γ (total) (pcf)	N (field)	σ(v) (psf)	γ (water) (pcf)	Water Head (ft)	Pore Pressure (psf)	σ' (v) (psf)	σ' (v) (tsf)	σ' (v) (kN/m²)	C_n	C_n (GDM)	N_{60} Energy Corrected	$N_{1(60)}$ Energy & Overburden Corrected	ϕ (Peck)	ϕ	ϕ (average)	Lateral Bearing (psf)	Harmonic Average Lateral Bearing (psf)
1	2.0	2.0	120	19	240.0				240.0	0.1	11.5	2	2	24	44	39	41	40	4,000	1,700
2	4.0	2.0	115	7	460.0				460.0	0.2	22.0	2	1	9	15	32	31	31	1,400	11
3	5.0	2.0	115	6	575.0				575.0	0.3	27.5	2	1	8	12	31	30	30	1,200	
4	7.0	2.0	120	49	840.0				840.0	0.4	40.2	2	1	61	87	45	45	45	4,500	# Layers
5	9.0	2.0	120	31	1,080.0				1,080.0	0.5	51.7	1	1	39	50	41	42	41	4,500	3
6	11.0	2.0	120	39	1,320.0				1,320.0	0.7	63.2	1	1	49	58	43	44	43	4,500	
7	13.0	2.0	120	45	1,560.0				1,560.0	0.8	74.7	1	1	56	62	44	45	44	4,500	∑ Layers Thickness
8	15.0	2.0	130	58	1,950.0	62.4	1.0	62.4	1,887.6	0.9	90.4	1	1	73	74	45	45	45	4,500	6.0
9	17.0	2.0	120	44	2,040.0	62.4	3.0	187.2	1,852.8	0.9	88.7	1	1	55	57	42	44	43	4,500	
10	19.0	2.0	120	30	2,280.0	62.4	5.0	312.0	1,968.0	1.0	94.2	1	1	38	38	38	39	38	4,500	
11	21.0	2.0	120	14	2,520.0	62.4	7.0	436.8	2,083.2	1.0	99.7	1	1	18	17	32	32	32	3,000	
12																				
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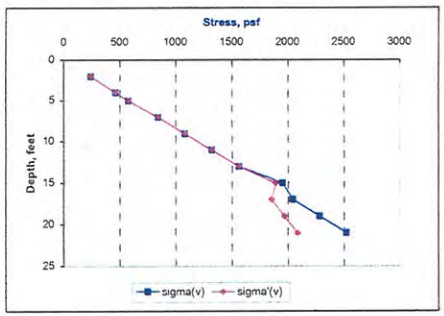
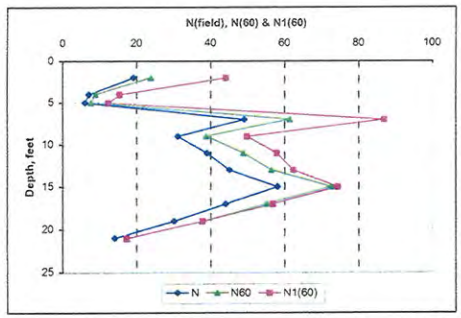
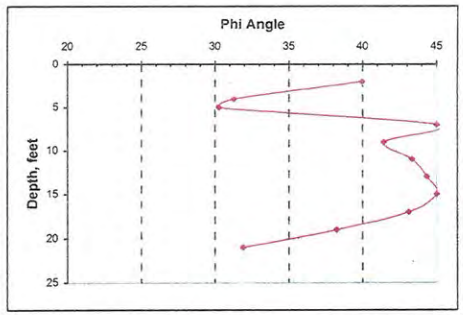
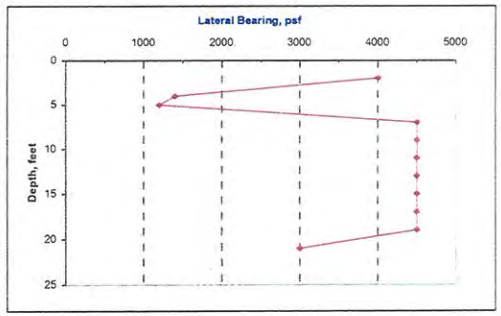
	∑ Layers Thickness	22.0																		









$$C_N = \sqrt{\frac{1}{\sigma'_{v\,(tsf)}}} = 9.78\sqrt{\frac{1}{\sigma'_{v\,(kN/m^2)}}}$$

$$C_N(GDM) = 0.77 \times \log\left(\frac{20}{\sigma'_{v\,(tsf)}}\right)$$

if σ'(v)<500psf, C_N=2.0
if σ'(v)>5500psf, C_N=0.6

$$\phi = 2.71 + 0.30N_{corr} - 5.4 \times 10^{-3} \times N_{corr}^2$$
$$Peck(1974), Wolff(1989)$$

$$\phi = 25 \times [0.15 \times 150 \times \sin(N_{corr})]$$

SPT vs Friction Angle & Lateral Bearing Capacity

Ver: 4-09a

SR 522 / US-2 Interchange Vicinity - Phase I
Snohomish County, Washington
XL-3591

Luminaires # 19 & 20

Boring No.	L-19-09
Water Depth (ft)	11

Station	U line 34+54
Offset	79.2' Rt.

Hammer Efficiency (%)	75
Correction Factor	1.25

Layer No.	Depth (ft)	layer Thickness (ft)	γ (total) (pcf)	N (field)	σ(v) (psf)	γ (water) (pcf)	Water Head (ft)	Pore Pressure (psf)	σ' (v) (psf)	σ' (v) (tsf)	σ' (v) (kN/m²)	C_n	C_n (GDM)	N_{60} Energy Corrected	$N_{1(60)}$ Energy & Overburden Corrected	ϕ (Peck)	ϕ	ϕ (average)	Lateral Bearing (psf)	Harmonic Average Lateral Bearing (psf)
1	1.0	3.0	120	25	120.0				120.0	0.1	5.7	2	2	31	62	44	45	44	4,500	3,300
2	4.0	2.0	120	11	480.0				480.0	0.2	23.0	2	1	14	24	34	34	34	2,300	6
3	6.0	2.0	115	10	690.0				690.0	0.3	33.0	2	1	13	19	33	32	33	2,050	
4	8.0	2.0	120	13	960.0				960.0	0.5	46.0	1	1	16	22	33	33	33	2,800	# Layers
5	11.0	3.0	120	30	1,320.0	62.4			1,320.0	0.7	63.2	1	1	38	44	39	41	40	4,500	2
6	16.0	5.0	120	38	1,920.0	62.4	5.0	312.0	1,608.0	0.8	77.0	1	1	48	52	41	43	42	4,500	
7																				∑ Layers Thickness
8																				5.0
9																				
10																				
11																				
12																				
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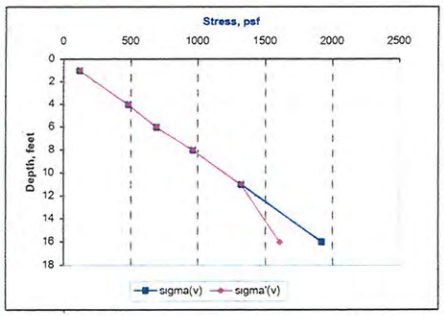
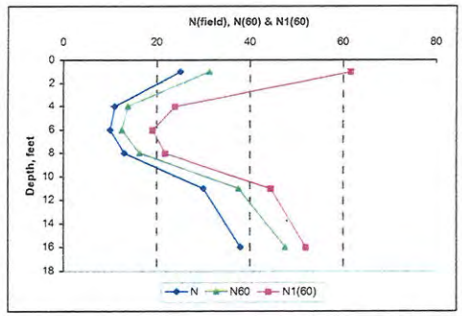
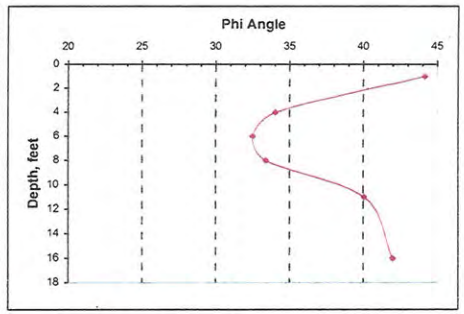
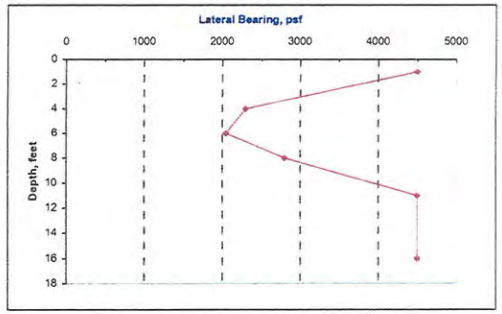
16																				
17																				
18																				
19																				
20																				
	∑ Layers Thickness	17.0																		









$$C_N = \sqrt{\frac{1}{\sigma'_{v\,(tsf)}}} = 9.78\sqrt{\frac{1}{\sigma'_{v\,(kN/m^2)}}}$$

$$C_N(GDM) = 0.77 \times \log\left(\frac{20}{\sigma'_v(tsf)}\right)$$

if σ'(v)<500psf, C_n=2.0
if σ'(v)>5500psf, C_n=0.6

$$\phi = 2.71 + 0.30N_{corr} - 5.4 \times 10^{-3} \times N_{corr}^2$$

Peck(1974), *Wolff*(1989)

$$\phi = 25 \times [0.15 \times 150 \times \sin(N_{corr})]$$

SPT vs Friction Angle & Lateral Bearing Capacity

Ver: 4-09a

SR 522 / US-2 Interchange Vicinity - Phase I
Snohomish County, Washington
XL-3591

Luminaire #22 & 23

Boring No.	L-22-09
Water Depth (ft)	14.5

Station	U line 40+29
Offset	68.1' Lt.

Hammer Efficiency (%)	75
Correction Factor	1.25

Layer No.	Depth (ft)	layer Thickness (ft)	γ (total) (pcf)	N (field)	σ(v) (psf)	γ (water) (pcf)	Water Head (ft)	Pore Pressure (psf)	σ' (v) (psf)	σ' (v) (tsf)	σ' (v) (kN/m²)	C_n	C_n (GDM)	N_{60} Energy Corrected	$N_{1(60)}$ Energy & Overburden Corrected	ϕ (Peck)	ϕ	ϕ (average)	Lateral Bearing (psf)	Harmonic Average Lateral Bearing (psf)
1	2.0	3.0	120	46	240.0				240.0	0.1	11.5	2	2	58	107	45	45	45	4,500	3,300
2	4.0	2.0	120	11	480.0				480.0	0.2	23.0	2	1	14	24	34	34	34	2,300	6
3	6.0	2.0	100	2	600.0				600.0	0.3	28.7	2	1	3	4	28	27	27	800	
4	8.0	3.0	135	101	1,080.0				1,080.0	0.5	51.7	1	1	126	162	45	32	38	4,500	# Layers
5	11.0	3.0	120	45	1,320.0				1,320.0	0.7	63.2	1	1	56	67	45	45	45	4,500	2
6	16.0	4.0	120	31	1,920.0	62.4	1.5	93.6	1,826.4	0.9	87.4	1	1	39	40	38	40	39	4,500	
7																				∑ Layers Thickness
8																				5.0
9																				
10																				
11																				
12																				
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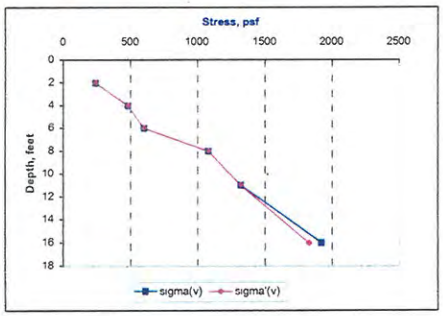
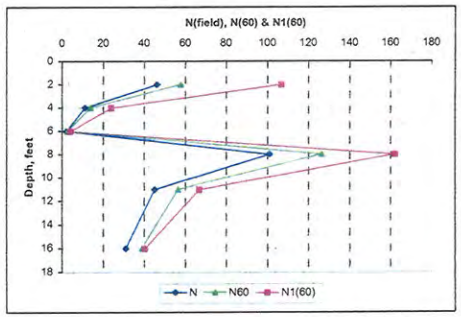
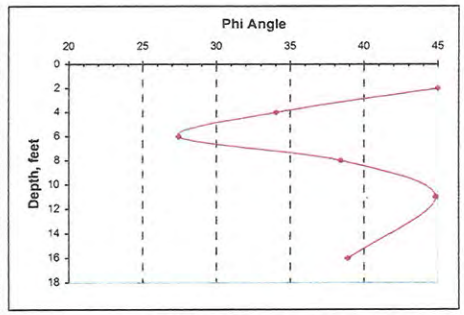
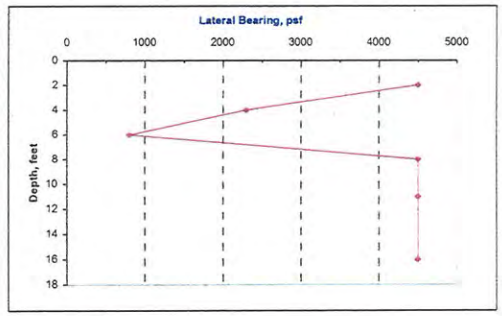
20																				
	∑ Layers Thickness	17.0																		









$$C_N = \sqrt{\frac{1}{\sigma'_{v\,(tsf)}}} = 9.78\sqrt{\frac{1}{\sigma'_{v\,(kN/m^2)}}}$$

$$C_N(GDM) = 0.77 \times \log\left(\frac{20}{\sigma'_{v\,(tsf)}}\right)$$

if σ'(v)<500psf, C_n=2.0
if σ'(v)>5500psf, C_n=0.6

$$\phi = 2.71 + 0.30N_{corr} - 5.4 \times 10^{-3} \times N_{corr}^2$$
$$Peck(1974), Wolff(1989)$$

$$\phi = 25 \times [0.15 \times 150 \times \sin(N_{corr})]$$

SPT vs Friction Angle & Lateral Bearing Capacity

Ver: 4-09a

SR 522 / US-2 Interchange Vicinity - Phase I
Snohomish County, Washington
XL-3591

Luminaires # 24, 25 & 26

Boring No.	L-25-09
Water Depth (ft)	8

Station	U line 46+07
Offset	65.7' Rt

Hammer Efficiency (%)	75
Correction Factor	1.25

Layer No.	Depth (ft)	layer Thickness (ft)	γ (total) (pcf)	N (field)	σ(v) (psf)	γ (water) (pcf)	Water Head (ft)	Pore Pressure (psf)	σ' (v) (psf)	σ' (v) (tsf)	σ' (v) (kN/m²)	C_n	C_n (GDM)	N_{60} Energy Corrected	$N_{1(60)}$ Energy & Overburden Corrected	ϕ (Peck)	ϕ	ϕ (average)	Lateral Bearing (psf)	Harmonic Average Lateral Bearing (psf)
1	1.0	3.0	135	55	135.0				135.0	0.1	6.5	2	2	69	134	45	41	43	4,500	3,750
2	4.0	2.0	120	14	480.0				480.0	0.2	23.0	2	1	18	30	36	36	36	3,000	6
3	6.0	2.0	120	25	720.0				720.0	0.4	34.5	2	1	31	47	40	41	41	4,500	
4	8.0	3.0	120	10	960.0	62.4			960.0	0.5	46.0	1	1	13	17	32	32	32	2,050	# Layers
5	11.0	2.0	120	12	1,320.0	62.4	3.0	187.2	1,132.8	0.6	54.2	1	1	15	19	33	32	32	2,550	2
6	16.0	5.0	120	16	1,920.0	62.4	8.0	499.2	1,420.8	0.7	68.0	1	1	20	23	34	34	34	3,450	
7																				∑ Layers Thickness
8																				5.0
9																				
10																				
11																				
12																				
13																				
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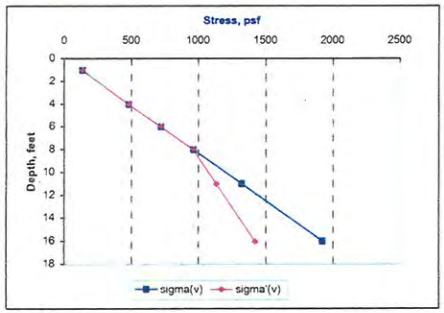
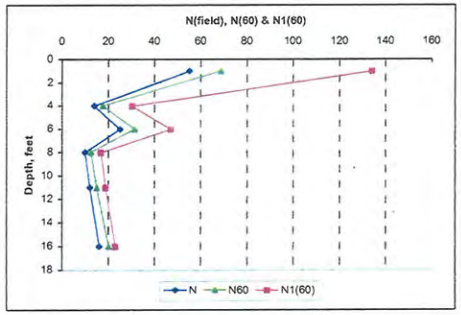
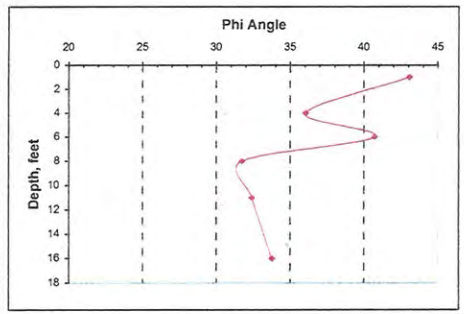
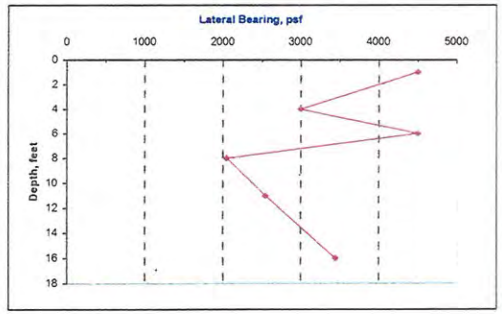
19																				
20																				
	∑ Layers Thickness	17.0																		









$$C_N = \sqrt{\frac{1}{\sigma'_v(tsf)}} = 9.78\sqrt{\frac{1}{\sigma'_v(kN/m^2)}}$$

$$C_N(GDM) = 0.77 \times \log\left(\frac{20}{\sigma'_v(tsf)}\right)$$

if σ'(v)<500psf, C_n=2.0

if σ'(v)>5500psf, C_n=0.6

$$\phi = 2.71 + 0.30N_{corr} - 5.4 \times 10^{-3} \times N_{corr}^2$$

Peck(1974), *Wolff*(1989)

$$\phi = 25 \times [0.15 \times 150 \times \sin(N_{corr})]$$

SPT vs Friction Angle & Lateral Bearing Capacity

Ver: 4-09a

SR 522 / US-2 Interchange Vicinity - Phase I
Snohomish County, Washington
XL-3591

Luminaires #27, 28 & 29

Boring No.	L-28-09
Water Depth (ft)	13

Station	U line 52+44
Offset	65.3' Rt

Hammer Efficiency (%)	75
Correction Factor	1.25

Layer No.	Depth (ft)	layer Thickness (ft)	γ (total) (pcf)	N (field)	σ(v) (psf)	γ (water) (pcf)	Water Head (ft)	Pore Pressure (psf)	σ' (v) (psf)	σ' (v) (tsf)	σ' (v) (kN/m²)	C_n	C_n (GDM)	N_{60} Energy Corrected	$N_{1(60)}$ Energy & Overburden Corrected	ϕ (Peck)	ϕ	ϕ (average)	Lateral Bearing (psf)	Harmonic Average Lateral Bearing (psf)
1	1.0	3.0	135	58	135.0				135.0	0.1	6.5	2	2	73	141	45	39	42	4,500	2,550
2	4.0	2.0	120	23	480.0				480.0	0.2	23.0	2	1	29	50	41	42	41	4,500	6
3	6.0	2.0	115	6	690.0				690.0	0.3	33.0	2	1	8	11	30	29	30	1,200	
4	8.0	3.0	120	19	960.0				960.0	0.5	46.0	1	1	24	32	36	37	37	4,000	# Layers
5	11.0	2.0	120	22	1,320.0				1,320.0	0.7	63.2	1	1	28	33	36	37	37	4,400	3
6	16.0	5.0	120	13	1,920.0	62.4	3.0	187.2	1,732.8	0.9	83.0	1	1	16	17	32	32	32	2,800	
7																				∑ Layers Thickness
8																				7.0
9																				
10																				
11																				
12																				
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16																				
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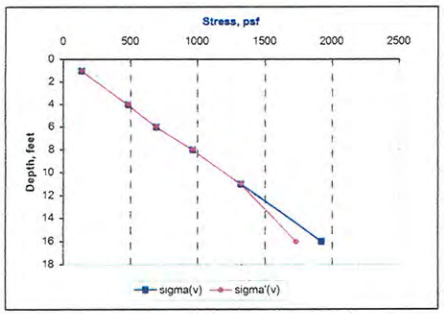
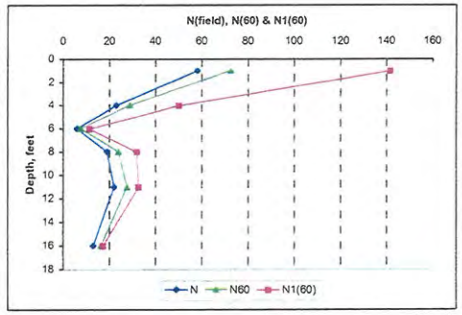
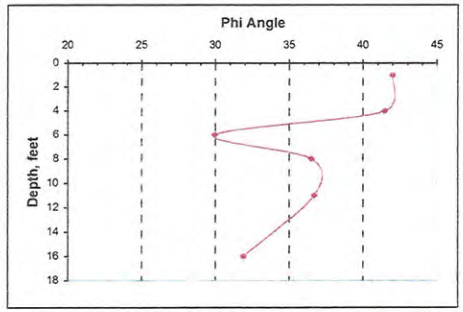
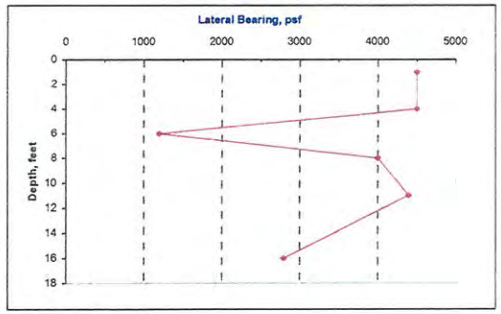
18																				
19																				
20																				
	∑ Layers Thickness	17.0																		









$$C'_N = \sqrt{\frac{1}{\sigma'_v(tsf)}} = 9.78\sqrt{\frac{1}{\sigma'_v(kN/m^2)}}$$

$$C_N(GDM) = 0.77 \times \log\left(\frac{20}{\sigma'_v(tsf)}\right)$$

if σ'(v)<500psf, C_n=2.0
if σ'(v)>5500psf, C_n=0.6

$$\phi = 2.71 + 0.30N_{corr} - 5.4 \times 10^{-3} \times N_{corr}^2$$
Peck(1974), *Wolff*(1989)

$$\phi = 25 \times [0.15 \times 150 \times \sin(N_{corr})]$$

SPT vs Friction Angle & Lateral Bearing Capacity

Ver: 4-09a

SR 522 / US-2 Interchange Vicinity - Phase I
Snohomish County, Washington
XL-3591

Luminaires # 31 & 32

Boring No.	L-32-09
Water Depth (ft)	9.5

Station	U line 35+77
Offset	49.8' Lt.

Hammer Efficiency (%)	75
Correction Factor	1.25

Layer No.	Depth (ft)	layer Thickness (ft)	γ (total) (pcf)	N (field)	σ(v) (psf)	γ (water) (pcf)	Water Head (ft)	Pore Pressure (psf)	σ' (v) (psf)	σ' (v) (tsf)	σ' (v) (kN/m²)	C_n	C_n (GDM)	N_{60} Energy Corrected	$N_{1(60)}$ Energy & Overburden Corrected	ϕ (Peck)	ϕ	ϕ (average)	Lateral Bearing (psf)	Harmonic Average Lateral Bearing (psf)
1	1.0	2.0	120	17	120.0				120.0	0.1	5.7	2	2	21	42	39	40	39	3,650	3,900
2	4.0	3.0	120	19	480.0				480.0	0.2	23.0	2	1	24	41	39	40	39	4,000	6
3	6.0	2.0	115	7	690.0				690.0	0.3	33.0	2	1	9	13	31	30	31	1,400	
4	8.0	2.0	120	19	960.0				960.0	0.5	46.0	1	1	24	32	36	37	37	4,000	# Layers
5	11.0	3.0	120	31	1,320.0	62.4	1.5	93.6	1,226.4	0.6	58.7	1	1	39	47	40	42	41	4,500	2
6	15.0	4.0	135	101	2,025.0	62.4	5.5	343.2	1,681.8	0.8	80.5	1	1	126	136	45	41	43	4,500	
7																				∑ Layers Thickness
8																				5.0
9																				
10																				
11																				
12																				
13																				
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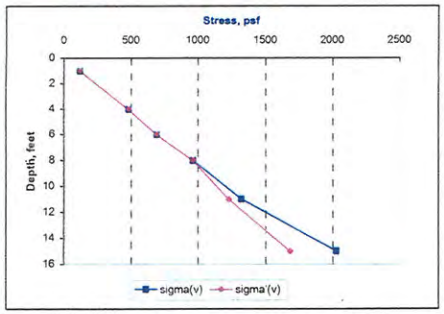
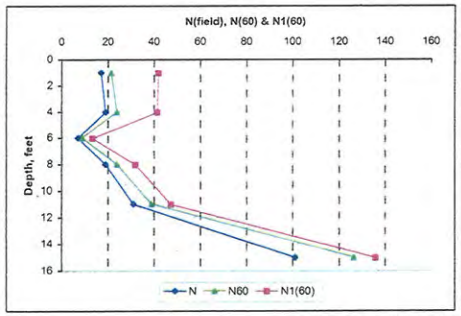
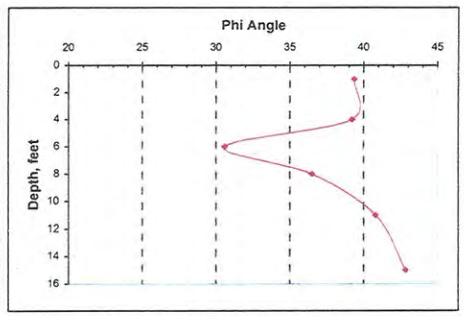
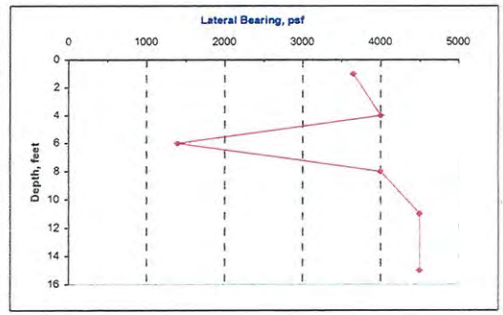
18																				
19																				
20																				
	∑ Layers Thickness	16.0																		









$$C_N = \sqrt{\frac{1}{\sigma'_{v\,(tsf)}}} = 9.78\sqrt{\frac{1}{\sigma'_{v\,(kN/m^2)}}}$$

$$C_N(GDM) = 0.77 \times \log\left(\frac{20}{\sigma'_v(tsf)}\right)$$

if σ'(v)<500psf, C_n=2.0
if σ'(v)>5500psf, C_n=0.6

$$\phi = 2.71 + 0.30N_{corr} - 5.4 \times 10^{-3} \times N_{corr}^2$$

Peck(1974), *Wolff*(1989)

$$\phi = 25 \times [0.15 \times 150 \times \sin(N_{corr})]$$

SPT vs Friction Angle & Lateral Bearing Capacity

Ver: 4-09a

SR 522 / US-2 Interchange Vicinity - Phase I
Snohomish County, Washington
XL-3591

Luminaires # 33 & 34

Boring No.	L-33-09
Water Depth (ft)	11

Station	U line 41+27
Offset	34.9' Lt

Hammer Efficiency (%)	75
Correction Factor	1.25

Layer No.	Depth (ft)	layer Thickness (ft)	γ (total) (pcf)	N (field)	σ(v) (psf)	γ (water) (pcf)	Water Head (ft)	Pore Pressure (psf)	σ' (v) (psf)	σ' (v) (tsf)	σ' (v) (kN/m²)	C_n	C_n (GDM)	N_{60} Energy Corrected	$N_{1(60)}$ Energy & Overburden Corrected	ϕ (Peck)	ϕ	ϕ (average)	Lateral Bearing (psf)	Harmonic Average Lateral Bearing (psf)
1	1.0	2.0	120	10	120.0				120.0	0.1	5.7	2	2	13	25	34	34	34	2,050	1,800
2	3.0	3.0	115	6	345.0				345.0	0.2	16.5	2	2	8	13	31	30	31	1,200	6
3	6.0	2.0	135	101	810.0				810.0	0.4	38.8	2	1	126	182	45	24	35	4,500	
4	8.0	2.0	130	50	1,040.0				1,040.0	0.5	49.8	1	1	63	81	45	45	45	4,500	# Layers
5	11.0	3.0	120	19	1,320.0	62.4			1,320.0	0.7	63.2	1	1	24	28	35	36	35	4,000	3
6	16.0	5.0	120	16	1,920.0	62.4	5.0	312.0	1,608.0	0.8	77.0	1	1	20	22	33	33	33	3,450	
7																				∑ Layers Thickness
8																				7.0
9																				
10																				
11																				
12																				
13																				
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17																				
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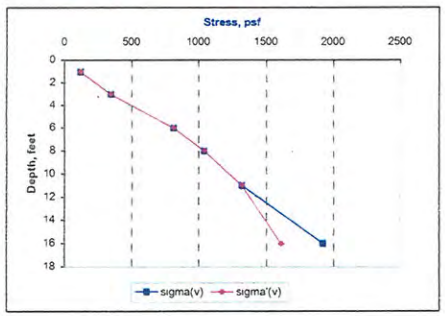
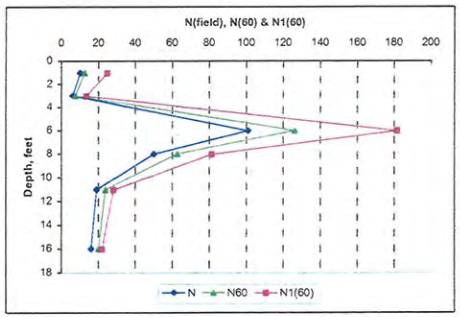
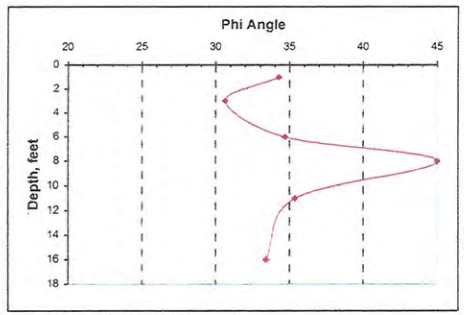
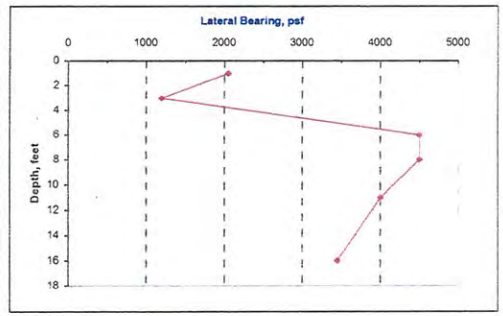
19																				
20																				
	∑ Layers Thickness	17.0																		









$$C'_N = \sqrt{\frac{1}{\sigma'_v(tsf)}} = 9.78\sqrt{\frac{1}{\sigma'_v(kN/m^2)}}$$

$$C_N(GDM) = 0.77 \times \log\left(\frac{20}{\sigma'_v(tsf)}\right)$$

if σ'(v)<500psf, C_n=2.0
if σ'(v)>5500psf, C_n=0.6

$$\phi = 27.1 + 0.30N_{corr} - 5.4 \times 10^{-3} \times N_{corr}^2$$
$$Peck(1974), Wolff(1989)$$

$$\phi = 25 \times [0.15 \times 150 \times \sin(N_{corr})]$$

SPT vs Friction Angle & Lateral Bearing Capacity

Ver: 4-09a

SR 522 / US-2 Interchange Vicinity - Phase I
Snohomish County, Washington
XL-3591

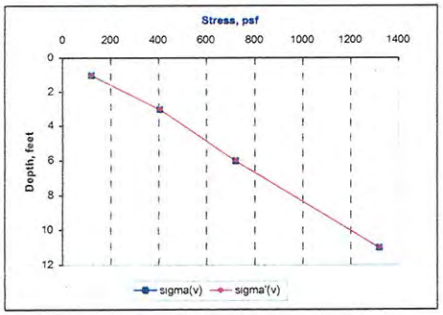
Luminaires # 35 & 36

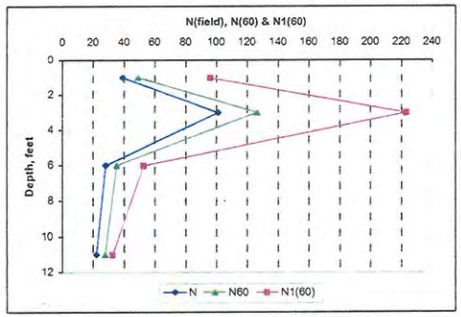
Boring No.	L-36-09
Water Depth (ft)	15

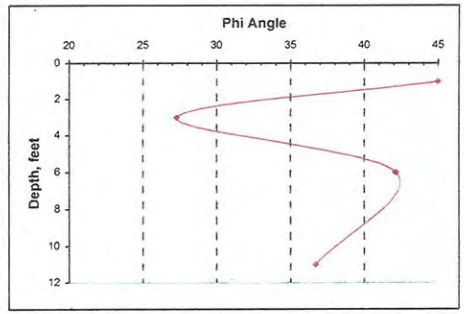
Station	U line 47+95
Offset	25.4' Lt

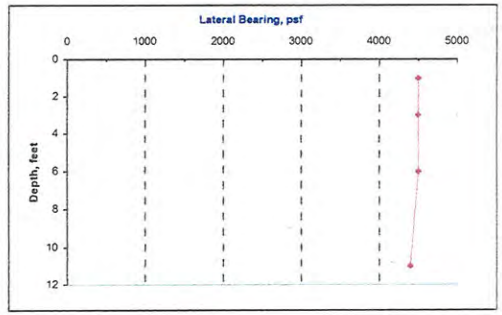
Hammer Efficiency (%)	75
Correction Factor	1.25

Layer No.	Depth (ft)	layer Thickness (ft)	γ (total) (pcf)	N (field)	σ(v) (psf)	γ (water) (pcf)	Water Head (ft)	Pore Pressure (psf)	σ' (v) (psf)	σ' (v) (tsf)	σ' (v) (kN/m²)	C_n	C_n (GDM)	N_{60} Energy Corrected	$N_{1(60)}$ Energy & Overburden Corrected	ϕ (Peck)	ϕ	ϕ (average)	Lateral Bearing (psf)	Harmonic Average Lateral Bearing (psf)
1	1.0	2.0	120	39	120.0				120.0	0.1	5.7	2	2	49	96	45	45	45	4,500	4,500
2	3.0	3.0	135	101	405.0				405.0	0.2	19.4	2	2	126	223	45	10	27	4,500	4
3	6.0	2.0	120	28	720.0				720.0	0.4	34.5	2	1	35	53	41	43	42	4,500	
4	11.0	10.0	120	22	1,320.0				1,320.0	0.7	63.2	1	1	28	33	36	37	37	4,400	# Layers
5																				2
6																				
7																				∑ Layers Thickness
8																				5.0
9																				
10																				
11																				
12																				
13																				
14																				
15																				
16																				
17																				
18																				
19																				
20																				
	∑ Layers Thickness	17.0																		









$$C_N = \sqrt{\frac{1}{\sigma'_v\,(tsf)}} = 9.78\sqrt{\frac{1}{\sigma'_v\,(kN/m^2)}}$$

$$C_N(GDM) = 0.77 \times \log\left(\frac{20}{\sigma'_v\,(tsf)}\right)$$

if σ'(v)<500psf, C_n=2.0

if σ'(v)>5500psf, C_n=0.6

$$\phi = 2.71 + 0.30N_{corr} - 5.4 \times 10^{-3} \times N_{corr}^2$$

Peck(1974), *Wolff* (1989)

$$\phi = 25 \times [0.15 \times 150 \times \sin(N_{corr})]$$

SPT vs Friction Angle & Lateral Bearing Capacity

Ver: 4-09a

SR 522 / US-2 Interchange Vicinity - Phase I
Snohomish County, Washington
XL-3591

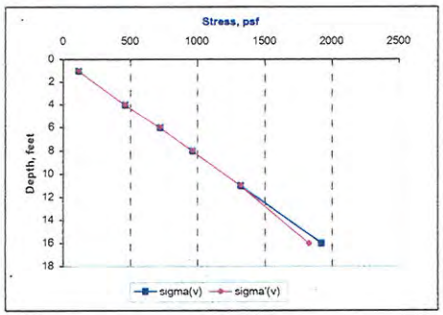
Luminaires # 37, 38 & 39

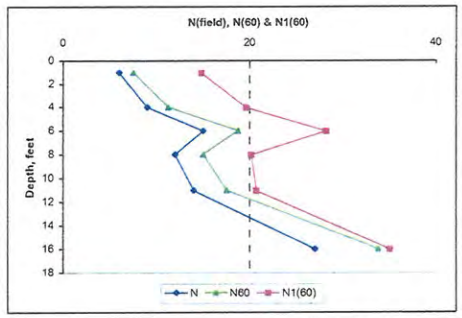
Boring No.	L-38-09
Water Depth (ft)	14.5

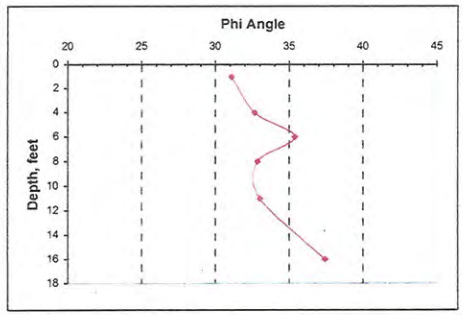
Station	U line 52+61
Offset	31' Lt

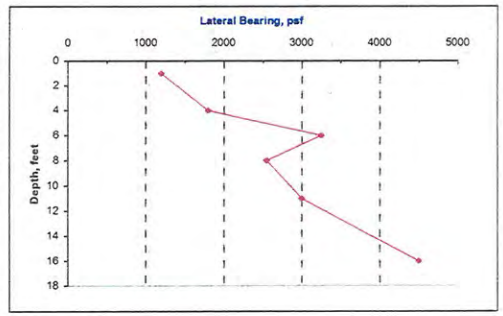
Hammer Efficiency (%)	75
Correction Factor	1.25

Layer No.	Depth (ft)	layer Thickness (ft)	γ (total) (pcf)	N (field)	σ(v) (psf)	γ (water) (pcf)	Water Head (ft)	Pore Pressure (psf)	σ' (v) (psf)	σ' (v) (tsf)	σ' (v) (kN/m²)	C_n	C_n (GDM)	N_{60} Energy Corrected	$N_{1(60)}$ Energy & Overburden Corrected	ϕ (Peck)	ϕ	ϕ (average)	Lateral Bearing (psf)	Harmonic Average Lateral Bearing (psf)
1	1.0	2.0	115	6	115.0				115.0	0.1	5.5	2	2	8	15	31	31	31	1,200	1,800
2	4.0	3.0	115	9	460.0				460.0	0.2	22.0	2	1	11	20	33	33	33	1,800	6
3	6.0	2.0	120	15	720.0				720.0	0.4	34.5	2	1	19	28	35	36	35	3,250	
4	8.0	3.0	120	12	960.0				960.0	0.5	46.0	1	1	15	20	33	33	33	2,550	# Layers
5	11.0	2.0	120	14	1,320.0				1,320.0	0.7	63.2	1	1	18	21	33	33	33	3,000	3
6	16.0	5.0	120	27	1,920.0	62.4	1.5	93.6	1,826.4	0.9	87.4	1	1	34	35	37	38	37	4,500	
7																				∑ Layers Thickness
8																				7.0
9																				
10																				
11																				
12																				
13																				
14																				
15																				
16																				
17																				
18																				
19																				
20																				
	∑ Layers Thickness	17.0																		









$$C_N = \sqrt{\frac{1}{\sigma'_{v(tsf)}}} = 9.78\sqrt{\frac{1}{\sigma'_{v(kN/m^2)}}}$$

$$C_N(GDM) = 0.77 \times \log\left(\frac{20}{\sigma'_{v(tsf)}}\right)$$

if σ'(v)<500psf, C_n=2.0
if σ'(v)>5500psf, C_n=0.6

$$\phi = 2.71 + 0.30N_{corr} - 5.4 \times 10^{-3} \times N_{corr}^2$$

Peck(1974),*Wolff*(1989)

$$\phi = 25 \times [0.15 \times 150 \times \sin(N_{corr})]$$

SPT vs Friction Angle & Lateral Bearing Capacity

Ver: 4-09a

SR 522 / US-2 Interchange Vicinity - Phase I
Snohomish County, Washington
XL-3591

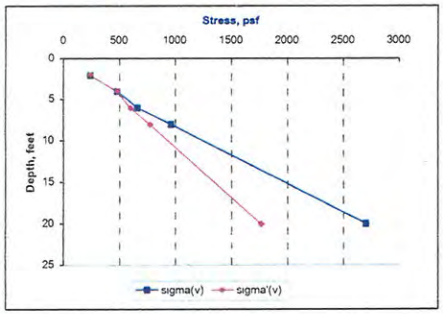
Signal #3 @ US2/SR522 Ramps

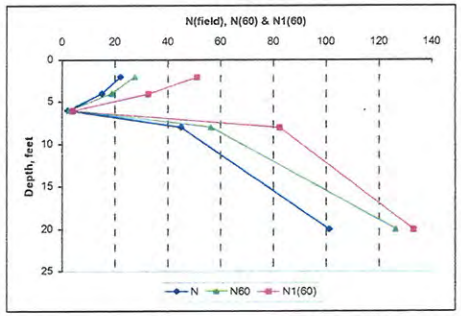
Boring No.	S-1-09
Water Depth (ft)	5

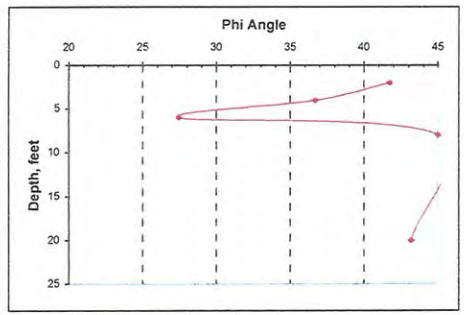
Station	U line 26+43
Offset	49' Lt

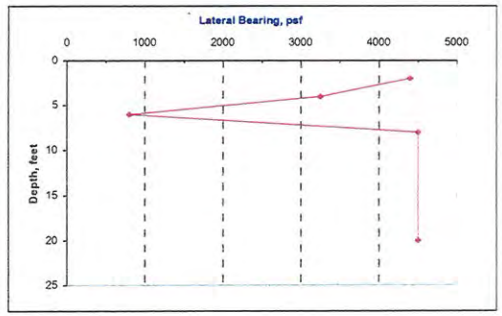
Hammer Efficiency (%)	75
Correction Factor	1.25

Layer No.	Depth (ft)	layer Thickness (ft)	γ (total) (pcf)	N (field)	σ(v) (psf)	γ (water) (pcf)	Water Head (ft)	Pore Pressure (psf)	σ' (v) (psf)	σ' (v) (tsf)	σ' (v) (kN/m²)	C_n	C_n (GDM)	N_{60} Energy Corrected	$N_{1(60)}$ Energy & Overburden Corrected	ϕ (Peck)	ϕ	ϕ (average)	Lateral Bearing (psf)	Harmonic Average Lateral Bearing (psf)
1	2.0	3.0	120	22	240.0				240.0	0.1	11.5	2	2	28	51	41	42	42	4,400	1,850
2	4.0	2.0	120	15	480.0				480.0	0.2	23.0	2	1	19	33	36	37	37	3,250	5
3	6.0	2.0	110	2	660.0	62.4	1.0	62.4	597.6	0.3	28.6	2	1	3	4	28	27	27	800	
4	8.0	2.0	120	45	960.0	62.4	3.0	187.2	772.8	0.4	37.0	2	1	56	82	45	45	45	4,500	# Layers
5	20.0	18.0	135	101	2,700.0	62.4	15.0	936.0	1,764.0	0.9	84.5	1	1	126	133	45	41	43	4,500	3
6																				
7																				∑ Layers Thickness
8																				7.0
9																				
10																				
11																				
12																				
13																				
14																				
15																				
16																				
17																				
18																				
19																				
20																				
	∑ Layers Thickness	27.0																		









$$C_N = \sqrt{\frac{1}{\sigma'_{v\,(tsf)}}} = 9.78\sqrt{\frac{1}{\sigma'_{v\,(kN/m^2)}}}$$

$$C_N(GDM) = 0.77 \times \log\left(\frac{20}{\sigma'_{v\,(tsf)}}\right)$$

if σ'(v)<500psf, C_n=2.0
if σ'(v)>5500psf, C_n=0.6

$$\phi = 2.71 + 0.30N_{corr} - 5.4 \times 10^{-3} \times N_{corr}^2$$

Peck(1974), *Wolff*(1989)

$$\phi = 25 \times [0.15 \times 150 \times \sin(N_{corr})]$$

SPT vs Friction Angle & Lateral Bearing Capacity

Ver: 4-09a

SR 522 / US-2 Interchange Vicinity - Phase I
Snohomish County, Washington
XL-3591

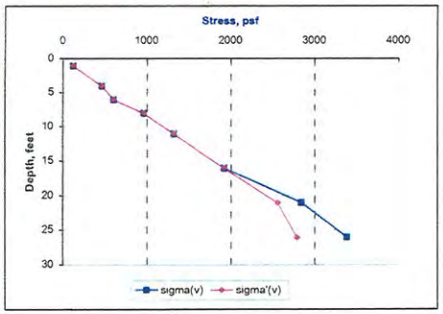
Signal #1 @US2/SR522 Ramps

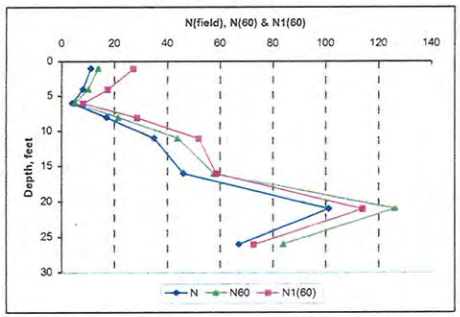
Boring No.	S-2-09
Water Depth (ft)	16.5

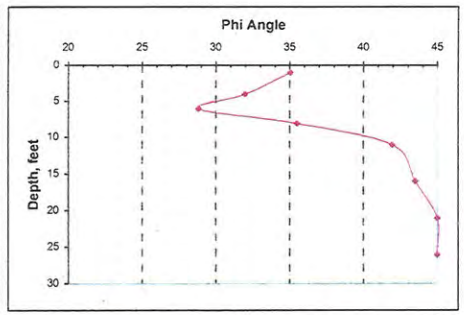
Station	U line 27+37
Offset	53' Rt.

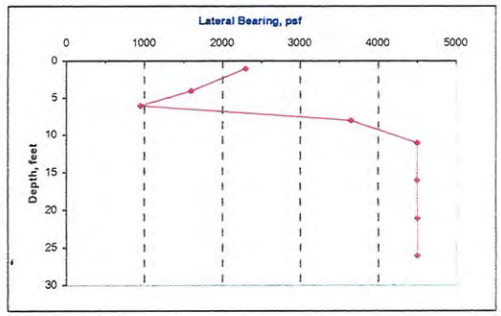
Hammer Efficiency (%)	75
Correction Factor	1.25

Layer No.	Depth (ft)	layer Thickness (ft)	γ (total) (pcf)	N (field)	σ(v) (psf)	γ (water) (pcf)	Water Head (ft)	Pore Pressure (psf)	σ' (v) (psf)	σ' (v) (tsf)	σ' (v) (kN/m²)	C_n	C_n (GDM)	N_{60} Energy Corrected	$N_{1(60)}$ Energy & Overburden Corrected	ϕ (Peck)	ϕ	ϕ (average)	Lateral Bearing (psf)	Harmonic Average Lateral Bearing (psf)
1	1.0	3.0	120	11	120.0				120.0	0.1	5.7	2	2	14	27	35	35	35	2,300	1,750
2	4.0	2.0	115	8	460.0				460.0	0.2	22.0	2	1	10	17	32	32	32	1,600	8
3	6.0	2.0	100	4	600.0				600.0	0.3	28.7	2	1	5	8	29	28	29	950	
4	8.0	2.0	120	17	960.0				960.0	0.5	46.0	1	1	21	29	35	36	36	3,650	# Layers
5	11.0	5.0	120	35	1,320.0				1,320.0	0.7	63.2	1	1	44	52	41	43	42	4,500	4
6	16.0	6.0	120	46	1,920.0				1,920.0	1.0	91.9	1	1	58	59	43	44	44	4,500	
7	21.0	5.0	135	101	2,835.0	62.4	4.5	280.8	2,554.2	1.3	122.3	1	1	126	114	45	45	45	4,500	∑ Layers Thickness
8	26.0	2.0	130	67	3,380.0	62.4	9.5	592.8	2,787.2	1.4	133.5	1	1	84	73	45	45	45	4,500	9.0
9																				
10																				
11																				
12																				
13																				
14																				
15																				
16																				
17																				
18																				
19																				
20																				
	∑ Layers Thickness	27.0																		









$$C_N = \sqrt{\frac{1}{\sigma'_v(tsf)}} = 9.78\sqrt{\frac{1}{\sigma'_v(kN/m^2)}}$$

$$C_N(GDM) = 0.77 \times \log\left(\frac{20}{\sigma'_v(tsf)}\right)$$

if σ'(v)<500psf, C_n=2.0
if σ'(v)>5500psf, C_n=0.6

$$\phi = 27.1 + 0.30N_{corr} - 5.4 \times 10^{-3} \times N_{corr}^2$$

Peck(1974), *Wolff*(1989)

$$\phi = 25 \times [0.15 \times 150 \times \sin(N_{corr})]$$

SPT vs Friction Angle & Lateral Bearing Capacity

Ver: 4-09a

SR 522 / US-2 Interchange Vicinity - Phase I
Snohomish County, Washington
XL-3591

Signal # 1 & 2 @ US-2 / Kelsey Street Intersection

Boring No.	S-4-09
Water Depth (ft)	16

Station	U line 38+77
Offset	77' Rt

Hammer Efficiency (%)	75
Correction Factor	1.25

Layer No.	Depth (ft)	layer Thickness (ft)	γ (total) (pcf)	N (field)	σ(v) (psf)	γ (water) (pcf)	Water Head (ft)	Pore Pressure (psf)	σ' (v) (psf)	σ' (v) (tsf)	σ' (v) (kN/m²)	C_n	C_n (GDM)	N_{60} Energy Corrected	$N_{1(60)}$ Energy & Overburden Corrected	ϕ (Peck)	ϕ	ϕ (average)	Lateral Bearing (psf)	Harmonic Average Lateral Bearing (psf)
1	1.0	3.0	120	14	120.0				120.0	0.1	5.7	2	2	18	34	37	38	37	3,000	1,100
2	4.0	2.0	100	3	400.0				400.0	0.2	19.2	2	2	4	7	29	28	28	850	
3	6.0	2.0	100	3	600.0				600.0	0.3	28.7	2	1	4	6	29	27	28	850	
4	8.0	2.0	100	2	800.0				800.0	0.4	38.3	2	1	3	4	28	26	27	800	# Layers
5	11.0	5.0	135	101	1,485.0				1,485.0	0.7	71.1	1	1	126	143	45	39	42	4,500	4
6	16.0	5.0	120	30	1,920.0	62.4			1,920.0	1.0	91.9	1	1	38	38	38	39	38	4,500	
7	22.0	8.0	120	26	2,640.0	62.4	6.0	374.4	2,265.6	1.1	108.5	1	1	33	31	36	37	36	4,500	∑ Layers Thickness
8																				9.0
9																				
10																				
11																				
12																				
13																				
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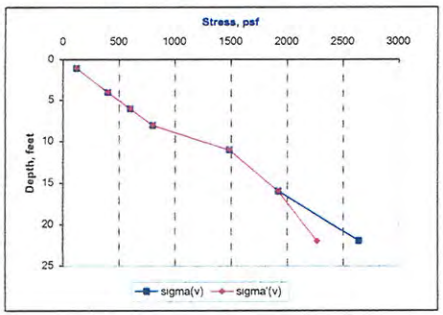
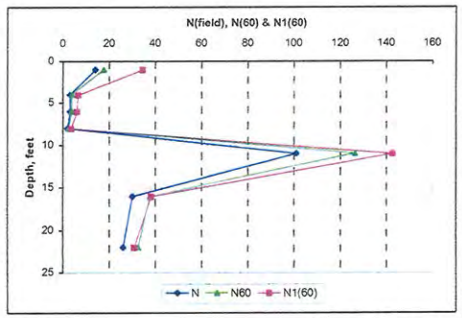
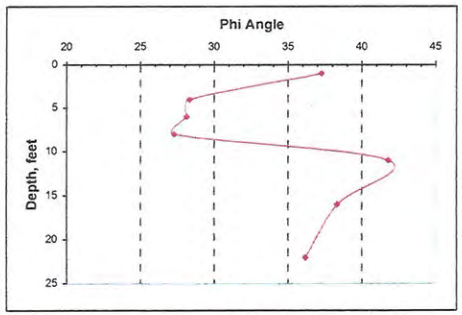
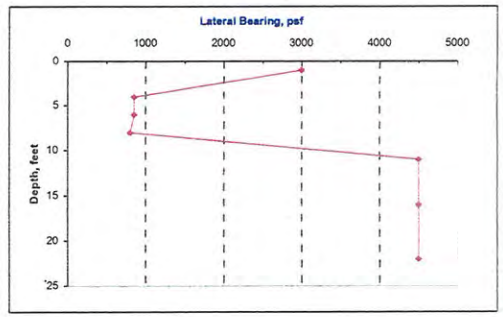
15																				
16																				
17																				
18																				
19																				
20																				
	∑ Layers Thickness	27.0																		









$$C_N = \sqrt{\frac{1}{\sigma'_{v\,(tsf)}}} = 9.78\sqrt{\frac{1}{\sigma'_{v\,(kN/m^2)}}}$$

$$C_N(GDM) = 0.77 \times \log\left(\frac{20}{\sigma'_v(tsf)}\right)$$

if σ'(v)<500psf, C_n=2.0
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$$\phi = 2.71 + 0.30N_{corr} - 5.4 \times 10^{-3} \times N_{corr}^2$$

Peck(1974), *Wolff*(1989)

$$\phi = 25 \times [0.15 \times 150 \times \sin(N_{corr})]$$

SPT vs Friction Angle & Lateral Bearing Capacity

Ver: 4-09a

SR 522 / US-2 Interchange Vicinity - Phase I
Snohomish County, Washington
XL-3591

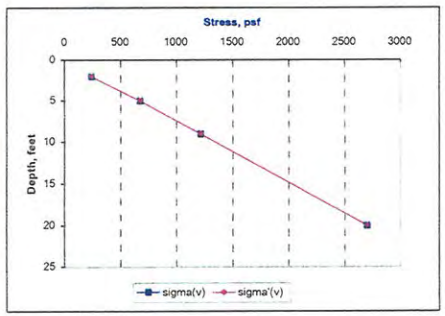
Sign Birdge #1 @ SR 522

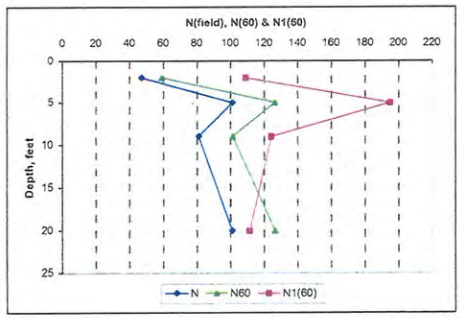
Boring No.	SB-1-09
Water Depth (ft)	30

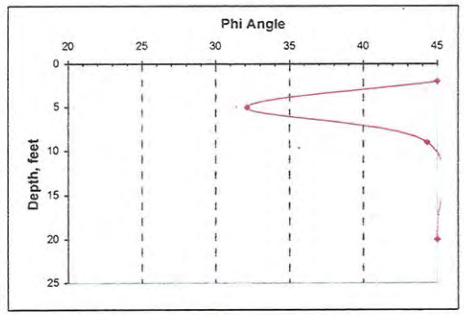
Station	LL 872+12
Offset	C/L

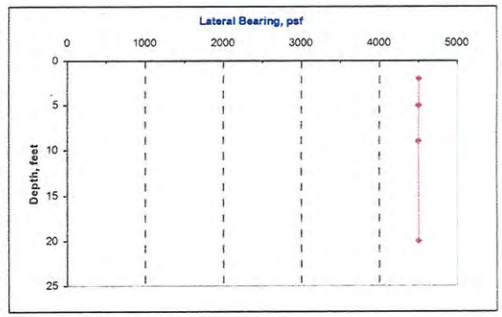
Hammer Efficiency (%)	75
Correction Factor	1.25

Layer No.	Depth (ft)	layer Thickness (ft)	γ (total) (pcf)	N (field)	σ(v) (psf)	γ (water) (pcf)	Water Head (ft)	Pore Pressure (psf)	σ' (v) (psf)	σ' (v) (tsf)	σ' (v) (kN/m²)	C_n	C_n (GDM)	N_{60} Energy Corrected	$N_{1(60)}$ Energy & Overburden Corrected	ϕ (Peck)	ϕ	ϕ (average)	Lateral Bearing (psf)	Harmonic Average Lateral Bearing (psf)
1	2.0	3.0	120	47	240.0				240.0	0.1	11.5	2	2	59	109	45	45	45	4,500	4,500
2	5.0	5.0	135	101	675.0				675.0	0.3	32.3	2	1	126	195	45	19	32	4,500	4
3	9.0	2.0	135	81	1,215.0				1,215.0	0.6	58.2	1	1	101	124	45	44	44	4,500	
4	20.0	16.0	135	101	2,700.0				2,700.0	1.4	129.3	1	1	126	111	45	45	45	4,500	# Layers 4
5																				
6																				
7																				∑ Layers Thickness
8																				26.0
9																				
10																				
11																				
12																				
13																				
14																				
15																				
16																				
17																				
18																				
19																				
20																				
	∑ Layers Thickness	26.0																		









$$C_N = \sqrt{\frac{1}{\sigma'_v\,(tsf)}} = 9.78\sqrt{\frac{1}{\sigma'_v\,(kN/m^2)}}$$

$$C_N(GDM) = 0.77 \times \log\left(\frac{20}{\sigma'_v\,(tsf)}\right)$$

if σ'(v)<500psf, C_n=2.0
if σ'(v)>5500psf, C_n=0.6

$$\phi = 2.71 + 0.30N_{corr} - 5.4 \times 10^{-3} \times N_{corr}^2$$

Peck(1974), *Wolff* (1989)

$$\phi = 25 \times \left[0.15 \times 150 \times \sin(N_{corr})\right]$$

SPT vs Friction Angle & Lateral Bearing Capacity

Ver: 4-09a

SR 522 / US-2 Interchange Vicinity - Phase I
Snohomish County, Washington
XL-3591

Sign Birdge # 1@ SR 522

Boring No.	SB-2-09
Water Depth (ft)	30

Station	LL 872+12
Offset	45' Rt.

Hammer Efficiency (%)	75
Correction Factor	1.25

Layer No.	Depth (ft)	layer Thickness (ft)	γ (total) (pcf)	N (field)	σ(v) (psf)	γ (water) (pcf)	Water Head (ft)	Pore Pressure (psf)	σ' (v) (psf)	σ' (v) (tsf)	σ' (v) (kN/m²)	C_n	C_n (GDM)	N_{60} Energy Corrected	$N_{1(60)}$ Energy & Overburden Corrected	ϕ (Peck)	ϕ	ϕ (average)	Lateral Bearing (psf)	Harmonic Average Lateral Bearing (psf)
1	3.0	5.0	130	57	390.0				390.0	0.2	18.7	2	2	71	126	45	43	44	4,500	4,500
2	15.0	16.0	135	101	2,025.0				2,025.0	1.0	97.0	1	1	126	126	45	43	44	4,500	
3																				
4																				
5																				
6																				
7																				
8																				
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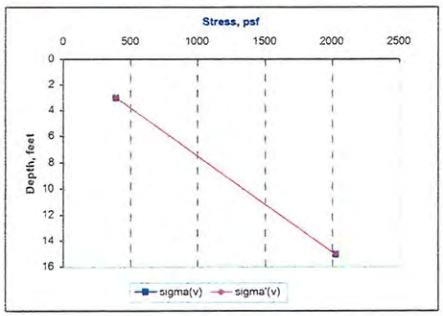
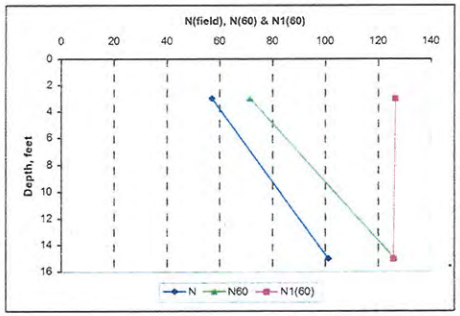
16																				
17																				
18																				
19																				
20																				
∑ Layers Thickness	21.0																			

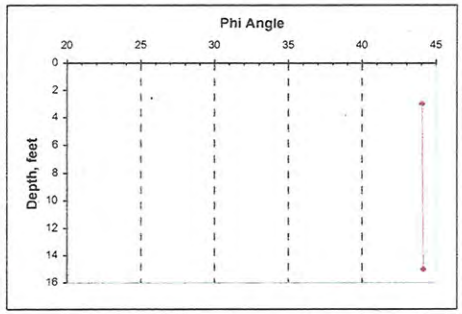
Harmonic Average Lateral Bearing (psf)
4,500
2

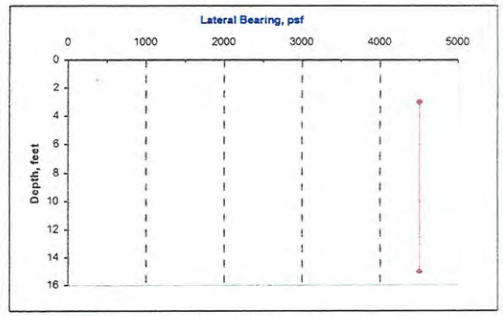
Layers
2

∑ Layers Thickness
21.0









$$C_N = \sqrt{\frac{1}{\sigma'_v(tsf)}} = 9.78\sqrt{\frac{1}{\sigma'_v(kN/m^2)}}$$

$$C_N(GDM) = 0.77 \times \log\left(\frac{20}{\sigma'_v(tsf)}\right)$$

if σ'(v)<500psf, C_n=2.0
if σ'(v)>5500psf, C_n=0.6

$$\phi = 2.71 + 0.30N_{corr} - 5.4 \times 10^{-3} \times N_{corr}^2$$

Peck(1974), *Wolff*(1989)

$$\phi = 25 \times [0.15 \times 150 \times \sin(N_{corr})]$$

SPT vs Friction Angle & Lateral Bearing Capacity

Ver: 4-09a

SR 522 / US-2 Interchange Vicinity - Phase I
Snohomish County, Washington
XL-3591

Camera Foundation

Boring No.	H-80p-08
Water Depth (ft)	32.5

Station	U line 22+65
Offset	115' Lt.

Hammer Efficiency (%)	75
Correction Factor	1.25

Layer No.	Depth (ft)	layer Thickness (ft)	γ (total) (pcf)	N (field)	σ(v) (psf)	γ (water) (pcf)	Water Head (ft)	Pore Pressure (psf)	σ' (v) (psf)	σ' (v) (tsf)	σ' (v) (kN/m²)	C_n	C_n (GDM)	N_{60} Energy Corrected	$N_{1(60)}$ Energy & Overburden Corrected	ϕ (Peck)	ϕ	ϕ (average)	Lateral Bearing (psf)	Harmonic Average Lateral Bearing (psf)
1	6.0	7.0	120	13	720.0				720.0	0.4	34.5	2	1	16	24	34	34	34	2,800	2,800
2	11.0	5.0	120	30	1,320.0				1,320.0	0.7	63.2	1	1	38	44	39	41	40	4,500	10
3	16.0	5.0	120	18	1,920.0				1,920.0	1.0	91.9	1	1	23	23	34	34	34	3,800	
4	21.0	5.0	120	43	2,520.0				2,520.0	1.3	120.7	1	1	54	49	40	42	41	4,500	# Layers
5	26.0	5.0	120	34	3,120.0				3,120.0	1.6	149.4	1	1	43	35	37	38	37	4,500	1
6	36.0	15.0	115	6	4,140.0	62.4	3.5	218.4	3,921.6	2.0	187.8	1	1	8	6	29	27	28	1,200	
7	46.0	5.0	135	90	6,210.0	62.4	13.5	842.4	5,367.6	2.7	257.0	1	1	113	72	45	45	45	4,500	∑ Layers Thickness
8	51.0	5.0	135	52	6,885.0	62.4	18.5	1,154.4	5,730.6	2.9	274.4	1	1	65	41	38	40	39	4,500	7.0
9	56.0	5.0	135	72	7,560.0	62.4	23.5	1,466.4	6,093.6	3.0	291.8	1	1	90	55	42	44	43	4,500	
10	61.0	9.0	135	52	8,235.0	62.4	28.5	1,778.4	6,456.6	3.2	309.1	1	1	65	39	38	39	39	4,500	
11																				
12																				
13																				
14																				
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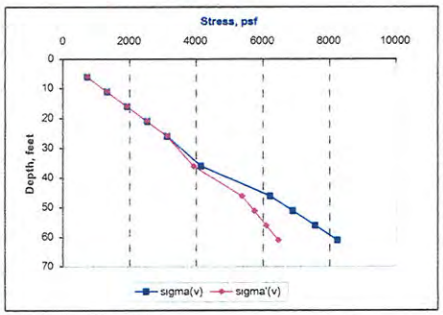
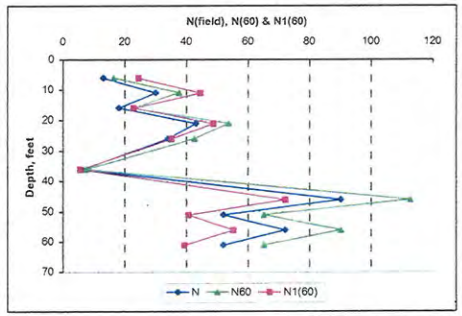
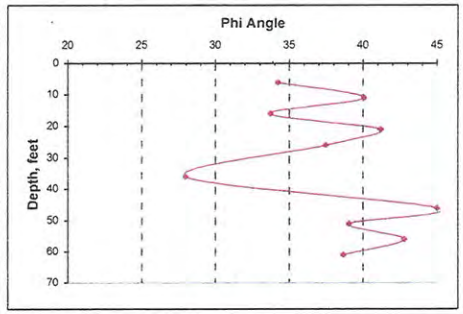
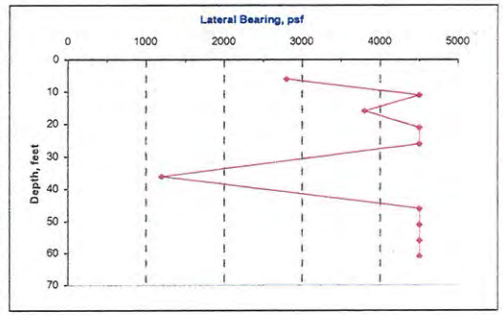
16																				
17																				
18																				
19																				
20																				
	∑ Layers Thickness	66.0																		









$$C_N = \sqrt{\frac{1}{\sigma'_{v\,(tsf)}}} = 9.78\sqrt{\frac{1}{\sigma'_{v\,(kN/m^2)}}}$$

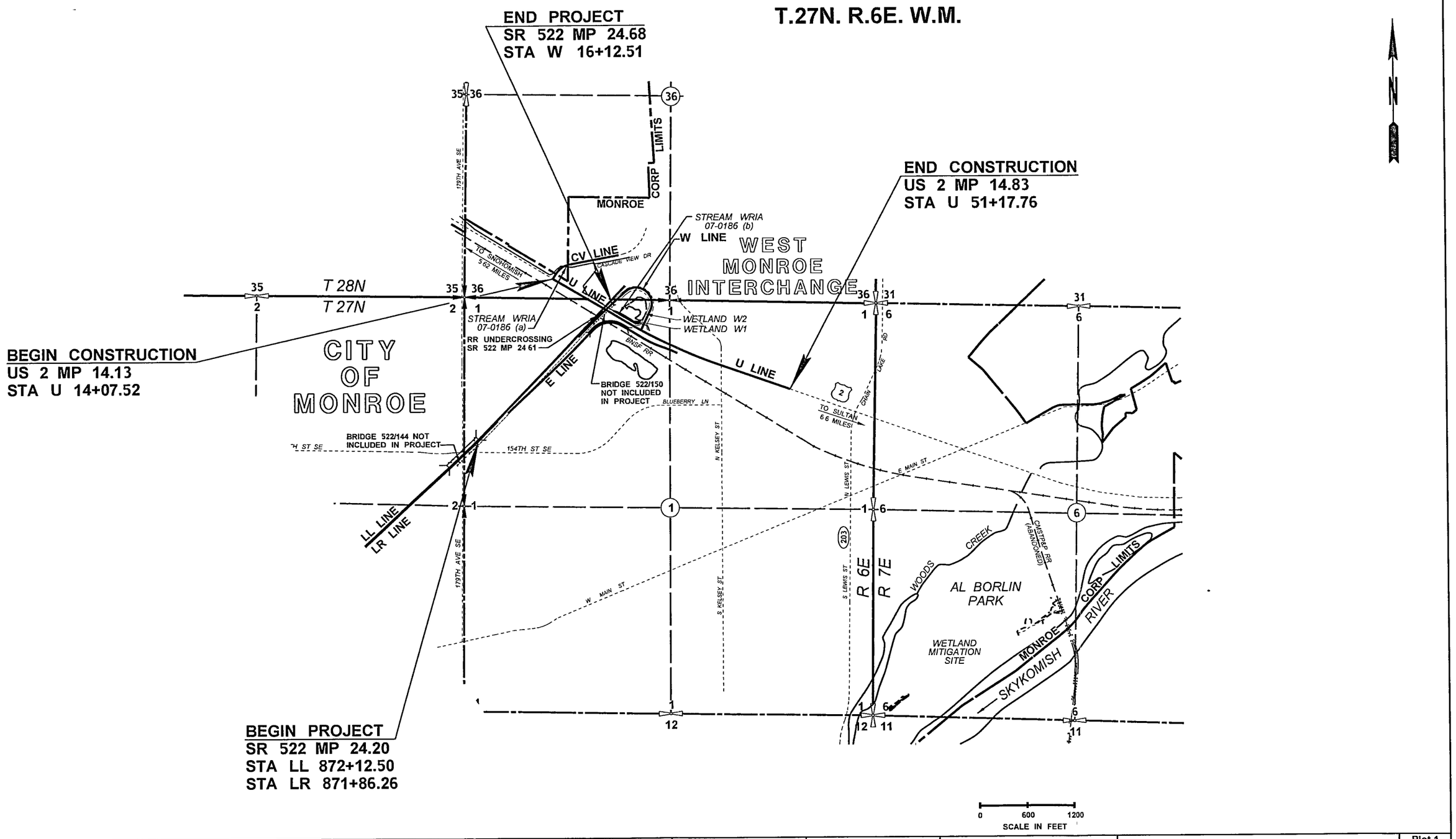
$$C_N(GDM) = 0.77 \times \log\left(\frac{20}{\sigma'_{v\,(tsf)}}\right)$$

if σ'(v)<500psf, C_n=2.0
if σ'(v)>5500psf, C_n=0.6

$$\phi = 27.1 + 0.30N_{corr} - 5.4 \times 10^{-3} \times N_{corr}^2$$

Peck(1974), *Wolff*(1989)

$$\phi = 25 \times [0.15 \times 150 \times \sin(N_{corr})]$$



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DATE	10/30/2009				JOB NUMBER		
PLOTTED BY	huah						
DESIGNED BY	T SILBERNAGEL				CONTRACT NO		LOCATION NO
ENTERED BY	T SILBERNAGEL						
CHECKED BY	O KIKUTA						
PROJ ENGR	D EDWARDS						
REGIONAL ADM	L ENG	REVISION	DATE	BY			

P E STAMP BOX DATE

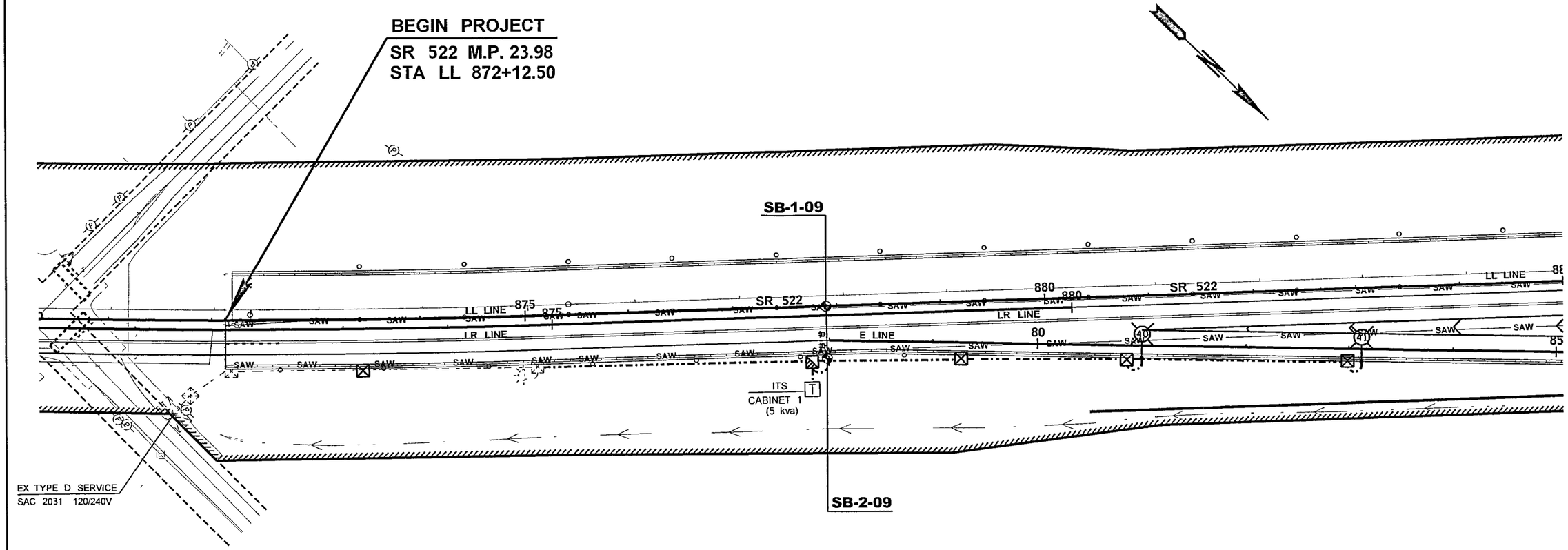
P E STAMP BOX DATE

Washington State Department of Transportation

SR 522
US 2 INTERCHANGE VICINITY

VICINITY MAP

Plot 1
VM1
SHEET OF SHEETS



LEGEND

EXISTING NEW

- TYPE 1 L JUNCTION BOX
- TYPE 2 L JUNCTION BOX
- TYPE 4 JUNCTION BOX (TRAFFIC BEARING)
- TYPE 5 JUNCTION BOX (TRAFFIC BEARING)
- TYPE 6 JUNCTION BOX (TRAFFIC BEARING)
- TYPE 8 JUNCTION BOX
- NEMA JUNCTION BOX
- NEMA JUNCTION BOX (UNDERDECK LUMINAIRE)
- ELECTRICAL SERVICE CABINET
- CONTROLLER CABINET
- TYPE 2 SIGNAL STANDARD
- TYPE 3 SIGNAL POLE
- LUMINAIRE STANDARD
- CONDUIT

0 50 100
SCALE IN FEET

CONSTRUCTION NOTES

(1) LUMINAIRE TO BE INSTALLED ON GRADE

LUMINAIRE SCHEDULE								SERVICE NO S*** ****
LUMINAIRE NUMBER	CIRCUIT	LOCATION STATION	LOCATION OFFSET	WATTAGE	MAST ARM	H1	BASE TYPE	COMMENTS
40	A	E 81+00	10 0 RT	400W	16	50	*	ON RETAINING WALL
41	A	E 83+12	9 7 RT	400W	16	50	*	ON RETAINING WALL

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TIME	11 41 50 AM
DATE	10/29/2009
PLOTTED BY	huah
DESIGNED BY	S KOV
ENTERED BY	H TRINH
CHECKED BY	A MOSTOWFY
PROJ ENGR	D EDWARDS
REGIONAL ADM	L ENG

REVISION | DATE | BY

REGION NO 10 | STATE WASH | FED AID PROJ NO
JOB NUMBER
CONTRACT NO | LOCATION NO

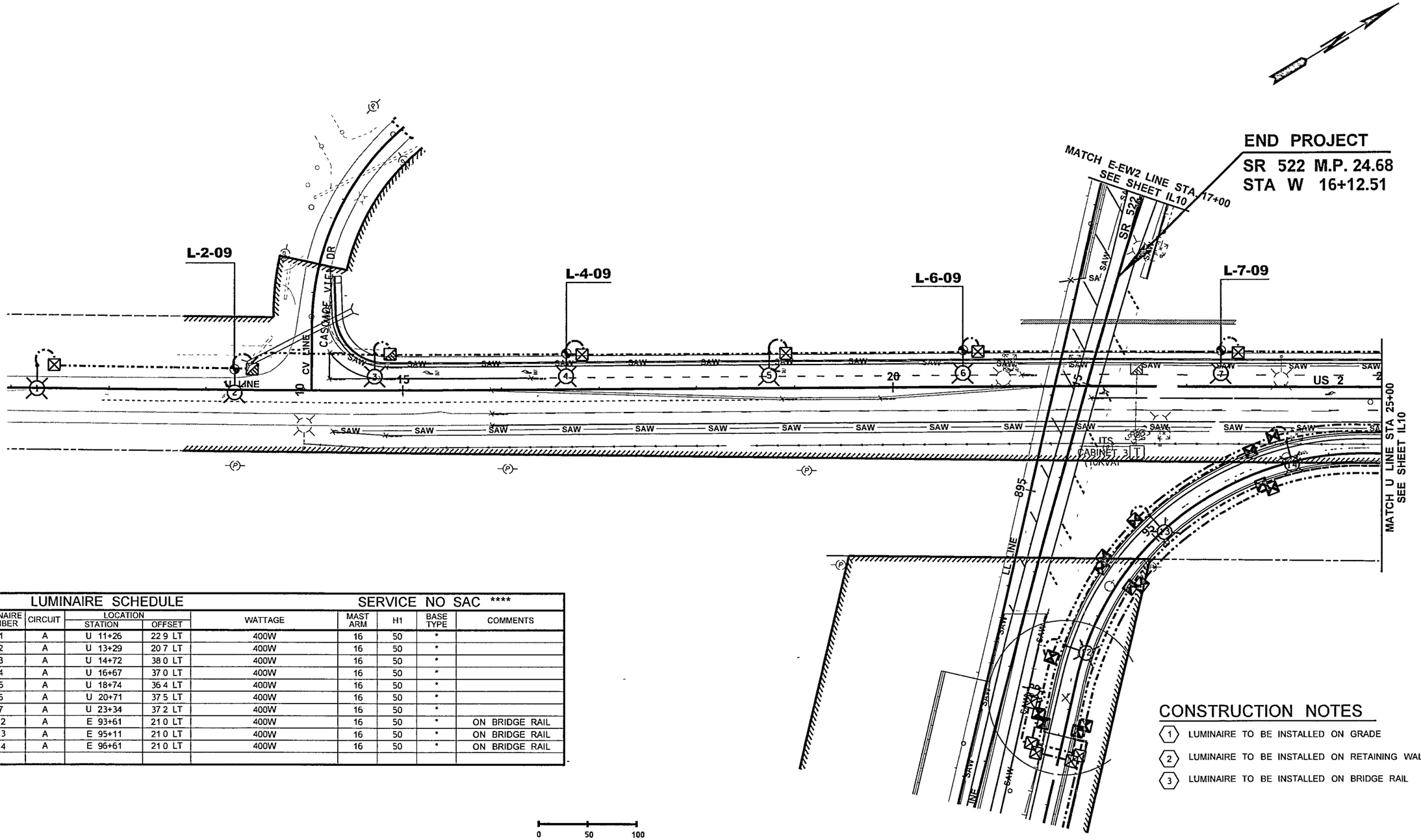
P E STAMP BOX DATE
P E STAMP BOX DATE

Washington State Department of Transportation

SR 522
SNOHOMISH RIVER BRIDGE TO US 2
SNOHOMISH COUNTY

BORING LOCATION PLAN

Plot 2
IL2
SHEET 1 OF 4 SHEETS



LUMINAIRE SCHEDULE — SERVICE NO SAC ****

LUMINAIRE NUMBER	CIRCUIT	LOCATION STATION	LOCATION OFFSET	WATTAGE	MAST ARM	H1	BASE TYPE	COMMENTS
1	A	U 11+26	22 9 LT	400W	16	50	*	
2	A	U 13+29	20 7 LT	400W	16	50	*	
3	A	U 14+72	38 0 LT	400W	16	50	*	
4	A	U 16+67	37 0 LT	400W	16	50	*	
5	A	U 18+74	36 4 LT	400W	16	50	*	
6	A	U 20+71	37 5 LT	400W	16	50	*	
7	A	U 23+34	37 2 LT	400W	16	50	*	
12	A	E 93+61	21 0 LT	400W	16	50	*	ON BRIDGE RAIL
13	A	E 95+11	21 0 LT	400W	16	50	*	ON BRIDGE RAIL
14	A	E 96+61	21 0 LT	400W	16	50	*	ON BRIDGE RAIL

CONSTRUCTION NOTES

1. LUMINAIRE TO BE INSTALLED ON GRADE
2. LUMINAIRE TO BE INSTALLED ON RETAINING WALL
3. LUMINAIRE TO BE INSTALLED ON BRIDGE RAIL

0 50 100
SCALE IN FEET

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DATE	10/29/2009
PLOTTED BY	huah
DESIGNED BY	S KOV
ENTERED BY	H TRINH
CHECKED BY	A MOSTOWFY
PROJ ENGR	D EDWARDS
REGIONAL ADM	L ENG

REVISION | DATE | BY

REGION NO 10 | STATE WASH | FED AID PROJ NO
JOB NUMBER
CONTRACT NO | LOCATION NO

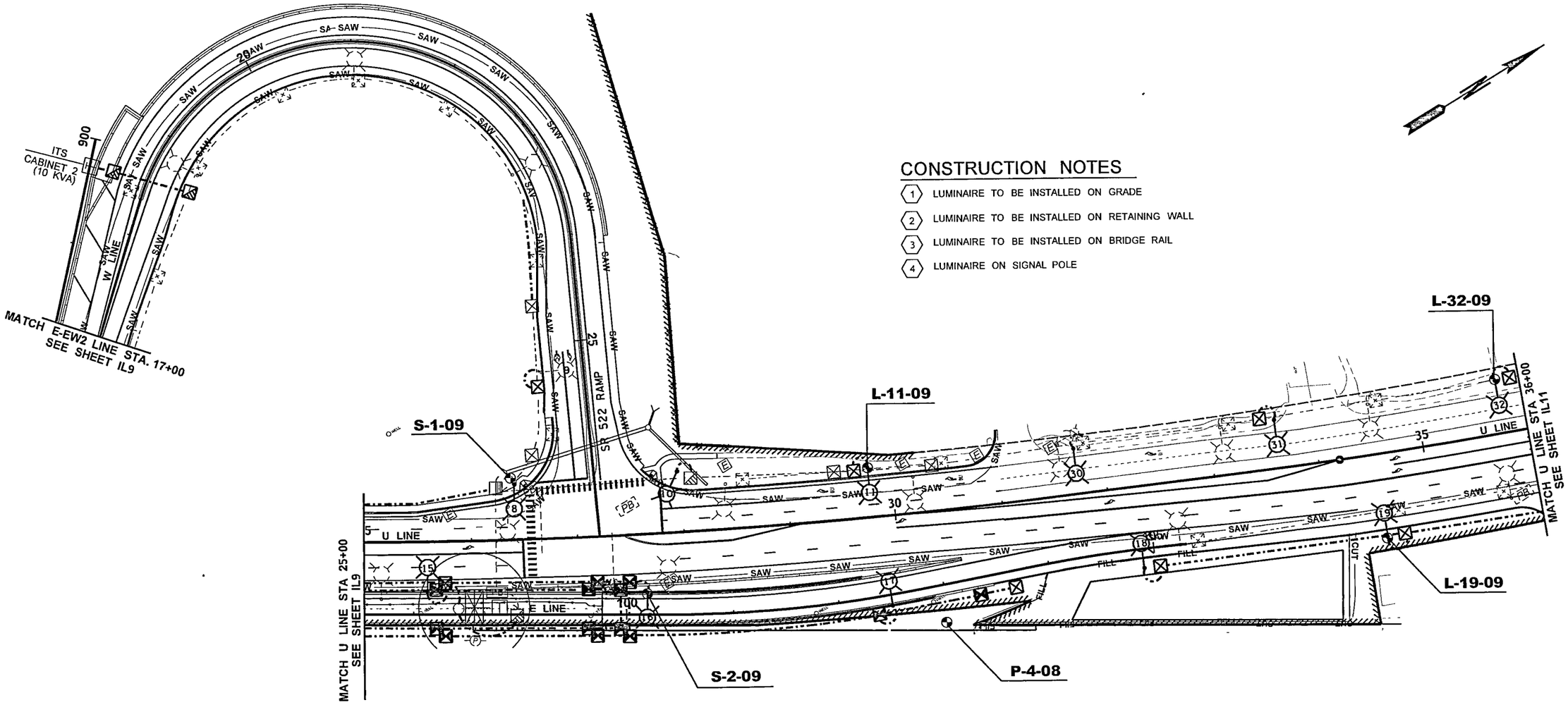
P E STAMP BOX DATE
P E. STAMP BOX DATE

Washington State Department of Transportation

SR 522
SNOHOMISH RIVER BRIDGE TO US 2
SNOHOMISH COUNTY

BORING LOCATION PLAN

Plot 3
IL3
SHEET 2 OF 4 SHEETS



CONSTRUCTION NOTES

1. LUMINAIRE TO BE INSTALLED ON GRADE
2. LUMINAIRE TO BE INSTALLED ON RETAINING WALL
3. LUMINAIRE TO BE INSTALLED ON BRIDGE RAIL
4. LUMINAIRE ON SIGNAL POLE

LUMINAIRE SCHEDULE — CITY OF MONROE SERVICE CABINET

LUMINAIRE NUMBER	CIRCUIT	LOCATION STATION	LOCATION OFFSET	WATTAGE	MAST ARM	H1	BASE TYPE	COMMENTS
18	1	E 104+89	18 0 RT	400W	16	50	FIXED	
19	1	U 34+54	79 2 RT	400W	16	50	FIXED	
30	2	U 31+73	42 8 LT	400W	16	50	FIXED	
31	2	U 33+63	45 8 LT	400W	16	50	FIXED	
32	2	U 35+77	49 8 LT	400W	16	50	FIXED	

LUMINAIRE SCHEDULE — SERVICE NO SAC ****

LUMINAIRE NUMBER	CIRCUIT	LOCATION STATION	LOCATION OFFSET	WATTAGE	MAST ARM	H1	BASE TYPE	COMMENTS
8	A	U 26+43	49 0 LT	400W	16	50	FIXED	ON SIGNAL POLE
9	A	W 25+26	40 0 RT	EX 400W	EX 16	EX 50	EX	
10	A	U 27+97	57 4 LT	400W	16	50	FIXED	*
11	A	U 29+77	46 9 LT	400W	16	50	FIXED	
15	C	E 98+13	21 0 LT	400W	16	50	FIXED	ON BRIDGE RAIL
16	C	E 100+20	20 9 LT	400W	16	50	FIXED	ON RETAINING WALL
17	C	E 102+50	10 3 RT	400W	16	50	FIXED	ON RETAINING WALL

* ROTATE 30° CLOCKWISE FROM THE OFFSET

0 50 100
SCALE IN FEET

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DATE	10/29/2009
PLOTTED BY	huah
DESIGNED BY	S KOV
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PROJ ENGR	D EDWARDS
REGIONAL ADM	L ENG

REVISION | DATE | BY

REGION NO 10 | STATE WASH | FED AID PROJ NO
JOB NUMBER
CONTRACT NO | LOCATION NO

DATE
P E STAMP BOX

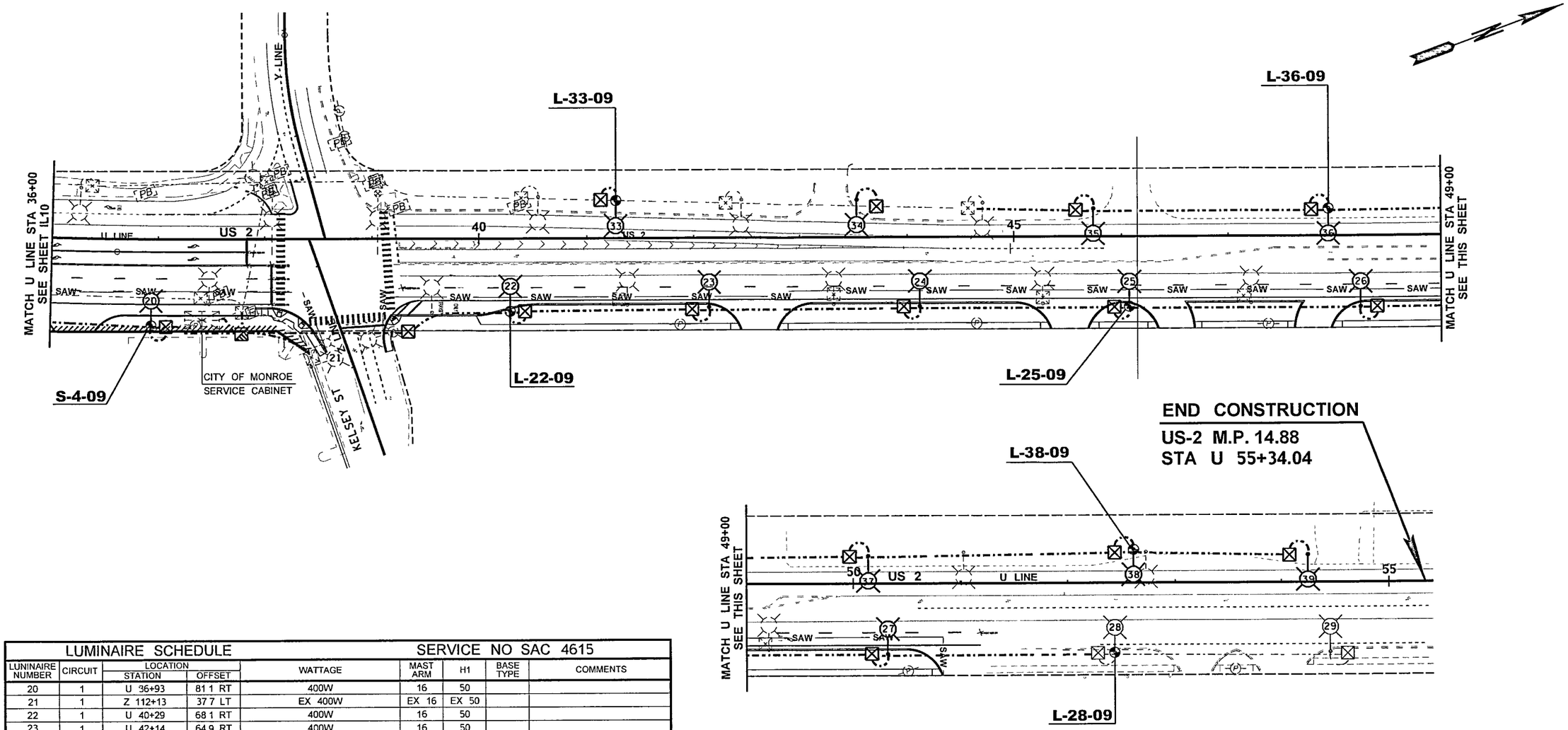
DATE
P E STAMP BOX

Washington State Department of Transportation

SR 522
SNOHOMISH RIVER BRIDGE TO US 2
SNOHOMISH COUNTY

BORING LOCATION PLAN

Plot 4
IL4
SHEET 3 & 4 SHEETS



LUMINAIRE SCHEDULE — SERVICE NO SAC 4615

LUMINAIRE NUMBER	CIRCUIT	LOCATION STATION	LOCATION OFFSET	WATTAGE	MAST ARM	H1	BASE TYPE	COMMENTS
20	1	U 36+93	81 1 RT	400W	16	50		
21	1	Z 112+13	37 7 LT	EX 400W	EX 16	EX 50		
22	1	U 40+29	68 1 RT	400W	16	50		
23	1	U 42+14	64 9 RT	400W	16	50		
24	1	U 44+12	64 7 RT	400W	16	50		
25	1	U 46+07	65 7 RT	400W	16	50		
26	1	U 48+25	66 4 RT	400W	16	50		
27	1	U 50+32	66 0 RT	400W	16	50		
28	1	U 52+44	65 3 RT	400W	16	50		
29	1	U 54+46	65 3 RT	400W	16	50		
33	2	U 41+27	34 9 LT	400W	16	50		
34	2	U 43+53	35 0 LT	400W	16	50		
35	2	U 45+74	26 0 LT	400W	16	50		
36	2	U 47+95	25 4 LT	400W	16	50		
37	2	U 50+14	25 9 LT	400W	16	50		
38	2	U 52+61	31 0 LT	400W	16	50		
39	2	U 54+25	25 8 LT	400W	16	50		

CONSTRUCTION NOTES

1. LUMINAIRE TO BE INSTALLED ON GRADE
5. LUMINAIRE TO BE REPLACED ON THE EXISTING FOUNDATION

0 50 100
SCALE IN FEET

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DATE	10/29/2009
PLOTTED BY	huah
DESIGNED BY	S KOV
ENTERED BY	H TRINH
CHECKED BY	A MOSTOWFY
PROJ ENGR	D EDWARDS
REGIONAL ADM	L ENG

REVISION | DATE | BY

REGION NO 10 | STATE WASH | FED AID PROJ NO
JOB NUMBER
CONTRACT NO | LOCATION NO

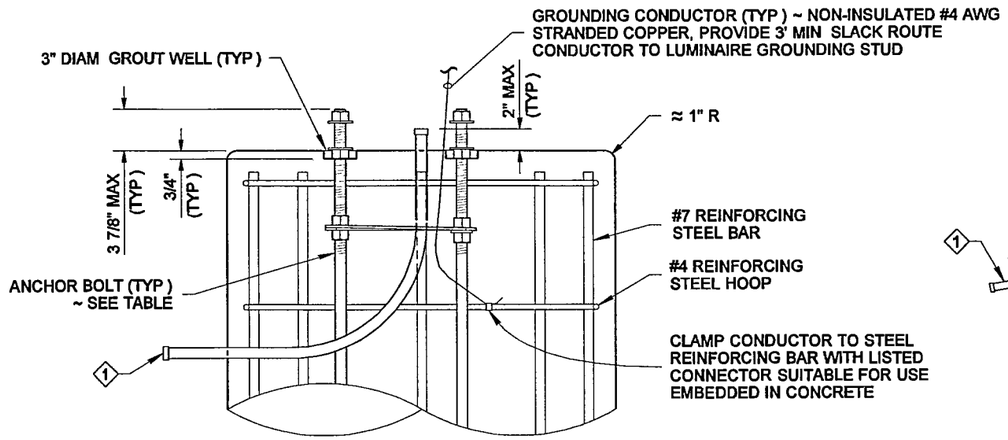
P E STAMP BOX DATE
P E STAMP BOX DATE

Washington State Department of Transportation

SR 522
SNOHOMISH RIVER BRIDGE TO US 2
SNOHOMISH COUNTY

BORING LOCATION PLAN

Plot 5
IL5
SHEET 4 OF 4 SHEETS

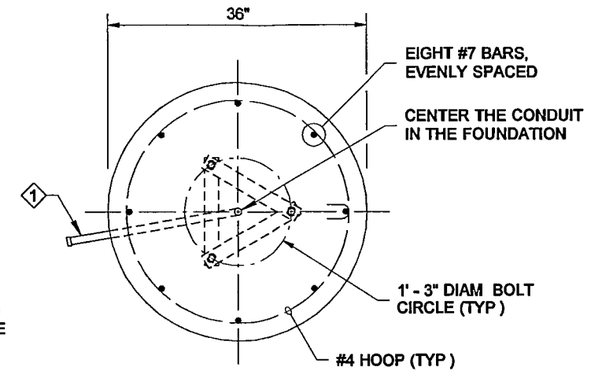


SEE **FIXED BASE** FOR DETAILS NOT SHOWN

PARTIAL ELEVATION VIEW

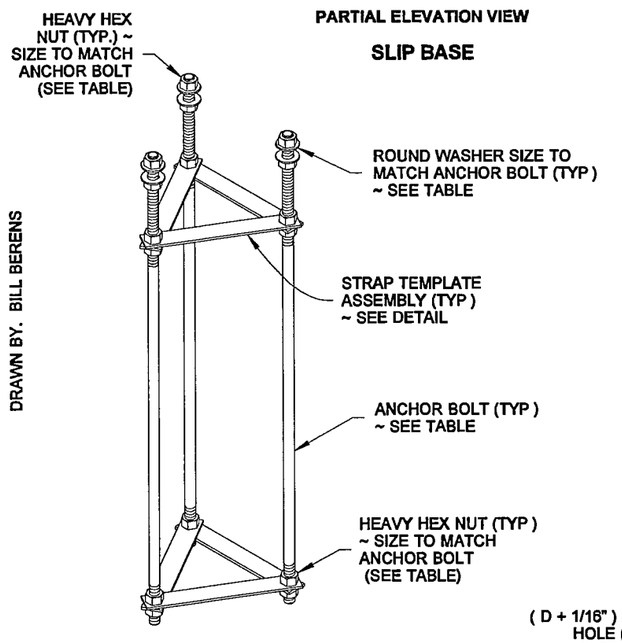
SLIP BASE

1 1" DIAM CONDUIT ~ CAP EACH END PROVIDE ADDITIONAL CONDUIT FOR COMMUNICATION OR SIGNAL CABLE WHERE SHOWN IN THE CONTRACT



TOP VIEW

FIXED BASE



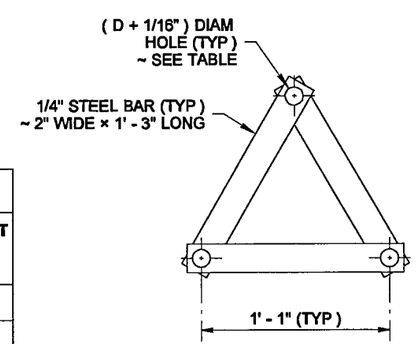
ISOMETRIC VIEW

ANCHOR BOLT ASSEMBLY

(SLIP BASE SHOWN)

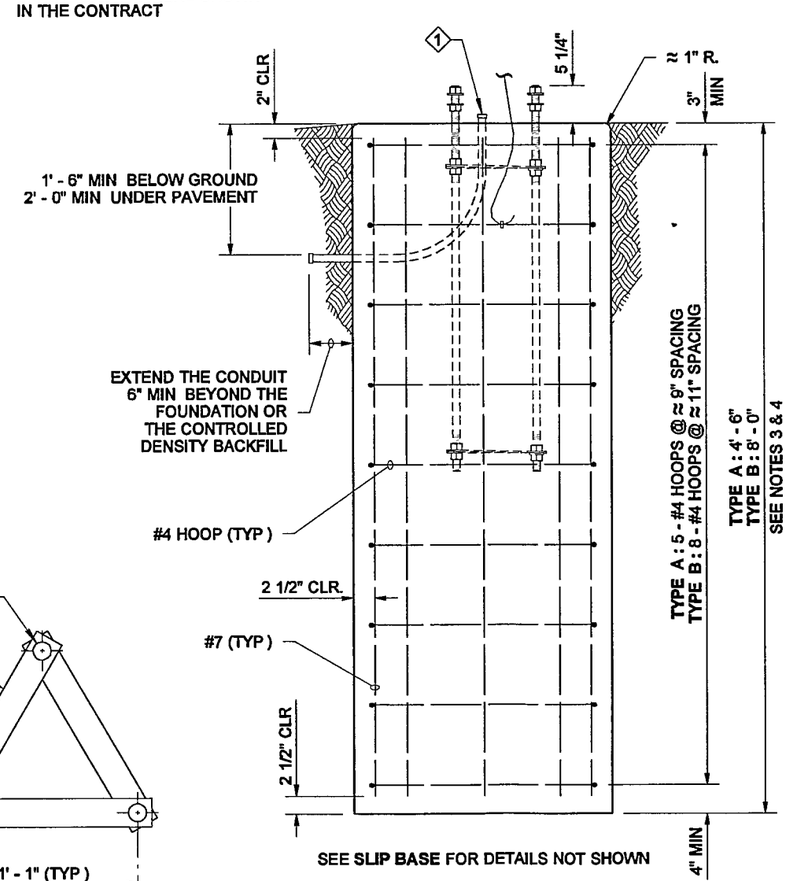
DRAWN BY. BILL BERENS

ANCHOR BOLT TABLE			
LUMINAIRE HEIGHT (H1)	MAST ARM TYPE	MAST ARM LENGTH	ANCHOR BOLT DIAMETER " D "
20' TO 50'	SINGLE	6' TO 16'	1"
20' TO 50'	DOUBLE	6' TO 8'	1"
20' TO 45'	DOUBLE	10' TO 16'	1"
46' TO 50'	DOUBLE	10' TO 16'	1 1/8"



TOP VIEW

STRAP TEMPLATE ASSEMBLY



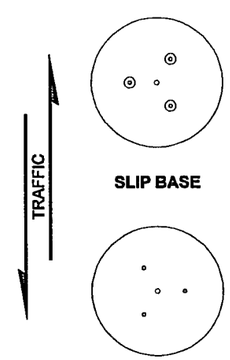
SEE **SLIP BASE** FOR DETAILS NOT SHOWN

ELEVATION VIEW

FIXED BASE

NOTES

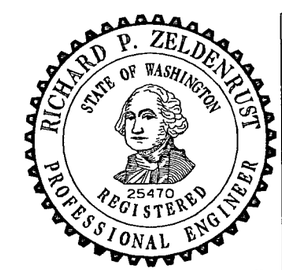
1. See **Standard Plan J-28.40** for luminaire pole base mounting details.
2. The Strap Templates shall be held in place by nuts, 6" from the top of the foundation and 3" from the bottom of the anchor bolts. 18 heavy duty hex nuts and 6 round washers are required for a Slip Base assembly. 18 heavy duty hex nuts and 6 plate washers are required for a Fixed Base assembly.
3. Use Steel Light Standard Foundation **Type A** on level ground or slopes not exceeding 4H.1V. Use **Type B** for slopes steeper than 4H:1V, but not exceeding 2H.1V. Slopes steeper than 2H:1V shall require a special design.
4. These foundations are designed for a minimum of 2,000 PSF (**TYPE A**) or 1,500 PSF (**TYPE B**) allowable lateral bearing pressure for the soil A special foundation shall be required for soil with lower allowable lateral bearing pressure than 1,500 PSF
5. The Luminaire Pole height shall not exceed 50' (H1)
6. Slip Bases shall not be installed on 50' (H1) poles with Double Mast Arms, nor on poles weighing more than 1000 lbs.
7. Slip Bases are not required on poles placed outside of the Design Clear Zone, nor on poles installed behind traffic barrier.
8. Foundations constructed within Ecology Embankments shall be increased in depth by the depth of the Ecology Embankment
9. Exposed portions of the foundation shall be formed to create a smooth finished surface All forming shall be removed upon completion of foundation construction
10. For excavation, concrete placement, and backfill options, see METHOD 1 and METHOD 2 on Sheet 2 of 2
11. The Anchor Bolts shall be high strength steel, manufactured from ASTM A449, with heavy hex nuts and hardened washers Galvanize the Anchor Bolts according to AASHTO M232.
12. The foundation shall meet the requirements of Standard Specification Sect 8-20 3(9)
13. See Standard Plan C-8b and C-14h for steel light standards on traffic barrier



SLIP BASE

FIXED BASE

ANCHOR BOLT LAYOUT



EXPIRES NOVEMBER 14, 2008

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE OF THE ORIGINAL SIGNED PLAN FILE AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST.

STEEL LIGHT STANDARD FOUNDATION TYPES A & B

STANDARD PLAN J-28.30-00

SHEET 1 OF 2 SHEETS

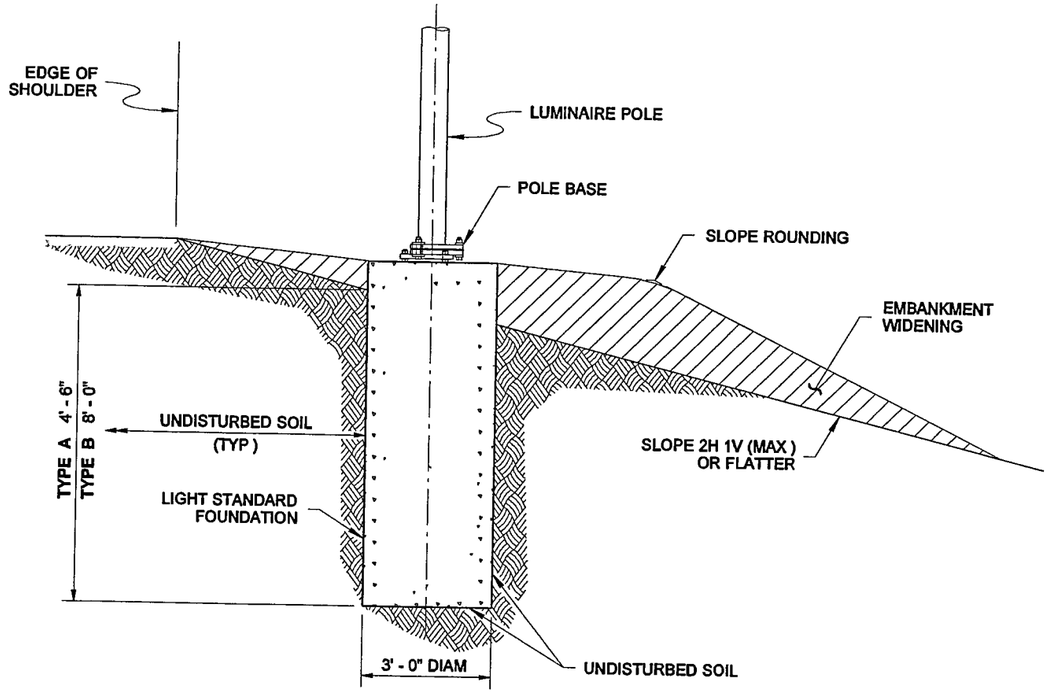
APPROVED FOR PUBLICATION

Pasco Bakotich III — STATE DESIGN ENGINEER

08-07-07 — DATE

Washington State Department of Transportation

DRAWN BY BILL BERENS



(CASE A SHOWN)

METHOD 1

NO SUBSURFACE FORM

This option is only used when the existing soil in the hole will remain standing and the cement concrete can be placed without causing the soil to collapse Concrete shall be cast directly against undisturbed soil

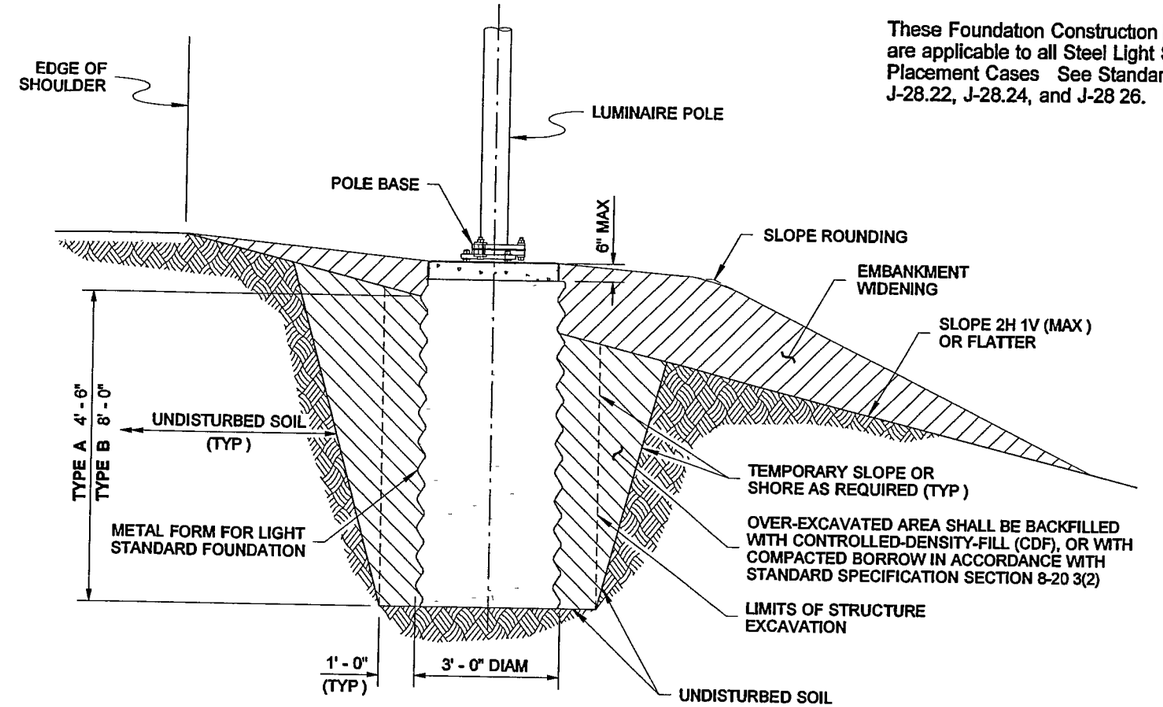
Auger the hole for the foundation Use paper or cardboard form to achieve a smooth finish on the final exposed cement concrete Support the form as necessary to remain plumb

See Standard Plans J-28 24 and J-28 26 for maximum heights of exposed foundation when no embankment widening is to be installed

Place the concrete foundation

After concrete has cured, remove the paper or cardboard form portion

Construct the embankment widening (if required)



(CASE A SHOWN)

METHOD 2

METAL (SUBSURFACE) FORM REQUIRED

When the existing soil will not retain a vertical face, over-excavate the foundation area and install a 36" diameter, corrugated metal (pipe) form. The corrugated metal form shall not extend more than 6" below any portion of the foundation that will remain exposed upon final grading Continue forming to full height using paper or cardboard form to achieve a smooth finish on final exposed cement concrete. Support the form as necessary to remain plumb

See Standard Plans J-28 24 and J-28 26 for maximum heights of exposed foundation when no embankment widening is to be installed

Place the concrete foundation

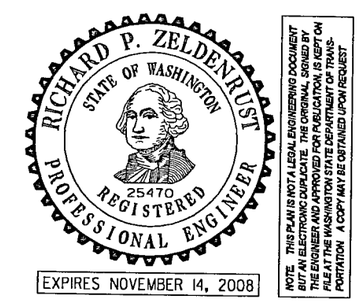
After concrete has cured, remove the paper or cardboard form portion

Backfill with controlled-density fill or compacted borrow in accordance with Standard Specification 8-20 3(2).

Construct the embankment widening (if required).

NOTES

These Foundation Construction Methods are applicable to all Steel Light Standard Placement Cases See Standard Plans J-28.22, J-28.24, and J-28 26.



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STEEL LIGHT STANDARD FOUNDATION TYPES A & B

STANDARD PLAN J-28.30-00

SHEET 2 OF 2 SHEETS

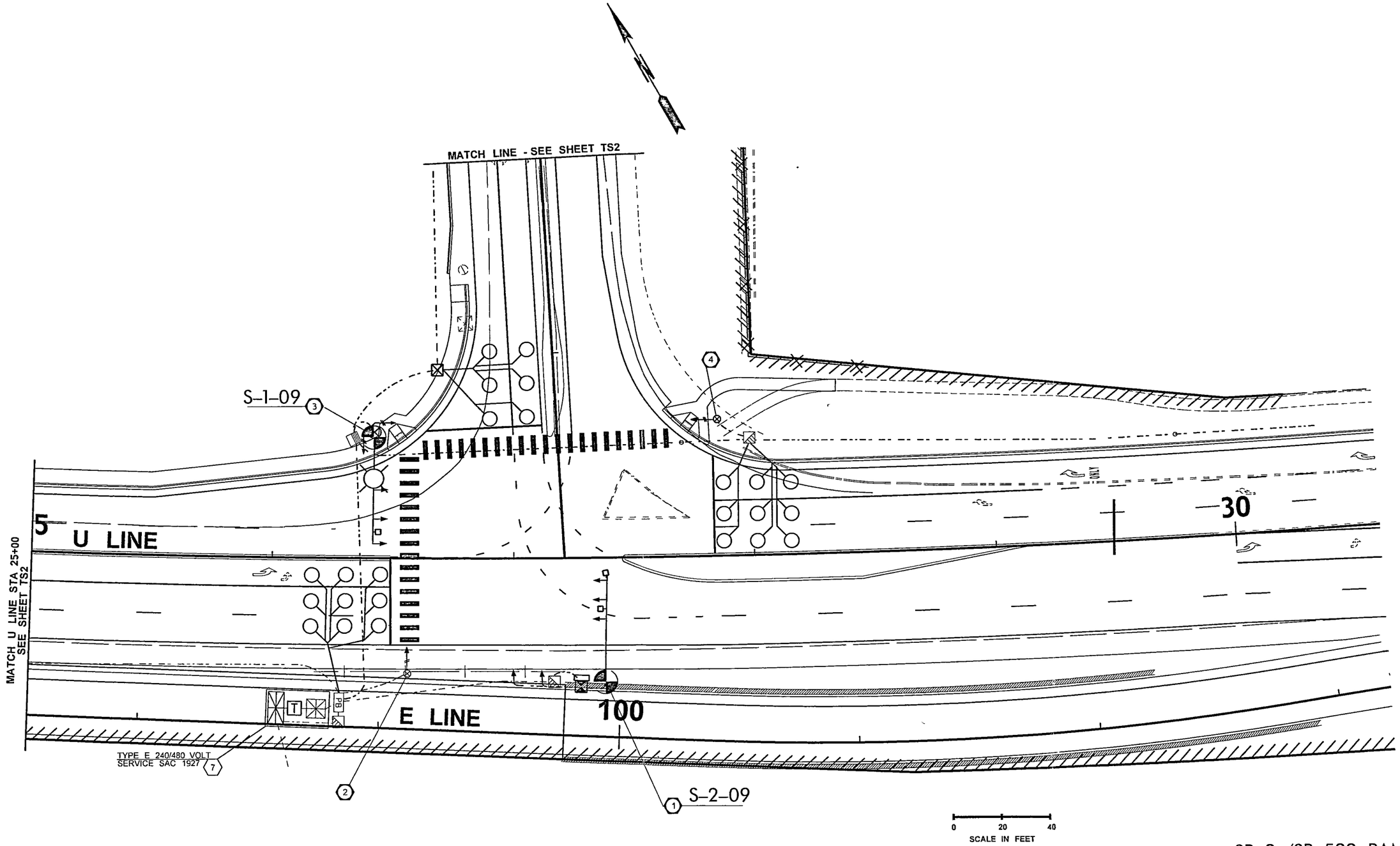
APPROVED FOR PUBLICATION

Pasco Bakotich III — STATE DESIGN ENGINEER

08-07-07 — DATE

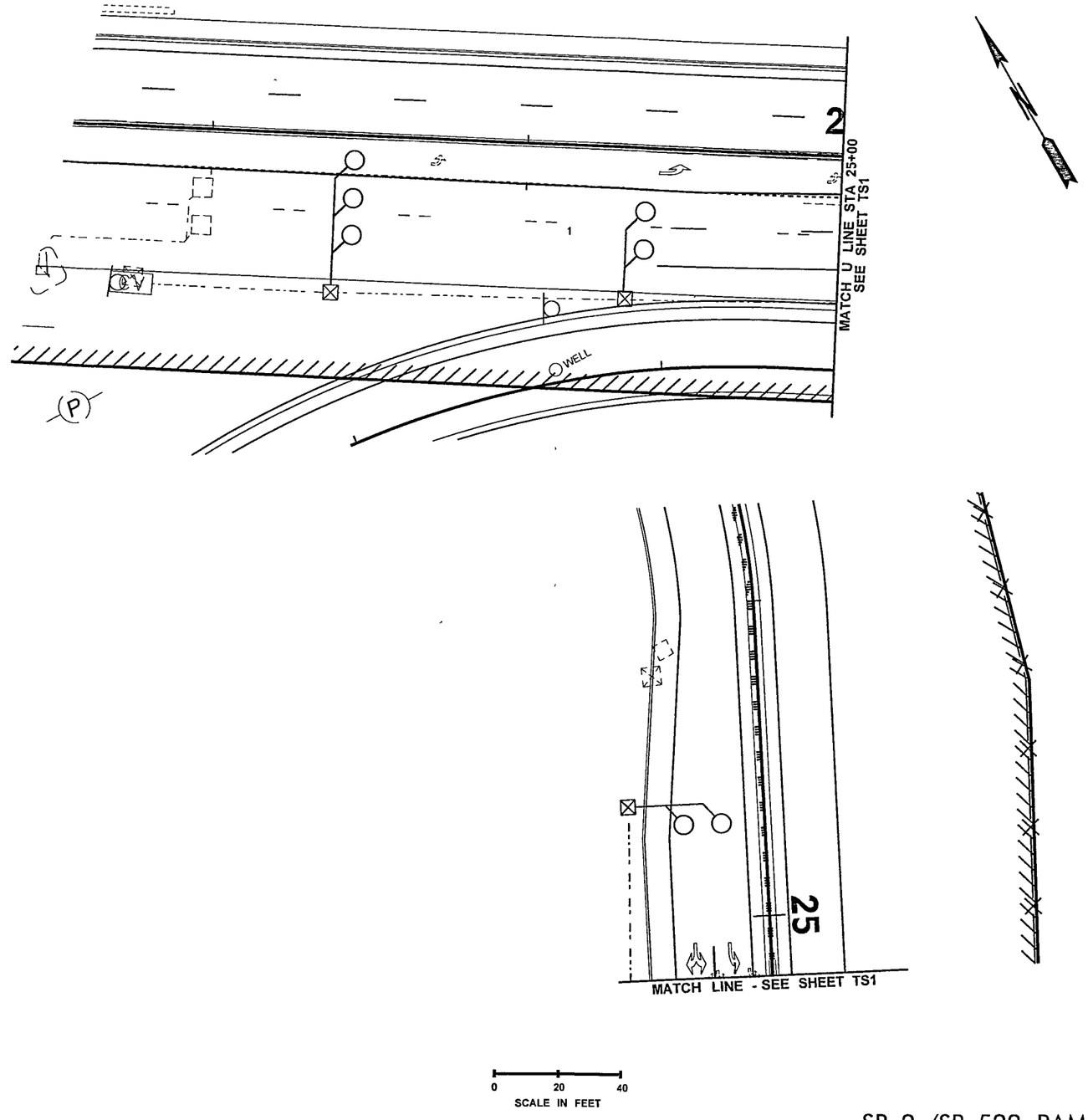
Washington State Department of Transportation

CONSTRUCTION METHODS



SR 2 /SR 522 RAMPS

	C \Documents and Settings\huah\Desktop\3591SIGSH dgn				REGION NO	STATE	FED AID PROJ NO			Plot 1
TIME	11 08 24 AM				10	WASH		Washington State Department of Transportation	SR 522 SNOHOMISH RIVER BRIDGE TO US 2 SNOHOMISH COUNTY	TS1
DATE	10/23/2009				JOB NUMBER					SHEET
PLOTTED BY	huah									OF
DESIGNED BY	A SCHAFI									SHEETS
ENTERED BY	H TRINH				CONTRACT NO		LOCATION NO		TRAFFIC SIGNAL PLAN	
CHECKED BY	A MOSTOWFY									
PROJ ENGR	D EDWARDS									
REGIONAL ADM	L ENG	REVISION	DATE	BY				P E STAMP BOX DATE	P E STAMP BOX DATE	



SR 2 /SR 522 RAMPS

FILE NAME	C \Documents and Settings\huah\Desktop\3591SIGSH dgn								
TIME	10 09 20 AM				REGION NO	STATE	FED AID PROJ NO		
DATE	10/23/2009				10	WASH			
PLOTTED BY	huah				JOB NUMBER				
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ENTERED BY	H TRINH								
CHECKED BY	A MOSTOWFY				CONTRACT NO		LOCATION NO		
PROJ ENGR	D EDWARDS								
REGIONAL ADM	L ENG	REVISION	DATE	BY					

P E STAMP BOX DATE

P E STAMP BOX DATE

Washington State Department of Transportation

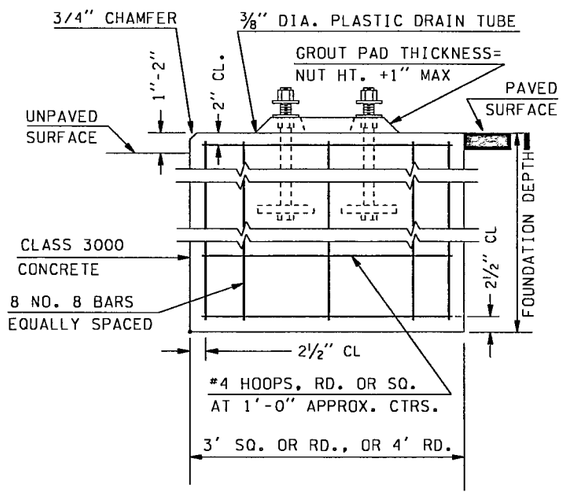
SR 522
SNOHOMISH RIVER BRIDGE TO US 2
SNOHOMISH COUNTY

TRAFFIC SIGNAL PLAN

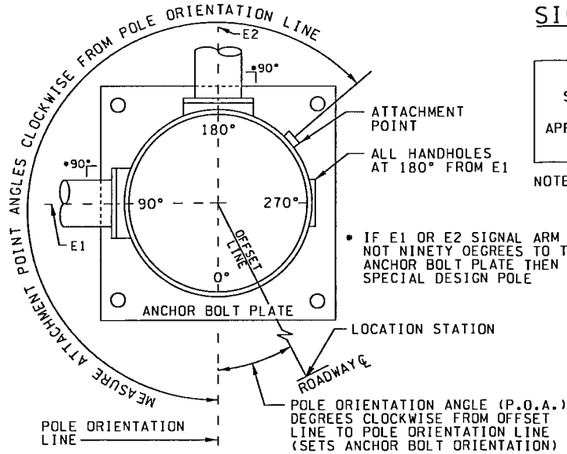
Plot 2
TS2
SHEET OF SHEETS

FOUNDATION DEPTH TABLE							
ALLOWABLE LATERAL BEARING PRESSURE (psf)	FOUNDATION TYPE	XYZ (CUBIC FEET) TYPE II, III AND SD MAST ARM STANDARDS					
		600	900	1,200	1,500	1,900	2,300
1,000	3' ROUND	10	10	11'	11	13	15
	3 SQUARE	8'	8'	9'	9'	10	11'
	4' ROUND	8	8'	9'	9'	10	11
1,500	3 ROUND	8'	8	9'	11'	13	15'
	3' SQUARE	7'	7	7'	8	8'	9'
	4' ROUND	7	7'	7	8	8	9
2,500	3 ROUND	6	6'	7'	11'	13'	15'
	3' SQUARE	6'	6	6'	6'	7	7'
	4 ROUND	6'	6'	6'	6'	7'	7'

THIS TABLE BASED ON A Ø VALUE OF 26°. FOR DOUBLE MAST ARM STANDARDS WITH 90° BETWEEN ARMS, USE THE LARGER XYZ VALUE FOR FOUNDATION DEPTH SELECTION. A SPECIAL FOUNDATION DESIGN IS REQUIRED FOR DOUBLE ARM STANDARDS IF THE ANGLE IS NOT 90°

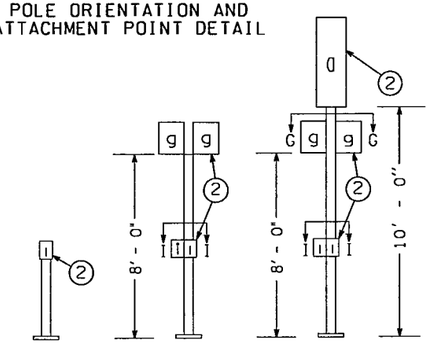


FOUNDATION DETAIL



• IF E1 OR E2 SIGNAL ARM IS NOT NINETY DEGREES TO THE ANCHOR BOLT PLATE THEN SPECIAL DESIGN POLE

POLE ORIENTATION AND ATTACHMENT POINT DETAIL

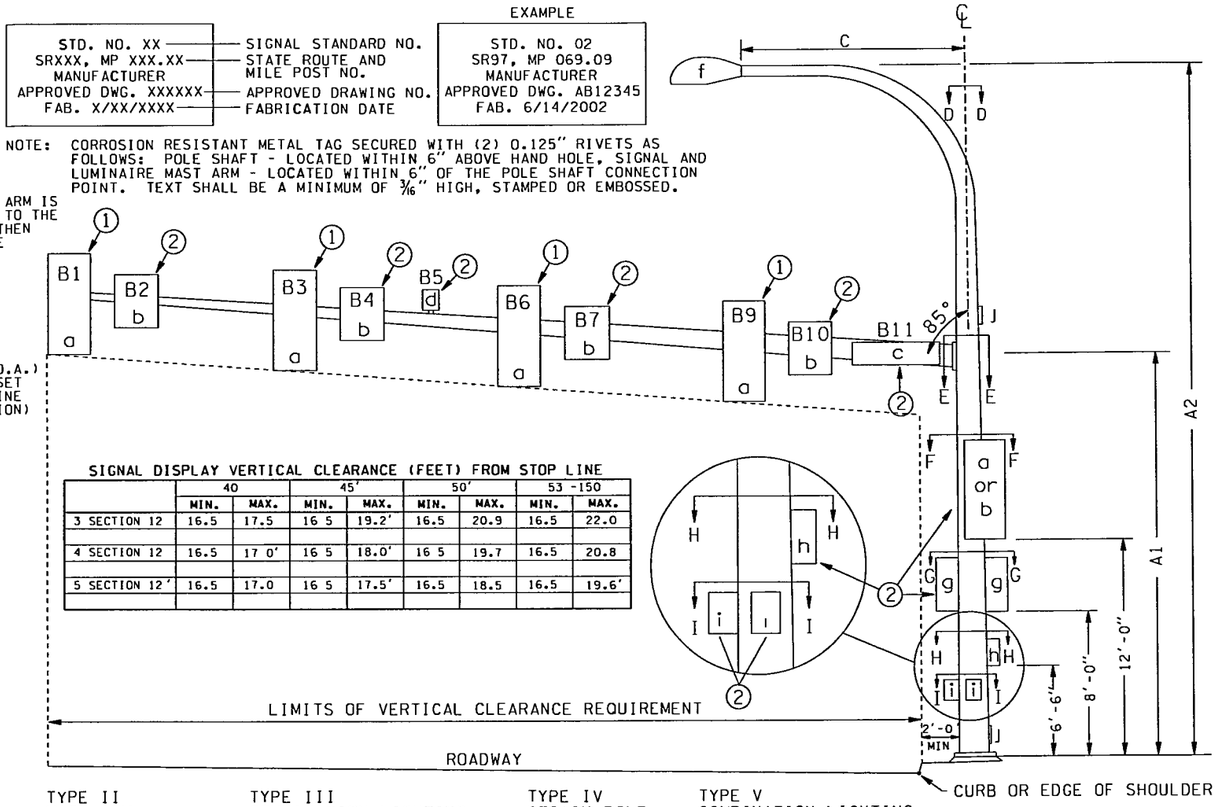


TYPE PPB PPB POST | TYPE PS PED. HEAD STANDARD | TYPE I VEHICLE HEAD STANDARD

SIGNAL STANDARD IDENTIFICATION TAG DETAIL

		EXAMPLE
STD. NO. XX	SIGNAL STANDARD NO.	STD. NO. 02
SRXXX, MP XXX.XX	STATE ROUTE AND MILE POST NO.	SR97, MP 069.09
MANUFACTURER		MANUFACTURER
APPROVED DWG. XXXXXX	APPROVED DRAWING NO.	APPROVED DWG. AB12345
FAB. X/XX/XXXX	FABRICATION DATE	FAB. 6/14/2002

NOTE: CORROSION RESISTANT METAL TAG SECURED WITH (2) 0.125" RIVETS AS FOLLOWS: POLE SHAFT - LOCATED WITHIN 6" ABOVE HAND HOLE, SIGNAL AND LUMINAIRE MAST ARM - LOCATED WITHIN 6" OF THE POLE SHAFT CONNECTION POINT. TEXT SHALL BE A MINIMUM OF 3/16" HIGH, STAMPED OR EMBOSSED.



SIGNAL DISPLAY VERTICAL CLEARANCE (FEET) FROM STOP LINE

	40		45'		50'		53 -150	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
3 SECTION 12	16.5	17.5	16 5	19.2'	16.5	20.9	16.5	22.0
4 SECTION 12	16.5	17 0'	16 5	18.0'	16 5	19.7	16.5	20.8
5 SECTION 12'	16.5	17.0	16 5	17.5'	16.5	18.5	16.5	19.6'

TYPE II MAST ARM SIGNAL STANDARD | TYPE III COMBINATION LIGHTING AND MAST ARM SIGNAL STANDARD | TYPE IV STRAIN POLE STANDARD | TYPE V COMBINATION LIGHTING AND STRAIN POLE STANDARD | TYPE SD SPECIAL DESIGN STANDARD

SIGNAL STANDARD DETAIL CHART

STD No	SR No	SR MILE POST	FIELD LOCATION STATION	OFFSET	LT.	RT.	P O A	TYPE	MOUNTING HEIGHT(FT) A1	A2	SIGNAL MAST ARM DATA: OFFSET DISTANCES (FT) (Z) (POLE ℄ TO ATTACHMENT POINT) B1	B2	B3	B5	B6	B9	B10	B11	WINDLOAD AREAS (FT)² (X)(Y) B1	B2	B3	B6	B9	B10	B11	(X)(Y)(Z) TOTAL(FT)³	LUMINAIRE ARM (FT) C	POLE ATTACHMENT POINT ANGLES (deg) D	E1	E2	F	G1	G2	H	I1	I2	FOUNDATION DEPTHS(FT) 3' RD	3' SQ.	4' RD.	REMARKS
1	2	14 38	27+37	53'		X	0	III	19 0	50	44		36	32	28			6	9 2		9.2	9 2			13 5	1075	16	0	0						135			-			
									19 0		38		28	32				6	11		9 2				13 5	756			270									-			
2	2	14 38	26+54	49'		X	0	PS																									0			0					
3	2	14 38	26+43	49'	X		0	III	19 0	50	43		32	35				6	9 2		9.2				13 5	771	16	0	0			90	180	135	0	270					
4	2	14 38	27+51	36'	X		0	PS																								90			180						

NOTES

(1) MOUNTING COUPLING INSTALLED AT OFFSET DISTANCE INDICATED IN CHART

(2) FIELD INSTALLED

ALTERNATE NOTE 1

FOR TYPE N MOUNT ONLY

DRILL 1" HOLE IN MAST ARM AND INSTALL PLASTIC SPLIT BUSHING FOR CABLE ENTRANCE

• TENON

LEGEND

a Vehicle Display
b. Sign
c. Street Name Sign
d. Pre-Empt Detector
e. Deleted (10/22/90)
f Luminaire
g Pedestrian Display
h Cabinet
i PPB-M
j. Handhole

SR 2 /SR 522 RAMPS

FILE NAME	T \414124\ELECTRICAL\Projects\SR522\XL2042\Signal\3591SIGSH dgn
TIME	7 56 32 AM
DATE	10/23/2009
PLOTTED BY	huah
DESIGNED BY	A SCHAFI
ENTERED BY	H TRINH
CHECKED BY	A MOSTOWFY
PROJ ENGR	D EDWARDS
REGIONAL ADM	L ENG

REVISION | DATE | BY

REGION NO 10 | STATE WASH | FED AID PROJ NO

JOB NUMBER

CONTRACT NO | LOCATION NO

P E STAMP BOX DATE

P E STAMP BOX DATE

Washington State Department of Transportation

SR 522
SNOHOMISH RIVER BRIDGE TO US 2
SNOHOMISH COUNTY

TRAFFIC SIGNAL PLAN

Plot 3
TS3
SHEET OF SHEETS

FOUNDATION DEPTH TABLE							
ALLOWABLE LATERAL BEARING PRESSURE (psf)	FOUNDATION TYPE	XYZ (CUBIC FEET) TYPE II,III AND SD MAST ARM STANDARDS					
		600	900	1,200	1,500	1,900	2,300
1,000	3' ROUND	10	10	11	11	13	15
	3' SQUARE	8	8'	9	9'	10'	11
	4' ROUND	8'	8'	9	9'	10'	11'
1,500	3' ROUND	8	8'	9'	11'	13'	15'
	3' SQUARE	7	7'	7'	8	8	9'
	4' ROUND	7	7	7	8	8	9
2,500	3 ROUND	6'	6'	7	11'	13	15
	3' SQUARE	6	6	6'	6'	7	7'
	4 ROUND	6	6'	6'	6'	7	7

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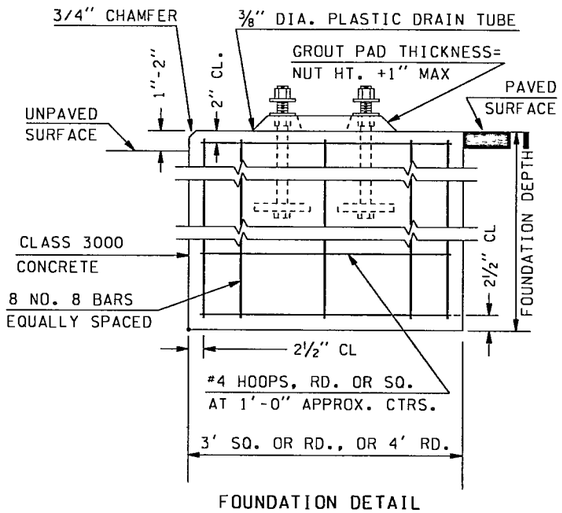
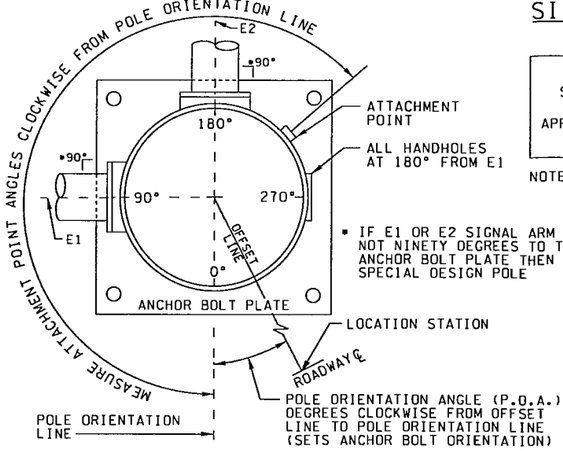


FOUNDATION DETAIL



* IF E1 OR E2 SIGNAL ARM IS NOT NINETY DEGREES TO THE ANCHOR BOLT PLATE THEN SPECIAL DESIGN POLE

POLE ORIENTATION AND ATTACHMENT POINT DETAIL

SIGNAL STANDARD IDENTIFICATION TAG DETAIL

		EXAMPLE
STD. NO. XX	SIGNAL STANDARD NO.	STD. NO. 02
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MANUFACTURER		MANUFACTURER
APPROVED DWG. XXXXXX	APPROVED DRAWING NO.	APPROVED DWG. AB12345
FAB. X/XX/XXXX	FABRICATION DATE	FAB. 6/14/2002

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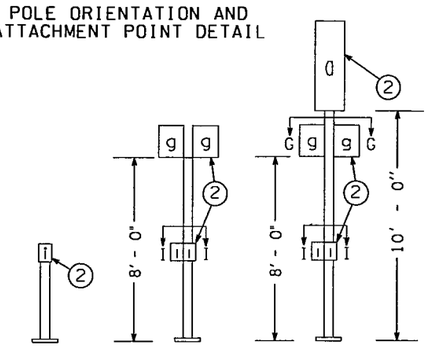
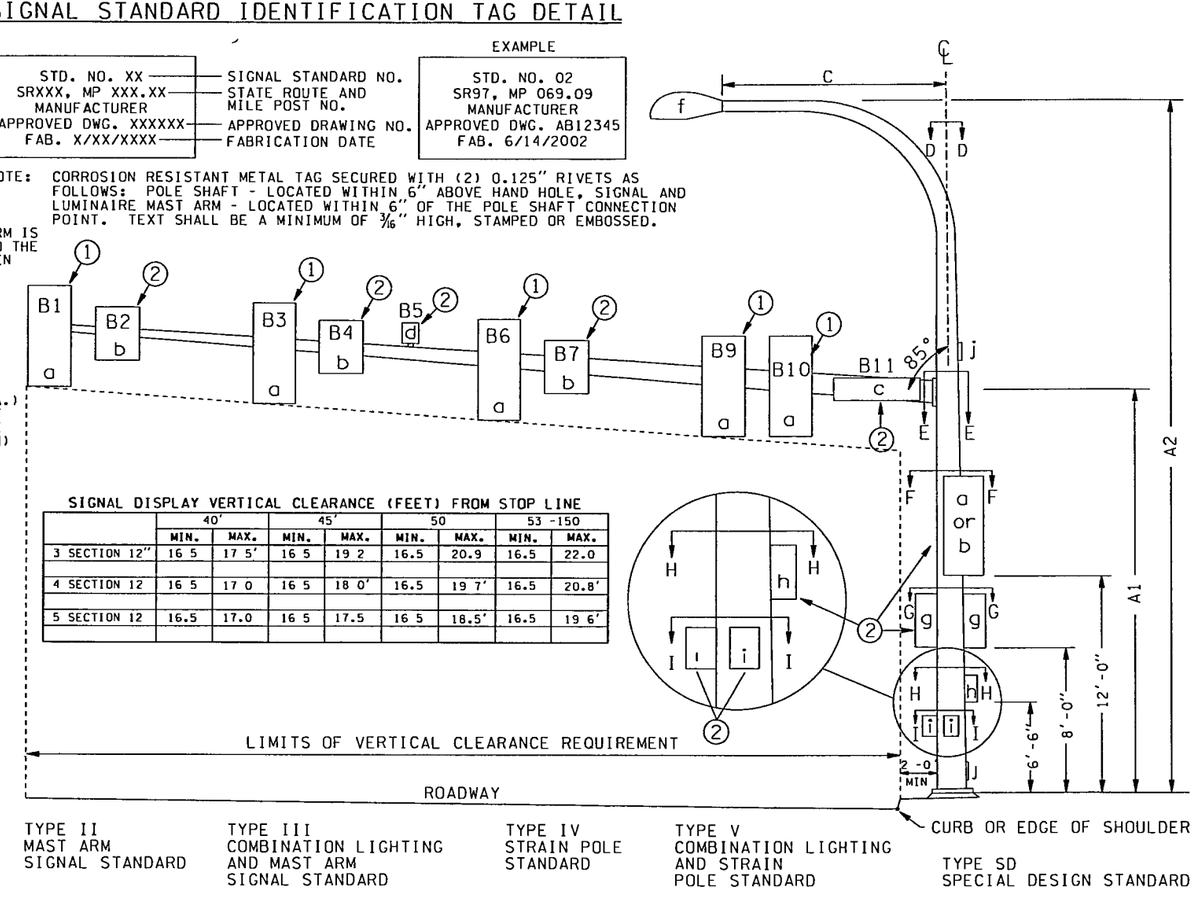


TYPE PPB PPB POST | TYPE PS PED. HEAD STANDARD | TYPE I VEHICLE HEAD STANDARD



SIGNAL DISPLAY VERTICAL CLEARANCE (FEET) FROM STOP LINE

	40'		45'		50		53 -150	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
3 SECTION 12"	16 5	17 5'	16 5	19 2	16.5	20.9	16.5	22.0
4 SECTION 12	16 5	17 0	16 5	18 0'	16.5	19 7'	16.5	20.8'
5 SECTION 12	16.5	17.0	16 5	17.5	16 5	18.5'	16.5	19 6'

TYPE II MAST ARM SIGNAL STANDARD | TYPE III COMBINATION LIGHTING AND MAST ARM SIGNAL STANDARD | TYPE IV STRAIN POLE STANDARD | TYPE V COMBINATION LIGHTING AND STRAIN POLE STANDARD | TYPE SD SPECIAL DESIGN STANDARD

SIGNAL STANDARD DETAIL CHART

STD No	SR No	SR MILE POST	FIELD LOCATION STATION	OFFSET	LT	RT	P O A	TYPE	MOUNTING HEIGHT(FT) A1	A2	SIGNAL MAST ARM DATA: OFFSET DISTANCES (FT) (Z) (POLE ℄ TO ATTACHMENT POINT) B1	B2	B3	B5	B6	B9	B10	B11	WINDLOAD AREAS (FT)² (X)(Y) B1	B2	B3	B6	B9	B10	B11	(X)(Y)(Z) TOTAL(FT)³	LUMINAIRE ARM (FT) C	POLE ATTACHMENT POINT ANGLES (deg) D	E1	E2	F	G1	G2	H	I1	I2	FOUNDATION DEPTHS(FT) 3' RD	3' SQ	4' RD.	REMARKS
1	2	14 57	39+51	75		X	0	II	19 0		65		57	51	45	32		6	9 2		9 2	9 2	9 2		13 5	1911			0						135					
2	2	14 57	39+34	81		X	0	PS																									81	171		0	90				
3	2	14 57	38+23	77		X	0	II	19 0		51*		47	40	43*	39	34*	6	9 2*		14 4	9 2*	9 2	9 2*	13 5	1260			90			180	270	135	0	90				

NOTES

1. MOUNTING COUPLING INSTALLED AT OFFSET DISTANCE INDICATED IN CHART.
2. FIELD INSTALLED

ALTERNATE NOTE 1

FOR TYPE N MOUNT ONLY

DRILL 1" HOLE IN MAST ARM AND INSTALL PLASTIC SPLIT BUSHING FOR CABLE ENTRANCE

* TENON

LEGEND

a. Vehicle Display
b Sign
c. Street Name Sign
d. Pre-Empt Detector
e. Deleted (10/22/90)
f. Luminaire
g Pedestrian Display
h Cabinet
I PPB-M
J. Handhole

SR 2 /KELSEY STREET

FILE NAME	T \414124\ELECTRICAL\Projects\SR522\XL2042\Signal\3591SIGSH dgn
TIME	7 56 33 AM
DATE	10/23/2009
PLOTTED BY	huah
DESIGNED BY	A SCHAFI
ENTERED BY	H TRINH
CHECKED BY	A MOSTOWFY
PROJ ENGR	D EDWARDS
REGIONAL ADM	L ENG

REVISION | DATE | BY

REGION NO 10 | STATE WASH | FED AID PROJ NO

JOB NUMBER

CONTRACT NO | LOCATION NO

P E STAMP BOX DATE

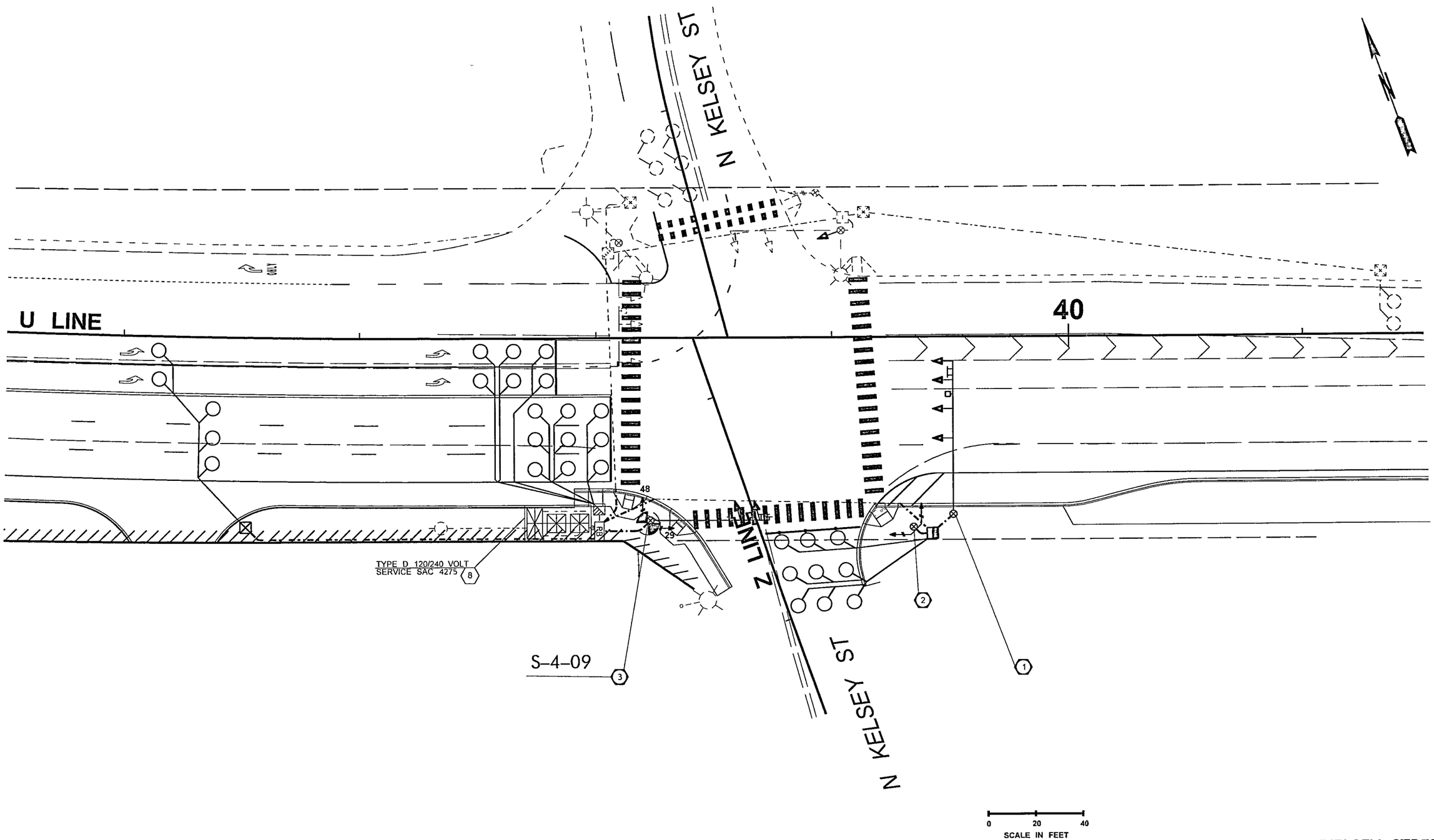
P E STAMP BOX DATE

Washington State Department of Transportation

SR 522
SNOHOMISH RIVER BRIDGE TO US 2
SNOHOMISH COUNTY

TRAFFIC SIGNAL PLAN

Plot 7
TS7
SHEET OF SHEETS



SR 2 /KELSEY STREET

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DATE	10/23/2009				10	WASH				
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DESIGNED BY	A SCHAFI									OF
ENTERED BY	H TRINH									SHEETS
CHECKED BY	A MOSTOWFY				CONTRACT NO		LOCATION NO			
PROJ ENGR	D EDWARDS									
REGIONAL ADM	L ENG	REVISION	DATE	BY						

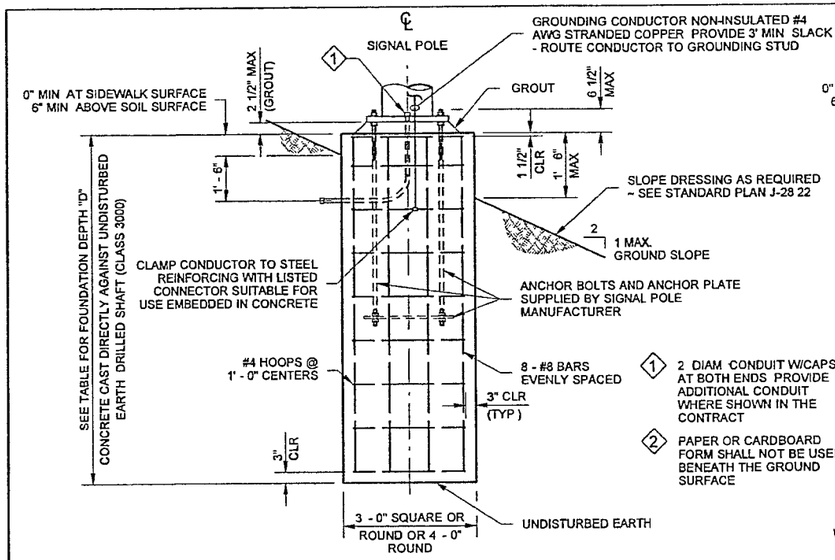
P E STAMP BOX DATE

P E STAMP BOX DATE

Washington State
Department of Transportation

SR 522
SNOHOMISH RIVER BRIDGE TO US 2
SNOHOMISH COUNTY

TRAFFIC SIGNAL PLAN



1 2 DIAM CONDUIT W/CAPS AT BOTH ENDS PROVIDE ADDITIONAL CONDUIT WHERE SHOWN IN THE CONTRACT

2 PAPER OR CARDBOARD FORM SHALL NOT BE USED BENEATH THE GROUND SURFACE

FOUNDATION REINFORCEMENT DETAIL

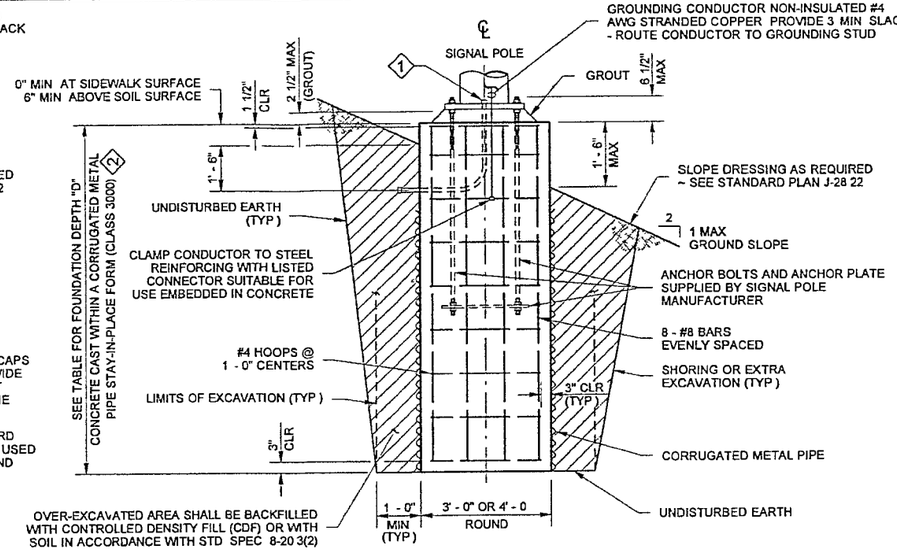
CONCRETE CAST DIRECTLY AGAINST UNDISTURBED EARTH DRILLED SHAFT

ALTERNATE # 1

NTS

NOTE

A TEMPORARY TEMPLATE SHALL BE USED TO HOLD THE ANCHOR BOLT ASSEMBLY SECURELY IN THE PROPER POSITION DURING THE FOUNDATION INSTALLATION



FOUNDATION REINFORCEMENT AND BACKFILL DETAIL

2 CONCRETE CAST WITHIN A CORRUGATED METAL PIPE STAY-IN PLACE FORM

ALTERNATE # 2

NTS

NOTES

1. This structure has been designed according to the 2001 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals with interim revisions through 2006 Design wind velocity is 90 mph and fatigue category III
2. Foundations are designed for Type II, III and SD Signal Standards with a maximum mast arm length of 65'
3. Foundations are designed for Single Mast Arm Standards and Double Mast Arm Standards with 90° between arms Special foundation design is required for Double Arm Standards where the angle between mast arms is other than 90° For Double Mast Arm Standards with 90° between arms, use larger XYZ value for foundation depth selection
4. Foundations not within the parameters of this standard require Special Design Contact WSDOT Bridge and Structures Office for Special Foundation Designs
5. Foundations constructed within Ecology Embankments shall be increased in depth by the depth of the Ecology Embankment
6. Exposed portions of the foundation shall be formed to create a smooth concrete surface All exposed formwork shall be removed upon completion of foundation construction
7. For design parameters between the values listed in Table, depth requirements may be interpolated between the values provided

FOUNDATION DEPTH "D" TABLE

ALTERNATE #1 - DRILLED SHAFT TYPE CONSTRUCTION

FOR LATERAL BEARING PRESSURE = 2500 PSF , Ø = 34° , 1500 PSF , Ø = 28° , 1000 PSF , Ø = 26°

GROUND SLOPE 3H 1V OR FLATTER

ALLOWABLE LATERAL BEARING PRESSURE	FOUNDATION TYPE	XYZ (FT³) 600	900	1200	1500	1900	2300	2700	3100
1000 PSF	3' - 0" ROUND	10' - 0"	10' - 0"	11' - 0"	11' - 0"	15' - 0"	18' - 0"	20' - 0"	20' - 0"
	3' - 0" SQUARE	8' - 0"	8' - 0"	9' - 0"	9' - 0"	10' - 0"	11' - 0"	12' - 0"	12' - 0"
	4' - 0" ROUND	8' - 0"	8' - 0"	9' - 0"	9' - 0"	10' - 0"	11' - 0"	12' - 0"	12' - 0"
1500 PSF	3' - 0" ROUND	8' - 0"	8' - 0"	9' - 0"	11' - 0"	13' - 0"	15' - 0"	18' - 0"	18' - 0"
	3' - 0" SQUARE	7' - 0"	7' - 0"	7' - 0"	8' - 0"	8' - 0"	9' - 0"	10' - 0"	10' - 0"
	4' - 0" ROUND	7' - 0"	7' - 0"	7' - 0"	8' - 0"	8' - 0"	9' - 0"	10' - 0"	10' - 0"
2500 PSF	3' - 0" ROUND	6' - 0"	6' - 0"	7' - 0"	8' - 0"	9' - 0"	11' - 0"	15' - 0"	15' - 0"
	3' - 0" SQUARE	6' - 0"	6' - 0"	6' - 0"	6' - 0"	7' - 0"	7' - 0"	8' - 0"	8' - 0"
	4' - 0" ROUND	6' - 0"	6' - 0"	6' - 0"	6' - 0"	7' - 0"	7' - 0"	8' - 0"	8' - 0"

GROUND SLOPE 2H 1V

ALLOWABLE LATERAL BEARING PRESSURE	FOUNDATION TYPE	XYZ (FT³) 600	900	1200	1500	1900	2300	2700	3100
1000 PSF	3' - 0" ROUND	SPECIAL FOUNDATION DESIGN							
	3' - 0" SQUARE	SPECIAL FOUNDATION DESIGN							
	4' - 0" ROUND	SPECIAL FOUNDATION DESIGN							
1500 PSF	3' - 0" ROUND	11' - 0"	11' - 0"	12' - 0"	14' - 0"	16' - 0"	18' - 0"	21' - 0"	21' - 0"
	3' - 0" SQUARE	10' - 0"	10' - 0"	10' - 0"	11' - 0"	11' - 0"	12' - 0"	13' - 0"	13' - 0"
	4' - 0" ROUND	10' - 0"	10' - 0"	10' - 0"	11' - 0"	11' - 0"	12' - 0"	13' - 0"	13' - 0"
2500 PSF	3' - 0" ROUND	9' - 0"	9' - 0"	10' - 0"	12' - 0"	12' - 0"	14' - 0"	18' - 0"	18' - 0"
	3' - 0" SQUARE	9' - 0"	9' - 0"	9' - 0"	9' - 0"	10' - 0"	10' - 0"	11' - 0"	11' - 0"
	4' - 0" ROUND	9' - 0"	9' - 0"	9' - 0"	9' - 0"	10' - 0"	10' - 0"	11' - 0"	11' - 0"

ALTERNATE #2 - CORRUGATED METAL PIPE TYPE CONSTRUCTION

FOR LATERAL BEARING PRESSURE = 2500 PSF , Ø = 23° , 1500 PSF , Ø = 18° , 1000 PSF , Ø = 17°

$\phi_{cased} = \frac{2}{3}\phi_{no\ casing}$

GROUND SLOPE 3H · 1V OR FLATTER

ALLOWABLE LATERAL BEARING PRESSURE	FOUNDATION TYPE	XYZ (FT³) 600	900	1200	1500	1900	2300	2700	3100
1000 PSF	3' - 0" ROUND	10' - 0"	10' - 0"	11' - 0"	15' - 0"	20' - 0"	25' - 0"	28' - 0"	28' - 0"
	4' - 0" ROUND	8' - 0"	8' - 0"	9' - 0"	12' - 0"	13' - 0"	14' - 0"	15' - 0"	15' - 0"
1500 PSF	3' - 0" ROUND	8' - 0"	8' - 0"	11' - 0"	15' - 0"	18' - 0"	21' - 0"	25' - 0"	25' - 0"
	4' - 0" ROUND	7' - 0"	7' - 0"	7' - 0"	8' - 0"	10' - 0"	13' - 0"	15' - 0"	15' - 0"
2500 PSF	3' - 0" ROUND	6' - 0"	6' - 0"	7' - 0"	11' - 0"	13' - 0"	18' - 0"	20' - 0"	20' - 0"
	4' - 0" ROUND	6' - 0"	6' - 0"	6' - 0"	6' - 0"	7' - 0"	9' - 0"	9' - 0"	9' - 0"

GROUND SLOPE 2H · 1V

ALLOWABLE LATERAL BEARING PRESSURE	FOUNDATION TYPE	XYZ (FT³) 600	900	1200	1500	1900	2300	2700	3100
1000 PSF	3' - 0" ROUND	SPECIAL FOUNDATION DESIGN							
	4' - 0" ROUND	SPECIAL FOUNDATION DESIGN							
1500 PSF	3' - 0" ROUND	11' - 0"	11' - 0"	14' - 0"	18' - 0"	21' - 0"	24' - 0"	28' - 0"	28' - 0"
	4' - 0" ROUND	10' - 0"	10' - 0"	10' - 0"	11' - 0"	13' - 0"	16' - 0"	18' - 0"	18' - 0"
2500 PSF	3' - 0" ROUND	9' - 0"	9' - 0"	10' - 0"	14' - 0"	16' - 0"	21' - 0"	23' - 0"	23' - 0"
	4' - 0" ROUND	9' - 0"	9' - 0"	9' - 0"	9' - 0"	10' - 0"	12' - 0"	12' - 0"	12' - 0"

ALTERNATE #2 - CONSTRUCTION METHOD

METAL (SUBSURFACE) FORM REQUIRED

When the existing soil will not retain a vertical face, over-excavate the foundation area and install a 36" or 48" diameter, corrugated metal (pipe) form The corrugated metal form shall extend 6" below final grading Continue forming to full height using paper or cardboard form to achieve a smooth finish on final exposed cement concrete Support the form as necessary to remain plumb

Place the concrete foundation

After concrete has cured, remove the paper or cardboard form portion

Backfill with controlled-density fill or compacted borrow in accordance with Standard Specification 8-20 3(2)

Construct the embankment widening (if required)

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DATE	12/6/2007
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DESIGNED BY	
ENTERED BY	
CHECKED BY	
PROJ. ENGR.	
REGIONAL ADM.	

REVISION | DATE | BY

REGION NO 10 | STATE WASH | FED.AID PROJ.NO.

JOB NUMBER

CONTRACT NO | LOCATION NO

GUY C. CHANDLER, STATE OF WASHINGTON, 32960, REGISTERED PROFESSIONAL ENGINEER — 12/06/07 DATE — EXPIRES AUGUST 08, 2007

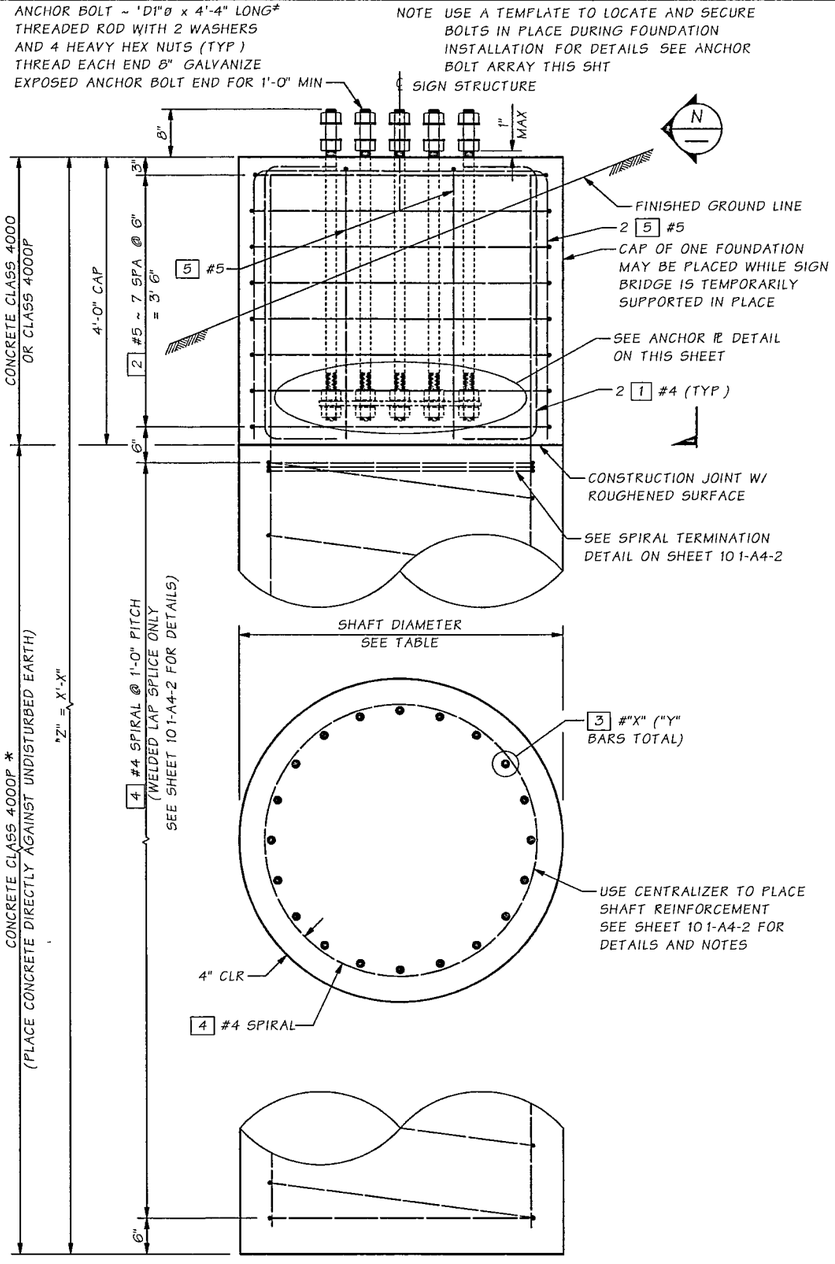
RICHARD P. ZELDENRUST, STATE OF WASHINGTON, 22340, REGISTERED PROFESSIONAL ENGINEER — 12/31/07 DATE — EXPIRES NOVEMBER 14, 2008

Washington State Department of Transportation

SIGNAL STANDARD FOUNDATION DETAILS

PLOT1

SHEET OF SHEETS



TYPE 1 FOUNDATION TABLE

	SPAN LENGTH ("S")	SHAFT DIAMETER	DEPTH ("Z")	FOUNDATION REINFORCEMENT SIZE (X)	FOUNDATION REINFORCEMENT NUMBER (Y)
CANTILEVER SIGN	LESS THAN 20'-0"	4'-6"	12'-6"	9	12
	20'-0' TO 30'-0'	4'-6"	15'-0"	9	16
SIGN BRIDGE	LESS THAN 60' 0"	4'-6"	15'-6"	9	18
	60'-0" TO 90'-0"	4'-6"	19'-0"	9	20
	90'-0" TO 120'-0"	5' 0'	21'-9"	11	15 BUNDLED PAIRS
	120'-0 TO 150'-0"	5'-0"	23'-6"	11	17 BUNDLED PAIRS

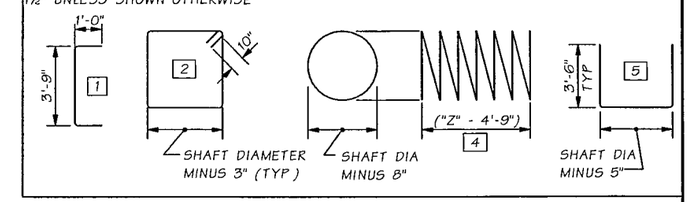
SHAFT DEPTH "Z" IS BASED ON ALLOWABLE LATERAL BEARING PRESSURE OF 2500 PSF OR MORE

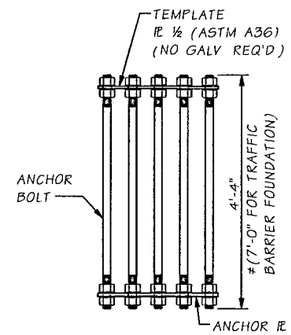
BAR LIST

MARK	LOCATION	SIZE	NO REQ'D	LENGTH	
1	CAP VERTICAL	4	4	5'-4'	
2	CAP HOOPS	8	8	"A"	
3	SHAFT VERTICAL	'X"	"Y"	"Z" 6'	STR
4	SHAFT SPIRAL	4	1	"A"	
5	CAP TOP	5	4	"A'	

NOTE CONCRETE COVER SHALL BE 1½" UNLESS SHOWN OTHERWISE

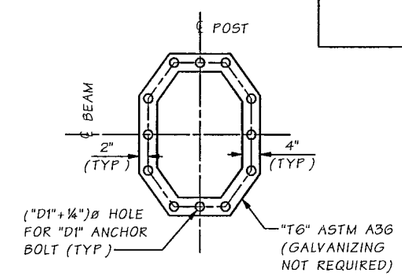
"A" ~ DETERMINE FROM PLANS





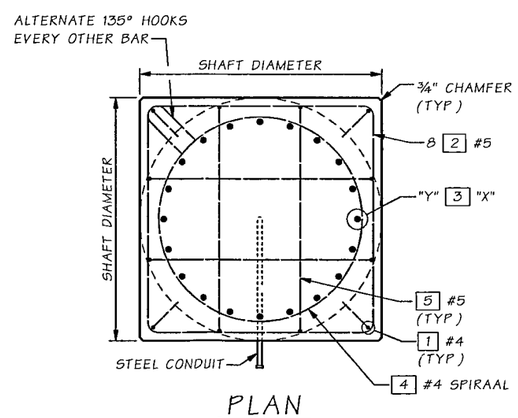
ANCHOR BOLT ARRAY

SHIP THE ANCHOR BOLT ARRAY ASSEMBLY AS A COMPLETE UNIT



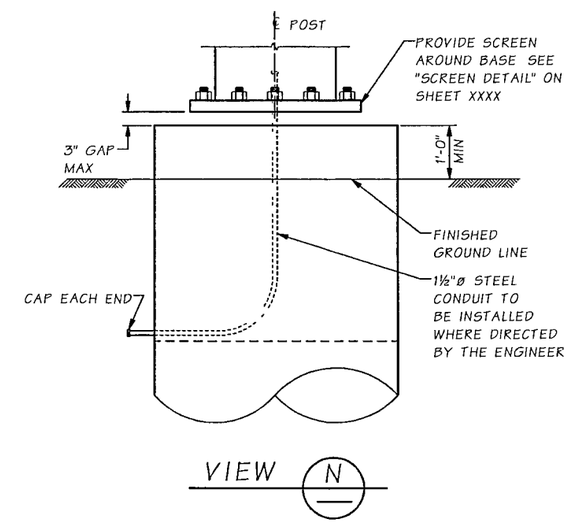
ANCHOR ℞ DETAIL

SEE SIGN STRUCTURE BASE PLATE FOR ANCHOR BOLT PATTERN



PLAN

ANCHOR BOLTS NOT SHOWN



VIEW

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Designed By									
Checked By					JOB NUMBER				
Detailed By									
Bridge Projects Engr									
Prelim Plan By									
Architect/Specialist	DATE	REVISION	BY	APP'D					

Mon Dec 15 10:33:32 2008

BRIDGE AND STRUCTURES OFFICE

Washington State Department of Transportation

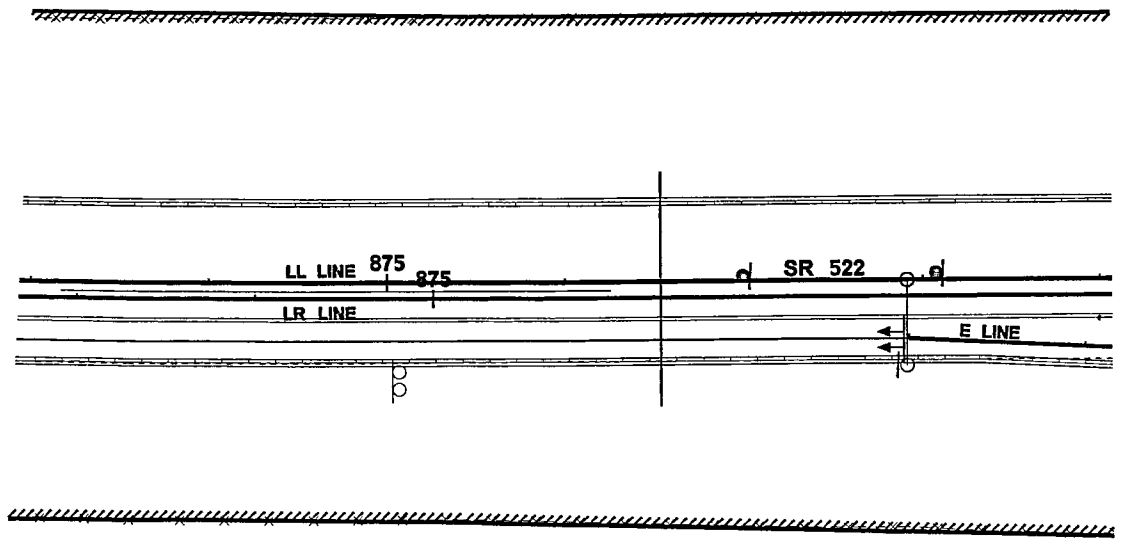
STANDARD SIGN BRIDGES

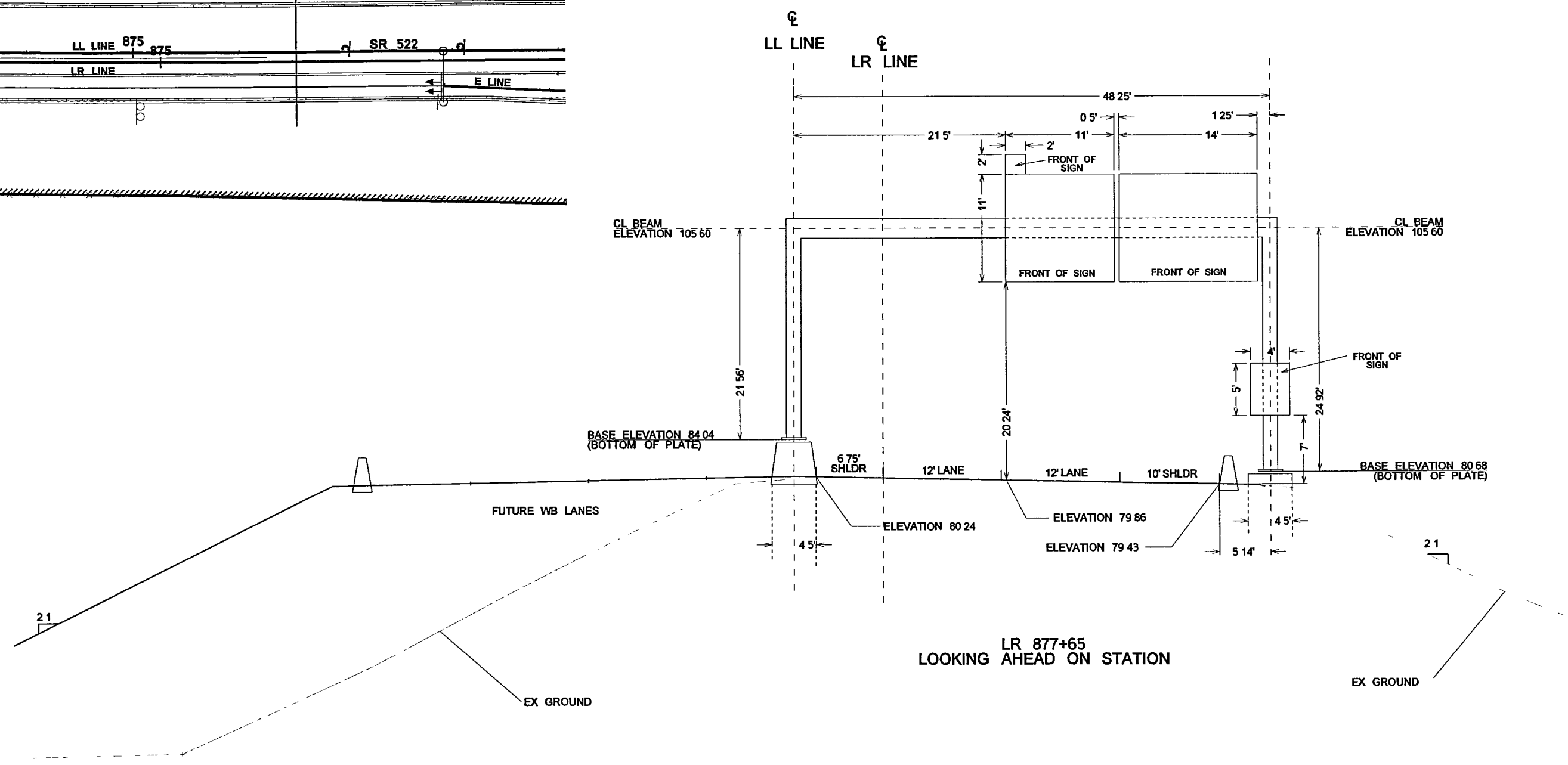
MONOTUBE SIGN STRUCTURES
FOUNDATION TYPE 1 - SHEET 1 OF 2

BRIDGE SHEET NO

SHEET OF SHEETS

SR JOB NO 10.1-A4-1 SHEET





LR 877+65
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DESIGNED BY	J. HOLDREN						
ENTERED BY	J HOLDREN				CONTRACT NO.		LOCATION NO.
CHECKED BY							
PROJ ENGR.	D. DO						
REGIONAL ADM	L ENG	REVISION	DATE	BY			

P.E. STAMP BOX DATE

P.E. STAMP BOX DATE

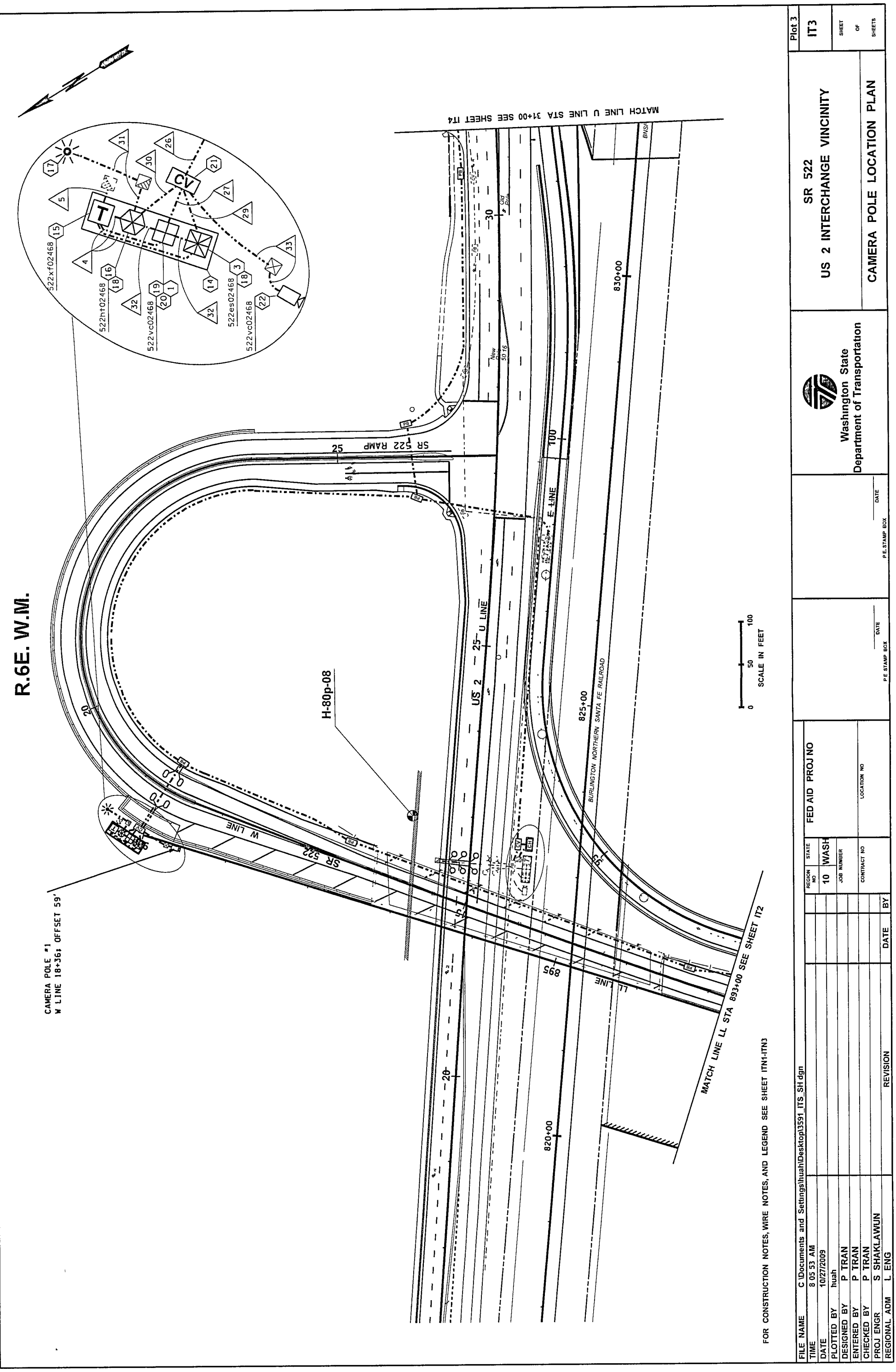
Washington State
Department of Transportation

SR 522
US 2 INTERCHANGE VICINITY

SIGN BRIDGE CROSS SECTION

Plot 1
PLAN REF NO

SHEET 1 OF 1 SHEETS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522ht02468
522vc02468
522es02468
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CV
H-80p-08
SR 522 RAMP
SR 522
W LINE
US 2
U LINE
E LINE
LL LINE
BURLINGTON NORTHERN SANTA FE RAILROAD
BNSF
New Pole 5016
Old Pole
MATCH LINE U LINE STA 31+00 SEE SHEET IT4
MATCH LINE LL STA 893+00 SEE SHEET IT2
820+00
825+00
830+00
895
SCALE IN FEET
0 50 100
FOR CONSTRUCTION NOTES, WIRE NOTES, AND LEGEND SEE SHEET ITN1-ITN3
Plot 3
IT3
SHEET OF SHEETS
SR 522
US 2 INTERCHANGE VINCINITY
CAMERA POLE LOCATION PLAN
Washington State
Department of Transportation
P.E. STAMP BOX
DATE
REGION NO 10
STATE WASH
FED AID PROJ NO
JOB NUMBER
CONTRACT NO
LOCATION NO
DATE BY
REVISION
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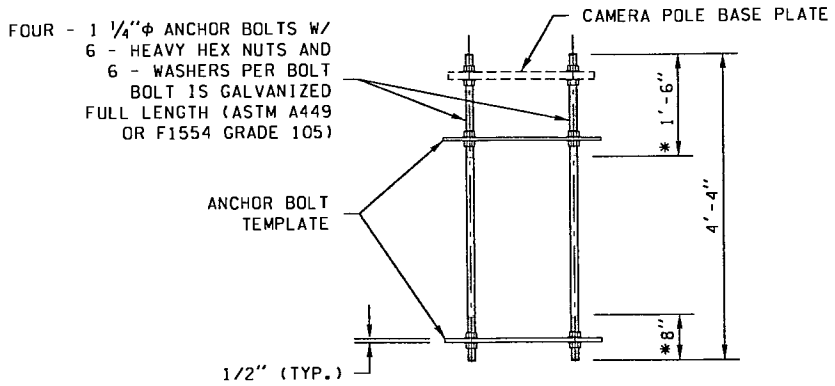
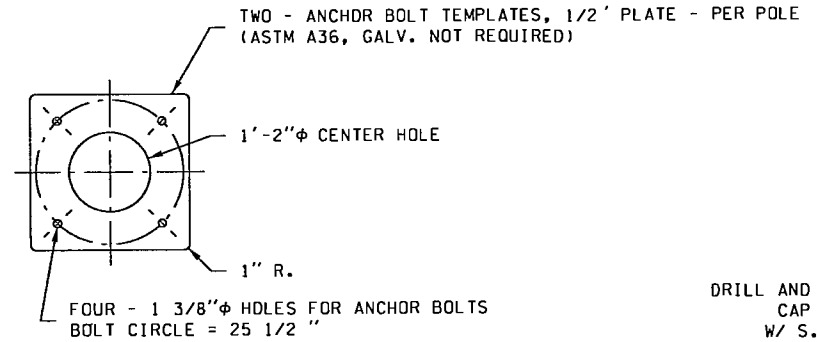
TIME 8:05:53 AM
DATE 10/27/2009
PLOTTED BY huah
DESIGNED BY P. TRAN
ENTERED BY P. TRAN
CHECKED BY P. TRAN
PROJ ENGR S. SHAKLAWUN
REGIONAL ADM L. ENG

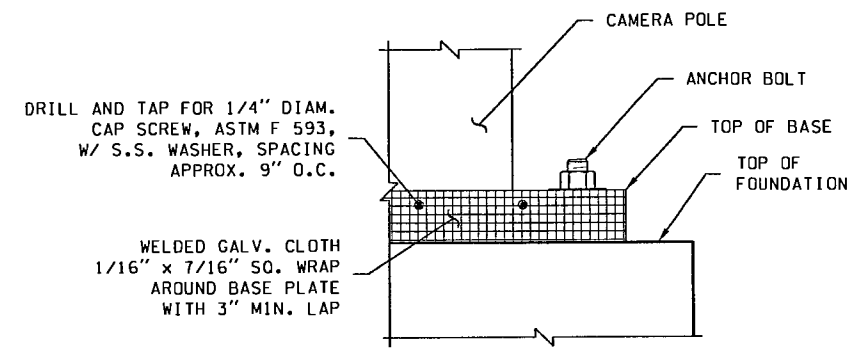
CAMERA POLE HEIGHT	DEPTH OF FOUNDATION "D"		ANCHOR BOLT ASTM A449 OR F1554 GR. 105		
	3H 1V OR FLATTER	2H 1V	DIAMETER	LENGTH	BOLT CIRCLE
50'	7'-0"	9'-0'	1 1/4'	4'-4"	25 1/2"
40'	5'-6"	7'-6"	1 1/4'	4'-4"	25 1/2
30'	4'-6"	6'-6"	1 1/4	4'-4"	25 1/2"



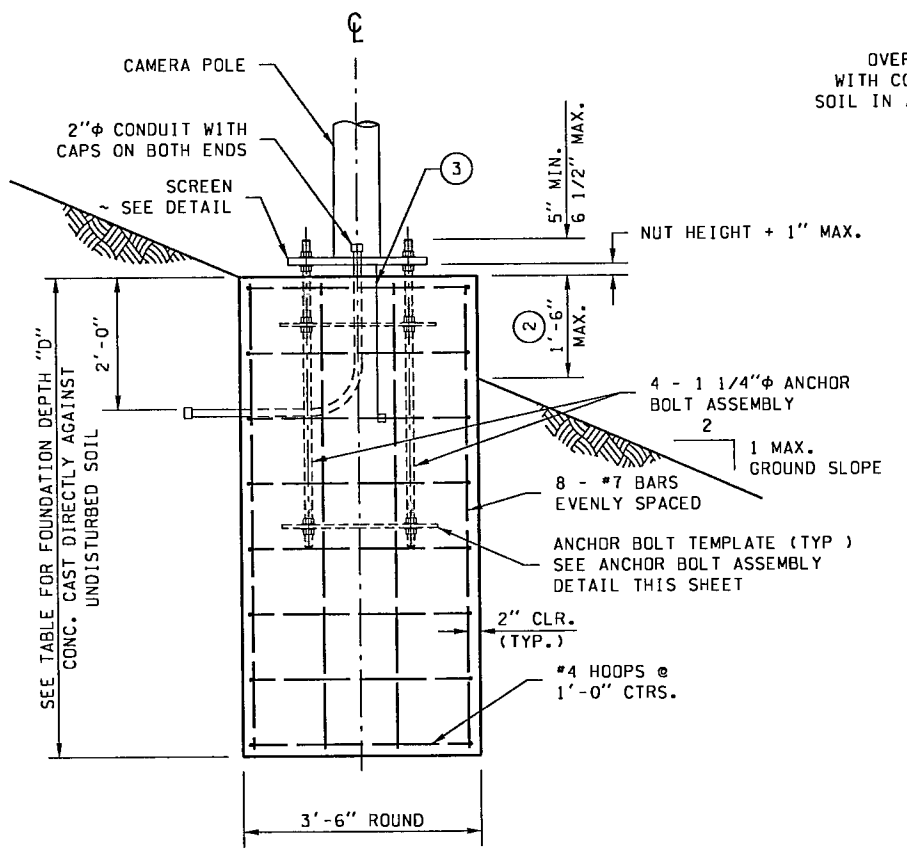


ANCHOR BOLT ASSEMBLY

* THREADED LENGTH



SCREEN DETAIL

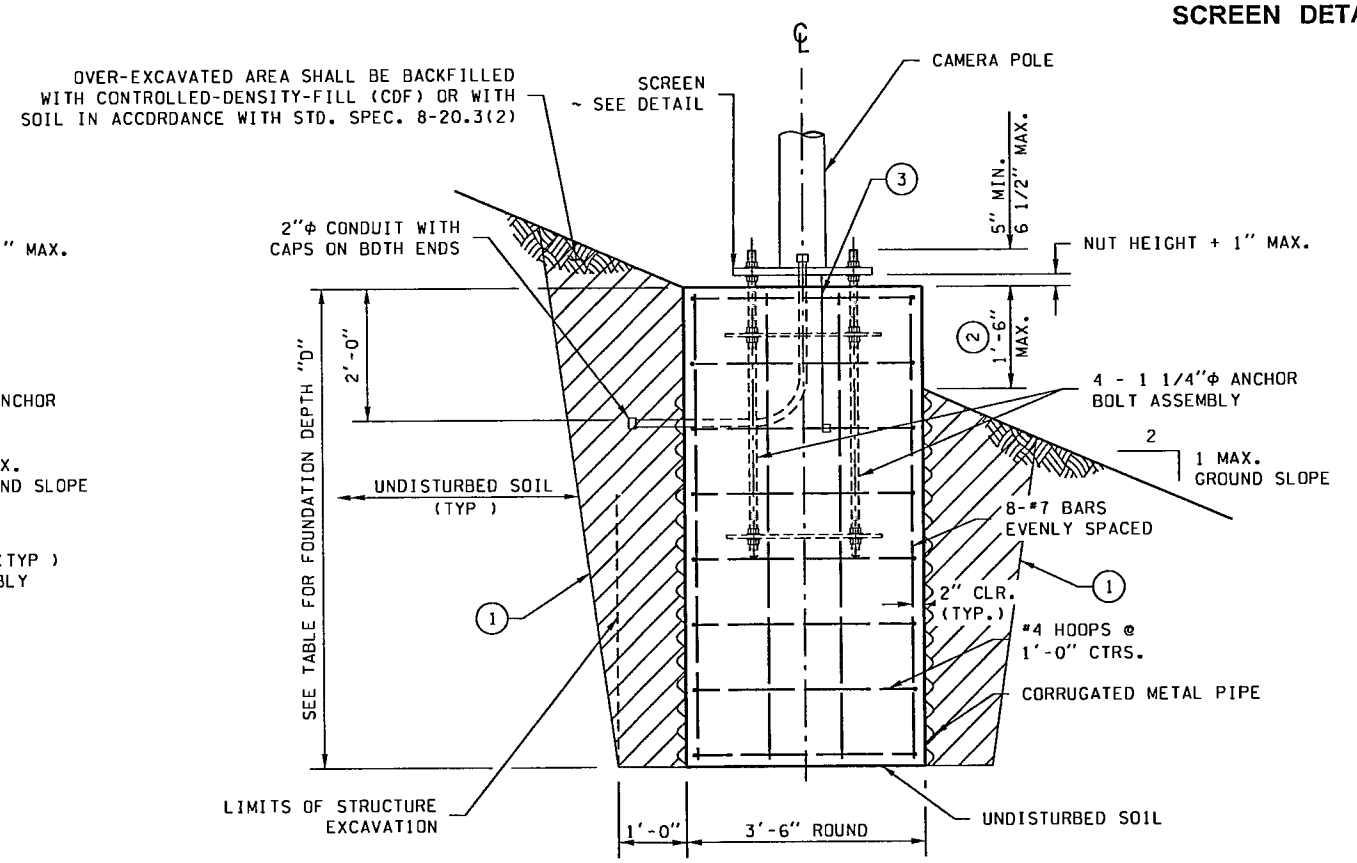


FOUNDATION REINFORCEMENT DETAIL

CONCRETE CAST DIRECTLY AGAINST UNDISTURBED EARTH.

ALTERNATE # 1

N.T.S.



FOUNDATION REINFORCEMENT AND BACKFILL DETAIL

CONCRETE CAST INSIDE CORRUGATED METAL PIPE STAY-IN-PLACE FORM.
PAPER OR CARDBOARD FORM SHALL NOT BE USED BENEATH THE GROUND SURFACE. (2)

ALTERNATE # 2

N.T.S.

GENERAL NOTES:

1. THESE FOUNDATIONS ARE DESIGNED FOR A MINIMUM OF 1,500 PSF ALLOWABLE LATERAL BEARING PRESSURE FOR THE SOIL. A SPECIAL FOUNDATION SHALL BE REQUIRED FOR SOIL WITH LOWER ALLOWABLE LATERAL BEARING PRESSURE THAN 1,500 PSF.
2. THESE FOUNDATIONS ARE DESIGNED FOR INSTALLATION ON LEVEL GROUND, OR ON SLOPING GROUND NOT TO EXCEED 2:1 SLOPES. STEEPER THAN 2:1 REQUIRE A SPECIAL DESIGN.
3. FOUNDATION CONSTRUCTED WITHIN ECOLOGY EMBANKMENTS SHALL BE INCREASED IN DEPTH BY THE DEPTH OF THE ECOLOGY EMBANKMENT.

DESIGN CRITERIA:
2001 AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS WITH INTERIM REVISIONS 2002 AND 2003.
WIND VELOCITY:
90 MPH
MAXIMUM POLE DEFLECTION SHALL NOT EXCEED 0.7" IN 30 MPH AND 1.4" IN 70 MPH WIND.
LOADING:
1.) CAMERA - EFFECTIVE PROJECT AREA = 4.00 SQ. FT. @ 2'-0" ABOVE POLE TOP.
2.) DISH - 1'-0"Φ @ POLE TOP LEVEL.

(1) SHORING OR EXTRA EXCAVATION AS REQUIRED.

(2) FOUNDATION TOP (1'-6") SHALL BE FORMED TO CREATE A SMOOTH CONCRETE SURFACE. ALL EXPOSED FORMING SHALL BE REMOVED UPON COMPLETION OF FOUNDATION CONSTRUCTION.

(3) GROUNDING CONDUCTOR #4 AWG STRANDED COPPER WITH 3'-0" MIN. SLACK. CLAMP CONDUCTOR TO REBAR WITH LISTED CONDUCTOR SUITABLE FOR USE EMBEDDED IN CONCRETE. ROUTE CONDUCTOR TO CAMERA POLE GROUNDING STUD.

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DESIGNED BY	
ENTERED BY	
CHECKED BY	
PROJ ENGR	
REGIONAL ADM	

REVISION	DATE	BY

REGION NO	STATE	FED AID PROJ NO
10	WASH	
JOB NUMBER		
CONTRACT NO		LOCATION NO

P.E. STAMP BOX DATE

P.E. STAMP BOX DATE

Washington State Department of Transportation

Plot 7

SHEET OF SHEETS

SR 522
US 2 INTERCHANGE
FLYOVER RAMP
10A010

APPENDIX O