Washington State Department of Transportation

Memorandum

Date: November 28, 2001

TO: John Hart/Dorothy Voss
Project Office
MS WA-48 Olympic Region

FROM: T. M. Allen / D. A. Williams
EEP Geotechnical Branch, MS 47365

SUBJECT: SR-107, OL-1181
Slough Bridges 107/5 & 107/6, MP 7.07 to MP 7.97
Summary Geotechnical Documents

Attached with this memorandum are the geotechnical reports in the subject project area. In accordance with Design Office direction, we are transmitting them in a camera-ready format for reproduction and provision to prospective bidders. The final geotechnical documentation package consists of:

1. Geotechnical Report dated December 12, 200. *"Slough Bridges Nos. 107/5 & 107/6 Replacement, Geotechnical Recommendations, MP 7.07 to MP 8.09."* This report replaced the previous geotechnical report dated October 26, 1993. The report documents the geotechnical information for two bridges and eight walls located on subject project.
2. Geophysical Exploration Report Prepared by GEORECON, Inc. dated February 5,1964. *"Geophysical Exploration Study for WSDOT proposed Interchange P.S.H. 9 (SR 12 and SR 107), Montesano, Washington."* This report documents the geophysical reconnaissance survey for the BA and CB line ramps and a section of SR 107.

If you have any questions regarding this memorandum, please contact Donald Williams at (360) 709-5457.

TMA:daw
DAW
Attachments

cc: Ranor W. Houx, Olympic Plans, Olympic Region, 47440 (cover Memorandum only)
Miles D. Lindsey, OSC Printing Services, 47330 (cover Memorandum only)

Washington State
Department of Transportation

FILE

Memorandum

Date: December 12, 2000

TO: J. A. Weigel,
MS- 47340
Bridge and Structures

FROM: T. M. Allen/D.A. Williams
FOSSC Geotechnical Branch

SUBJECT: SR-107, C. S. 3109, OL-1181
Slough Bridge Nos. 107/5 & 107/6 Replacement
MP 7.07 to MP 8.09
Geotechnical Report - Structures

Attached with this memorandum is the geotechnical report for the subject project. The report summarizes our recommendations for the scope of work as of August 2000. The report presents the geotechnical recommendations for the replacement of Bridge No. 107/5, Bridge No. 107/6, earthwork, and retaining walls attached to the new bridges. Region Materials provided pavement recommendations by separate memorandum approved on December 15, 1997. This report summarizes the following:

- Foundation recommendations for Replacement Bridges and Temporary Detour Bridge.
- Foundation recommendations for 225 ft of retaining walls.
- Evaluated slope stability and settlement of major fills.
- Construction considerations.
- Geology/soils, which includes existing test boring information.
- Laboratory Test Data.

If you have questions regarding geotechnical information or require further information, please contact Donald A. Williams at (360) 709-5457.

TMA:DAW
Attachment

cc: Y. A. Mhatre, MS-47340, Bridge and Structures
Scott Larson, MS-47340, Bridge and Structures
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Geotechnical Report

Slough Bridges Nos. 107/5 & 107/6 Replacement

SR 107, C.S. 1409, 0L-1181

Geotechnical Recommendations for the replacement of Slough Bridges No. 107/5 and No. 107/6.

M.P. 7.07 to M.P. 8.09

Reviewed By

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12/13/00

December 12, 2000

Washington State Department of Transportation

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INTRODUCTION

The existing Bridge Nos. 107/5 and 107/6 are scheduled to be replaced. This report replaces previous geotechnical investigations conducted at the site. The bridges were built in 1953 and are located between the Junction of SR-12 and SR-101 and the Chehalis River in the Montesano Industrial area. The bridges are located 0.4 miles South of the SR-12 Junction.

The current proposal is to replace the existing treated timber trestle structures and widen the roadway to the current highway standards. Both bridges will be Pre-cast Pre-stressed (PCPS) 18-inch Slab Bridges. The new bridges will be approximately 306 ft long and 37 ft wide with 10 ft curtain walls. The structures are located in the flood plain of the Wynoochee and Chehalis Rivers. The new roadway grade will be locally raised at the bridge sites so that the 100-year flood will pass under the new structure. The existing roadway grade will be raised up to 2.5 ft in height. The bridges will span existing slough areas along the existing alignment as shown in the Figures 2-A and 4-A in Appendix A.

Approximately 225 ft of new retaining walls are planned to extend from the corners of the new bridges. The walls are needed to keep the new fill from impacting the existing railroad grade to the west of the new alignment. The walls to the west will have between one and two feet of exposed wall face. The walls to the east are needed to maintain the existing flow channel and keep the fill within the new right-of-way limits. A commitment to maintain or improve the existing hydraulic gradient is an important design consideration for this project. The new alignment will place sliver fills of up to 14 ft in height on the existing slopes, which are adjacent to the Chehalis River.

A temporary detour is planned utilizing the Puget Sound and Pacific Rail Road line west of the existing structures. The existing railroad bridges are timber trestles approximately 290 ft and 257 ft in length. The detour will consist a single lane timber planked structure providing an 18 ft wide roadway.

The analyses, conclusions, and recommendations presented in this report are based on the project description and site conditions that existed at the time of the field exploration. We assume the exploratory borings represent the subsurface conditions throughout the project area. If different subsurface conditions are encountered or appear to be present, we should be contacted so that we can reevaluate our recommendations and assist you.

REGIONAL GEOLOGY AND SEISMICITY

The project site is located in the west central portion of Washington State approximately 11 miles east of Grays Harbor. The project is located within the Chehalis and Wynoochee River Flood Plain. The confluence of the two river systems is located approximately 0.6 miles SSW of the Bridge 107/5 site. The river level is affected by tidal action from Grays Harbor. Flooding from both river systems can produce large fluctuations in ground water that are short in duration.

The river valleys cut through folded and faulted, Tertiary, sedimentary and igneous rock between the Willipa Hills and Olympic Mountains geomorphic provinces. The Chehalis River was a major melt water river channel during the past glacial periods. The continental ice sheets advanced and retreated in the Puget Sound Lowland. Coarse-grained sediments (sands and gravels) were deposited in the river channel. Later, slack water or over bank deposits (silty sand

to elastic silt with organics) were deposited in the river valleys. The thickness of the slack water deposits varies between 20 ft and 70 ft along the proposed alignment.

Seismicity

The project is located along the convergent zone of the continental and oceanic crustal plates. The seismicity of this area is associated primarily with the interaction of the Juan de Fuca and North American crustal plates. The Juan de Fuca plate is being subducted beneath the North American plate off the coast of Washington. Seismicity can generally be characterized by shallow and deep focus earthquakes. The shallow earthquakes (less than 35 km in depth) occur within the North American plate and are believed to be due to north-south compression and possibly crustal rebound resulting from the removal of the glacial ice. The deep focus earthquakes (greater than 40 km in depth) are associated with crustal movement of the subducting Juan de Fuca plate beneath western Washington. In general, the deeper subcrustal seismic events have greater magnitude and are less frequent than the shallower events.

The bridge sites are located in a moderately active tectonic province. The surrounding hills were formed due to the uplift and compression of continental plates. A series of anticline and synclines folds were formed northwest-trending fault zones have been mapped in the region. A series of thrust faults are located approximately 13 miles north of the site. A series of dip-slip faults are located 5 to 10 miles south to southwest of the site. These faults were active during the Eocene between 35 and 56 million years ago. Only minor movement is evident in the geologic record since the Eocene. Based on the geologic evidence, these faults are considered inactive. The recorded seismic events in the Puget Sound basin have produced shallow crustal events of magnitudes on the order of 7.5. The most significant recorded earthquake in the immediate area was a magnitude 5.5 earthquake that occurred 5 miles north of Satsop on July 2, 1999. This earthquake was along the Benioff seismic zone between the two tectonic plates approximately 28 miles (41 km) in depth and located approximately 10 miles northeast of the project site.

FIELD EXPLORATION

The field investigation consisted of a review of historical records, field reconnaissance, and drilling 21 test borings. Seven test borings were drilled in 1986. Six test holes were drilled in 1993. Eight test holes were drilled in 2000. The test borings were drilled to provide subsurface information for the design of the Slough Bridges and to evaluate the new fills. The test hole locations in the vicinity of the proposed bridge are shown on the attached site plan views in Appendix A and are listed in Table 1 below.

Previous investigations include a Geotechnical Report dated October 26, 1993; a geophysical investigation report dated February 5, 1964; and a previous test boring drilled in 1958. In 1993, a geotechnical investigation was conducted to replace the existing bridges with 20 ft diameter arch culverts and pre-approved proprietary MSE walls. Due to concerns with the reduction of the hydraulic cross-section, the cost of ground improvement and the time to construct the culvert option, the design was changed to a bridge option early in the spring of 2000. As part of the SR-12 and SR-107 interchange, two geophysical lines were conducted along SR-107 in the vicinity of Bridge 107/6. A copy of the geophysical study is attached in Appendix F.

Soil sampling was performed at the test hole locations. Standard penetration tests (SPT), in general, were taken at approximately 5 ft intervals. Twenty-one Shelby tubes and 70 Washington

undisturbed samples were obtained in the fine-grained soils. Eleven-field vane shear test were performed to test the in situ soil strength. The disturbed soil samples were visually identified in the field and then submitted to the Materials Laboratory for a more detailed classification. Copies of all the test hole logs are included in Appendix B.

Table 1 *Test Boring locations and elevations for Slough Bridges 107/5 and 107/6.*

Test Hole No.	Station SR 107 Line	Offset (feet)	Ground Elevation (feet)
Bridge 107/5			
H-13-00	36+77	58 Rt.	17.3
J-2-86	37+21	32 Rt.	7.0
H-1-93	37+34	14.5 Lt.	11.4
H-2-93	38+30	9.8 Lt.	9.8
H-3-93	38+60	35 Rt.	6.0
H-7-00	39+03	23.2 Lt.	6.6
J-1-86	40+18	30 Rt.	7.5
H-14-00	40+25	57 Lt.	11.1
Line Work			
C-1A-86	35+85	5 Rt.	13.4
C-2A-86	42+03	13 Rt.	16.8
H-8-00	43+23	30.4 Rt.	8.3
H-9-00	43+61	11.8 Rt.	17.1
V-4-58	46+50	8 Rt.	6.9
C-1-86	51+12	47 Rt.	8.2
Bridge 107/6			
H-15-00	47+04	70 Rt.	15.0
J-1A-86	47+51	11.5 Rt.	13.6
H-4-93	47+68	18.7 Lt.	12.5
H-5-93	48+45	30 Rt.	5.0
H-6-93	48+75	17.7 Lt.	2.1
H-10-00	48+17	8.9 Rt.	7.0
H-11-00	49+33	10.7 Rt.	7.0
C-2-86	49+93	11.5 Rt.	9.4
H-12-00	50+50	9.9 Rt.	17.9

LABORATORY TESTING

Laboratory testing was performed on selected samples from the field exploration programs. All disturbed soil samples were visually examined and then grouped together based on particle size distribution, consistency, and color. Once groups of samples were established that had similar characteristics, a minimum of one sample per group was tested. The testing consisted of performing particle size analyses, determining the liquid limit if applicable, and determining the plastic limit and plasticity index if applicable. The tests were done in accordance with AASHTO T-88, T-89, and T-90 guide specifications respectively. After the testing was completed, the samples were classified using the Unified Soil Classification System (USCS).

Specialized Testing was performed on selected samples to determine the soil strength and the rate of settlement for the site soils. In 1993, twelve unconsolidated-undrained (UU) triaxial tests were performed to determine the short-term soil strength. Three consolidation-undrained (CU) triaxial tests were performed to determine the potential strength gain after the soil consolidates. Ten consolidation tests were performed to determine the rate of settlement. In 2000, four UU triaxial tests were performed to verify the field vane shear results. An additional consolidation test was performed in the area of major fill. Six hydrometer gradation tests were performed to better determine the amount of clay in the soil.

The results of all laboratory testing are summarized in Appendix C.

SITE SOIL CONDITIONS

The field investigation indicated the presence of four major soil units at the bridge sites. The soils are grouped based on engineering properties, classification, and depositional environment. Please refer to the soil profiles in Appendix A for a summary of the subsurface data and interpreted conditions. The four units are:

Unit 1 Fill – dense to very loose sands and gravel with varying amounts of silt.

Unit 2 Soft silts with organics that vary from organic silt to silt to elastic silt.

Unit 3 Medium dense to dense well-graded gravel with sand. Interbeds of loose sandy silt to silty sand are included in this unit.

Unit 4 Dense to very dense well graded gravel and sand with gravel.

Test hole plan views and soil profiles depicting generalized foundation conditions are presented in Appendix A.

LIQUEFACTION

The bridge site is on the flood plain of both the Chehalis and Wynoochee Rivers. Liquefaction to the point of viscous fluid behavior is not suspected to occur at this site. However, some soil units and isolated zones of soil are expected to have reduced strength do to the build up of pore water pressures. The Unit 2 soil gradations are near the boundary for potentially liquefiable and unliquefiable soils. Soils below 50 ft in depth are not expected to liquefy or lose strength. The bridge drilled shaft foundations are designed for reduced soil strength due to potential soil

softening expected after a major earthquake in the shallower soil units. Ground improvement to mitigate the reduction in soil strength was not considered at this site.

HYDROLOGY

The slough channels were constructed in 1953 when the existing bridges were built. During periods of major flooding, water runs over the existing roadway. It is our understanding that the net hydraulic section will remain the same as present. The WSDOT Hydraulic Office is evaluating the proposed roadway configuration to verify that the design is in compliance with the net zero hydraulic section. The 100-year flood from the rivers is estimated to be at elevation 19.2 ft with a maximum velocity of 7.5 ft^3/sec. The normal high water of the sloughs is at elevation 5.3 ft. The flood plain contains a mixture of clay, silt, and sand with organics and woody debris.

The ground water in general varied between elevations 0.0 ft to elevation 7.0 ft during our investigation. Piezometers were installed in test holes H-1-93, H-3-93, H-4-93, and H-6-93. Readings were taken spring, summer and fall. The ground water appeared to vary with the seasonal fluctuations of the Chehalis River. For geotechnical design, we assumed the ground water to be at elevation 2 ft.

During drilling, the driller reported loss of drilling fluid in several zones within Units 3 and 4 soils, indicating the presence of highly permeable zones.

GEOTECHNICAL RECOMMENDATIONS

Fill Design Recommendations

The new fill varies both in depth and horizontal extent. The new roadway centerline varies up to 13.3 ft right of the existing centerline. The new fill widening will extend up to 14 ft horizontally. The area between Stations 27+63 and 36+80 will require fills less than 2.5 ft in height on top of existing fill embankment. The fill between Bridges107/5 and 107/6 will require new fills of variable thickness. Major new fill is located between Stations 42+00 and 46+00. The bridge approach fills will be confined by retaining walls. The roadway grade will be locally raised up to 2.5 ft at the bridge approaches. The new fill will vary up to 13.5 ft in height.

Minor Fill

Minor fill of less than 2.5 ft in thickness will be placed on the existing roadway embankment. The settlement from placing this fill on stable embankment soils is estimated to be less than 2 inches. The new fills should be constructed using select or gravel borrow. Select borrow is not "all weather" material and may be difficult to place and compact in wet weather. If wet weather construction is likely, gravel borrow should be required in the PS&E. All fills should be constructed according to Section 2-03.3(14) in the Standard Specifications. The fills should be compacted to Method B requirements. The new slopes will be stable with 2H: 1V or flatter slopes.

Major Fill – Station 42+00 to Station 46+00

The right shoulder will be widened between 8 ft and 14 ft, with fill heights up to 13 ft in height. Settlement will likely vary from one inch at the existing shoulder, to 3 inches at the new roadway shoulder, and to up to 6 inches at the toe of the existing slope. The primary settlement should

occur within 5 months after the fill has been placed. In addition, we estimate up to 2 inches of post construction (creep) settlement will occur over a 10-year period. One method of maintaining the roadway grade is to over-build the shoulder by 3 inches to account for the expected differential settlement.

There is a potential for cracks to develop at the new shoulder of the road and in the slope embankment due to the settlement. The cracks need to be filled in order to prevent the surface water from seeping into the embankment. Large cracks in the slope can be filled with sand. The cracks in the road should be repaired according to Section 5-04.3(5) C Crack Sealing in the Standard Specifications.

The new fills should be constructed using select or gravel borrow. Select borrow is not "all weather" material and may be difficult to place and compact in wet weather. If wet weather construction is likely, gravel borrow should be required in the PS&E. All fills should be constructed according to Section 2-03.3(14) in the Standard Specifications. The fills should be compacted to Method B requirements. The new slopes will be stable with 2H:1V or flatter slopes.

Construction of the new fill on very loose to soft soil with a high water table can present a potential construction problem. The native undisturbed soil has adequate soil strength to provide the required bearing capacity. However, the movement of heavy construction equipment over the site can degrade the foundation subgrade. We recommend preserving the existing root matt under the new fill "foot print". Further, we recommend limiting the use of vibrating compaction equipment in the bottom 2 ft of the new fill. Vibratory compaction equipment could create pumping soils at the base of the fill. Method A compaction should be used for the first 2 ft of fill. Method B should be used throughout the remaining of the embankment.

We recommend supplementing the following sections of the Standard Specifications:

Clearing, Grubbing, and Roadside Cleanup

Section 2-01.3(1) of the Standard Specifications is supplemented by the following:

The area between Station 42+00 to Station 46+00 shall be cleared of all brush, and woody debris to the existing ground surface without disturbing the root masses. Grubbing in this area shall not be performed.

Roadway Excavation and Embankment

Section 2-03.3(14) Embankment Construction is supplemented by the following:

Soft Base.

Between Station 42+00 to Station 46+00, the Contractor may place the lower part of the fill by dumping and spreading successive loads to form a uniform layer, up to 2 feet in thickness; to support equipment used to place and compact upper layers. Construction vehicles shall be limited in size and weight to prevent excessive rutting. Method A

compaction of Section 2-03.3(14)C shall be used for the first 2 ft of fill. Method B should be used through out the remaining of the embankment.

Fills at the Railroad Trestles

Two railroad trestle bridges are adjacent to the proposed bridge replacements. One trestle is located between Stations 37+27 (34 ft Left) and 40+17 (35 ft Left). The second trestle is located between Stations 47+61 (33 ft Left) and 50+16 (33 ft Left). It is our understanding that during construction the trestles will be used as a single lane detour. Additional approach fill will be required to widen the existing railroad grade. In general, this new fill will be minor (less than 2 ft). The existing railroad trestles are supported by timber piles.

Settlement of the new fills should only affect the end bents of the trestles. There are two sources, which can cause this settlement. One is the new detour fill and the second is the new fill for the bridge approaches. The ends of the trestle located between Stations 37+27 and 40+17 will have up to 3 ft of fill placed on the existing 7 ft high embankment. We estimate between 1 and 2 inches of settlement could result from the placing the new fill at the new bridge approaches and detour.

The placing of the new fill at the ends of the trestle will cause additional loads to be applied to the existing timber piles. The loads will be from negative skin friction (downdrag) and possible lateral movement due to the fill settlement. We estimate up to 5 tons of downdrag load and up to 0.5 inches of lateral movement will occur at the ends of the trestles. The existing piles should be re-evaluated to confirm adequate capacity is maintained. If needed, corrective measures should be included in the contract for bridge repair.

Fills at the Bridge Approaches

The bridges approaches will have varying amount of fill. The new fills at the ends of the bridges will be confined by retaining walls that tie into a 10 ft curtain wall at Piers 1 and 6. Due to the varying thickness of Soil Unit 2 the amount of settlement will vary at each site as discussed below.

The new fills should be constructed using select or gravel borrow. Select borrow is not "all weather" material and may be difficult to place and compact in wet weather. If wet weather construction is likely, gravel borrow should be required in the PS&E. All fills should be constructed according to Section 2-03.3(14) in the Standard Specifications. The fills should be compacted to Method B requirements. The new slopes will be stable with 2H: 1V or flatter slopes.

Bridge 107/5 Approach Embankment Recommendations

The approach embankments will require fills with a maximum height of 2.5 ft on top of the roadway to up to 13 ft along the right shoulder. We expect settlement will vary across the new embankment between 1 to 2 inches. At Pier 1, we estimate up to 8 ft wedge of fill next to the new bridge. The wedge of fill will likely settle approximately 2.5 inches at the new shoulder. The primary settlement should occur within 7 years at Pier 1. The fill at Pier 6 will likely settle between 3 and 5 inches. The primary settlement should occur within 2 years after the fill has been placed at Pier 6. Approximately 50 % of the settlement should occur within the first 9

months. In addition, we estimate up to 1.5 inches of post construction (creep) settlement will occur over a 10-year period.

Bridge 107/6 Approach Embankment Recommendations

Both approach embankments will require fills with a maximum height of 2.5 ft on top of the roadway to up to 9 ft along the right shoulder. We expect settlement to vary across the embankment between 1 and 2 inches. The new right shoulder will likely settle between 3 and 4 inches. The primary settlement should occur within 12 months after the fill has been placed. Approximately 50 % of the settlement should occur within the first 3 months. In addition, we estimate up to 1.5 inches of post construction (creep) settlement will occur over a 10-year period.

Approach Slabs

The Design Manual Section 1120.03(6) requires all bridges to have approach slabs unless approval for their deletion has been given. We recommend approach slabs not be used due to the amount of differential settlement across the roadway prism. We believe the settlement will be more than the approach slab can handle. Long-term maintenance at the bridge ends will be more effective.

Bridge 107/5 Foundation Design Recommendations

The new bridge will be approximately 306 ft long and 37 ft wide. It is our understanding that the preferred foundation support is drilled shafts. Pile supported foundations are also feasible, but are thought to be more difficult to construct in the confined footprint of the bridge over soft soil conditions. One design proposed launching the new structure from the new abutments while maintaining a single lane of traffic on the existing bridge. This pile option would require more piers, which could reduce the hydraulic section and likely take two construction seasons to build. Spread footings are not feasible due to the thick layer of soft soil present at the site.

Two different shaft designs are under consideration, one with a single shaft at the interior pier and the other with two shafts at the interior piers. We understand structure and substructure design will be performed using Load and Resistance Factored Design (LRFD) methodology. Enclosed in Appendix D are the ultimate capacity charts for strength, service, and extreme event limit states. The figures show the net load that can be applied at the top of the shaft. *The weight of the shaft has not been deducted from the compressive capacity in the figures and is not included in the uplift capacity.*

We recommend that the shafts have a minimum tip elevation below the loose soil lenses in Unit 3. We recommend a tip elevation below elevation –67 ft to minimize settlement. Additional depth may be required to satisfy lateral load requirements.

The figures in Appendix D are for 3 ft and 4.5 ft diameter shafts at the end piers (Piers 1 and 6) and for 5.5 ft, 6.0 ft, and 7.5 ft diameter shafts at the interior piers (Piers 2 thru 5). We recommend permanent casing full depth for ease of construction. Separate plots for ultimate skin friction (Q_s) and ultimate end bearing (Q_p) are provided on the figures. At a given depth on the figures, the factored resistance (Q') can be determined by adding the ultimate skin friction multiplied by its resistance factor (ϕ_s) and the ultimate end bearing multiplied by its resistance factor (ϕ_p) as shown in the following equation:

$$Q' = Q_s * \phi_s + Q_p * \phi_p$$

For the service limit state, settlement of the shaft foundations is expected to be less than one inch. Settlement is assumed to occur as the loads are applied. Post construction settlement should be negligible. Table 2 provides the resistance factors for shaft design.

Table 2 Resistance Factors for Shaft Design

Limit State	Resistance Factor		
	Skin Friction, ϕ_s	**End Bearing, ϕ_p**	**Uplift, ϕ_s**
Strength	0.65	0.50	0.55
Service	1.0	1.0	N/A
Extreme Event (Soil Softening Conditions)	1.0	1.0	1.0

Ground settlement and static downdrag at the abutment shafts will occur over a period of time. We estimate primary settlement will take up to 7 years to occur at Pier 1 and up to 2 years to occur at Pier 6. The amount of settlement will also vary across the width of the new roadway as previously discussed in the embankment section. Negative Skin Friction (downdrag) and skin friction loss are expected. The loads shown in Table 3 should be added to the other applied loads to account for static downdrag. To account for skin friction loss due to downdrag subtract the appropriate value in Table 4 from the strength limit side friction (Q_s) capacity plots shown in Appendix D to determine the ultimate skin friction at any given tip elevation.

Please note that Tables 3 and 4 provide downdrag loads for both the drilled shafts for the bridge, and the soldier piles for the walls discussed later in this report.

Table 3 Estimated Downdrag Loads.

Shaft Diameter	Q_{DDs}, Static Conditions (tons)		
	Pier 1	**Piers 2 to 5**	**Pier 6**
2.0 ft	25	N/A	20
2.5 ft	30	N/A	25
3.0 ft	35	N/A	30
4.5 ft	52	N/A	46

Table 4 Estimated Skin Friction Loss Due to Downdrag Loads.

Shaft Diameter	Q_S, Static Conditions (tons)		
	Pier 1	Piers 2 to 5	Pier 6
2.0 ft	25	N/A	20
2.5 ft	30	N/A	25
3.0 ft	35	N/A	30
4.5 ft	52	N/A	46

In Appendix E, we have provided earth pressure diagrams for the new retaining wall attached to the new abutments. The soil properties can also be used to estimate the forces acting on the abutments. See Figures 3-E and 4-E for Piers 1 and 6, respectively.

Bridge 107/6 Foundation Design Recommendations

The new bridge will be approximately 306 ft long and 37 ft wide. It is our understanding that the preferred foundation support is drilled shafts. Pile supported foundations are also feasible, but are thought to be more difficult to construct in the confined footprint of the bridge over soft soil conditions. One design proposed launching the new structure from the new abutments while maintaining a single lane of traffic on the existing bridge. This pile option would require more piers, which could reduce the hydraulic section and likely take two construction seasons to build. Spread footings are not feasible due to the thick layer of soft soil present at the site.

Two different shaft designs are under considerations, one with a single shaft at the interior pier and the other with two shafts at the interior piers. We understand structure and substructure design will be performed using Load and Resistance Factored Design (LRFD) methodology. Enclosed in Appendix D are the ultimate capacity charts for strength, service, and extreme event limit states. The figures show the net load that can be applied at the top of the shaft. *The weight of the shaft has not been deducted from the compressive capacity in the figures and is not included in the uplift capacity.*

We recommend that the shafts have a minimum tip elevation below the loose soil lenses in Unit 3. We recommend a tip elevation below elevation – 55 ft to minimize settlement. Additional depth may be required to satisfy lateral load requirements.

The figures in Appendix D are for 3 ft and 4.5 ft diameter shafts at the end piers (Piers 1 and 6) and for 5.5 ft, 6.0 ft, and 7.5 ft diameter shafts at the interior piers (Piers 2 thru 5). We recommend permanent casing full depth for ease of construction. Separate plots for ultimate skin friction (Q_s) and ultimate end bearing (Q_p) are provided on the figures. At a given depth on the figures, the factored resistance (Q') can be determined by adding the ultimate skin friction multiplied by its resistance factor (ϕ_s) and the ultimate end bearing multiplied by its resistance factor (ϕ_p) as shown in the following equation:

$$Q' = Q_s * \phi_s + Q_p * \phi_p$$

For the service limit state, settlement of the shaft foundations is expected to be less than one inch. Settlement is assumed to occur as the loads are applied. Post construction settlement should be negligible. Table 5 provides the resistance factors for shaft design.

Table 5 Resistance Factors for Shaft Design

Limit State	Resistance Factor		
	Skin Friction, ϕ_s	**End Bearing, ϕ_p**	**Uplift, ϕ_s**
Strength	0.65	0.50	0.55
Service	1.0	0.50	N/A
Extreme Event (Soil Softening Conditions)	1.0	1.0	1.0

Ground settlement and static downdrag at the abutment shafts will occur over a period of time. We estimate primary settlement will take up to one year to occur. The amount of settlement will also vary across the width of the new roadway as previously discussed in the embankment section. Negative Skin Friction (downdrag) and skin friction loss are expected. The loads shown in Table 6 should be added to the other applied loads to account for static downdrag. To account for skin friction loss due to downdrag subtract the appropriate value in Table 7 from the strength limit side friction (Q_s) capacity plots shown in Appendix D to determine the ultimate skin friction at any given tip elevation.

Please note that Tables 6 and 7 provide downdrag loads for both the drilled shafts for the bridge, and the soldier piles for the walls discussed later in this report.

Table 6 Estimated Downdrag Loads.

Shaft Diameter	Q_{DDs}, Static Conditions (tons)		
	Pier 1	**Piers 2 to 5**	**Pier 6**
2.0 ft	27	N/A	32
2.5 ft	32	N/A	40
3.0 ft	40	N/A	50
4.5 ft	60	N/A	72

Table 7 Estimated Skin Friction Loss Due to Downdrag Loads.

Shaft Diameter	Q_S, Static Conditions (tons)		
	Pier 1	Piers 2 to 5	Pier 6
2.0 ft	27	N/A	32
2.5 ft	32	N/A	40
3.0 ft	40	N/A	50
4.5 ft	60	N/A	72

In Appendix E, we have provided earth pressure diagrams for the new retaining wall attached to the new abutments. The soil properties can also be used to estimate the forces acting on the abutments. See Figures 5-E and 6-E for Piers 1 and 6, respectively.

Lateral Load Analysis for Bridge 107/5 and Bridge 107/6

For the analysis of deep foundations, axial capacity plots and LPILE/COM624 input parameters for each pier are attached. P-y curve input parameters are attached in Appendix D.

Design Earthquake Parameters

An acceleration coefficient of 0.27 g is recommended for seismic design of the structures on this project in accordance with the Bridge Design Manual.

Design response spectra presented in the AASHTO Guide Specifications for Seismic Design of Highway Bridges are considered appropriate for seismic design of the structures on this project. A Type IV soil profile and a site coefficient of 2.0 are recommended for Bridge 107/5. A Type III soil profile and a site coefficient of 1.5 are recommended for Bridge 107/6.

GEOTECHNICAL RECOMMENDATIONS FOR RETAINING WALLS

The bridge approach fills will be supported by new retaining walls. The amount of fill varies across the embankment. On the west side of the roadway, we estimate up to 2 ft of new fill will be retained by Walls C, D, G and H. On the east side, major fill will be placed on soft ground. We estimate that Walls A, B, E and F will retain up to 10 ft of new fill. The approximate wall dimensions are summarized in Table 8. We have used the site data provided in August 2000 and 2H: 1V embankment slopes for estimating the wall dimensions.

Table 8 Retaining Wall Site Data

Wall	Approximate Location Station (Offset)	Approximate Length (ft)	Approximate Height (ft)	Recommended Wall Type
Bridge 107/5				
Wall D	STA 36+80 to STA 37+08 (Lt.)	28	3	MSE or MBW
Wall A	RA 60+55 to STA 37+08 (Rt.)	55	14.5 (max)	Soldier Pile
Wall C	STA 40+29 to STA 40+60 (Lt.)	31	3	MSE or MBW
Wall B	STA 40+29 to STA 40+57 (Rt.)	25	13.3 (max)	Soldier Pile
Bridge 107/6				
Wall H	STA 46+98 to STA 47+21 (Lt.)	23	3	MSE or MBW
Wall E	STA 47+05 to STA 47+21 (Rt.)	16	11 (max)	Soldier Pile
Wall G	STA 50+46 to STA 50+66 (Lt.)	20	3	MSE or MBW
Wall F	STA 50+46 to STA 50+73 (Rt.)	27	11 (max)	Soldier Pile

For the walls located along the right (eastern) side of the roadway, we recommend either cantilever soldier piles walls or soldier pile/tieback walls. Walls A, B, E and F will require a special design by the Bridge and Structures. We have provided typical earth pressure diagrams in Appendix E. For estimating additional vertical load due to fill settlement on the pile shafts, the downdrag loads are presented in Tables 3 and 4 for Walls A and B, and Tables 6 and 7 for Walls E and F. It is our understanding that Wall A will be constructed in a tight radius as shown in Figure 1-E. We provided two different wall segments for this wall, Figures 2-E and 3-E. Walls B, E and F have one design segment. See Figures 4-E, 5-E and 6-E for details.

For cantilever soldier pile walls, a concrete deadman anchor system can be used to increase the overturning stability of the new walls, if needed. Figure 7-E shows the typical sections for deadman anchor design. The design values presented in Figures 2-E to 6-E can be used below the mud line. The location of the deadman should be located in the zone of full resistance. This zone is outside the active wedge acting on the retaining wall. If the deadman's passive wedge overlaps the active wedge acting on the wall, the maximum theoretical passive resistance would be reduced. Therefore, the deadman's efficiency to provide the required resistance is compromised. The deadman should have at least a minimum of three (3) ft of soil cover to mobilize full passive resistance.

For the walls located along the left (western) side of the roadway, we recommend either a pre-approved proprietary MSE wall or Masonry Concrete Modular Block Retaining Wall (MBW). It is our understanding, a minor wall between the new roadway fill and the existing railroad line is required. The walls will be built on a relative flat grade on top of the existing embankment. Settlement for both wall systems will be approximately 2 inches. Settlement should occur over a period of time due the compressible soft soils, which underlie the existing fill. Post-construction

settlement of the wall should be approximately 1.0 inch this settlement will take between 1 and 7 years to be completed.

We estimate a MSE or MBW wall will have total wall heights of up to 3 ft. An allowable bearing pressure of up to 3 ksf can be used for both wall types. Attached in Appendix E is a copy of the current special provision for an unreinforced MBW wall. This special needs to be included in the contract documents if a MBW wall type is selected.

Recommendations for implementing pre-approved proprietary MSE wall alternates are included below.

Recommendations for Wall Stability and Foundation Design

Our geotechnical design includes evaluation of overall external stability, wall foundation bearing capacity and embedment depth required, wall settlement, soil properties, and minimum base width to be used for design. The proprietary MSE wall manufacturer will evaluate the wall for overturning stability, sliding stability, and internal stability of the wall. They will provide the size, length, and spacing of the soil backfill reinforcement, wall width required, all facing design and connection details, and any special design and construction requirements.

We recommend that the current GSP for "Structural Earth Wall" be used. As part of the GSP, specific design information needs to be included. The following design information should be inserted in the GSP Fill-ins:

Soil Properties	**Wall Backfill**	**Retained Soil**	**Foundation Soil**
Unit Weight (pcf)	130	125	120
Friction Angle (degrees)	36°	34°	34°
Cohesion (psf)	0	0	0
		AASHTO Load Group I	AASHTO Load Group VII
Allowable Bearing Capacity (ksf)		3	4.5
Acceleration Coefficient (g)		0	0.27

The following items should be considered in preparation of contract documents:

1. The wall should be placed on a level foundation in the direction perpendicular to the wall face.
2. MSE or MBW wall base/footing should be located using a minimum embedment criterion. We recommend a minimum embedment of 1.0 ft below final ground surface, since the wall is placed on top of the existing embankment. In no case should the wall base/footing embedment be less than 10 percent of the wall height. The Bridge Design Manual gives the minimum embedment criteria.

3. MSE or MBW walls should have a wall face batter no steeper than 48V:1H.
4. The base width of the MSE walls should not be less than 70 percent of the wall height to insure overall stability. Greater wall base widths may be needed to provide adequate overturning, sliding, and internal stability for the walls.
5. Backfill within the reinforced wall prism should consist of gravel borrow or gravel backfill for walls.
6. Properly compacted (Method B) gravel borrow or select borrow can be used behind the reinforced wall prism depending on weather conditions during construction. Common Borrow is not recommended.

It is best to locate catch basins, grate inlets, signal foundations, outside the reinforced backfill zone of the MSE walls to avoid interference with the soil reinforcement. However, in some cases it may not be possible to do this. In those cases where conflict with these reinforcement obstructions cannot be avoided, the location(s) and dimensions of the reinforcement obstruction(s) relative to the wall must be clearly indicated in the retaining wall plans in the PS&E, so that wall manufacture is aware of their presence.

Once the contract is awarded, the wall manufacturer will complete the wall designs and submit them as shop drawings. The Bridge and Structures Office will need to review and approve the wall shop drawings and calculations.

CONSTRUCTION CONSIDERATIONS

Construction considerations that will require attention during design and construction of this project are as follows:

1. We expect very difficult conditions will be encountered during shaft construction. Soil caving is likely to occur during shaft excavations. Both the drilled shafts and the soldier pile shafts should be cased full depth. The shafts will penetrate between 35 ft and 65 ft into saturated, dense to very dense sands and gravels with cobbles and boulders. Open hole drilling will not be an option at this site. We expect wet drilling conditions at the site. CSL testing per the shaft Bridge Special Provision (BSP) will be required.
2. We recommend permanent casing should be required at shaft sites. This is to prevent the sidewalls in the soft soils from squeezing inward during excavation and bulge outward due the difference in weight of the concrete and soil. It is our understanding that the preliminary shaft design places the shaft tip at elevation –83 ft. The following table summarizes the casing requirements and should be included in the Special Provisions:

Bridge 107/5 and Bridge 107/6	**Casing Type**	**Elev. of Bottom of Required Casing**
Pier 1 through Pier 6	Permanent	- 83 ft

3. Temporary casing should be required for the full depth of the cantilever soldier pile shafts.

4. We expect the shaft casing will be installed in segments. Side friction will likely be high and setup may occur causing advancement of the casing to be very difficult.

5. Buried logs and other obstructions may be encountered in Unit 2 soils. Wood was reported in two of the test borings, C-86 and H-8-00. The shaft excavation may encounter logs or woody debris.

6. Groundwater level is controlled by the level of either the Chehalis or Wynoochee Rivers. We expect that there will be seasonal and tidal fluctuations where high water levels will occur during the spring runoff, the fall and winter rains and strong tidal surges from Grays Harbor. The period of high water could impact the placement of fill at the site and the construction at the end piers. Slurry levels in the shaft casings must be maintained above the river elevations.

7. It is our understanding that the existing structures can be used as working platform in order to construct the new drilled shafts.

8. We recommend that a Summary of Geotechnical Conditions be included in the contract documents to identify potential construction difficulties. The Summary of Geotechnical Conditions was forwarded to Bridge and Structures to be included in their PS&E package. A copy of the Summary of Geotechnical Conditions is also included in Appendix F.

CLOSURE

The proposed bridge widening foundation recommendations are summarized in the attached appendices. The test hole locations and subsurface profile sheets are in Appendix A. Logs of Test Borings and laboratory test data are included in Appendices B and C, respectively. Drilled Shaft Design Figures and P-y Soil Input Data are included in Appendix D. Appendix E has earth pressure diagrams for soldier pile retaining wall design, and Special Provisions for non-reinforced masonry concrete modular bock wall. A copy of geophysical exploration performed in the vicinity of the project site is included in Appendix F.

If you have questions or require further information, please contact Don Williams at (360) 709-5457.

APPENDIX - A

Figure 1-A	Site Plan
Figure 2-A	Bridge 107/5 Test Hole Locations
Figure 3-A	Bridge 107/6 Subsurface Profile
Figure 4-A	Bridge 107/6 Test Hole Locations
Figure 5-A	Bridge 107/6 Subsurface Profile
Figure 6-A	Subsurface Profile at Station 43+50

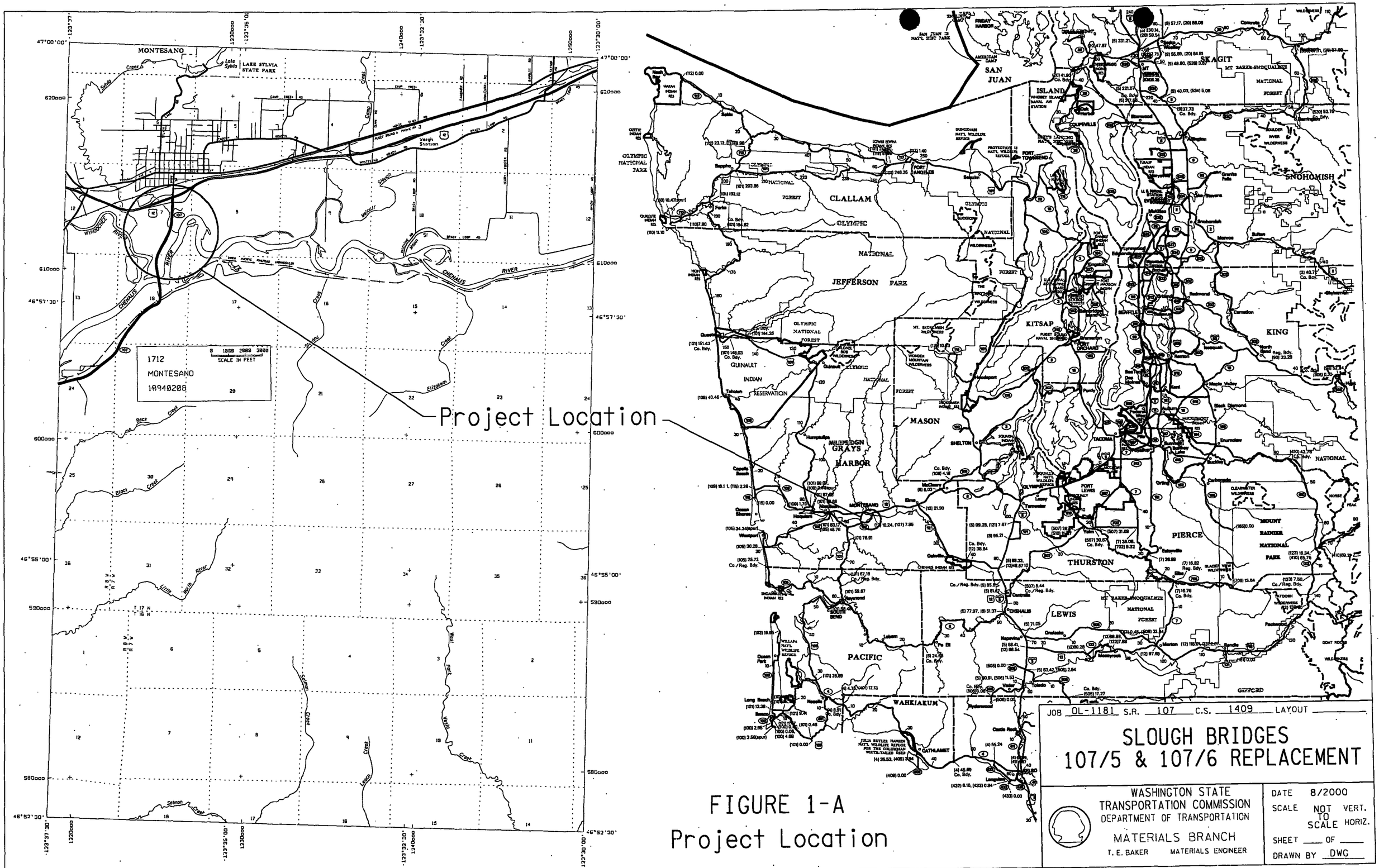

FIGURE 1-A
Project Location

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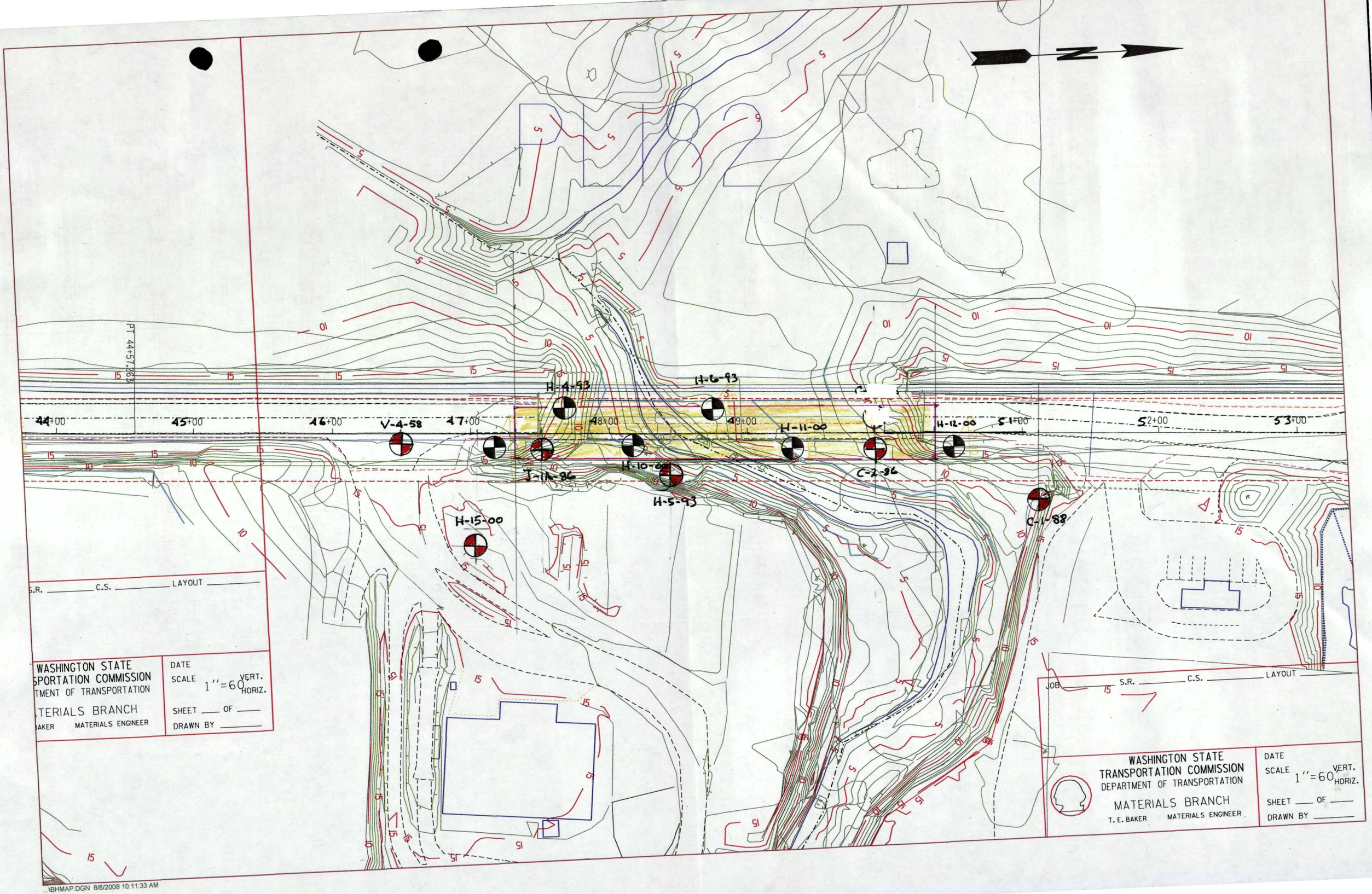

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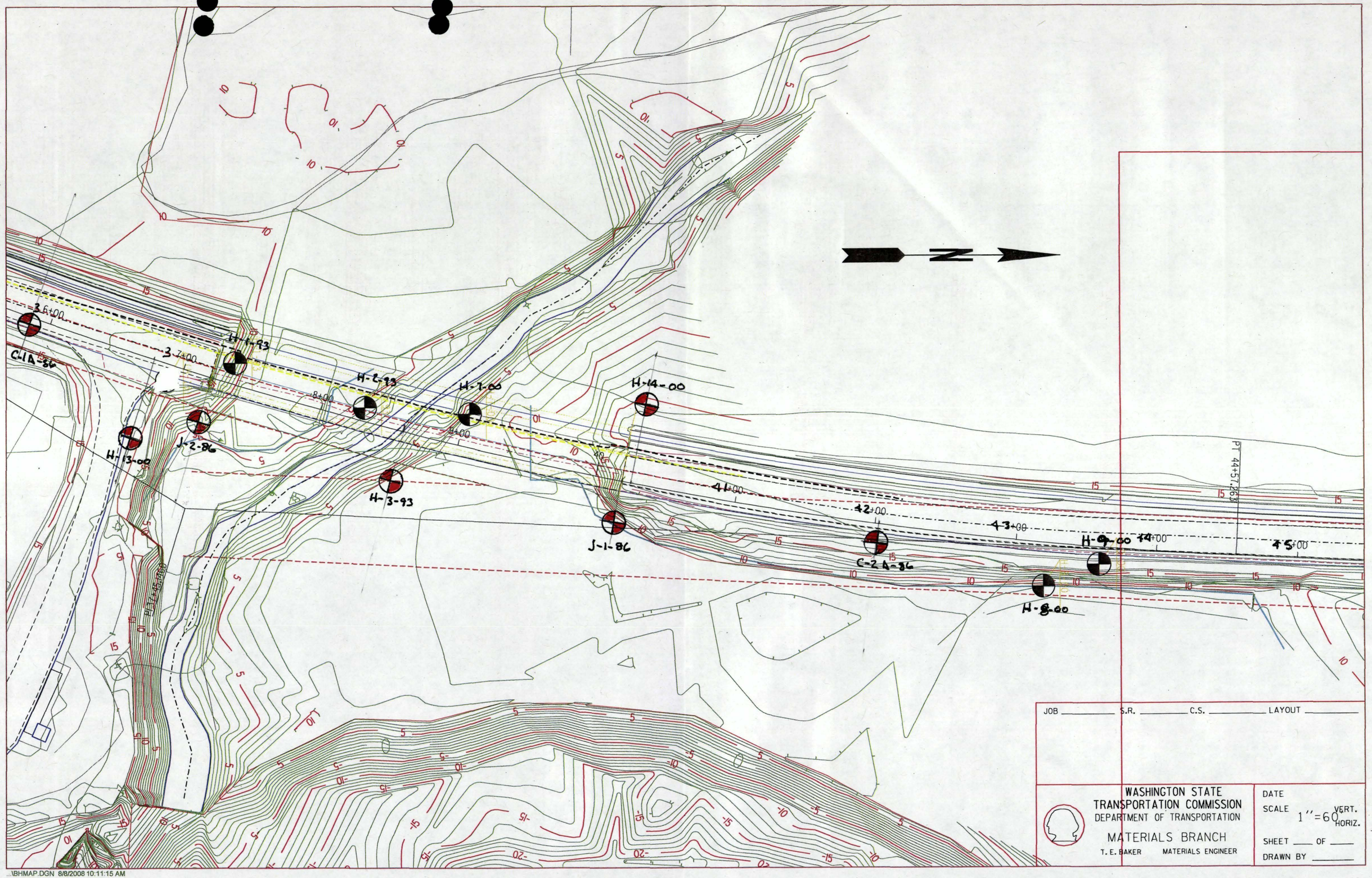

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GRAYS HARBOR COUNTY

SR 107

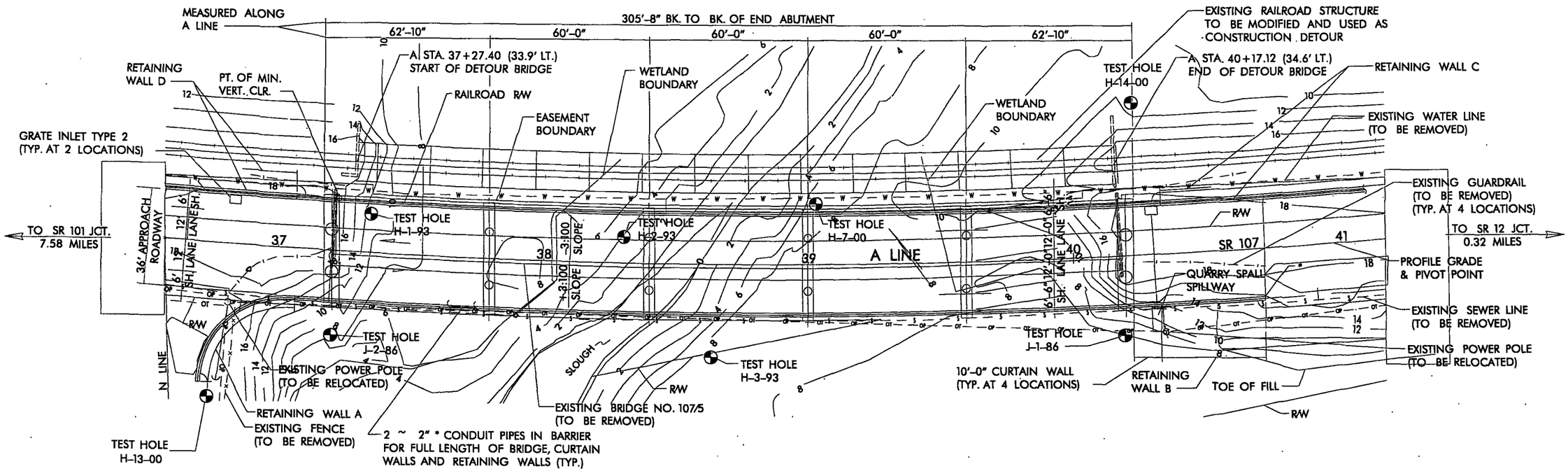

FIGURE 2-A:

Test Hole Locations

JOB OL-1181 S.R. 107 C.S. 1409

SLOUGH BRIDGE 107/5 REPLACEMENT

WASHINGTON STATE TRANSPORTATION COMMISSION
DEPARTMENT OF TRANSPORTATION
MATERIALS BRANCH
T. E. BAKER MATERIALS ENGINEER

DATE 8/2000
SCALE 1" = 40' VERT.
1" = 40' HORIZ.
SHEET ___ OF ___
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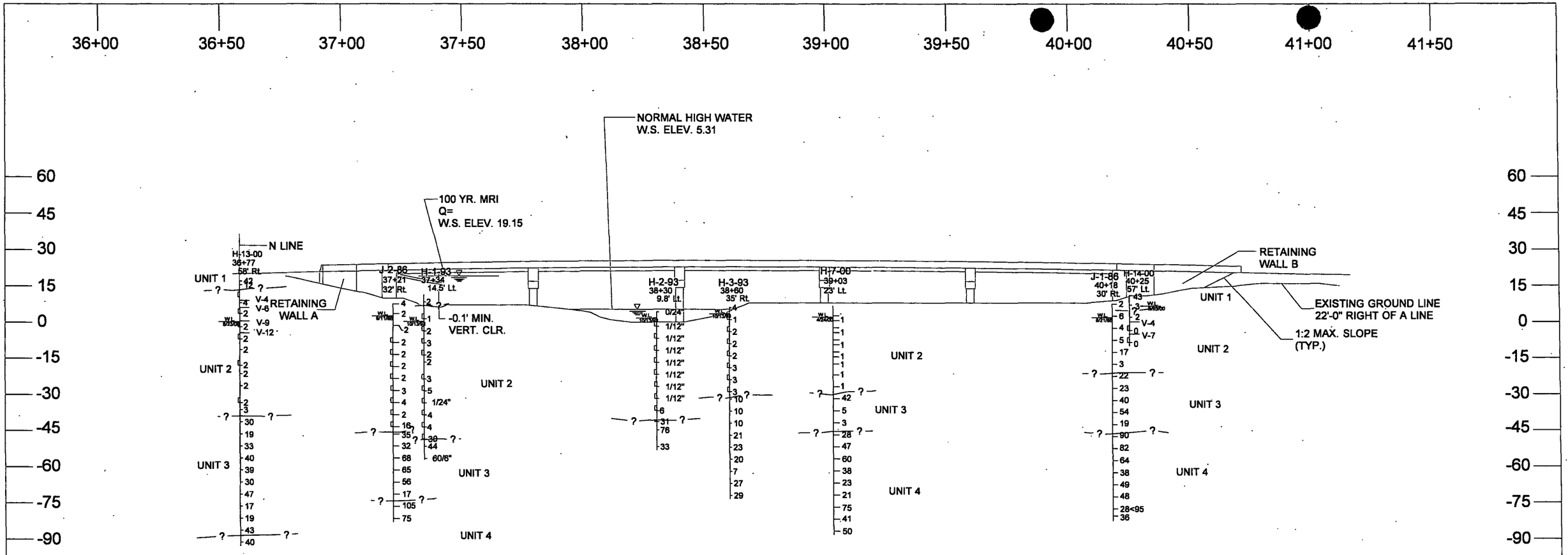

LEGEND

UNIT 1	FILL Dense to very loose sands and gravel with varying amounts of silt.
UNIT 2	Soft silt with organics
UNIT 3	Medium dense to dense well graded gravel with sand and 2' to 9' lenses of loose silty sand
UNIT 4	Dense to very dense well graded gravel and sand with gravel

TEST HOLE LEGEND

H-1-98	TEST HOLE NUMBER
110+55	TEST HOLE STATION
26 ft. Rt.	TEST HOLE OFFSET
23	STANDARD PENETROMETER TEST (BLOWS PER FOOT)
	UNDISTURBED SAMPLE
W.L. 8-6-86	WATER LEVEL & DATE
?	INDICATES SOIL/ROCK STRATA BETWEEN TEST HOLES MAY NOT BE CONTINUOUS
	INDICATES INTACT ROCK
86%	INDICATES CORE SAMPLE TAKEN
	ROCK QUALITY DESIGNATION

DATUM

NGVD 1929

FIGURE 3-A:

Subsurface Profile

JOB OL-1181 S.R. 107 C.S. 1409

SLOUGH BRIDGE 107/5 REPLACEMENT

WASHINGTON STATE
TRANSPORTATION COMMISSION
DEPARTMENT OF TRANSPORTATION

MATERIALS BRANCH

T. E. BAKER MATERIALS ENGINEER

DATE 8/2000
SCALE 1" = 40'VERT.
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GRAYS HARBOR COUNTY

SR 107

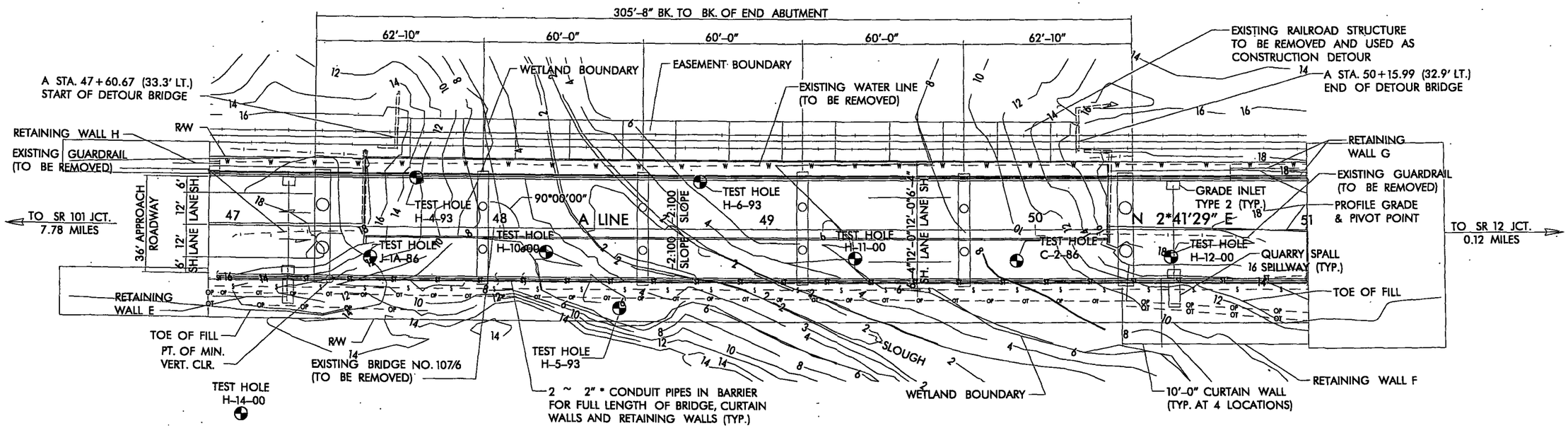

FIGURE 4-A:

Test Hole Locations

JOB OL-1181 S.R. 107 C.S. 1409

SLOUGH BRIDGE 107/6 REPLACEMENT

WASHINGTON STATE TRANSPORTATION COMMISSION
DEPARTMENT OF TRANSPORTATION
MATERIALS BRANCH
T. E. BAKER MATERIALS ENGINEER

DATE 8/2000
SCALE 1" = 40' VERT.
1" = 40' HORIZ.
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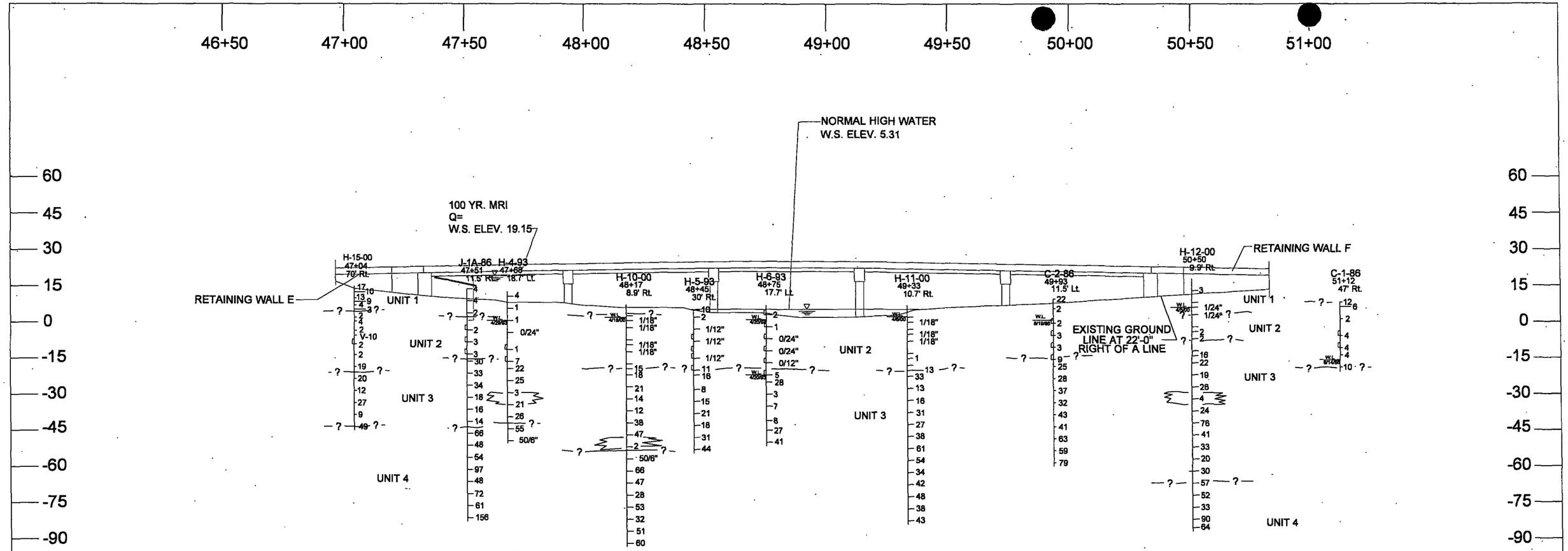

LEGEND

UNIT 1	FILL ILoose to very loose sands and gravel with varying amounts of silt.
UNIT 2	Soft silt with organics
UNIT 3	Medium dense to dense well graded gravel with sand and 2' to 5' lenses of loose silty sand
UNIT 4	Dense to very dense well graded gravel and sand with gravel

TEST HOLE LEGEND

H-1-98 TEST HOLE NUMBER
110+55 TEST HOLE STATION
26 ft.Rt. TEST HOLE OFFSET

23 STANDARD PENETROMETER TEST (BLOWS PER FOOT)
UNDISTURBED SAMPLE
W.L. 8-6-86 WATER LEVEL & DATE
? INDICATES SOIL/ROCK STRATA BETWEEN TEST HOLES MAY NOT BE CONTINUOUS
INDICATES INTACT ROCK
86% INDICATES CORE SAMPLE TAKEN
ROCK QUALITY DESIGNATION

DATUM
NGVD 1929

FIGURE 5-A:
Subsurface Profile

JOB OL-1181 S.R. 107 C.S. 1409

SLOUGH BRIDGE 107/6 REPLACEMENT

WASHINGTON STATE
TRANSPORTATION COMMISSION
DEPARTMENT OF TRANSPORTATION
MATERIALS BRANCH
T. E. BAKER MATERIALS ENGINEER

DATE 8/2000
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1" = 40' HORIZ.
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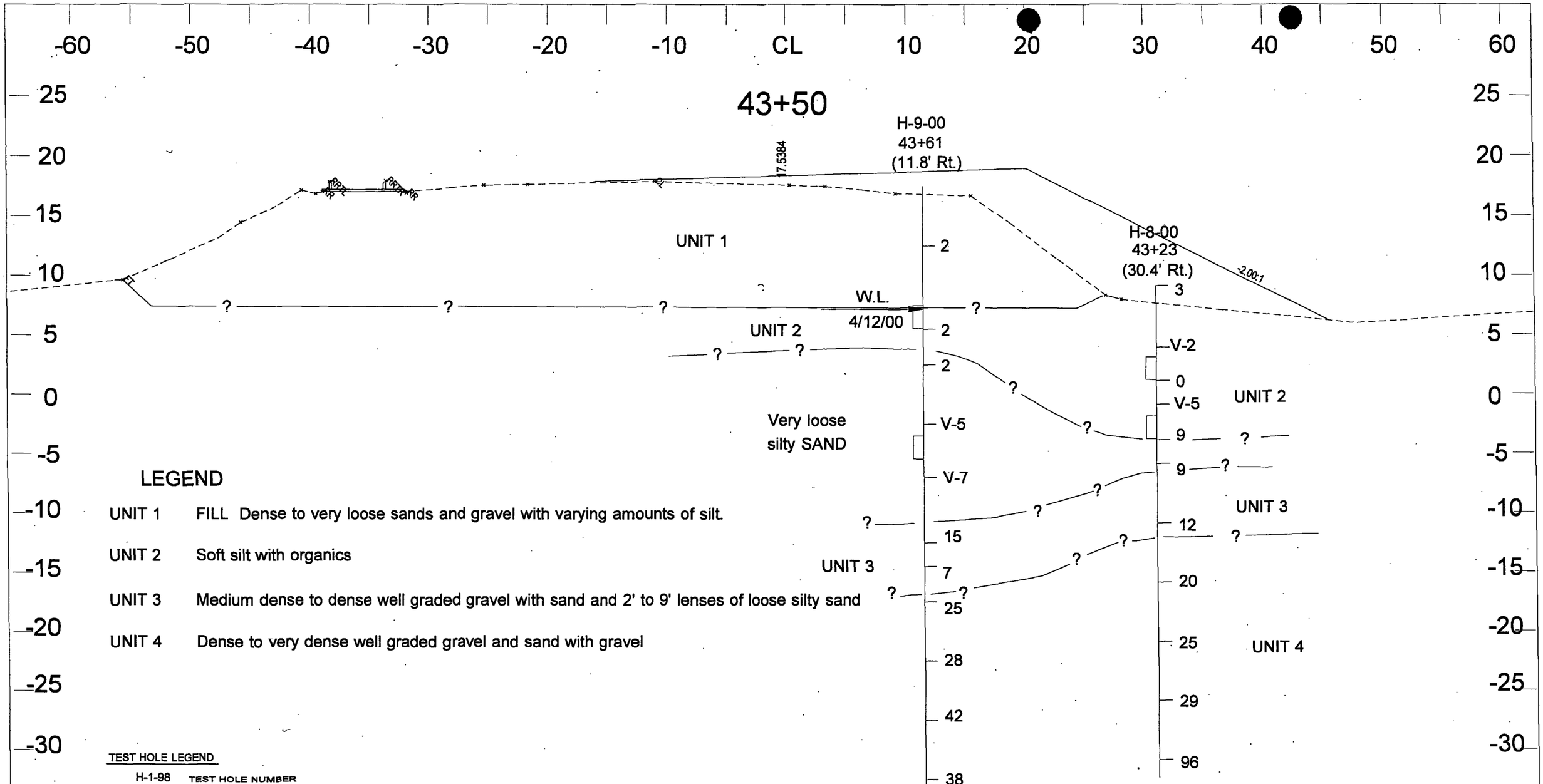

LEGEND

UNIT 1	FILL Dense to very loose sands and gravel with varying amounts of silt.
UNIT 2	Soft silt with organics
UNIT 3	Medium dense to dense well graded gravel with sand and 2' to 9' lenses of loose silty sand
UNIT 4	Dense to very dense well graded gravel and sand with gravel

TEST HOLE LEGEND

H-1-98	TEST HOLE NUMBER
110+55	TEST HOLE STATION
26 ft. Rt.	TEST HOLE OFFSET
23	STANDARD PENETROMETER TEST (BLOWS PER FOOT)
	UNDISTURBED SAMPLE
W.L. 8-6-86	WATER LEVEL & DATE
?	INDICATES SOIL/ROCK STRATA BETWEEN TEST HOLES MAY NOT BE CONTINUOUS
	INDICATES INTACT ROCK
86%	INDICATES CORE SAMPLE TAKEN
	ROCK QUALITY DESIGNATION

FIGURE 6-A:

Subsurface Profile in the Vicinity of Major Fill

STA 43+00 to STA 46+00

JOB OL-1181 S.R. 107 C.S. 1409 LAYOUT

SLOUGH BRIDGES
107/5 & 107/6 REPLACEMENT

WASHINGTON STATE
TRANSPORTATION COMMISSION
DEPARTMENT OF TRANSPORTATION
MATERIALS BRANCH
T. E. BAKER MATERIALS ENGINEER

DATE 10/2000
SCALE 1" = 8' VERT.
1" = 8' HORIZ.
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APPENDIX - B

Logs of Test Borings

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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

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 graine particles are similar to angular but have rounded edges.
Subrounded	Coarse grained particles hav 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 stiated.
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 lense.
Medium Grained	1mm to 5mm	Most crystal Boundaries/grains are distinguishable with the aid of a hand lense.
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

Discontinuities

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.

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-7-00

PROJECT Slough Bridge 107/5 and 107/6 — Job No. OL-1181

SR 12 and SR 107 Vicinity of Montesano — S.R. 107

Station 39+03 — Offset 23' Lt — C.S. 1409

Equipment CME 45 w/ autohammer — Casing HW-26,HQ — Ground El 6.6 (2.01 m)

Method of Boring Wet Rotary

Start Date April 24, 2000 — Completion Date April 27, 2000 — Sheet 1 of 5

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
								1 ft.=0.3048 m.		
	1					S-1		No Recovery		
5								04/27/2000	▽	
	2			1/18" (1)		D-2		MH, M.C.=71%, PI=10 SILT, organic material, very soft, dark gray, moist, Homogeneous, no HCl reaction Length Recovered 0.6 ft, Length Retained 0.6 ft		
						S-3		No Recovery		
10	3									
				1/18" (1)		D-4	GS MC	ML, SILT, organic material, very soft, dark gray, moist, Homogeneous, no HCl reaction Length Recovered 1.5 ft, Length Retained 1.5 ft		
	4									
						S-5		Sandy SILT, very loose, dark gray, moist, Homogeneous, no HCl reaction Length Recovered 0.8 ft, Length Retained 0.8 ft		
15										
	5			1/12" 1 (1)		D-6		Sandy SILT, root hairs, very soft, dark gray, moist, Homogeneous, no HCl reaction Length Recovered 1.1 ft, Length Retained 1.1 ft		
						S-7		Sandy Elastic SILT, organic material, very soft, dark gray, moist, Homogeneous, no HCl reaction		
20	6									

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-7-00

Sheet 2 of 5

PROJECT Slough Bridge 107/5 and 107/6

Job No. OL-1181

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
								Length Recovered 2.0 ft, Length Retained 2.0 ft		
				1/12" 1 (1)		D-8		Sandy Elastic SILT, very soft, dark gray, moist, Homogeneous, no HCl reaction Length Recovered 1.4 ft, Length Retained 1.4 ft		
	7									
25				1/12" 1 (1)		D-9	GS MC	ML SILT, very soft, dark gray, moist, Stratified, no HCl reaction Length Recovered 1.5 ft, Length Retained 1.5 ft		
	8									
30	9			1/12" 1 (1)		D-10		Elastic SILT, organic material, very soft, dark gray, moist, Stratified, no HCl reaction Length Recovered 1.5 ft, Length Retained 1.5 ft		
	10									
35				1/12" 1 (1)		D-11		Sandy SILT, very soft, dark gray, moist, Homogeneous, no HCl reaction Length Recovered 1.3 ft, Length Retained 1.3 ft		
	11									
40	12			12 21 21 (42)		D-12	GS MC	SW-SM, MC=9% Well graded SAND with silt and gravel, dense, dark gray, moist, Homogeneous, no HCl reaction Length Recovered 1.0 ft, Length Retained 1.0 ft		
	13									
45				4 3 2		D-13		Well graded SAND with silt and gravel, loose, dark gray, moist, Stratified, no HCl reaction Length Recovered 0.8 ft, Length Retained 0.8 ft		

LOG OF TEST BORING

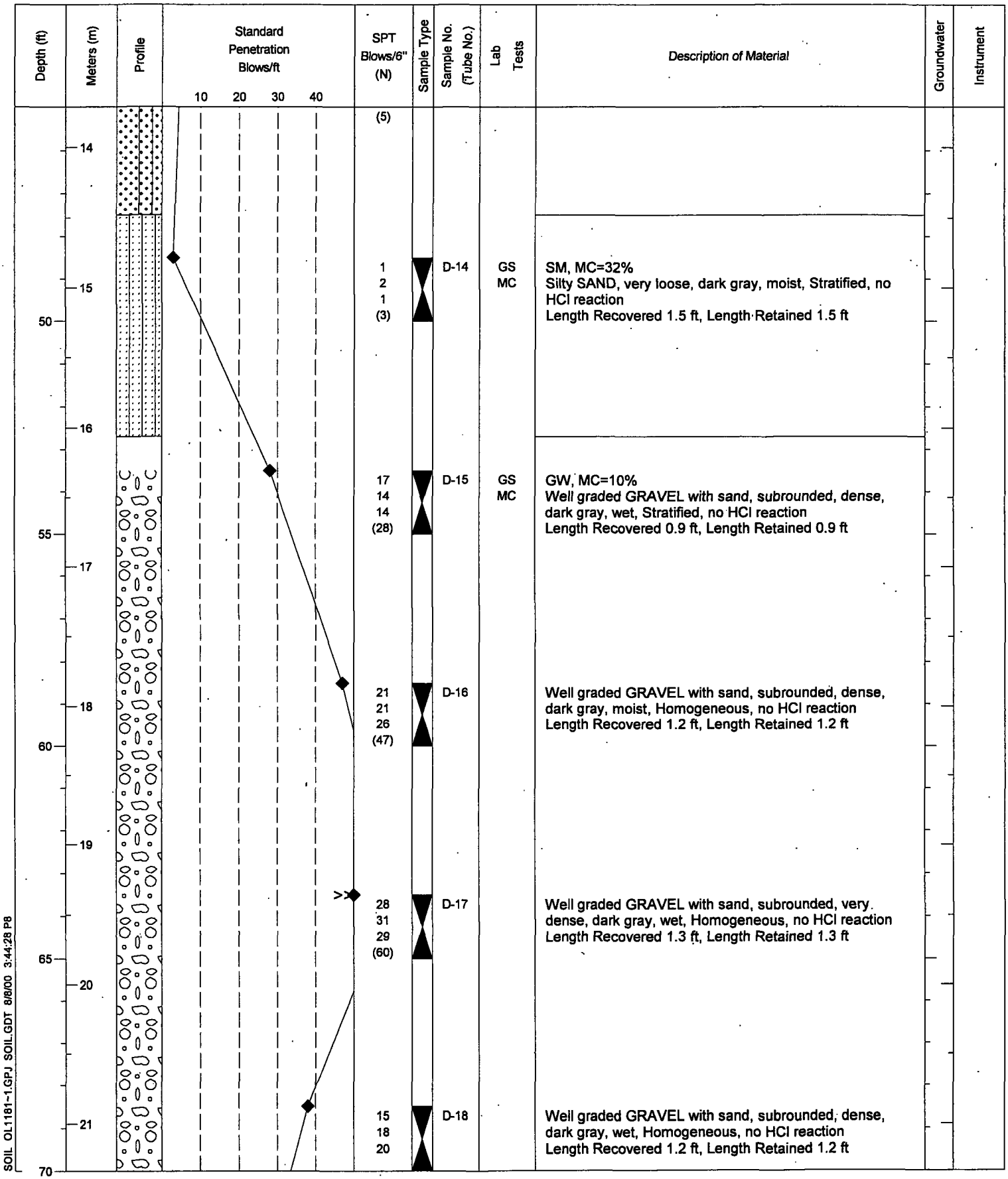
Washington State Department of Transportation

HOLE No. H-7-00

Sheet 3 of 5

PROJECT Slough Bridge 107/5 and 107/6

Job No. OL-1181



LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-7-00

Sheet 4 of 5

PROJECT Slough Bridge 107/5 and 107/6

Job No. OL-1181

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
				(38)						
	22									
				13 11 12 (23)		D-19		Well graded GRAVEL with sand, subrounded, medium dense, dark gray, wet, Stratified, no HCl reaction Length Recovered 1.1 ft, Length Retained 1.1 ft		
75	23									
	24			7 8 13 (21)		D-20	GS MC	GW, MC=13% Well graded GRAVEL with sand, subrounded, medium dense, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 1.0 ft, Length Retained 1.0 ft		
80										
	25									
			>>	25 37 38 (75)		D-21		Well graded GRAVEL with sand, subrounded, very dense, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 1.0 ft, Length Retained 1.0 ft		
85	26									
	27			20 20 21 (41)		D-22	GS MC	SP, MC=17% Poorly graded SAND with gravel, dense, dark gray, moist, Homogeneous, no HCl reaction Length Recovered 1.5 ft, Length Retained 1.5 ft		
90										
	28									
				22 20 30		D-23		Poorly graded SAND with gravel, very dense, dark gray, moist, Homogeneous, no HCl reaction Length Recovered 1.3 ft, Length Retained 1.3 ft		
95										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-7-00**

Sheet **5** of **5**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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
	29			(50)						
								End of test hole boring at 95 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.		
	30									
100										
	31									
105	32									
	33									
110										
	34									
115	35									
	36									
120										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-8-00**

PROJECT **Slough Bridge 107/5 and 107/6** Job No. **OL-1181**

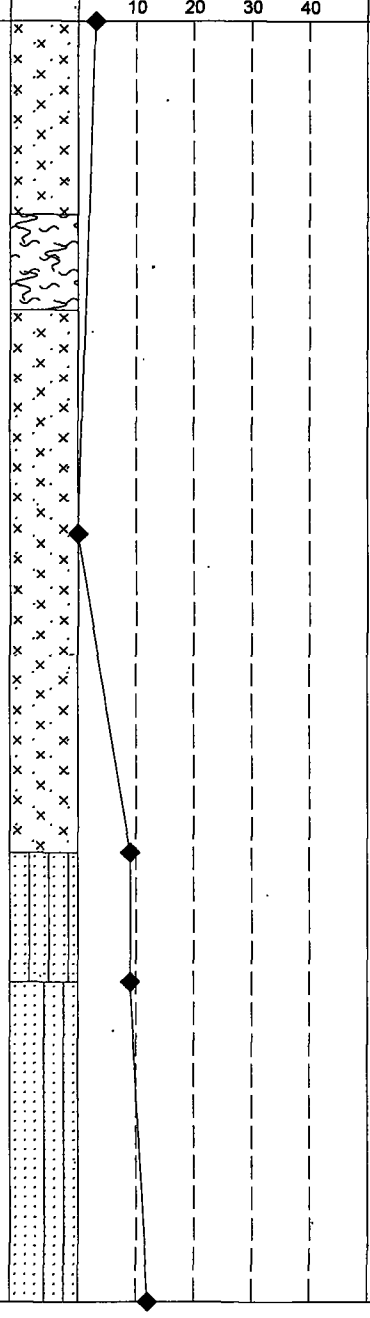
SR 12 and SR 107 Vicinity of Montesano S.R. **107**

Station **43+23** Offset **30.4' Rt** C.S. **1409**

Equipment **CME 45 w/ cathead** Casing **HQ-40'** Ground El **8.3 (2.53 m)**

Method of Boring **Wet Rotary**

Start Date **April 18, 2000** Completion Date **April 18, 2000** Sheet **1** of **2**



Depth (ft)	Meters (m)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
		1 1 2 (3)		D-1		SILT with SAND, soft, strong brown, moist, Disrupted, no HCl reaction, mottled, orange, gray, lensed with chunks of sandstone, pieces of wood, and clay. Length Recovered 1.0 ft, Length Retained 1.0 ft		
	1					NOTE: *Buried log between* 3 ft and 4.5 ft below ground surface.		
5				VS-2		Undisturbed shear strength = 777 psf. Remolded shear strength = 280 psf.		
	2			U-3 A B C D	CU UU GS MC PI	(U-3/B) ML, MC=48%, PI=7 (U-3/C) ML, MC=47%, PI=9 Sandy SILT, clay, soft, brown, wet, Disrupted, no HCl reaction, mottled reddish yellow and light olive brown, FeO staining. 3' to 4.5' wood. Length Recovered 1.4 ft, Length Retained 1.4 ft		
		0 0 0 (0)		D-4		Sandy SILT, very soft, olive gray, wet, no HCl reaction, mottled with gray and orange, FeO staining. Length Recovered 1.5 ft, Length Retained 1.0 ft		
10	3			VS-5		Undisturbed shear strength = 901 psf. Remolded shear strength = 373 psf.		
				U-6 A B C D	UU GS MC	(U-6/B) ML, MC=53% (U-6/C) ML, MC=45% Sandy SILT, very soft, dark gray, wet, no HCl reaction, stratified, very fine sand and silt with roots. Length Recovered 1.4 ft, Length Retained 1.4 ft		
	4	5 5 4 (9)		D-7	GS MC	SM, MC=46% Silty SAND, very loose, dark olive gray, wet, Stratified, no HCl reaction Length Recovered 1.5 ft, Length Retained 1.0 ft		
15		5 5 4 (9)		D-8	GS MC	SP-SM, MC=15% Poorly graded SAND with silt and gravel, loose, dark gray, wet, Homogeneous, no HCl reaction. Length Recovered 1.0 ft, Length Retained 1.0 ft		
	5							
	6							
20								

LOG OF TEST BORING

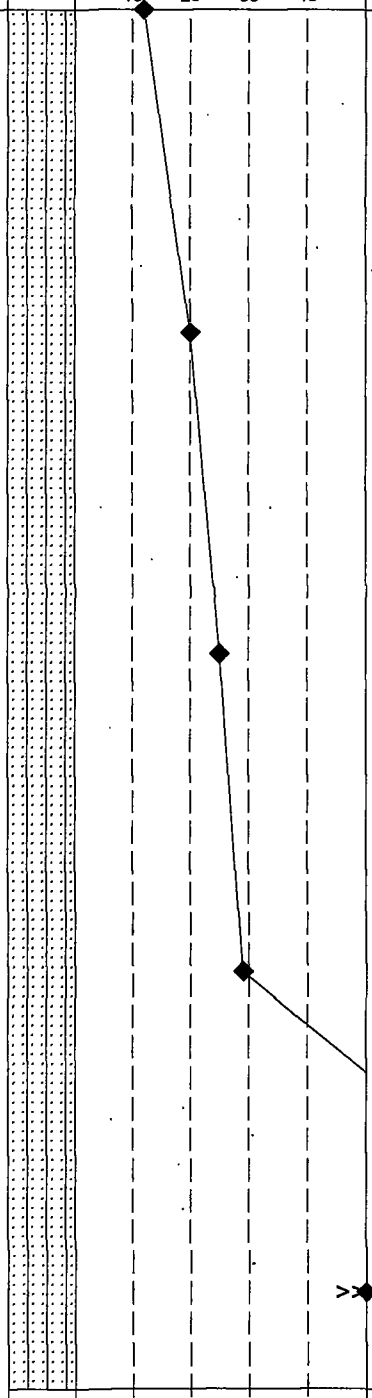
Washington State Department of Transportation

HOLE No. **H-8-00**

Sheet 2 of 2

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**



Depth (ft)	Meters (m)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
		6 5 7 (12)		D-9		Well graded GRAVEL with sand, loose, dark gray, wet, Homogeneous, no HCl reaction. Length Recovered 0.8 ft, Length Retained 0.8 ft		
	7							
25		8 9 11 (20)		D-10		Well graded GRAVEL with sand, medium dense, olive gray, wet, Homogeneous, no HCl reaction, lensed with pockets of silt. Length Recovered 1.0 ft, Length Retained 1.0 ft		
	8							
	9							
30		11 12 13 (25)		D-11		Well graded GRAVEL with sand, dense, olive gray, wet, Homogeneous, no HCl reaction, more gravel, harder drilling from 27'. Length Recovered 0.9 ft, Length Retained 0.9 ft		
	10							
35		10 16 13 (29)		D-12		Well graded GRAVEL with sand, dense, olive gray, wet, Homogeneous, no HCl reaction. Length Recovered 0.9 ft, Length Retained 0.9 ft		
	11							
	12							
40		>>22 46 50 (96)		D-13		Well graded GRAVEL with sand, very dense, olive gray, wet, Homogeneous, no HCl reaction. Length Recovered 0.6 ft, Length Retained 0.6 ft		
	13					End of test hole boring at 41.5 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.		
45								

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-9-00

PROJECT Slough Bridge 107/5 and 107/6 — Job No. OL-1181

SR 12 and SR 107 Vicinity of Montesano — S.R. 107

Station 43+61 — Offset 11.8' Rt — C.S. 1409

Equipment CME 45 w/ autohammer — Casing HQx50 — Ground El 17.1 (5.21 m)

Method of Boring Wet Rotary

Start Date April 11, 2000 — Completion Date April 12, 2000 — Sheet 1 of 3

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
								1 ft.=0.3048 m.		
5	1, 2			1 1 1 (2)		D-1	GS MC	ML, MC=49% SILT with SAND, very loose, brown to light brown, moist, Homogeneous, no HCl reaction Length Recovered 0.5 ft, Length Retained 0.5 ft		
10	3					U-2 A B C	UU GS MC PI	(U-2/B) MH, MC=69%, PI=17 Elastic SILT, very loose, gray, moist, Homogeneous, no HCl reaction Length Recovered 1.0 ft, Length Retained 1.0 ft	▽ 04/12/2000	
	4			1 1 1 (2)		D-3	GS MC	SM, MC=33% Silty SAND, very loose, brown and gray, wet, Laminated, Fissured, no HCl reaction Length Recovered 0.8 ft, Length Retained 0.8 ft		
15	5			1 1 1 (2)		D-4		Silty SAND, very loose, brown and gray, wet, Laminated, Fissured, no HCl reaction Length Recovered 1.5 ft, Length Retained 1.0 ft		
20	6									

LOG OF TEST BORING

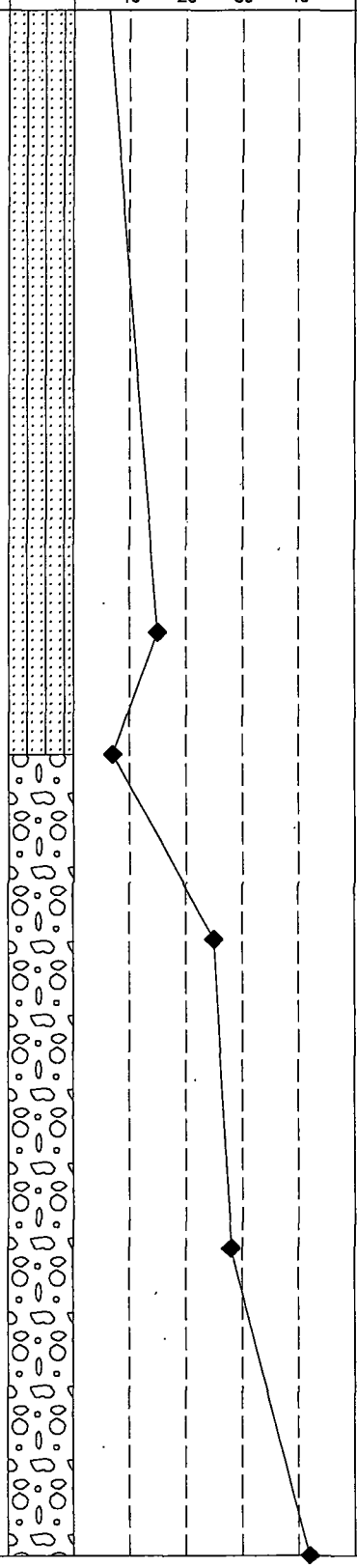
Washington State Department of Transportation

HOLE No. **H-9-00**

Sheet **2** of **3**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**



Depth (ft)	Meters (m)	Profile	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
					V-5		Undisturbed shear strength = 1119 psf. Remolded shear strength = 342 psf.		
					U-6 A B C D	UU GS MC	(U-5/B) MC=40% Sandy SILT, very loose, gray, wet, Homogeneous, no HCl reaction (U-5/E) SM, MC=45% Silty SAND, dark gray Length Recovered 1.4 ft, Length Retained 1.4 ft		
25	7				V-7		Undisturbed shear strength = 218 psf.		
	8								
30	9		10 8 7 (15)		D-8		Silty SAND, medium dense, dark bluish gray, wet, Homogeneous, no HCl reaction Length Recovered 0.8 ft, Length Retained 0.8 ft		
	10		3 3 4 (7)		D-9		Well graded GRAVEL with sand, subangular, loose, gray, wet, Homogeneous, no HCl reaction Length Recovered 1.5 ft, Length Retained 1.0 ft		
35	11		11 12 13 (25)		D-10		Well graded GRAVEL with sand, subangular, dense, dark bluish gray, wet, Homogeneous, no HCl reaction Length Recovered 0.8 ft, Length Retained 0.7 ft		
40	12		12 13 15 (28)		D-11		Well graded GRAVEL with sand, subangular, dense, dark bluish gray, wet, Homogeneous, no HCl reaction Length Recovered 0.8 ft, Length Retained 0.7 ft		
45	13								

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-9-00**

Sheet **3** of **3**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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			18 20 22 (42)		D-12		Well graded GRAVEL with sand, subangular, dense, dark bluish gray, wet, Homogeneous, no HCl reaction Length Recovered 1.0 ft, Length Retained 0.7 ft		
	15									
50				22 19 19 (38)		D-13		Well graded GRAVEL with sand, subangular, dense, dark bluish gray, wet, Homogeneous, no HCl reaction Length Recovered 1.0 ft, Length Retained 0.8 ft		
	16							End of test hole boring at 51.5 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.		
55	17									
	18									
60										
	19									
65										
	20									
	21									
70										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-10-00

PROJECT Slough Bridge 107/5 and 107/6 — Job No. OL-1181

SR 12 and SR 107 Vicinity of Montesano — S.R. 107

Station 48+17 — Offset 8.9' Rt — C.S. 1409

Equipment CME 45 w/ autohammer — Casing HW 26.5, HQ — Ground El 7.0 (2.13 m)

Method of Boring Wet Rotary

Start Date April 11, 2000 — Completion Date April 18, 2000 — Sheet 1 of 5

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
								1 ft.=0.3048 m.		
	1									
5						S-1		ORGANIC SOIL, very soft, dark gray, moist, Homogeneous, no HCl reaction Length Recovered 1.0 ft, Length Retained 1.0 ft 04/18/2000		
	2			1/18" (1)		D-2		SILT with organic material, very soft, dark gray, moist, Homogeneous, no HCl reaction Length Recovered 1.5 ft, Length Retained 1.5 ft		
10	3			1/18" (1)		D-3		ML SILT, very soft, dark gray, moist, Homogeneous, no HCl reaction Length Recovered 1.5 ft, Length Retained 1.5 ft		
	4									
15						S-4		SILT, very soft, dark gray, moist, Homogeneous, no HCl reaction Length Recovered 1.5 ft, Length Retained 1.5 ft		
	5			1/18" (1)		D-5		SILT, very soft, dark gray, moist, Homogeneous, no HCl reaction Length Recovered 1.5 ft, Length Retained 1.5 ft		
20	6			1/18"		D-6		Sandy SILT, very loose, dark gray, moist, Homogeneous,		

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-10-00**

Sheet 2 of 5

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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
				(1)				no HCl reaction Length Recovered 1.5 ft, Length Retained 1.5 ft		
	7									
25						S-7		Sandy SILT, loose, dark gray, moist, Stratified, no HCl reaction Length Recovered 1.5 ft, Length Retained 1.5 ft		
	8			4 7 8 (15)		D-8		Well graded SAND with gravel, medium dense, dark gray, moist, Homogeneous, no HCl reaction Length Recovered 0.8 ft, Length Retained 0.8 ft		
	9			7 9 9 (18)		D-9		Well graded GRAVEL with sand, subrounded, medium dense, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 0.8 ft, Length Retained 0.8 ft		
30										
	10									
35				9 10 11 (21)		D-10		Well graded GRAVEL with sand, medium dense, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 0.9 ft, Length Retained 0.9 ft		
	11									
	12			6 7 7 (14)		D-11		Well graded GRAVEL with sand, subrounded, medium dense, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 0.8 ft, Length Retained 0.8 ft		
40										
	13									
45				5 6		D-12		Well graded GRAVEL with sand, subrounded, medium dense, dark gray, wet, Homogeneous, no HCl reaction		

LOG OF TEST BORING

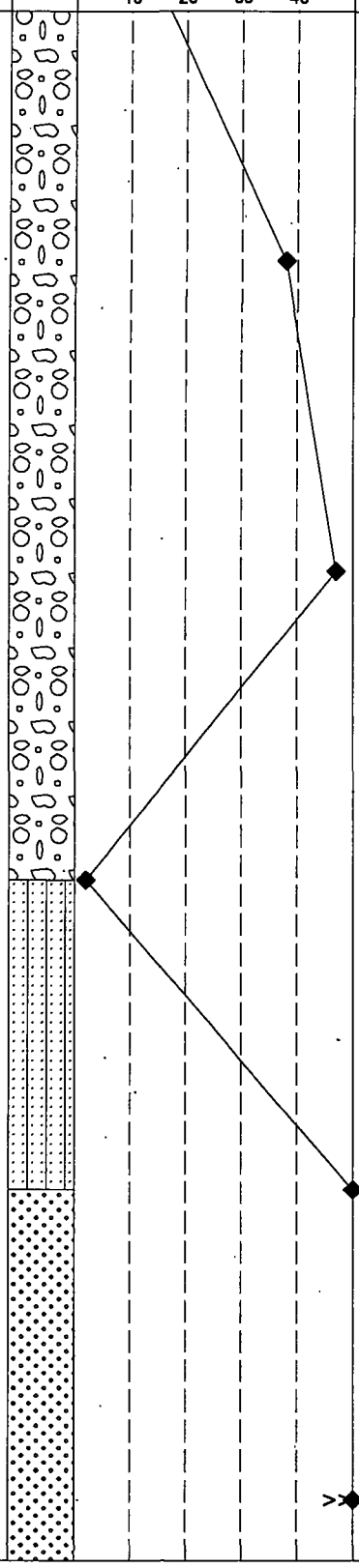
Washington State Department of Transportation

HOLE No. **H-10-00**

Sheet **3** of **5**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**



Depth (ft)	Meters (m)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
		6 (12)				Length Recovered 0.7 ft, Length Retained 0.7 ft		
	14							
	15	16 19 17 (38)		D-13		GW, M.C.=10% Well graded GRAVEL with sand, dense, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 1.2 ft, Length Retained 1.2 ft		
50								
	16							
		41 27 20 (47)		D-14		Well graded GRAVEL with sand, subrounded, dense, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 1.3 ft, Length Retained 1.3 ft		
55								
	17							
	18	2 1 1 (2)		D-15		SM, M.C. = 44% Silty SAND, organic material, very loose, dark gray, wet, Stratified, no HCl reaction Length Recovered 1.3 ft, Length Retained 1.3 ft		
60								
	19							
		27 50/6 (50/6")		D-16		Silty GRAVEL with sand, subrounded, very dense, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 1.0 ft, Length Retained 1.0 ft		
65								
	20							
	21	>> 47 43		D-17		Well graded GRAVEL with sand, subrounded, very dense, dark gray, wet, Homogeneous, no HCl reaction		
70								

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-10-00

Sheet 4 of 5

PROJECT Slough Bridge 107/5 and 107/6

Job No. OL-1181

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
				23 (66)				Length Recovered 1.2 ft, Length Retained 1.2 ft		
	22									
75	23			41 27 20 (47)		D-18		Silty GRAVEL with sand, subrounded, dense, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 1.3 ft, Length Retained 1.3 ft		
	24			8 13 15 (28)		D-19		Well graded SAND with gravel, dense, dark gray, wet, Stratified, no HCl reaction Length Recovered 1.2 ft, Length Retained 1.2 ft		
80	25									
85	26			17 25 28 (53)		D-20		GP, M.C.=11% Poorly graded GRAVEL with sand, subrounded, very dense, dark gray, wet, Stratified, no HCl reaction Length Recovered 1.3 ft, Length Retained 1.3 ft		
	27			12 20 12 (32)		D-21		Poorly graded GRAVEL with sand, subrounded, dense, dark gray, wet, Stratified, no HCl reaction Length Recovered 1.1 ft, Length Retained 1.1 ft		
90	28									
95				21 30		D-22		Poorly graded GRAVEL with sand, subrounded, very dense, dark gray, wet, Homogeneous, no HCl reaction		

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-10-00

Sheet 5 of 5

PROJECT Slough Bridge 107/5 and 107/6

Job No. OL-1181

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
	29			21 (51)				Length Recovered 1.5 ft, Length Retained 1.5 ft		
	30			21 20 40 (60)		D-23		Poorly graded GRAVEL with sand, subrounded, very dense, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 0.7 ft, Length Retained 0.7 ft		
100										
	31							End of test hole boring at 100.5 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.		
105	32									
	33									
110										
	34									
115	35									
	36									
120										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-11-00

PROJECT Slough Bridge 107/5 and 107/6 — Job No. OL-1181

SR 12 and SR 107 Vicinity of Montesano — S.R. 107

Station 49+33 — Offset 10.7' Rt — C.S. 1409

Equipment CME 45 w/ autohammer — Casing HW 26.5,HQ — Ground El 7.0 (2.13 m)

Method of Boring Wet Rotary

Start Date April 4, 2000 — Completion Date April 6, 2000 — Sheet 1 of 4

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
								1 ft.=0.3048 m.		
	1									
5						S-1		No Recovery	4/6/2000	
	2			1/18" (1)		D-2		ORGANIC SOIL, very soft, dark gray, moist, Homogeneous, no HCl reaction Length Recovered 1.5 ft, Length Retained 1.5 ft		
10	3					S-3		ORGANIC SOIL, very soft, dark gray, moist, Homogeneous, no HCl reaction Length Recovered 2.0 ft, Length Retained 2.0 ft		
	4			1/18" (1)		D-4		ORGANIC SOIL, very soft, dark gray, moist, Homogeneous, no HCl reaction Length Recovered 1.2 ft, Length Retained 1.2 ft		
15	5			1/18" (1)		D-5	GS AL	MH, PI = 13 Elastic Silt, very soft, dark gray, moist, Stratified, no HCl reaction Length Recovered 1.5 ft, Length Retained 1.5 ft		
20	6									

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-11-00

Sheet 2 of 4

PROJECT Slough Bridge 107/5 and 107/6

Job No. OL-1181

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
						S-6		Sandy ORGANIC SOIL, very soft, dark gray, moist, Stratified, no HCl reaction Length Recovered 0.5 ft, Length Retained 0.5 ft		
	7			1/12" 1 (1)		D-7		Sandy ORGANIC SOIL, very soft, dark gray, moist, Stratified, no HCl reaction Length Recovered 1.5 ft, Length Retained 1.5 ft		
25						S-8		Sandy ORGANIC SOIL, soft, dark gray, moist, Stratified, no HCl reaction Length Recovered 2.0 ft, Length Retained 2.0 ft		
	8			2 5 8 (13)		D-9	GS MC	SP-SM, M.C.= 21% Poorly graded SAND with silt and gravel, medium dense, dark gray, wet, Stratified, no HCl reaction Length Recovered 0.8 ft, Length Retained 0.8 ft		
	9			15 18 15 (33)		D-10		Silty GRAVEL with sand, subrounded, dense, dark gray, moist, Homogeneous, no HCl reaction Length Recovered 1.0 ft, Length Retained 1.0 ft		
30										
	10									
35				11 8 5 (13)		D-11		Silty GRAVEL with sand, subrounded, medium dense, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 0.9 ft, Length Retained 0.9 ft		
	11									
	12			9 9 7 (16)		D-12		Silty GRAVEL with sand, subrounded, medium dense, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 0.6 ft, Length Retained 0.6 ft		
40										
	13									
45				12		D-13		Silty GRAVEL with sand, subrounded, dense, dark gray,		

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-11-00**

Sheet **3** of **4**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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			15 16 (31)				wet, Homogeneous, no HCl reaction Length Recovered 0.9 ft, Length Retained 0.9 ft		
50	15			8 10 17 (27)		D-14		Silty GRAVEL with sand, subrounded, dense, DARK GRAY, wet, Homogeneous, no HCl reaction Length Recovered 1.1 ft, Length Retained 1.1 ft		
	16									
55	17			15 25 13 (38)		D-15		Silty GRAVEL with sand, subrounded, dense, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 0.9 ft, Length Retained 0.9 ft		
	18									
60			>>	23 31 30 (61)		D-16	GS MC	GW, M.C.≈9% Well graded GRAVEL with sand, subrounded, very dense, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 0.9 ft, Length Retained 0.9 ft		
	19									
65	20		>>	35 28 26 (54)		D-17		Silty GRAVEL with sand, subrounded, very dense, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 1.2 ft, Length Retained 1.2 ft		
	21									
70				9		D-18		Silty GRAVEL with sand, subrounded, dense, dark gray,		

SOIL OL1181~1.GPJ SOIL.GDT 8/8/00 3:43:49 P8

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-11-00**

Sheet **4** of **4**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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
				17 17 (34)				wet, Stratified, no HCl reaction Length Recovered 1.0 ft, Length Retained 1.0 ft		
	22									
75	23			11 14 28 (42)		D-19		Well graded GRAVEL with sand, subrounded, dense, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 1.0 ft, Length Retained 1.0 ft		
	24									
80				15 31 17 (48)		D-20		Silty GRAVEL with sand, subrounded, dense, dark gray, wet, Stratified, no HCl reaction Length Recovered 1.2 ft, Length Retained 1.2 ft		
	25									
85	26			17 17 21 (38)		D-21		Silty GRAVEL with sand, subrounded, dense, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 1.2 ft, Length Retained 1.2 ft		
	27									
90				20 18 25 (43)		D-22		Silty GRAVEL with sand, subrounded, dense, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 1.0 ft, Length Retained 1.0 ft		
	28							End of test hole boring at 91 ft below ground elevation.		
95								This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Water Table fluctuated with tide.		

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-12-00

PROJECT Slough Bridge 107/5 and 107/6 — Job No. OL-1181

SR 12 and SR 107 Vicinity of Montesano — S.R. 107

Station 50+50 — Offset 9.9' Rt — C.S. 1409

Equipment CME 45 w/ autohammer — Casing (HWT x 40.0)(HQ x 120.0 — Ground El 17.9 (5.46 m)

Method of Boring Wet Rotary

Start Date April 3, 2000 — Completion Date April 10, 2000 — Sheet 1 of 5

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
								1 ft.=0.3048 m.		
	1									
5				2 2 1 (3)		D-1		Silty SAND, very loose, brown, moist, Homogeneous, no HCl reaction, Small pieces of wood debris. Length Recovered 0.8 ft, Length Retained 0.8 ft		
	2									
10	3					SH-2		Sandy SILT, very loose, gray, moist, Stratified, no HCl reaction, laminated with dark red and brown oxidized stains Length Recovered 2.0 ft, Length Retained 2.0 ft		
				1/24 (1)		D-3	GS MC	SM, MC=38% Silty SAND	▽ 04/05/2000	
	4									
15				1/24 (1)		D-4		Silty SAND, very loose, dark gray, moist, Laminated, Fissured, no HCl reaction, fibrous peat, fine grains of mica. Length Recovered 1.5 ft, Length Retained 1.0 ft		
	5									
	6									
20										

LOG OF TEST BORING

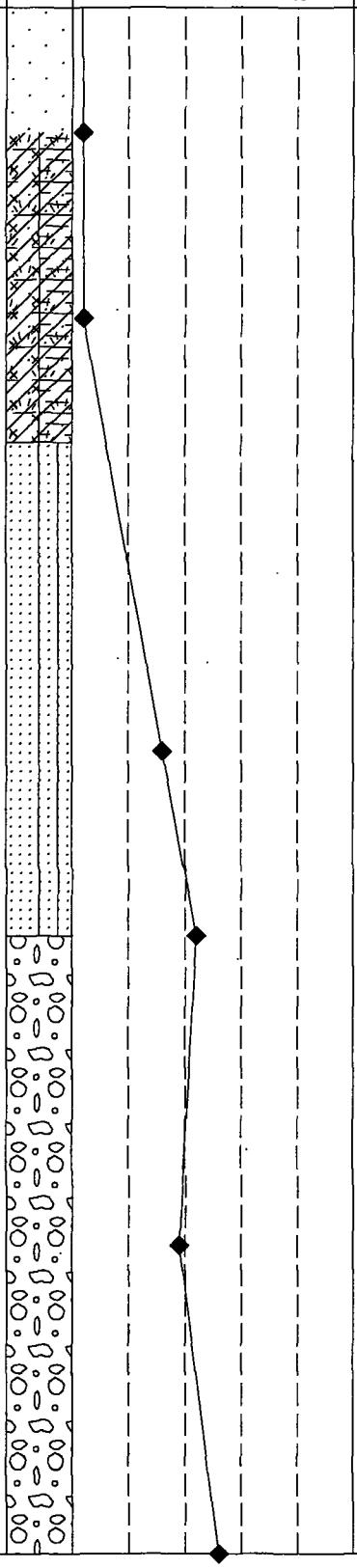
Washington State Department of Transportation

HOLE No. **H-12-00**

Sheet **2** of **5**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**



Depth (ft)	Meters (m)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				SH-5		SILT, very loose, dark gray, moist, Homogeneous, no HCl reaction, 0 to 50 psi to push undisturbed 2.0'. Same down pressure to push SH-1. Length Recovered 2.0 ft, Length Retained 2.0 ft		
	7	1 1 1 (2)		D-6	GS MC AL	OH, M.C.=82%, PI=19, LLB=119, LLA=74 ORGANIC SILT, very loose, gray, moist, Laminated, Fissured, no HCl reaction, fibrous peat. Length Recovered 1.5 ft, Length Retained 1.0 ft		
25	8	1 1 1 (2)		D-7	GS MC AL	OH, MC=64%, PI=29, LLB=100, LLA=67 ORGANIC SILT with purple stains, very soft, gray, moist, Laminated, Fissured, no HCl reaction. Length Recovered 1.5 ft, Length Retained 1.0 ft		
	9							
30				SH-8		No Recovery		
	10	5 7 9 (16)		D-9	GS MC	SP-SM, MC=17% Poorly graded SAND with silt and gravel, medium dense, dark gray, wet, Laminated, Fissured, no HCl reaction. Length Recovered 1.3 ft, Length Retained 1.0 ft		
35	11	6 10 12 (22)		D-10		Well graded GRAVEL with sand, subrounded, medium dense, gray, wet, Laminated, Fissured, no HCl reaction. Length Recovered 0.1 ft, Length Retained 0.1 ft		
	12							
40	13	7 11 8 (19)		D-11		Well graded GRAVEL with sand, subrounded, medium dense, dark gray, wet, Homogeneous, no HCl reaction. Length Recovered 1.0 ft, Length Retained 1.0 ft		
45								

LOG OF TEST BORING

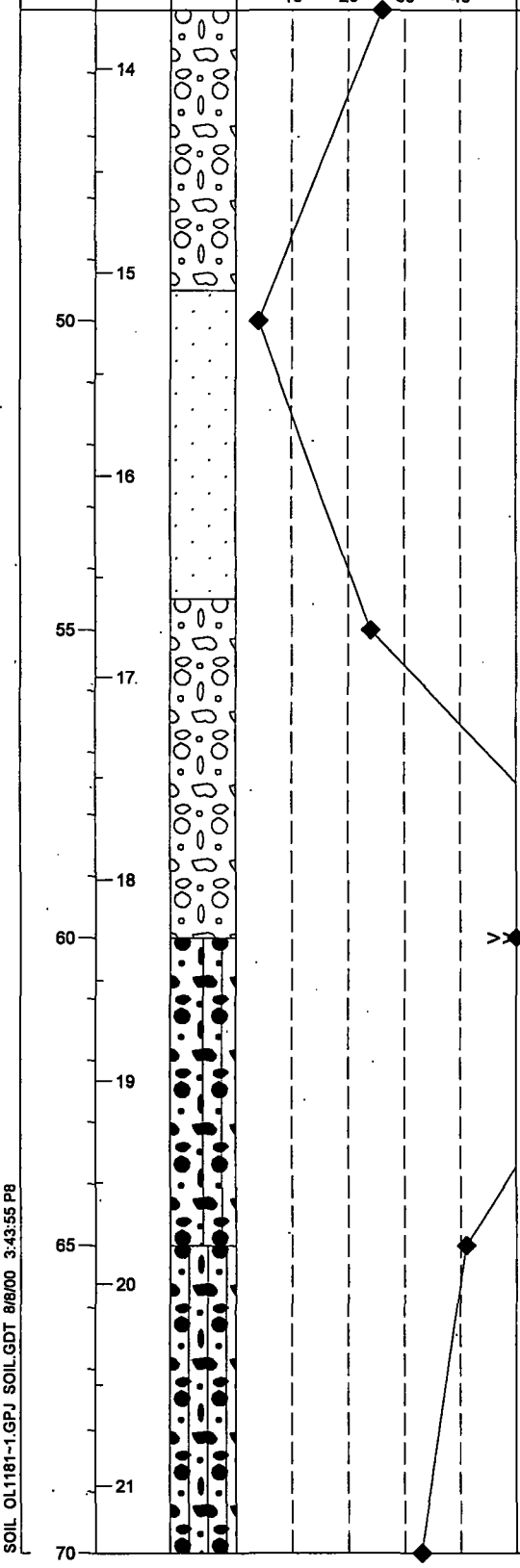
Washington State Department of Transportation

HOLE No. H-12-00

Sheet 3 of 5

PROJECT Slough Bridge 107/5 and 107/6

Job No. OL-1181



SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
11 14 12 (26)		D-12	GS MC	GW, MC=6% Well graded GRAVEL with sand, subrounded, dense, gray, wet, Homogeneous, no HCl reaction. Length Recovered 1.0 ft, Length Retained 1.0 ft		
2 2 2 (4)		D-13	GS	ML SILT with sand, organics and small wood fibers and shells, very loose, gray, moist, Laminated, Fissured, no HCl reaction, . 100% fluid recovery. Length Recovered 0.8 ft, Length Retained 0.8 ft		
15 13 11 (24)		D-14		Well graded GRAVEL with sand, subrounded, medium dense, gray, moist, Homogeneous, no HCl reaction. Length Recovered 0.8 ft, Length Retained 0.8 ft		
17 37 39 (76)		D-15	GS MC	GP-GM, MC=14% Poorly graded GRAVEL with silt and sand, subrounded, very dense, gray, moist, Laminated, Fissured, no HCl reaction. Length Recovered 0.9 ft, Length Retained 0.9 ft		
16 17 24 (41)		D-16		Silty GRAVEL with sand, subrounded, dense, gray, moist, Homogeneous, no HCl reaction. Length Recovered 1.0 ft, Length Retained 1.0 ft		

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-12-00**

Sheet **4** of **5**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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
				15 15 18 (33)		D-17		Silty GRAVEL with sand, angular, dense, gray, moist, Homogeneous, no HCl reaction. Length Recovered 0.7 ft, Length Retained 0.7 ft		
	22									
75	23			16 10 10 (20)		D-18		Silty GRAVEL with sand, subrounded, medium dense, gray, moist, Homogeneous, no HCl reaction Length Recovered 1.0 ft, Length Retained 0.8 ft		
	24									
80				15 15 15 (30)		D-19	GS MC	04/06/2000 SW, MC=10% Well graded SAND with gravel	▼	
	25									
85	26		>>	18 24 33 (57)		D-20		Silty GRAVEL with sand, subrounded, very dense, gray, wet, Homogeneous, no HCl reaction, loosely bonded together with a silt matrix. Length Recovered 1.5 ft, Length Retained 1.0 ft		
	27									
90	28		>>	22 22 30 (52)		D-21		Silty GRAVEL with sand, subrounded, very dense, gray, wet, Homogeneous, no HCl reaction, loosely bonded together with a silt matrix. Length Recovered 1.2 ft, Length Retained 1.0 ft		
95										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-12-00**

Sheet **5** of **5**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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
	29			13 14 19 (33)		D-22		Silty GRAVEL with sand, dense, very dark gray, wet, homogeneous, No HCl reaction. Encountered some cobbles during drilling. Recovered: 1.1 ft. Retained: 1.1 ft.		
	30									
100			>>	15 40 50 (90)		D-23	GS MC	GP, MC=8% Poorly graded GRAVEL, very dense, very dark gray, wet, homogeneous, No HCl reaction. Encountered some cobbles during drilling. Recovered: 0.9 ft. Retained: 0.9 ft.		
	31									
			>>	39 34 30 (64)		D-24		Silty GRAVEL with sand, very dense, very dark gray, wet, homogeneous, No HCl reaction. Recovered: 1.3 ft. Retained: 1.3 ft.		
105	32									
								End of test hole boring at 105 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.		
	33									
110										
	34									
115	35									
	36									
120										

SOIL OL1181-1.GPJ SOIL.GDT 8/8/00 3:43:56 P8

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-14-00

PROJECT Slough Bridge 107/5 and 107/6 — Job No. OL-1181

SR 12 and SR 107 Vicinity of Montesano — S.R. 107

Station 40+25 — Offset 57' Lt — C.S. 1409

Equipment CME 45 w/ autohammer — Casing HQ — Ground El 11.1 (3.38 m)

Method of Boring Wet Rotary

Start Date August 23, 2000 — Completion Date August 23, 2000 — Sheet 1 of 2

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
				9 18 25 (43)		D-1	GS MC	GP, M.C.= 5% Poorly graded GRAVEL with sand and organics, subrounded, dense, brown, dry, homogeneous Recovered and Retained: 1.5 ft.		
5	1, 2			1 2 1 (3)		D-2		Silty GRAVEL with organics, subrounded, soft reddish brown, moist, homogeneous Recovered and Retained: 0.3 ft.	▽	
10	3			1 1 1 (2)		D-3		SILT with organics, reddish brown, moist, homogeneous Recovered and Retained: 1.5 ft.		
						V-4		Undisturbed shear strength = 1150 psf Remolded shear strength = 124 psf		
	4					S-5				
15				0 0 0 (0)		D-6		SILT with organics, brown, moist, homogeneous Recovered and Retained: 1.5 ft.		
	5					V-7		Undisturbed shear strength = 964 psf Remolded shear strength = 124 psf		
						S-8				
20	6			0		D-9		SILT with organics, gray, moist, homogeneous		

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-14-00**

Sheet **2** of **2**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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
				0 0 (0)				Recovered and Retained: 1.5 ft.		
	7							End of Test Hole Boring at 21 feet below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.		
25	8									
30	9									
	10									
35	11									
40	12									
	13									
45										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-13-00**

PROJECT **Slough Bridge 107/5 and 107/6** Job No. **OL-1181**

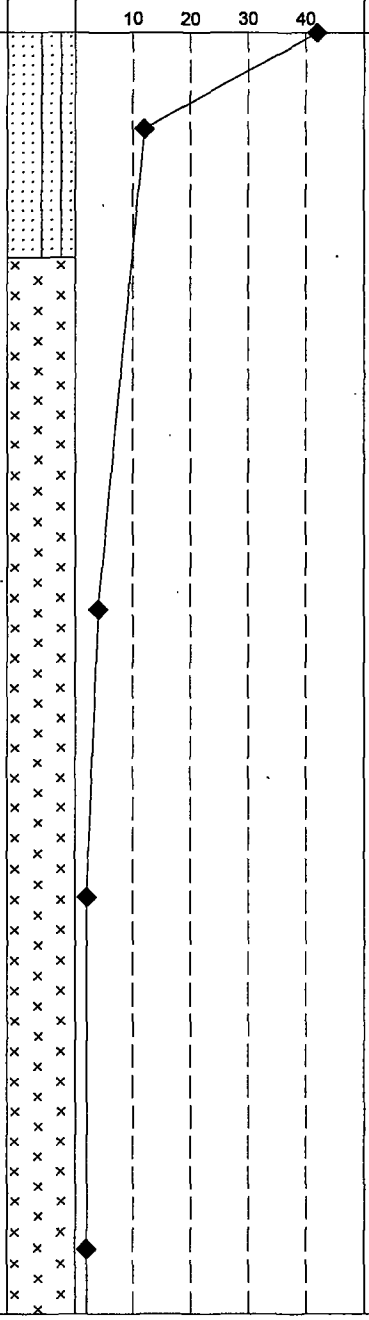
SR 12 and SR 107 Vicinity of Montesano S.R. **107**

Station **36+77** Offset **58' RT.** C.S. **1409**

Equipment **BK-81 w/ autohammer** Casing **HQx112** Ground El **17.2 (5.24 m)**

Method of Boring **Wet Rotary**

Start Date **August 17, 2000** Completion Date **August 24, 2000** Sheet **1** of **5**



Depth (ft)	Meters (m)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
		25 25 17 (42)		D-1		Poorly graded SAND with silt and gravel, subangular, dense, dark gray, dry, Homogeneous, no HCl reaction Length Recovered 1.3 ft		
		15 9 3 (12)		D-2	GS MC	SP-SM, M.C.= 12% Poorly graded SAND with silt and gravel, subangular, medium dense, dark grayish brown, dry, Homogeneous, no HCl reaction, the bottom 4" changed to dark gray silt. Length Recovered 1.5 ft		
5	1			S-3		SILT, very loose, dark gray, moist, Homogeneous, no HCl reaction Length Recovered 1.5 ft		
	2			Vane-4		Undisturbed shear strength = 497 psf Remolded shear strength = 186 psf		
10	3	1 1 3 (4)		D-5		SILT with trace of root hairs and wood , very loose, dark gray, moist, Homogeneous, no HCl reaction Length Recovered 1.5 ft		
				Vane-6		Undisturbed shear strength = 311 psf Remolded shear strength = 155 psf		
	4			U-7 A B C		SILT, very loose, dark gray, moist, Homogeneous, no HCl reaction Length Recovered 1.0 ft		
15		0 1 1 (2)		D-8		Elastic SILT, very loose, dark greenish gray, moist, Homogeneous, no HCl reaction, with traces of hair roots and FeO stains Length Recovered 1.0 ft		
	5			Vane-9		08/23/2000 Undisturbed shear strength = 560 psf Remolded shear strength = 155 psf	▽	
				U-10 A B C		SILT, very loose, dark greenish gray, moist, Homogeneous, no HCl reaction Length Recovered 1.0 ft		
20	6	0 1		D-11		Elastic SILT, soft, dark greenish gray, moist, Homogeneous, no HCl reaction		

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-13-00**

Sheet **2** of **5**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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
				1 (2)				Length Recovered 1.0 ft		
						Vain-12				
						S-13		Undisturbed shear strength = 497 psf Remolded shear strength = 311 psf		
	7									
25				1 1 1 (2)		D-14		Elastic SILT, soft, dark greenish gray, wet, Homogeneous, no HCl reaction, with traces of wood organics Length Recovered 1.3 ft		
	8									
30	9			1 1 1 (2)		D-15		Elastic SILT, soft, dark greenish gray, moist, Homogeneous, no HCl reaction Length Recovered 1.5 ft		
	10									
35						S-16		SILT, very loose, dark greenish gray, moist, Homogeneous, no HCl reaction Length Recovered 2.0 ft		
	11			1 1 1 (2)		D-17		Elastic SILT, very loose, dark greenish gray, moist, Homogeneous, no HCl reaction Length Recovered 1.0 ft		
40	12			0 1 1 (2)		D-18		Elastic SILT, very loose, dark greenish gray, wet, Homogeneous, no HCl reaction Length Recovered 1.2 ft		
	13									
45				1 1 1		D-19		SILT, very loose, dark greenish gray, wet, Homogeneous, no HCl reaction Length Recovered 1.5 ft		

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-13-00**

Sheet **3** of **5**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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
				(2)						
	14									
						S-20		Elastic SILT, soft, dark greenish gray, wet, Homogeneous, no HCl reaction Length Recovered 2.0 ft		
	15									
50										
				0 1 1 (2)		D-21		Elastic SILT, soft, dark greenish gray, wet, Homogeneous, no HCl reaction Length Recovered 1.5 ft		
	16									
				1 1 2 (3)		D-22		SILT, very loose, dark greenish gray, moist, Laminated, no HCl reaction, laminated with brown organics throughtout. Soil Change at 56.5' to sand and gravel. Length Recovered 1.5 ft		
55										
	17									
				22 15 15 (30)		D-23		Well graded GRAVEL with sand, silt, subangular, dense, very dark gray, wet, Homogeneous, no HCl reaction Length Recovered 1.3 ft		
	18									
60										
	19									
				10 9 10 (19)		D-24		Well graded GRAVEL with sand, silt, subangular, medium dense, very dark gray, wet, Homogeneous, no HCl reaction Length Recovered 1.2 ft		
65										
	20									
	21			13 13 20		D-25		Well graded GRAVEL with sand, silt, subangular, dense, dark gray, moist, Homogeneous, no HCl reaction Length Recovered 1.0 ft		
70										

LOG OF TEST BORING

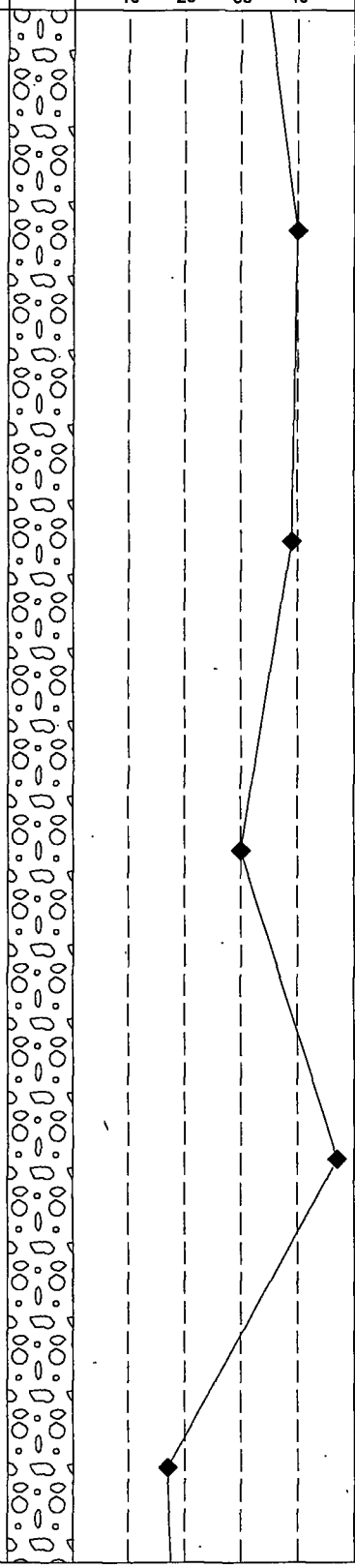
Washington State Department of Transportation

HOLE No. H-13-00

Sheet 4 of 5

PROJECT Slough Bridge 107/5 and 107/6

Job No. OL-1181



Depth (ft)	Meters (m)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
		(33)						
	22							
		16 22 18 (40)		D-26		Well graded GRAVEL, sand and silt, subrounded, dense, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 1.1 ft		
75	23							
	24	18 19 20 (39)		D-27		Well graded GRAVEL, sand and silt, subangular, dense, dark gray, wet, Homogeneous, no HCl reaction, Length Recovered 1.2 ft		
80								
	25							
		15 18 12 (30)		D-28		Well graded GRAVEL, sand and silt, subrounded, dense, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 1.0 ft		
85	26							
	27	27 22 25 (47)		D-29		Well graded GRAVEL with sand, silt, subrounded, dense, dark gray, wetHomogeneous, no HCl reaction Length Recovered 1.0 ft		
90	28							
		11 8 9		D-30		Well graded GRAVEL, sand and silt, subrounded, medium dense, dark gray, saturated, Homogeneous, no HCl reaction,		
95								

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-13-00**

Sheet **5** of **5**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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
	29			(17)				Length Recovered 0.8 ft [Note] lost water return fromt 95' to bottom of test hole.		
	30			10 11 8 (19)		D-31		Well graded GRAVEL, sand and silt, subrounded, medium dense, dark gray, saturated, Homogeneous, no HCl reaction. Length Recovered 0.8 ft		
100										
	31									
				14 20 23 (43)		D-32		Silty GRAVEL, sand, subrounded, dense, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 0.8 ft		
105	32									
	33			34 23 17 (40)		D-33		Well graded GRAVEL with sand, silt, subangular, dense, dark gray, wet, Homogeneous, no HCl reaction, Length Recovered 1.3 ft		
110										
	34							End of test hole boring at 110 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.		
115	35									
	36									
120										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-15-00**

PROJECT **Slough Bridge 107/5 and 107/6** Job No. **OL-1181**

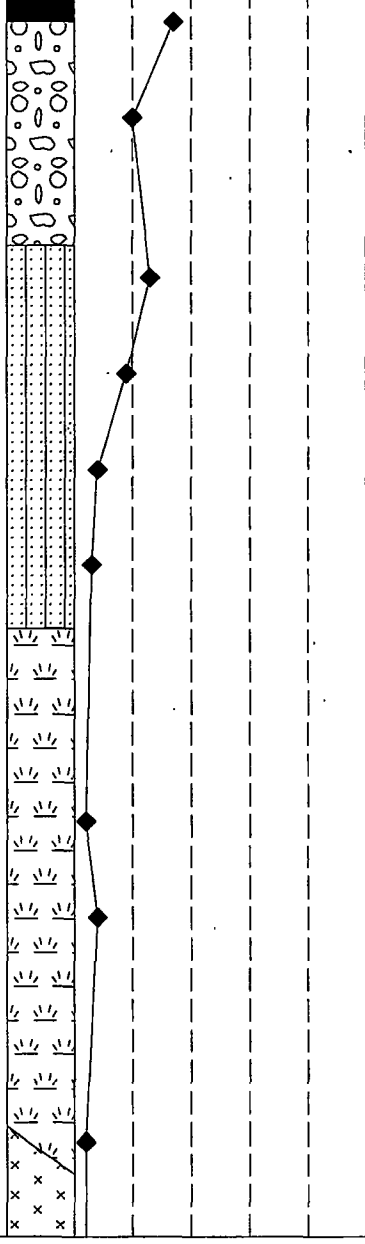
SR 12 and SR 107 Vicinity of Montesano S.R. **107**

Station **47+04** Offset **70' Rt.** C.S. **1409**

Equipment **BK-81 w/ autohammer** Casing **HQx62** Ground El **15.0 (4.57 m)**

Method of Boring **Wet Rotary**

Start Date **September 6, 2000** Completion Date **September 7, 2000** Sheet **1** of **3**



Depth (ft)	Meters (m)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
						ASPHALT		
		13 11 6 (17)		D-1		Well graded GRAVEL, silt and sand, subangular, medium dense, dark greenish gray, wet, Homogeneous, no HCl reaction Length Recovered 1.0 ft		
	1	4 6 4 (10)		D-2		Well graded GRAVEL with sand, subrounded, loose, very dark gray to black, wet, Homogeneous, no HCl reaction Length Recovered 0.7 ft		
5		4 7 6 (13)		D-3	GS MC	GP-GM, M.C.= 14% Poorly graded GRAVEL with silt and sand, medium dense, dark gray, wet, Homogeneous, no HCl reaction, with hair roots Length Recovered 1.2 ft		
	2	3 5 4 (9)		D-4		Poorly graded GRAVEL with silt and sand, subrounded, loose, dark gray, wet, Homogeneous, no HCl reaction, with hair roots Length Recovered 1.3 ft		
		2 1 3 (4)		D-5		Poorly graded GRAVEL with silt and sand, subrounded, very loose, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 0.5 ft		
10	3	0 2 1 (3)		D-6		Poorly graded GRAVEL with silt and sand, very loose, dark gray, wet, Homogeneous, no HCl reaction, with wood organics and hair roots Length Recovered 0.5 ft		
	4	1 1 1 (2)		D-7		ORGANIC SOIL, soft, dark gray, moist, Laminated, no HCl reaction Length Recovered 1.5 ft		
15		2 2 2 (4)		D-8		ORGANIC SOIL with gravel, soft, dark gray, moist, Laminated, no HCl reaction Length Recovered 1.0 ft		
	5	0 1 1		D-9		SILT, very loose, dark gray, moist, Homogeneous, no HCl reaction, with traces of organics. Length Recovered 1.5 ft		
20	6							

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-15-00

Sheet 2 of 3

PROJECT Slough Bridge 107/5 and 107/6

Job No. OL-1181

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
				(2)		V-10		Undisturbed shear strength = 995 psf Remolded shear strength = 373 psf		
	7					S-11		SILT, very loose, dark gray, moist, Homogeneous, no HCl reaction Length Recovered 2.0 ft		
25				1 1 1 (2)		D-12		SILT, very loose, dark gray, moist, Laminated, no HCl reaction, with sand lenses, brown organics, hair roots and traces of sea shells Length Recovered 1.3 ft		
	8									
30	9			0 1 1 (2)		D-13		SILT, very loose, dark gray, moist, Laminated, no HCl reaction, with brown organics and sea shells Length Recovered 1.5 ft		
	10									
35				13 10 9 (19)		D-14		Well graded GRAVEL with sand, subrounded, medium dense, dark gray, wet, Homogeneous, no HCl reaction, soil change at approx. 33.5' Length Recovered 1.0 ft		
	11									
40	12			10 10 10 (20)		D-15		Well graded GRAVEL, sand, subangular, medium dense, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 1.0 ft		
	13									
45				7 5 6		D-16		Well graded GRAVEL with sand, subrounded, medium dense, dark gray, wet, Homogeneous, no HCl reaction, a large gravel was stuck in the spt shoe influencing the		

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-15-00**

Sheet 3 of 3

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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
				(12)				recovery. Length Recovered 0.3 ft		
	14									
				9 9 9 (27)		D-17		Well graded GRAVEL, sand, subangular, medium dense, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 1.0 ft		
	15									
50										
	16									
				5 4 5 (9)		D-18		Well graded GRAVEL, sand and silt, subrounded, loose, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 0.8 ft		
55										
	17									
				25 22 27 (49)		D-19		Well graded GRAVEL, subangular, dense, dark gray, wet, Homogeneous, no HCl reaction Length Recovered 1.0 ft		
	18									
60										
								End of test hole boring at 60 ft below ground elevation.		
	19							This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.		
65										
	20									
	21									
70										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-1-93

PROJECT Slough Bridge 107/5 and 107/6 — Job No. OL-1181

SR 12 and SR 107 Vicinity of Montesano — S.R. 107

Station 37+34 — Offset 14.5' Lt — C.S. 1409

Equipment — Casing 4" Augers to 68.0' — Ground El 11.4 (3.47 m)

Method of Boring Hollow Core Augers

Start Date — Completion Date April 29, 1993 — Sheet 1 of 4

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
	1			1 1 1 1 (2)		STD PEN 1		**GW, M.C.=27.5%** Very loose, brown, moist, slightly silty, fine to coarse sandy **GRAVEL** with wood and fibrous organic material. Retained 0.8 ft.		
5	2					U-2 A B		**MH, M.C.=46.5% TO 57.6%** Mottled light gray and yellow, wet, gravelly, fine sandy, elastic **SILT**.		
10	3			1 1 (1/6")		STD PEN 3		No recovery.	▽	
	4					U-4 A				
15	5			1 1 1 1 (2)		STD PEN 5		**MH, M.C.=56.0%** Soft, gray, wet, medium sandy, gravelly, elastic **SILT**. Retained 2.0 ft.		
						U-6 A B		**MH, M.C.=54.3% TO 62.1%** Gray, wet, gravelly, fine to coarse sandy, elastic **SILT**.		
20	6									

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-1-93**

Sheet **2** of **4**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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
				1 1 2 2 (3)		STD PEN 7		Soft, gray, wet **SILT**. Retained 2.0 ft.		
	7					U-8		**ML, M.C.=48.4%** Gray, wet, gravelly, fine to coarse sandy **SILT**.		
25				1 1 1 1 (2)		STD PEN 9		**SM, M.C.=36.6%** Very loose, gray, wet, very silty, fine **SAND**. Retained 2.0 ft.		
	8									
				1 1 1 (2)		STD PEN 10		Very soft, gray, wet, gravelly, fine to coarse sandy, elastic **SILT**. Retained 2.0 ft.		
	9									
30										
	10					U-11 A B				
35				1 1 2 2 (3)		STD PEN 12		Soft, gray, wet elastic **SILT**. Retained 2.0 ft.		
	11									
						U-13		No recovery.		
	12									
40				3 2 3 4 (5)		STD PEN 14		**ML, M.C.=44.1%** Loose, gray, wet, gravelly, fine sandy **SILT**. Retained 2.0 ft.		
	13					U-15 A B		**ML, M.C.=40.7%** Gray, wet, fine sandy **SILT**.		
45										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-1-93**

Sheet **3** of **4**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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			1/24" (1/24")		STD PEN 16		Very soft, gray, wet, fine sandy **SILT**. Retained 2.0 ft.		
	15					U-17 A B C D				
50				1 2 2 2 (4)		STD PEN 18		Soft, brownish gray, fine sandy **SILT** with organic material. Retained 2.0 ft.		
	16					U-19 A to E				
55	17			1 2 2 2 (4)		STD PEN 20		Soft, grayish brown, **SILT** with wood and fibrous organic material. Retained 2.0 ft.		
	18					U-21 A to E				
60				8 14 16 (30)		STD PEN 22		**GW, M.C.=11.4%** Dense, gray, saturated, slightly silty, fine to coarse sandy **GRAVEL**. Retained 1.5 ft.		
	19			20 21 23 (44)		STD PEN 23		***SW-SM, M.C.=8.8%** Dense, gray, moist, silty, fine to coarse sandy **GRAVEL**. Retained 1.2 ft.		
65	20									
			>>	60/6" (60/6")		STD PEN 24		Very dense, gray, wet, silty, fine to coarse sandy **GRAVEL**. Retained 0.3 ft.		
	21							End of test boring at 68.6 ft. below ground elevation.		
70										

SOIL: OL1181-1.GPJ SOIL.GDT 11/20/00 7:25:55 A11

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-1-93

Sheet 4 of 4

PROJECT Slough Bridge 107/5 and 107/6

Job No. OL-1181

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
								70 ft. of piezometer pipe installed.		
								Date **Measurement below ground** **Water table elevation**		
								06/23/93 11.25' 0.2'		
								10/13/93 11.50' -0.1'		
	22							*Laboratory test results reflect the finer fraction of soil observed in the field.		
								This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.		
75	23									
	24									
80										
	25									
85	26									
	27									
90										
	28									
95										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-2-93

PROJECT Slough Bridge 107/5 and 107/6 — Job No. OL-1181

SR 12 and SR 107 Vicinity of Montesano — S.R. 107

Station 38+30 — Offset 9.8' Lt — C.S. 1409

Equipment — Casing 4" Augers to 56.0' — Ground El 4.2 (1.28 m)

Method of Boring Hollow Core Augers

Start Date — Completion Date April 28, 1993 — Sheet 1 of 3

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
				0/24" (0/24")		STD PEN 1		**ML, M.C.=98.4%** Very soft, dark gray, wet, fine to medium sandy **SILT** with wood fragments. Retained 1.0 ft.		
	1									
5						U-2 A B C		**ML, M.C.=111.5%** Dark gray, wet, fine to medium sandy **SILT** with fibrous organic material.		
	2			1/12" 1/12" (1/12")		STD PEN 3		Very soft, dark gray, wet, fine to medium sandy **SILT** with fibrous organic material. Retained 2.0 ft.		
10	3					U-4 A to E		**ML, M.C.=77.3%** Dark gray, wet, fine sandy **SILT** with wood and fibrous organic material.		
				1/12" 1/12" (1/12")		STD PEN 5		Very soft, gray, wet, fine sandy **SILT**. Retained 2.0 ft.		
	4									
15						U-6 A B C D				
	5			1/12" 1/12" (1/12")		STD PEN 7		Very soft, gray, wet, slightly organic **SILT**. Retained 2.0 ft.		
	6					U-8 A		**ML, M.C.=72.1%** Gray, wet, slightly organic **SILT**.		
20										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-2-93**

Sheet **2** of **3**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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
				1/12" 1/12" (1/12")		B C D STD PEN 9		Very soft, gray, wet, fine sandy **SILT**. Retained 2.0 ft.		
	7									
25						U-10 A B C D				
	8			1/12" 1/12" (1/12")		STD PEN 11		Very soft, gray, wet, fine sandy **SILT**. Retained 2.0 ft.		
	9					U-12 A B C				
30				1/12" 1/12" (1/12")		STD PEN 13		Very soft, gray, wet, fine sandy **SILT**. Retained 2.0 ft.		
	10									
35						U-14 A B C D				
	11			1/12" 1/12" (1/12")		STD PEN 15		**ML, M.C.=47.3%** Very soft, dark gray, wet, fine sandy **SILT**. Retained 2.0 ft.		
	12					U-16 A B C				
40				1 3 3 (6)		STD PEN 17		Medium stiff, gray, moist, fine sandy **SILT** with a 6 inch sand layer. Retained 1.5 ft.		
	13									
45										

SOIL OL1181-1.GPJ SOIL.GDT 11/20/00 7:29:11 A11

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-2-93

Sheet 3 of 3

PROJECT Slough Bridge 107/5 and 107/6

Job No. OL-1181

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
						U-18		No recovery.		
	14			5 9 22 (31)		STD PEN 19		Dense, dark gray, saturated, silty, fine to coarse sandy **GRAVEL.** Retained 1.5 ft.		
	15		>>	16 36 40 (76)		STD PEN 20		*Very dense, dark gray, wet, silty, fine to coarse sandy* **GRAVEL.** Retained 1.5 ft.		
50										
	16									
55								3 ft. heave, set up and washed out heave.		
	17			7 15 18 (33)		STD PEN 21		Dense, dark gray, wet, silty, fine to coarse sandy **GRAVEL.** Retained 0.7 ft.		
								End of test boring at 57.5 ft. below ground elevation. Water table elevation not determined. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.		
	18									
60										
	19									
65										
	20									
	21									
70										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-3-93

PROJECT Slough Bridge 107/5 and 107/6 — Job No. OL-1181

SR 12 and SR 107 Vicinity of Montesano — S.R. 107

Station 38+60 — Offset 35' Rt — C.S. 1409

Equipment — Casing 4" Augers to 78.0 ' — Ground El 6.0' (m)

Method of Boring Hollow Core Augers

Start Date — Completion Date April 14, 1993 — Sheet 1 of 4

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
				1 2 2 2 (4)		STD PEN 1		**ML, M.C.=58.1%** Soft, brown and gray, wet, fine sandy **SILT** with root hairs. Retained 2.0 ft.		
	1			(1)		STD PEN 2		Very soft, dark gray, wet, fine sandy **SILT** with root hairs. Retained 2.0 ft.		
5						U-3 A B		Gray, wet, fine sandy **SILT** with fibrous organic material.		
	2					U-4 A B C		**ML, M.C.=79.3% TO 81.5%** Gray, wet, fine sandy **SILT** with fibrous organic material.		
10	3			1 1 1 1 (2)		STD PEN 5		Very soft, gray, wet, fine sandy **SILT**. Retained 2.0 ft.		
	4					U-6 A B C D		**ML, M.C.=71.0% TO 73.2%** Olive gray, wet **SILT**.		
15	5			1 1 1 1 (2)		STD PEN 7		Very soft, gray, wet **SILT**. Retained 2.0 ft.		
						U-8 A B C D		**MH, M.C.=77.4%** Gray, wet, fine sandy, elastic **SILT**.		
20	6									

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-3-93**

Sheet **2** of **4**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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
				1 1 1 1 (2)		STD PEN 9		Very soft, gray, wet, fine sandy **SILT**. Retained 2.0 ft.		
	7					U-10 A B C				
25				1 1 2 2 (3)		STD PEN 11		Soft, gray, moist to wet **SILT**. Retained 2.0 ft.		
	8					U-12 A B		Gray, moist to wet **SILT**.		
	9									
30				1 1 2 2 (3)		STD PEN 13		Soft, gray, moist, **SILT** with wood fragments. Retained 2.0 ft.		
	10					U-14 A B C D		**MH, M.C.=53.9%** Dark gray, wet, fine to medium sandy, elastic **SILT**.		
35				1 1 1 2 (3)		STD PEN 15		Very soft, gray, moist, fine sandy **SILT**. Retained 2.0 ft.		
	11							Very loose, gray, wet, gravelly, fine to coarse **SAND**.		
				4 5 5 (10)		STD PEN 16		***SW, M.C.=8.1%** Loose, gray, wet, slightly silty, fine to coarse sandy **GRAVEL**. Retained 0.7 ft.		
	12									
40										
	13									
				5 6 4 (10)		STD PEN 17		**SM, M.C.=32.9%** Loose, wet, gray, very silty fine **SAND**. Retained 1.0 ft.		
45										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-3-93

Sheet 3 of 4

PROJECT Slough Bridge 107/5 and 107/6

Job No. OL-1181

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									
				4 5 5 (10)		STD PEN 18		Loose, wet, gray, very silty, fine **SAND**. Retained 1.5 ft.		
	15									
50										
	16									
				4 8 13 (21)		STD PEN 19		Medium dense, gray, wet, silty, sandy **GRAVEL** with a 7 inch layer of wood fragments. Retained 1.0 ft.		
55										
	17									
				10 11 12 (23)		STD PEN 20		**GW, M.C.=11.0%** Medium dense, gray, wet, slightly silty, sandy **GRAVEL**. Retained 1.0 ft.		
	18									
60										
	19									
				15 12 8 (20)		STD PEN 21		**SM, M.C.=27.2%** Medium dense, dark gray, wet, silty, fine to coarse ***SAND***. Retained 1.5 ft.		
65										
	20									
				2 3 4 (7)		STD PEN 22		Loose, gray, wet, silty, fine to coarse **SAND** with wood fragments. Retained 1.5 ft.		
	21									
70										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-3-93

Sheet 4 of 4

PROJECT Slough Bridge 107/5 and 107/6

Job No. OL-1181

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									
				2 3 4 (27)		STD PEN 23		***SP, M.C.=14.1%** Medium dense, gray, wet, slightly silty, fine to coarse sandy **GRAVEL.** Retained 1.2 ft.		
75	23									
	24			17 15 14 (29)		STD PEN 24		Medium dense, gray, wet, slightly silty, fine to coarse sandy **GRAVEL.** Retained 1.5 ft.		
80								Test hole stopped at 79.5 ft. below ground elevation.		
	25							Eighty-two feet of piezometer pipe installed.		
								Date Measurement Below Ground Water Table Elevation 06/23/93 2.5' 3.5' 10/13/93 3.5' 2.5'		
								*Laboratory test results reflect the finer fraction of soil observed in the field.		
85	26									
								This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.		
	27									
90										
	28									
95										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-4-93**

PROJECT **Slough Bridge 107/5 and 107/6** Job No. **OL-1181**

SR 12 and SR 107 Vicinity of Montesano S.R. **107**

Station **47+68** Offset **18.7' Lt** C.S. **1409**

Equipment Casing **4" Augers to** Ground El **12.5 (3.81 m)**

Method of Boring **Hollow Core Augers**

Start Date Completion Date **April 29, 1993** Sheet **1** of **3**

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
				1 2 2 3 (4)		STD PEN 1		Very loose, dark brown, moist, silty, fine to coarse sandy **GRAVEL**. Retained 0.5 ft.		
5	1									
	2			1 0 1 2 (1)		STD PEN 2		**SP-SM, M.C.=22.7%** Very loose, yellowish brown, saturated, silty, gravelly, fine to coarse **SAND**. Retained 1.5 ft.		
10	3								▽	
				1 0 1 1 (1)		STD PEN 3		**ML, M.C.=81.7%** Very soft, dark grayish brown, wet, gravelly, fine to coarse sandy **SILT** with a trace of fibrous organic material. Retained 2.0 ft.		
15	4									
	5			0/24" (0/24")		STD PEN 4		Very soft, dark grayish brown, moist, gravelly, fine sandy **SILT** with a trace of fibrous organic material. Retained 2.0 ft.		
20	6									

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-4-93**

Sheet **2** of **3**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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
						U-1 C D E F		**ML, M.C.=61.8%** Dark grayish brown, fine sandy **SILT** with a trace of fibrous organic material. Retained 2.0 ft.		
	7			1 0 1 2 (1)		STD PEN 5		Very soft, dark gray, wet, fine sandy **SILT**. Retained 2.0 ft.		
25										
	8					U-2 C D E F		**ML, M.C.=63.6%** Dark gray, fine sandy **SILT** with trace of fibrous organic material.		
	9			1 2 5 11 (7)		STD PEN 6		**SM, M.C.=59.5%** Loose, dark gray, wet, fine sandy **SILT** to gravelly, coarse **SAND** at 30.8'. Retained 2.0 ft. 8.0' Heave.		
30										
	10			4 8 14 16 (22)		STD PEN 7		Medium dense, dark gray, saturated, gravelly, fine to coarse **SAND**. Retained 1.7 ft.		
35										
	11			10 12 13 11 (25)		STD PEN 8		Medium dense, dark gray, saturated, silty, gravelly, fine to coarse **SAND**. Retained 1.8 ft.		
	12									
40										
	13			3 2 1 2 (3)		STD PEN 9		Very loose, dark gray, saturated, gravelly, fine to coarse **SAND** with 2 ft. organic layer at 43.5 ft. Retained 1.4 ft.		
45										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-4-93**

Sheet **3** of **3**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

Depth (ft)	Meters (m)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Description of Material
	14	9 11 10 18 (21)		STD PEN 10	(4 ft. Heave) Medium dense, dark gray, saturated, slightly silty, gravelly, fine to coarse **SAND**. Retained 2.0 ft.
50	15				
	16	11 9 17 (26)		STD PEN 11	**GW, M.C.=11.1%** Medium dense, dark gray, saturated, slightly silty, fine to coarse sandy **GRAVEL**. Retained 1.5 ft.
55	17				
		>> 16 30 25 (55)		STD PEN 12	Very dense, gray, saturated, slightly silty, fine to coarse sandy **GRAVEL**. Retained 1.5 ft.
60	18				
	19	16 50 (50/6")		STD PEN 13	Very dense, gray, saturated, slightly silty, fine to coarse sandy **GRAVEL**. Retained 1.0 ft.
65	20				End of test boring at 63.0 ft. below ground elevation. 65.0 ft. of piezometer installed.
	21				
70					

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

Profile

Lab Tests

Groundwater

Instrument

Date	Measurement below ground elevation	Water table
04-29-93	30.8'	- 18.3'
06-23-93	12.25'	0.3'
10-13-93	12.50'	0.0'

This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-5-93

PROJECT Slough Bridge 107/5 and 107/6 — Job No. OL-1181

SR 12 and SR 107 Vicinity of Montesano — S.R. 107

Station 48+45 — Offset 30' Rt — C.S. 1409

Equipment — Casing 4" Augers to 58.0' — Ground El 5.0' (m)

Method of Boring Hollow Core Augers

Start Date — Completion Date April 12, 1993 — Sheet 1 of 3

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
				2 5 5 2 (10)		STD PEN 1		**GW, M.C.=18.9%** Loose, brown, moist, slightly silty, fine to coarse sandy **GRAVEL** with a 3" layer of organic silty, sandy gravel. Retained 0.7 ft.		
	1			1 1 1 1 (2)		STD PEN 2		**ML, M.C.=103.2%** Soft, gray, wet **SILT** with pieces of organic material, rotten wood, etc. Retained 1.9 ft.		
5										
	2									
				1/12" 1/12" (1/12"		STD PEN 3		Very soft, gray, wet, gravelly, sandy **SILT** with fibrous organic material. Retained 1.2 ft.		
10	3					U-4 A B C		**ML, M.C. = 54.7%** Dark gray, wet, fine sandy **SILT.**		
	4			1/12" 1/12" (1/12"		STD PEN 5		Very soft, gray, wet, fine sandy **SILT.** Retained 2.0 ft.		
15	5					U-6 A B C D		**ML, M.C. = 64.5%** Dark gray, wet, fine sandy **SILT.**		
						U-7 A B C				
20	6									

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-5-93

Sheet 2 of 3

PROJECT Slough Bridge 107/5 and 107/6

Job No. OL-1181

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
				1/12" 1/12" (1/12"		STD PEN 8		Very soft, gray, wet, fine sandy **SILT**. Retained 2.0 ft.		
	7					U-9 A B C D				
25				5 6 5 (11)		STD PEN 10		Medium dense, gray, wet, silty, fine to coarse sandy **GRAVEL**. Retained 0.9 ft.		
	8			4 9 7 (16)		STD PEN 11		(2 ft. Heave)		
								Medium dense, gray, wet, slightly silty, sandy **GRAVEL**. Retained 0.5 ft.		
	9									
30										
	10			7 4 4 (8)		STD PEN 12		***SP, M.C.=18.0%** Loose, gray, wet, slightly silty, fine to coarse sandy **GRAVEL**. Retained 1.5 ft.		
35										
	11							(2 ft. Heave)		
				12.8.7.(15)		STD PEN 13		Medium dense, gray, wet, slightly silty, fine to coarse sandy **GRAVEL**. Retained 0.8 ft.		
	12									
40										
	13			7 10 11 (21)		STD PEN 14		Medium dense, gray, wet, slightly silty, fine to coarse sandy **GRAVEL**. Retained 1.5 ft.		
45										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-5-93**

Sheet **3** of **3**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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									
				10 8 10 (18)		STD PEN 15		Medium dense, gray, wet, slightly silty, fine to coarse sandy **GRAVEL.** Retained 1.0 ft.		
	15									
50										
	16									
				10 16 15 (31)		STD PEN 16		Dense, gray, wet, slightly silty, fine to coarse sandy **GRAVEL.** Retained 1.5 ft.		
55										
	17									
				16 22 22 (44)		STD PEN 17		Dense, gray, wet, slightly silty, fine to coarse sandy **GRAVEL.** Retained 1.5 ft.		
	18									
60								End of test boring at 59.5 ft. below ground elevation. Water table elevation not determined. *Laboratory test results reflect the finer fraction of soil observed in the field. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.		
	19									
65										
	20									
	21									
70										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. H-6-93

PROJECT Slough Bridge 107/5 and 107/6 — Job No. OL-1181

SR 12 and SR 107 Vicinity of Montesano — S.R. 107

Station 48+75 — Offset 17.7' Lt — C.S. 1409

Equipment — Casing — Ground El 7.0 (2.13 m)

Method of Boring Hollow Core Auger

Start Date — Completion Date April 20, 1993 — Sheet 1 of 3

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
						U-1 E F		Dark grayish brown **SILT** with organic fragments. Retained 0.8 ft.		
	1									
5				0 1 1 1 (2)		STD PEN 1		*Soft, dark grayish brown, wet, fine to medium sandy* **SILT** with wood fragments. Retained 1.5 ft.		
	2					U-2 D E F		**ML-MH, M.C.=105.2% TO 109.9%** *Grayish brown fine sandy* **SILT** *with organic fragments.* Retained 1.0 ft.		
10	3			0 0 1 1 (1)		STD PEN 2		Very soft, dark brown, wet, fine sandy, elastic **SILT** with wood fragments at 10.0 ft. Retained 1.5 ft.		
	4					U-3 B C D E		**ML, M.C.=67.5% TO 90.9%** *Dark brownish gray, fine sandy* **SILT**. Retained 1.7 ft.		
15				0 0 0 0 (0/24")		STD PEN 3		Very soft, dark brownish gray, wet, fine sandy **SILT** with trace organic fragments. Retained 2.0 ft.		
	5					U-4 B C D E		**ML, M.C.=60.7% TO 73.8%** *Dark brown, fine sandy* **SILT**. Retained 0.7 ft.		
20	6			0 0		STD PEN		Very soft, dark brownish gray, wet, fine sandy **SILT** with trace of organic fragments		

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-6-93**

Sheet **2** of **3**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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
				0 0 (0/24")		4		Retained 2.0 ft.		
						U-5 C D E F		Gray **SILT** with trace of organic fragments. Retained 1.4 ft.		
	7			0 0 0 2 (0/12")		STD PEN 5		Very soft, brownish gray, wet, fine sandy **SILT** with trace of organic fragments to silty, fine **SAND** at 25.7 ft. Retained 2.0 ft.		
25										
	8					U-6		**SAND** No recovery.		
	9			1 2 3 4 (5)		STD PEN 6		**SM, M.C.=42.9%** Loose, dark gray, moist, very silty, fine to medium **SAND** with trace of organic fragments. Retained 2.0 ft.	▽	
30										
	10			5 8 10 10 (28)		STD PEN 7		Medium dense, dark gray, moist, very silty, fine to coarse **SAND** with trace of organic fragments. Retained 2.0 ft.		
35										
	11			1 1 2 3 (3)		STD PEN 8		Very loose, dark gray, wet, silty, gravelly, fine to coarse **SAND** with wood fragment from 37.5 ft. to 38.2 ft. Retained 2.0 ft.		
	12									
40										
	13			6 5 2 3 (7)		STD PEN 9		Loose, dark gray, wet, silty, gravelly, fine to coarse **SAND** with trace of organic fragments. Retained 2.0 ft.		
45										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **H-6-93**

Sheet **3** of **3**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

Depth (ft)	Meters (m)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material
	14					
		6 4 4 8 (8)		STD PEN 10		Loose, dark gray, wet, slightly silty, gravelly, fine to coarse **SAND**. Retained 1.7 ft.
	15					
50						
	16	13 13 14 13 (27)		STD PEN 11		Dense, dark gray, wet, slightly silty, gravelly, fine to coarse **SAND**. Retained 2.0 ft.
55						
	17					
		34 19 21 (41)		STD PEN 12		Dense, dark gray, wet, slightly silty, gravelly, fine to coarse **SAND**. Retained 1.3 ft.
	18					End of test boring at 58.5 ft. below ground elevation.
60						Sixty-one feet of piezometer pipe installed.
	19					**Date** **Measurement Below Ground** **Water Table Elevation** 04-20-93 29.0' -22.0' 06-23-93 6.0' 1.0' 10-13-93 6.6' 0.4'
65						This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.
	20					
	21					
70						

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

Profile

Groundwater

Instrument

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. C-1-86

PROJECT Slough Bridge 107/5 and 107/6 — Job No. OL-1181

SR 12 and SR 107 Vicinity of Montesano — S.R. 107

Station 51+12 — Offset 47' Rt — C.S. 1409

Equipment — Casing 3" to 30' — Ground El 8.2' (m)

Method of Boring Hollow Core Augers

Start Date — Completion Date August 14, 1986 — Sheet 1 of 2

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
				6 6 6 6 (12)		STD PEN 1		Stiff, brown, dry **SILT.**		
	1			2 3 3 3 (6)		STD PEN 2		*Medium stiff, brown, moist* **SILT.**		
5										
	2			1 1 1 1 (2)		STD PEN 3		Soft, grey, wet **SILT.**		
10	3									
						U-4		Wood		
	4			2 2 2 2 (4)		STD PEN 5		Soft, grey, wet **SILT.**		
15	5			C E		U-6				
	6			2 2		STD PEN		Soft, grey, moist **SILT.**		
20										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. C-1-86

Sheet 2 of 2

PROJECT Slough Bridge 107/5 and 107/6

Job No. OL-1181

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
				2 2 (4)		7				
				2 2 2 2 (4)		STD PEN 8		Soft, grey, wet, sandy **SILT.**		
25	7									
	8			4 4 6 8 10		STD PEN 9		Loose, grey, wet, fine to coarse **SAND.**		
30	9							End of the Test Hole Boring at 29.0 ft. below ground elevation. This is a Summary Log of the Test Hole Boring. *Soil/Rock descriptions are derived from visual field identifications.*		
35	10									
40	11									
	12									
45	13									

SOIL OL1181-1.GPJ SOIL.GDT 8/8/00 3:43:19 P8

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. C-2-86

PROJECT Slough Bridge 107/5 and 107/6 — Job No. OL-1181

SR 12 and SR 107 Vicinity of Montesano — S.R. 107

Station 49+93 — Offset 11.5' Rt — C.S. 1409

Equipment — Casing 3" to 68' — Ground El 9.4' (m)

Method of Boring Hollow Core Augers

Start Date — Completion Date August 19, 1986 — Sheet 1 of 4

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
				2 9 13 7 (22)		STD PEN 1		Dense, brown, dry, silty, sandy **GRAVEL.**		
	1							Soft, grey, moist, sandy **SILT.**		
5				1 1 1 2 (2)		STD PEN 2				
	2									
						U-3 A B			▽	
10	3			1 1 1 1 (2)		STD PEN 4		Soft, grey, moist, fine sandy **SILT.**		
	4					U-5 A B C				
15				1 2 1 2 (3)		STD PEN 6		Soft, grey and brown, moist, fine sandy **SILT** with organics and wood fragments.		
	5									
						U-7 A B C				
20	6									

SOIL OL1181-1.GPJ SOIL.GDT 8/8/00 3:43:27 P8

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **C-2-86**

Sheet 2 of 4

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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
				1 2 1 2 (3)		STD PEN 8		Soft, grey and brown, moist, fine sandy **SILT** with wood fragments.		
	7					U-9 A B				
25				1 3 6 10 (9)		STD PEN 10				
	8							Loose, grey, moist, gravelly, silty, fine to coarse **SAND.**		
				7 11 14 17 (25)		STD PEN 11		Dense, grey, wet, sandy **GRAVEL.**		
30	9									
	10			6 12 16 14 (28)		STD PEN 12		Dense, grey, wet, sandy **GRAVEL.**		
35	11									
				15 17 20 (37)		STD PEN 13		Dense, grey, wet, sandy **GRAVEL.**		
40	12									
	13			6 11 21 23 (32)		STD PEN 14		Dense, grey, wet, sandy **GRAVEL.**		
45										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. C-2-86

Sheet 3 of 4

PROJECT Slough Bridge 107/5 and 107/6

Job No. OL-1181

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									
				11 17 26 (43)		STD PEN 15		Dense, grey, wet, slightly silty, sandy **GRAVEL.**		
	15									
50										
	16			9 20 21 (41)		STD PEN 16		Dense, grey, wet, sandy **GRAVEL.**		
55										
	17									
			>>	35 30 33 (63)		STD PEN 17		Very dense, grey, wet, sandy **GRAVEL.**		
	18									
60										
	19									
			>>	5 25 34 (59)		STD PEN 18		Very dense, grey, wet, silty, fine to coarse sandy **GRAVEL.**		
65										
	20									
			>>	24 26 43 (79)		STD PEN 19		Very dense, grey, wet, sandy **GRAVEL.**		
	21									
70								End of the Test Hole Boring at 69.5 ft. below ground		

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. C-2-86

Sheet 4 of 4

PROJECT Slough Bridge 107/5 and 107/6

Job No. OL-1181

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
								elevation.		
	22							This is a Summary Log of the Test Hole Boring. Soil/Rock descriptions are derived from visual field identifications.		
75	23									
	24									
80										
	25									
85	26									
	27									
90										
	28									
95										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. C-1A-86

PROJECT Slough Bridge 107/5 and 107/6 — Job No. OL-1181

SR 12 and SR 107 Vicinity of Montesano — S.R. 107

Station 35+85 — Offset 5' Rt — C.S. 1409

Equipment — Casing 3" to 47' — Ground El 13.4' (m)

Method of Boring Hollow Core Augers

Start Date — Completion Date August 13, 1986 — Sheet 1 of 3

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
				2 4 5 6 (9)		STD PEN. 1		Loose, brown, sandy, silty **GRAVEL.**		
	1			2 3 5 6 (8)		STD PEN 2		Loose, brown, moist, gravelly, sandy, **SILT.**		
5	2			1 1 2 1 (3)		STD PEN 3		Soft, grey, moist **SILT.**		
10	3			1 2 2 2 (4)		STD PEN 4		Soft, grey, wet **SILT.**		
15	4					U-5 D			▽	
20	5			1 1		STD PEN		Soft, grey, wet **SILT.**		
	6									

SOIL OL1181-1.GPJ SOIL.GDT 10/4/00 3:17:23 P10

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **C-1A-86**

Sheet **2** of **3**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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
				1 1 (2)		6				
						U-7 D E				
	7			1 2 2 2 (4)		STD PEN 8		Soft, grey, wet **SILT**.		
25										
	8					U-9 C D E				
	9			1 1 2 2 (3)		STD PEN 10		Soft, grey, wet **SILT**.		
30										
	10					U-11 D E F				
35				1 2 3 3 (5)		STD PEN 12		Medium stiff, grey, wet **SILT** with a trace of fine sand and sea shell fragments.		
	11					U-13 C D E				
	12			2 3 3 4 (6)		STD PEN 14		Medium stiff, grey, moist **SILT** with sea shell fragments.		
40								Medium stiff, grey, moist **SILT** with sea shell fragments.		
	13					U-15 C D E				
45				3 5		STD PEN		Stiff, grey, moist **SILT** with sea shell fragments.		

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **C-1A-86**

Sheet **3** of **3**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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			4 6 (9)		16				
						U-17 B				
	15		>>	16 35 38 35 (73)		STD PEN 18		Very dense, grey, moist, silty, fine to coarse sandy **GRAVEL.**		
50										
	16							End of the Test Hole Boring at 51.0 ft. below ground elevation. This is a Summary Log of the Test Hole Boring. Soil/Rock descriptions are derived from visual field identifications.		
55										
	17									
	18									
60										
	19									
65										
	20									
	21									
70										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. C-2A-86

PROJECT Slough Bridge 107/5 and 107/6 — Job No. OL-1181

SR 12 and SR 107 Vicinity of Montesano — S.R. 107

Station 42+03 — Offset 13' Rt — C.S. 1409

Equipment — Casing 3" to 32' — Ground El 16.8 (5.12 m)

Method of Boring Hollow Core Augers

Start Date — Completion Date August 13, 1986 — Sheet 1 of 2

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
				7 8 8 4(16)		STD PEN 1		Medium dense, brown, silty, fine to coarse sandy **GRAVEL.**		
	1			2 2 2 4(4)		STD PEN 2		Very loose, brown, moist, gravelly, fine to coarse sandy **SILT.**		
5										
	2			1 2 2 3(4)		STD PEN 3		Very loose, brown, moist, gravelly, silty **SAND.**		
10	3									
	4			1 2 2 2(4)		STD PEN 4		Soft, grey, moist, fine sandy **SILT** with wood and organic material.		
15	5			1 2 2 5 (4)		STD PEN 5		Soft, brown, moist **SILT** with wood and organic material.		
20	6									

SOIL OL1181-1.GPJ SOIL.GDT 8/8/00 3:43:31 P8

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **C-2A-86**

Sheet **2** of **2**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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
									▽	
	7			2 6 12 9 (18)		STD PEN 6		*Medium dense, grey, wet, silty, fine to coarse* **SAND.**		
25										
	8			10 12 14 15 (26)		STD PEN 7		Dense, grey, wet, slightly silty, fine to coarse **SAND.**		
	9									
30										
	10			9 9 12 17 (21)		STD PEN 8		Medium dense, grey, wet, silty, fine to coarse sandy **GRAVEL.**		
35								End of the Test Hole Boring at 34.0 ft. below ground elevation.		
	11							This is a Summary Log of the Test Hole Boring. Soil/Rock descriptions are derived from visual field identifications.		
	12									
40										
	13									
45										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. J-1-86

PROJECT Slough Bridge 107/5 and 107/6 — Job No. OL-1181

SR 12 and SR 107 Vicinity of Montesano — S.R. 107

Station 40+18 — Offset 30' Rt. — C.S. 1409

Equipment — Casing 3" to 88' — Ground El 7.5' (m)

Method of Boring Wash and Chop

Start Date — Completion Date August 21, 1986 — Sheet 1 of 4

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
				1 1 1 1 (2)		STD. PEN. 1		Soft, brown, dry **SILT** with roots and wood.		
								Bored through 3 ft. diameter log. (2 ft. to 5 ft. below ground elevation)		
	1									
5				5 4 2 2 (6)		STD. PEN. 2		No Recovery.	▽	
	2							Bored through 2 ft. diameter log. (7 ft. to 9 ft. below ground elevation)		
10	3			3 2 2 2 (4)		STD. PEN. 3		Soft, grey, moist **SILT** with wood fragments.		
	4							Scattered wood fragments.		
15	5			3 2 3 2 (5)		STD. PEN. 4		No Recovery.		
20	6									

SOIL OL1181-1.GPJ SOIL.GDT 8/8/00 3:44:41 P8

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. J-1-86

Sheet 2 of 4

PROJECT Slough Bridge 107/5 and 107/6

Job No. OL-1181

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
				6 8 9 5 (17)		STD. PEN. 5		Medium dense, grey, wet, silty, fine to coarse **SAND** with wood fragments.		
	7									
25				2 2 1 3 (3)		STD. PEN. 6		Very loose, grey, wet, slightly silty, **SAND.**		
	8									
	9									
30				12 11 11 10 (22)		STD. PEN. 7		Medium dense, grey, wet, silty, fine to coarse sandy **GRAVEL.**		
	10									
35				11 8 15 18 (23)		STD. PEN. 8		Medium dense, grey, wet, silty, fine to coarse sandy **GRAVEL.**		
	11									
	12									
40				21 21 19 20 (40)		STD. PEN. 9		Dense, grey, wet, slightly silty, fine to coarse sandy **GRAVEL**		
	13									
45										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. J-1-86

Sheet 3 of 4

PROJECT Slough Bridge 107/5 and 107/6

Job No. OL-1181

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			34 30 24 (54)		STD. PEN. 10		Very dense, grey, wet, slightly silty, sandy **GRAVEL.**		
	15									
50				23 9 10 20 (19)		STD. PEN. 11		Medium dense, grey, wet, silty, sandy **GRAVEL.**		
	16									
55			>>	37 35 55 (90)		STD. PEN. 12		Very dense, grey, wet, slightly silty, sandy **GRAVEL.**		
	17									
	18									
60			>>	53 41 41 (82)		STD. PEN. 13		Very dense, grey, wet, slightly silty, sandy **GRAVEL.**		
	19									
65			>>	44 32 32 (64)		STD. PEN. 14		Very dense, grey, wet, slightly silty, sandy **GRAVEL.**		
	20									
	21									
70										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **J-1-86**

Sheet **4** of **4**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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
				12 13 25 (38)		STD. PEN. 15		Dense, grey, wet, slightly silty, sandy **GRAVEL.**		
	22									
75	23			20 19 30 (49)		STD. PEN. 16		Dense, grey, wet, sandy **GRAVEL.**		
	24									
80				15 23 25 (48)		STD. PEN. 17		Dense, grey, wet, sandy **GRAVEL.**		
	25									
85	26		>>	25 27 28 (55)		STD. PEN. 18		Very dense, grey, wet, slightly silty, sandy **GRAVEL.**		
	27			26 19 17 17 (36)		STD. PEN. 19		Dense, grey, wet, slightly silty, sandy **GRAVEL.**		
90								End of the Test Hole Boring at 90.0 ft. below ground elevation.		
	28							This is a Summary Log of the Test Hole Boring. Soil/Rock descriptions are derived from visual field identifications.		
95										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. J-2-86

PROJECT Slough Bridge 107/5 and 107/6 — Job No. OL-1181

SR 12 and SR 107 Vicinity of Montesano — S.R. 107

Station 37+21 — Offset 32' Rt. — C.S. 1409

Equipment — Casing 3" to 89' — Ground El 7.5' (m)

Method of Boring Wash and Chop

Start Date — Completion Date September 11, 1986 — Sheet 1 of 4

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
				1 2 2 3 (4)		STD PEN 1		Soft, brown, gravelly, fine to coarse sandy **SILT.**		
	1									
5				1 1 1 2 (2)		STD PEN 2		Soft, grey, wet, fine to coarse sandy **SILT** with wood fragments.	▽	
	2									
10	3			1 1 1 2 (2)		STD PEN 3		Soft, grey, wet **SILT.**		
	4									
15						U-4 D E				
	5			1 1 1 1 (2)		STD PEN 5		Soft, grey, wet, **SILT.**		
	6					U-6 E				
20										

SOIL OL1181~1.GPJ SOIL.GDT 10/19/00 10:29:23 A10

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **J-2-86**

Sheet **2** of **4**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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
						F				
				1 1 1 1 (2)		STD PEN 7		Soft, grey, wet **SILT.**		
	7									
						U-8 D E F				
25										
	8			1 1 1 2 (2)		STD PEN 9		Soft, grey, wet **SILT.**		
	9					U-10 E F				
30										
				1 1 1 2 (2)		STD PEN 11		Soft, grey, wet, fine sandy **SILT.**		
	10									
						U-12 A B				
35										
	11			2 1 2 2 (3)		STD PEN 13		Soft, grey, wet, **SILT.**		
	12					U-14 B C D				
40										
				2 2 2 2 (4)		STD PEN 15		Soft, grey, wet, **SILT** with organic material.		
	13									
						U-16 A				
45										

SOIL OL1181-1.GPJ SOIL.GDT 10/19/00 10:29:24 A10

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. J-2-86

Sheet 3 of 4

PROJECT Slough Bridge 107/5 and 107/6

Job No. OL-1181

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			2 1 1 2 (2)		B STD PEN 17		Very soft, grey, wet, **SILT** with fibrous organic material.		
50	15			3 2 14 20 (16)		U-18 A B C STD PEN 19				
	16			23 17 18 14 (35)		STD PEN 20		Medium dense, grey, wet, silty, fine to coarse sandy **GRAVEL.**		
55	17			14 13 19 20 (32)		STD PEN 21		Dense, grey, wet, silty, fine to coarse sandy **GRAVEL.**		
60	18			>> 36 40 28 (68)		STD PEN 22		Dense, grey, wet, silty, fine to coarse sandy **GRAVEL.**		
65	19			>> 30 40		STD PEN		Very dense, grey, wet, silty, fine to coarse sandy **GRAVEL.**		
70	20							Very dense, grey, wet, silty, fine to coarse sandy **GRAVEL.**		
	21									

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. J-2-86

Sheet 4 of 4

PROJECT Slough Bridge 107/5 and 107/6

Job No. OL-1181

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
				25 (65)		23				
	22									
75	23		>>	30 23 33 (56)		STD PEN 24		Very dense, grey, wet, silty, fine to coarse sandy **GRAVEL.**		
	24			8 8 9 17 (17)		STD PEN 25		Medium dense, grey, wet, gravelly, fine to medium **SAND.**		
80	25									
85	26		>>	60 50 55 (105)		STD PEN 26		Very dense, grey, wet, silty, fine to coarse sandy **GRAVEL.**		
	27									
90			>>	24 35 40 (75)		STD PEN 27		Very dense, grey, wet, silty, fine to coarse sandy **GRAVEL.**		
	28							End of the Test Hole Boring at 90.5 ft. below ground elevation.		
95								This is a Summary Log of the Test Hole Boring. Soil/Rock descriptions are derived from visual field identifications.		

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. J-1A-86

PROJECT Slough Bridge 107/5 and 107/6 — Job No. OL-1181

SR 12 and SR 107 Vicinity of Montesano — S.R. 107

Station 47+51 — Offset 11.5' Rt. — C.S. 1409

Equipment — Casing 3" to 96.5' — Ground El 13.6' (m)

Method of Boring Wash and Chop

Start Date — Completion Date September 4, 1986 — Sheet 1 of 5

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
				1 2 2 1 (4)		STD PEN 1		Loose, brown, dry, sandy, silty **GRAVEL.**		
5	1			2 2 2 2 (4)		STD PEN 2		Soft, brown, moist, sandy, gravelly **SILT.**		
10	2			2 1 1 1 (2)		STD PEN 3		Soft, grey and brown, moist, fine sandy **SILT** with organics and wood fragments.		
15	3					U-4 A B C				
20	4			1 1 1 1 (2)		STD PEN 5		Soft, grey, moist, fine sandy **SILT** with fibrous organic fragments.		
	5									
	6									

SOIL OL1181-1.GPJ SOIL.GDT 8/8/00 3:44:47 P8

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. J-1A-86

Sheet 2 of 5

PROJECT Slough Bridge 107/5 and 107/6

Job No. OL-1181

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
						U-6		No Recovery.		
	7			1 1 2 1 (3)		STD PEN 7		Soft, grey, wet **SILT.**		
25						U-8 A B C				
	8			1 1 2 2 (3)		STD PEN 9		*Soft, grey, moist* **SILT.**		
	9									
30				15 15 15 10 (30)		STD PEN 10		Dense, grey, wet, silty, fine to coarse sandy **GRAVEL** with a trace of **SILT.**		
	10									
35				20 17 16 16 (33)		STD PEN 11		Dense, grey, wet, silty, fine to coarse sandy **GRAVEL.**		
	11									
	12									
40				31 19 15 (34)		STD PEN 12		Dense, grey, wet, silty, fine to coarse sandy **GRAVEL.**		
	13									
45										

LOG OF TEST BORING

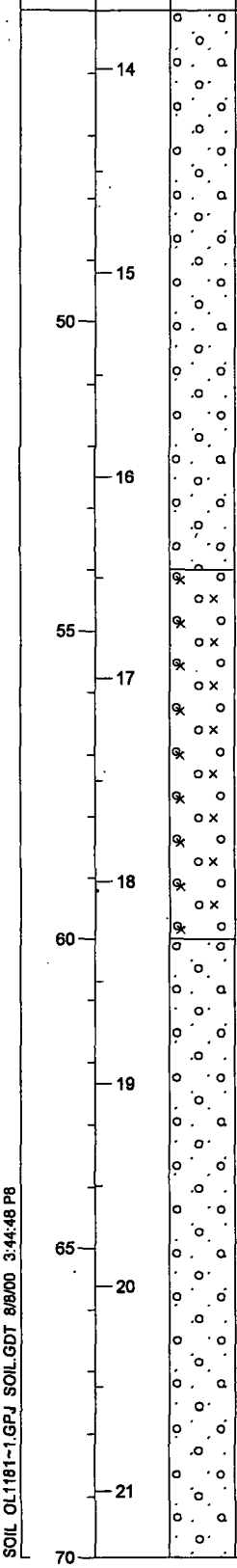
Washington State Department of Transportation

HOLE No. J-1A-86

Sheet 3 of 5

PROJECT Slough Bridge 107/5 and 107/6

Job No. OL-1181



SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
10 10 8 12 (18)		STD PEN 13		Medium dense, grey, wet, sandy **GRAVEL.**		
13 8 8 7 (16)		STD PEN 14		Medium dense, grey, wet, sandy **GRAVEL.**		
2 7 7 5 (14)		STD PEN 15		Medium dense, grey, wet, fine to coarse sandy, very silty **GRAVEL** with a 6" layer of silt.		
23 33 33 (66)		STD PEN 16		Very dense, grey, wet, sandy **GRAVEL.**		
31 22 26 (48)		STD PEN 17		Dense, grey, wet, sandy **GRAVEL.**		

SOIL OL1181-1.GPJ SOIL.GDT 8/8/00 3:44:48 P8

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **J-1A-86**

Sheet **4** of **5**

PROJECT **Slough Bridge 107/5 and 107/6**

Job No. **OL-1181**

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
				16 17 37 (54)		STD PEN 18		Very dense, grey, wet, silt sandy **GRAVEL.**		
	22									
75	23			34 75 22 15 (97)		STD PEN 19		Very dense, grey, wet, slightly silty, sandy **GRAVEL.**		
	24									
80				40 26 22 23 (48)		STD PEN 20		Dense, grey, wet, sandy **GRAVEL.**		
	25									
85	26			34 32 40 (72)		STD PEN 21		Very dense, grey, wet, sandy **GRAVEL.**		
	27									
90				26 28 33 (61)		STD PEN 22		Very dense, grey, wet, sandy **GRAVEL.**		
	28									
95										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. J-1A-86

Sheet 5 of 5

PROJECT Slough Bridge 107/5 and 107/6

Job No. OL-1181

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
	29			33 66 90 (156)		STD PEN 23		Very dense, grey, wet, silty, sandy **GRAVEL.**		
								End of the Test Hole Boring at 96.5 ft. below ground elevation. Water Table Elevation:Not determined. This is a Summary Log of the Test Hole Boring. Soil/Rock descriptions are derived from visual field identifications.		
	30									
100										
	31									
105	32									
	33									
110										
	34									
115	35									
	36									
120										

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **V-4-58**

PROJECT **Elma to Aberdeen** Job No. **L-1619**

Vicinity of Slough Bridges 107/6 S.R. **107**

Station **SR-107 46+50** Offset **8' Rt.** C.S. **1409**

Equipment _____ Casing _____ Ground El **6.9 (2.10 m)**

Method of Boring **Jet Wash**

Start Date **February 21, 1958** Completion Date **February 24, 1958** Sheet **1** of **2**

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									
	2					U-1	1 2 3	Dark gray silty clay with layers of dark gray sand - fine to medium		
10	3									
						U-2	4 5 6	Dark gray clayey silt with layers of dark gray sand (fine to medium) - organic		
	4									
15						U-3	7 8 9			
	5							Dark gray sand (fine)		
				(5)		D-4		Dark gray silty very fine sand, very soft.		
								Log		
20	6			(36)		D-5		Gray gravelly sand with silt		

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No. **V-4-58**

Sheet **2** of **2**

PROJECT **Elma to Aberdeen**

Job No. **L-1619**

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
								(medium to coarse)		
	7			(13)		D-6				
								Gray sandy gravel		
								Gray clayey sandy gravel.		
25										
	8									
				(12)		D-7				
	9									
30										
	10									
				(17)		D-8		No Recovery		
35										
	11									
	12			(25)		D-9		No Recovery		
40										
								End of Test Hole Boring at 40.5 feet below ground elevation.		
	13									
								This is a summary Log of Test Boring. Soil/Rock descriptions are derived from 1958 visual field identifications.		
45										

APPENDIX - C

Laboratory Test Data

LABORATORY SUMMARY

Test Hole Number	Sample No.	Lab Number	Sample Depth (feet)	USCS	Unit Weight (pcf)	Moisture Content (%)	Gradation Fraction			Atterberg Limits			SPECIALIZED TESTING					TRIAXIAL TEST		
							Gravel (%)	Sand (%)	Fines (%)	LL (%)	PL (%)	PI (%)	Consolidation Test P_o	C_a	C_c	C_v	C_∞		Po	Su
Slough Bridge No. 107/5													(ksf)			(ft/yr)		Type	(psi)	(psf)
H-1-93	D-1	F-0486-1	3.0-5.0	GW		27.5	47.9	47.5	4.6											
	U-2A	F-0486-2	8.0-8.3	MH	104.8	46.5	8.8	9.9	81.3	55.8	34.0	21.8			0.147	20	0.0026			
	U-2B	F-0486-3	8.3-8.7	MH	100.1	57.6	0	17.2	82.8	51.3	32.2	19.1						UU	6	310
	D-5	F-0486-5	15.0-17.0	MH		56.0	8.3	5.9	85.8	58.0	38.9	19.1								
	U-6A	F-0486-6	18.0-18.3	MH	97.3	62.1	2.5	7.1	90.4	64.6	42.6	22.0						UU	12	281
	U-6B	F-0486-7	18.3-18.7	MH	97.2	54.3							1.7	0.034	0.200	11	0.0047			[illegible]
	U-8A	F-0486-9	23.0-25.0	ML		48.4	8.8	40.4	50.7											
	D-9	F-0486-10	25.0-27.0	SM		36.6	0.8	64.4	34.8											
	D-14	F-0486-15	40.0-42.0	ML		44.1	3.0	34.3	62.7											
	U-15B	F-0486-17	44.3-43.7	ML	107.4	40.7	0	15.8	84.2	39.9	29.0	10.9	2.0	0.084	0.116	138	0.0070			
	D-16	F-0486-18	45.0-47.0	ML		39.1	0	8.4	91.6	40.9										
	D-22	F-0486-35	60.0-61.5	GW		11.4	59.3	37.0	3.7											
	D-23	F-0486-36	63.0-64.3	SP/SM		8.8	26.2	65.3	8.5											
H-2-93	D-1	F-0482-1	0 - 2.0	ML		98.4	0	6.8	93.2											
	U-2A	F-0482-2	4.0 - 4.3	ML	85.7	111.5	0.6	38.6	60.8				1.32	0.150	0.297	166	0.0056			
	U-4C	F-0482-8	9.7-10.0	ML	95.7	77.3	0	3.8	96.2									UU	5	216
	U-8A	F-0482-17	19.0-19.3	ML	94.4	72.1	0	3.9	96.1									UU	12	237
	D-15	F-0482-35	36.0-38.0	ML		47.3	0	10.9	89.1											
H-3-93	D-1	F-0448-1	0 - 2.0	ML		58.1	0	4.3	95.7	49.1	40.7	8.4								
	U-4A	F-0448-5	8.0-8.3	ML	95.6	81.5	0	6.6	93.4									UU	5	[illegible]1
	U-4B	F-0448-6	8.3-8.7	ML	94.8	79.3	0	6.6	93.4					0.020	0.257	88	0.0098			
	U-6A	F-0448-9	13.0-13.3	ML	98.1	73.2	0	1.4	98.6									CU	15	1282
	U-6B	F-0448-10	13.3-13.7	ML	97.8	71.0	0	1.3	98.7										30	2174
	U-6C	F-0448-11	13.7-14.0	ML	97.7	71.2	0	2.1	97.9										60	3700
	U-8B	F-0448-15	18.3-18.7	MH	97.1	77.4	0	2.6	97.4	55.6	42.0	13.6						UU	12	336
	U-14B	F-0448-27	33.3-33.7	MH	100.7	53.9	0	5.1	94.9	51.9	36.8	15.1	1.8	0.090	0.143	110	0.0041			
	D-16	F-0448-31	38.0-39.5	SW		8.1	38.2	59.8	2.0											
	D-17	F-0448-32	43.0-44.5	SM		32.9	0	53.9	46.1											
	D-20	F-0448-35	58.0-59.5	GW		11.0	54.1	32.8	3.1											
	D-21	F-0448-36	63.0-64.5	SM		27.2	0	86.8	13.2											
	D-23	F-0448-38	73.0-74.5	SP		14.1	42.9	53.7	3.4											

LABORATORY SUMMARY

Test Hole Number	Sample No.	Lab Number	Sample Depth (feet)	USCS	Unit Weight (pcf)	Moisture Content (%)	Gradation Fraction Gravel (%)	Sand (%)	Fines (%)	Atterberg Limits LL (%)	PL (%)	PI (%)	SPECIALIZED TESTING Consolidation Test P_o	C_a	C_c	C_v	C_∞	TRIAXIAL TEST And Field Test Su - Undisturbed Su' - Remolded		
Slough Bridge No. 107/5 (2000 Drilling)													(ksf)			(ft/yr)		Type		
H-7-00	D-2	F-3352	6.0-7.5	ML		71	0	7.2	92.8											
	D-4	F-3352	11.0-12.5	ML			0	9.3	90.7				Clay = 13 %			Hydrometer		Sp. G. = 2.657		
	D-9	F-3352	24.0-25.5	ML			0	6.0	94.0				Clay = 18 %			Hydrometer		Sp. G. = 2.655		
	D-12	F-3352	38.5-40.0	SW-SM		9	46.3	48.4	5.3											
	D-14	F-3352	48.5-50.0	SM			0	55.0	45.0				Clay = 6.5 %			Hydrometer		Sp. G. = 2.655		
	D-15	F-3352	53.5-55.0	GW		10	54.4	41.0	4.5											
	D-20	F-3352	78.5-80.0	GW		13	71.0	26.9	2.1											
	D-22	F-3352	88.5-90.0	SP		17	28.9	70.1	1.0											
																			Su	Su'
H-13-00	D-2	F-3473	6.0-7.5	SP-SM		12	42.1	49.9	8.0										(psf)	(psf)
	V-4	F-3473	8.0 - 8.5															Vane	497	186
	V-6	F-3473	11.0-11.5															Vane	311	155
	V-9	F-3473	16.5- 17.0															Vane	560	155
	V-12	F-3473	22.0-22.5															Vane	497	497
H-14-00	D-1	F-3478	0.0-1.5	GP		5	72.6	23.4	4.0											
	V-4	F-3478	11.0-12.5															Vane	1150	124
	V-4	F-3478	16.0-17.5															Vane	964	124
Fill Vicinity of STA 46+50																				
H-8-00	V-2	F-3344	5.2 - 6.0															Vane	777	[illegible]0
	U-3B	F-3344	6.0 - 8.0	ML	108.3	48	0	31.1	68.9	42	36	7	2.0	0.014	0.166	84	0.002			
	U-3C	F-3344	6.6 - 7.0	ML	108.6	47	0	32.0	68.0	41	32	9	UU -	Confining Pressure in psi / Shear Strength (Su) in psf.				UU	2	276
	V-2	F-3344	10.0 -11.0															Vane	901	373
	U-6B	F-3344	11.3-11.7	ML	105.8	53	0	34.1	65.9				UU -	Confining Pressure in psi / Shear Strength (Su) in psf.				UU	4	248
	U-6C	F-3344	11.7-12.0	ML	108.6	45	0	39.2	60.8						Erroneous Test Results					
	D-7	F-3344	13.0-14.5	SM		46	0	70.7	29.3											
	D-8	F-3344	15.0-16.5	SP-SM		15	36.2	57.5	6.3											

LABORATORY SUMMARY

Test Hole Number	Sample No.	Lab Number	Sample Depth (feet)	USCS	Unit Weight (pcf)	Moisture Content (%)	Gradation Fraction			Atterberg Limits			SPECIALIZED TESTING					TRIAXIAL TEST		
							Gravel (%)	Sand (%)	Fines (%)	LL (%)	PL (%)	PI (%)	Consolidation Test P_o	C_a	C_c	C_v	C_∞		Po	Su
Fill Vicinity of STA 46+50													(ksf)			(ft/yr)		Type	(psi)	(psf)
H-9-00	D-1	F-3335	12.0-13.5	ML		49	0	25.4	74.6											
	U-2B	F-3335	10.3-10.7	MH	99.0	69	0	4.9	95.1	64	47	17						UU	9	293
	D-3	F-3335	12.0-13.5	SM		33	7.5	78.5	14.0											
	V-5	F-3335	20.9-21.5															Vane	1119	342
	U-6B	F-3335	21.7-22.0		115.4	40														
	U-6E	F-3335	22.3-22.6	SM	111.0	45	0	56.6	43.4									UU	12	[illegible]5
	V-7	F-3335	25.3-26.0															Vane	218	(psf)
Slough Bridge No. 107/6																				
H-4-93	D-2	F-0456-2	7.0-9.0	SP-SM		22.7	12.9	79.2	7.9											
	D-3	F-0456-3	12.0-14.0	ML		81.7	11.2	21.0	67.8	13.5	NP	NP								
	U-1D	F-0456-6	23.0-23.3	ML	101.2	61.8	0	8.8	91.2				2.0	0.072	0.225	246	0.0033			
	U-2D	F-0456-11	28.0-28.3	ML	97.8	63.6	0	2.6	97.4				2.2	0.060	0.235	237	0.0080			
	D-6	F-0456-14	29.0-31.0	SM		59.5	25.9	35.7	38.4											
	D-11	F-0456-19	52.0-53.5	GW		11.1	11.3	85.1	3.6											
H-5-93	D-1	F-0449-1	0 - 2.0	GW		18.9	51.0	35.5	3.9											
	D-2	F-0449-2	3.0 - 5.0	ML		103.2	2.6	20.1	77.3											
	U-4B	F-0449-5	9.7-10.0	ML	103.3	54.7	0	14.4	85.6									UU	7	486
	U-6B	F-0449-9	19.0-19.3	ML	97.2	64.5	0	5.6	94.4									UU	10	187
	D-12	F-0449-23	33.0-34.5	SP		18.0	32.8	64.6	2.6											[illegible]
H-6-93	U-2D	F-0454-4	8.0-8.3	ML	85.0	105.2	4.4	39.4	56.2						0.166	34	0.0042			
	U-2E	F-0454-5	8.3-8.7	ML	86.0	109.9	0	3.5	96.5									UU	5	72
	U-2F	F-0454-6	8.7-9.0	MH	85.0	109.5	0	4.9	95.1	62.4	51.1	11.3						UU	5	116
	U-3C	F-0454-9	12.7-13.0	ML	85.5	90.9	0.1	36.7	63.2						0.242	21	0.0050			
	U-3D	F-0454-10	13.0-13.3	ML	97.1	70.2	0	4.0	96.0									UU	8	162
	U-3E	F-0454-11	13.3-13.7	ML	99.4	67.5	0	1.6	98.4									UU	8	287
	U-4C	F-0454-15	17.7-18.0	ML	103.0	60.7	0	19.5	80.5									CU	15	3154
	U-4D	F-0454-16	18.0-18.3	ML	110.4	68.9	0	9.5	90.5										30	6422
	U-4E	F-0454-17	18.3-18.7	ML	96.2	73.8	0	4.7	95.3										60	1,0714
	D-6	F-0454-25	29.0-31.0	SM		42.9	0.3	79.3	20.4											

LABORATORY SUMMARY

Test Hole Number	Sample No.	Lab Number	Sample Depth (feet)	USCS	Unit Weight (pcf)	Moisture Content (%)	Gradation Fraction Gravel (%)	Sand (%)	Fines (%)	Atterberg Limits LL (%)	PL (%)	PI (%)	SPECIALIZED TESTING Consolidation Test P_o	C_a	C_c	C_v	C_∞	TRIAXIAL TEST And Field Test Su - Undisturbed Su' - Remolded		
Slough Bridge No. 107/6 (2000 Drilling)													(ksf)			(ft/yr)				
H-10-00	D-3	F-3345	9.5-11.0	ML			0	14.5	85.5				Clay = 13.7 %			Hydrometer		Sp. G. = 2.699		
	D-8	F-3345	26.2-27.7	SW		13	27.2	69.4	3.4											
	D-10	F-3345	34.0-35.5	GW		10	51.4	43.6	5.0											
	D-13	F-3345	49.0-50.5	GW		10	51.7	44.7	3.6											
	D-15	F-3345	59.0-60.5	SM		44	8.9	67.2	23.9											
	D-19	F-3345	79.0-80.5	SW		12	39.8	57.1	3.1											
	D-20	F-3345	84.0-85.5	GW		11	49.4	46.8	3.8											
H-11-00	D-5	F-3337	15.5-16.5	MH			0	8.1	91.9	56	43	13	Clay = 15.0 %			Hydrometer		Sp. G. = 2.621		
	D-9	F-3337	27.0-28.5	SW		21	37.7	54.9	7.4											
	D-16	F-3337	59.5-61.0	ML		9	65.2	31.3	3.5											
H-12-00	D-3	F-3338	12.0-13.5	SM		38	0.1	57.0	42.9											
	D-6	F-3338	22.0-23.5	OH		82	0	11.1	88.8	72	53	19								
	D-7	F-3338	25.0-26.5	OH		64	0	2.9	97.1	67	38	29								
	D-9	F-3338	32.0-33.5	SP		17	23.8	68.2	8.0											
	D-12	F-3338	45.0-46.5	GW		6	64.4	32.6	3.0											
	D-13	F-3338	50.0-51.5	ML			0	28.3	71.7				Clay = 8.0 %			Hydrometer		Sp. G. = 2.737		
	D-15	F-3338	60.0-61.5	GW-GM		14	55.5	34.7	9.8											
	D-19	F-3338	80.0-81.5	SW		10	38.3	58.6	3.1											
	D-23	F-3338	100-101.5	GP		8	86.4	13.4	0.1											
																			Su	[illegible]'
H-15-00	D-3	F-3474	5.0- 6.5	GP-GM		14	46.6	45.0	8.4										(psf)	(psf)
	V-10	F-3474	20.0-20.5															Vane	995	373

Job No. **OL-1181** Date **July 21, 2000**

Hole No. **H-7-00** Sheet **1** of **2**

Project **Slough Bridge 107/5 and 107/6**

Laboratory Summary

Washington State Department of Transportation

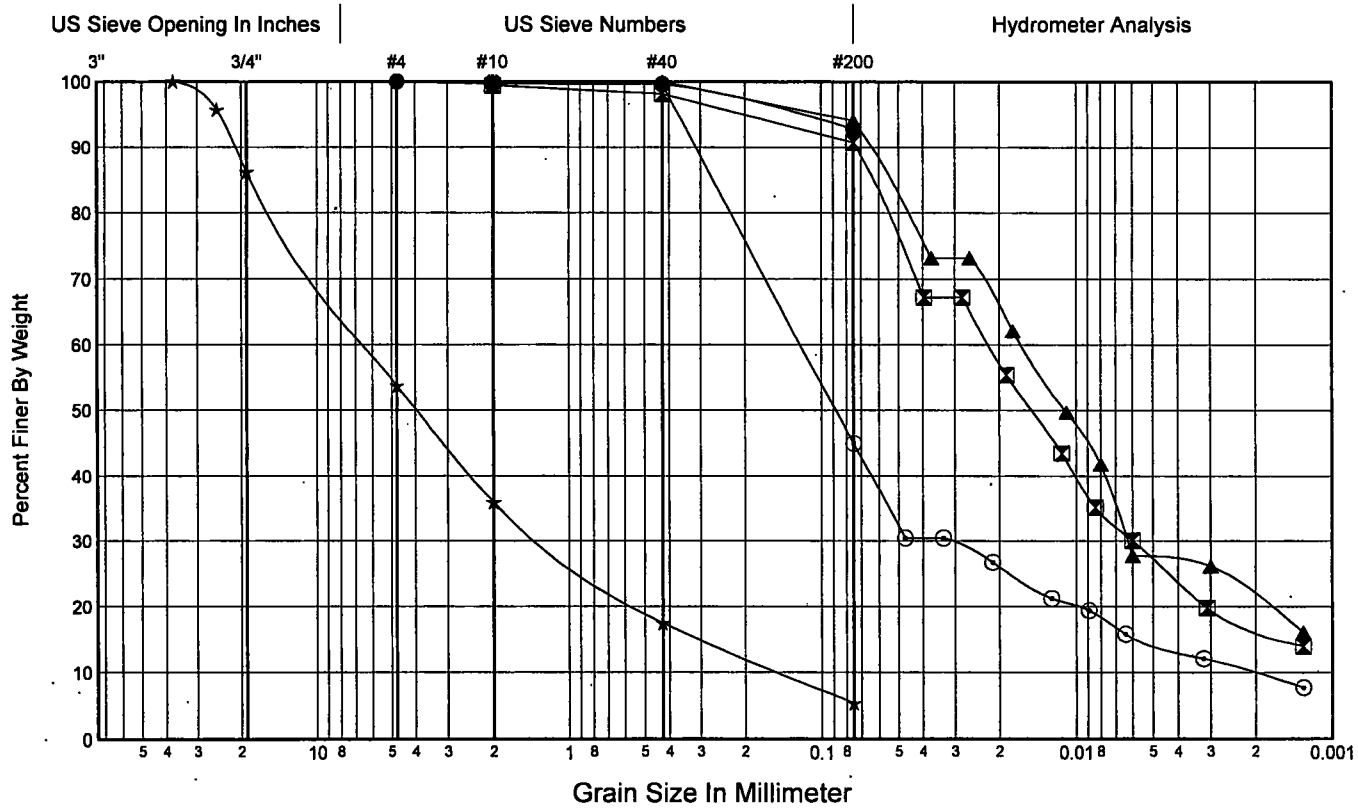
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	6.0	1.83	D-2	ML	See Boring Log	SILT	71	49	39	10
⊠	11.0	3.35	D-4	ML	See Boring Log	SILT		NP	NP	NP
▲	24.0	7.32	D-9	ML	See Boring Log	SILT		NP	NP	NP
★	38.5	11.73	D-12	SW-SM	See Boring Log	WELL-GRADED SAND with SILT and GRAVEL	9	NP	NP	NP
⊙	48.5	14.78	D-14	SM	See Boring Log	SILTY SAND		NP	NP	NP

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cc	Cu
●	0.0	7.2	92.8		
⊠	0.0	8.7	90.7		
▲	0.0	6.0	94.0		
★	46.3	48.4	5.3	1.6	42.5
⊙	0.0	55.0	45.0	4.0	58.0

GRADATION VALUES

	D60	D50	D30	D20	D10
●					
⊠	0.02	0.01	0.01	0.00	
▲	0.02	0.01	0.01	0.00	
★	6.21	3.96	1.22	0.53	0.15
⊙	0.12	0.09	0.03	0.01	0.00



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

Job No. **OL-1181** Date **July 21, 2000**

Hole No. **H-7-00** Sheet **2** of **2**

Project **Slough Bridge 107/5 and 107/6**

Laboratory Summary

Washington State Department of Transportation

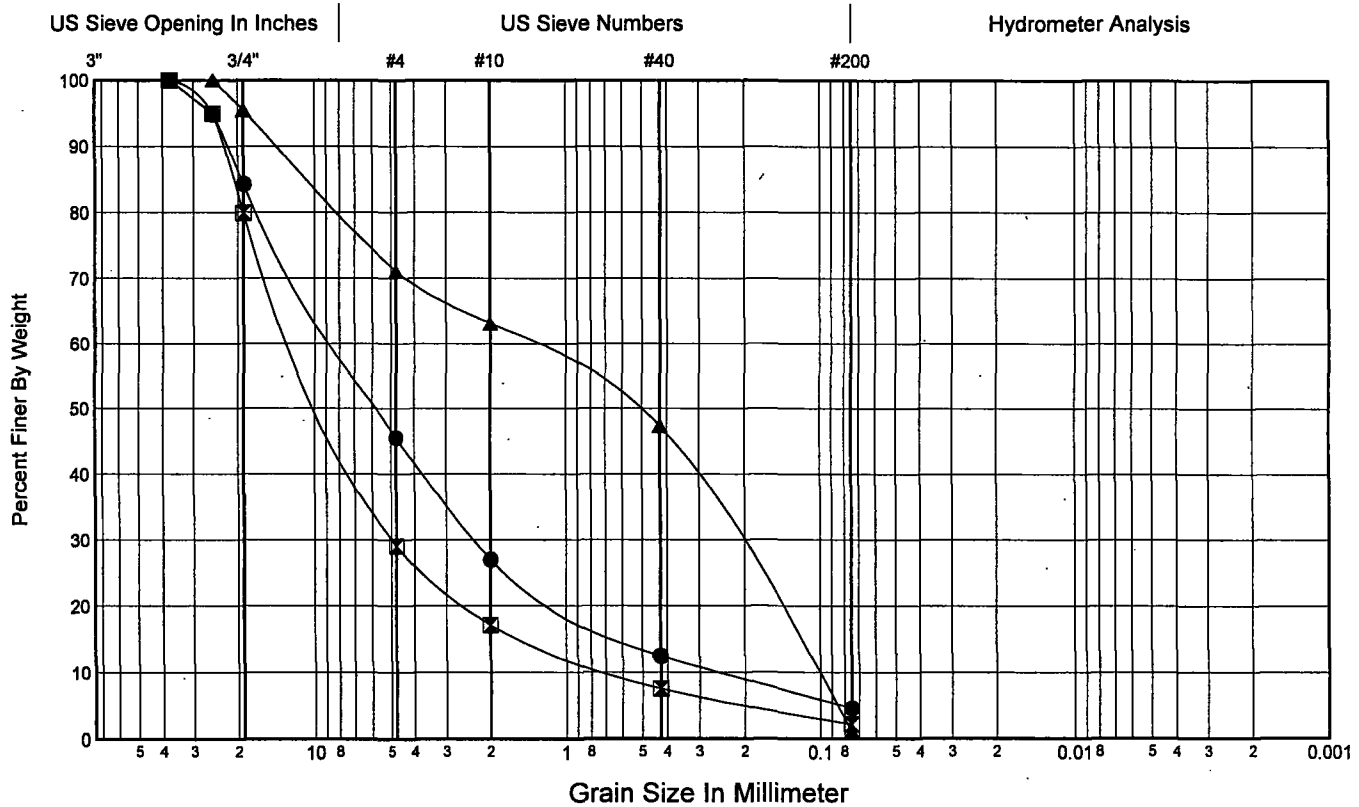
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	53.5	16.31	D-15	GW	See Boring Log	WELL-GRADED GRAVEL with SAND	10	NP	NP	NP
⊠	78.5	23.93	D-20	GW	See Boring Log	WELL-GRADED GRAVEL with SAND	13	NP	NP	NP
▲	88.5	26.97	D-22	SP	See Boring Log	POORLY GRADED SAND with GRAVEL	17	NP	NP	NP

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cc	Cu
●	54.4	41.0	4.5	2.7	32.1
⊠	71.0	26.9	2.1	3.4	17.4
▲	28.9	70.1	1.0	0.3	14.0

GRADATION VALUES

	D60	D50	D30	D20	D10
●	7.96	5.57	2.30	0.95	0.25
⊠	11.04	8.41	4.88	2.46	0.64
▲	1.47	0.55	0.22	0.15	0.11



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

Job No. **OL-1181** Date **July 24, 2000**

Hole No. **H-8-00** Sheet **1** of **1**

Project **Slough Bridge 107/5 and 107/6**

Laboratory Summary

Washington State Department of Transportation

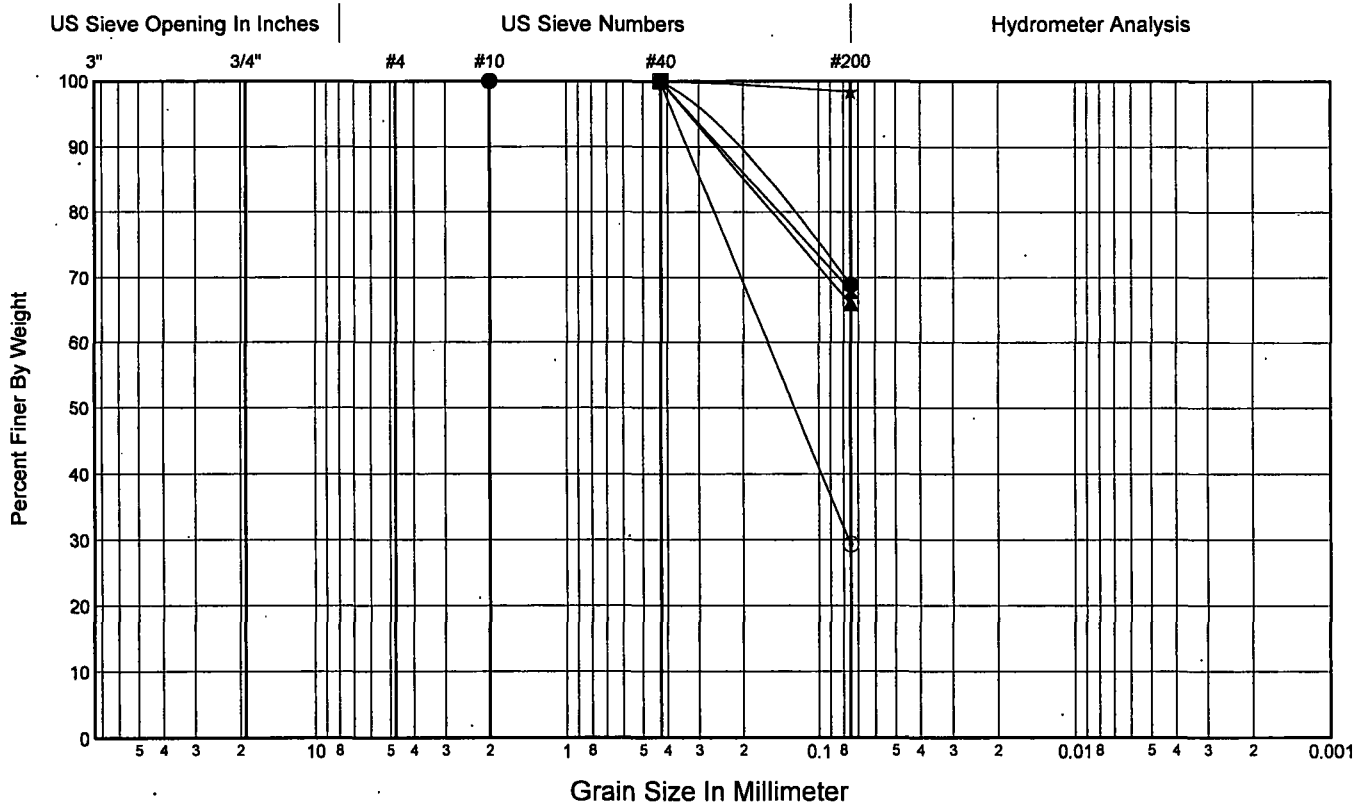
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	6.3	1.92	U-3/B	ML	See Boring Log	SANDY SILT mottled reddish yellow and light olive brown	48	42	35	7
⊠	6.7	2.04	U-3/C	ML	See Boring Log	SANDY SILT	47	41	32	9
▲	11.3	3.44	U-6/B	ML	See Boring Log	SANDY SILT	53	NP	NP	NP
★	11.7	3.57	U-6/C	ML	See Boring Log	SILT	45	NP	NP	NP
⊙	13.0	3.96	D-7	SM	See Boring Log	SILTY SAND	46	NP	NP	NP

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cc	Cu
●	0.0	31.1	68.9		
⊠	0.0	32.0	68.0		
▲	0.0	34.1	65.9		
★	0.0	1.7	98.3		
⊙	0.0	70.7	29.3		

GRADATION VALUES

	D60	D50	D30	D20	D10
●					
⊠					
▲					
★					
⊙	0.16	0.12	0.08		



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

Job No. **OL-1181** Date **July 24, 2000**

Hole No. **H-8-00** Sheet **2** of **1**

Project **Slough Bridge 107/5 and 107/6**

Laboratory Summary

Washington State Department of Transportation

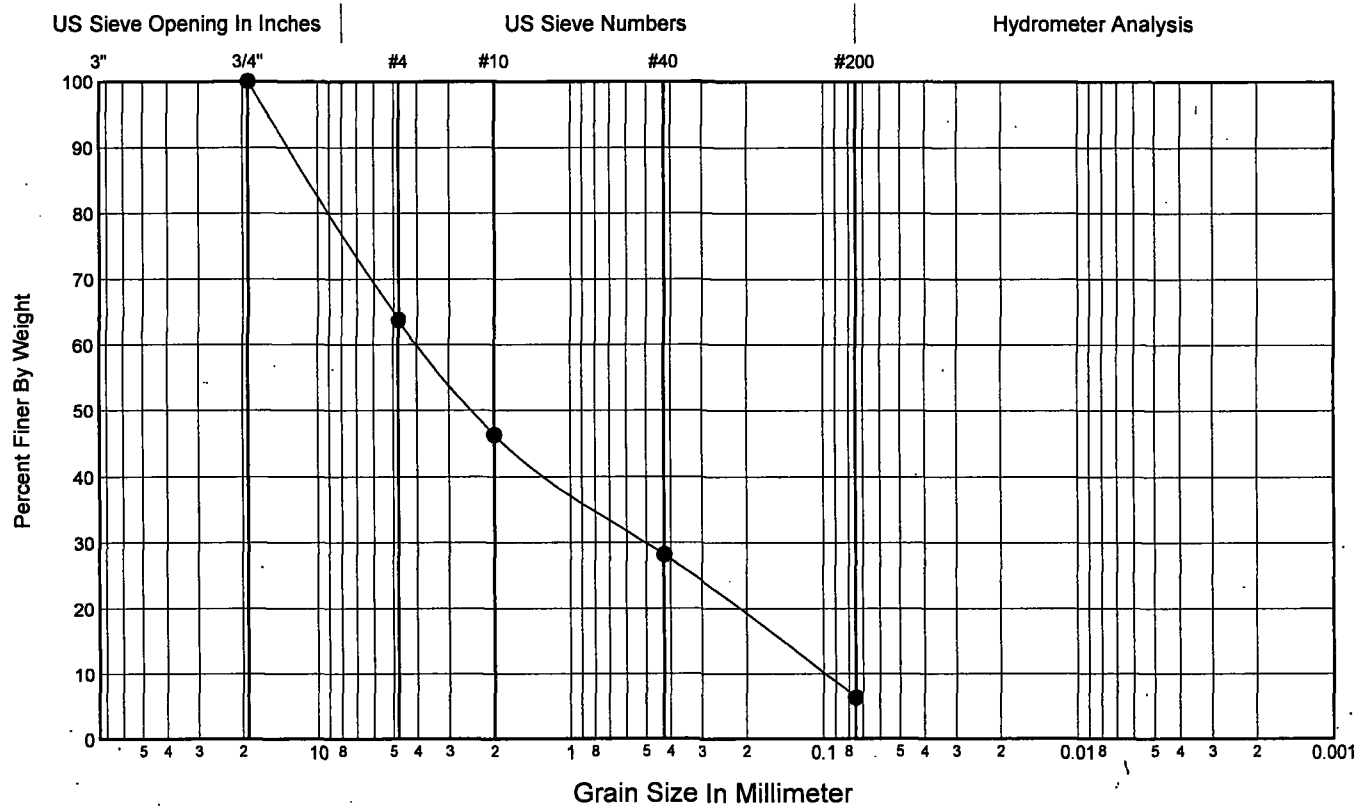
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	15.0	4.57	D-8	SP-SM	See Boring Log	POORLY GRADED SAND with SILT and GRAVEL	15	NP	NP	NP

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cc	Cu
●	36.2	57.5	6.3	0.6	39.0

GRADATION VALUES

	D60	D50	D30	D20	D10
●	3.94	2.40	0.50	0.22	0.10



Job No. **OL-1181** Date **July 24, 2000**

Hole No. **H-9-00** Sheet **1** of **1**

Project **Slough Bridge 107/5 and 107/6**

Laboratory Summary

Washington State Department of Transportation

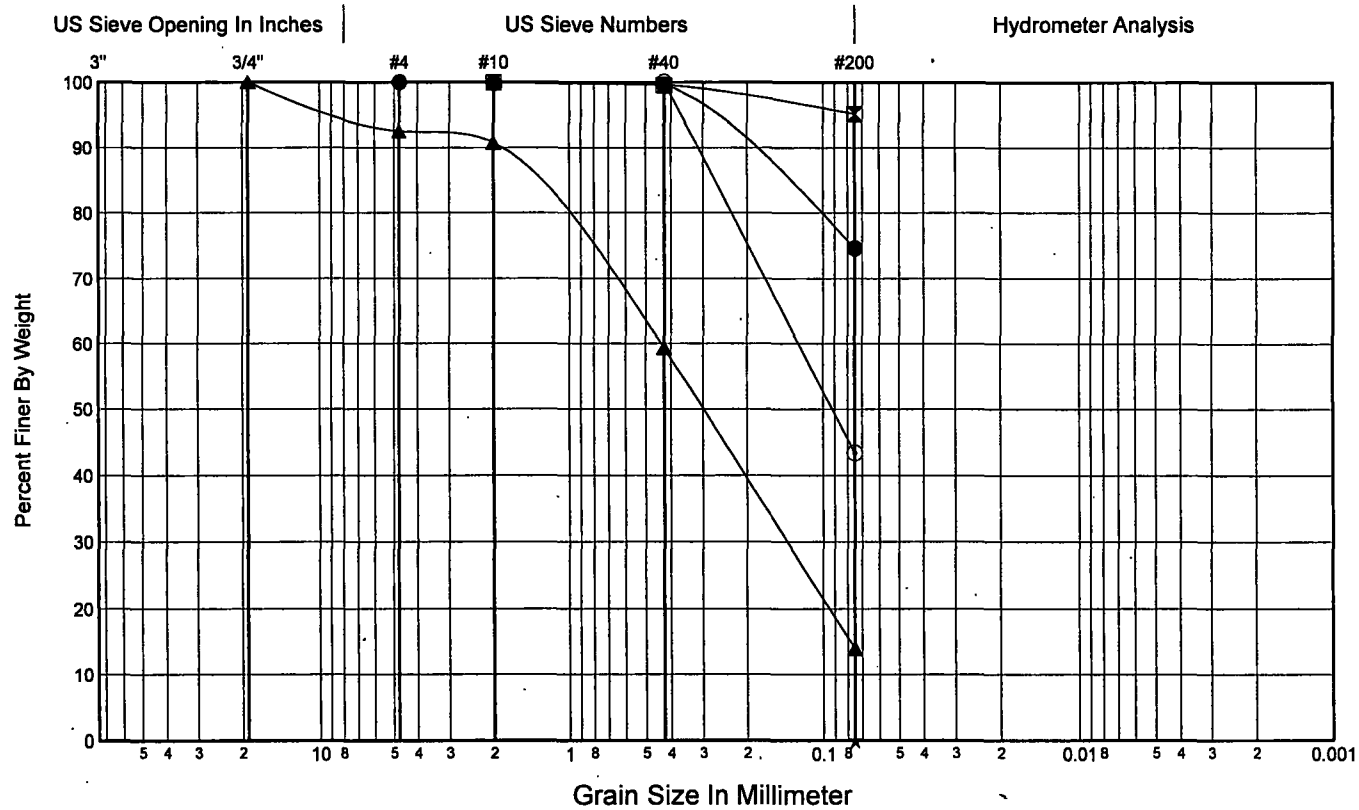
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	5.0	1.52	D-1	ML	See Boring Log	SILT with SAND	49	NP	NP	NP
⊠	10.3	3.14	U-2/B	MH	See Boring Log	ELASTIC SILT	69	64	47	17
▲	12.0	3.66	D-3	SM	See Boring Log	SILTY SAND	33	NP	NP	NP
★	21.7	6.61	U-6/B		See Boring Log		40	NP	NP	NP
⊙	22.3	6.80	U-6/E	SM	See Boring Log	SILTY SAND dark gray	45	NP	NP	NP

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cc	Cu
●	0.0	25.4	74.6		
⊠	0.0	4.9	95.1		
▲	7.5	78.5	14.0		
★					
⊙	0.0	56.6	43.4		

GRADATION VALUES

	D60	D50	D30	D20	D10
●					
⊠					
▲	0.44	0.30	0.14	0.09	
★					
⊙	0.12	0.09			



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

Job No. **OL-1181** Date **July 24, 2000**

Hole No. **H-10-00** Sheet **1** of **2**

Project **Slough Bridge 107/5 and 107/6**

Laboratory Summary

Washington State Department of Transportation

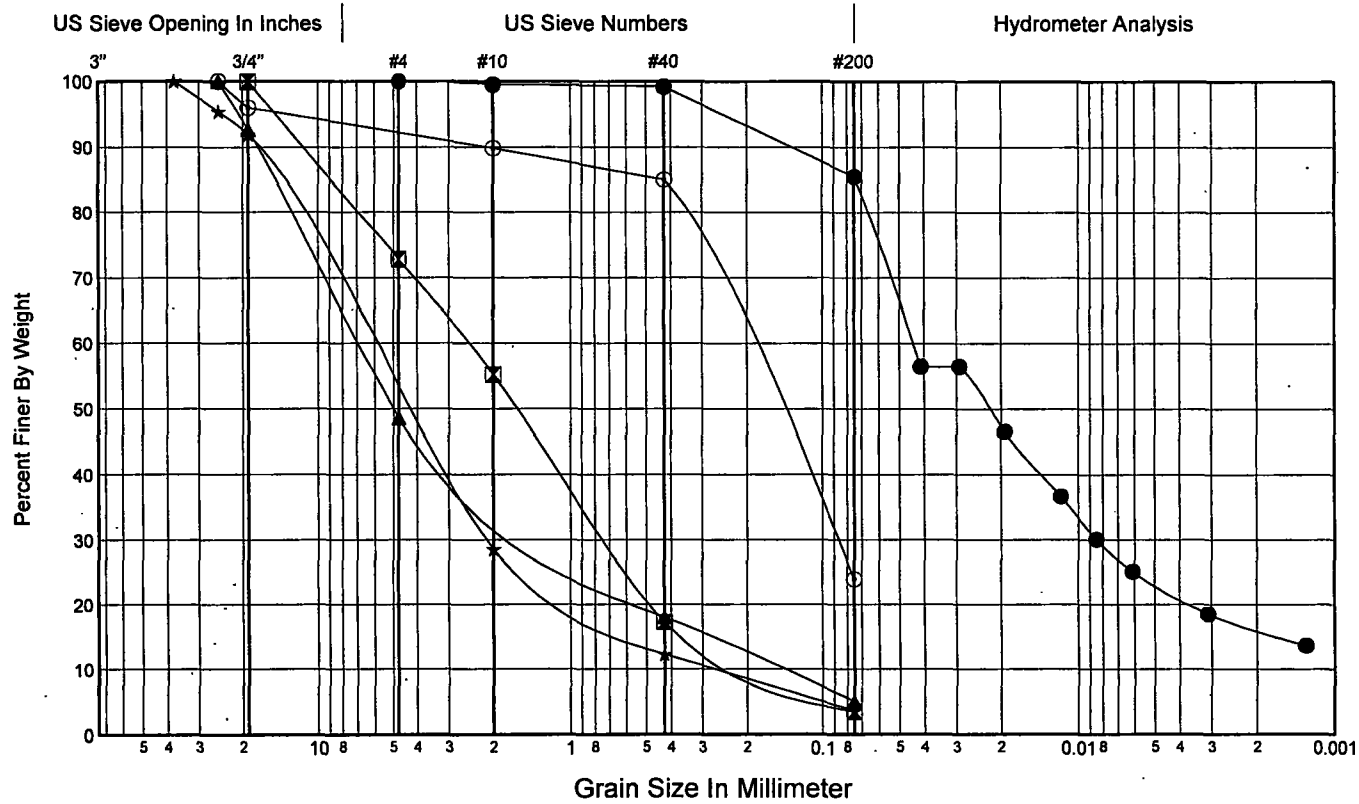
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	9.5	2.90	D-3	ML	See Boring Log	SILT		NP	NP	NP
⊠	26.2	7.99	D-8	SW	See Boring Log	WELL-GRADED SAND with GRAVEL	13	NP	NP	NP
▲	34.0	10.36	D-10	GW	See Boring Log	WELL-GRADED GRAVEL with SAND	10	NP	NP	NP
★	49.0	14.94	D-13	SW	See Boring Log	WELL-GRADED SAND with GRAVEL	10	NP	NP	NP
⊙	59.0	17.98	D-15	SM	See Boring Log	SILTY SAND	44	NP	NP	NP

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cc	Cu
●	0.0	14.5	85.5		
⊠	27.2	69.4	3.4	1.2	14.8
▲	51.4	43.6	5.0	1.2	46.5
★	47.1	49.4	3.6	2.7	22.5
⊙	7.8	68.3	23.9		

GRADATION VALUES

	D60	D50	D30	D20	D10
●	0.04	0.02	0.01	0.00	
⊠	2.52	1.61	0.71	0.47	0.17
▲	6.80	4.96	1.09	0.50	0.15
★	6.11	4.28	2.10	0.89	0.27
⊙	0.21	0.16	0.09		



Job No. **OL-1181** Date **July 24, 2000**

Hole No. **H-10-00** Sheet **2** of **2**

Project **Slough Bridge 107/5 and 107/6**

Laboratory Summary

Washington State Department of Transportation

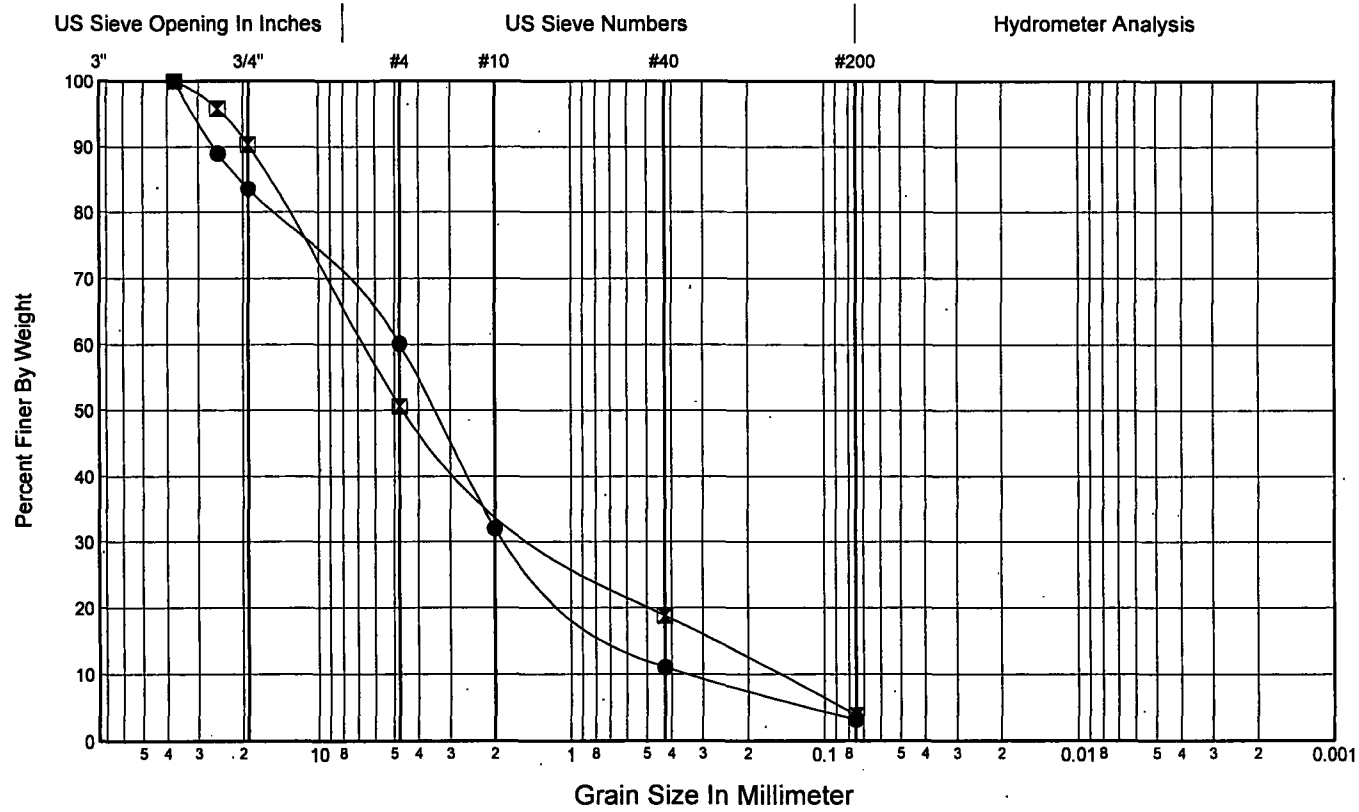
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	79.0	24.08	D-19	SW	See Boring Log	WELL-GRADED SAND with GRAVEL	12	NP	NP	NP
⊠	84.0	25.60	D-20	GP	See Boring Log	POORLY GRADED GRAVEL with SAND	11	NP	NP	NP

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cc	Cu
●	39.8	57.1	3.1	1.9	13.9
⊠	49.4	46.8	3.8	1.0	42.9

GRADATION VALUES

	D60	D50	D30	D20	D10
●	4.73	3.48	1.72	0.82	0.34
⊠	6.60	4.54	1.00	0.47	0.15



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

Job No. **OL-1181** Date **July 24, 2000**

Hole No. **H-11-00** Sheet **1** of **1**

Project **Slough Bridge 107/5 and 107/6**

Laboratory Summary

Washington State Department of Transportation

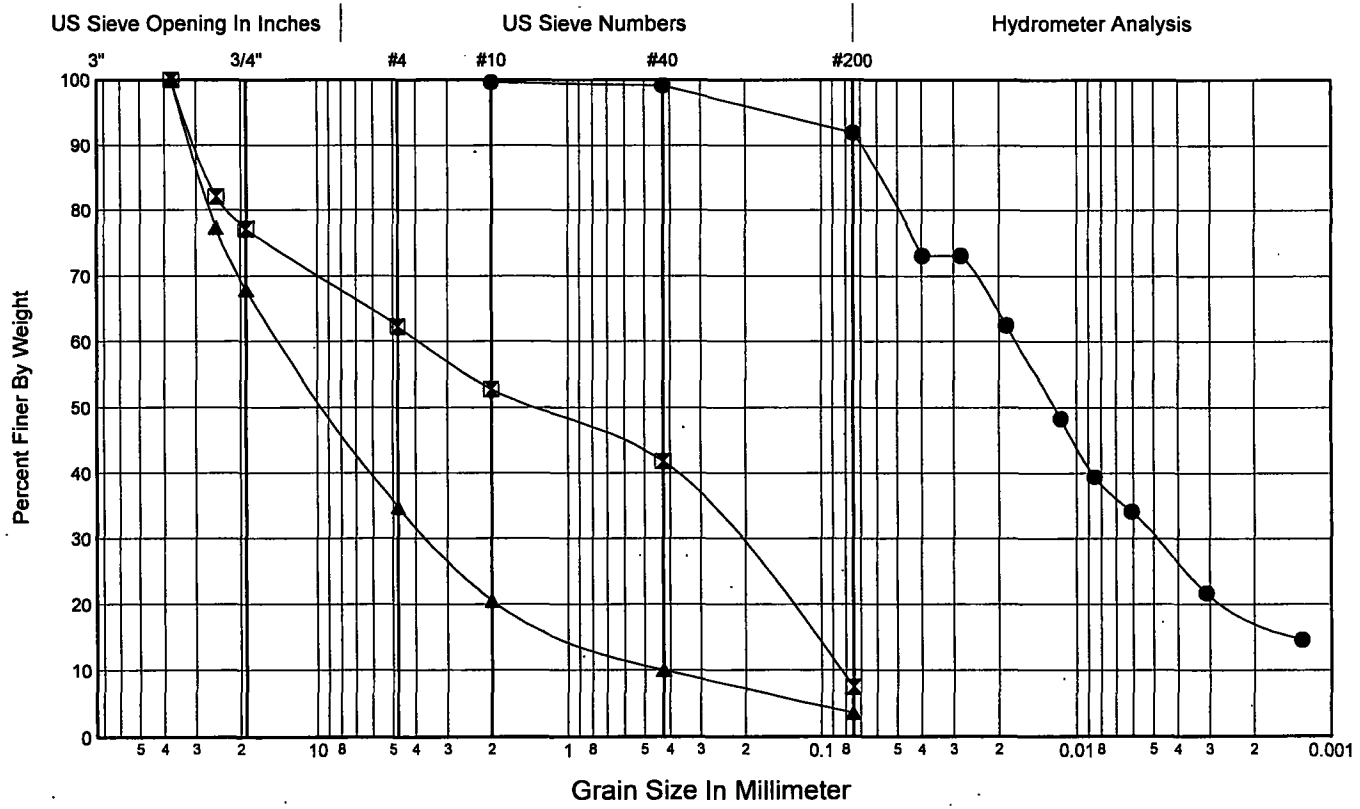
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	15.0	4.57	D-5	MH	See Boring Log	ELASTIC SILT		56	43	13
⊠	27.0	8.23	D-9	SP-SM	See Boring Log	POORLY GRADED SAND with SILT and GRAVEL	21	NP	NP	NP
▲	59.5	18.14	D-16	GW	See Boring Log	WELL-GRADED GRAVEL with SAND	9	NP	NP	NP

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cc	Cu
●	0.0	8.1	91.9		
⊠	37.7	54.9	7.4	0.2	45.2
▲	65.2	31.3	3.5	2.2	32.0

GRADATION VALUES

	D60	D50	D30	D20	D10
●	0.02	0.01	0.00	0.00	
⊠	3.86	1.35	0.23	0.14	0.09
▲	13.66	8.99	3.56	1.86	0.43



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

Job No. **OL-1181** Date **July 24, 2000**

Hole No. **H-12-00** Sheet **1** of **2**

Project **Slough Bridge 107/5 and 107/6**

Laboratory Summary

Washington State Department of Transportation

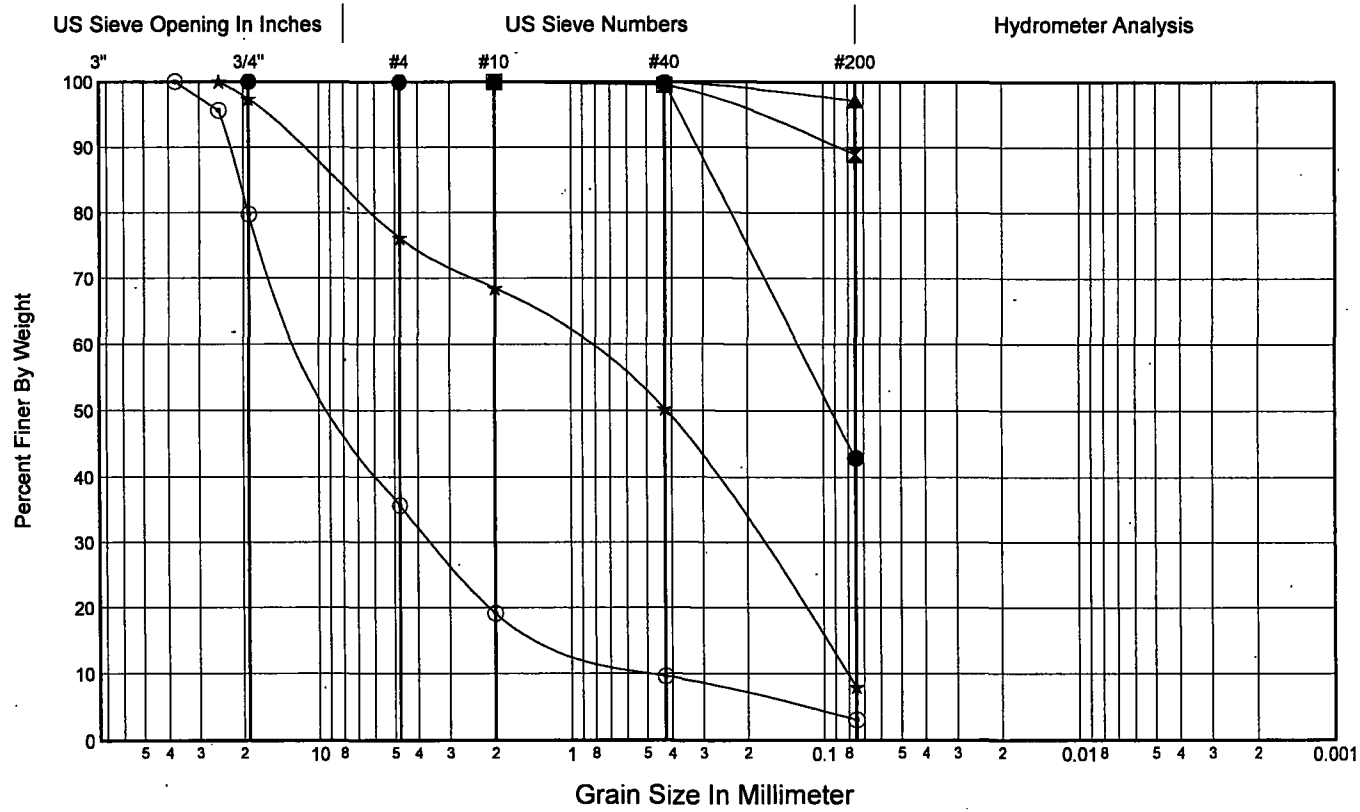
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	12.0	3.66	D-3	SM	See Boring Log	SILTY SAND	38	NP	NP	NP
⊠	22.0	6.71	D-6	OH	See Boring Log	ORGANIC SILT	82	72	53	19
▲	25.0	7.62	D-7	OH	See Boring Log	ORGANIC SILT	64	67	38	29
★	32.0	9.75	D-9	SP-SM	See Boring Log	POORLY GRADED SAND with SILT and GRAVEL	17	NP	NP	NP
⊙	45.0	13.72	D-12	GW	See Boring Log	WELL-GRADED GRAVEL with SAND	6	NP	NP	NP

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cc	Cu
●	0.1	57.0	42.9		
⊠	0.0	11.1	88.9		
▲	0.0	2.9	97.1		
★	23.8	68.2	8.0	0.4	11.9
⊙	64.4	32.6	3.0	2.7	22.5

GRADATION VALUES

	D60	D50	D30	D20	D10
●	0.13	0.09			
⊠					
▲					
★	0.97	0.42	0.19	0.12	0.08
⊙	10.22	7.47	3.54	2.09	0.45



Job No. **OL-1181** Date **July 24, 2000**

Hole No. **H-12-00** Sheet **2** of **2**

Project **Slough Bridge 107/5 and 107/6**

Laboratory Summary

Washington State Department of Transportation

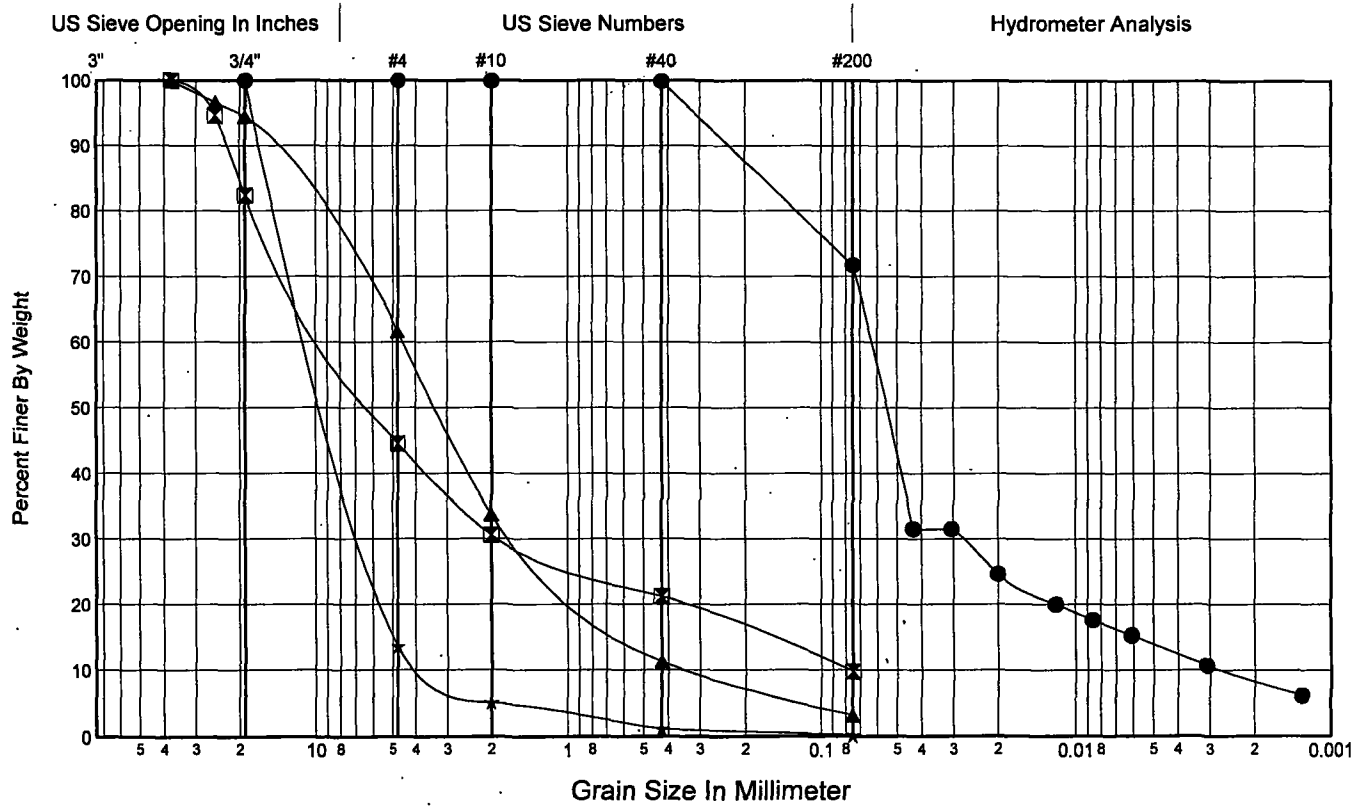
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	50.0	15.24	D-13	ML	See Boring Log	SILT with SAND		NP	NP	NP
⊠	60.0	18.29	D-15	GP-GM	See Boring Log	POORLY GRADED GRAVEL with SILT and SAND	14	NP	NP	NP
▲	80.0	24.38	D-19	SW	See Boring Log	WELL-GRADED SAND with GRAVEL	10	NP	NP	NP
★	100.0	30.48	D-23	GP	See Boring Log	POORLY GRADED GRAVEL	8	NP	NP	NP

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cc	Cu
●	0.0	28.3	71.7	4.5	23.5
⊠	55.5	34.8	9.8	5.1	107.8
▲	38.3	58.6	3.1	1.6	13.9
★	86.4	13.4	0.1	1.2	3.0

GRADATION VALUES

	D60	D50	D30	D20	D10
●	0.06	0.06	0.03	0.01	0.00
⊠	8.37	5.80	1.83	0.36	0.08
▲	4.51	3.31	1.56	0.78	0.33
★	10.00	8.52	6.18	5.27	3.31



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

Job No. **OL-1181** Date **October 4, 2000**

Hole No. **H-13-00** Sheet **1** of **1**

Project **Slough Bridge 107/5 and 107/6**

Laboratory Summary

Washington State Department of Transportation

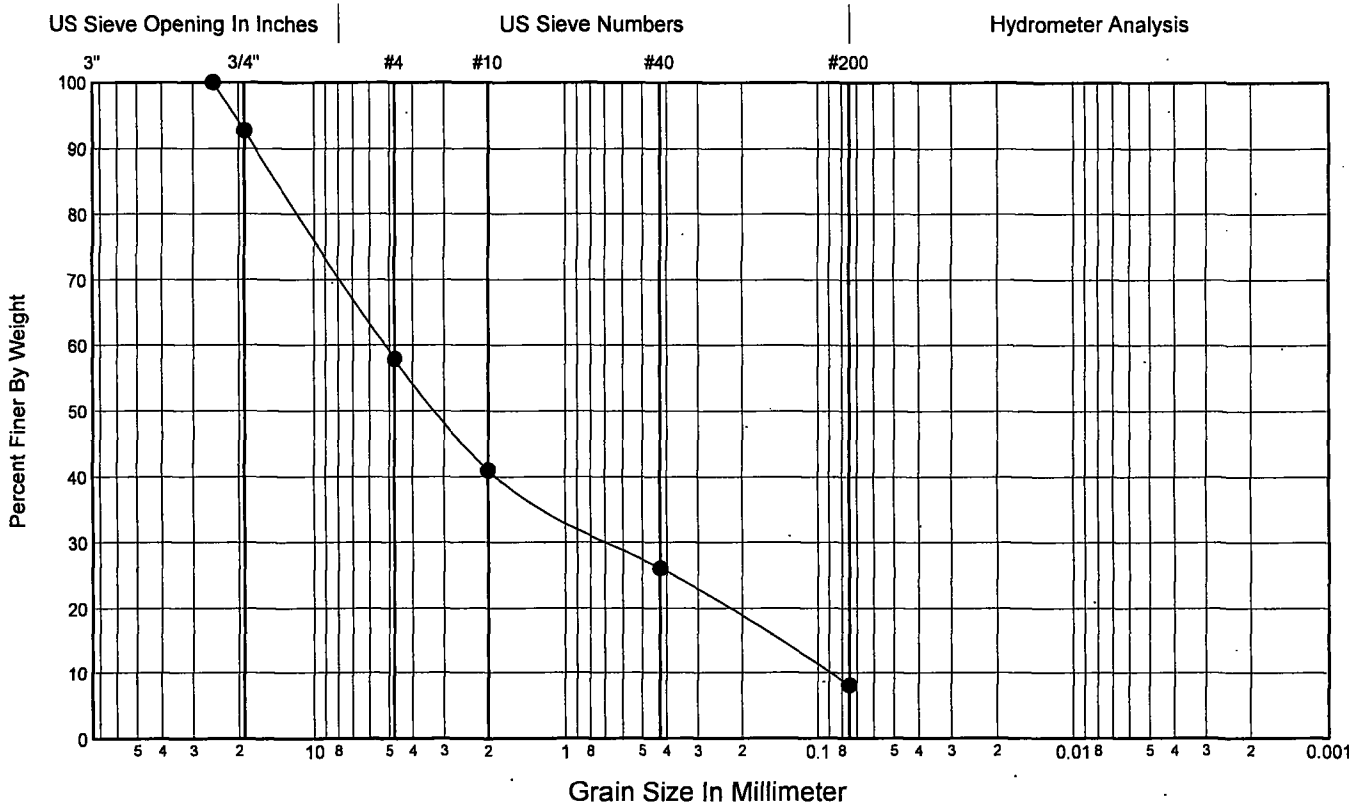
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	1.5	0.46	D-2	SP-SM	See Boring Log	POORLY GRADED SAND with SILT and GRAVEL	12	NP	NP	NP

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cc	Cu
●	42.1	49.9	8.0	0.9	57.0

GRADATION VALUES

	D60	D50	D30	D20	D10
●	5.17	3.17	0.64	0.24	0.09



Job No. **OL-1181** Date **October 4, 2000**

Hole No. **H-14-00** Sheet **1** of **1**

Project **Slough Bridge 107/5 and 107/6**

Laboratory Summary

Washington State Department of Transportation

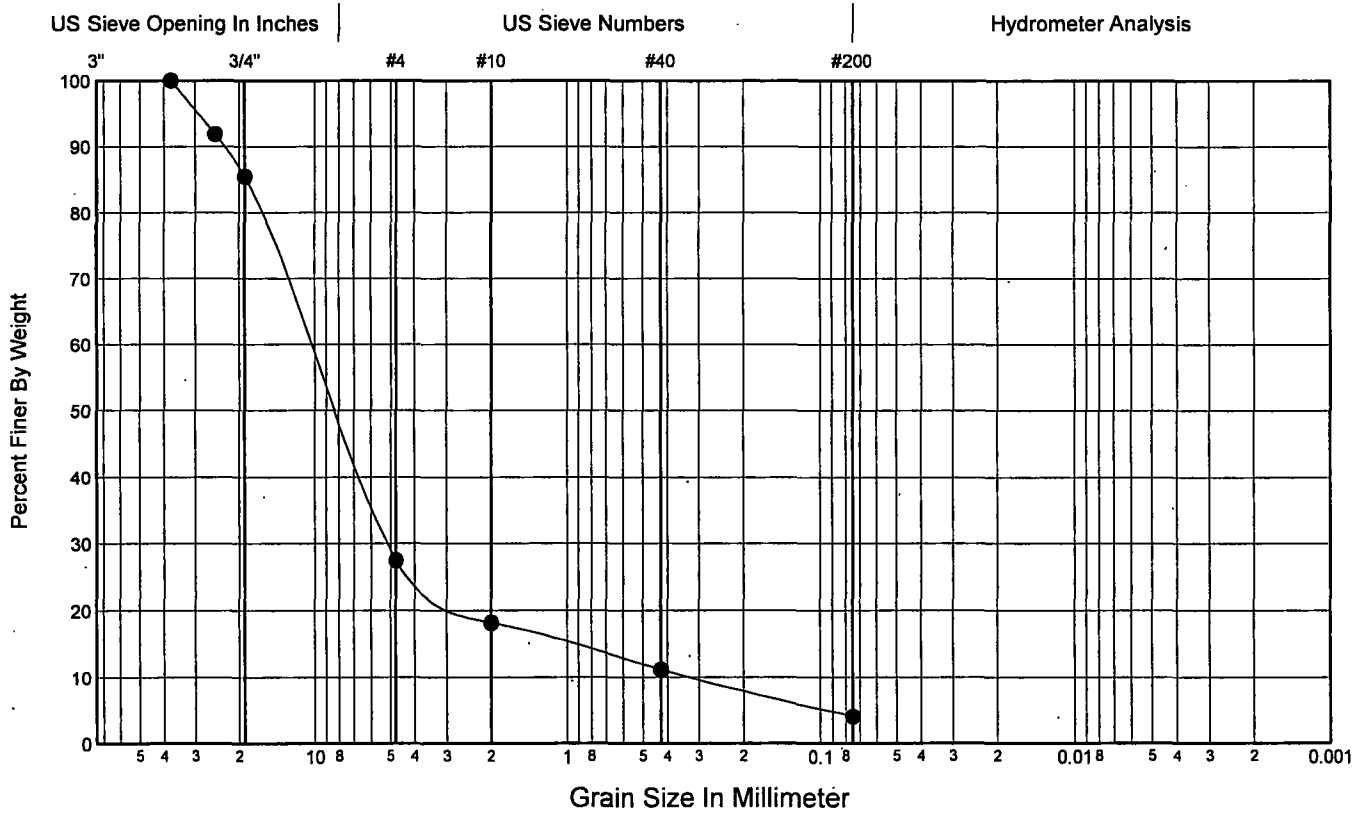
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	0.0	0.00	D-1	GP	See Boring Log	POORLY GRADED GRAVEL with SAND	5	NP	NP	NP

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cc	Cu
●	72.6	23.4	4.0	7.7	32.3

GRADATION VALUES

	D60	D50	D30	D20	D10
●	10.33	8.14	5.05	2.37	0.32



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

Job No. **OL-1181** Date **October 4, 2000**

Hole No. **H-15-00** Sheet **1** of **1**

Project **Slough Bridge 107/5 and 107/6**

Laboratory Summary

Washington State Department of Transportation

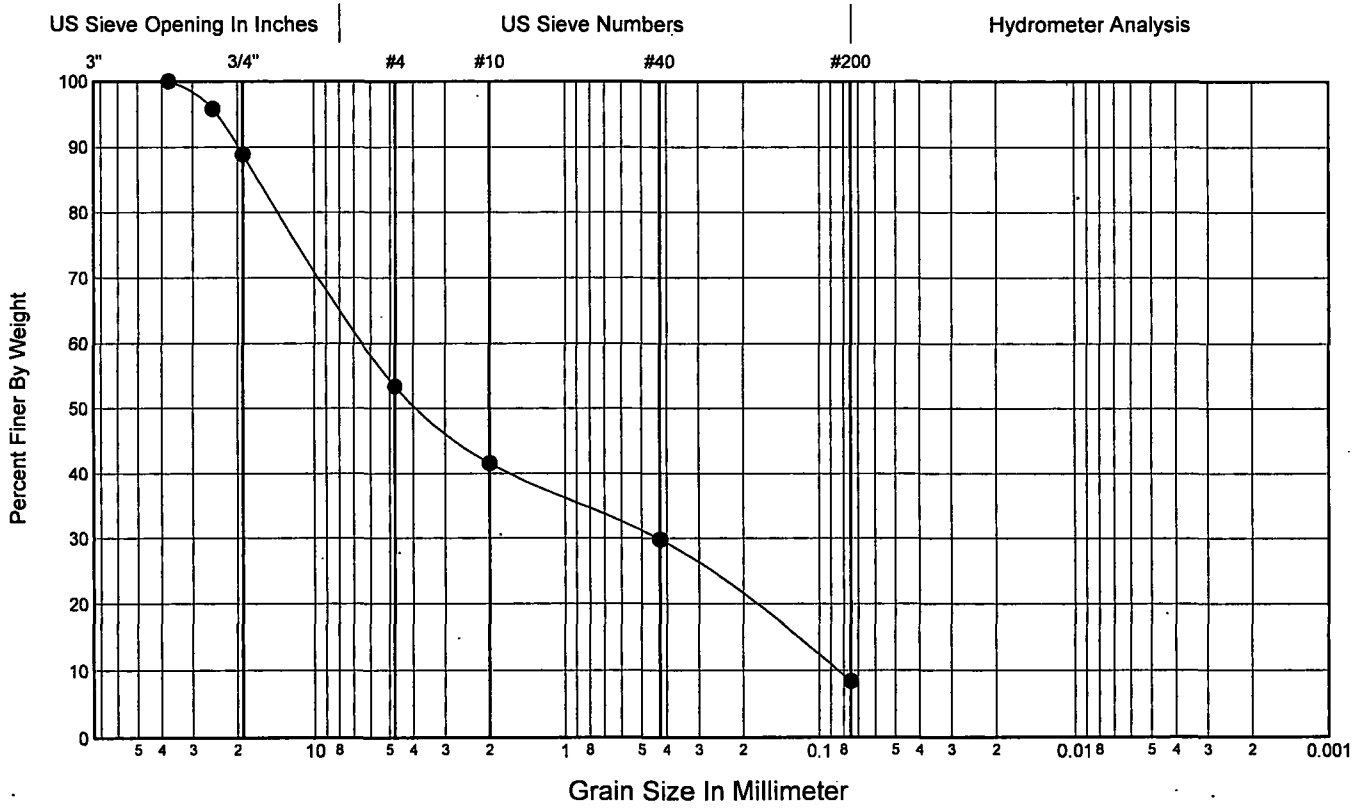
	Depth (ft)	Depth (m)	Sample No.	USCS	Color	Description	MC%	LL	PL	PI
●	5.0	1.52	D-3	GP-GM	See Boring Log	POORLY GRADED GRAVEL with SILT and SAND	14	NP	NP	NP

GRADATION FRACTIONS

	%Gravel	%Sand	%Fines	Cc	Cu
●	46.6	45.0	8.4	0.4	71.9

GRADATION VALUES

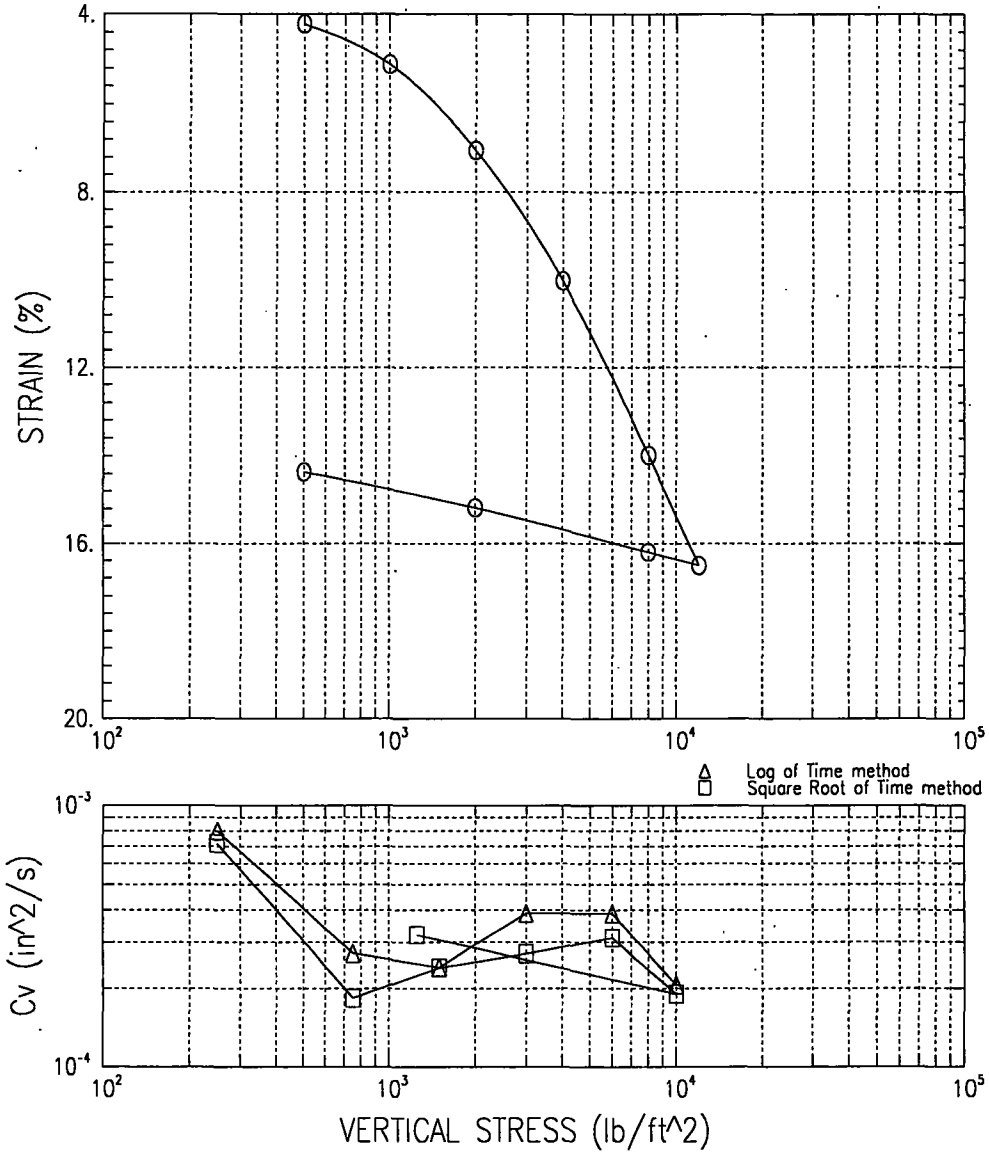
	D60	D50	D30	D20	D10
●	6.16	3.71	0.44	0.19	0.09



Gravel	Sand			Silt and Clay
	Coarse	Medium	Fine	

CONSOLIDATION TEST

SUMMARY REPORT



Washington State D.O.T.
Project Name : SLOUGH BRIDGES 107/5 & 6
Project No : OL-1181 Boring No : H-8-00 Sample No : U-3/B
Test Date : 5/31/00 Test No : 3344U3B Depth : 6.3-6.7 FT
Description : MOIST MOTTLED REDDISH YELLOW & LT OLIVE BRN SILT
Remarks :

CONSOLIDATION TEST DATA

Project : SLOUGH BRIDGES 107/5 & 6
Location : SR-107
Project No.: OL-1181
Boring No.: H-8-00
Tested by : LHB
Checked by : DW
Sample No.: U-3/B
Test Date : 5/31/00
Depth : 6.3-6.7 FT
Test No. : 3344U3B
Sample Type: WSDOT TUBE

Soil Description : MOIST MOTTLED REDDISH YELLOW & LT OLIVE BRN SILT
Remarks :

	APPLIED PRESSURE (lb/ft^2)	FINAL DISPLACEMENT (in)	VOID RATIO	STRAIN AT END (%)	FITTING T50 TIME (min) SQ.RT.	LOG	COEFFICIENT OF CONSOLIDATION (in^2/s) SQ.RT.	LOG	AVE
1)	500.0	0.026	-0.042	4.22	0.4	0.4	7.17E-004	8.01E-004	7.59E-004
2)	1000.0	0.032	-0.051	5.12	1.6	1.1	1.84E-004	2.72E-004	2.28E-004
3)	2000.0	0.044	-0.070	7.05	1.2	1.2	2.40E-004	2.41E-004	2.41E-004
4)	4000.0	0.063	-0.100	10.02	1.0	0.7	2.72E-004	3.88E-004	3.30E-004
5)	8000.0	0.087	-0.140	13.98	0.8	0.6	3.12E-004	3.87E-004	3.50E-004
6)	12000.0	0.103	-0.165	16.51	1.2	1.1	1.90E-004	2.06E-004	1.98E-004
7)	8000.0	0.101	-0.162	16.20	0.0	0.0	0.00E+000	0.00E+000	0.00E+000
8)	2000.0	0.095	-0.152	15.18	0.0	0.0	0.00E+000	0.00E+000	0.00E+000
9)	500.0	0.090	-0.144	14.36	0.7	0.0	3.20E-004	0.00E+000	3.20E-004

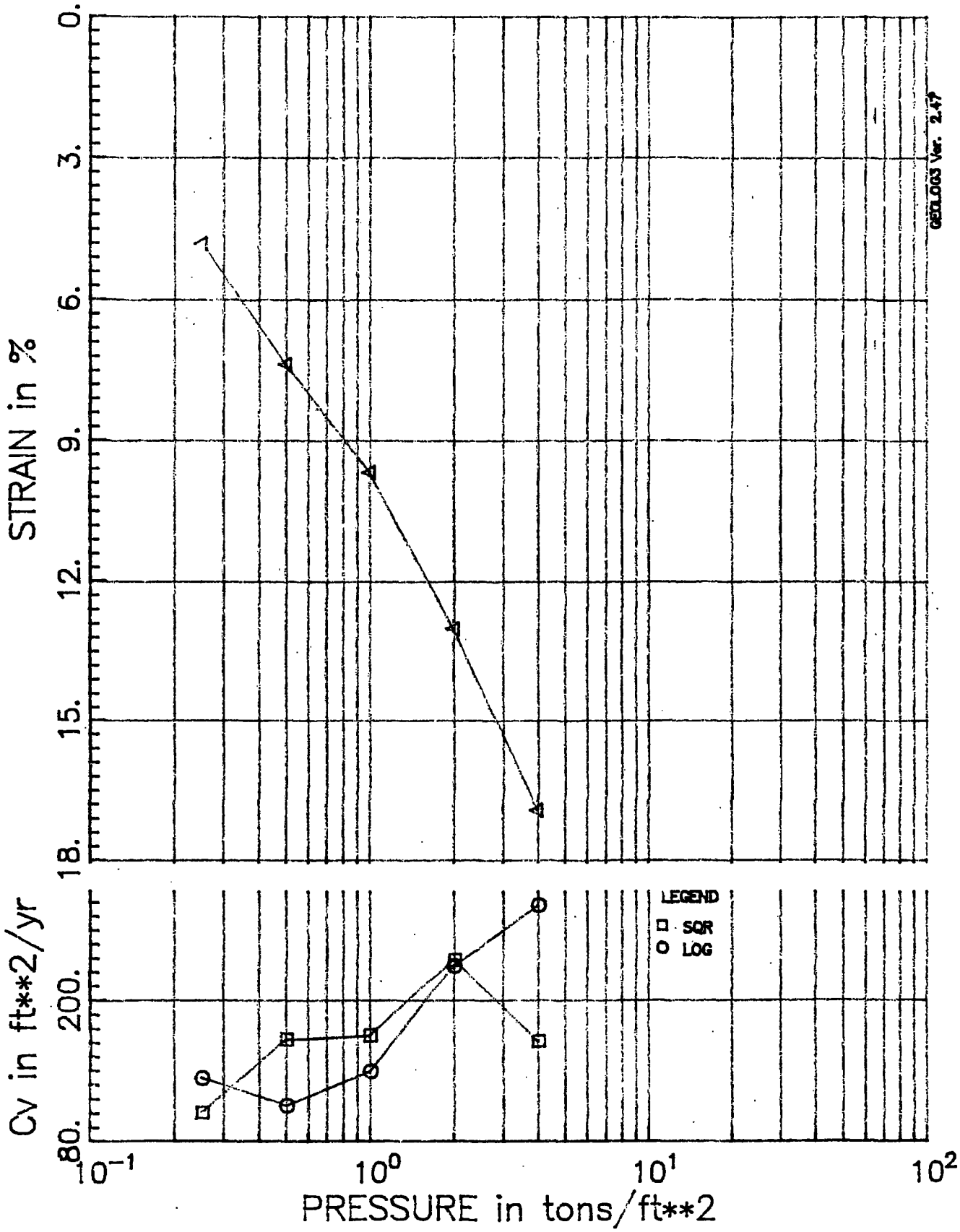
CONSOLIDATION TEST DATA

Project : SLOUGH BRIDGES 107/5 & 6
Location : SR-107
Project No.: OL-1181
Boring No.: H-8-00
Tested by : LHB
Checked by : DW
Sample No.: U-3/B
Test Date : 5/31/00
Depth : 6.3-6.7 FT
Test No. : 3344U3B
Sample Type: WSDOT TUBE

Soil Description : MOIST MOTTLED REDDISH YELLOW & LT OLIVE BRN SILT
Remarks :

Specific Gravity : 2.65
Liquid Limit : 0
Initial Height : 0.63 (in)
Initial Void Ratio : 0.00
Plastic Limit : 0
Sample Diameter : 1.91 (in)
Final Void Ratio : -0.14
Plasticity Index : 0

	BEFORE CONSOLIDATION		AFTER CONSOLIDATION	
	TRIMMINGS	SPECIMEN + RING	SPECIMEN + RING	TRIMMINGS
CONTAINER NO.		RING	RING	
WT CONTAINER + WET SOIL (gm)	352.70	460.10	456.00	0.00
WT CONTAINER + DRY SOIL (gm)	264.90	409.40	409.40	0.00
WT CONTAINER (gm)	81.90	409.40	409.40	0.00
WT DRY SOIL (gm)	0.00	0.00	0.00	-37.30
WATER CONTENT (%)	0.00	0.00	0.00	0.00
VOID RATIO	------	0.00	0.00	------
DEGREE OF SATURATION (%)	------	0.00	0.00	------
DRY DENSITY (lb/ft^3)	------	0.00	0.00	------



SOIL DESCRIPTION: DK GRAY WET
FINE SANDY SILT

BORING: H-1-93 SAMPLE: U-15/B DEPTH: 48.5'

WATER CONTENT
NATURAL: 0.47
AFTER TEST: 0.35

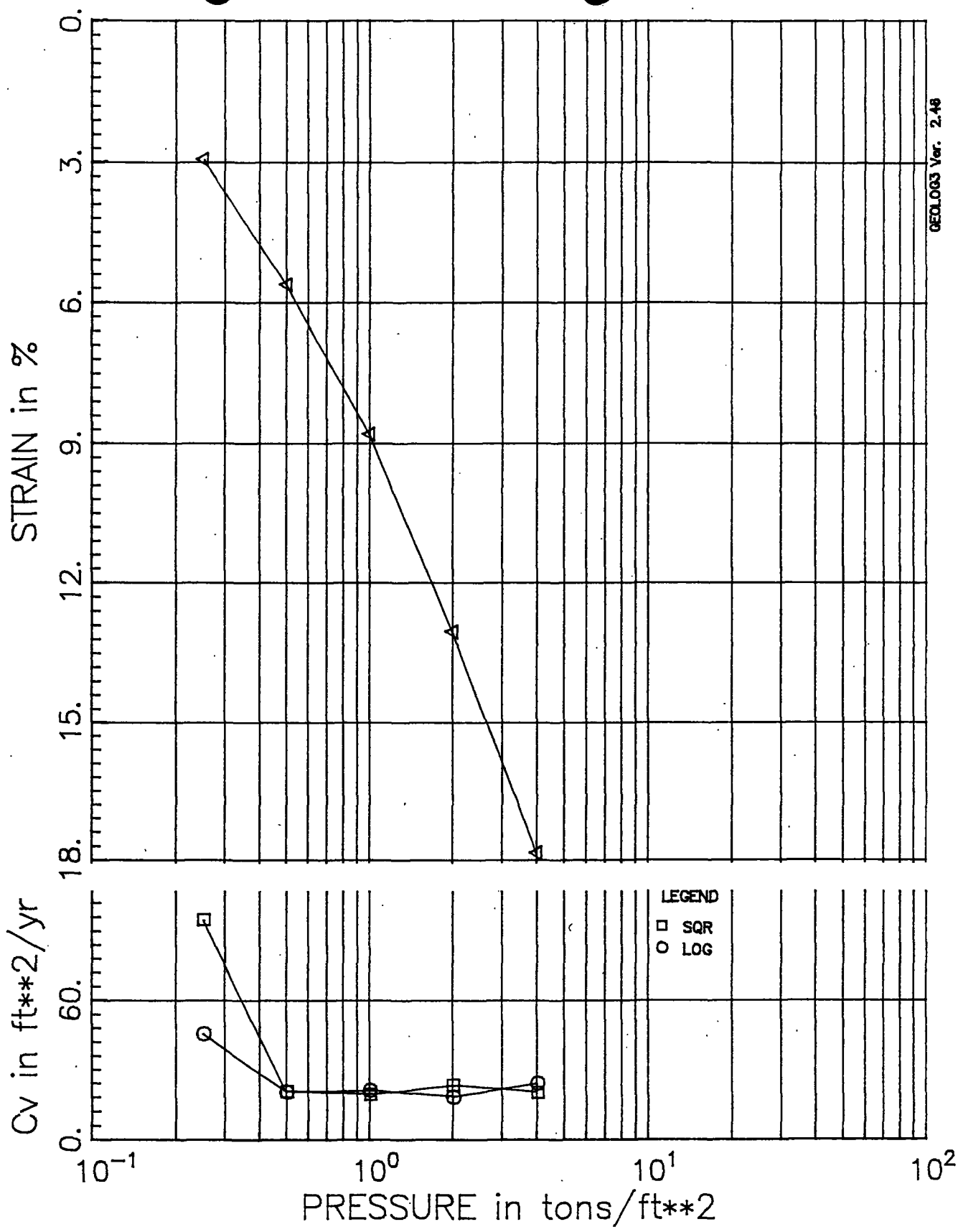
INITIAL VOID RATIO: 1.24

PROJECT: SLOUGH BRIDGE 107/5
FILE NO: GL-1181
DATE: 5-12-93

CONSOLIDATION TEST NO: F0486-17

Testname: F0486-17

WASHINGTON STATE DOT



SOIL DESCRIPTION: MTLD LT GRAY
YELOISH BR WET GRVLY F SDY SILT

BORING: H-1-93 SAMPLE: U-2/A DEPTH: 8.2'

WATER CONTENT
NATURAL: 0.55
AFTER TEST: 0.43

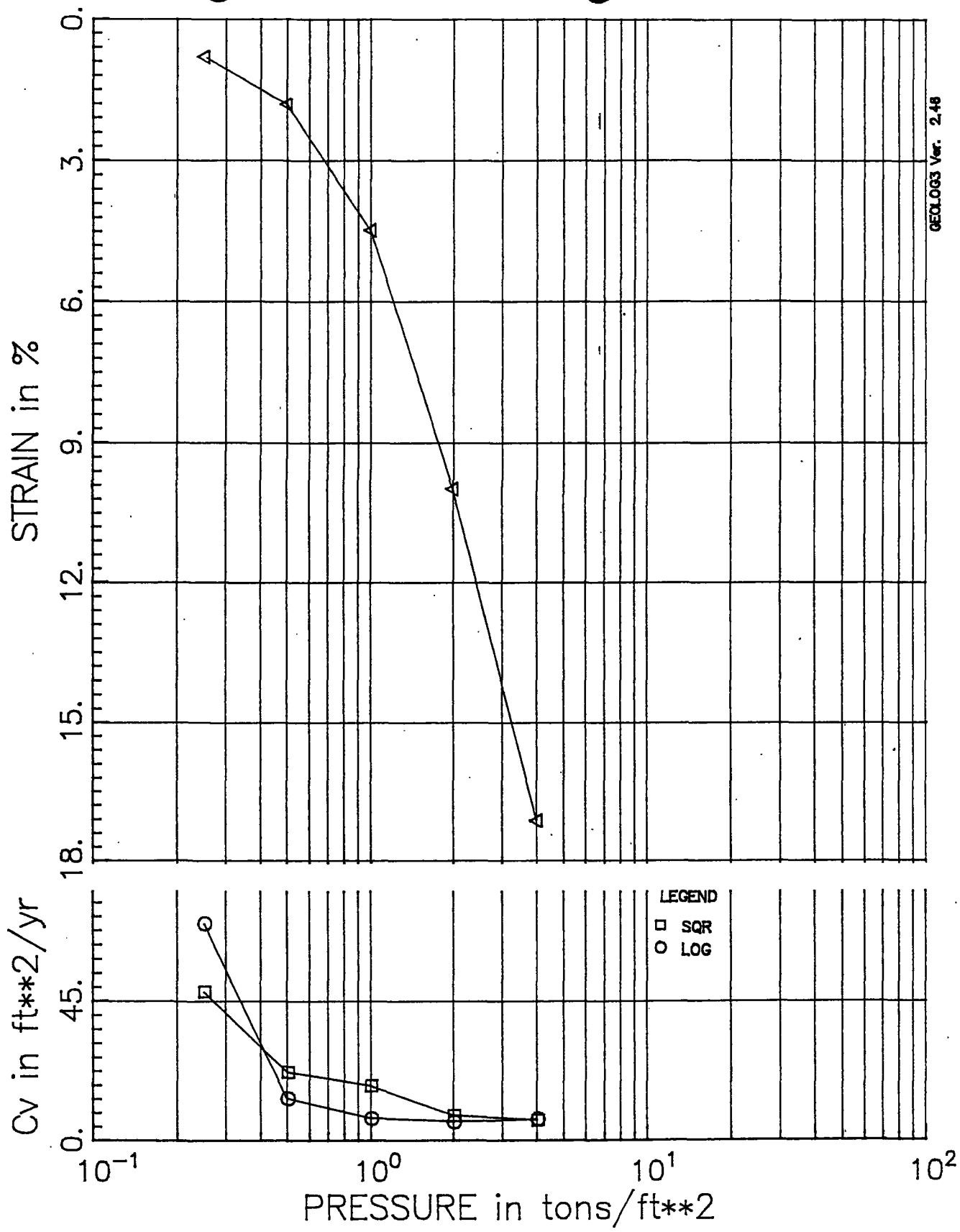
INITIAL VOID RATIO: 1.47

PROJECT: SLOUGH BRIDGE 107/5
FILE NO: OL-1181
DATE: 5-12-93

CONSOLIDATION TEST NO: F0486-2

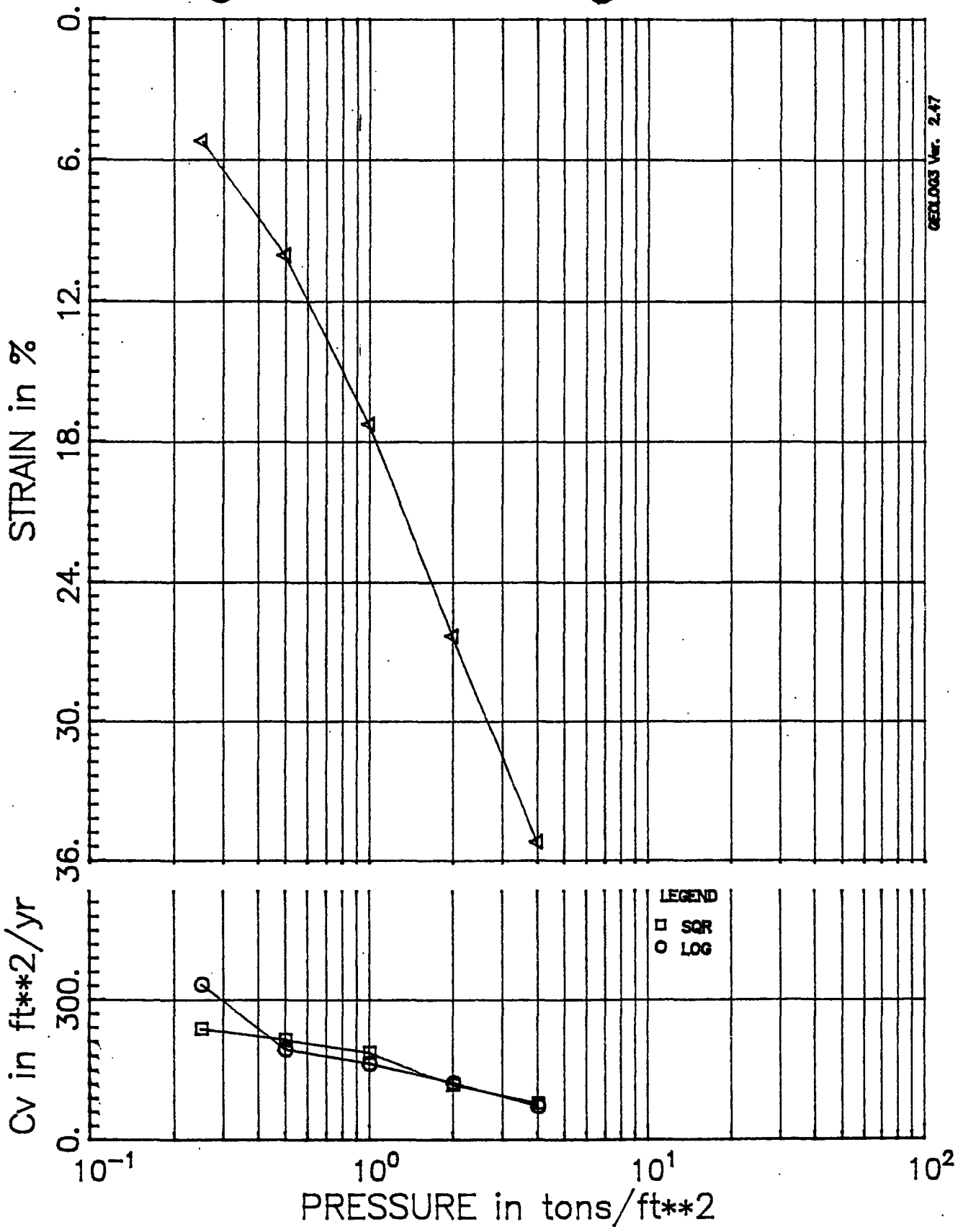
Testname: F0486-2

WASHINGTON STATE DOT



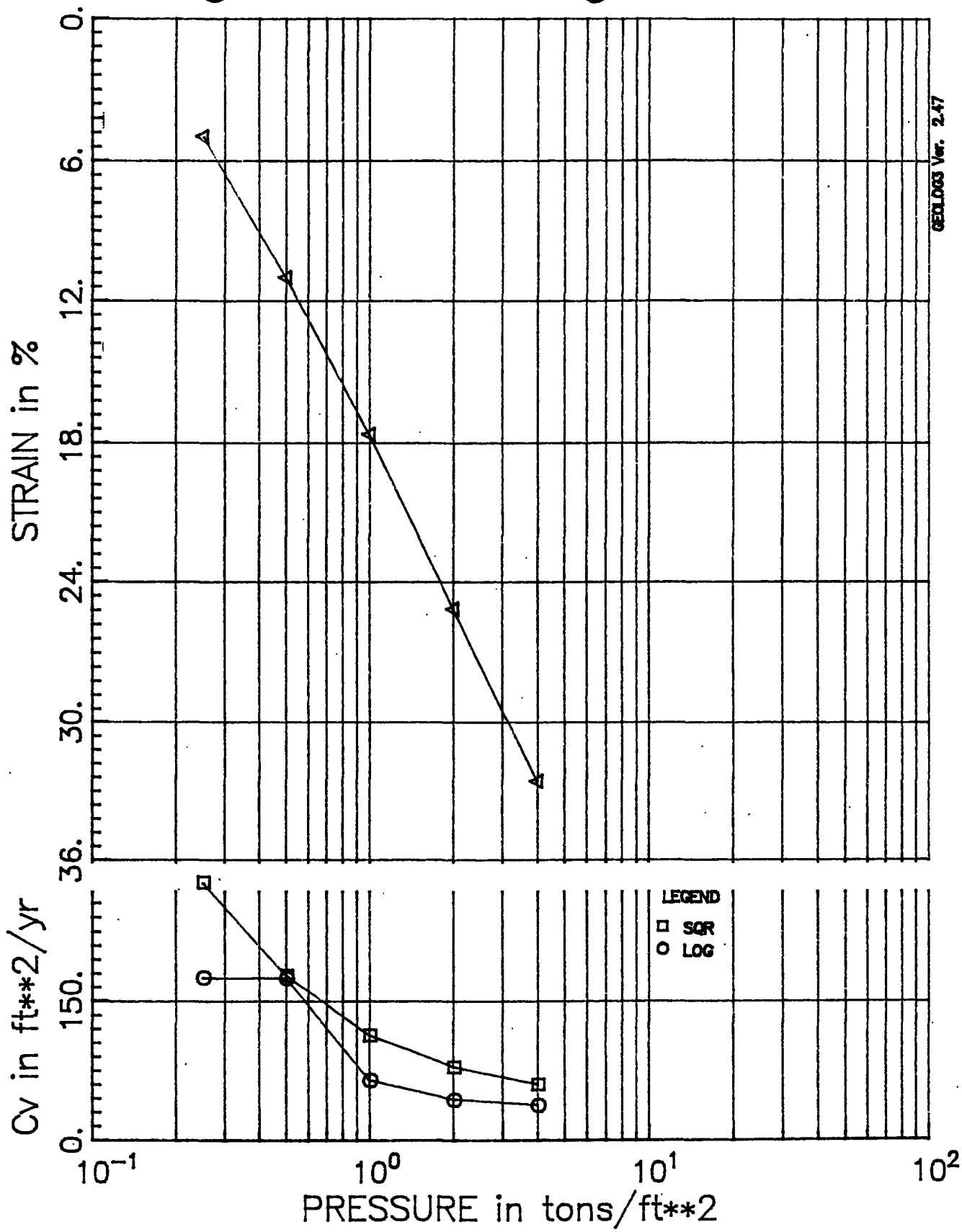
SOIL DESCRIPTION: DK GRAY WET
GRAVELLY FINE TO MED. SANDY SILT
BORING: H-1-93 SAMPLE: U-6/B DEPTH: 18.5'
WATER CONTENT
NATURAL: 0.70
AFTER TEST: 0.56
INITIAL VOID RATIO: 1.87

PROJECT: SLOUGH BRIDGE 107/5
FILE NO: OL-1181
DATE: 5-12-93
CONSOLIDATION TEST NO: F0486-7
Testname: F0486-7
WASHINGTON STATE DOT



SOIL DESCRIPTION: GR SAT F TO M
SDY SILT W/FOM
BORING: H-2-93 SAMPLE: U-2/A DEPTH: 33.5'
WATER CONTENT
NATURAL: 1.20
AFTER TEST: 0.74
INITIAL VOID RATIO: 3.44

PROJECT: SLOUGH BRIDGE 107/5
FILE NO: OL-1181
DATE: 5-12-93
CONSOLIDATION TEST NO: F0482-2
Testname: F0482-2
WASHINGTON STATE DOT



SOIL DESCRIPTION: DK GRAY SAT
F SANDY SILT

BORING: H-3-93 SAMPLE: U-4/B DEPTH: 8.5'

WATER CONTENT
NATURAL: 0.88
AFTER TEST: 0.59

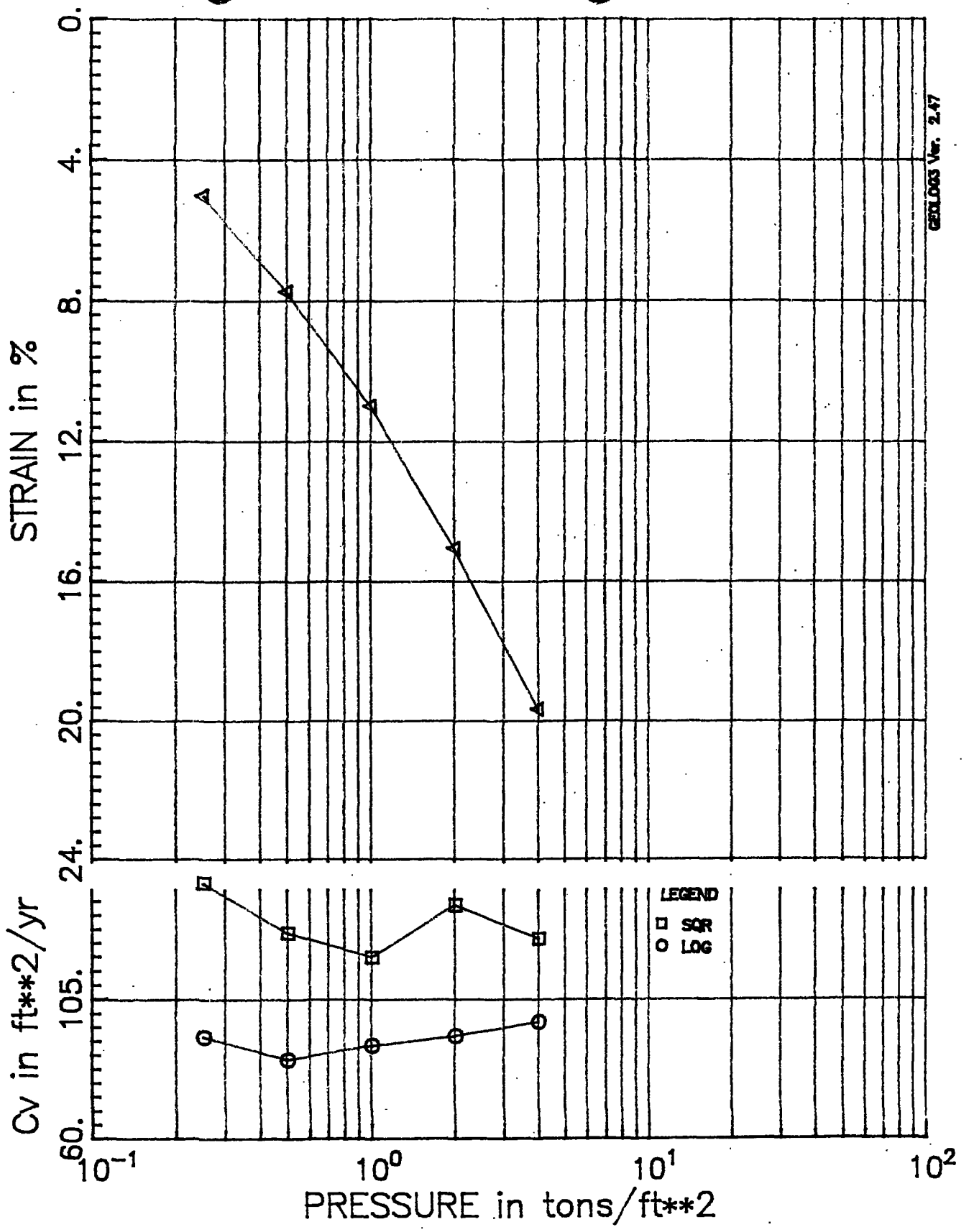
INITIAL VOID RATIO: 2.47

PROJECT: SLOUGH BRIDGE 107/5
FILE NO: CL-1181
DATE: 5-12-93

CONSOLIDATION TEST NO: F0448-6

Testname: F0448-6

WASHINGTON STATE DOT



SOIL DESCRIPTION: DK GRAY WET
F TO M SDY SILT

BORING: H-3-93 SAMPLE: U-14/B DEPTH: 33.5'

WATER CONTENT
NATURAL: 0.53
AFTER TEST: 0.41

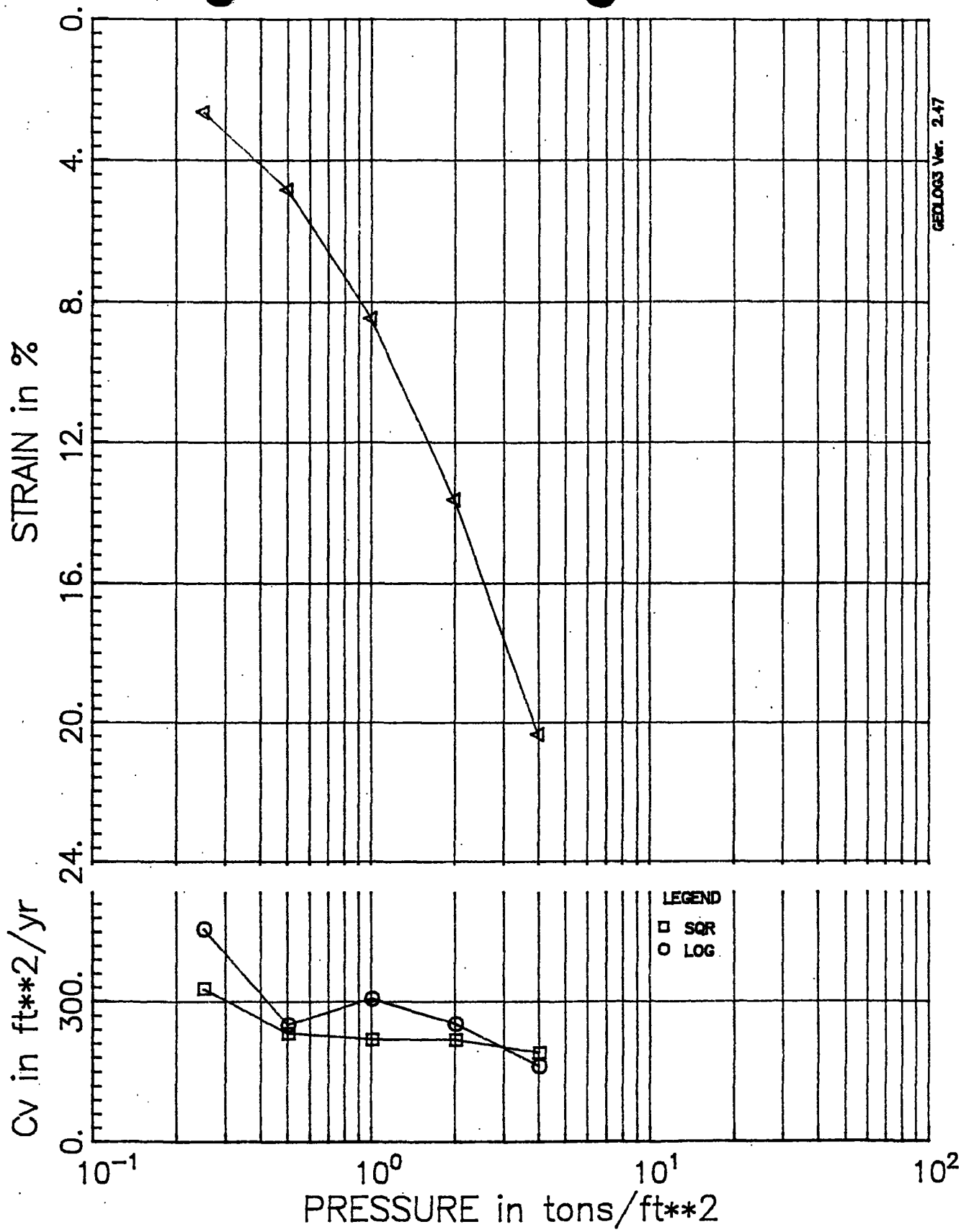
INITIAL VOID RATIO: 1.43

PROJECT: SLOUGH BRIDGE 107/5
FILE NO: GL-1181
DATE: 5-12-93

CONSOLIDATION TEST NO: F0448-27

Testname: F0448-27

WASHINGTON STATE DOT



SOIL DESCRIPTION: DARK GRAY WET
FINE SANDY SILT

BORING: H-4-93 SAMPLE: U-1/D DEPTH: 23.2'

WATER CONTENT
NATURAL: 0.58
AFTER TEST: 0.46

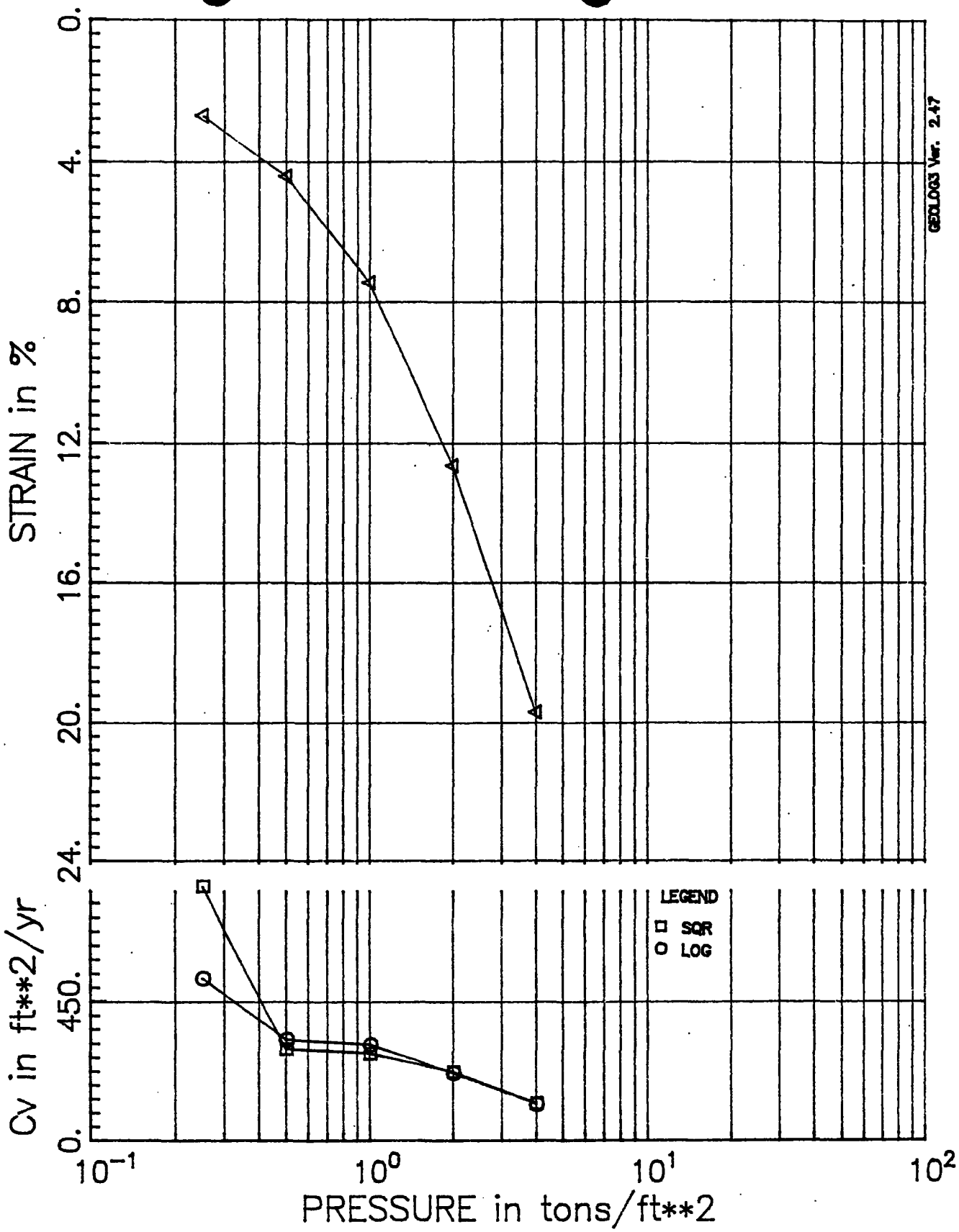
INITIAL VOID RATIO: 1.51

PROJECT: SLOUGH BRIDGE 107/6
FILE NO: OL-1181
DATE: 5-19-93

CONSOLIDATION TEST NO: F-0456-6

Testname: F0456-6

WASHINGTON STATE DOT



SOIL DESCRIPTION: GRAY WET FINE SANDY SILT W/FOM

BORING: H-4-93 SAMPLE: U-2/C DEPTH: 28.2'

WATER CONTENT
NATURAL: 0.65
AFTER TEST: 0.53

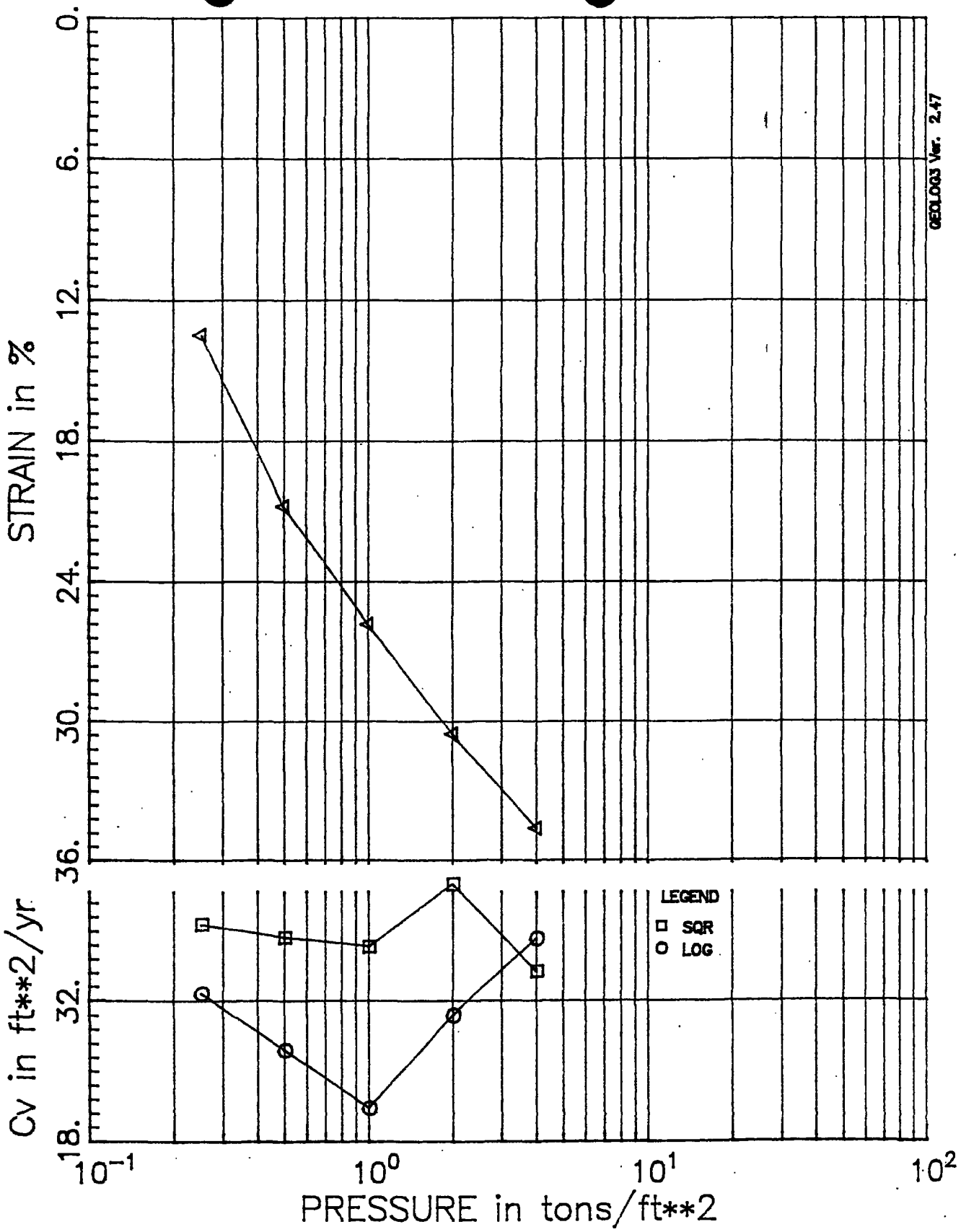
INITIAL VOID RATIO: 1.75

PROJECT: SLOUGH BRIDGE 107/6
FILE NO: OL-1181
DATE: 5-19-93

CONSOLIDATION TEST NO: F-0456-11

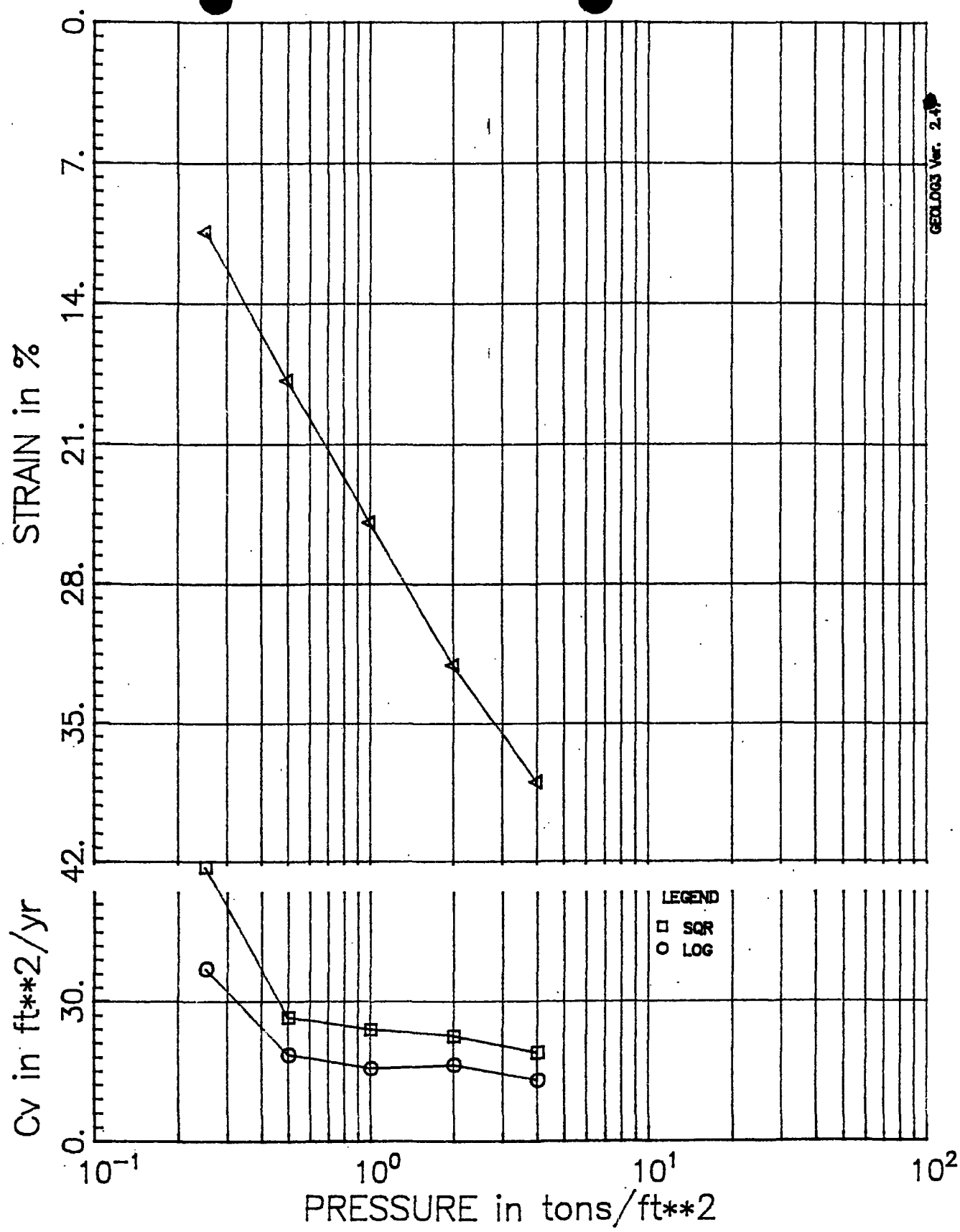
Testname: F0456-11

WASHINGTON STATE DOT



SOIL DESCRIPTION: GR SAT GRVLY
F TO M SDY SILT W/FOM
BORING: H-6-93 SAMPLE: U-2/D DEPTH: 8.2'
WATER CONTENT
NATURAL: 0.93
AFTER TEST: 0.51
INITIAL VOID RATIO: 2.50

PROJECT: SLOUGH BRIDGE 107/6
FILE NO: OL-1181
DATE: 5-12-93
CONSOLIDATION TEST NO: F0454-4
Testname: F0454-4
WASHINGTON STATE DOT



SOIL DESCRIPTION: DK GRAY SAT
F SDY SILT W/FOM

BORING: H-6-93 SAMPLE: U-3/C DEPTH: 12.8'

WATER CONTENT
NATURAL: 1.11
AFTER TEST: 0.61

INITIAL VOID RATIO: 3.07

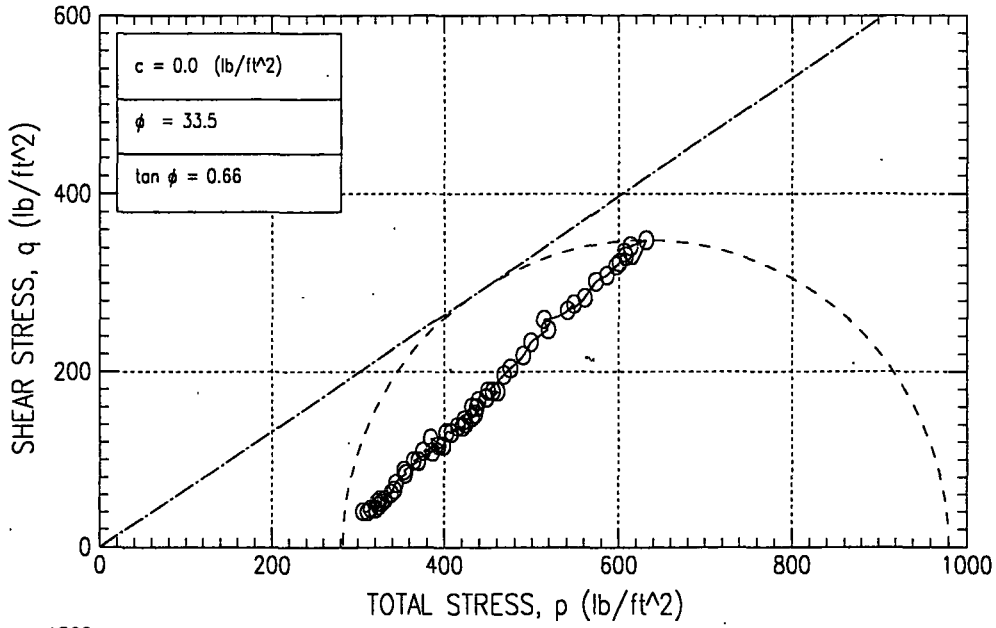
PROJECT: SLOUGH BRIDGE 107/6
FILE NO: OL-1181
DATE: 5-12-93

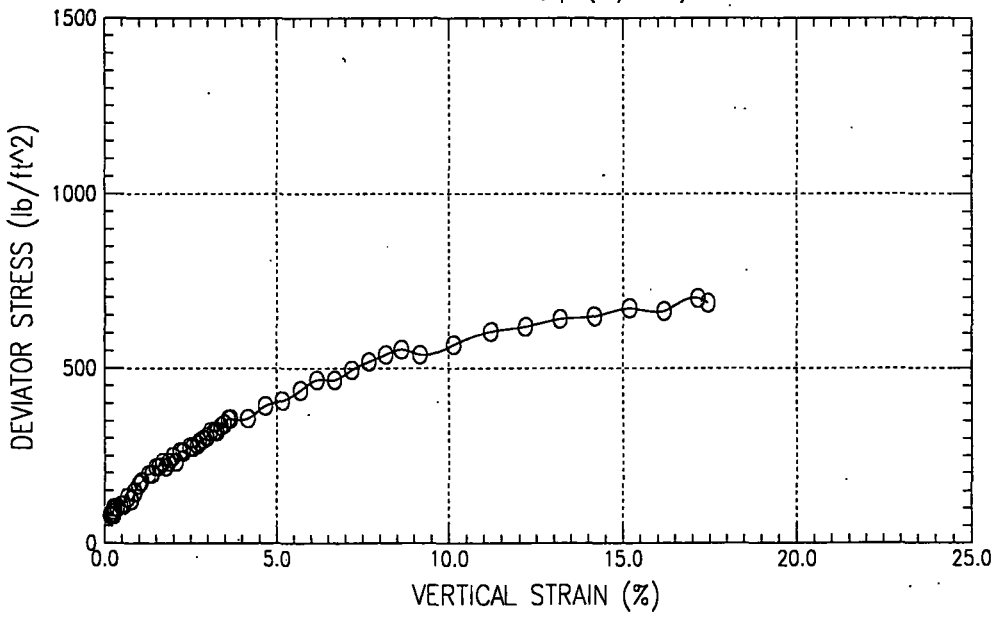
CONSOLIDATION TEST NO: F0454-9

Testname: F0454-9

WASHINGTON STATE DOT

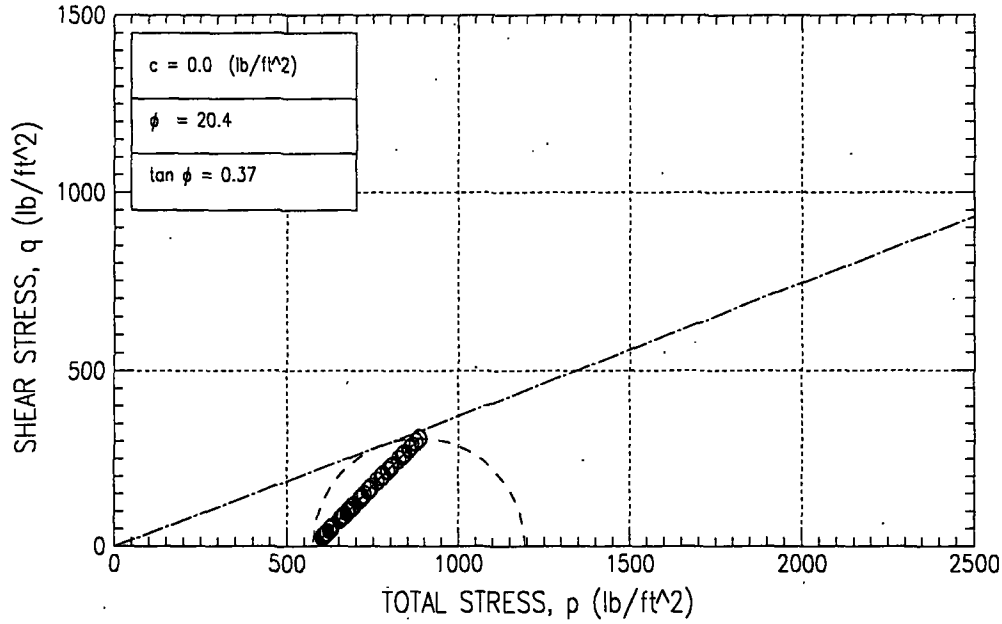
UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

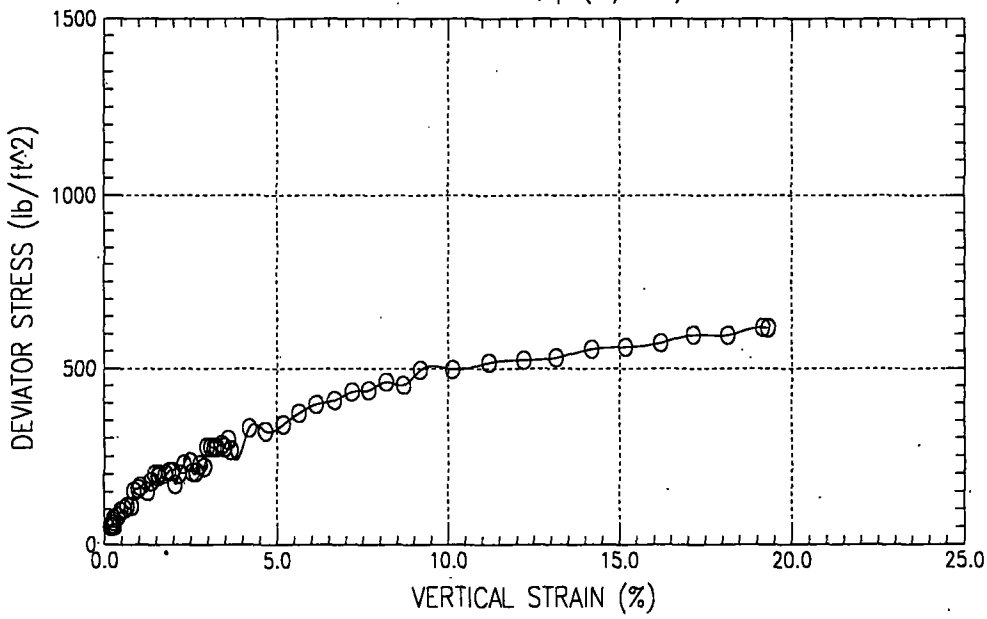




Washington State D.O.T.
Project Name : SLOUGH BRIDGES 107/5 & 6
Project No : OL-1181 Boring No : H-8-00 Sample No : U-3/C
Test Date : 5/19/00 Test No : 3344U3C Depth : 6.6-7 FT
Description : MOIST GRAY SILT
Remarks :

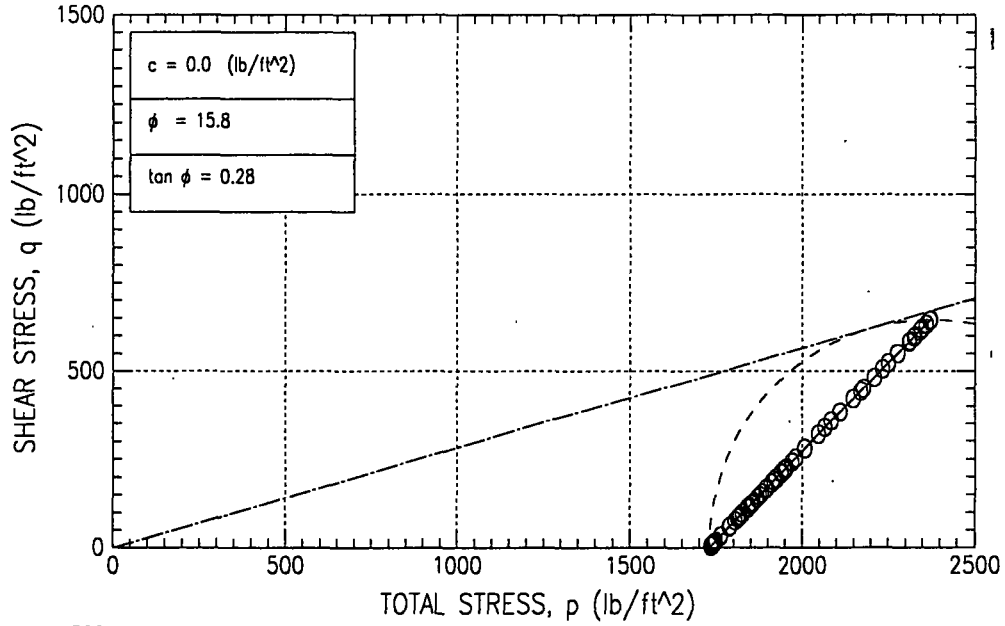
UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

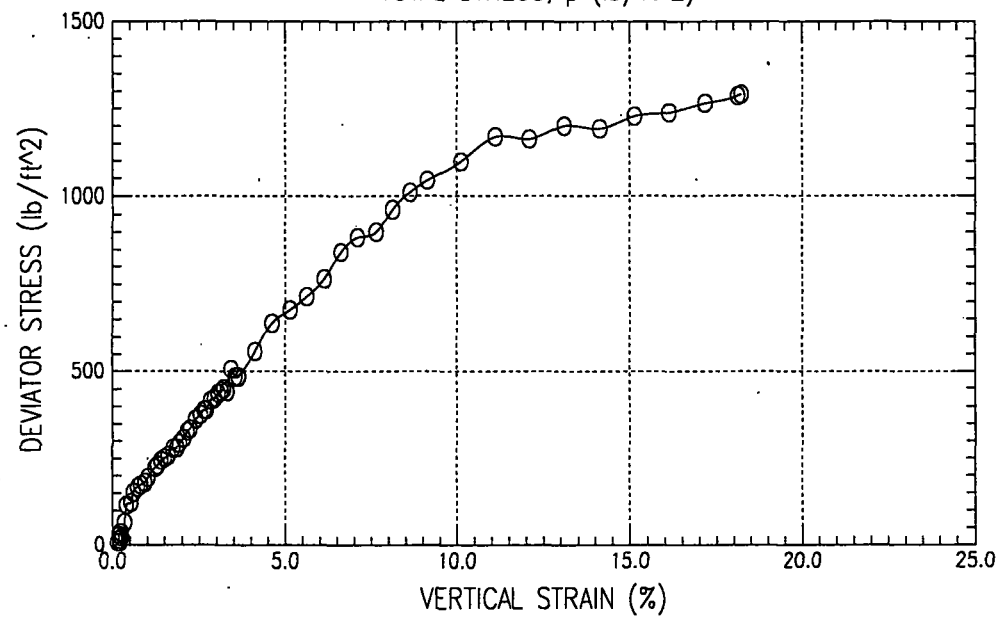




Washington State D.O.T.
Project Name : SLOUGH BRIDGES 107/5 & 6
Project No : OL-1181 Boring No : H-8-00 Sample No : U-6/B
Test Date : 6/1/00 Test No : 3344U6B Depth : 11.3-11.7
Description : MOIST DARK GRAY SILT
Remarks :

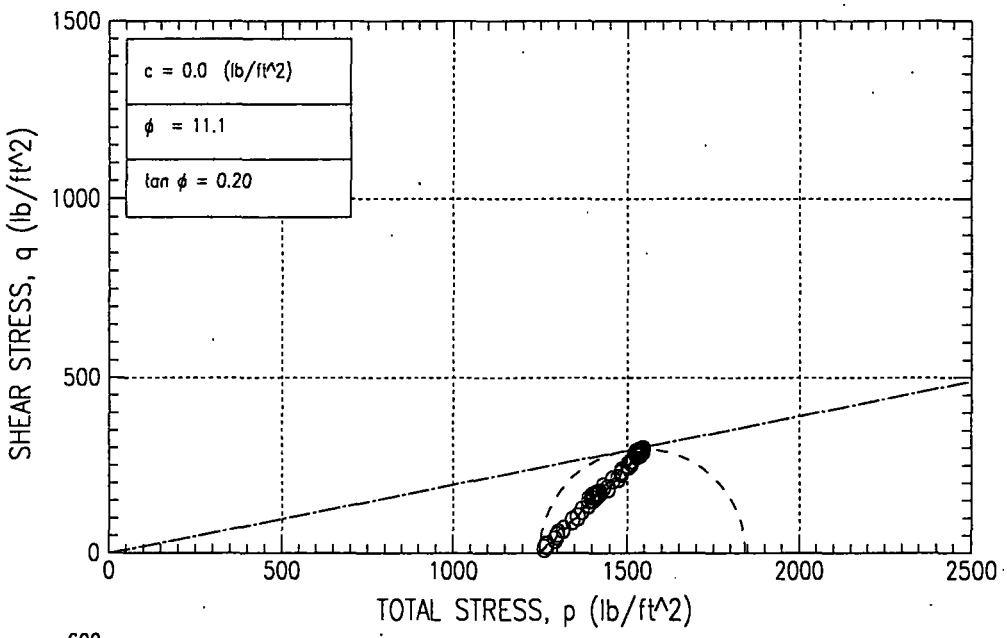
UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

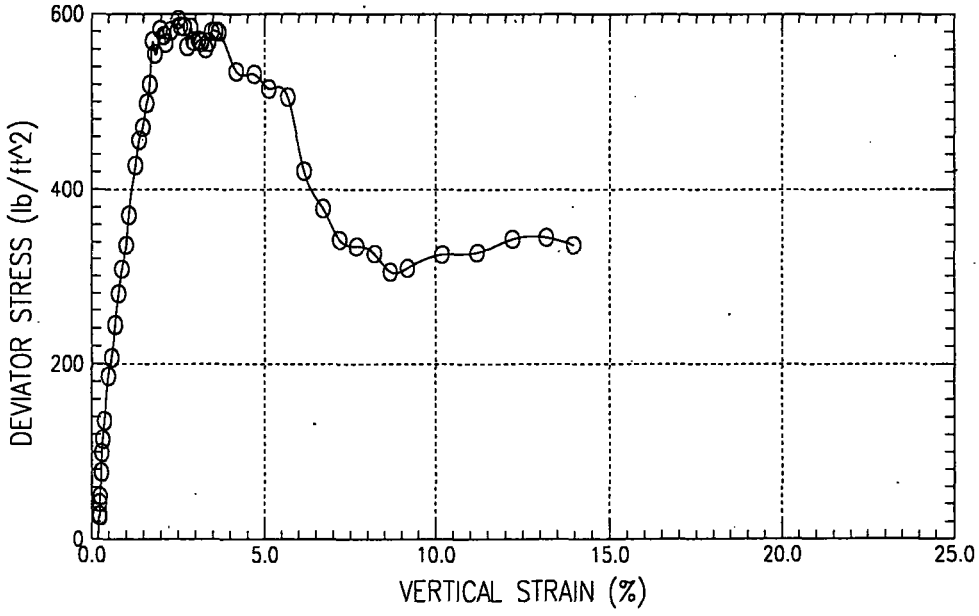




Washington State D.O.T.
Project Name : SLOUGH BRIDGES 107/5 & 6
Project No : OL-1181 Boring No : H-9-00 Sample No : U-5/E
Test Date : 5/31/00 Test No : 3335U5E Depth : 22.3-22.7
Description : MOIST DARK GRAY SANDY SILT
Remarks :

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

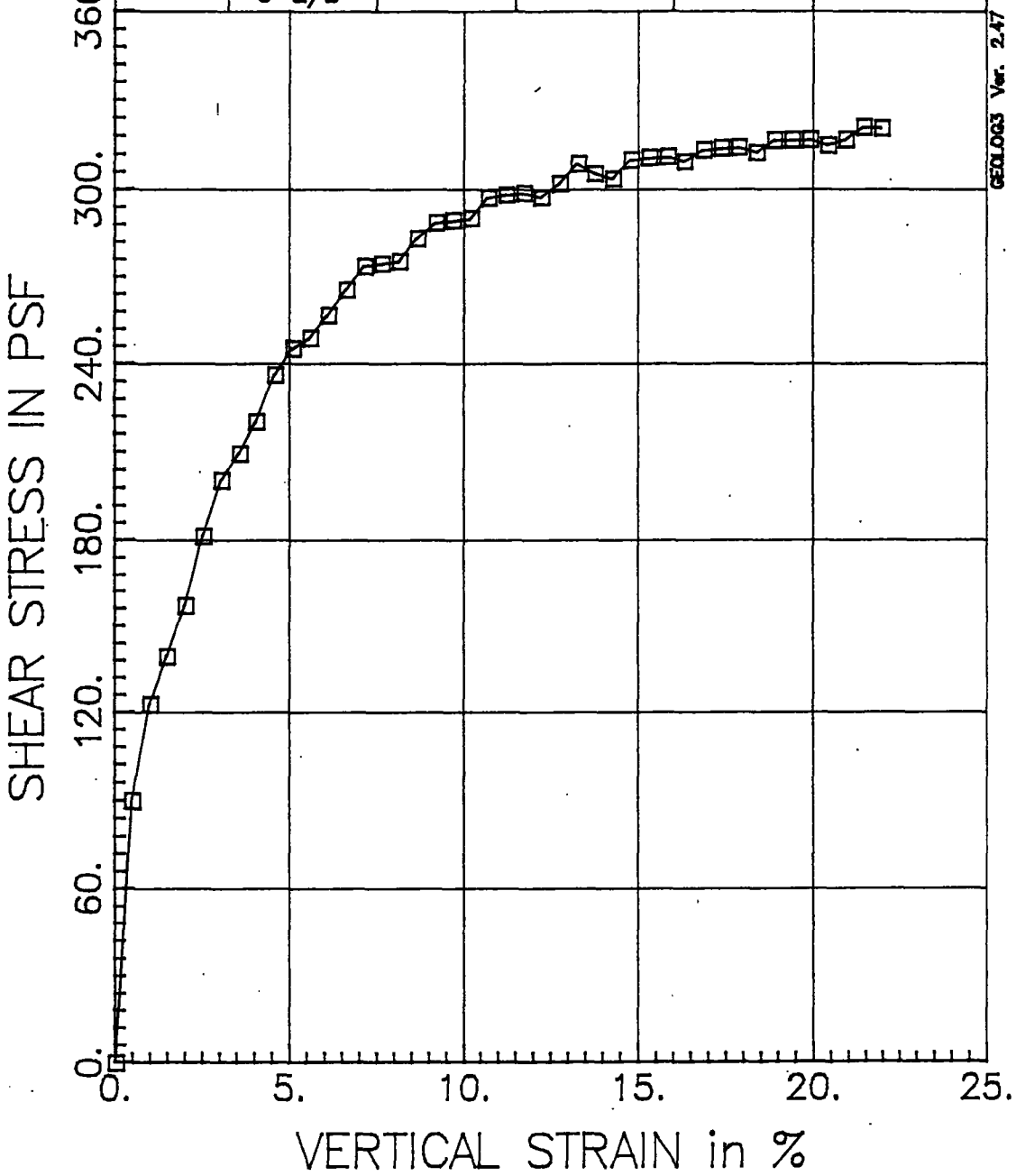




Washington State D.O.T.
Project Name : SLOUGH BRIDGES 107/5 & 6
Project No : OL-1181 Boring No : H-9-00 Sample No : U-2/B
Test Date : 5/19/00 Test No : 3335U2B Depth : 10.3-10.7
Description : MOIST GRAY STIFF SILT
Remarks :

UNCONFINED COMPRESSION TEST

TEST NO.	SAMPLE	DEPTH ft.	WATER CONTENT %	UNIT WEIGHT pcf	CELL PRESSURE psi
F-0486-3	H-1-93 U-2/B	8.5'	57.58	101.14	6



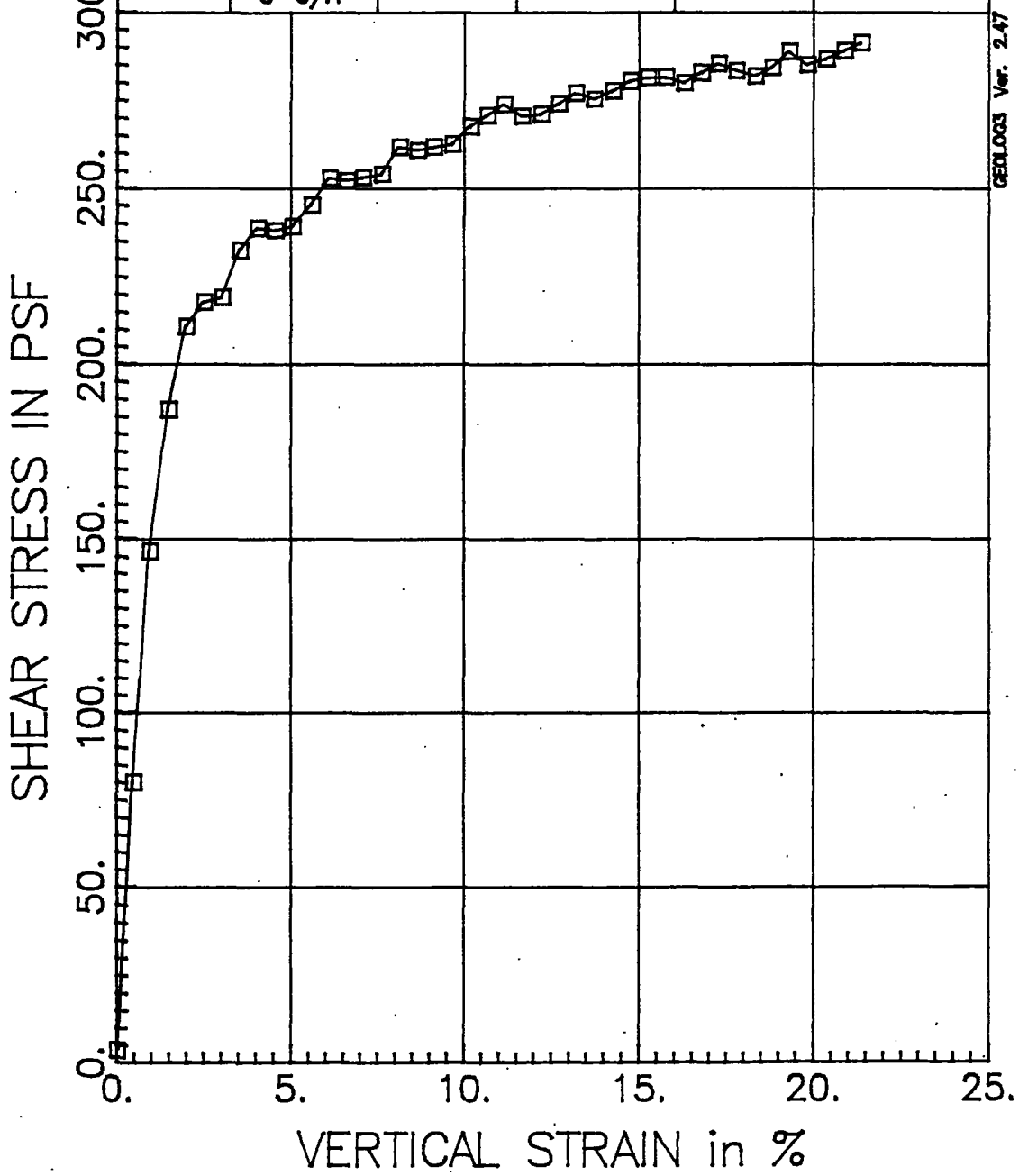
WASHINGTON STATE DOT
TEST NAME: F0486-3

STRAIN RATE = 1 %/min

PROJECT: SLOUGH BRIDGE
107/5
DATE:5-27-93
FILE NO.: OL-1181

UNCONFINED COMPRESSION TEST

TEST NO.	SAMPLE	DEPTH ft.	WATER CONTENT %	UNIT WEIGHT pcf	CELL PRESSURE psi
F-0486-6	H-1-93 U-6/A	18.2'	62.09	97.28	12



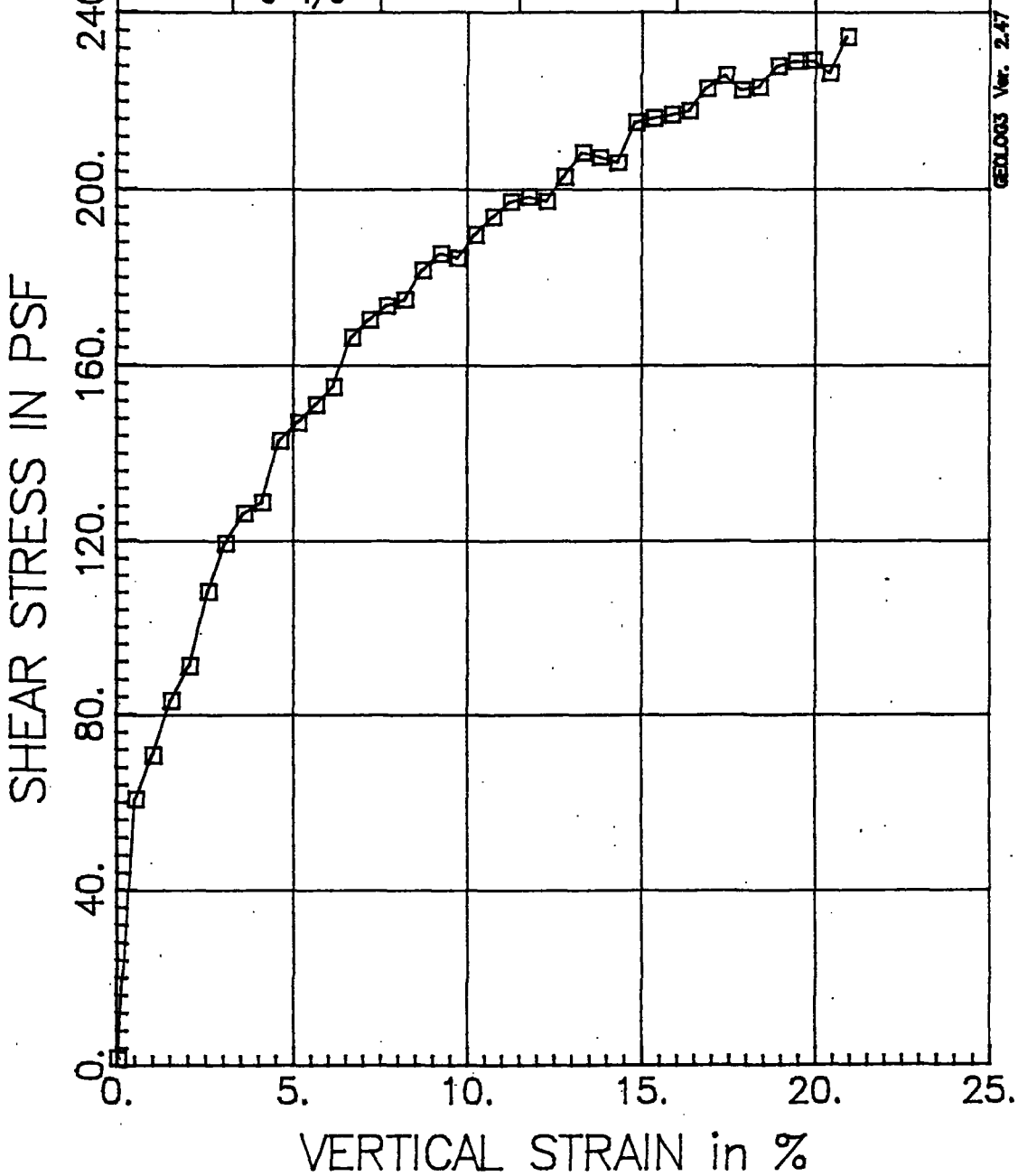
WASHINGTON STATE DOT
TEST NAME: F0486-6

STRAIN RATE = 1 %/min

PROJECT: SLOUGH BRIDGE
107/5
DATE:5-27-93
FILE NO.: OL-1181

UNCONFINED COMPRESSION TEST

TEST NO.	SAMPLE	DEPTH ft.	WATER CONTENT %	UNIT WEIGHT pcf	CELL PRESSURE psi
F-0482-8	H-2-93 U-4/C	9.8'	77.30	95.72	5



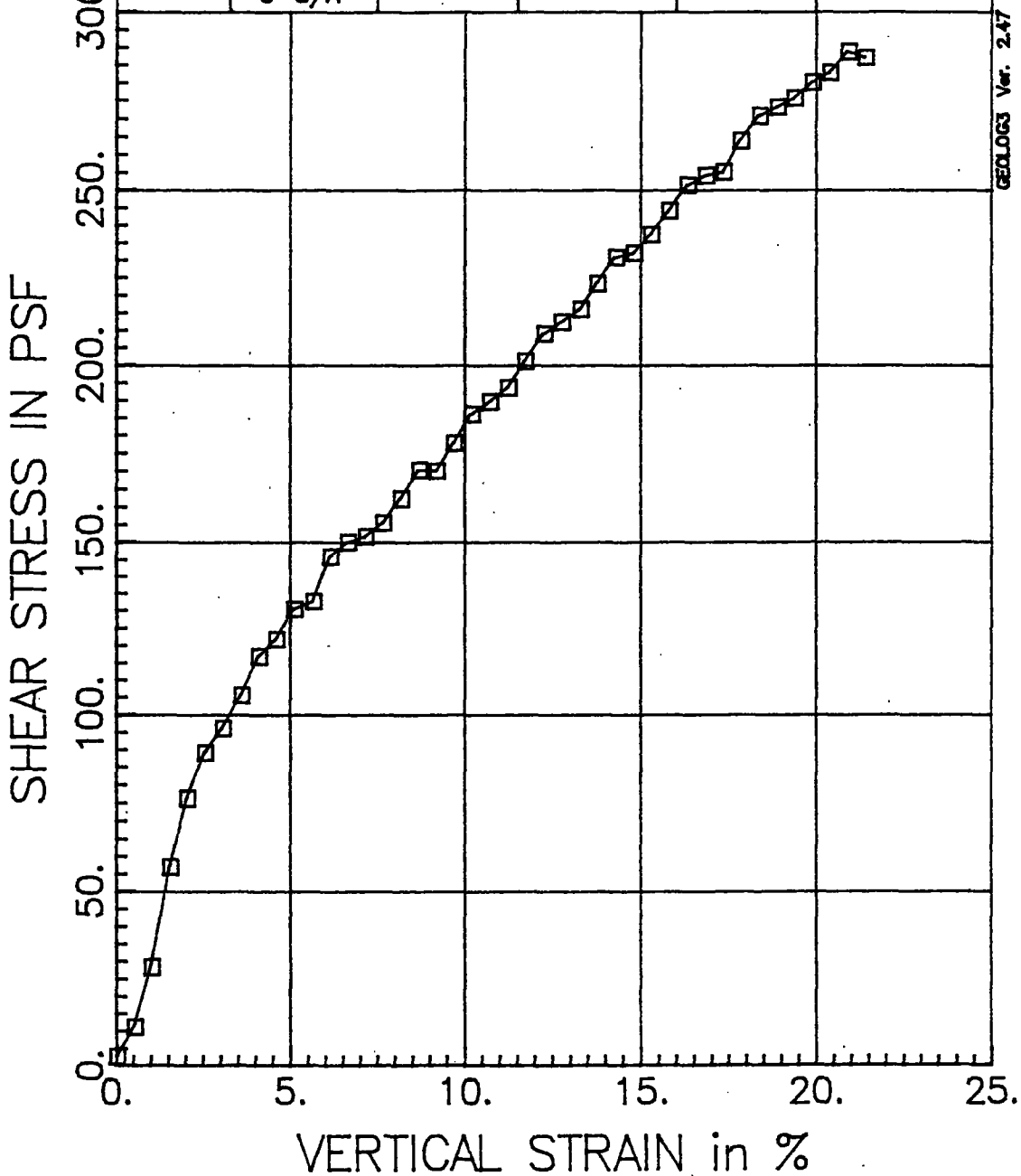
WASHINGTON STATE DOT
TEST NAME: F0482-8

STRAIN RATE = 1 %/min

PROJECT: SLOUGH BRIDGE
107/5
DATE:5-27-93
FILE NO.: OL-1181

UNCONFINED COMPRESSION TEST

TEST NO.	SAMPLE	DEPTH ft.	WATER CONTENT %	UNIT WEIGHT pcf	CELL PRESSURE psi
F-0482-17	H-2-93 U-8/A	19	72.11	94.35	12



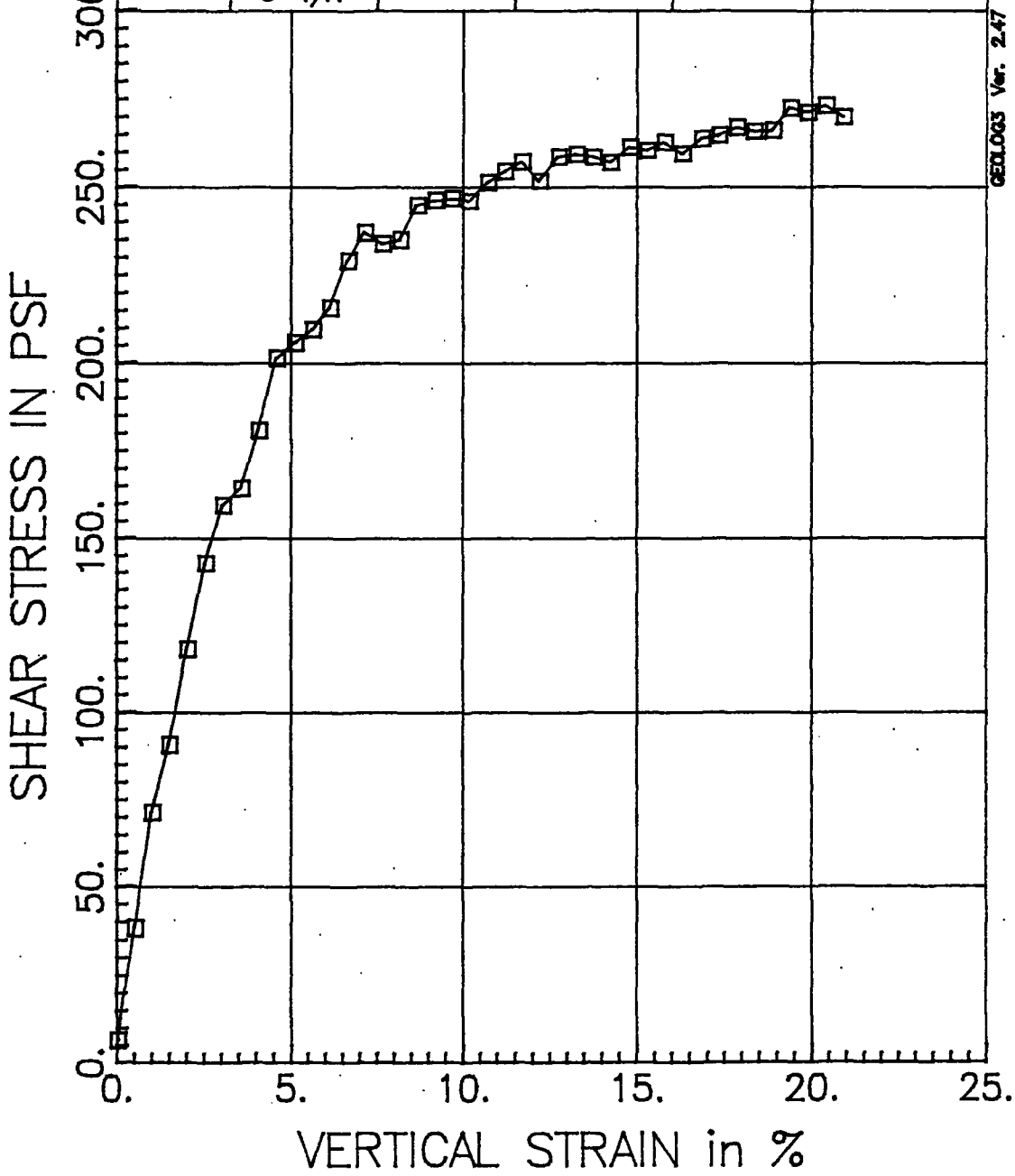
WASHINGTON STATE DOT
TEST NAME: F0482-17

STRAIN RATE = 1 %/min

PROJECT: SLOUGH BRIDGE
107/5
DATE:5-27-93
FILE NO.: OL-1181

UNCONFINED COMPRESSION TEST

TEST NO.	SAMPLE	DEPTH ft.	WATER CONTENT %	UNIT WEIGHT pcf	CELL PRESSURE psi
F-0448-5	H-3-93 U-4/A	8.2'	81.51	95.55	5



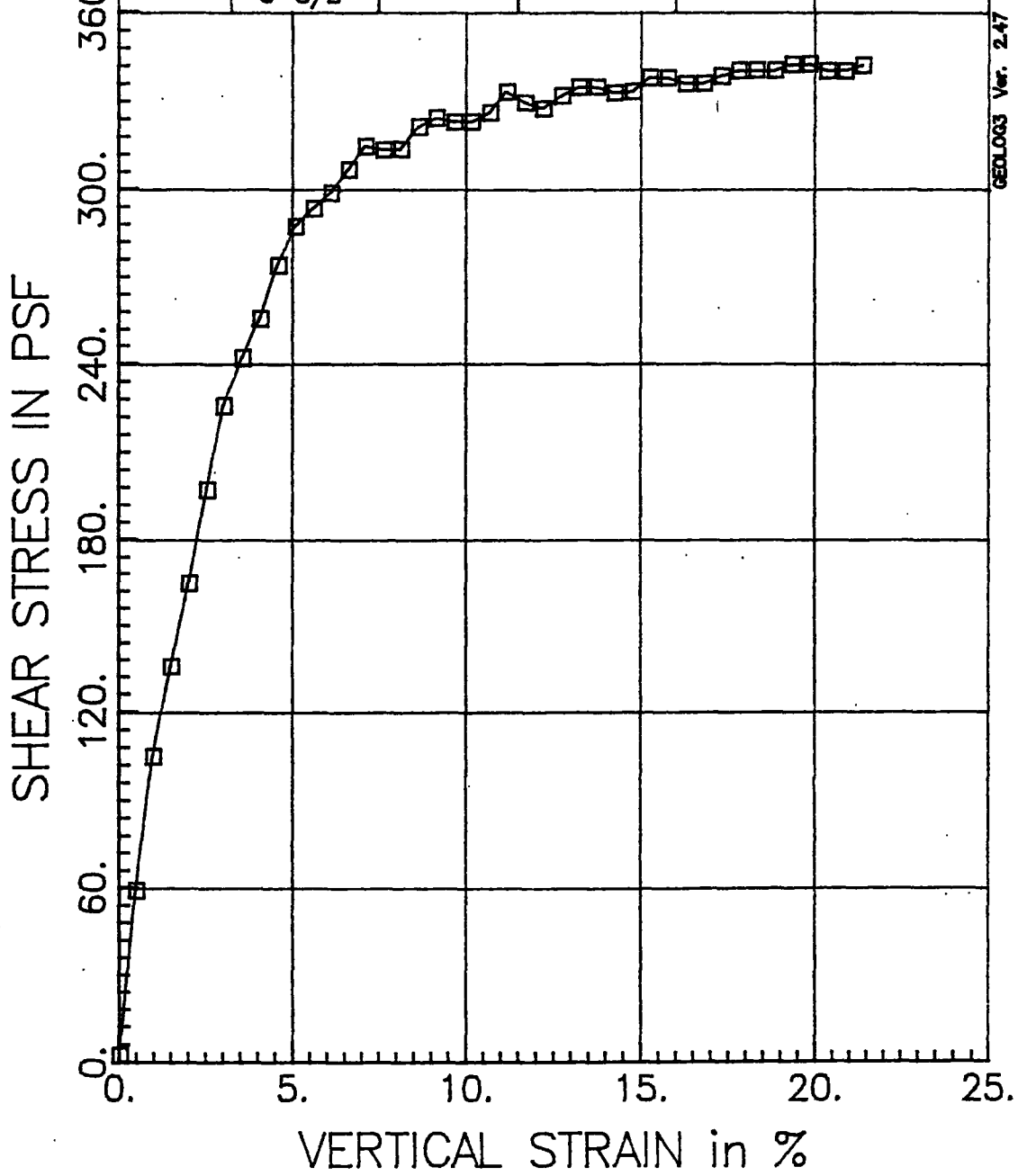
WASHINGTON STATE DOT
TEST NAME: F0448-5

STRAIN RATE = 1 %/min

PROJECT: SLOUGH BRIDGE
107/5
DATE:5-27-93
FILE NO.: OL-1181

UNCONFINED COMPRESSION TEST

TEST NO.	SAMPLE	DEPTH ft.	WATER CONTENT %	UNIT WEIGHT pcf	CELL PRESSURE psi
F-0448-15	H-3-93 U-8/B	18.5'	77.44	97.11	1



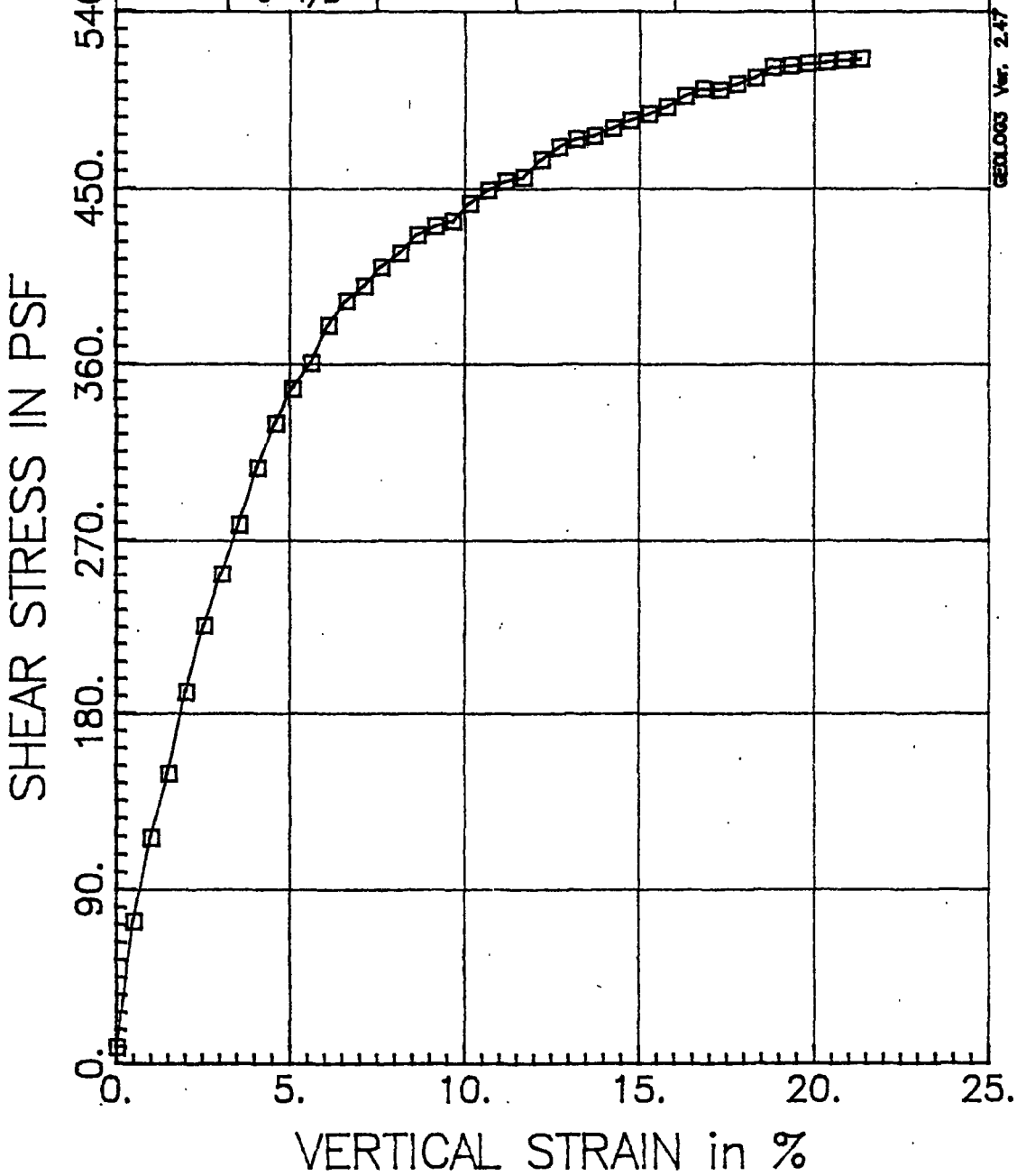
WASHINGTON STATE DOT
TEST NAME: F0448-15

STRAIN RATE = 1 %/min

PROJECT: SLOUGH BRIDGE
107/5
DATE:5-27-93
FILE NO.: OL-1181

UNCONFINED COMPRESSION TEST

TEST NO.	SAMPLE	DEPTH ft.	WATER CONTENT %	UNIT WEIGHT pcf	CELL PRESSURE psi
F0449-5	H-5-93 U-4/B	10.5'	54.73	104.43	7



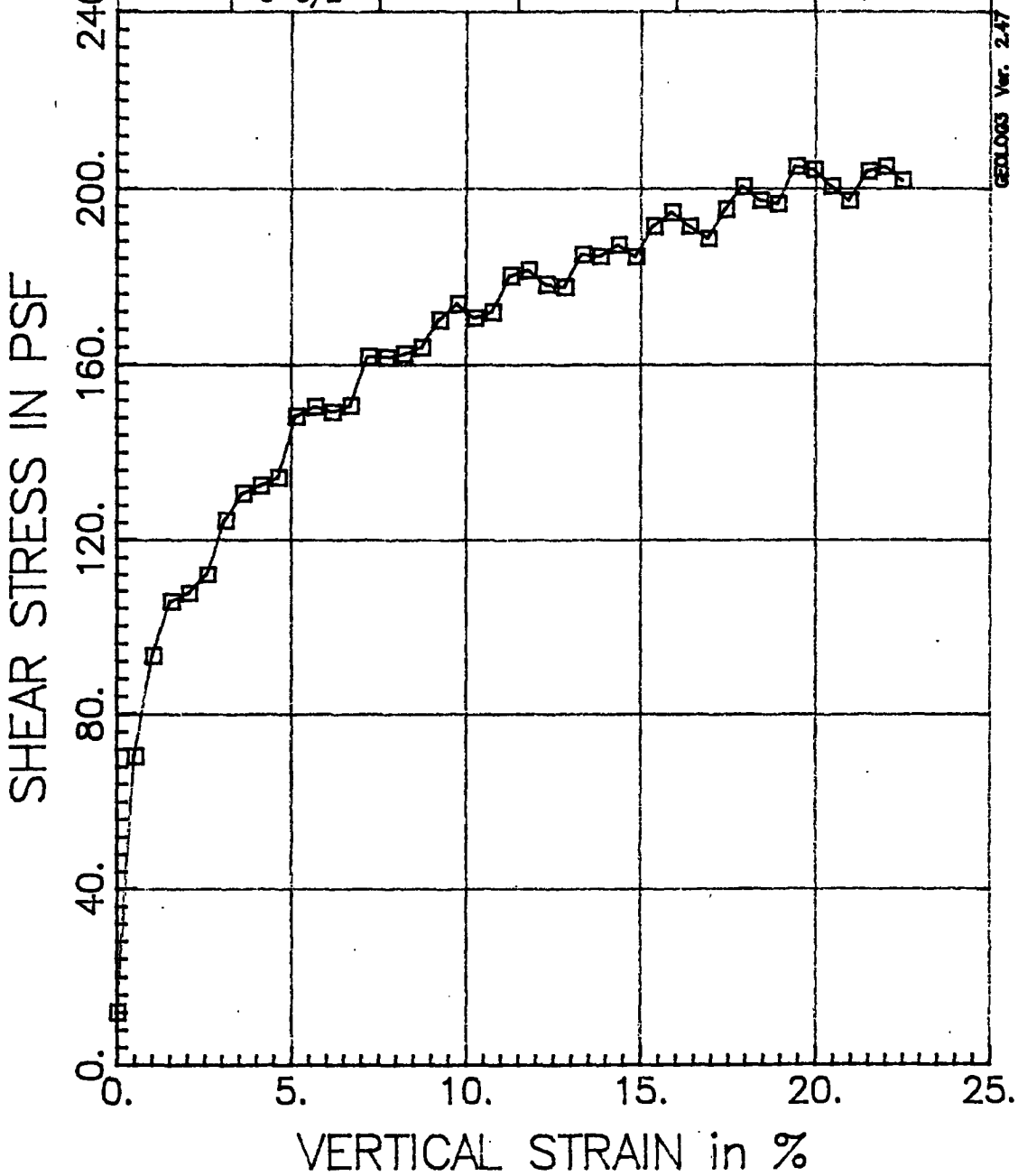
WASHINGTON STATE DOT
TEST NAME: F0449-5

STRAIN RATE = 1 %/min

PROJECT: SLOUGH BRIDGE
107/6
DATE:8-19-93
FILE NO.: OL-1181

UNCONFINED COMPRESSION TEST

TEST NO.	SAMPLE	DEPTH ft.	WATER CONTENT %	UNIT WEIGHT pcf	CELL PRESSURE psi
F0449-9	H-5-93 U-6/B	15.5'	64.53	98.24	1



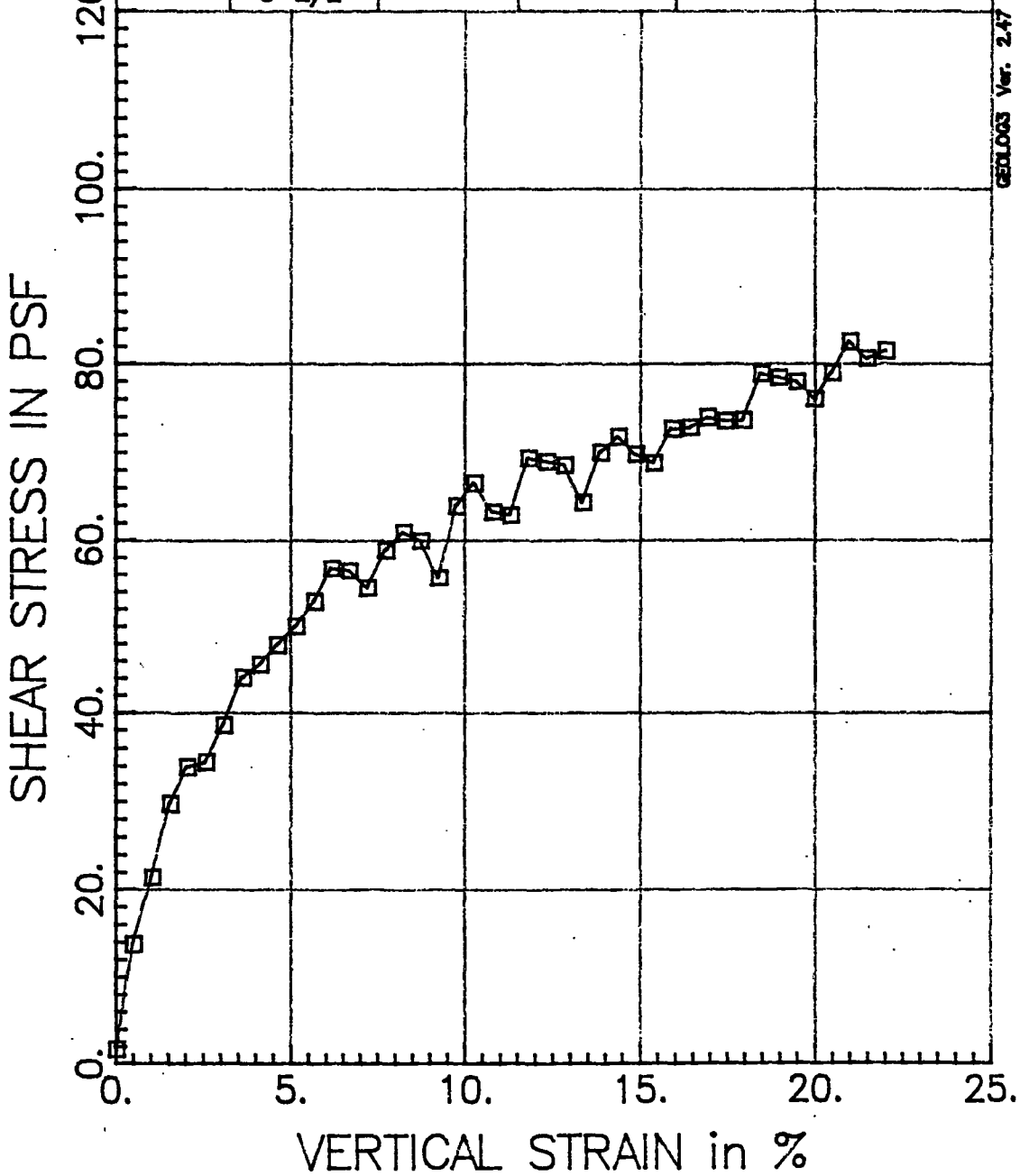
WASHINGTON STATE DOT
TEST NAME: F0449-9

STRAIN RATE = 1 %/min

PROJECT: SLOUGH BRIDGE
107/6
DATE:8-18-93
FILE NO.: OL-1181

UNCONFINED COMPRESSION TEST

TEST NO.	SAMPLE	DEPTH ft.	WATER CONTENT %	UNIT WEIGHT pcf	CELL PRESSURE psi
F0454-5	H-6-93 U-2/E	8.5'	109.91	86.91	5



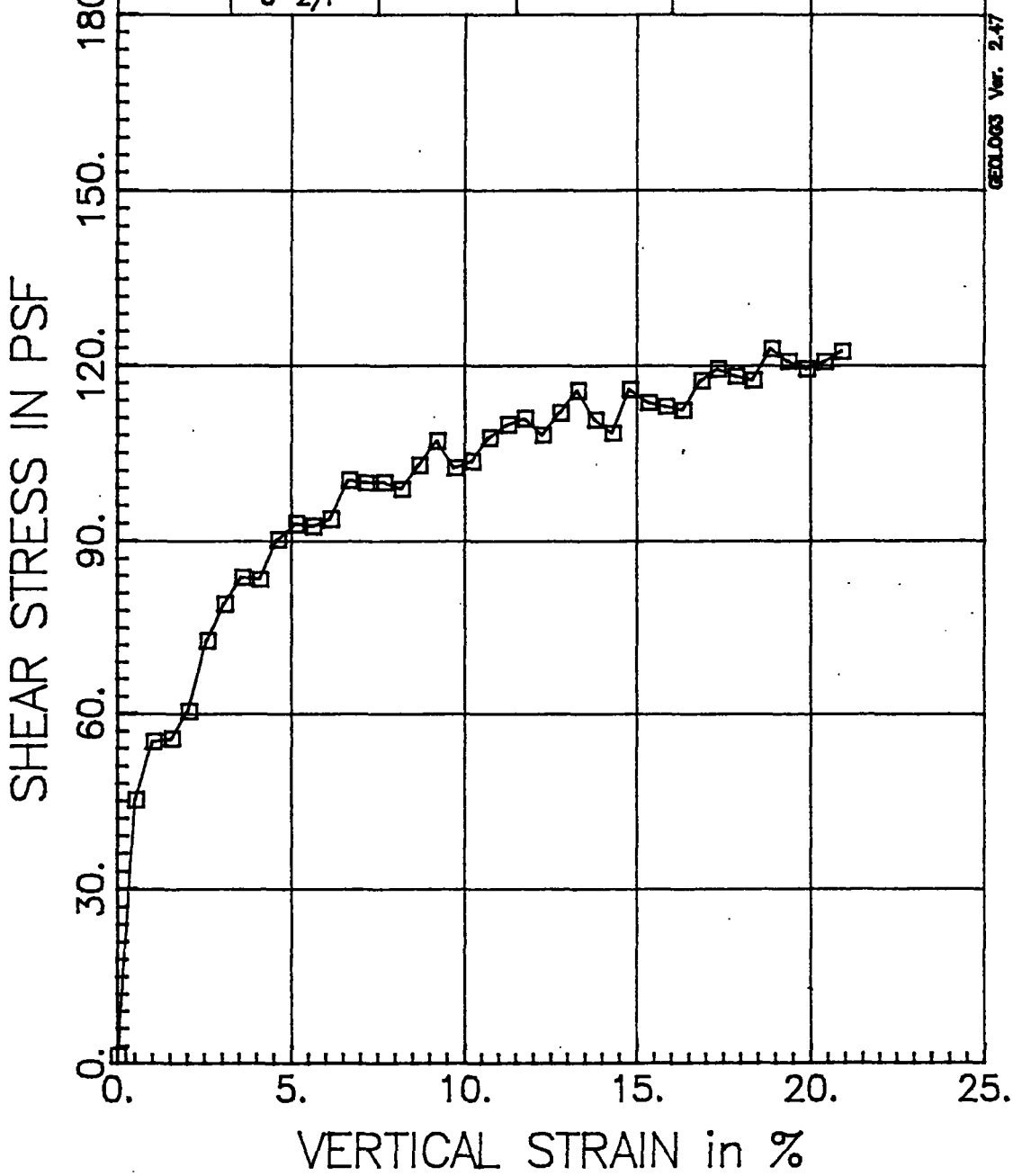
WASHINGTON STATE DOT
TEST NAME: F0454-5

STRAIN RATE = 1 %/min

PROJECT: SLOUGH BRIDGE
107/6
DATE:8-18-93
FILE NO.: OL-1181

UNCONFINED COMPRESSION TEST

TEST NO.	SAMPLE	DEPTH ft.	WATER CONTENT %	UNIT WEIGHT pcf	CELL PRESSURE psi
F-0454-6	H-6-93 U-2/F	8.8'	109.45	84.98	5



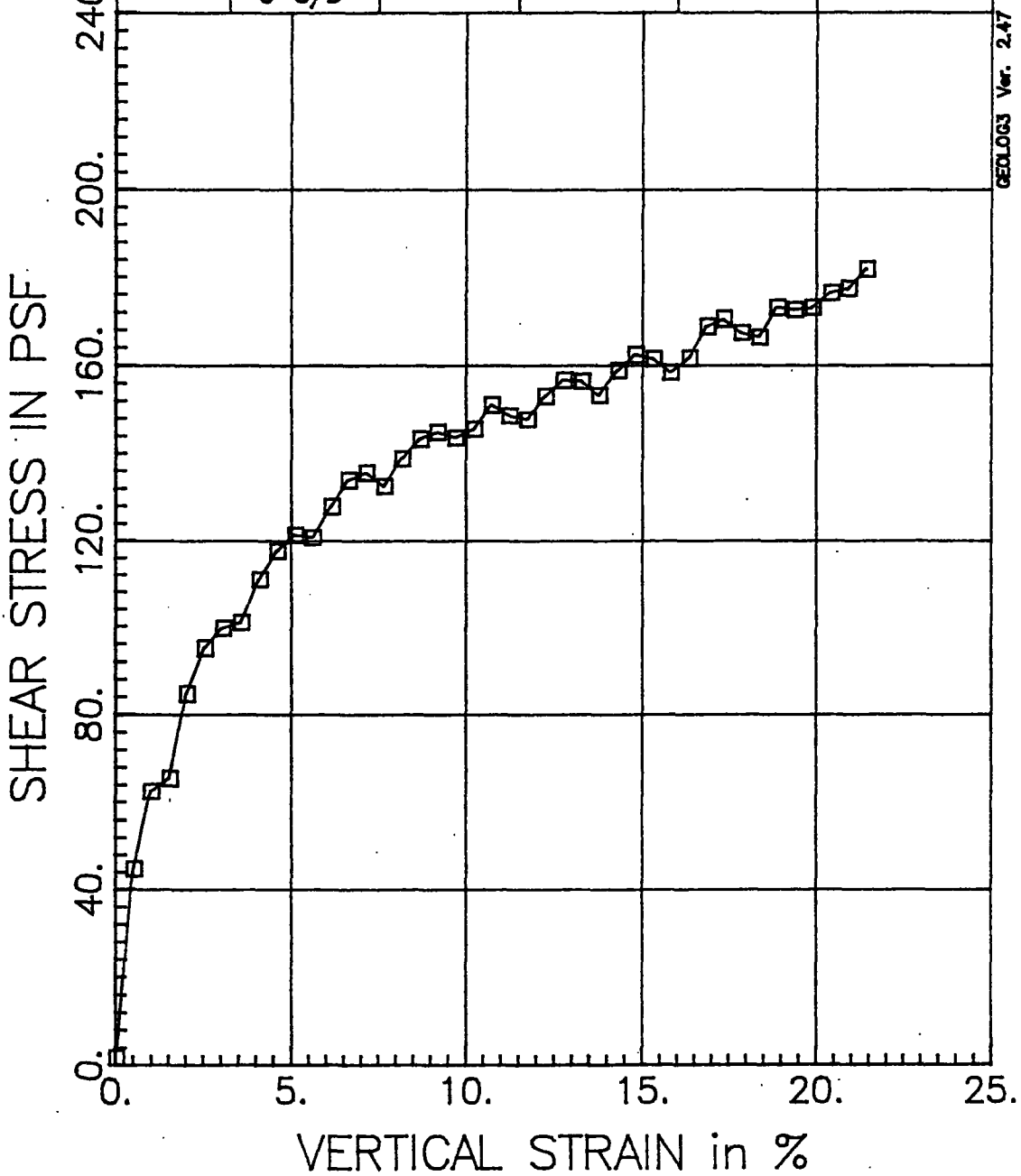
WASHINGTON STATE DOT
TEST NAME: F0454-6

STRAIN RATE = 1 %/min

PROJECT: SLOUGH BRIDGE
107/6
DATE:5-27-93
FILE NO.: OL-1181

UNCONFINED COMPRESSION TEST

TEST NO.	SAMPLE	DEPTH ft.	WATER CONTENT %	UNIT WEIGHT pcf	CELL PRESSURE psi
F-0454-10	H-6-93 U-3/D	13.2'	70.21	97.08	8



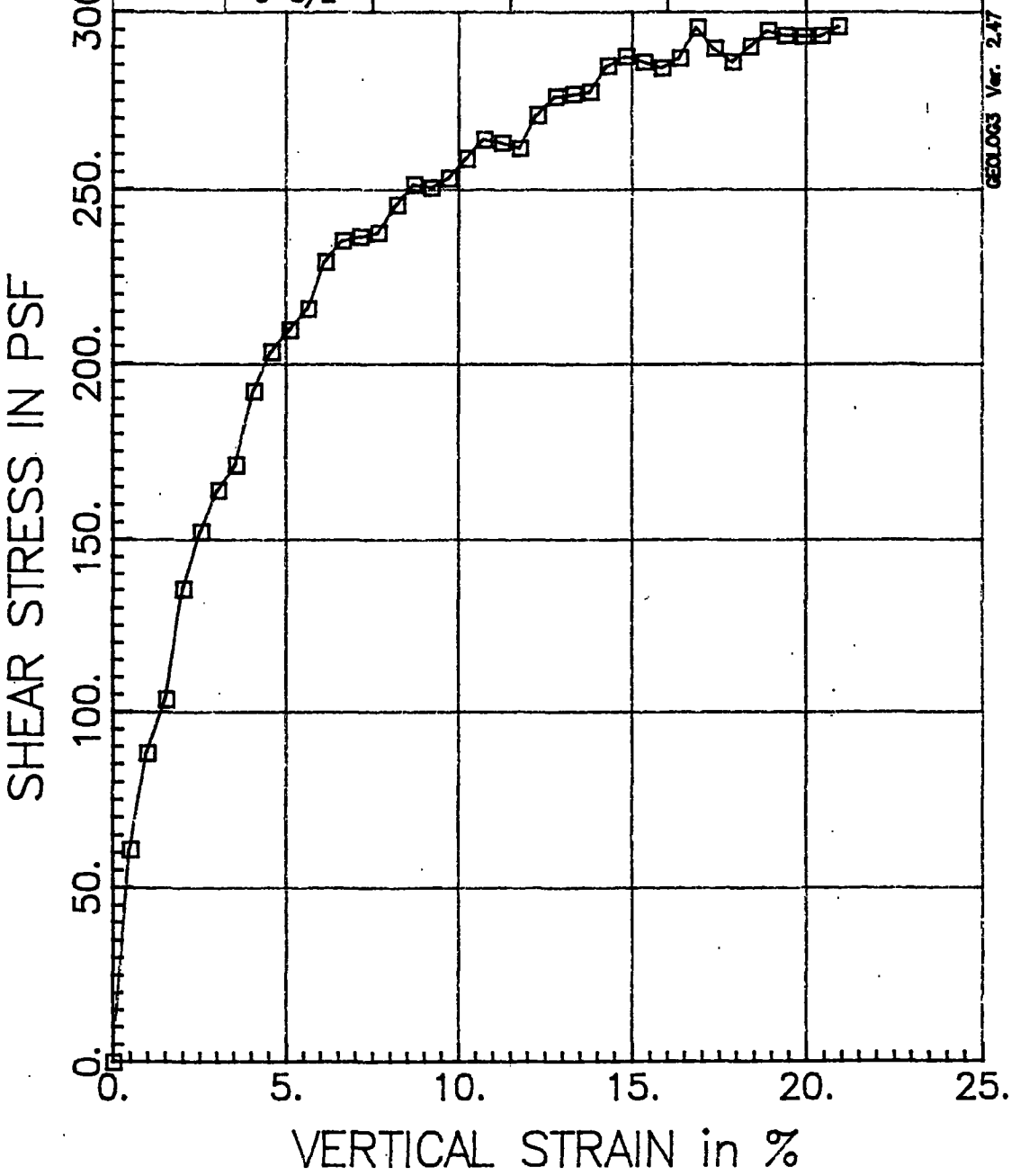
WASHINGTON STATE DOT
TEST NAME: F0454-10

STRAIN RATE = 1 %/min

PROJECT: SLOUGH BRIDGE
107/6
DATE:5-27-93
FILE NO.: OL-1181

UNCONFINED COMPRESSION TEST

TEST NO.	SAMPLE	DEPTH ft.	WATER CONTENT %	UNIT WEIGHT pcf	CELL PRESSURE psi
F0454-11	H-6-93 U-3/E	13.5'	67.53	100.44	8



WASHINGTON STATE DOT
TEST NAME: F0454-11

STRAIN RATE = 1 %/min

PROJECT: SLOUGH BRIDGE
107/6
DATE:8-18-93
FILE NO.: OL-1181

Golder Associates

TRANSMITTAL LETTER

To Washington State Dept. of Transportation
1655 South Second Ave.
Tumwater, Washington 98502

Date June 2, 1993
Project No. 933-1284

ATTENTION: Don Williams

Sent by

☐ Mail
☐ Air Freight
☐ Hand Carried

☐ Under Separate Cover
X Enclosed
X UPS

Quantity	Item	Description
1	Set of test results	CU testing of samples from borings H-3-93 and H-6-93
6	Tested soil samples	H-3-93: F-0448-9, F-0448-10, F-0448-11 H-6-93: F-0454-15, F-0454-16, F-0454-17
2	Backup soil samples	H-3-93: F-0448-12, H-6-93: F-0454-18

Remarks: Please call me if you have any questions or require any additional testing.

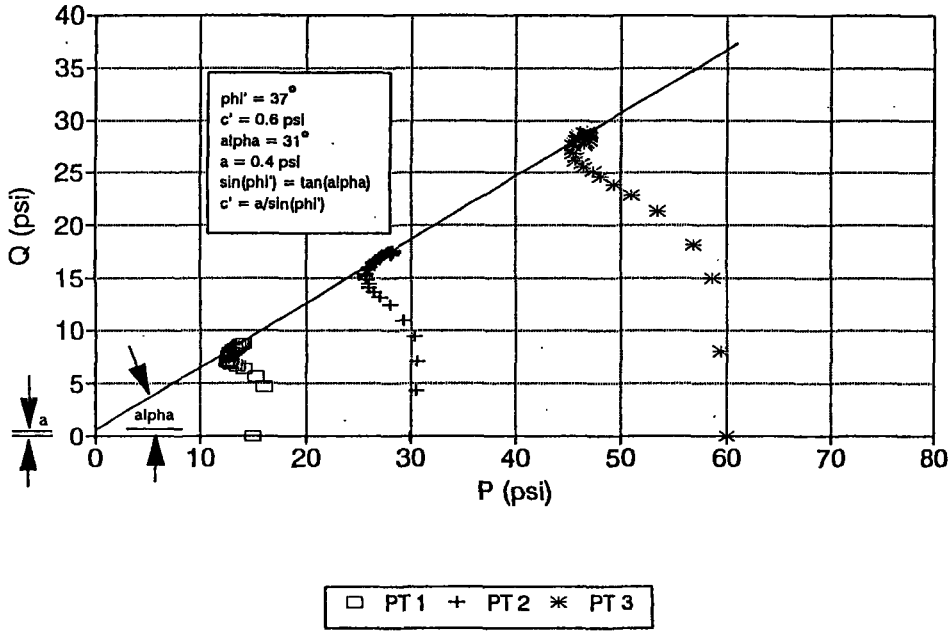
Thank you.

Per Dan Oster - Laboratory Manager

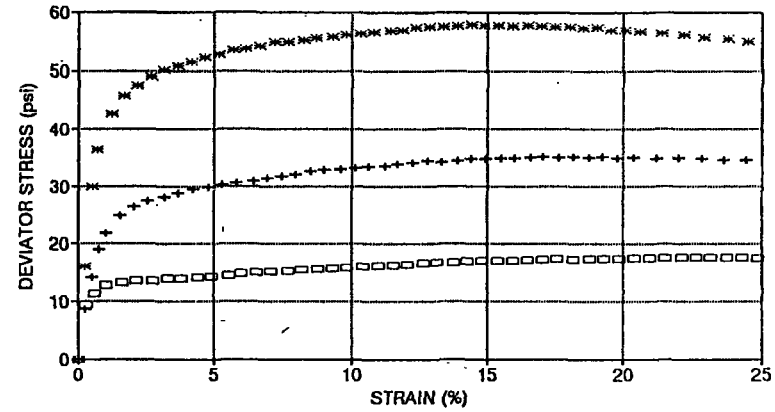
DRC

CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST -- ASTM D4767

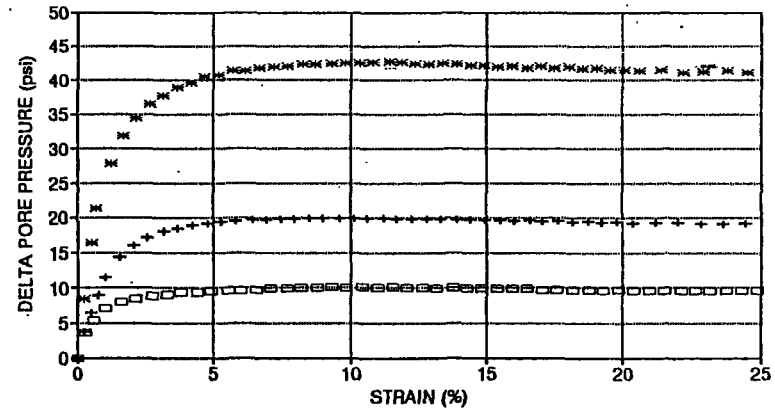
P-Q PLOT



STRESS-STRAIN CURVES



PORE PRESSURE CHANGE VS. STRAIN



	PT 1	PT 2	PT 3
Borehole No.	H-6-93	H-6-93	H-6-93
Sample No.	F-0454-15	F-0454-16	F-0454-17
Depth	17'8"-18'0"	18'0"-18'4"	18'4"-18'8"
Specimen Diameter (in)	1.920	1.889	1.909
Specimen Height (in)	3.621	3.730	3.971
Cell Pressure (psi)	55.0	70.0	100.0
Back Pressure (psi)	40.0	40.0	40.0
Effective Confining Pressure (psi)	15.0	30.0	60.0
Average Strain Rate (%/min)	0.28	0.27	0.26
Water Content Before Test (%)	60.7	68.9	73.8
Water Content After Test (%)	42.9	47.2	46.4
Dry Density (pcf)	64.1	59.5	55.3

Project:	WSDOT/SLOUGH BR. - CU TESTING/WA		
Project No.:	933-1284	Tech:	DPO
Date:	6-1-93	Review:	DPO/MF
Golder Associates Inc.		Redmond, WA	

CONSOLIDATED-UNDRAINED TRIAXIAL SHEAR TEST

Project: WSDOT/SLOUGH BR.-CU TESTING/WA

Project Number: 933-1284

POINT 1

Date: 5-21-93 | Sample Number: H-6-93, F-0454-15

Technician: DPO | Depth (ft): 17'8'-18'0"

PRE-CONSOLIDATION		POST-CONSOLIDATION			
				Cell Number:	L0344
				Panel Number:	L0017
LENGTH (cm):	9.196	LENGTH (cm):	8.787	Load Frame:	L0024
DIAMETER (cm):	4.876	DIAMETER (cm):	4.511		
VOLUME (ml):	171.7	VOLUME (ml):	140.4	LVDT Factor (cm/unit):	2.540
WET WEIGHT (gm):	283.15	WET WEIGHT (gm):	251.86	*Load Cell Factor (pounds/unit):*	1.0
WET DENSITY (pcf):	103.0	WET DENSITY (pcf):	112.0	Pore Transducer Factor (psi/unit):	1.00
DRY WEIGHT (gm):	176.23	DRY WEIGHT (gm):	176.23	Cell Transducer Factor (psi/unit):	1.00
DRY DENS. (pcf):	64.1	DRY DENS. (pcf):	78.4		
MOISTURE (%):	60.7%	MOISTURE (%):	42.9%	INITIAL READINGS [DATA PRO]	
SATURATION (%):	*100.0%*	*SATURATION (%):*	*100.0%*	*LVDT:*	*0.979*
				Load Cell:	8.7
CONSOLIDATION				Pore Pressure (@ zero psi):	0.0
PRE-CONSOL LVDT:	0.820	TOTAL VOL. CHANGE (ml):	19.9	Cell Pressure (@ zero psi):	0.0
BEFORE SHEARING LVDT:	0.981				
LENGTH CHANGE (cm):	0.409			Specific Gravity (assumed):	2.72

CONSOLIDATION DATA								SHEAR DATA					CORRECTED READINGS												
DAY	HR	MIN	SEC	ELAPSED MINUTES	PORE READING	AMOUNT DRAINED	TOTAL VOLUME	TIME	STRAIN READING	PORE READING	LOAD READING	CELL	STRAIN (%)	PORE (psi)	LOAD (lbs.)	AREA (sq.in.)	CELL (psi)	DEVIATOR STRESS (psi)	DELTA PORE (psi)	S1' (psi)	S3' (psi)	S1'-S3' / 2 (psi)	S1'+S3' / 2 (psi)	S1' / S3'
21	13	50	0	0.00	25.0	0.0	0.0	921	0.979	40.02	8.7	55.0	0.0%	40.0	0.0	2.477	55.0	0.0	0.0	15.0	15.0	0.0	15.0	1.00
21	13	50	10	0.17	23.5	0.0	1.5	922	0.989	43.66	32.2	55.0	0.3%	43.7	23.5	2.484	55.0	9.5	3.6	20.6	11.3	4.7	16.1	1.83
21	13	50	30	0.50	22.6	0.0	2.4	923	1.000	45.41	37.0	55.0	0.6%	45.4	28.3	2.492	55.0	11.4	5.4	20.9	9.6	5.7	15.3	2.18
21	13	51	0	1.00	21.8	0.0	3.2	925	1.015	47.19	40.8	55.0	1.0%	47.2	32.0	2.503	55.0	12.8	7.2	20.6	7.8	6.4	14.2	2.64
21	13	52	0	2.00	20.5	0.0	4.5	927	1.035	48.17	42.1	55.0	1.6%	48.2	33.4	2.518	55.0	13.3	8.2	20.1	6.8	6.6	13.5	2.94
21	13	54	0	4.00	18.8	0.0	6.2	929	1.053	48.65	43.3	55.0	2.1%	48.7	34.5	2.531	55.0	13.6	8.6	20.0	6.4	6.8	13.2	3.15
21	13	59	0	9.00	16.2	0.0	8.8	931	1.074	48.98	43.6	55.0	2.7%	49.0	34.9	2.547	55.0	13.7	9.0	19.7	6.0	6.8	12.9	3.27
21	14	6	0	16.00	14.0	0.0	11.0	933	1.093	49.19	44.5	55.0	3.3%	49.2	35.8	2.562	55.0	14.0	9.2	19.8	5.8	7.0	12.8	3.40
21	14	39	0	49.00	10.9	0.0	14.1	935	1.110	49.45	44.8	55.0	3.8%	49.5	36.0	2.575	55.0	14.0	9.4	19.5	5.5	7.0	12.5	3.52
21	15	30	0	100.00	9.8	0.0	15.2	937	1.132	49.52	45.7	55.0	4.4%	49.5	36.9	2.592	55.0	14.2	9.5	19.7	5.5	7.1	12.6	3.60
21	16	39	0	169.00	9.2	0.0	15.8	939	1.149	49.70	46.1	55.0	4.9%	49.7	37.3	2.605	55.0	14.3	9.7	19.6	5.3	7.2	12.5	3.70
22	8	3	0	1093.00	7.0	0.0	18.0	941	1.171	49.74	46.8	55.0	5.5%	49.7	38.1	2.623	55.0	14.5	9.7	19.8	5.3	7.3	12.5	3.76
24	9	16	0	4046.00	5.1	0.0	19.9	943	1.188	49.81	47.6	55.0	6.0%	49.8	38.9	2.635	55.0	14.8	9.8	20.0	5.2	7.4	12.6	3.84
								945	1.206	49.89	48.4	55.0	6.6%	49.9	39.7	2.651	55.0	15.0	9.9	20.1	5.1	7.5	12.6	3.93
								947	1.224	49.98	49.0	55.0	7.1%	50.0	40.3	2.666	55.0	15.1	9.9	20.1	5.0	7.6	12.6	4.00
								949	1.245	50.00	49.5	55.0	7.7%	50.0	40.8	2.683	55.0	15.2	10.0	20.2	5.0	7.6	12.6	4.04
								951	1.263	50.03	50.3	55.0	8.2%	50.0	41.6	2.699	55.0	15.4	10.0	20.4	5.0	7.7	12.7	4.10
								953	1.283	50.07	50.9	55.0	8.8%	50.1	42.1	2.716	55.0	15.5	10.0	20.4	4.9	7.8	12.7	4.15
								955	1.301	50.11	51.6	55.0	9.3%	50.1	42.8	2.731	55.0	15.7	10.1	20.6	4.9	7.8	12.7	4.21
								957	1.319	50.07	52.2	55.0	9.8%	50.1	43.5	2.747	55.0	15.8	10.0	20.8	4.9	7.9	12.8	4.21
								959	1.339	50.11	53.1	55.0	10.4%	50.1	44.3	2.765	55.0	16.0	10.1	20.9	4.9	8.0	12.9	4.28
								1001	1.358	50.07	53.8	55.0	11.0%	50.1	45.1	2.782	55.0	16.2	10.0	21.1	4.9	8.1	13.0	4.28
								1003	1.377	50.11	54.2	55.0	11.5%	50.1	45.4	2.799	55.0	16.2	10.1	21.1	4.9	8.1	13.0	4.32
								1005	1.395	50.03	54.7	55.0	12.0%	50.0	46.0	2.816	55.0	16.3	10.0	21.3	5.0	8.2	13.1	4.29
								1007	1.416	50.07	55.7	55.0	12.6%	50.1	47.0	2.835	55.0	16.6	10.0	21.5	4.9	8.3	13.2	4.36
								1009	1.433	49.96	56.5	55.0	13.1%	50.0	47.7	2.851	55.0	16.7	9.9	21.8	5.0	8.4	13.4	4.32
								1011	1.454	50.03	56.7	55.0	13.7%	50.0	48.0	2.871	55.0	16.7	10.0	21.7	5.0	8.4	13.3	4.36
								1013	1.471	50.00	57.6	55.0	14.2%	50.0	48.8	2.888	55.0	16.9	10.0	21.9	5.0	8.5	13.5	4.38
								1015	1.490	49.96	58.3	55.0	14.8%	50.0	49.5	2.908	55.0	17.0	9.9	22.1	5.0	8.5	13.6	4.38
								1017	1.510	49.92	58.8	55.0	15.3%	49.9	50.0	2.926	55.0	17.1	9.9	22.2	5.1	8.5	13.6	4.37
								1019	1.531	49.92	59.1	55.0	16.0%	49.9	50.4	2.947	55.0	17.1	9.9	22.2	5.1	8.5	13.6	4.36
								1021	1.549	49.92	59.7	55.0	16.5%	49.9	51.0	2.966	55.0	17.2	9.9	22.3	5.1	8.6	13.7	4.39
								1023	1.569	49.89	60.3	55.0	17.1%	49.9	51.6	2.986	55.0	17.3	9.9	22.4	5.1	8.6	13.7	4.38
								1025	1.587	49.85	60.9	55.0	17.6%	49.9	52.1	3.005	55.0	17.3	9.8	22.5	5.1	8.7	13.8	4.37
								1027	1.607	49.89	61.0	55.0	18.2%	49.9	52.3	3.027	55.0	17.3	9.9	22.4	5.1	8.6	13.8	4.38
								1029	1.628	49.85	61.9	55.0	18.8%	49.9	53.2	3.049	55.0	17.4	9.8	22.6	5.1	8.7	13.9	4.38
								1031	1.647	49.81	62.1	55.0	19.3%	49.8	53.4	3.070	55.0	17.4	9.8	22.6	5.2	8.7	13.9	4.35
								1033	1.666	49.85	62.5	55.0	19.9%	49.9	53.8	3.091	55.0	17.4	9.8	22.6	5.1	8.7	13.9	4.38
								1035	1.685	49.78	63.1	55.0	20.4%	49.8	54.3	3.112	55.0	17.5	9.8	22.7	5.2	8.7	13.9	4.34
								1037	1.704	49.78	63.7	55.0	21.0%	49.8	54.9	3.134	55.0	17.5	9.8	22.7	5.2	8.8	14.0	4.36
								1039	1.723	49.78	64.1	55.0	21.5%	49.8	55.3	3.156	55.0	17.5	9.8	22.8	5.2	8.8	14.0	4.36
								1041	1.744	49.74	64.6	55.0	22.1%	49.7	55.9	3.180	55.0	17.6	9.7	22.8	5.3	8.8	14.0	4.34
								1043	1.763	49.74	65.2	55.0	22.7%	49.7	56.5	3.203	55.0	17.6	9.7	22.9	5.3	8.8	14.1	4.35
								1045	1.781	49.74	65.4	55.0	23.2%	49.7	56.7	3.225	55.0	17.6	9.7	22.8	5.3	8.8	14.1	4.34
								1047	1.801	49.74	65.9	55.0	23.8%	49.7	57.1	3.249	55.0	17.6	9.7	22.8	5.3	8.8	14.1	4.34
								1049	1.820	49.74	66.4	55.0	24.3%	49.7	57.7	3.273	55.0	17.6	9.7	22.9	5.3	8.8	14.1	4.35
								1051	1.840	49.74	66.6	55.0	24.9%	49.7	57.9	3.298	55.0	17.6	9.7	22.8	5.3	8.8	14.0	4.34

CONSOLIDATED-UNDRAINED TRIAXIAL SHEAR TEST

Project: WSDOT/SLOUGH BR.-CU TESTING/WA

Project Number: 933-1284

POINT 2

Date: 5-25-93 | Sample Number: H-6-93, F-0454-16

Technician: DPO | Depth (ft): 18'0'-18'4"

PRE-CONSOLIDATION		POST-CONSOLIDATION			
LENGTH (cm):	9.473	LENGTH (cm):	9.008	Cell Number:	L0344
DIAMETER (cm):	4.796	DIAMETER (cm):	4.383	Panel Number:	L0017
VOLUME (ml):	171.3	VOLUME (ml):	135.9	Load Frame:	L0024
WET WEIGHT (gm):	275.61	WET WEIGHT (gm):	240.25	LVDT Factor (cm/unit):	2.540
WET DENSITY (pcf):	100.5	WET DENSITY (pcf):	110.4	Load Cell Factor (pounds/unit):	1.0
DRY WEIGHT (gm):	163.20	DRY WEIGHT (gm):	163.20	Pore Transducer Factor (psi/unit):	1.00
DRY DENS. (pcf):	59.5	DRY DENS. (pcf):	75.0	Cell Transducer Factor (psi/unit):	1.00
MOISTURE (%):	68.9%	MOISTURE (%):	47.2%	INITIAL READINGS [DATA PRO]	
SATURATION (%):	100.0%	SATURATION (%):	100.0%	LVDT:	0.910
				Load Cell:	8.7
CONSOLIDATION				Pore Pressure (@ zero psi):	0.0
PRE-CONSOL LVDT:	0.708	TOTAL VOL. CHANGE (ml):	28.9	Cell Pressure (@ zero psi):	0.0
BEFORE SHEARING LVDT:	0.892				
LENGTH CHANGE (cm):	0.465			Specific Gravity (assumed):	2.77

CONSOLIDATION DATA								SHEAR DATA					CORRECTED READINGS					DEVIATOR STRESS	DELTA PORE	S1'	S3'	S1'-S3' / 2	S1'+S3' / 2	S1' / S3'
DAY	HR	MIN	SEC	ELAPSED MINUTES	PORE READING	AMOUNT DRAINED	TOTAL VOLUME	TIME	STRAIN READING	PORE READING	LOAD READING	CELL	STRAIN (%)	PORE (psi)	LOAD (lbs.)	AREA (sq.in.)	CELL (psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	
25	14	15	0	0.00	25.0	0.0	0.0	1042	0.910	40.04	8.7	70.0	0.0%	40.0	0.0	2.339	70.0	0.0	0.0	30.0	30.0	0.0	30.0	1.00
25	14	15	10	0.17	22.3	0.0	2.7	1043	0.919	43.77	29.0	70.0	0.3%	43.8	20.3	2.345	70.0	8.6	3.7	34.9	26.2	4.3	30.6	1.33
25	14	15	30	0.50	20.6	0.0	4.4	1044	0.928	46.52	42.1	70.0	0.5%	46.5	33.4	2.351	70.0	14.2	6.5	37.7	23.5	7.1	30.6	1.60
25	14	16	0	1.00	18.9	0.0	6.1	1045	0.938	49.12	53.4	70.0	0.8%	49.1	44.7	2.357	70.0	19.0	9.1	39.8	20.9	9.5	30.4	1.91
25	14	17	0	2.00	16.5	0.0	8.5	1046	0.946	51.60	60.5	70.0	1.0%	51.6	51.7	2.363	70.0	21.9	11.6	40.3	18.4	10.9	29.3	2.19
25	14	19	0	4.00	13.2	0.0	11.8	1048	0.965	54.40	67.7	70.0	1.6%	54.4	59.0	2.376	70.0	24.8	14.4	40.4	15.6	12.4	28.0	2.59
25	14	24	0	9.00	8.7	0.0	16.3	1050	0.984	56.19	71.7	70.0	2.1%	56.2	62.9	2.389	70.0	26.4	16.2	40.2	13.8	13.2	27.0	2.91
25	14	31	0	16.00	5.7	0.0	19.3	1052	1.001	57.17	74.5	70.0	2.6%	57.2	65.8	2.400	70.0	27.4	17.1	40.2	12.8	13.7	26.5	3.14
25	14	51	0	36.00	2.8	0.0	22.2	1054	1.023	58.05	76.7	70.0	3.2%	58.1	68.0	2.416	70.0	28.1	18.0	40.1	12.0	14.1	26.0	3.36
25	15	19	0	84.00	1.5	23.5	23.5	1056	1.040	58.45	78.8	70.0	3.7%	58.5	70.0	2.428	70.0	28.8	18.4	40.4	11.5	14.4	26.0	3.50
25	15	55	0	100.00	24.2	0.0	24.4	1058	1.060	58.92	80.8	70.0	4.2%	58.9	72.1	2.442	70.0	29.5	18.9	40.6	11.1	14.8	25.8	3.66
25	17	4	0	169.00	22.9	0.0	25.7	1100	1.080	59.17	82.0	70.0	4.8%	59.2	73.3	2.456	70.0	29.8	19.1	40.7	10.8	14.9	25.7	3.75
26	8	11	0	1076.00	19.6	0.0	28.9	1102	1.097	59.43	83.6	70.0	5.3%	59.4	74.9	2.469	70.0	30.3	19.4	40.9	10.6	15.2	25.7	3.87
								1104	1.116	59.54	84.8	70.0	5.8%	59.5	76.1	2.483	70.0	30.6	19.5	41.1	10.5	15.3	25.8	3.93
								1106	1.138	59.76	86.0	70.0	6.4%	59.8	77.3	2.499	70.0	30.9	19.7	41.2	10.2	15.5	25.7	4.02
								1108	1.156	59.76	87.7	70.0	6.9%	59.8	78.9	2.513	70.0	31.4	19.7	41.6	10.2	15.7	25.9	4.07
								1110	1.175	59.83	88.9	70.0	7.5%	59.8	80.1	2.528	70.0	31.7	19.8	41.9	10.2	15.9	26.0	4.12
								1112	1.192	59.87	90.1	70.0	8.0%	59.9	81.4	2.541	70.0	32.0	19.8	42.2	10.1	16.0	26.1	4.16
								1114	1.212	59.94	92.1	70.0	8.5%	59.9	83.4	2.556	70.0	32.6	19.9	42.7	10.1	16.3	26.4	4.24
								1116	1.229	59.94	92.9	70.0	9.0%	59.9	84.2	2.570	70.0	32.8	19.9	42.8	10.1	16.4	26.4	4.26
								1118	1.250	59.98	93.8	70.0	9.6%	60.0	85.1	2.587	70.0	32.9	19.9	42.9	10.0	16.4	26.5	4.28
								1120	1.269	59.98	95.1	70.0	10.1%	60.0	86.4	2.602	70.0	33.2	19.9	43.2	10.0	16.6	26.6	4.31
								1122	1.286	59.98	96.2	70.0	10.6%	60.0	87.4	2.616	70.0	33.4	19.9	43.4	10.0	16.7	26.7	4.34
								1124	1.306	59.98	97.0	70.0	11.2%	60.0	88.2	2.633	70.0	33.5	19.9	43.5	10.0	16.8	26.8	4.35
								1126	1.324	59.90	98.2	70.0	11.7%	59.9	89.5	2.648	70.0	33.8	19.9	43.9	10.1	16.9	27.0	4.34
								1128	1.344	59.90	99.4	70.0	12.2%	59.9	90.7	2.665	70.0	34.0	19.9	44.1	10.1	17.0	27.1	4.37
								1130	1.363	59.87	101.0	70.0	12.8%	59.9	92.3	2.681	70.0	34.4	19.8	44.6	10.1	17.2	27.3	4.40
								1132	1.382	59.83	101.0	70.0	13.3%	59.8	92.3	2.698	70.0	34.2	19.8	44.4	10.2	17.1	27.3	4.36
								1134	1.402	59.76	102.2	70.0	13.9%	59.8	93.5	2.715	70.0	34.4	19.7	44.7	10.2	17.2	27.5	4.36
								1136	1.420	59.76	103.5	70.0	14.4%	59.8	94.7	2.731	70.0	34.7	19.7	44.9	10.2	17.3	27.6	4.39
								1138	1.440	59.68	104.3	70.0	14.9%	59.7	95.5	2.750	70.0	34.7	19.6	45.1	10.3	17.4	27.7	4.37
								1140	1.459	59.68	105.1	70.0	15.5%	59.7	96.3	2.767	70.0	34.8	19.6	45.1	10.3	17.4	27.7	4.37
								1142	1.478	59.54	105.9	70.0	16.0%	59.5	97.1	2.785	70.0	34.9	19.5	45.3	10.5	17.4	27.9	4.33
								1144	1.498	59.68	106.7	70.0	16.6%	59.7	98.0	2.804	70.0	34.9	19.6	45.3	10.3	17.5	27.8	4.39
								1146	1.515	59.50	107.5	70.0	17.1%	59.5	98.8	2.820	70.0	35.0	19.5	45.5	10.5	17.5	28.0	4.34
								1148	1.535	59.54	107.9	70.0	17.6%	59.5	99.2	2.839	70.0	34.9	19.5	45.4	10.5	17.5	27.9	4.34
								1150	1.554	59.39	109.1	70.0	18.2%	59.4	100.4	2.858	70.0	35.1	19.4	45.7	10.6	17.6	28.2	4.31
								1152	1.575	59.47	109.5	70.0	18.8%	59.5	100.8	2.878	70.0	35.0	19.4	45.6	10.5	17.5	28.0	4.33
								1154	1.592	59.32	110.3	70.0	19.2%	59.3	101.6	2.896	70.0	35.1	19.3	45.8	10.7	17.5	28.2	4.29
								1156	1.612	59.36	110.3	70.0	19.8%	59.4	101.6	2.916	70.0	34.8	19.3	45.5	10.6	17.4	28.1	4.27
								1158	1.633	59.21	111.5	70.0	20.4%	59.2	102.8	2.938	70.0	35.0	19.2	45.8	10.8	17.5	28.3	4.24
								1201	1.662	59.25	112.0	70.0	21.2%	59.3	103.2	2.968	70.0	34.8	19.2	45.5	10.8	17.4	28.1	4.24
								1204	1.690	59.25	113.2	70.0	22.0%	59.3	104.4	2.998	70.0	34.8	19.2	45.6	10.8	17.4	28.2	4.24
								1207	1.721	59.06	114.0	70.0	22.9%	59.1	105.2	3.032	70.0	34.7	19.0	45.8	10.9	17.4	28.3	4.17
								1210	1.748	59.14	114.4	70.0	23.6%	59.1	105.6	3.062	70.0	34.5	19.1	45.4	10.9	17.2	28.1	4.18
								1213	1.778	59.21	115.6	70.0	24.5%	59.2	106.9	3.097	70.0	34.5	19.2	45.3	10.8	17.3	28.0	4.20

CONSOLIDATED-UNDRAINED TRIAXIAL SHEAR TEST

Project: WSDOT/SLOUGH BR.-CU TESTING/WA

Project Number: 933-1284

POINT 3

Date: 5-27-93 | Sample Number: H-6-93, F-0454-17

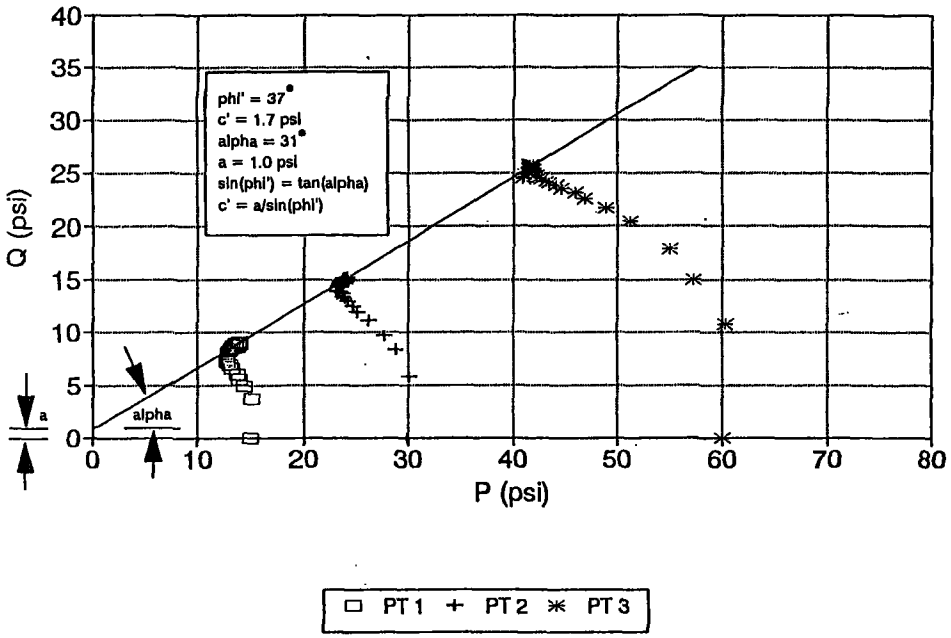
Technician: DPO | Depth (ft): 18'4"-18'8"

PRE-CONSOLIDATION		POST-CONSOLIDATION			
LENGTH (cm):	10.086	LENGTH (cm):	9.370	Cell Number:	L0344
DIAMETER (cm):	4.850	DIAMETER (cm):	4.380	Panel Number:	L0017
VOLUME (ml):	186.3	VOLUME (ml):	141.2	Load Frame:	L0024
WET WEIGHT (gm):	286.96	WET WEIGHT (gm):	241.78	LVDT Factor (cm/unit):	2.540
WET DENSITY (pcf):	96.2	WET DENSITY (pcf):	107.0	Load Cell Factor (pounds/unit):	1.0
DRY WEIGHT (gm):	165.13	DRY WEIGHT (gm):	165.13	Pore Transducer Factor (psi/unit):	1.00
DRY DENS. (pcf):	55.3	DRY DENS. (pcf):	73.0	Cell Transducer Factor (psi/unit):	1.00
MOISTURE (%):	73.8%	MOISTURE (%):	46.4%	INITIAL READINGS [DATA PRO]	
SATURATION (%):	97.3%	SATURATION (%):	95.8%	LVDT:	0.751
				Load Cell:	11.2
CONSOLIDATION				Pore Pressure (@ zero psi):	0.0
PRE-CONSOL LVDT:	0.423	TOTAL VOL. CHANGE (ml):	37.3	Cell Pressure (@ zero psi):	0.0
BEFORE SHEARING LVDT:	0.705				
LENGTH CHANGE (cm):	0.716			Specific Gravity (assumed):	2.70

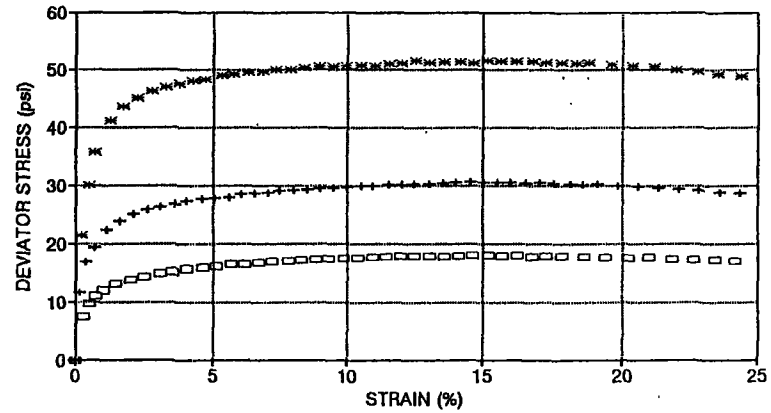
CONSOLIDATION DATA								SHEAR DATA					CORRECTED READINGS														
DAY	HR	MIN	SEC	ELAPSED MINUTES	PORE READING	AMOUNT DRAINED	TOTAL VOLUME	TIME	STRAIN READING	PORE READING	LOAD READING	CELL	STRAIN (%)	PORE (psi)	LOAD (lbs.)	AREA (sq.in.)	CELL (psi)	DEVIATOR STRESS (psi)	DELTA PORE (psi)	S1' (psi)	S3' (psi)	S1'-S3' / 2 (psi)	S1'+S3' / 2 (psi)	S1' / S3'
27	14	50	0	0.00	25.0	0.0	0.0	912	0.751	40.02	11.2	100.0	0.0%	40.0	0.0	2.335	100.0	0.0	0.0	60.0	60.0	0.0	60.0	1.00
27	14	50	10	0.17	21.8	0.0	3.2	913	0.761	48.58	48.7	100.0	0.3%	48.6	37.6	2.341	100.0	16.0	8.6	67.5	51.4	8.0	59.4	1.31
27	14	50	30	0.50	20.0	0.0	5.0	914	0.770	56.37	81.6	100.0	0.5%	56.4	70.4	2.347	100.0	30.0	16.3	73.6	43.6	15.0	58.6	1.69
27	14	51	0	1.00	18.1	0.0	6.9	915	0.777	61.40	96.6	100.0	0.7%	61.4	85.4	2.352	100.0	36.3	21.4	74.9	38.6	18.2	56.8	1.94
27	14	52	0	2.00	15.5	0.0	9.5	917	0.797	67.95	112.0	100.0	1.2%	68.0	100.8	2.365	100.0	42.6	27.9	74.7	32.1	21.3	53.4	2.33
27	14	54	0	4.00	11.7	0.0	13.3	919	0.814	71.92	120.0	100.0	1.7%	71.9	108.9	2.376	100.0	45.8	31.9	73.9	28.1	22.9	51.0	2.63
27	14	59	0	9.00	5.7	0.0	19.3	921	0.831	74.47	124.9	100.0	2.2%	74.5	113.7	2.387	100.0	47.7	34.5	73.2	25.5	23.8	49.4	2.87
27	15	6	0	16.00	0.6	24.4	24.4	923	0.850	76.51	129.0	100.0	2.7%	76.5	117.8	2.400	100.0	49.1	36.5	72.6	23.5	24.5	48.0	3.09
27	15	26	0	36.00	18.6	0.0	30.8	925	0.867	77.68	132.2	100.0	3.1%	77.7	121.0	2.411	100.0	50.2	37.7	72.5	22.3	25.1	47.4	3.25
27	15	54	0	64.00	16.1	0.0	33.3	927	0.887	78.99	134.6	100.0	3.7%	79.0	123.5	2.424	100.0	50.9	39.0	71.9	21.0	25.5	46.5	3.42
27	16	51	0	121.00	14.8	0.0	34.6	929	0.905	79.57	137.0	100.0	4.2%	79.6	125.9	2.437	100.0	51.7	39.5	72.1	20.4	25.8	46.3	3.53
28	8	3	0	1033.00	12.1	0.0	37.3	931	0.923	80.52	139.5	100.0	4.7%	80.5	128.3	2.449	100.0	52.4	40.5	71.9	19.5	26.2	45.7	3.69
								933	0.942	80.74	141.5	100.0	5.2%	80.7	130.3	2.463	100.0	52.9	40.7	72.2	19.3	26.5	45.7	3.75
								935	0.961	81.39	143.9	100.0	5.7%	81.4	132.8	2.476	100.0	53.6	41.4	72.2	18.6	26.8	45.4	3.88
								937	0.978	81.46	145.1	100.0	6.2%	81.5	134.0	2.488	100.0	53.8	41.4	72.4	18.5	26.9	45.5	3.90
								939	0.998	81.83	147.2	100.0	6.7%	81.8	136.0	2.503	100.0	54.3	41.8	72.5	18.2	27.2	45.3	3.99
								941	1.017	81.97	149.6	100.0	7.2%	82.0	138.4	2.517	100.0	55.0	42.0	73.0	18.0	27.5	45.5	4.05
								943	1.035	82.12	150.4	100.0	7.7%	82.1	139.2	2.530	100.0	55.0	42.1	72.9	17.9	27.5	45.4	4.08
								945	1.056	82.27	152.0	100.0	8.3%	82.3	140.9	2.546	100.0	55.3	42.2	73.1	17.7	27.7	45.4	4.12
								947	1.073	82.27	153.6	100.0	8.7%	82.3	142.5	2.558	100.0	55.7	42.2	73.4	17.7	27.8	45.6	4.14
								949	1.094	82.34	155.3	100.0	9.3%	82.3	144.1	2.574	100.0	56.0	42.3	73.6	17.7	28.0	45.6	4.17
								951	1.112	82.42	156.9	100.0	9.8%	82.4	145.7	2.588	100.0	56.3	42.4	73.9	17.6	28.1	45.7	4.20
								953	1.132	82.42	158.5	100.0	10.3%	82.4	147.3	2.604	100.0	56.6	42.4	74.2	17.6	28.3	45.9	4.22
								955	1.149	82.56	159.7	100.0	10.8%	82.6	148.6	2.618	100.0	56.8	42.5	74.2	17.4	28.4	45.8	4.26
								957	1.171	82.63	161.3	100.0	11.4%	82.6	150.2	2.635	100.0	57.0	42.6	74.4	17.4	28.5	45.9	4.28
								959	1.188	82.56	162.5	100.0	11.8%	82.6	151.4	2.649	100.0	57.1	42.5	74.6	17.4	28.6	46.0	4.28
								1001	1.206	82.34	164.2	100.0	12.3%	82.3	153.0	2.664	100.0	57.4	42.3	75.1	17.7	28.7	46.4	4.25
								1003	1.225	82.27	165.4	100.0	12.8%	82.3	154.2	2.679	100.0	57.6	42.2	75.3	17.7	28.8	46.5	4.25
								1005	1.244	82.41	166.2	100.0	13.4%	82.4	155.0	2.695	100.0	57.5	42.4	75.1	17.6	28.8	46.3	4.27
								1007	1.263	82.27	167.4	100.0	13.9%	82.3	156.2	2.711	100.0	57.6	42.2	75.4	17.7	28.8	46.5	4.25
								1009	1.282	82.19	169.0	100.0	14.4%	82.2	157.9	2.728	100.0	57.9	42.2	75.7	17.8	28.9	46.7	4.25
								1011	1.301	82.19	169.8	100.0	14.9%	82.2	158.7	2.744	100.0	57.8	42.2	75.6	17.8	28.9	46.7	4.25
								1013	1.319	81.97	170.6	100.0	15.4%	82.0	159.5	2.760	100.0	57.8	42.0	75.8	18.0	28.9	46.9	4.20
								1015	1.339	82.12	171.4	100.0	15.9%	82.1	160.3	2.778	100.0	57.7	42.1	75.6	17.9	28.8	46.7	4.23
								1017	1.360	81.83	172.7	100.0	16.5%	81.8	161.5	2.797	100.0	57.7	41.8	75.9	18.2	28.9	47.0	4.18
								1019	1.378	82.12	173.5	100.0	17.0%	82.1	162.3	2.813	100.0	57.7	42.1	75.6	17.9	28.8	46.7	4.23
								1021	1.398	81.76	173.9	100.0	17.5%	81.8	162.7	2.830	100.0	57.5	41.7	75.7	18.2	28.7	47.0	4.15
								1023	1.416	81.97	175.1	100.0	18.0%	82.0	163.9	2.849	100.0	57.5	42.0	75.6	18.0	28.8	46.8	4.19
								1025	1.435	81.68	175.5	100.0	18.5%	81.7	164.3	2.867	100.0	57.3	41.7	75.6	18.3	28.7	47.0	4.13
								1027	1.454	81.76	176.7	100.0	19.1%	81.8	165.6	2.885	100.0	57.4	41.7	75.6	18.2	28.7	46.9	4.15
								1029	1.472	81.54	176.7	100.0	19.5%	81.5	165.6	2.902	100.0	57.0	41.5	75.5	18.5	28.5	47.0	4.09
								1031	1.491	81.54	177.9	100.0	20.1%	81.5	166.8	2.921	100.0	57.1	41.5	75.5	18.5	28.5	47.0	4.09
								1033	1.512	81.46	178.3	100.0	20.6%	81.5	167.2	2.942	100.0	56.8	41.4	75.4	18.5	28.4	47.0	4.06
								1036	1.540	81.54	179.1	100.0	21.4%	81.5	168.0	2.970	100.0	56.5	41.5	75.0	18.5	28.3	46.7	4.06
								1039	1.569	81.17	179.9	100.0	22.2%	81.2	168.8	3.000	100.0	56.3	41.2	75.1	18.8	28.1	47.0	3.99
								1042	1.597	81.25	180.4	100.0	22.9%	81.3	169.2	3.030	100.0	55.8	41.2	74.8	18.8	27.9	46.7	3.98
								1045	1.628	81.39	181.8	100.0	23.8%	81.4	170.4	3.063	100.0	55.8	41.4	74.2	18.8	27.8	46.4	3.99
								1048	1.656	81.17	182.0	100.0	24.5%	81.2	170.8	3.094	100.0	55.2	41.2	74.0	18.8	27.6	46.4	3.93

CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST -- ASTM D4767

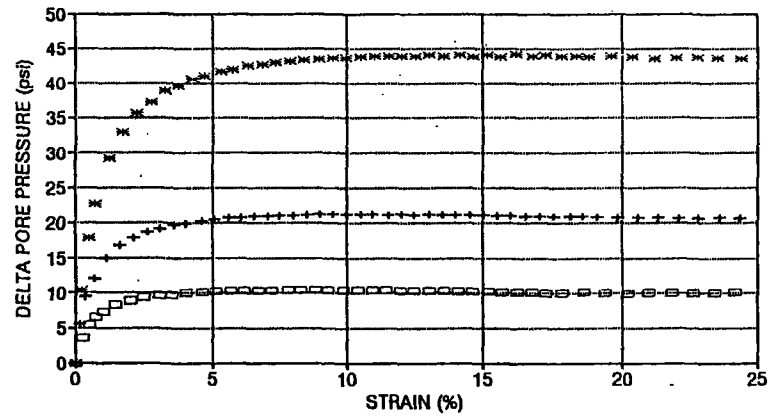
P-Q PLOT



STRESS-STRAIN CURVES



PORE PRESSURE CHANGE VS. STRAIN



	PT 1	PT 2	PT 3
Borehole No.	H-3-93	H-3-93	H-3-93
Sample No.	F-0448-9	F-0448-10	F-0448-11
Depth	13'0"-13'4"	13'4"-13'8"	13'8"-14'0"
Specimen Diameter (in)	1.898	1.893	1.905
Specimen Height (in)	3.735	3.997	3.951
Cell Pressure (psi)	55.0	70.0	100.0
Back Pressure (psi)	40.0	40.0	40.0
Effective Confining Pressure (psi)	15.0	30.0	60.0
Average Strain Rate (%/min)	0.26	0.25	0.26
Water Content Before Test (%)	73.2	71.0	71.2
Water Content After Test (%)	58.9	52.9	47.9
Dry Density (pcf)	56.7	57.2	57.1

Project:	WSDOT/SLOUGH BR. - CU TESTING/WA		
Project No.:	933-1284	Tech:	DPO
Date:	5-21-93	Review:	DPO/MF
Golder Associates Inc.		Redmond, WA	

CONSOLIDATED-UNDRAINED TRIAXIAL SHEAR TEST

Project: WSDOT/SLOUGH BR.-CU TESTING/WA

Project Number: 933-1284

POINT 1

Date: 5-13-93 | Sample Number: H-3-93, F-0448-9

Technician: DPO | Depth (ft): 13'0'-13'4"

PRE-CONSOLIDATION		POST-CONSOLIDATION			
				Cell Number:	L0344
				Panel Number:	L0017
LENGTH (cm):	9.488	LENGTH (cm):	9.137	Load Frame:	L0024
DIAMETER (cm):	4.822	DIAMETER (cm):	4.582		
VOLUME (ml):	173.3	VOLUME (ml):	150.7	LVDT Factor (cm/unit):	2.540
WET WEIGHT (gm):	272.33	WET WEIGHT (gm):	249.76	Load Cell Factor (pounds/unit):	1.0
WET DENSITY (pcf):	98.1	WET DENSITY (pcf):	103.5	Pore Transducer Factor (psi/unit):	1.00
DRY WEIGHT (gm):	157.22	DRY WEIGHT (gm):	157.22	Cell Transducer Factor (psi/unit):	1.00
DRY DENS. (pcf):	56.7	DRY DENS. (pcf):	65.1		
MOISTURE (%):	73.2%	MOISTURE (%):	58.9%	INITIAL READINGS [DATA PRO]	
SATURATION (%):	99.9%	SATURATION (%):	99.8%	LVDT:	0.806
				Load Cell:	10.4
CONSOLIDATION				Pore Pressure (@ zero psi):	0.0
PRE-CONSOL LVDT:	0.670	TOTAL VOL. CHANGE (ml):	20.1	Cell Pressure (@ zero psi):	0.0
BEFORE SHEARING LVDT:	0.808				
LENGTH CHANGE (cm):	0.351			Specific Gravity (assumed):	2.71

CONSOLIDATION DATA								SHEAR DATA					CORRECTED READINGS					DEVIATOR STRESS	DELTA PORE	S1'	S3'	S1'-S3' / 2	S1'+S3' / 2	S1' / S3'
DAY	HR	MIN	SEC	ELAPSED MINUTES	PORE READING	AMOUNT DRAINED	TOTAL VOLUME	TIME	STRAIN READING	PORE READING	LOAD READING	CELL	STRAIN (%)	PORE (psi)	LOAD (lbs.)	AREA (sq in.)	CELL (psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	
13	14	27	0	0.00	25.0	0.0	0.0	907	0.806	40.02	10.4	55.0	0.0%	40.0	0.0	2.556	55.0	0.0	0.0	15.0	15.0	0.0	15.0	1.00
13	14	27	10	0.17	22.1	0.0	2.9	908	0.816	43.59	29.4	55.0	0.3%	43.6	19.0	2.563	55.0	7.4	3.6	18.8	11.4	3.7	15.1	1.65
13	14	27	30	0.50	20.0	0.0	5.0	909	0.824	45.52	35.5	55.0	0.5%	45.5	25.1	2.569	55.0	9.8	5.5	19.2	9.5	4.9	14.4	2.03
13	14	28	0	1.00	18.2	0.0	6.8	910	0.833	46.65	39.1	55.0	0.8%	46.7	28.7	2.576	55.0	11.1	6.6	19.5	8.4	5.6	13.9	2.33
13	14	29	0	2.00	15.9	0.0	9.1	911	0.843	47.37	41.5	55.0	1.0%	47.4	31.2	2.583	55.0	12.1	7.3	19.7	7.6	6.0	13.7	2.58
13	14	31	0	4.00	13.7	0.0	11.3	913	0.860	48.39	44.6	55.0	1.5%	48.4	34.2	2.595	55.0	13.2	8.4	19.6	6.6	6.6	13.2	3.00
13	14	36	0	9.00	11.7	0.0	13.3	915	0.879	48.98	46.7	55.0	2.0%	49.0	36.3	2.609	55.0	13.9	9.0	19.9	6.0	7.0	13.0	3.31
13	14	43	0	16.00	10.9	0.0	14.1	917	0.896	49.45	48.3	55.0	2.5%	49.5	37.9	2.622	55.0	14.5	9.4	20.0	5.6	7.2	12.6	3.61
13	15	3	0	36.00	10.0	0.0	15.0	919	0.916	49.74	49.5	55.0	3.1%	49.7	39.2	2.637	55.0	14.9	9.7	20.1	5.3	7.4	12.7	3.82
13	15	31	0	64.00	9.3	0.0	15.7	921	0.933	49.89	50.8	55.0	3.5%	49.9	40.4	2.650	55.0	15.3	9.9	20.4	5.1	7.6	12.7	3.99
13	16	7	0	100.00	8.8	0.0	16.2	923	0.952	50.07	52.0	55.0	4.1%	50.1	41.7	2.664	55.0	15.6	10.0	20.6	4.9	7.8	12.8	4.17
13	16	51	0	144.00	8.3	0.0	16.7	925	0.971	50.18	53.0	55.0	4.6%	50.2	42.7	2.679	55.0	15.9	10.2	20.7	4.8	8.0	12.8	4.30
14	8	6	0	1059.00	4.9	0.0	20.1	927	0.989	50.25	53.8	55.0	5.1%	50.3	43.5	2.693	55.0	16.1	10.2	20.9	4.8	8.1	12.8	4.40
								929	1.010	50.34	55.0	55.0	5.7%	50.3	44.6	2.710	55.0	16.5	10.3	21.1	4.7	8.2	12.9	4.53
								931	1.028	50.34	55.4	55.0	6.2%	50.3	45.0	2.724	55.0	16.6	10.3	21.2	4.7	8.3	12.9	4.55
								933	1.047	50.37	56.1	55.0	6.7%	50.4	45.8	2.740	55.0	16.7	10.4	21.3	4.6	8.4	13.0	4.61
								935	1.064	50.38	56.9	55.0	7.2%	50.4	46.5	2.754	55.0	16.9	10.4	21.5	4.6	8.4	13.1	4.66
								937	1.086	50.39	57.5	55.0	7.8%	50.4	47.2	2.772	55.0	17.0	10.4	21.6	4.6	8.5	13.1	4.69
								939	1.103	50.41	58.1	55.0	8.3%	50.4	47.8	2.788	55.0	17.1	10.4	21.7	4.6	8.6	13.2	4.73
								941	1.123	50.42	58.7	55.0	8.8%	50.4	48.3	2.803	55.0	17.2	10.4	21.8	4.6	8.6	13.2	4.76
								943	1.140	50.41	59.5	55.0	9.3%	50.4	49.1	2.818	55.0	17.4	10.4	22.0	4.6	8.7	13.3	4.79
								945	1.160	50.42	60.1	55.0	9.8%	50.4	49.7	2.835	55.0	17.5	10.4	22.1	4.6	8.8	13.4	4.82
								947	1.179	50.45	60.6	55.0	10.4%	50.4	50.3	2.852	55.0	17.6	10.4	22.2	4.6	8.8	13.4	4.87
								949	1.199	50.45	61.4	55.0	10.9%	50.4	51.0	2.870	55.0	17.8	10.4	22.3	4.6	8.9	13.4	4.90
								951	1.217	50.41	61.9	55.0	11.4%	50.4	51.6	2.886	55.0	17.9	10.4	22.5	4.6	8.9	13.5	4.89
								953	1.237	50.38	62.4	55.0	12.0%	50.4	52.1	2.904	55.0	17.9	10.4	22.6	4.6	9.0	13.6	4.88
								955	1.255	50.37	62.9	55.0	12.5%	50.4	52.6	2.921	55.0	18.0	10.4	22.6	4.6	9.0	13.6	4.89
								957	1.275	50.35	63.2	55.0	13.0%	50.4	52.8	2.940	55.0	18.0	10.3	22.6	4.6	9.0	13.6	4.86
								959	1.294	50.31	63.3	55.0	13.6%	50.3	52.9	2.958	55.0	17.9	10.3	22.6	4.7	8.9	13.6	4.82
								1001	1.313	50.27	63.9	55.0	14.1%	50.3	53.6	2.976	55.0	18.0	10.2	22.7	4.7	9.0	13.7	4.80
								1003	1.332	50.24	64.4	55.0	14.5%	50.2	54.1	2.994	55.0	18.1	10.2	22.8	4.8	9.0	13.8	4.79
								1005	1.352	50.21	65.0	55.0	15.2%	50.2	54.8	3.014	55.0	18.1	10.2	22.9	4.8	9.1	13.8	4.78
								1007	1.370	50.18	64.8	55.0	15.7%	50.2	54.4	3.032	55.0	17.9	10.2	22.8	4.8	9.0	13.8	4.72
								1009	1.389	50.16	65.4	55.0	16.2%	50.2	55.1	3.051	55.0	18.0	10.1	22.9	4.8	9.0	13.9	4.73
								1011	1.408	50.12	65.3	55.0	16.7%	50.1	55.0	3.070	55.0	17.9	10.1	22.8	4.9	9.0	13.8	4.67
								1013	1.426	50.04	65.8	55.0	17.2%	50.0	55.5	3.089	55.0	18.0	10.0	22.9	5.0	9.0	13.9	4.62
								1015	1.446	50.08	66.2	55.0	17.8%	50.1	55.9	3.110	55.0	18.0	10.1	22.9	4.9	9.0	13.9	4.65
								1018	1.475	50.13	66.4	55.0	18.6%	50.1	56.1	3.140	55.0	17.9	10.1	22.7	4.9	8.9	13.8	4.67
								1021	1.502	50.04	66.6	55.0	19.3%	50.0	56.3	3.170	55.0	17.8	10.0	22.7	5.0	8.9	13.8	4.58
								1024	1.533	49.97	66.7	55.0	20.2%	50.0	56.3	3.204	55.0	17.6	10.0	22.6	5.0	8.8	13.8	4.49
								1027	1.560	50.03	67.6	55.0	21.0%	50.0	57.3	3.234	55.0	17.7	10.0	22.7	5.0	8.9	13.8	4.56
								1030	1.591	50.04	67.3	55.0	21.8%	50.0	57.0	3.270	55.0	17.4	10.0	22.4	5.0	8.7	13.7	4.51
								1033	1.620	50.01	67.5	55.0	22.6%	50.0	57.2	3.304	55.0	17.3	10.0	22.3	5.0	8.7	13.6	4.47
								1036	1.648	50.06	68.1	55.0	23.4%	50.1	57.7	3.338	55.0	17.3	10.0	22.2	4.9	8.6	13.6	4.50
								1039	1.676	50.13	68.0	55.0	24.2%	50.1	57.6	3.372	55.0	17.1	10.1	22.0	4.9	8.5	13.4	4.51

Project: WSDOT/SLOUGH BR.-CU TESTING/WA

CONSOLIDATED-UNDRAINED TRIAXIAL SHEAR TEST

Project Number: 933-1284

POINT 2

Date: 5-14-93 | Sample Number: H-3-93, F-0448-10

Technician: DPO | Depth (ft): 13'4"-13'6"

PRE-CONSOLIDATION		POST-CONSOLIDATION			
				Cell Number:	L0344
				Panel Number:	L0017
LENGTH (cm):	10.151	LENGTH (cm):	9.564	Load Frame:	L0024
DIAMETER (cm):	4.807	DIAMETER (cm):	4.522		
VOLUME (ml):	184.2	VOLUME (ml):	153.6	LVDT Factor (cm/unit):	2.540
WET WEIGHT (gm):	288.58	WET WEIGHT (gm):	257.95	Load Cell Factor (pounds/unit):	1.0
WET DENSITY (pcf):	97.8	WET DENSITY (pcf):	104.9	Pore Transducer Factor (psi/unit):	1.00
DRY WEIGHT (gm):	168.76	DRY WEIGHT (gm):	168.76	Cell Transducer Factor (psi/unit):	1.00
DRY DENS. (pcf):	57.2	DRY DENS. (pcf):	68.6		
MOISTURE (%):	71.0%	MOISTURE (%):	52.9%	INITIAL READINGS [DATA PRO]	
SATURATION (%):	98.3%	SATURATION (%):	97.7%	LVDT:	0.629
				Load Cell:	12.0
CONSOLIDATION				Pore Pressure (@ zero psi):	0.0
PRE-CONSOL LVDT:	0.398	TOTAL VOL. CHANGE (ml):	26.4	Cell Pressure (@ zero psi):	0.0
BEFORE SHEARING LVDT:	0.629				
LENGTH CHANGE (cm):	0.587			Specific Gravity (assumed):	2.71

CONSOLIDATION DATA								SHEAR DATA					CORRECTED READINGS					DEVIATOR STRESS	DELTA PORE	S1'	S3'	S1'-S3' / 2	S1'+S3' / 2	S1' / S3'
DAY	HR	MIN	SEC	ELAPSED MINUTES	PORE READING	AMOUNT DRAINED	TOTAL VOLUME	TIME	STRAIN READING	PORE READING	LOAD READING	CELL	STRAIN (%)	PORE (psi)	LOAD (lbs.)	AREA (sq.in.)	CELL (psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	
17	11	4	0	0.00	25.0	0.0	0.0	827	0.629	40.04	12.0	70.0	0.0%	40.0	0.0	2.489	70.0	0.0	0.0	30.0	30.0	0.0	30.0	1.00
17	11	4	10	0.17	20.9	0.0	4.1	828	0.635	45.67	41.1	70.0	0.2%	45.7	29.1	2.493	70.0	11.7	5.6	36.0	24.3	5.8	30.2	1.48
17	11	4	30	0.50	18.1	0.0	6.9	829	0.643	49.60	54.0	70.0	0.4%	49.6	42.1	2.499	70.0	16.8	9.6	37.2	20.4	8.4	28.8	1.83
17	11	5	0	1.00	15.5	0.0	9.5	830	0.655	52.04	60.8	70.0	0.7%	52.0	48.8	2.507	70.0	19.5	12.0	37.4	18.0	9.7	27.7	2.08
17	11	6	0	2.00	12.3	0.0	12.7	832	0.672	54.99	68.3	70.0	1.1%	55.0	56.3	2.518	70.0	22.4	15.0	37.4	15.0	11.2	26.2	2.49
17	11	8	0	4.00	8.6	0.0	16.4	834	0.691	56.81	72.3	70.0	1.6%	56.8	60.3	2.531	70.0	23.8	16.8	37.0	13.2	11.9	25.1	2.81
17	11	13	0	9.00	4.9	0.0	20.1	836	0.709	57.83	75.5	70.0	2.1%	57.8	63.6	2.543	70.0	25.0	17.8	37.2	12.2	12.5	24.7	3.05
17	11	20	0	16.00	3.2	21.8	21.8	838	0.728	58.70	78.0	70.0	2.6%	58.7	66.0	2.556	70.0	25.8	18.7	37.1	11.3	12.9	24.2	3.28
17	11	40	0	36.00	23.5	0.0	23.3	840	0.745	59.21	79.8	70.0	3.1%	59.2	67.6	2.568	70.0	26.3	19.2	37.1	10.8	13.2	23.9	3.44
17	12	8	0	64.00	23.0	0.0	23.8	842	0.765	59.72	81.2	70.0	3.6%	59.7	69.2	2.582	70.0	26.8	19.7	37.1	10.3	13.4	23.7	3.61
17	13	5	0	121.00	22.5	0.0	24.3	844	0.781	59.98	82.8	70.0	4.0%	60.0	70.8	2.594	70.0	27.3	19.9	37.3	10.0	13.7	23.7	3.73
17	14	20	0	196.00	22.0	0.0	24.8	846	0.801	60.34	84.0	70.0	4.6%	60.3	72.1	2.608	70.0	27.6	20.3	37.3	9.7	13.8	23.5	3.86
17	16	28	0	324.00	21.7	0.0	25.1	848	0.820	60.56	84.8	70.0	5.1%	60.6	72.9	2.622	70.0	27.8	20.5	37.2	9.4	13.9	23.3	3.94
18	8	21	0	1277.00	20.4	0.0	26.4	850	0.839	60.78	85.6	70.0	5.6%	60.8	73.7	2.636	70.0	27.9	20.7	37.2	9.2	14.0	23.2	4.03
								852	0.856	60.85	87.3	70.0	6.0%	60.9	75.3	2.649	70.0	28.4	20.8	37.6	9.2	14.2	23.4	4.11
								854	0.875	61.00	88.1	70.0	6.5%	61.0	76.1	2.663	70.0	28.6	21.0	37.6	9.0	14.3	23.3	4.17
								856	0.893	61.03	88.9	70.0	7.0%	61.0	76.9	2.677	70.0	28.7	21.0	37.7	9.0	14.4	23.3	4.20
								858	0.910	61.10	90.1	70.0	7.5%	61.1	78.1	2.690	70.0	29.0	21.1	37.9	8.9	14.5	23.4	4.26
								900	0.929	61.14	90.9	70.0	8.0%	61.1	78.9	2.705	70.0	29.2	21.1	38.0	8.9	14.6	23.5	4.29
								902	0.949	61.21	91.7	70.0	8.5%	61.2	79.7	2.720	70.0	29.3	21.2	38.1	8.8	14.7	23.4	4.33
								904	0.966	61.29	92.5	70.0	8.9%	61.3	80.6	2.734	70.0	29.5	21.3	38.2	8.7	14.7	23.4	4.38
								906	0.985	61.25	93.3	70.0	9.5%	61.3	81.3	2.749	70.0	29.6	21.2	38.3	8.8	14.8	23.5	4.38
								908	1.005	61.29	94.1	70.0	10.0%	61.3	82.2	2.765	70.0	29.7	21.3	38.4	8.7	14.9	23.6	4.41
								910	1.024	61.25	95.4	70.0	10.5%	61.3	83.4	2.781	70.0	30.0	21.2	38.7	8.8	15.0	23.7	4.43
								912	1.041	61.32	95.8	70.0	10.9%	61.3	83.8	2.795	70.0	30.0	21.3	38.7	8.7	15.0	23.7	4.45
								914	1.063	61.21	97.0	70.0	11.5%	61.2	85.0	2.813	70.0	30.2	21.2	39.0	8.8	15.1	23.9	4.44
								916	1.081	61.29	97.4	70.0	12.0%	61.3	85.4	2.829	70.0	30.2	21.3	38.9	8.7	15.1	23.8	4.47
								918	1.099	61.21	98.2	70.0	12.5%	61.2	86.2	2.844	70.0	30.3	21.2	39.1	8.8	15.2	23.9	4.45
								920	1.119	61.29	98.6	70.0	13.0%	61.3	86.6	2.862	70.0	30.3	21.3	39.0	8.7	15.1	23.8	4.48
								922	1.138	61.18	99.6	70.0	13.5%	61.2	87.6	2.878	70.0	30.4	21.1	39.3	8.8	15.2	24.0	4.45
								924	1.156	61.21	100.2	70.0	14.0%	61.2	88.2	2.894	70.0	30.5	21.2	39.3	8.8	15.2	24.0	4.47
								926	1.176	61.18	101.0	70.0	14.5%	61.2	89.1	2.912	70.0	30.6	21.1	39.4	8.8	15.3	24.1	4.47
								928	1.195	61.18	101.4	70.0	15.0%	61.2	89.5	2.930	70.0	30.5	21.1	39.4	8.8	15.3	24.1	4.46
								930	1.213	61.10	101.8	70.0	15.5%	61.1	89.9	2.948	70.0	30.5	21.1	39.4	8.9	15.3	24.2	4.43
								932	1.231	61.10	102.2	70.0	16.0%	61.1	90.3	2.963	70.0	30.5	21.1	39.4	8.9	15.2	24.1	4.42
								934	1.251	61.03	102.6	70.0	16.5%	61.0	90.7	2.982	70.0	30.4	21.0	39.4	9.0	15.2	24.2	4.39
								936	1.270	61.00	103.5	70.0	17.0%	61.0	91.5	3.000	70.0	30.5	21.0	39.5	9.0	15.2	24.2	4.39
								938	1.288	61.03	103.9	70.0	17.5%	61.0	91.9	3.017	70.0	30.5	21.0	39.4	9.0	15.2	24.2	4.39
								940	1.310	60.96	103.9	70.0	18.1%	61.0	91.9	3.039	70.0	30.2	20.9	39.3	9.0	15.1	24.2	4.34
								942	1.327	60.96	104.3	70.0	18.5%	61.0	92.3	3.056	70.0	30.2	20.9	39.2	9.0	15.1	24.1	4.34
								944	1.347	60.92	105.1	70.0	19.1%	60.9	93.1	3.076	70.0	30.3	20.9	39.3	9.1	15.1	24.2	4.33
								947	1.375	60.81	105.1	70.0	19.8%	60.8	93.1	3.104	70.0	30.0	20.8	39.2	9.2	15.0	24.2	4.26
								950	1.404	60.85	105.5	70.0	20.6%	60.9	93.5	3.134	70.0	29.8	20.8	39.0	9.2	14.9	24.1	4.23
								953	1.432	60.78	105.5	70.0	21.3%	60.8	93.5	3.164	70.0	29.6	20.7	38.8	9.2	14.8	24.0	4.21
								956	1.460	60.70	105.9	70.0	22.1%	60.7	93.9	3.194	70.0	29.4	20.7	38.7	9.3	14.7	24.0	4.16
								959	1.488	60.74	105.9	70.0	22.8%	60.7	93.9	3.225	70.0	29.1	20.7	38.4	9.3	14.6	23.8	4.14
								1002	1.518	60.81	105.9	70.0	23.6%	60.8	93.9	3.259	70.0	28.8	20.8	38.0	9.2	14.4	23.6	4.14
								1005	1.547	60.74	106.3	70.0	24.4%	60.7	94.3	3.292	70.0	28.7	20.7	37.9	9.3	14.3	23.6	4.09

CONSOLIDATED-UNDRAINED TRIAXIAL SHEAR TEST

Project: WSDOT/SLOUGH BR-CU TESTING/WA

Project Number: 933-1284

POINT 3

Date: 5-18-93 | Sample Number: H-3-93, F-0448-11

Technician: DPO | Depth (ft): 13'8"-14'0"

PRE-CONSOLIDATION		POST-CONSOLIDATION	
LENGTH (cm):	10.036	LENGTH (cm):	9.244
DIAMETER (cm):	4.838	DIAMETER (cm):	4.473
VOLUME (ml):	184.5	VOLUME (ml):	145.2
WET WEIGHT (gm):	288.75	WET WEIGHT (gm):	249.49
WET DENSITY (pcf):	97.7	WET DENSITY (pcf):	107.3
DRY WEIGHT (gm):	168.65	DRY WEIGHT (gm):	168.65
DRY DENS. (pcf):	57.1	DRY DENS. (pcf):	72.5
MOISTURE (%):	71.2%	MOISTURE (%):	47.9%
SATURATION (%):	98.2%	SATURATION (%):	97.4%

CONSOLIDATION			
PRE-CONSOL LVDT:	0.446	TOTAL VOL. CHANGE (ml):	40.7
BEFORE SHEARING LVDT:	0.758		
LENGTH CHANGE (cm):	0.792		

Cell Number:	L0344
Panel Number:	L0017
Load Frame:	L0024
LVDT Factor (cm/unit):	2.540
Load Cell Factor (pounds/unit):	1.0
Pore Transducer Factor (psi/unit):	1.00
Cell Transducer Factor (psi/unit):	1.00
INITIAL READINGS [DATA PRO]	
LVDT:	0.758
Load Cell:	18.5
Pore Pressure (@ zero psi):	0.0
Cell Pressure (@ zero psi):	0.0
Specific Gravity (assumed):	2.71

CONSOLIDATION DATA								SHEAR DATA					CORRECTED READINGS												
DAY	HR	MIN	SEC	ELAPSED MINUTES	PORE READING	AMOUNT DRAINED	TOTAL VOLUME	TIME	STRAIN READING	PORE READING	LOAD READING	CELL	STRAIN (%)	PORE (psi)	LOAD (lbs.)	AREA (sq.in.)	CELL (psi)	DEVIATOR STRESS (psi)	DELTA PORE (psi)	S1' (psi)	S3' (psi)	S1'-S3' / 2 (psi)	S1'+S3' / 2 (psi)	S1' / S3'
19	10	0	0	0.00	25.0	0.0	0.0	825	0.758	40.04	18.5	100.0	0.0%	40.0	0.0	2.435	100.0	0.0	0.0	60.0	60.0	0.0	60.0	1.00
19	10	0	10	0.17	18.3	0.0	6.7	826	0.766	50.47	71.1	100.0	0.2%	50.5	52.6	2.441	100.0	21.6	10.4	71.1	49.5	10.8	60.3	1.44
19	10	0	30	0.50	13.9	0.0	11.1	827	0.776	57.83	91.9	100.0	0.5%	57.8	73.5	2.446	100.0	30.0	17.8	72.2	42.2	15.0	57.2	1.71
19	10	1	0	1.00	10.0	0.0	15.0	828	0.784	62.82	105.9	100.0	0.7%	62.8	87.4	2.453	100.0	35.6	22.8	72.8	37.2	17.8	55.0	1.96
19	10	2	0	2.00	5.2	0.0	19.8	830	0.804	69.30	119.6	100.0	1.3%	69.3	101.2	2.467	100.0	41.0	29.3	71.7	30.7	20.5	51.2	2.34
19	10	4	0	4.00	0.0	25.0	25.0	832	0.821	72.94	126.5	100.0	1.7%	72.9	108.1	2.478	100.0	43.6	32.9	70.7	27.1	21.8	48.9	2.61
19	10	9	0	9.00	19.8	0.0	30.2	834	0.840	75.71	131.0	100.0	2.3%	75.7	112.5	2.492	100.0	45.2	35.7	69.5	24.3	22.6	46.9	2.86
19	10	16	0	16.00	17.6	0.0	32.4	836	0.859	77.24	134.6	100.0	2.8%	77.2	116.2	2.505	100.0	46.4	37.2	69.1	22.8	23.2	45.9	3.04
19	10	36	0	36.00	15.9	0.0	34.1	838	0.877	78.84	137.0	100.0	3.3%	78.8	118.6	2.518	100.0	47.1	38.8	68.3	21.2	23.6	44.7	3.23
19	11	4	0	64.00	15.0	0.0	35.0	840	0.895	79.64	139.1	100.0	3.8%	79.6	120.6	2.531	100.0	47.7	39.6	68.0	20.4	23.8	44.2	3.34
19	12	1	0	121.00	14.0	0.0	36.0	842	0.913	80.66	141.1	100.0	4.3%	80.7	122.6	2.544	100.0	48.2	40.6	67.6	19.3	24.1	43.4	3.49
19	13	45	0	225.00	13.0	0.0	37.0	844	0.929	81.10	142.3	100.0	4.7%	81.1	123.9	2.555	100.0	48.5	41.1	67.4	18.9	24.2	43.1	3.56
19	16	40	0	400.00	12.1	0.0	37.9	846	0.951	81.76	144.3	100.0	5.3%	81.8	125.9	2.572	100.0	48.9	41.7	67.2	18.2	24.5	42.7	3.68
20	8	2	0	1322.00	9.3	0.0	40.7	848	0.968	82.05	145.5	100.0	5.8%	82.1	127.1	2.585	100.0	49.2	42.0	67.1	18.0	24.6	42.5	3.74
								850	0.987	82.48	147.2	100.0	6.3%	82.5	128.7	2.599	100.0	49.5	42.4	67.0	17.5	24.8	42.3	3.83
								852	1.007	82.70	148.4	100.0	6.8%	82.7	129.9	2.614	100.0	49.7	42.7	67.0	17.3	24.8	42.1	3.87
								854	1.024	82.99	150.0	100.0	7.3%	83.0	131.5	2.627	100.0	50.1	43.0	67.1	17.0	25.0	42.0	3.94
								856	1.044	83.14	150.8	100.0	7.9%	83.1	132.4	2.643	100.0	50.1	43.1	66.9	16.9	25.0	41.9	3.97
								858	1.063	83.36	152.4	100.0	8.4%	83.4	134.0	2.658	100.0	50.4	43.3	67.0	16.6	25.2	41.8	4.03
								900	1.083	83.43	153.6	100.0	8.9%	83.4	135.2	2.674	100.0	50.6	43.4	67.1	16.6	25.3	41.8	4.05
								902	1.102	83.65	154.4	100.0	9.5%	83.7	136.0	2.690	100.0	50.6	43.6	66.9	16.3	25.3	41.6	4.09
								904	1.120	83.65	155.7	100.0	9.9%	83.7	137.2	2.704	100.0	50.7	43.6	67.1	16.3	25.4	41.7	4.10
								906	1.140	83.80	156.9	100.0	10.5%	83.8	138.4	2.721	100.0	50.9	43.8	67.1	16.2	25.4	41.6	4.14
								908	1.159	83.87	157.3	100.0	11.0%	83.9	138.8	2.737	100.0	50.7	43.8	66.9	16.1	25.4	41.5	4.14
								910	1.178	83.87	158.9	100.0	11.5%	83.9	140.5	2.753	100.0	51.0	43.8	67.1	16.1	25.5	41.6	4.16
								912	1.195	83.94	160.1	100.0	12.0%	83.9	141.7	2.768	100.0	51.2	43.9	67.2	16.1	25.6	41.7	4.19
								914	1.214	83.87	162.1	100.0	12.5%	83.9	143.7	2.784	100.0	51.6	43.8	67.7	16.1	25.8	41.9	4.20
								916	1.232	84.09	162.1	100.0	13.0%	84.1	143.7	2.800	100.0	51.3	44.1	67.2	15.9	25.7	41.6	4.23
								918	1.252	83.87	163.4	100.0	13.6%	83.9	144.9	2.818	100.0	51.4	43.8	67.6	16.1	25.7	41.8	4.19
								920	1.273	84.09	164.2	100.0	14.2%	84.1	145.7	2.837	100.0	51.4	44.1	67.3	15.9	25.7	41.6	4.23
								922	1.291	83.80	164.6	100.0	14.6%	83.8	146.1	2.853	100.0	51.2	43.8	67.4	16.2	25.6	41.8	4.16
								924	1.309	84.09	166.6	100.0	15.1%	84.1	148.1	2.870	100.0	51.6	44.1	67.5	15.9	25.8	41.7	4.24
								926	1.327	83.80	167.0	100.0	15.6%	83.8	148.5	2.887	100.0	51.5	43.8	67.7	16.2	25.7	41.9	4.18
								928	1.347	84.16	168.2	100.0	16.2%	84.2	149.8	2.906	100.0	51.5	44.1	67.4	15.8	25.6	41.6	4.26
								930	1.368	83.87	169.0	100.0	16.8%	83.9	150.6	2.926	100.0	51.5	43.8	67.6	16.1	25.7	41.9	4.19
								932	1.385	84.09	169.4	100.0	17.2%	84.1	151.0	2.942	100.0	51.3	44.1	67.2	15.9	25.7	41.6	4.22
								934	1.405	83.87	170.2	100.0	17.8%	83.9	151.8	2.962	100.0	51.2	43.8	67.4	16.1	25.6	41.8	4.18
								936	1.424	83.94	171.0	100.0	18.3%	83.9	152.6	2.981	100.0	51.2	43.9	67.2	16.1	25.6	41.7	4.19
								938	1.441	83.80	172.3	100.0	18.8%	83.8	153.8	2.998	100.0	51.3	43.8	67.5	16.2	25.6	41.8	4.17
								941	1.471	83.87	172.7	100.0	19.6%	83.9	154.2	3.029	100.0	50.9	43.8	67.0	16.1	25.5	41.6	4.16
								944	1.499	83.80	173.5	100.0	20.4%	83.8	155.0	3.058	100.0	50.7	43.8	66.9	16.2	25.3	41.5	4.13
								947	1.526	83.50	174.7	100.0	21.2%	83.5	156.2	3.089	100.0	50.6	43.5	67.1	16.5	25.3	41.8	4.07
								950	1.558	83.58	174.7	100.0	22.0%	83.6	156.2	3.122	100.0	50.0	43.5	66.5	16.4	25.0	41.4	4.05
								953	1.587	83.72	175.1	100.0	22.8%	83.7	156.6	3.154	100.0	49.7	43.7	65.9	16.3	24.8	41.1	4.05
								956	1.615	83.58	175.1	100.0	23.5%	83.6	156.6	3.186	100.0	49.2	43.5	65.6	16.4	24.6	41.0	3.99
								959	1.646	83.50	175.9	100.0	24.4%	83.5	157.5	3.221	100.0	48.9	43.5	65.4	16.5	24.4	40.9	3.96

APPENDIX - D

Bridge N0. 107/5 Design Curves – Drilled Shaft Option

Pier 1: 3.0 ft. Diameter Permanent Casing Full Depth.
4.5 ft. Diameter Permanent Casing Full Depth.

Piers 2-4: 5.5 ft. Diameter Permanent Casing Full Depth.
6.0 ft. Diameter Permanent Casing Full Depth.
7.5 ft. Diameter Permanent Casing Full Depth.

Pier 5: 5.5 ft. Diameter Permanent Casing Full Depth.
6.0 ft. Diameter Permanent Casing Full Depth.
7.5 ft. Diameter Permanent Casing Full Depth.

Pier 6: 3.0 ft. Diameter Permanent Casing Full Depth.
4.5 ft. Diameter Permanent Casing Full Depth.

P-Y Curve Soil Data

Bridge N0. 107/6 Design Curves – Drilled Shaft Option

Pier 1: 3.0 ft. Diameter Permanent Casing Full Depth.
4.5 ft. Diameter Permanent Casing Full Depth.

Piers 2-5: 5.5 ft. Diameter Permanent Casing Full Depth.
6.0 ft. Diameter Permanent Casing Full Depth.
7.5 ft. Diameter Permanent Casing Full Depth.

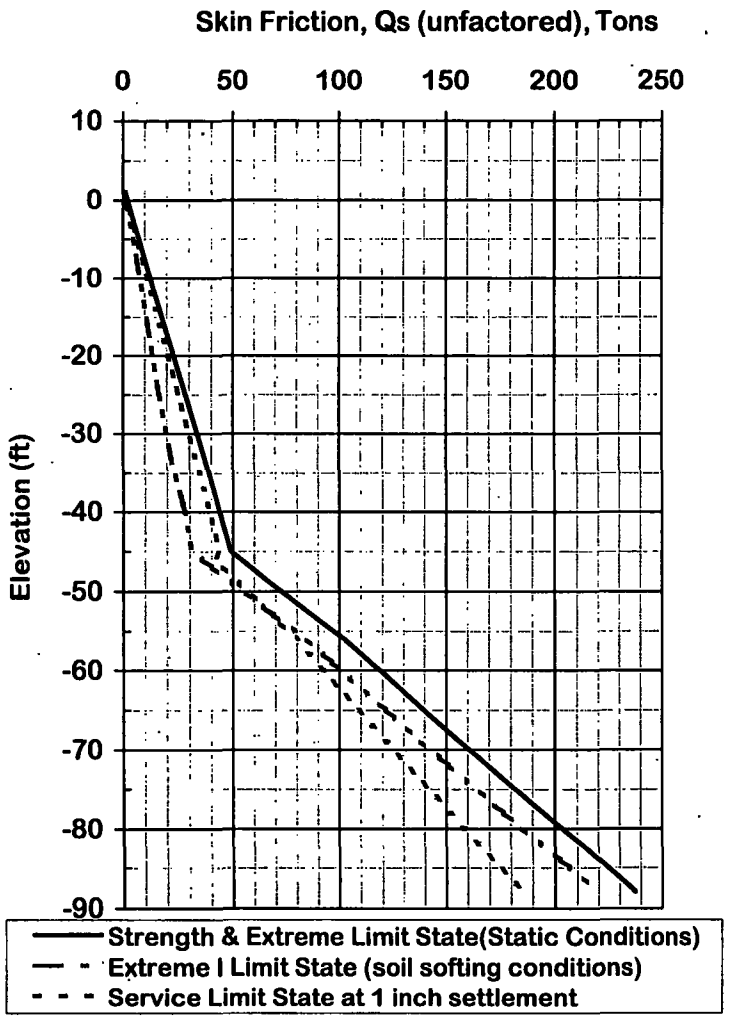
Pier 6: 3.0 ft. Diameter Permanent Casing Full Depth.
4.5 ft. Diameter Permanent Casing Full Depth.

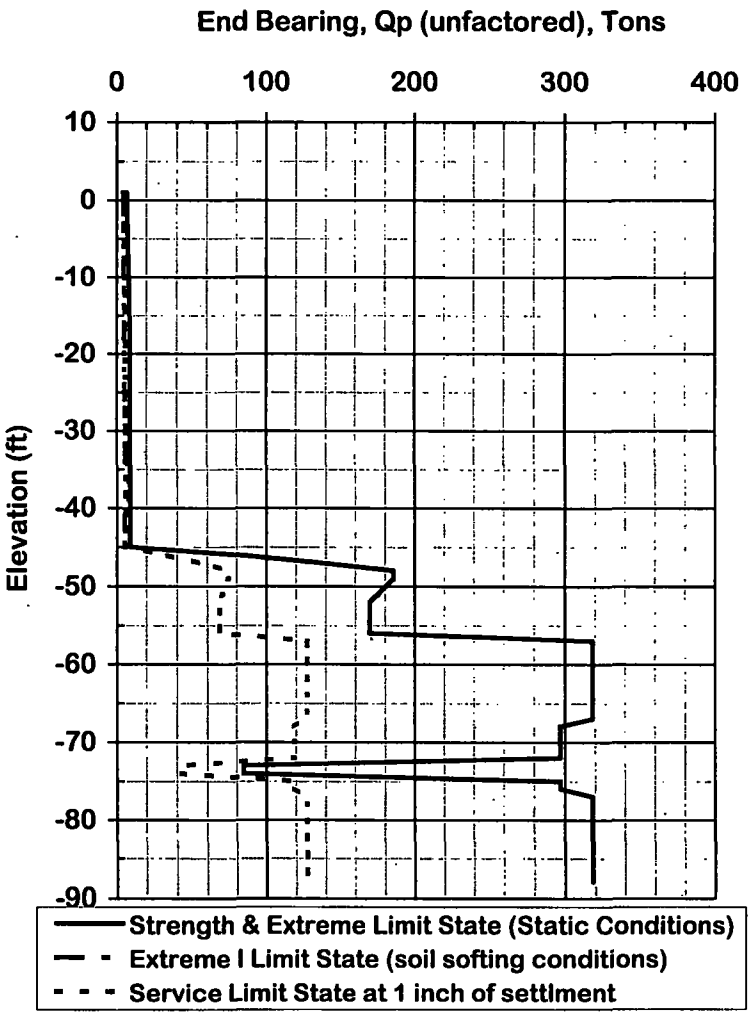
P-Y Curve Soil Data

Unfactored Strength, Service, and Extreme Limit State Capacity for Drilled Shafts

SR-107 Slough Bridge 107/5 **Pier 1**

Diameter = 3.0 feet
Shaft Type = Permanent Casing Full Depth.

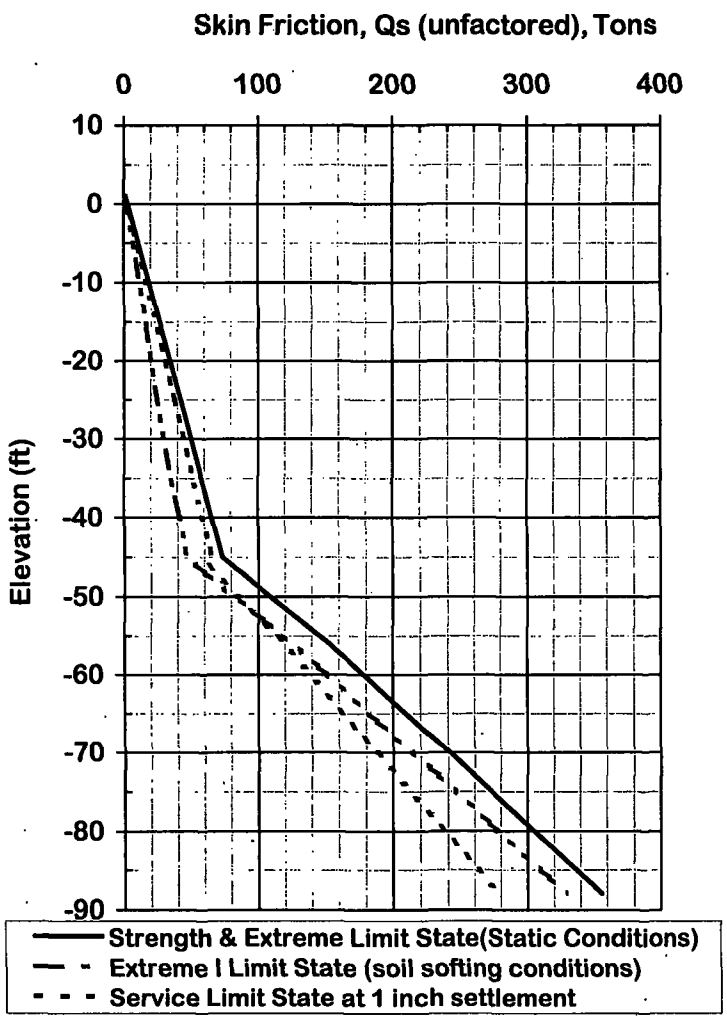


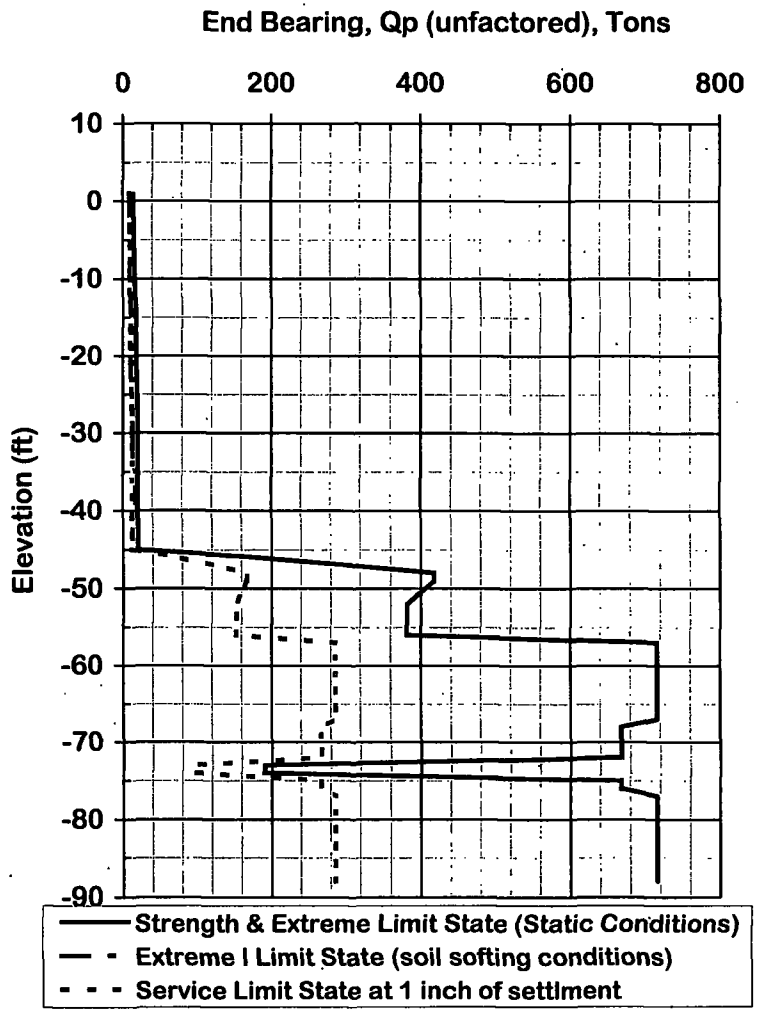


Unfactored Strength, Service, and Extreme Limit State Capacity for Drilled Shafts

SR-107 Slough Bridge 107/5 **Pier 1**

Diameter = 4.5 feet
Shaft Type = Permanent Casing Full Depth.

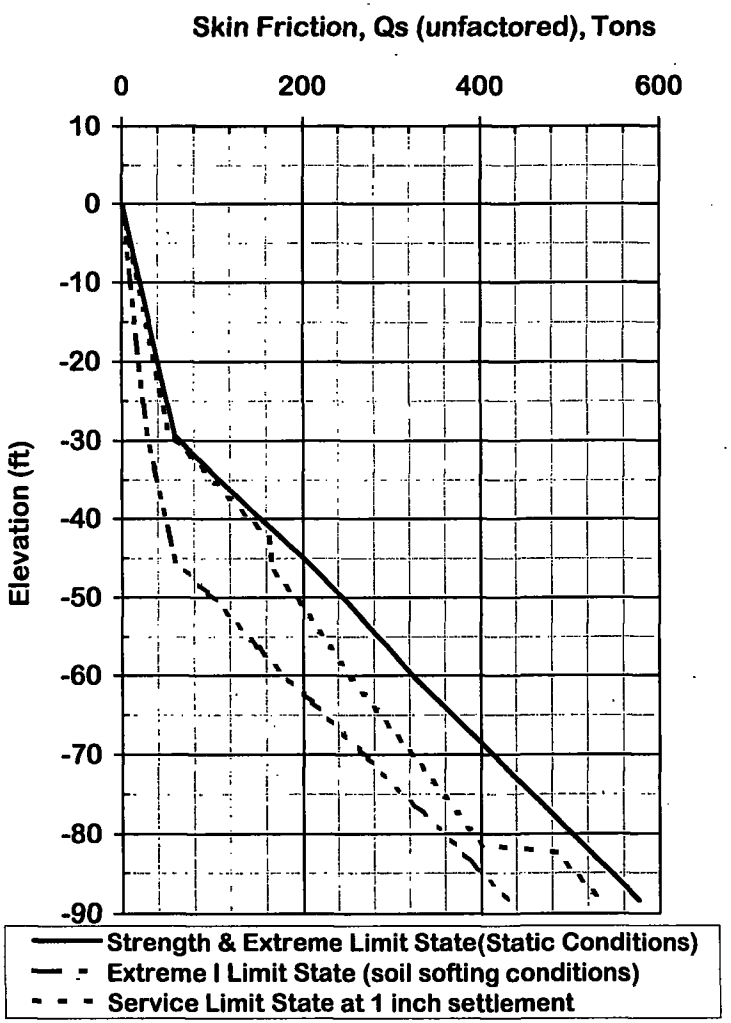


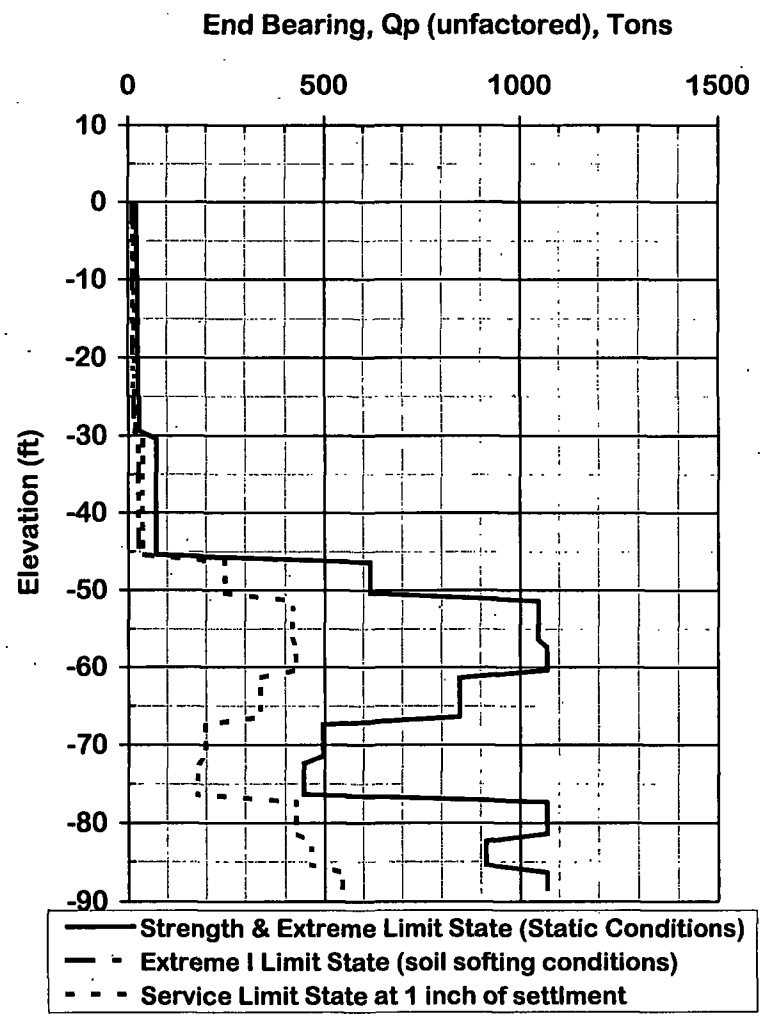


Unfactored Strength, Service, and Extreme Limit State Capacity for Drilled Shafts

SR-107 Slough Bridge 107/5 Piers 2 to 4

Diameter = 5.5 feet
Shaft Type = Permanent Casing Full Depth.

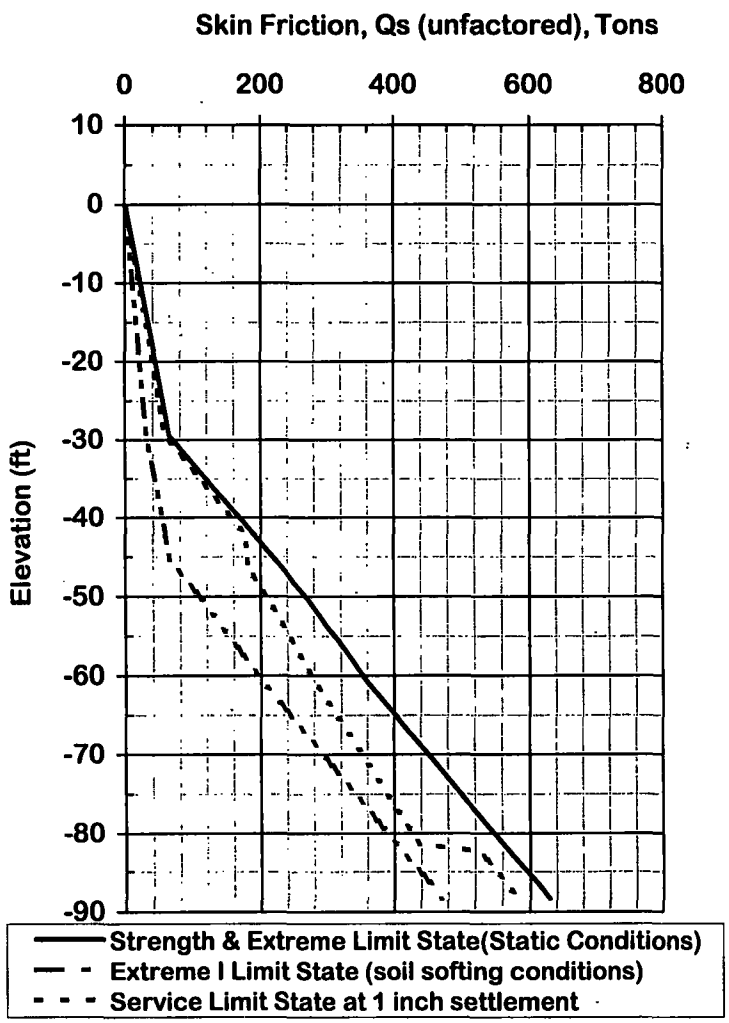


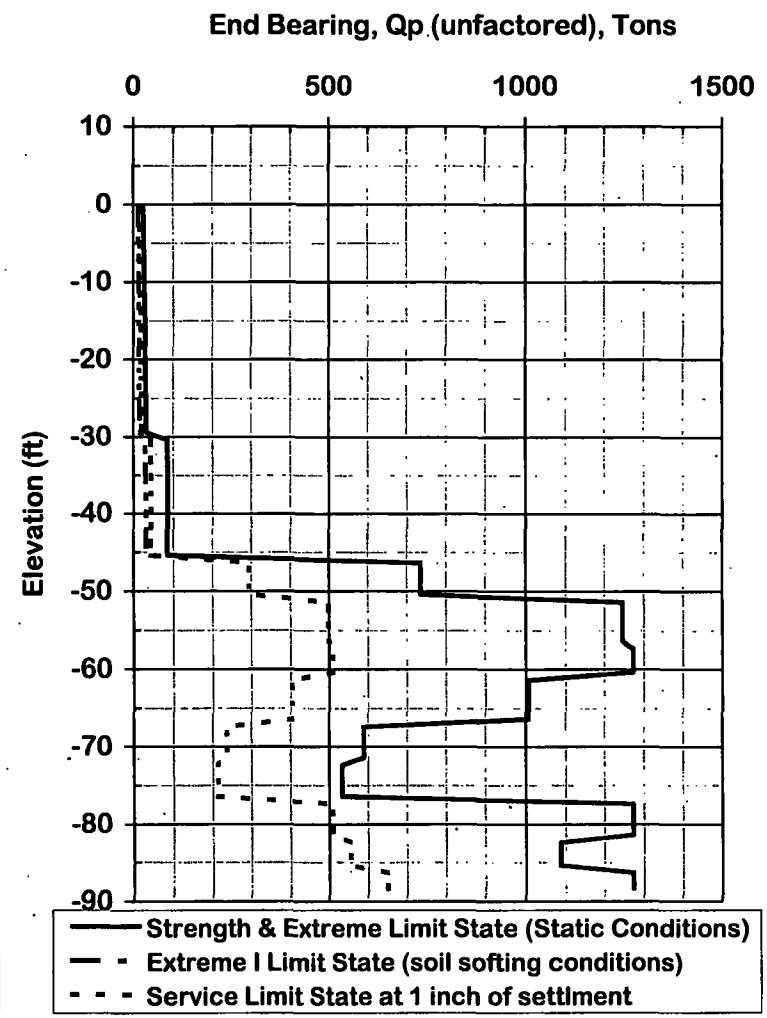


Unfactored Strength, Service, and Extreme Limit State Capacity for Drilled Shafts

SR-107 Slough Bridge 107/5 Piers 2 to 4

Diameter = 6.0 feet
Shaft Type = Permanent Casing full depth.

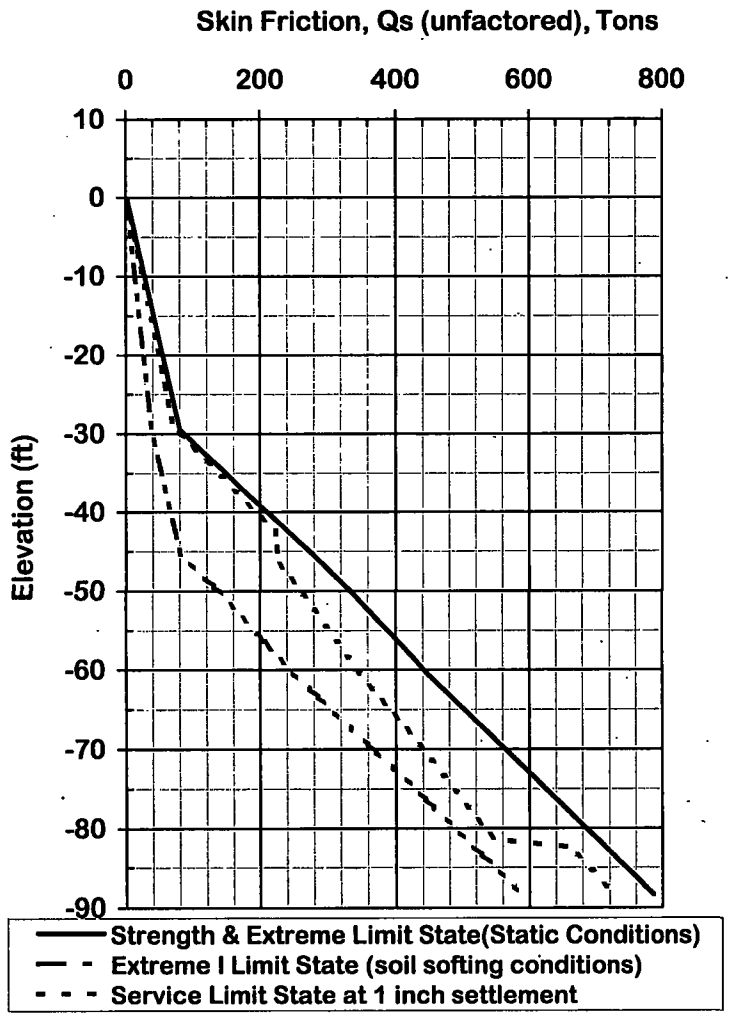


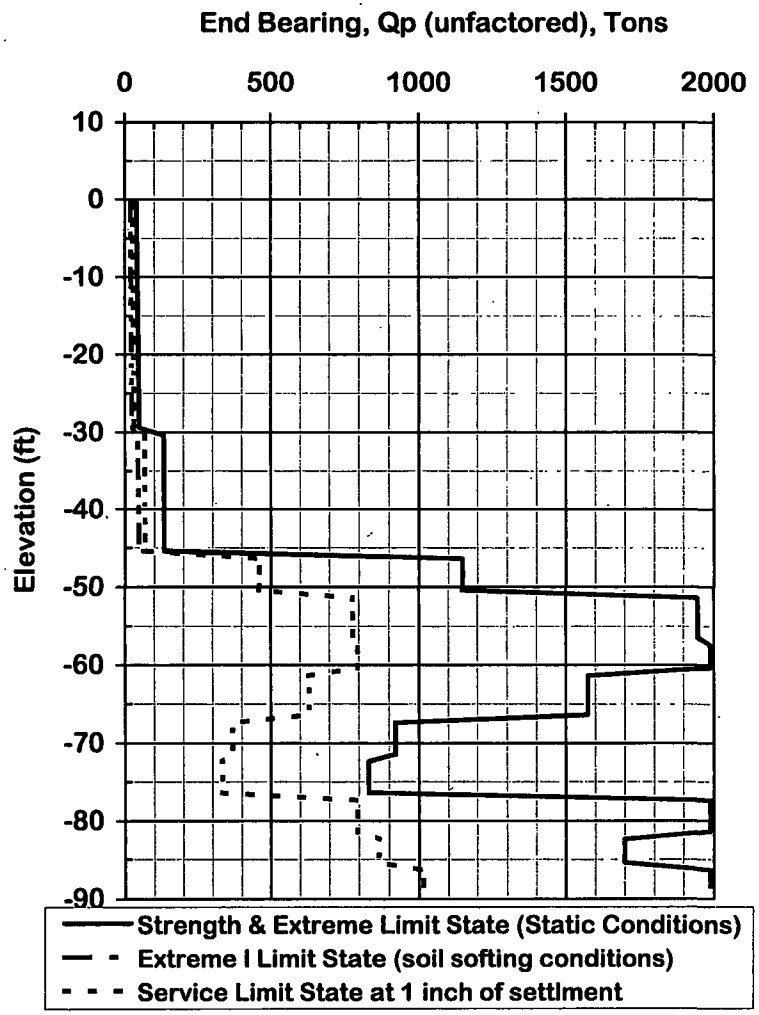


Unfactored Strength, Service, and Extreme Limit State Capacity for Drilled Shafts

SR-107 Slough Bridge 107/5 Piers 2 to 4

Diameter = 7.5 feet
Shaft Type = Permanent Casing Full Depth.

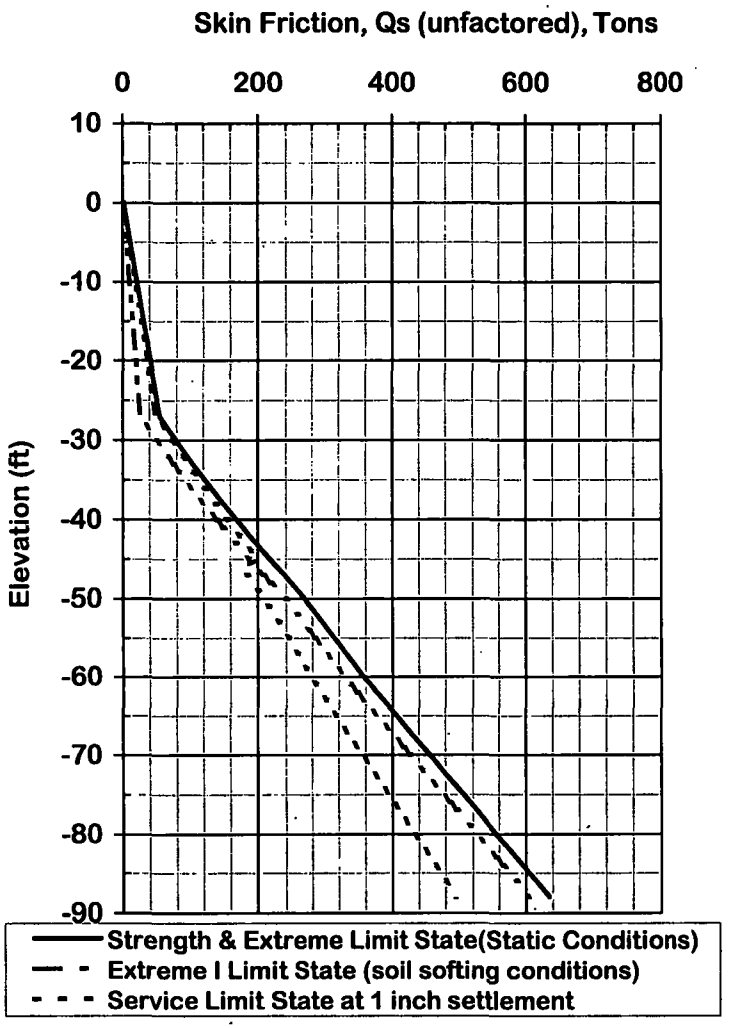


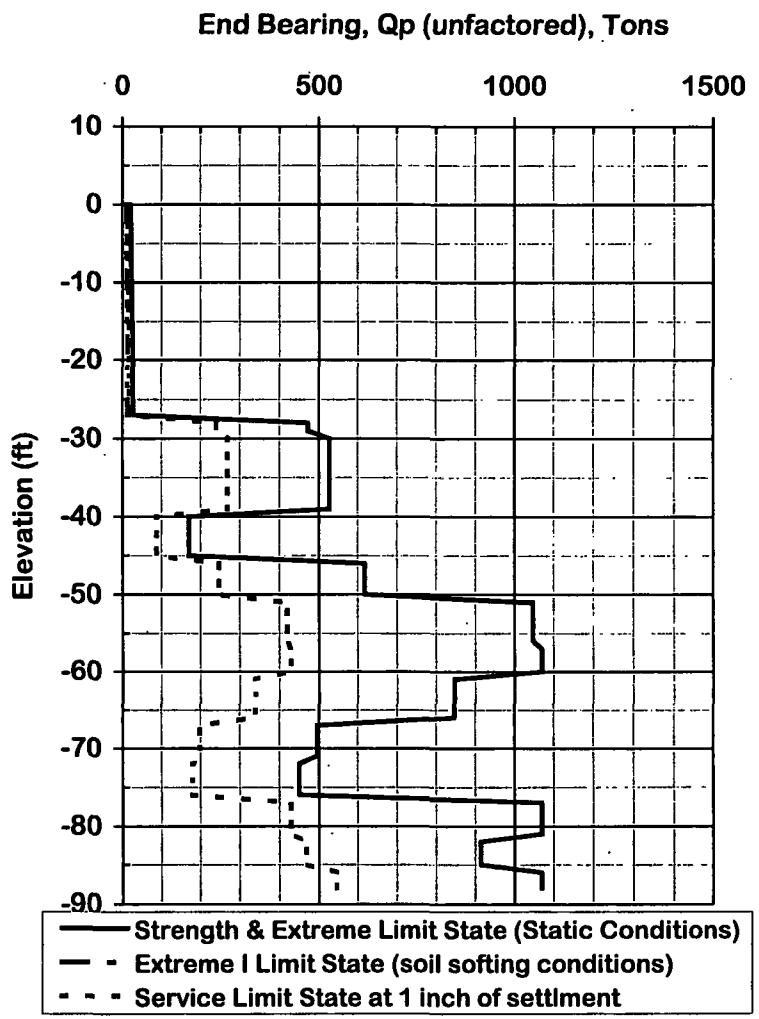


Unfactored Strength, Service, and Extreme Limit State Capacity for Drilled Shafts

SR-107 Slough Bridge 107/5 **Pier 5**

Diameter = 5.5 feet
Shaft Type = Permanent Casing Full Depth.

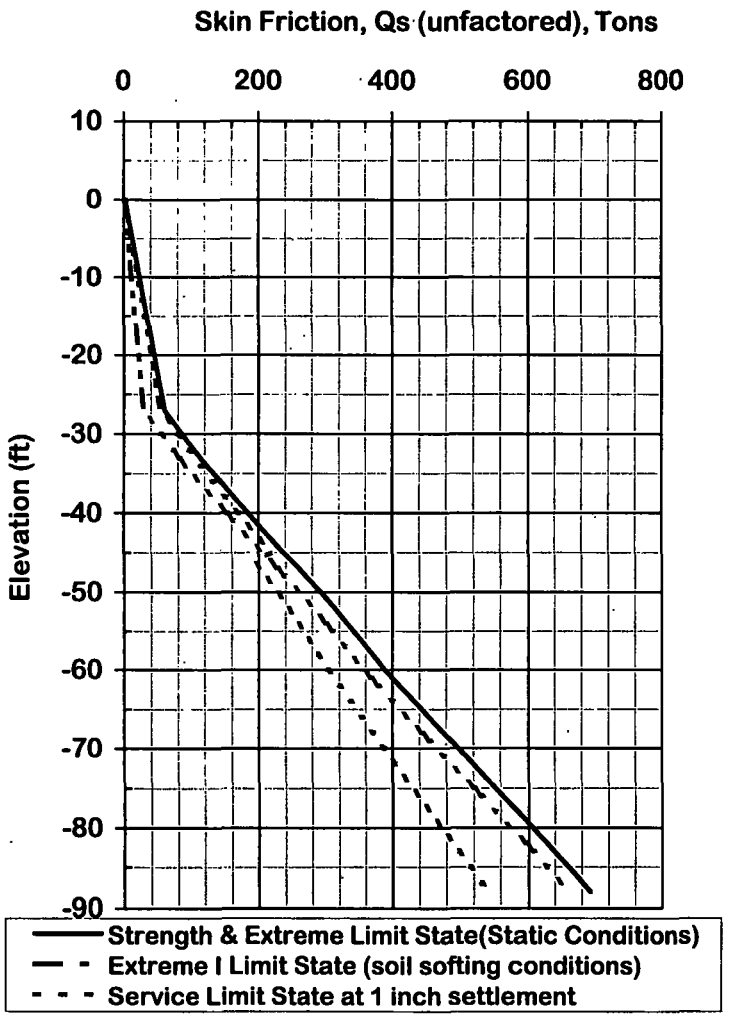


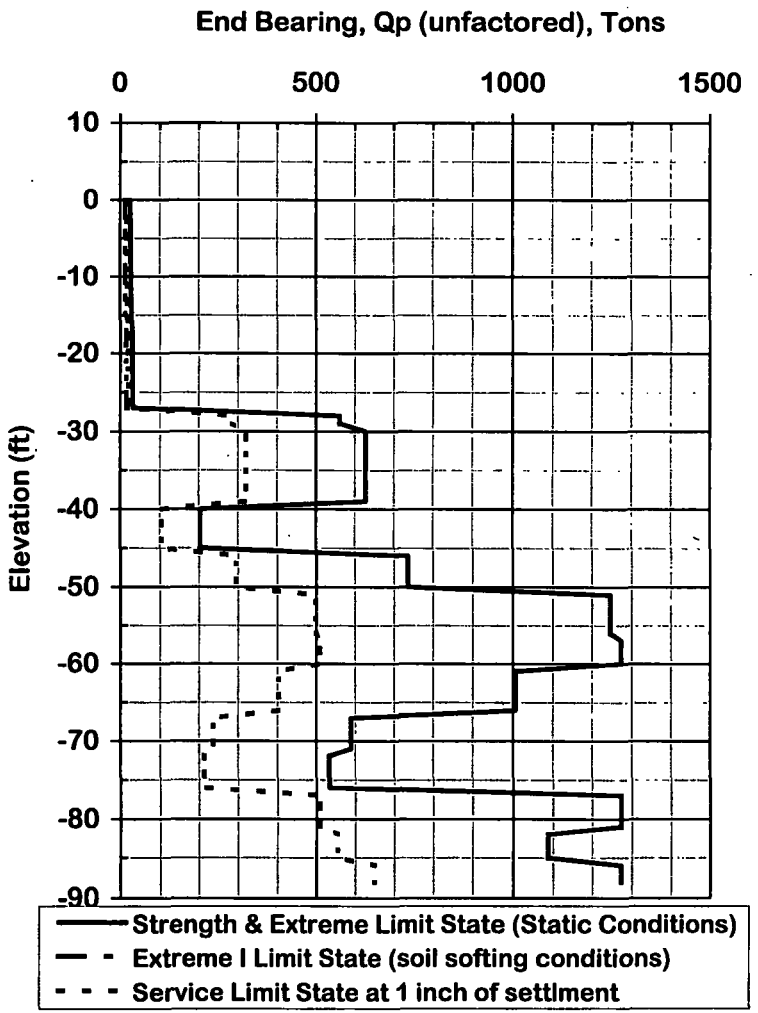


Unfactored Strength, Service, and Extreme Limit State Capacity for Drilled Shafts

SR-107 Slough Bridge 107/5 Pier 5

Diameter = 6.0 feet
Shaft Type = Permanent Casing Full Depth.

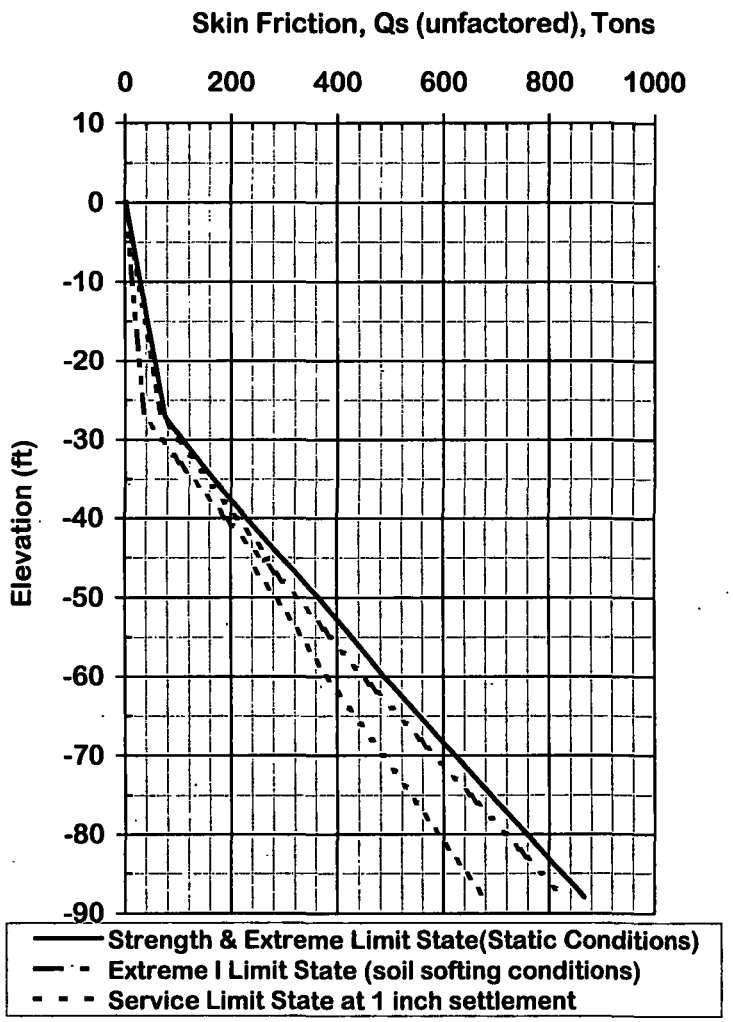


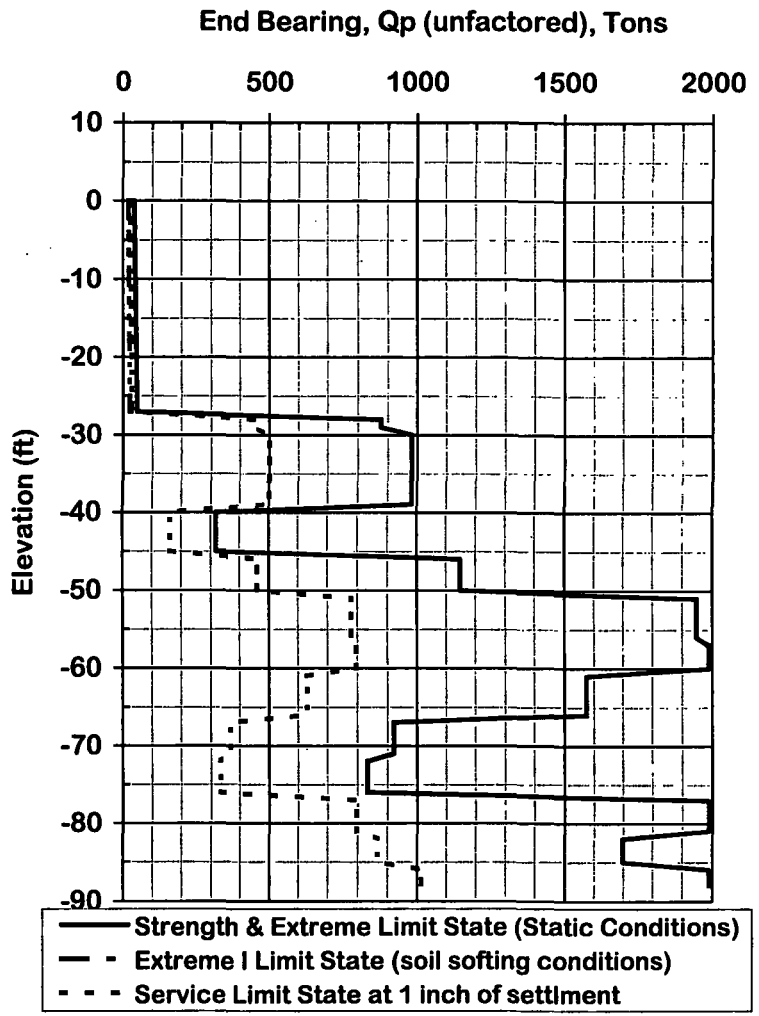


Unfactored Strength, Service, and Extreme Limit State Capacity for Drilled Shafts

SR-107 Slough Bridge 107/5 **Pier 5**

Diameter = 7.5 feet
Shaft Type = Permanent Casing Full Depth.

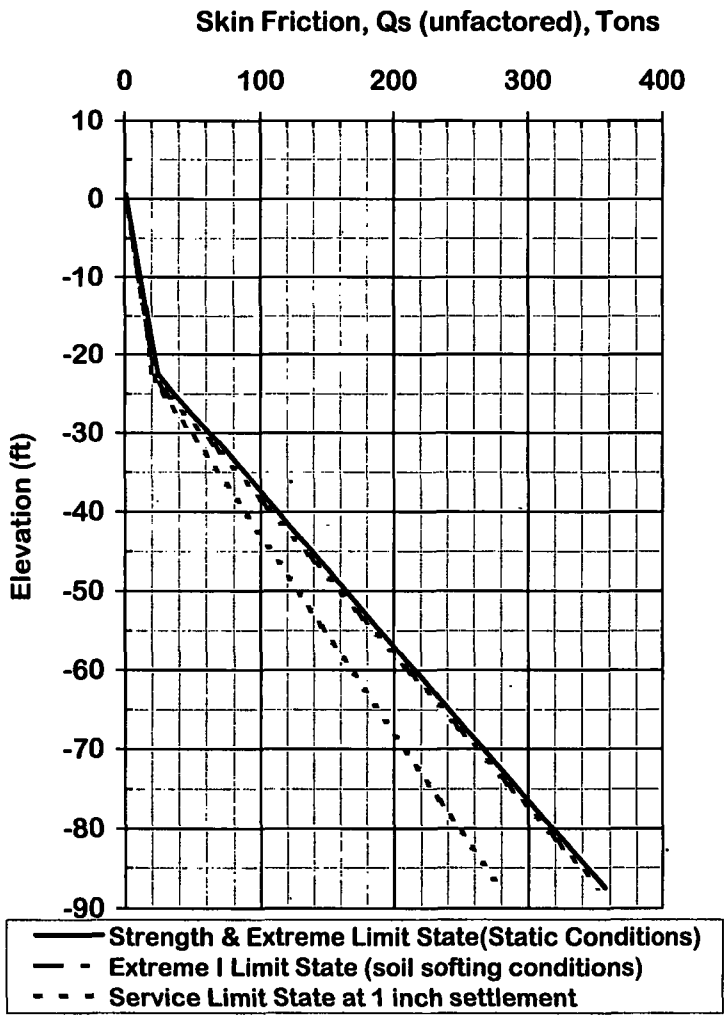


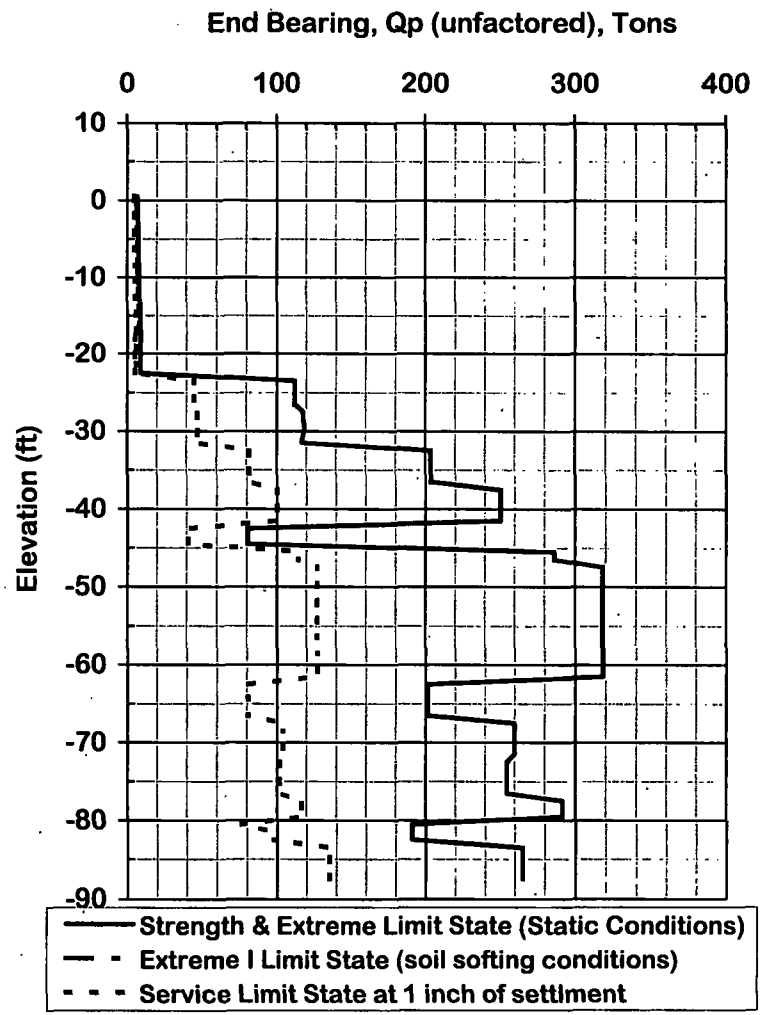


Unfactored Strength, Service, and Extreme Limit State Capacity for Drilled Shafts

SR-107 Slough Bridge 107/5 **Pier 6**

Diameter = 3.0 feet
Shaft Type = Permanent Casing Full Depth.

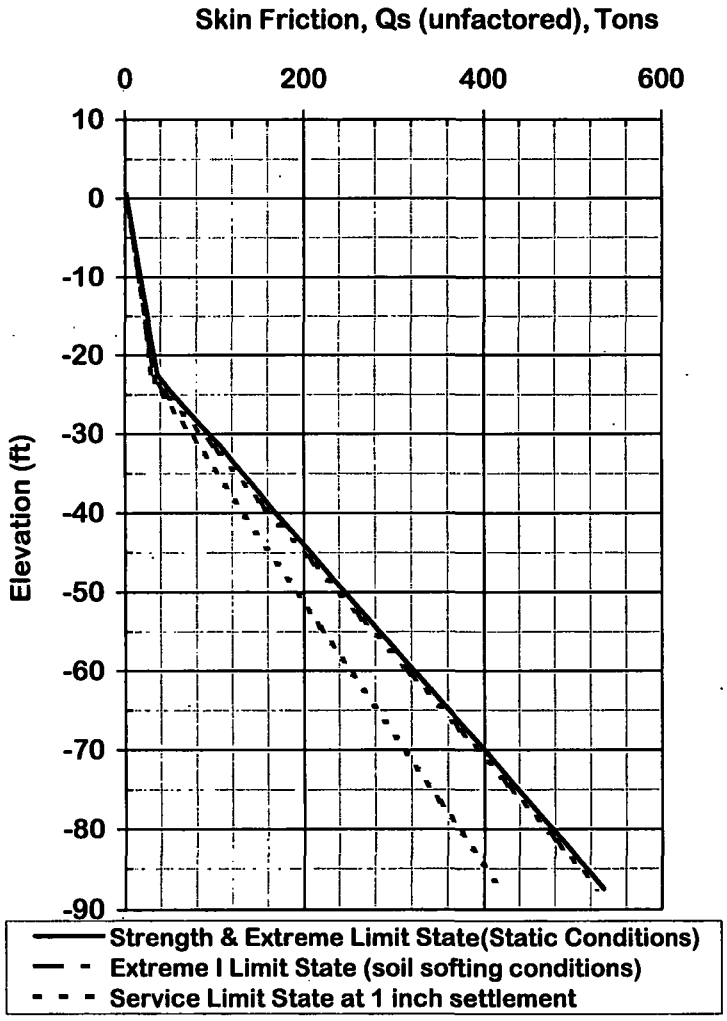


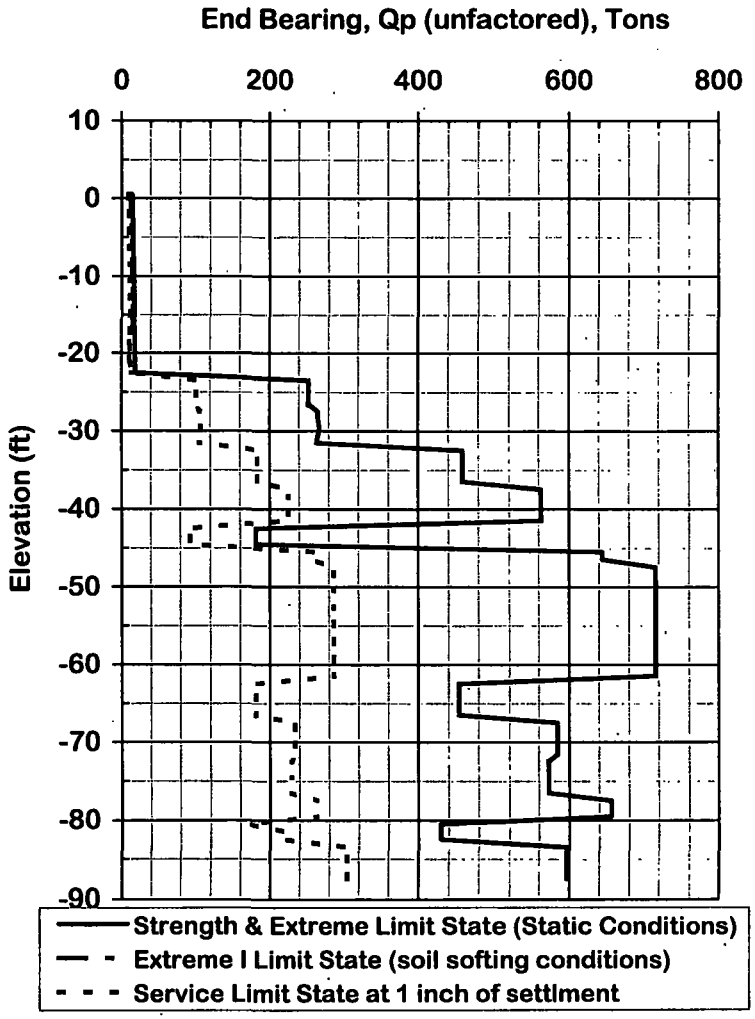


Unfactored Strength, Service, and Extreme Limit State Capacity for Drilled Shafts

SR-107 Slough Bridge 107/5 Pier 6

Diameter = 4.5 feet
Shaft Type = Permanent Casing Full Depth.





SR-107 Slough Bridge 107/5
Bridge Replacement

P-Y CURVE SOIL DATA
for LPILE Program

Applies to Pier: 1

Ground Surface Elevation (ft): 7.0

					STATIC ANALYSIS						
Soil Layer	Depth to Layer Bottom	Bottom of Layer Elevation	Soil Type	KSOIL	Effective Unit Weight of Soil		Cohesion		Axial Strain ε_{50}	Friction Angle ϕ	Modulus of Subgrade Reaction k
	ft	ft			lb/in3	pcf	psi	psf	(%)	(deg)	pci
1	5	2.0	Soft Clay	1	0.058	100	0.97	140	4.0		
2	41	-34.0	Soft Clay	1	0.022	38	0.97	140	4.0		
3	52	-45.0	Soft Clay	1	0.022	38	0.97	140	4.0		
4	80	-73.0	Sand	4	0.039	68				38	120
5	82	-75.0	Sand	4	0.036	63				30	30
6	100	-93.0	Sand	4	0.042	72				44	200

					DYNAMIC ANALYSIS						
Soil Layer	Depth to Layer Bottom	Bottom of Layer Elevation	Soil Type	KSOIL	Effective Unit Weight of Soil		Cohesion		Axial Strain ε_{50}	Friction Angle ϕ	Modulus of Subgrade Reaction k
	ft	ft			lb/in3	pcf	psi	psf	(%)	(deg)	pci
1	5	2.0	Soft Clay	1	0.058	100	0.59	85	4.0		
2	41	-34.0	Soft Clay	1	0.021	37	0.59	85	4.0		
3	52	-45.0	Soft Clay	1	0.021	37	0.85	122	4.0		
4	80	-73.0	Sand	4	0.039	68				38	120
5	82	-75.0	Sand	4	0.036	63				30	30
6	100	-93.0	Sand	4	0.042	72				44	200

Applies to Piers: 2 to 4

Ground Surface Elevation (ft): 6.6

					STATIC ANALYSIS						
Soil Layer	Depth to Layer Bottom	Bottom of Layer Elevation	Soil Type	KSOIL	Effective Unit Weight of Soil		Cohesion		Axial Strain ε_{50}	Friction Angle ϕ	Modulus of Subgrade Reaction k
	ft	ft			lb/in3	pcf	psi	psf	(%)	(deg)	pci
1	5	1.9	Soft Clay	1	0.058	100	0.97	140	4.0		
2	36	-29.1	Soft Clay	1	0.022	38	0.97	140	4.0		
3	53	-46.1	Sand	4	0.022	38				27	10
4	83	-76.4	Sand	4	0.039	68				38	120
5	100	-93.4	Sand	4	0.036	63				44	200

					DYNAMIC ANALYSIS						
Soil Layer	Depth to Layer Bottom	Bottom of Layer Elevation	Soil Type	KSOIL	Effective Unit Weight of Soil		Cohesion		Axial Strain ε_{50}	Friction Angle ϕ	Modulus of Subgrade Reaction k
	ft	ft			lb/in3	pcf	psi	psf	(%)	(deg)	pci
1	5	1.9	Soft Clay	1	0.058	100	0.46	66	4.0		
2	36	-29.1	Soft Clay	1	0.021	37	0.46	66	4.0		
3	53	-46.1	Soft Clay	1	0.021	37	0.85	122	4.0		
4	83	-76.4	Sand	4	0.039	68				38	120
5	100	-93.4	Sand	4	0.036	63				44	200

SR-107 Slough Bridge 107/5
Bridge Replacement

P-Y CURVE SOIL DATA
for LPILE Program

Applies to Pier: 5

Ground Surface Elevation (ft): 7.0

					STATIC ANALYSIS						
Soil Layer	Depth to Layer Bottom	Bottom of Layer Elevation	Soil Type	KSOIL	Effective Unit Weight of Soil		Cohesion		Axial Strain ε_{50}	Friction Angle ϕ	Modulus of Subgrade Reaction k
	ft	ft			lb/in3	pcf	psi	psf	(%)	(deg)	pci
1	5	2.0	Soft Clay	1	0.022	38	0.97	140	4.0		
2	34	-27.0	Soft Clay	1	0.022	38	0.97	140	4.0		
3	46	-39.0	Sand	4	0.036	63				36	90
4	52	-45.0	Sand	4	0.028	48				30	40
5	82	-75.0	Sand	4	0.039	68				40	140
6	100	-93.0	Sand	4	0.039	68				44	200

					DYNAMIC ANALYSIS						
Soil Layer	Depth to Layer Bottom	Bottom of Layer Elevation	Soil Type	KSOIL	Effective Unit Weight of Soil		Cohesion		Axial Strain ε_{50}	Friction Angle ϕ	Modulus of Subgrade Reaction k
	ft	ft			lb/in3	pcf	psi	psf	(%)	(deg)	pci
1	5	2.0	Soft Clay	1	0.058	100	0.46	66	4.0		
2	34	-27.0	Soft Clay	1	0.022	38	0.46	66	4.0		
3	46	-39.0	Sand	4	0.036	63				36	90
4	52	-45.0	Sand	4	0.028	48				32	40
5	82	-75.0	Sand	4	0.039	68				40	140
6	100	-93.0	Sand	4	0.039	68				44	200

Applies to Pier: 6

Ground Surface Elevation (ft): 7.5

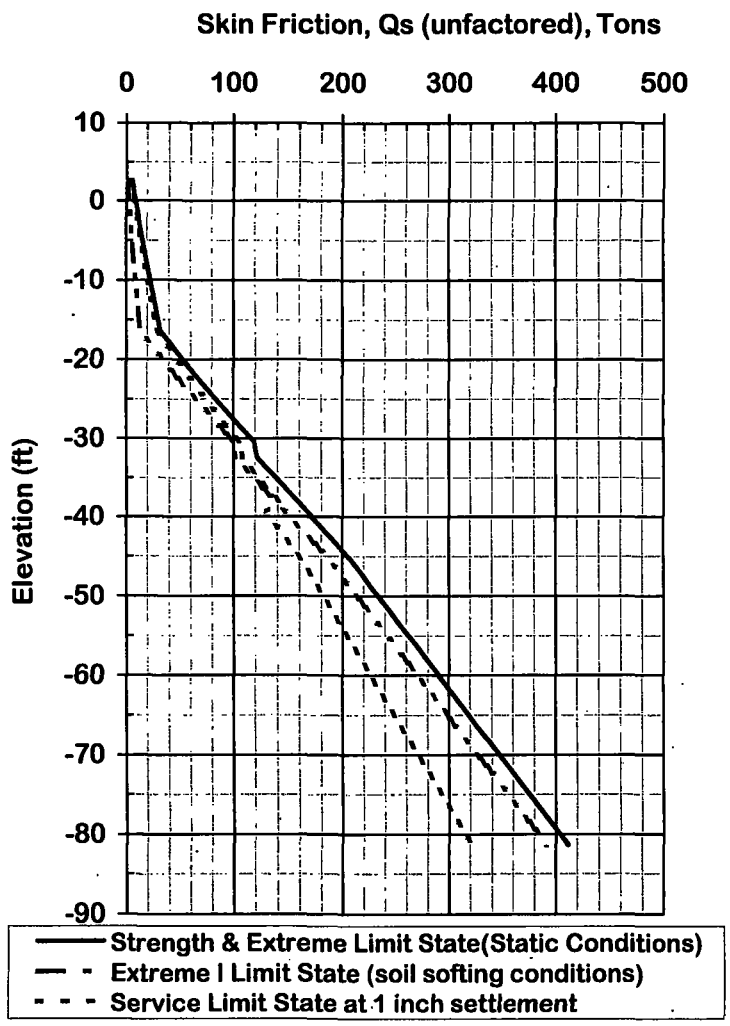
					STATIC ANALYSIS						
Soil Layer	Depth to Layer Bottom	Bottom of Layer Elevation	Soil Type	KSOIL	Effective Unit Weight of Soil		Cohesion		Axial Strain ε_{50}	Friction Angle ϕ	Modulus of Subgrade Reaction k
	ft	ft			lb/in3	pcf	psi	psf	(%)	(deg)	pci
1	5.7	1.8	Soft Clay	1	0.058	100	0.97	140	4.0		
2	30	-22.5	Soft Clay	1	0.022	38	0.97	140	4.0		
3	49	-41.5	Sand	4	0.038	66				36	90
4	52	-44.5	Sand	4	0.036	63				32	50
5	100	-92.5	Sand	4	0.039	68				40	140

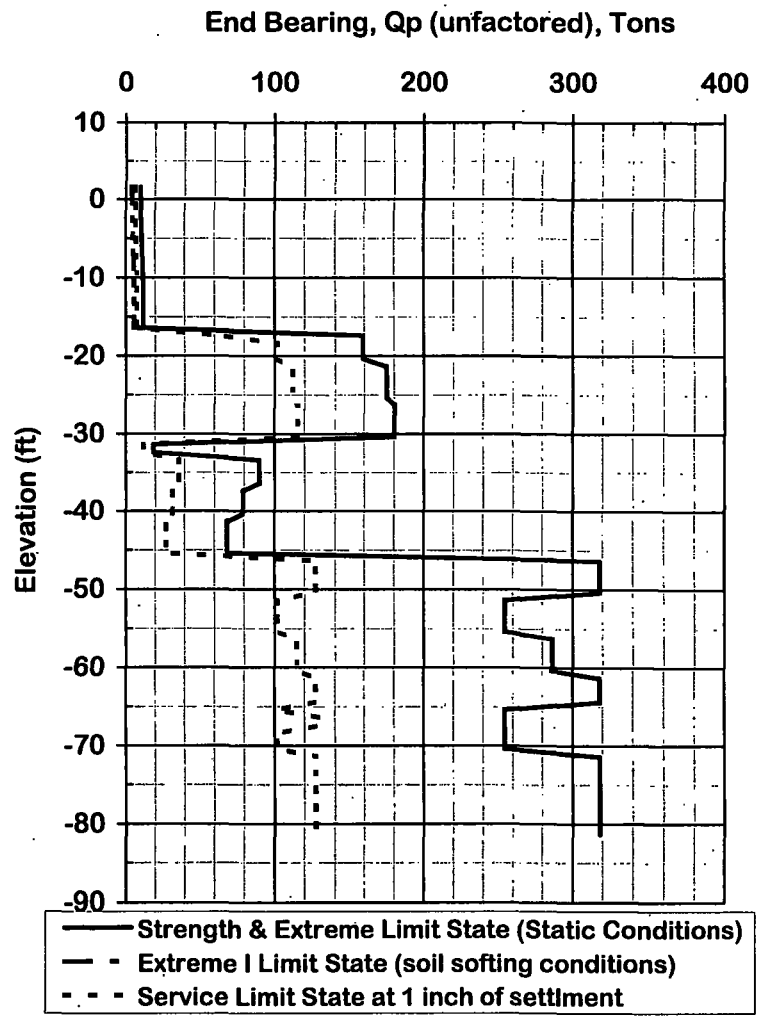
					DYNAMIC ANALYSIS						
Soil Layer	Depth to Layer Bottom	Bottom of Layer Elevation	Soil Type	KSOIL	Effective Unit Weight of Soil		Cohesion		Axial Strain ε_{50}	Friction Angle ϕ	Modulus of Subgrade Reaction k
	ft	ft			lb/in3	pcf	psi	psf	(%)	(deg)	pci
1	5.7	1.8	Soft Clay	1	0.058	100	0.56	80	4.0		
2	30	-22.5	Soft Clay	1	0.022	38	0.56	80	4.0		
3	49	-41.5	Sand	4	0.038	66				36	90
4	52	-44.5	Sand	4	0.036	63				32	40
5	100	-92.5	Sand	4	0.039	68				40	140

Unfactored Strength, Service, and Extreme Limit State Capacity for Drilled Shafts

SR-107 Slough Bridge 107/6 Pier 1

Diameter = 3.0 feet
Shaft Type = Permanent Casing Full Depth.

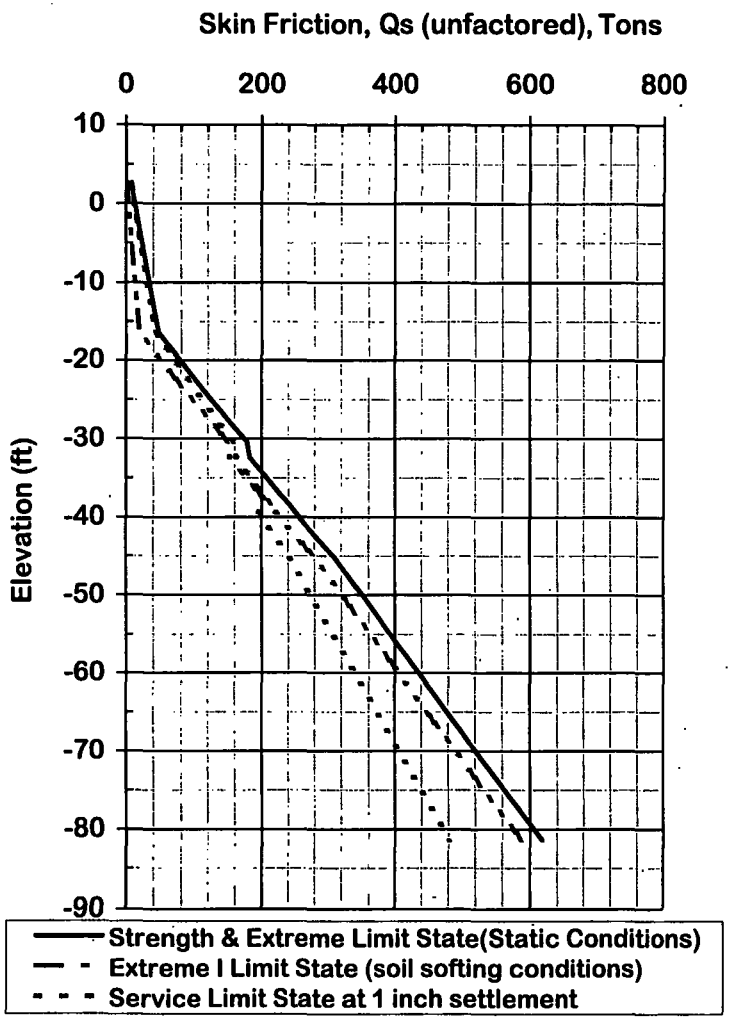


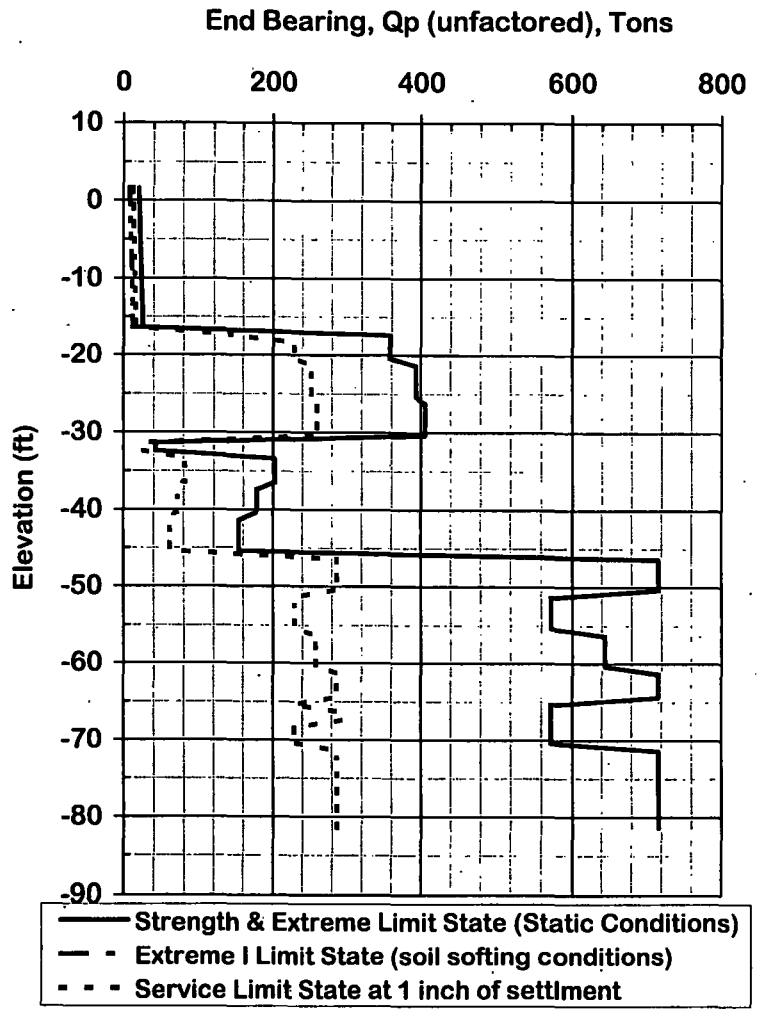


Unfactored Strength, Service, and Extreme Limit State Capacity for Drilled Shafts

SR-107 Slough Bridge 107/6 **Pier 1**

Diameter = 4.5 feet
Shaft Type = Permanent Casing Full Depth.

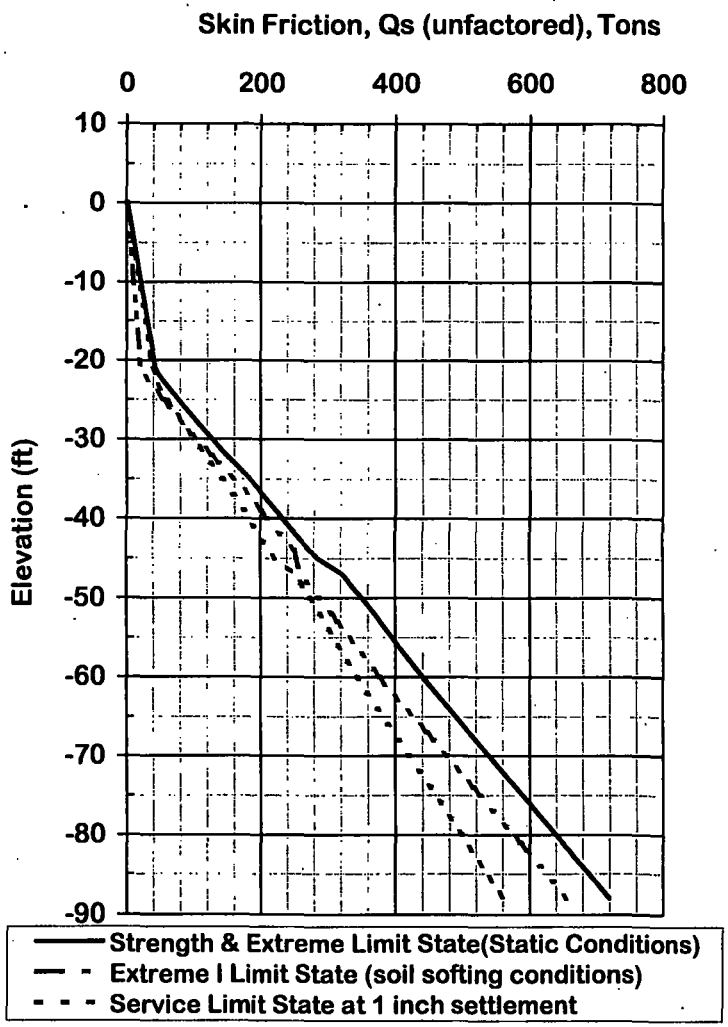


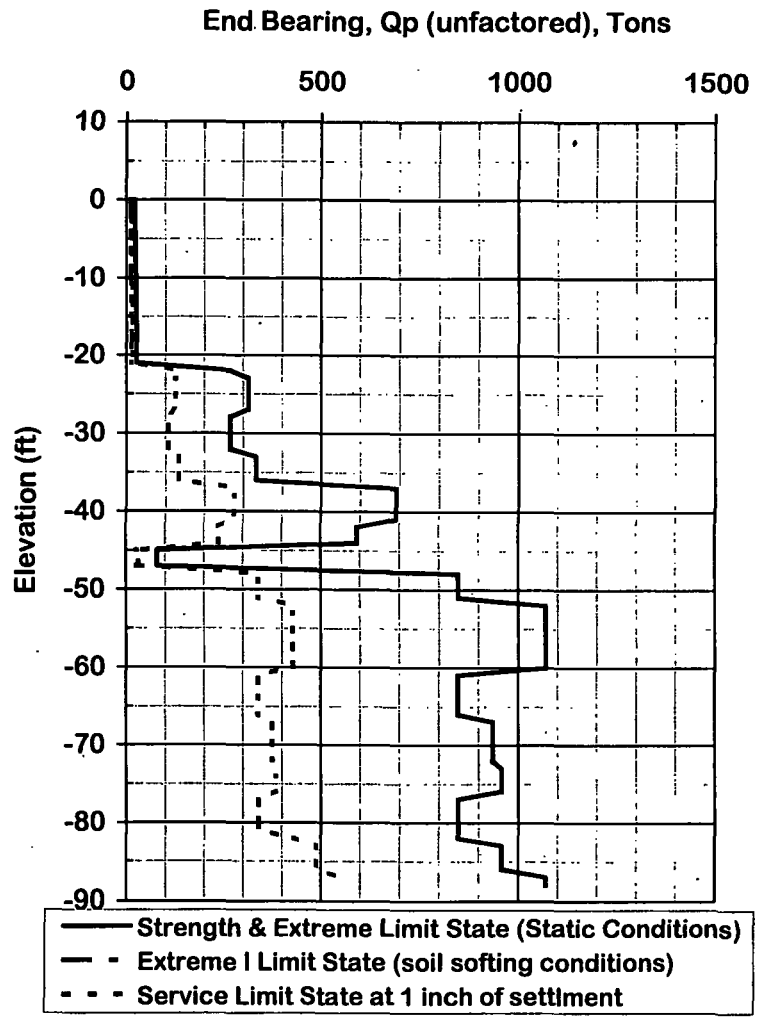


Unfactored Strength, Service, and Extreme Limit State Capacity for Drilled Shafts

SR-107 Slough Bridge 107/6 Piers 2 to 5

Diameter = 5.5 feet
Shaft Type = Permanent Casing Full Depth.

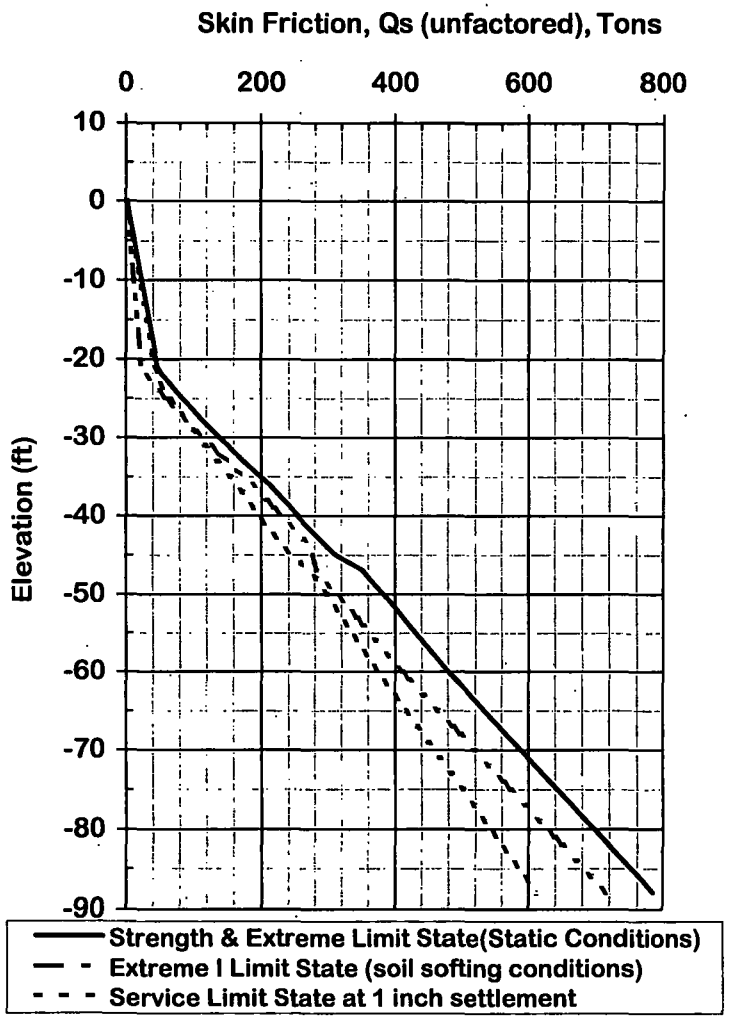


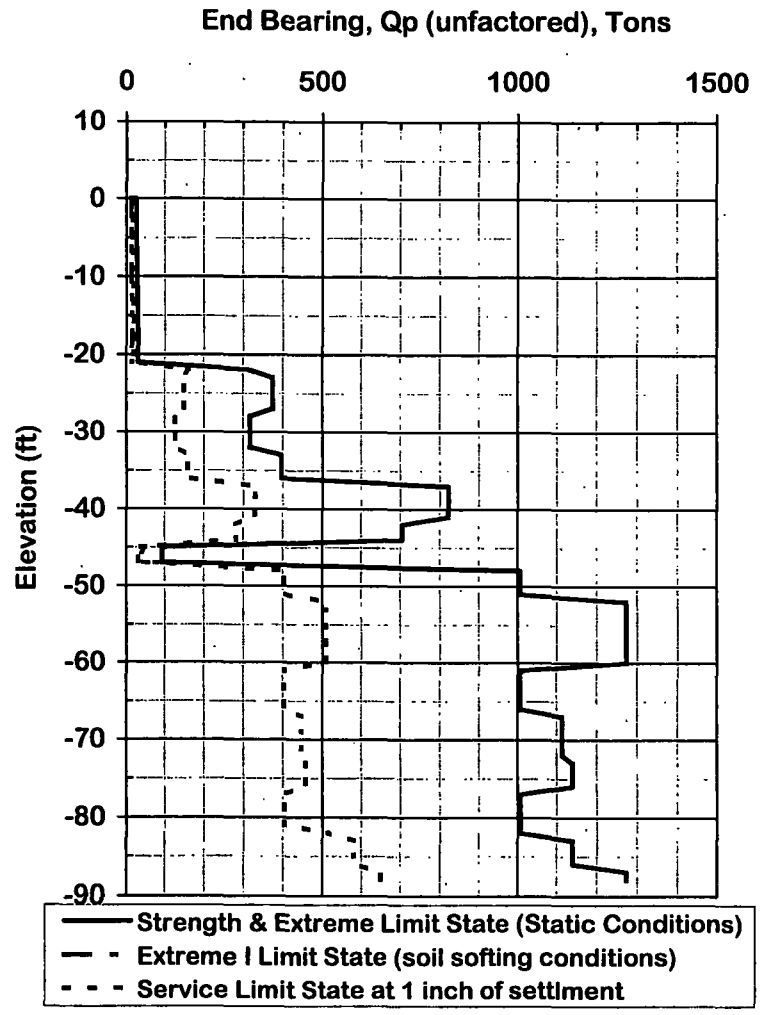


Unfactored Strength, Service, and Extreme Limit State Capacity for Drilled Shafts

SR-107 Slough Bridge 107/6 Piers 2 to 5

Diameter = 6.0 feet
Shaft Type = Permanent Casing Full Depth.

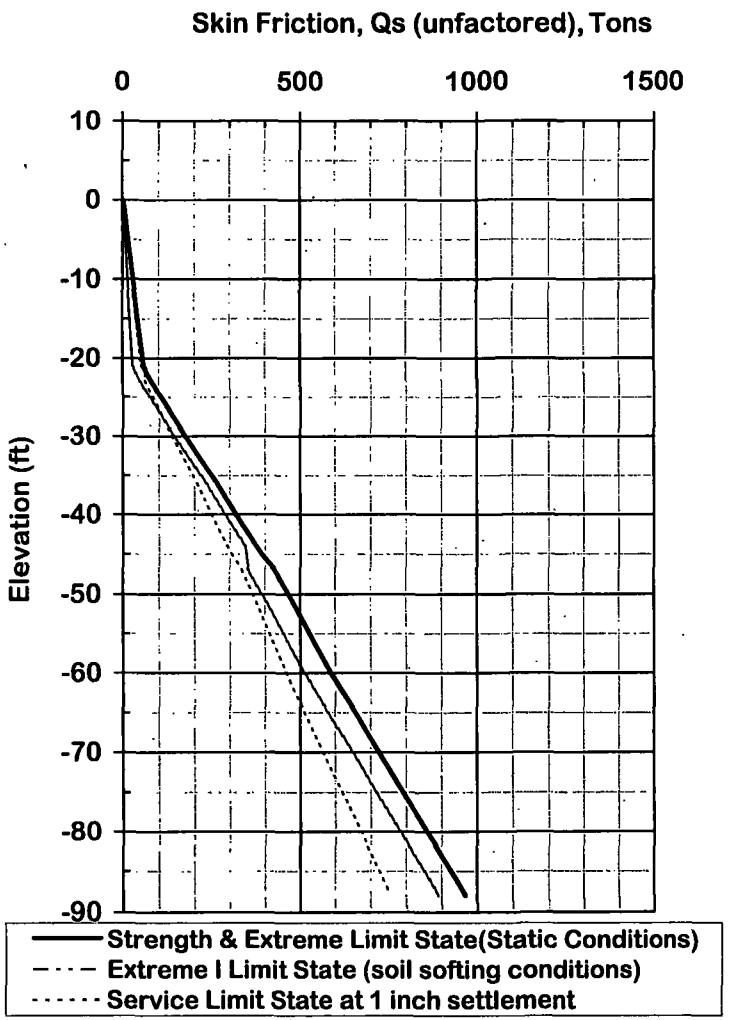


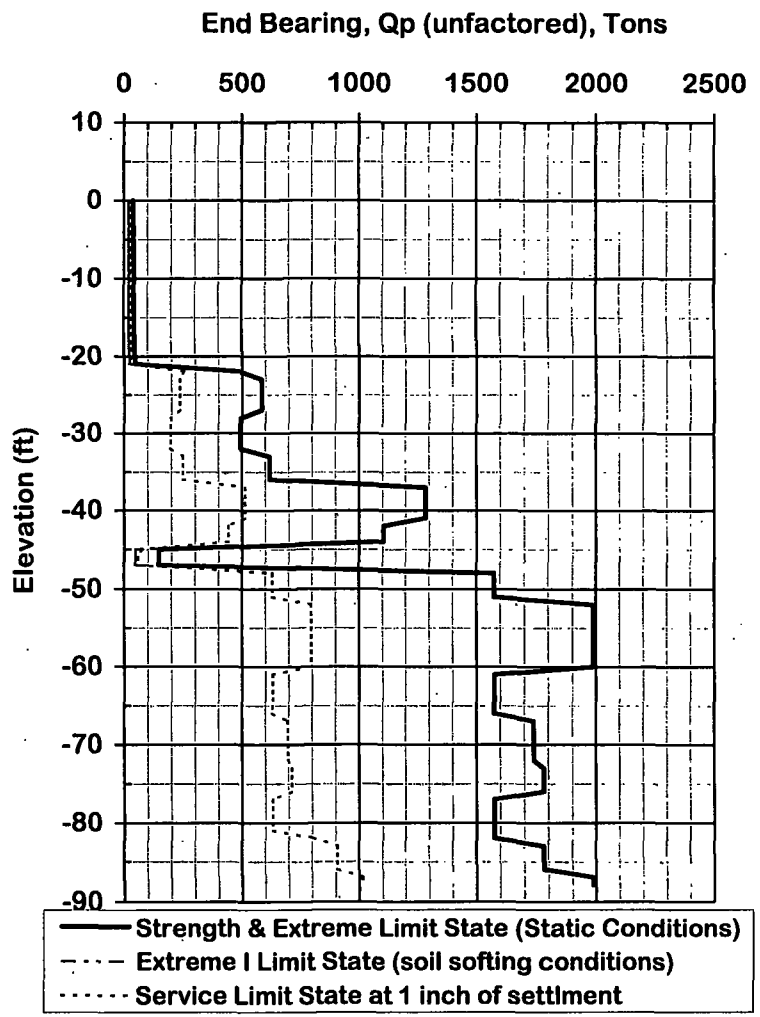


Unfactored Strength, Service, and Extreme Limit State Capacity for Drilled Shafts

SR-107 Slough Bridge 107/6 **Piers 2 to 5**

Diameter = 7.5 feet
Shaft Type = Permanent Casing Full Depth.

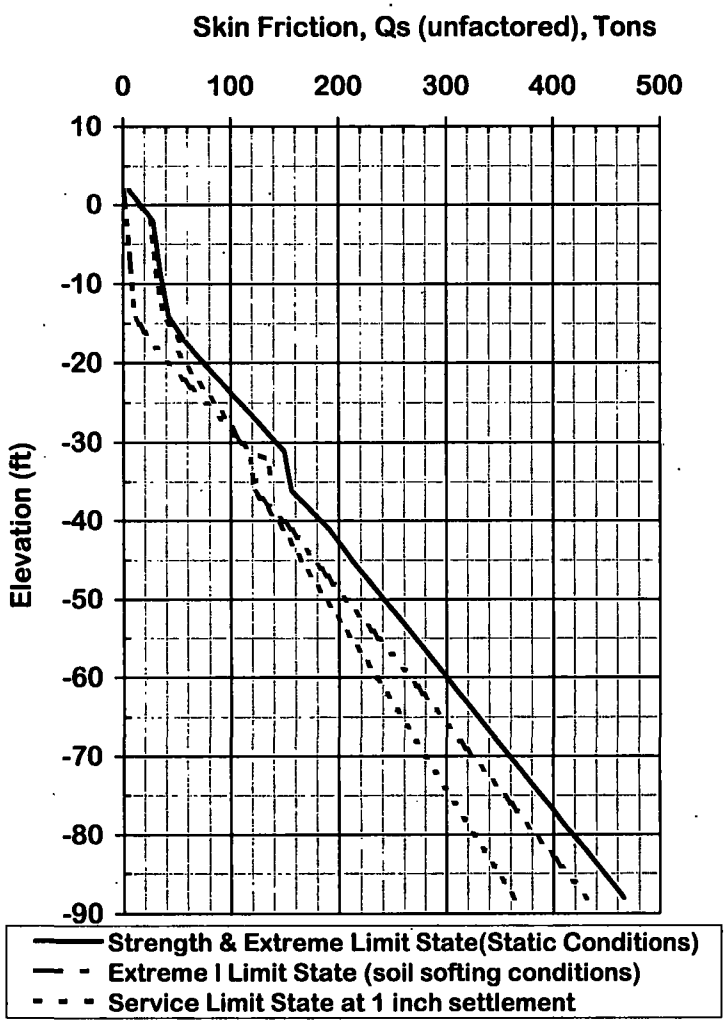


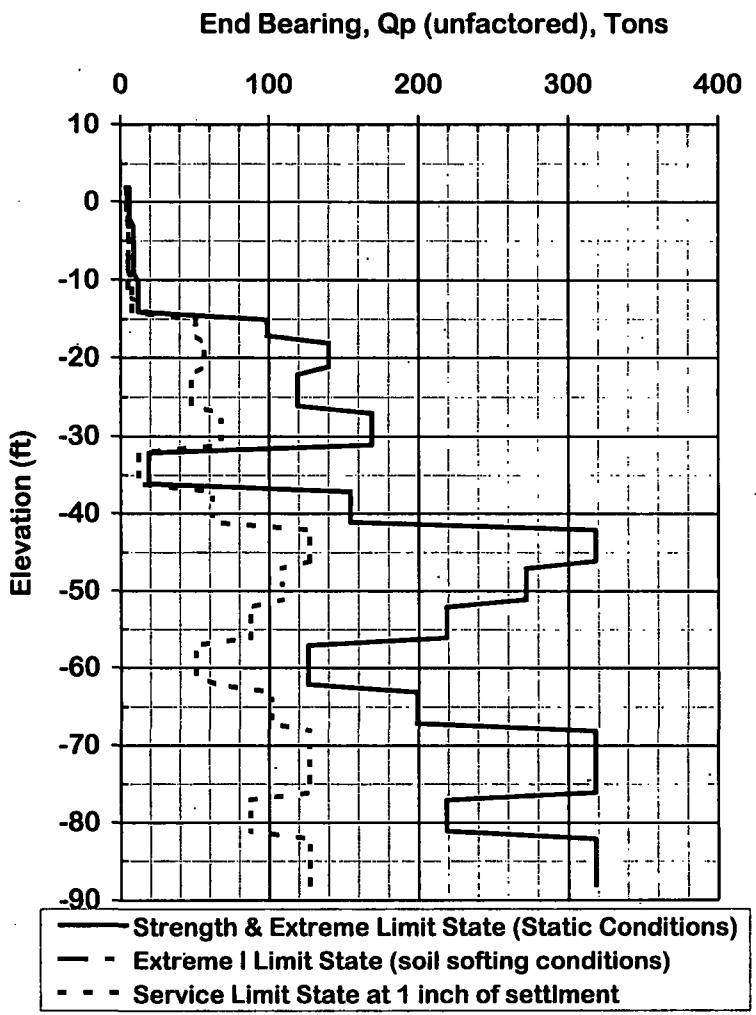


Unfactored Strength, Service, and Extreme Limit State Capacity for Drilled Shafts

SR-107 Slough Bridge 107/6 Pier 6

Diameter = 3.0 feet
Shaft Type = Permanent Casing Full Depth.

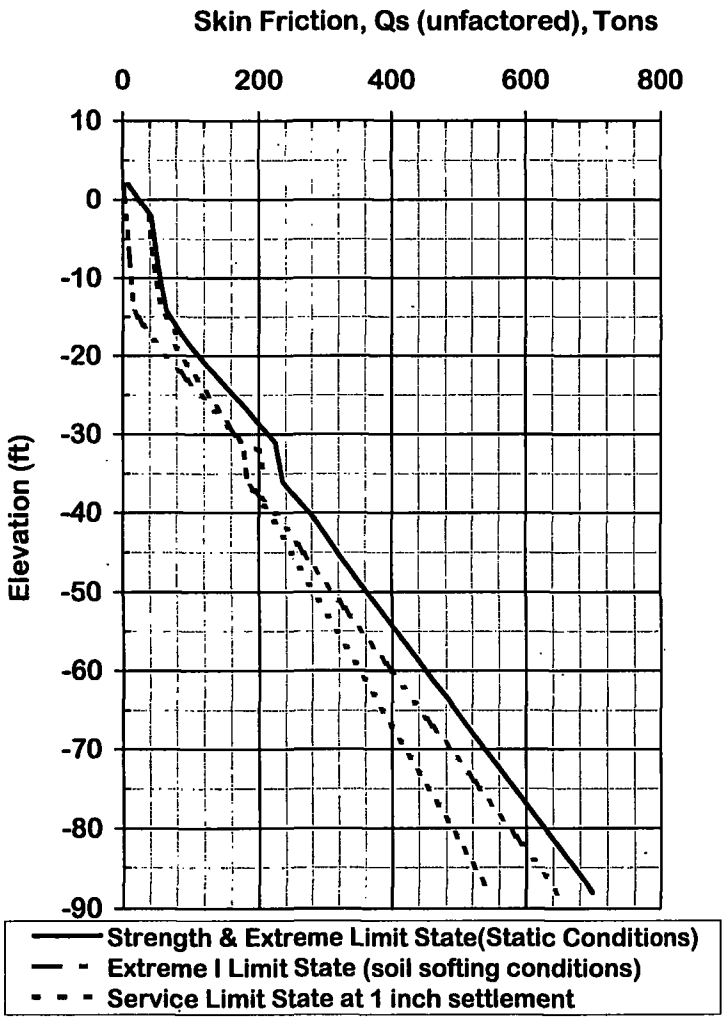


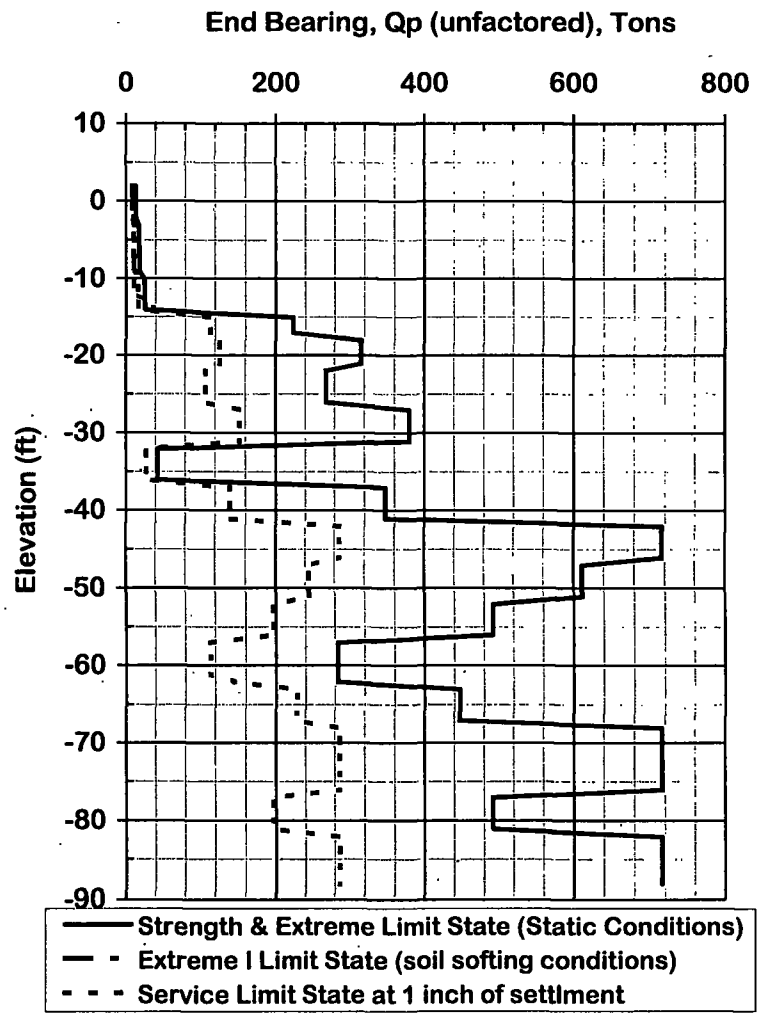


Unfactored Strength, Service, and Extreme Limit State Capacity for Drilled Shafts

SR-107 Slough Bridge 107/6 Pier 6

Diameter = 4.5 feet
Shaft Type = Permanent Casing Full Depth.





SR-107 Slough Bridge 107/6
Bridge Replacement

P-Y CURVE SOIL DATA
for LPILE Program

Applies to Pier: 1

Ground Surface Elevation (ft): 13.6

					STATIC ANALYSIS						
Soil Layer	Depth to Layer Bottom	Bottom of Layer Elevation	Soil Type	KSOIL	Effective Unit Weight of Soil		Cohesion		Axial Strain ε_{50}	Friction Angle ϕ	Modulus of Subgrade Reaction k
	ft	ft			lb/in3	pcf	psi	psf	(%)	(deg)	pci
1	12	1.8	Sand	4	0.064	110				27	25
2	30	-16.4	Soft Clay	1	0.022	38	1.32	190	4.0		
3	44	-30.4	Sand	4	0.038	66				38	120
4	46	-32.4	Sand	4	0.028	48				27	20
5	60	-46.4	Sand	4	0.036	63				34	70
6	100	-86.4	Sand	4	0.039	68				42	140

					DYNAMIC ANALYSIS						
Soil Layer	Depth to Layer Bottom	Bottom of Layer Elevation	Soil Type	KSOIL	Effective Unit Weight of Soil		Cohesion		Axial Strain ε_{50}	Friction Angle ϕ	Modulus of Subgrade Reaction k
	ft	ft			lb/in3	pcf	psi	psf	(%)	(deg)	pci
1	12	1.8	Soft Clay	1	0.058	100	0.90	130	4.0		
2	30	-16.4	Soft Clay	1	0.021	37	0.62	90	4.0		
3	44	-30.4	Sand	4	0.038	66				38	120
4	46	-32.4	Soft Clay	1	0.028	48	0.85	122	2.0		
5	60	-46.4	Sand	4	0.036	63				34	70
6	100	-86.4	Sand	4	0.039	68				42	170

Applies to Piers: 2 to 5

Ground Surface Elevation (ft): 7.0

					STATIC ANALYSIS						
Soil Layer	Depth to Layer Bottom	Bottom of Layer Elevation	Soil Type	KSOIL	Effective Unit Weight of Soil		Cohesion		Axial Strain ε_{50}	Friction Angle ϕ	Modulus of Subgrade Reaction k
	ft	ft			lb/in3	pcf	psi	psf	(%)	(deg)	pci
1	5	2.3	Soft Clay	1	0.058	100	0.97	140	4.0		
2	28	-21.0	Soft Clay	1	0.022	38	0.97	140	4.0		
3	51	-44.0	Sand	4	0.036	63				34	60
4	54	-47.0	Sand	4	0.031	53				27	20
5	100	-93.0	Sand	4	0.039	68				42	170

					DYNAMIC ANALYSIS						
Soil Layer	Depth to Layer Bottom	Bottom of Layer Elevation	Soil Type	KSOIL	Effective Unit Weight of Soil		Cohesion		Axial Strain ε_{50}	Friction Angle ϕ	Modulus of Subgrade Reaction k
	ft	ft			lb/in3	pcf	psi	psf	(%)	(deg)	pci
1	5	2.3	Soft Clay	1	0.058	100	0.47	68	4.0		
2	28	-21.0	Soft Clay	1	0.021	37	0.46	66	4.0		
3	51	-44.0	Sand	4	0.036	63				34	60
4	54	-47.0	Sand	4	0.031	53				26	10
5	100	-93.0	Sand	4	0.039	68				42	170

P-Y CURVE SOIL DATA
for LPILE Program

Applies to Pier: 6

Ground Surface Elevation (ft): 17.9

					STATIC ANALYSIS						
Soil Layer	Depth to Layer Bottom	Bottom of Layer Elevation	Soil Type	KSOIL	Effective Unit Weight of Soil		Cohesion		Axial Strain ε_{50}	Friction Angle ϕ	Modulus of Subgrade Reaction k
	ft	ft			lb/in3	pcf	psi	psf	(%)	(deg)	pci
1	12	5.9	Sand	4	0.058	100				27	25
2	20	-2.1	Sand	4	0.022	38				26	20
3	32	-14.1	Soft Clay	1	0.022	38	0.97	140	4.0		
4	49	-31.1	Sand	4	0.038	66				36	90
5	54	-36.1	Sand	4	0.025	43				27	20
5	85	-67.1	Sand	4	0.039	68				36	90
6	100	-82.1	Sand	4	0.039	68				42	170

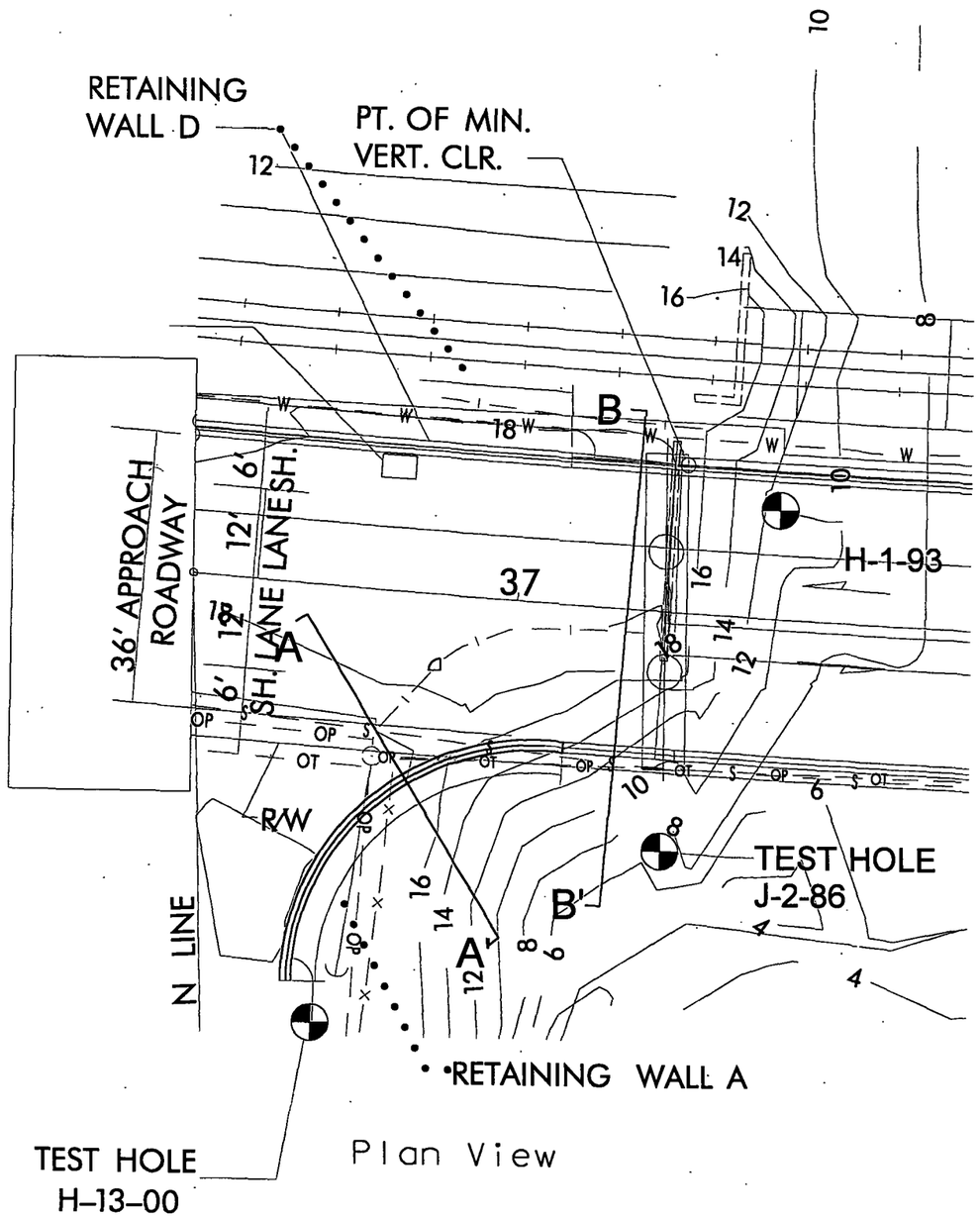
					DYNAMIC ANALYSIS						
Soil Layer	Depth to Layer Bottom	Bottom of Layer Elevation	Soil Type	KSOIL	Effective Unit Weight of Soil		Cohesion		Axial Strain ε_{50}	Friction Angle ϕ	Modulus of Subgrade Reaction k
	ft	ft			lb/in3	pcf	psi	psf	(%)	(deg)	pci
1	12	5.9	Soft Clay	1	0.058	100	0.69	100	2.0		
2	20	-2.1	Soft Clay	1	0.022	38	0.49	70	2.0		
3	32	-14.1	Soft Clay	1	0.022	38	0.56	80	4.0		
4	49	-31.1	Sand	4	0.038	66				36	90
5	54	-36.1	Sand	4	0.025	43				26	10
5	85	-67.1	Sand	4	0.039	68				36	90
6	100	-82.1	Sand	4	0.039	68				42	170

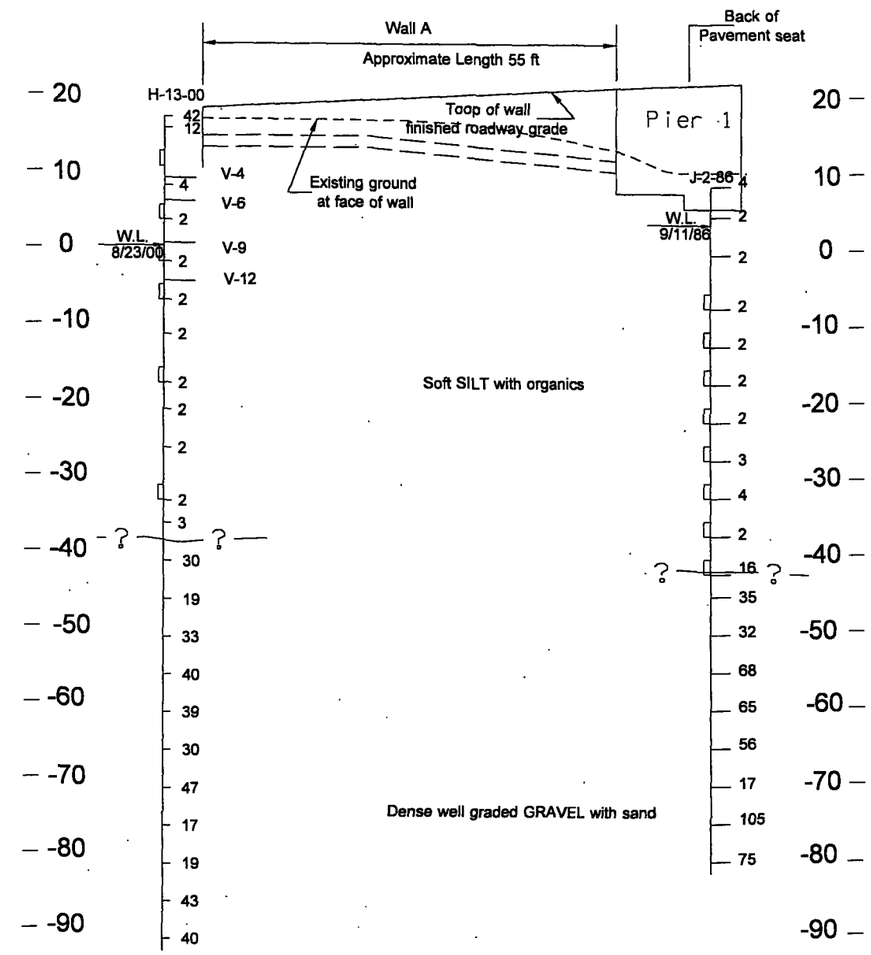
APPENDIX - E

Retaining Wall Design Curves

Figure 1-E	Wall A Plan View and Cross-Section View
Figure 2-E	Wall A - Section A-A' Earth Pressure Diagram
Figure 3-E	Wall A - Section B-B' Earth Pressure Diagram
Figure 4-E	Wall B - Earth Pressure Diagram Station 40+20 to Station 40+60
Figure 5-E	Wall E - Earth Pressure Diagram Station 47+00 to Station 47+30
Figure 6-E	Wall F - Earth Pressure Diagram Station 50+35 to Station 50+75
Figure 7-E	Typical Section for Deadman Anchor Design

Masonry Concrete Modular Block Retaining Wall Special Provision





Cross Section View

JOB OL-1181 S.R. 107 C.S. 1409 LAYOUT

SLOUGH BRIDGE 107/5 REPLACEMENT

WASHINGTON STATE TRANSPORTATION COMMISSION
DEPARTMENT OF TRANSPORTATION
MATERIALS BRANCH
T. E. BAKER MATERIALS ENGINEER

DATE 8/2000
SCALE 1" = 20' VERT. 1" = 20' HORIZ.
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FIGURE 1-E:
Wall A Plan View and Cross Section View

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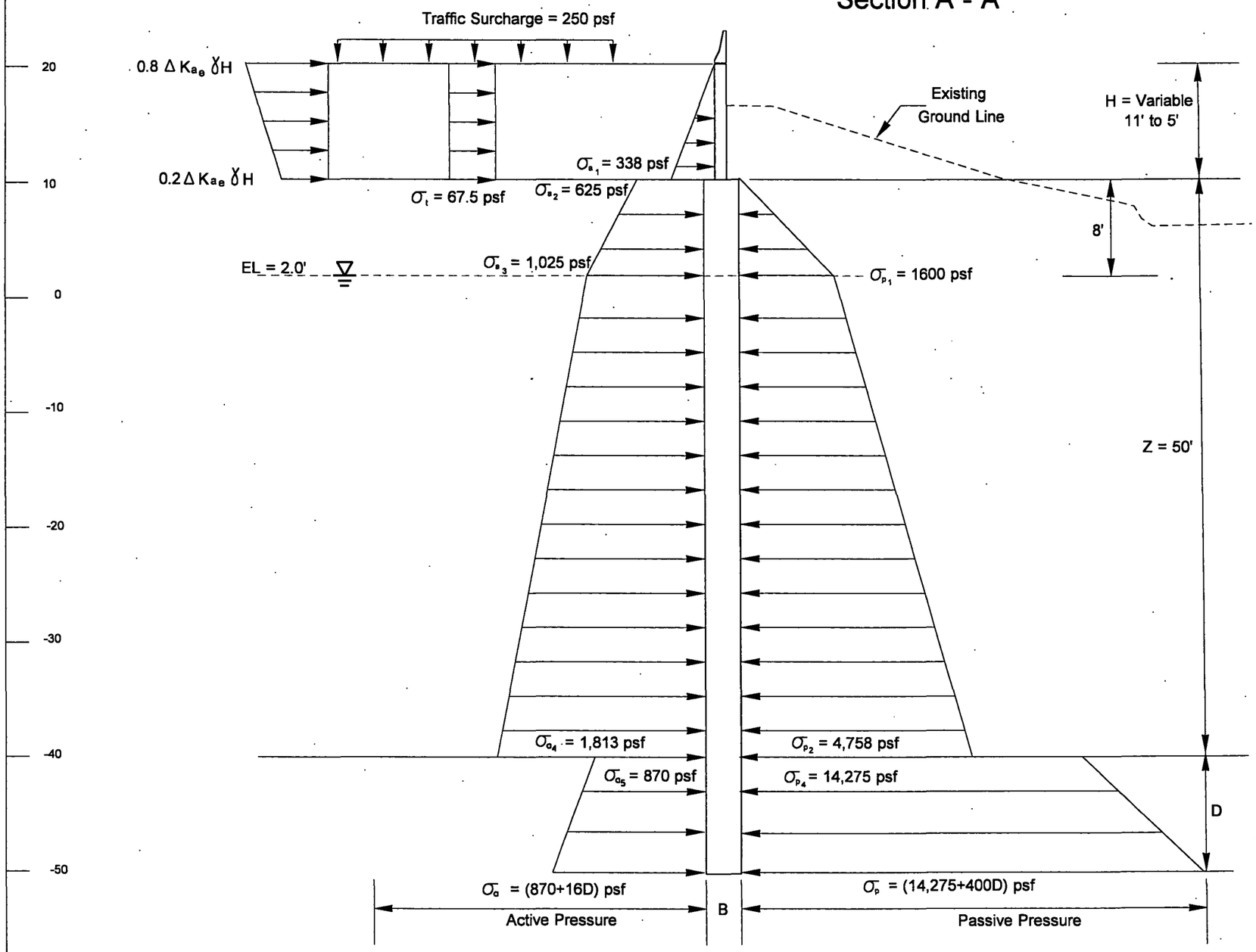
Wall A
Section A - A'



Fill

ϕ = 35°
γ = 125 pcf
K_a = 0.27
K_{ae} = 0.34

Soft SILT with organics

ϕ = 20°
γ = 100 pcf
K_a = 0.5
K_p = 2.0

NOTES: (1) Active pressure is given as $\sigma_a = K_a \gamma H$. Active pressure acts over one soldier pile diameter.
(2) Passive pressure is given as $\sigma_p = K_p \gamma H$, K_p includes a factor of safety of 1.5(K_p/1.5). Passive pressure may be taken to act over three soldier pile diameters where piles are spaced greater than 3D.
(3) $\Delta K_{ae} = (K_{ae} - K_a)$

Dense SANDS and GRAVEL

ϕ = 38°
γ = 130 pcf
K_a = 0.24
K_p = 6.0

JOB OL-1181 S.R. 107 C.S. 1409 LAYOUT

SLOUGH BRIDGE 107/5 REPLACEMENT

WASHINGTON STATE TRANSPORTATION COMMISSION
DEPARTMENT OF TRANSPORTATION
MATERIALS BRANCH
T. E. BAKER MATERIALS ENGINEER

DATE 8/2000
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1" = 10' HORIZ.
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FIGURE 2-E:
Typical Earth pressure Diagram Wall A

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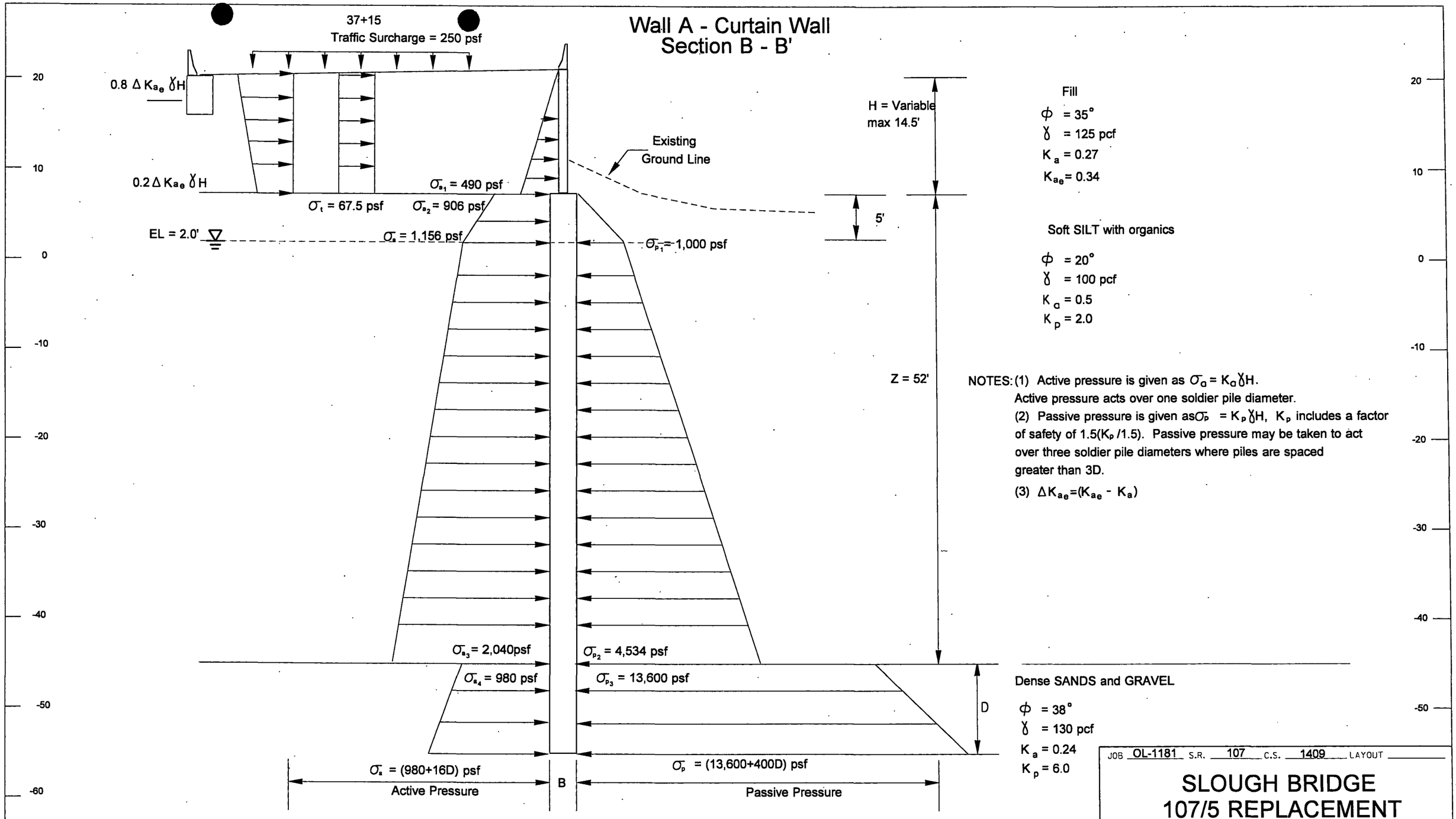
Wall A - Curtain Wall
Section B - B'



Fill

ϕ = 35°
γ = 125 pcf
K_a = 0.27
K_{ae} = 0.34

Soft SILT with organics

ϕ = 20°
γ = 100 pcf
K_a = 0.5
K_p = 2.0

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(3) $\Delta K_{ae} = (K_{ae} - K_a)$

Dense SANDS and GRAVEL

ϕ = 38°
γ = 130 pcf
K_a = 0.24
K_p = 6.0

FIGURE 3-E:
Typical Earth pressure Diagram
STA 37+00 to STA 37+23

JOB OL-1181 S.R. 107 C.S. 1409 LAYOUT

SLOUGH BRIDGE 107/5 REPLACEMENT

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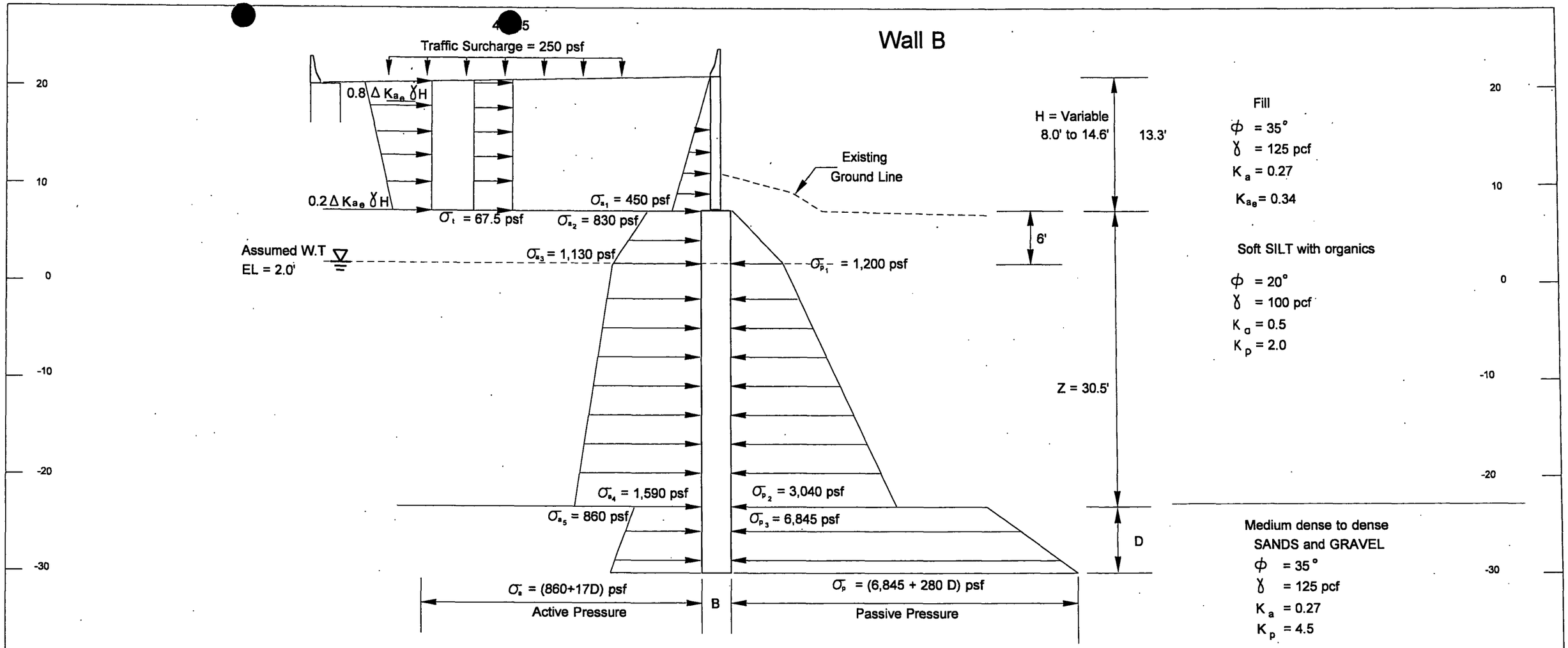

NOTES: (1) Active pressure is given as $\sigma_a = K_a \gamma H$.
Active pressure acts over one soldier pile diameter.
(2) Passive pressure is given as $\sigma_p = K_p \gamma H$, K_p includes a factor of safety of $1.5(K_p/1.5)$. Passive pressure may be taken to act over three soldier pile diameters where piles are spaced greater than 3D.
(3) $\Delta K_{ae} = (K_{ae} - K_a)$

FIGURE 4-E:
Typical Earth pressure Diagram
STA 40+20 to STA 40+60

JOB OL-1181 S.R. 107 C.S. 1409 LAYOUT

SLOUGH BRIDGE
107/5 REPLACEMENT

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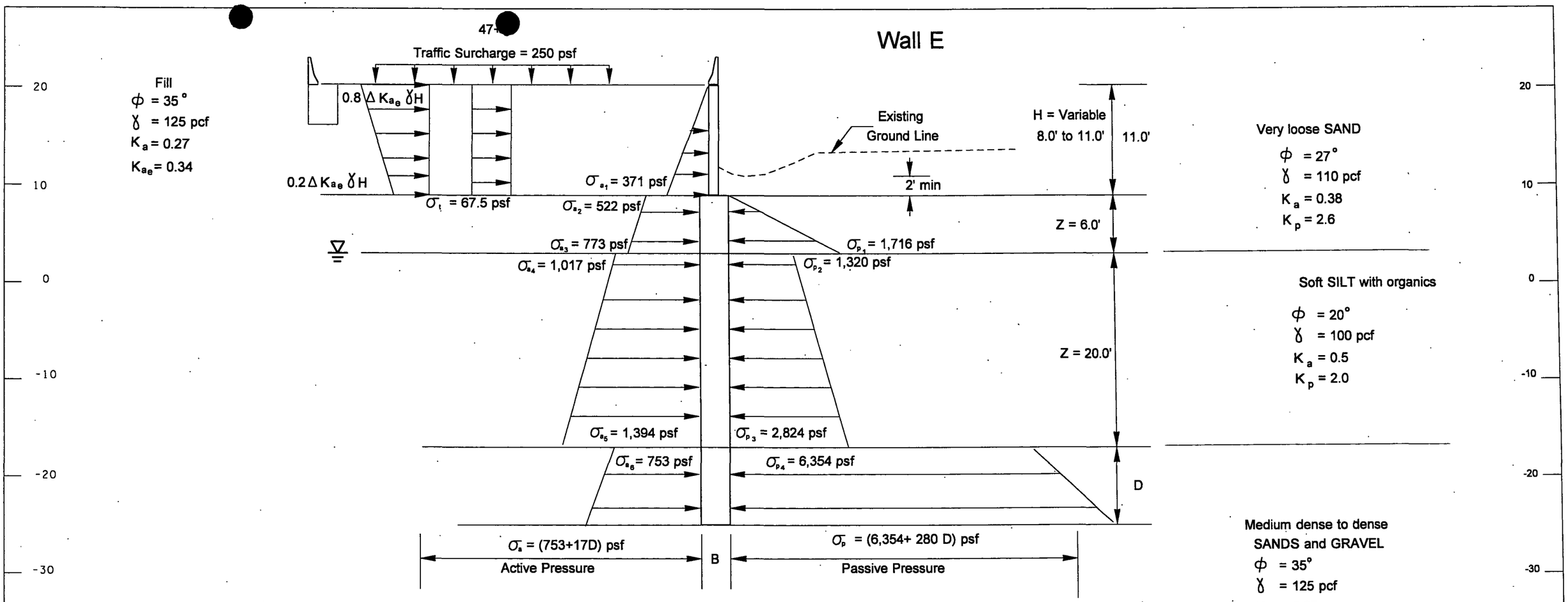

NOTES: (1) Active pressure is given as $\sigma_a = K_a \gamma H$.
Active pressure acts over one soldier pile diameter.
(2) Passive pressure is given as $\sigma_p = K_p \gamma H$, K_p includes a factor of safety of 1.5(K_p/1.5). Passive pressure may be taken to act over three soldier pile diameters where piles are spaced greater than 3D.
(3) $\Delta K_{ae} = (K_{ae} - K_a)$

FIGURE 5-E:
Typical Earth pressure Diagram
STA 47+00 to STA 47+30

JOB OL-1181 S.R. 107 C.S. 1409 LAYOUT

SLOUGH BRIDGE 107/6 REPLACEMENT

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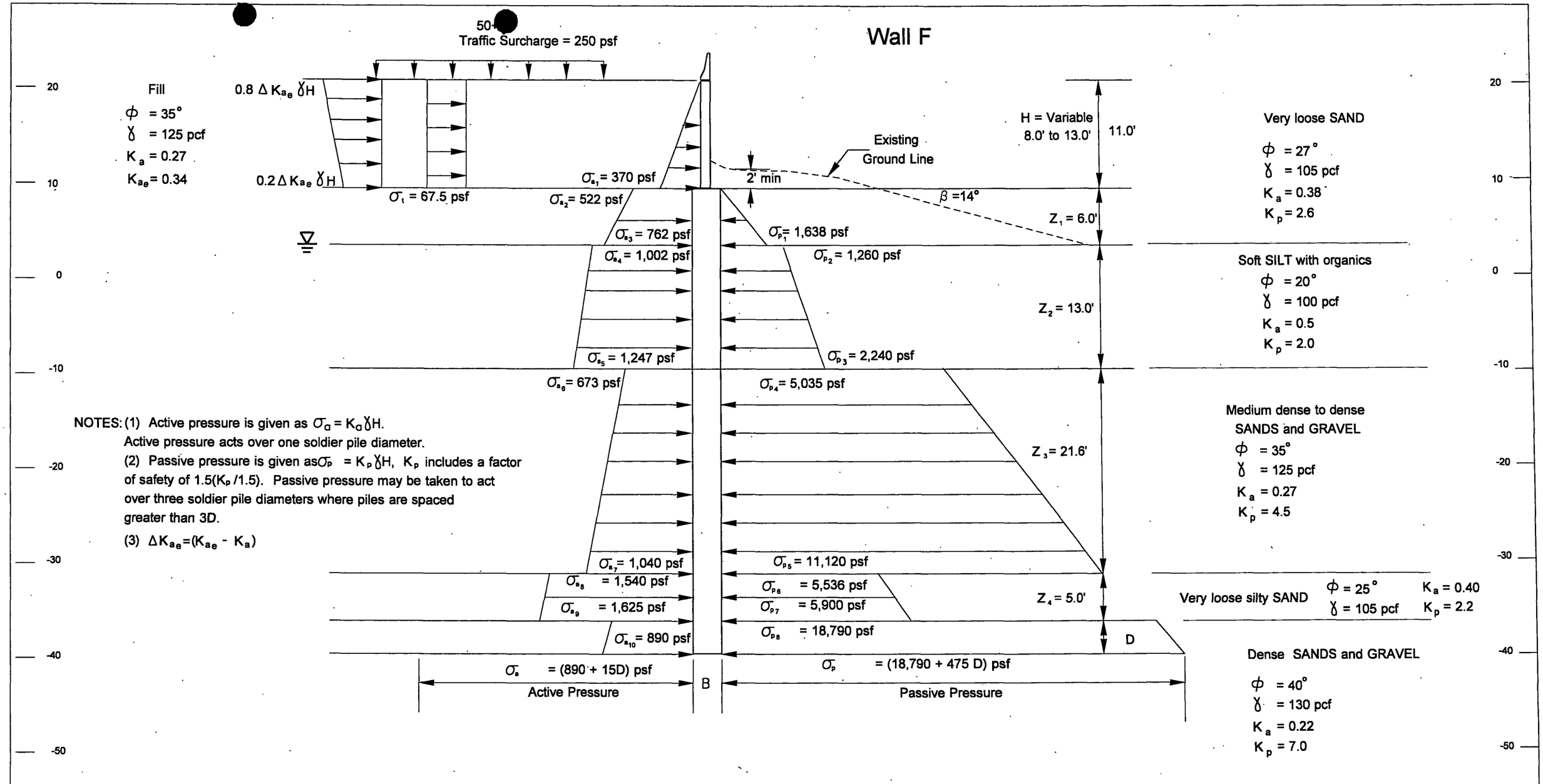
Wall F



NOTES: (1) Active pressure is given as $\sigma_a = K_a \gamma H$.
Active pressure acts over one soldier pile diameter.
(2) Passive pressure is given as $\sigma_p = K_p \gamma H$, K_p includes a factor of safety of 1.5(K_p/1.5). Passive pressure may be taken to act over three soldier pile diameters where piles are spaced greater than 3D.
(3) $\Delta K_{ae} = (K_{ae} - K_a)$

FIGURE 6-E:
Typical Earth pressure Diagram
STA 50+35 to STA 50+75

JOB OL-1181 S.R. 107 C.S. 1409 LAYOUT

SLOUGH BRIDGE
107/6 REPLACEMENT

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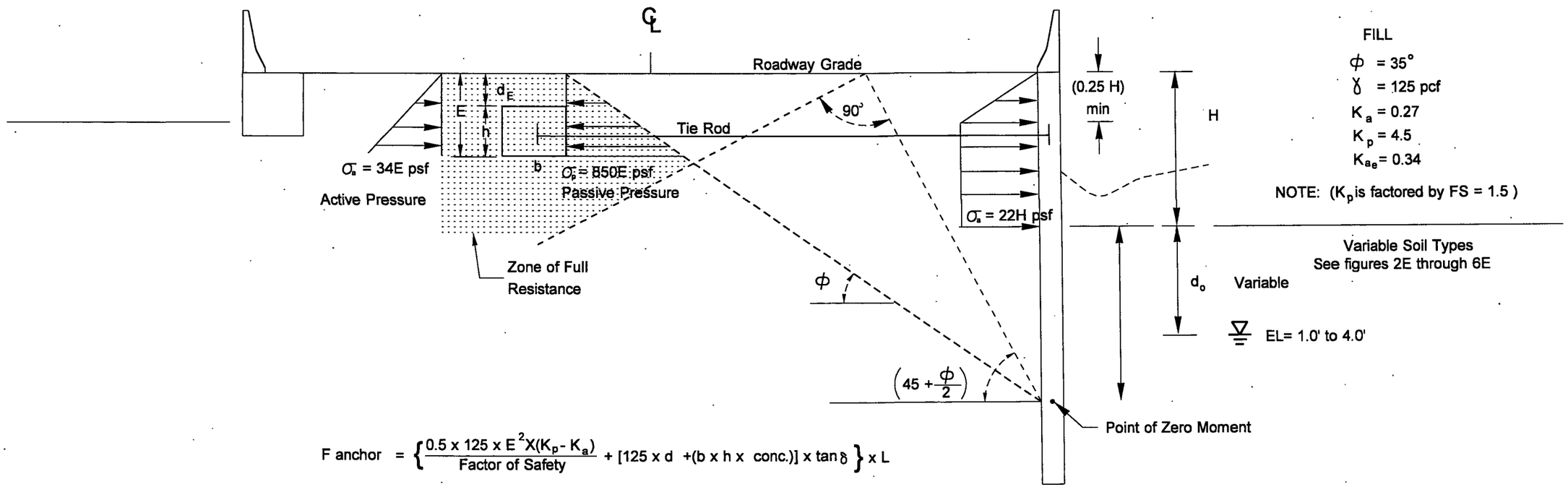

$$F_{anchor} = \left\{ \frac{0.5 \times 125 \times E^2 X (K_p - K_a)}{\text{Factor of Safety}} + [125 \times d + (b \times h \times \text{conc.})] \times \tan\delta \right\} \times L$$

Where:

F anchor = allowable anchor force

E = depth to base of deadman from ground surface

d_E = depth to top of deadmane from ground surface, h/2 or minimum 3 ft.

γconc. = unit weight of concrete = 150 pcf

K_p = passive earth pressure coefficient (unfactored) = K_p x 1.5 = 6.8

K_a = active earth pressure coefficient

δ = concrete / soil friction angle = 23°

b = width of concrete deadman

h = height of concrete deadman

l = length of concrete deadman parallel to wall

FS = Factor of Safety = 2.0

FIGURE 7-E:

Typical Section for Deadman Anchor Design

JOB OL-1181 S.R. 107 C.S. 1409 LAYOUT

SLOUGH BRIDGE
107/6 REPLACEMENT

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MASONRY CONCRETE MODULAR BLOCK RETAINING WALL

Description
Where shown in the Plans or where designated by the Engineer, the Contractor shall construct masonry concrete modular block retaining wall.

Quality Assurance
The completed walls shall meet the following tolerances:

1. Deviation from the design batter and horizontal alignment shall not exceed one (1) inch when measured along a 10 ft straight edge. The face batter deviation measurement will be made at the midpoint of each facing block layer

2. Deviation from the overall design batter of the wall shall not exceed 0.75 inches per 10 ft of wall height

3. The base of the retaining wall excavation shall be within 3 inches of the staked elevations unless otherwise directed by the Engineer

4. The external wall dimensions shall be placed within 2 inches of that staked on the ground.

5. The wall manufacturer shall provide a qualified and experienced representative at the job site at the start of wall construction and as needed to resolve construction problems. Recommendations made by the representative and approved by the Engineer shall be followed by the Contractor.

Submittals
The Contractor shall, a minimum of 30 days prior to beginning wall construction, submit to the Engineer for approval, a construction manual that provides step-by-step directions for construction of the wall system. The manual shall include, but not be limited to the following:

1. Detailed Plans for each wall.

2. Proposed wall construction method, including types of equipment to be used and proposed erection sequence.

3. Certificate of compliance, samples, and test data for the purpose of acceptance.

Materials
General
Material specifications in these Special Provisions shall take precedence over requirements of the wall manufacturer, unless otherwise approved by the Engineer in advance of their use in the construction.

Backfill Material
Backfill material for the wall shall meet the requirements of Section 9-03.12(2), Gravel backfill for Walls.

Backfill For Leveling Pad
Material for the wall face leveling pad shall meet the requirements of Section 9-03.9(3), Crushed Surfacing Base Course.

Concrete Facing Units
The concrete facing units shall be constructed to the dimension and shape as detailed in the Plans and shall meet all the materials, manufacturing, and physical requirements of ASTM C1372 except for the following:

Compressive Strength minimum, per ASTM C-140	4,000 psi at 28 days
Water absorption maximum	5 percent
Unit Weight minimum	95 psf of wall face

The block manufacturer shall provide a certificate of compliance and test data for the lot of material sent to the job site demonstrating that the property requirements provided above have been met. The maximum lot size for the purposes of this specification shall be 2,000 blocks.

The units shall have angled sides and capable of attaining concave and convex alignment curves with a minimum radius of 3.5 feet. The facing units shall have a broken face finish. The height of each individual block shall be within $\pm$ 1/16 inches of the specified dimension.

The length and width of each block shall be within $\pm$ 1/8 inches of the specified dimensions. Hollow units shall have a minimum wall thickness of 1.25 inches. Any blocks, which have defects, which indicate imperfect molding, defects indicating honeycomb or open texture concrete, or cracked or severely chipped blocks will be rejected.

Facing units shall be interlocked with concrete shear keys or non-corrosive polyester/fiberglass or polyethylene solid pins. The pins shall have a minimum diameter of 1/2 inch.

Foundation
Excavation shall be in accordance with the requirements of Section 2-09 and in close conformance to the limits shown in the Plans.

The foundation subgrade for the structure shall be graded level and compacted to the satisfaction of the Engineer. Once foundation construction has begun, the Contractor shall take precaution to direct surface runoff from adjacent areas away from the wall construction site.

The wall face leveling pad shall be compacted using Method C. The surface of the leveling pad shall be hard and level. The leveling pad shall be prepared in a manner, which will insure complete contact between each wall facing unit in the lowest course of facing units and the leveling pad.

Wall Erection
The walls shall be constructed to the configurations, lines and grades shown in the Plans and in accordance with the Manufacturer's recommendations as approved by the Engineer.

Wall construction shall begin at the lowest portion of the excavation and each layer shall be placed horizontally. The first course of the wall units shall be checked for level and proper alignment, prior to proceeding with the next course.

Facing units may be saw cut as required using standard masonry tools. Sawn, half width blocks shall not be used in the base course.

If connecting pins are used between facing units for shear restraint, they shall be installed in each concrete facing unit in a manner, which will insure that the pins will protrude a minimum of one (1) inch into each facing unit.

All voids within and around the concrete facing units shall be filled with Gravel Backfill for Walls and tamped in place. Excess fill material shall be swept from the surface of the concrete facing blocks.

Wall facing units shall be turned into the embankment at the ends of each course where the change in the wall elevation is greater than the individual block height. A minimum of three units shall be installed below grade at these ends. End returns are not required for elevation changes of which are less than the block height.

The cap course shall be bonded to the adjacent lower course with an approved cement base, waterproof anchoring cement.

Backfill Placement
Each layer of backfill shall be compacted to 95 percent of maximum density. The water content of the wall backfill shall not deviate above the optimum water content by more than 3 percent. Compaction within 3 feet of the wall face shall be achieved using light mechanical tampers approved by the Engineer and shall be done in a manner to cause no damage or distortion to the wall facing elements.

Measurement
The masonry retaining wall will be measured by the square foot of completed wall in place. The vertical limits for measurement are from the foundation to the top of the wall. The horizontal limits for measurement are from end of wall to the end of wall.

Gravel backfill for walls will be measured by the cubic foot in place determined by the limits shown in the plans.

Structure excavation will be measured by the cubic yard to the limits shown in the Plans.

Payment
The unit contract price per square meter for "Retaining Wall" shall be full pay for performing the wall construction work.

The Unit contract price per cubic meter for "Gravel backfill for Walls Incl. Haul" shall be full pay for furnishing, processing, hauling, placing, and compacting the backfill material.

APPENDIX - F

Summary of Geotechical Conditions

Geophysical Report SR-12 /SR-107 Interchange

Boyd O. Bush, GEORECON Inc., February 5, 1964

Summary of Geotechnical Conditions

Slough Bridges SR-107/5 and SR-107/6

Site soil varies along the alignment. The bridge sites are located within the Chehalis and Wynoochee River flood plain. The Chehalis River was the primary drainage for melt water emanating from continental ice sheets in the Puget Sound Lowland. Extensive deposits of water lain sediments are present at this site. In general, the soils consist of a mixture of clay, silt, gravel, cobbles and boulders with buried logs and other organic materials.

Slough River Bridge No. 107/5

The new bridge will be supported on drilled shafts. The end piers (Piers 1 and 6) will have 4.5 ft diameter shafts. The interior piers will be 7.5 ft diameter drilled shafts. The piers are located in old buried channel of the Chehalis River. The shafts are design for a tip elevation of -83 ft. The thickness of the soft soils varies between 30 ft and 60 ft along the alignment. The soft soils are underlain by dense to very dense well-graded sands and gravel with cobbles and boulders. The well-graded sands and gravels have very little fine soils to prevent the sidewalls from caving. The very dense soil was encountered at elevations -22.5 ft at Pier 6 and -49 ft at Pier 1. The soils above the dense soils consist of saturated, soft with organic material. See borings J-1-86, J-2-86, H-1-93, H-2-93, H-3-93, H-7-00, H-13-00, and H-14-00.

We expect very difficult conditions will be encountered during shaft construction. The site is located in a slough channel that is affected by tidal influences and storm surges. There is limited access to stage and construct the shafts. An existing railroad line is within 6 ft west of the proposed structure. The line will be used as a temporary detour around the construction site. The surface soils are soft, and may not support heavy construction equipment. Hard driving conditions should be expected for placing shaft casing.

Permanent casing may be required for the full depth of the shaft. The total length of the shafts will be between 90 feet and 100 feet. Shaft casing will likely be installed in segments. Side friction will likely be high and setup may occur during splicing or work stoppages, causing advancement of the casing to be difficult. In the upper soils between the ground surface and the top of dense sands and gravels, buried logs and stumps are likely to be encountered. The shafts will penetrate between 35 feet and 60 feet into saturated, dense to very dense sands and gravels with cobbles and boulders. Caving soils were encountered during test exploration. The potential for caving appears to be severe throughout the entire soils column. Open hole (uncased) drilling may not be an option at this site for both the soft and dense soils, even with the use of drilling slurry.

Slough Bridge No. 107/6

The new bridge will be supported on drilled shafts. The end piers (Piers 1 and 6) will have 4.5 ft diameter shafts. The interior piers will be 7.5 ft diameter drilled shafts. The piers are located in old buried channel of the Chehalis River. The shafts are designed for a tip elevation of -83 ft. The thickness of the soft soils varies between 25 ft and 35 ft along the alignment. The soft soils are underlain by dense to very dense well-graded sands and gravel with cobbles and boulders. The well-graded sands and gravels have very little fine soils to prevent the sidewalls from caving. The very dense soil was encountered between elevations -43 ft at Pier 1 and -55 ft at Pier 2. The soils above the dense soils consist of saturated, soft with organic material. See borings J-1A-86, C-2-86, H-4-93, H-5-93, H-6-93, H-10-00, H-11-00, and H-12-00.

We expect very difficult conditions will be encountered during shaft construction. The site is located in a slough channel that is affected by tidal influences and storm surges. There is limited access to stage and construct the shafts. An existing railroad line is within 5 ft west of the

proposed structure. The line will be used as a temporary detour around the construction site. The surface soils are soft and may not support heavy construction equipment. Hard driving conditions should be expected for placing shaft casing.

Permanent casing may be required for the full depth of the shaft. The total length of the shafts will be between 90 feet and 100 feet. Shaft casing will likely be installed in segments. Side friction will likely be high and setup may occur during splicing or work stoppages, causing advancement of the casing to be difficult. In the upper soils between the ground surface and the top of dense sands and gravels, buried logs and stumps are likely to be encountered. The shafts will penetrate up to 65 feet into saturated, dense to very dense sands and gravels with cobbles and boulders. Caving soils were encountered during test exploration. The potential for caving appears to be severe throughout the entire soils column. Open hole (uncased) drilling may not be an option at this site for both the soft and the dense soils, even with the use of drilling slurry.

Retaining Walls A, B, E and F

The approach embankment east of the new roadway will be supported by new retaining wall built on soft soils. The wall heights will vary up to 14 ft. The cantilever Soldier Pile Walls will likely penetrate to the dense sand and gravel layer. The foundation soils are similar to the soils found at the end piers of the new bridges. The soils above the dense soils consist of saturated, soft with organic material. See borings J-1-86, J-1A-86, J-2-86, H-12-00, and H-15-00.

Temporary casing will likely be required for the full depth of the soldier pile shaft. The potential for caving appears to be severe throughout the entire soils column. In the upper soils between the ground surface and the top of dense sands and gravels, buried logs and stumps are likely to be encountered. Open hole (uncased) drilling may not be an option at this site for both the soft and the dense soils, even with the use of drilling slurry.

Major Fills – Station 42+00 to Station 46+00

New fill will be placed on saturated soft soil. The movement of heavy construction equipment, including the use of vibratory compaction equipment, could degrade the foundation subgrade and create pumping soils. Difficulties in achieving compaction should be expected. The soils are represented in borings V-4-58, C2A-86, H-8-00, and H-9-00.

Available Geotechnical Reports

The relevant geotechnical information is summarized in the following reports:

D. A. Williams, *Geotechnical Report – Slough Bridges 107/5 and 107/6 Replacement.* (Bridge Option), December 12, 2000.

D. A. Williams, *Geotechnical Report – Slough Bridges 107/5 and 107/6 Replacement.* (Arch Culvert with MSE Retaining Walls Option), October 26, 1993.

GEO-RECON, Inc., *Geophysical Exploration Study for WSDOT proposed Interchange P.S.H. 9 (SR-12 and SR 107), Montesano, Washington,* February 5,1964.

GEO-RECON INC.
GEOPHYSICAL EXPLORATIONS
1105 NORTH 38th STREET • SEATTLE 3, WASHINGTON • MElrose 2-7130

February 5, 1964

Washington State Highway Commission
Department of Highways
Office of District Engineer
Olympia, Washington

Gentlemen:

This letter and enclosed drawings contain the results of a geophysical investigation that has been conducted between Stations 140+00 and 200+00 of the proposed realignment of Primary State Highway No. 9, and in a proposed borrow area, adjacent to the Chehalis River, in the vicinity of Montesano, Grays Harbor County, Washington.

The purpose of the investigation was to determine the depth and configuration of the surface of firm materials underlying a swamp and to make a reconnaissance survey of a proposed nearby borrow area.

Field work was completed between 16 December, 1963 and 15 January, 1964 and consisted of 9500 feet of refraction seismic survey and 19 electrical resistivity tests. The locations are shown on Fig. 1, Geophysical Exploration Plan. Electrical resistivity test R-1 offered inconclusive results and its location is, therefore, not shown.

The results of the investigation are shown on Fig. 2, Geophysical Profiles. The following classification of materials, based upon seismic velocities, resistivity values and drilling data, has been used:

PROBABLE CLASSIFICATION	VELOCITY RANGE feet/sec	AVERAGE RESISTIVITY RANGE ohm/feet
Soft, organic material: clay, silt and silty sand	900-2300	5-30 (40-70 at borrow area)
Fairly dense silty sand or sand and gravel	3500-4500	48-90 (145-400 at borrow area)
Dense sand and gravel	5900-6600	65-2000
Bedrock (Siltstone?)	7000-7900	3-25

Correlating the drill hole data with seismic velocities made it evident that the difference in velocities was caused more by "mechanical" characteristics than by variations in composition as shown by the different velocities of the two sand and gravel materials shown in the classification chart. On the other hand, resistivity values reflect variations in composition rather than degrees of compaction.

The 900-2300 fps material, which is probably compressible, is irregular in thickness. Local lenses of firmer material may occur within the main mass of soft material and samples of these lenses may indicate that they are sufficiently dense to afford adequate foundation. We are of the opinion, however, that these lenses are of limited dimension as they were not detected during the geophysical exploration. Seismic refractions will originate from the more massive dense deposits but not from thin local lenses of firmer material interbedded within soft deposits of overburden.

An example of such a large lens, or layer, may be observed between Stations 0+00 and 6+00 on Line SL 4, where a layer of 4000 fps material is apparently underlain by 2300 fps material. The top of this layer was detected by both seismic and resistivity sounding; resistivity tests R12 and R14 indicate that the layer is between 5 and 10 feet thick and is underlain by low-resistivity

material which has been classified as a clayey or silty soil. This example aptly illustrates the value of resistivity testing, as in this case the underlying clay did not refract but was readily located by resistivity measurements.

The 3500-4500 fps material presents certain difficulties in classification. The only drill hole correlation is DH2, where the bottom material which was not penetrated by the hand drilling, was classified as sand. At this location, and at all locations where this material was tested by resistivity methods, the resultant higher resistivity values indicated a predominantly granular material. It may offer sufficient foundation strength but, we believe, should be tested, if possible.

The 5900-6600 fps material is dense gravelly sand, sandy gravel and gravel, and will, in our opinion, furnish adequate foundation.

Possible bedrock is included in the 7000-7900 fps classification. Weakly-cemented sandstones and siltstones outcrop south of the Chehalis River and could exhibit the velocities measured. Similar velocities were detected in bedrock exposed at the Elbow Riffle bridge site at Elma.

At the borrow area (SL 6 and R18, R19) three material types were detected. The surface layer, 1000 fps, has a moderately high resistivity value and is probably a sandy soil. The intermediate layer of 4500 fps has a quite high resistivity value, which is indicative of a clean sandy, or gravelly, material. The bottom layer is probably sand and gravel. The geophysical results indicate that the site will contain mostly granular material, at least in the vicinity of the area tested.

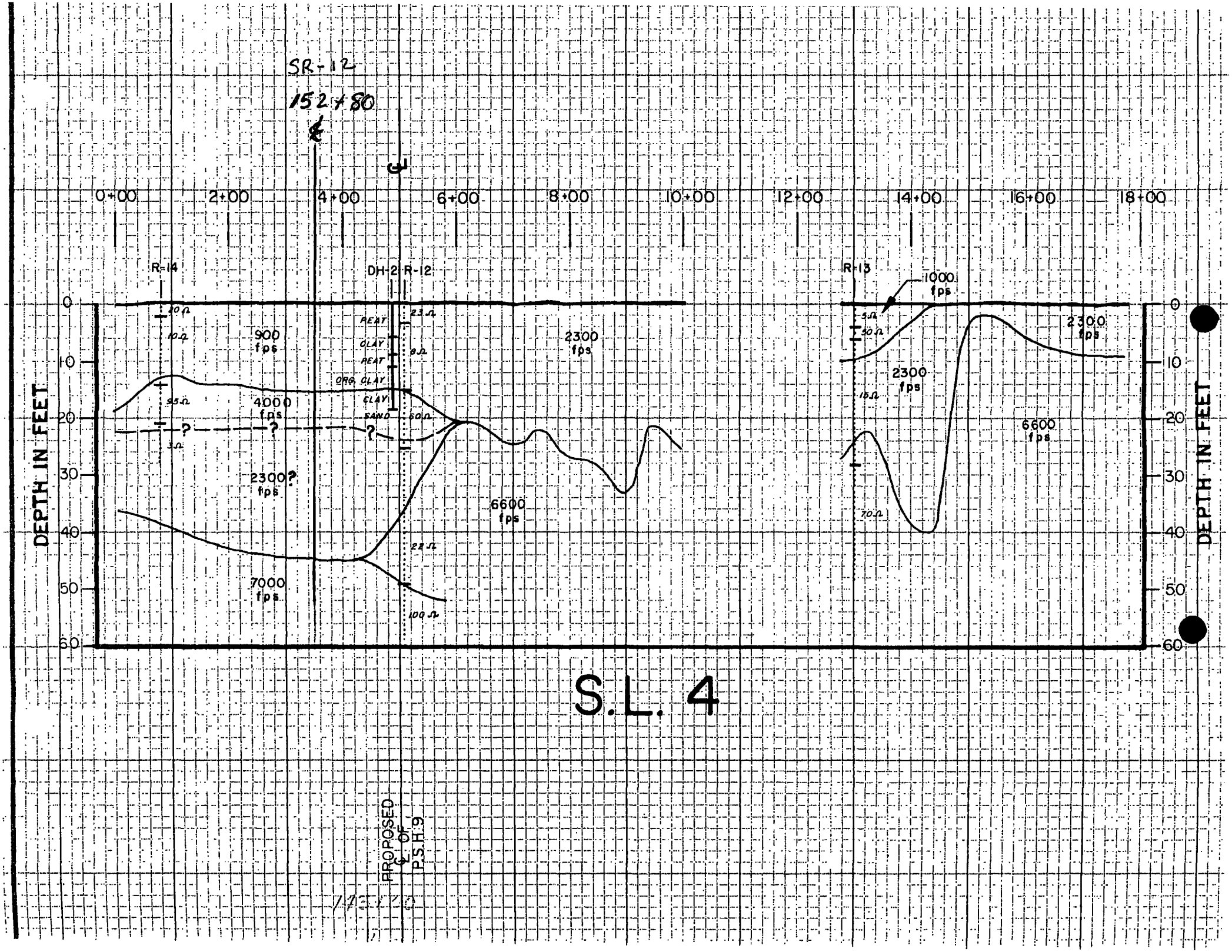
Based on the exploration data, and on a study of the regional geologic map of the area, it is apparent that the swampy area consists of recent alluvium which has been deposited in older stream channels eroded into Pleistocene glacial drift and Miocene marine rocks. We believe that the

5900-6600 fps material represents drift and the 7000-7900 fps material is probably rock.

In conclusion, it is our opinion that the materials displacing velocities of 2500 fps or lower are soils of low density and, with the exception of the borrow site, are probably compressible. Those having velocities of 3500-4500 fps are probably granular and are compacted, although not to the degree of the higher-velocity material. Buried channels were readily detected by seismic refraction. Clayey soil interbedded, or underlying, granular material was classified by low resistivity values but was not located by seismic methods. If further tests are contemplated we recommend resistivity tests for classifying the compressible soil and seismic tests for tracing out buried channels.

GEO-RECON, INC.

by Boyd O. Bush
BOYD O. BUSH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6+00
8+00
10+00
12+00
14+00
16+00
18+00
R-14
DH-2 R-12
R-13
DEPTH IN FEET
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10Ω
10Ω
900 fps
95Ω
4000 fps
3Ω
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23Ω
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100Ω
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6600 fps
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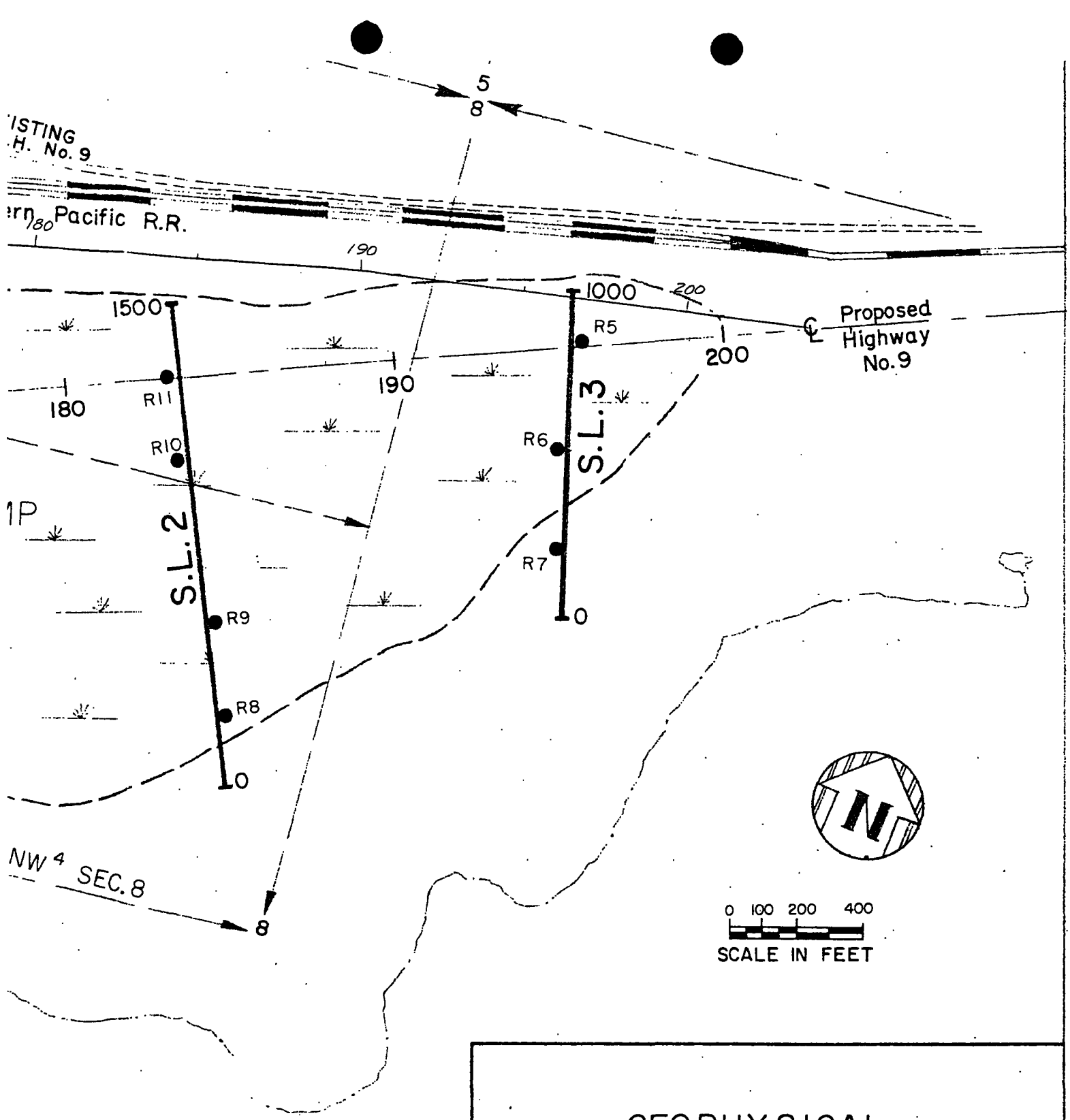

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GEOPHYSICAL EXPLORATION PLAN

P.S.H. NO. 9 MONTESANO, WASH.

GEO-RECON INC.

JAN. 1964

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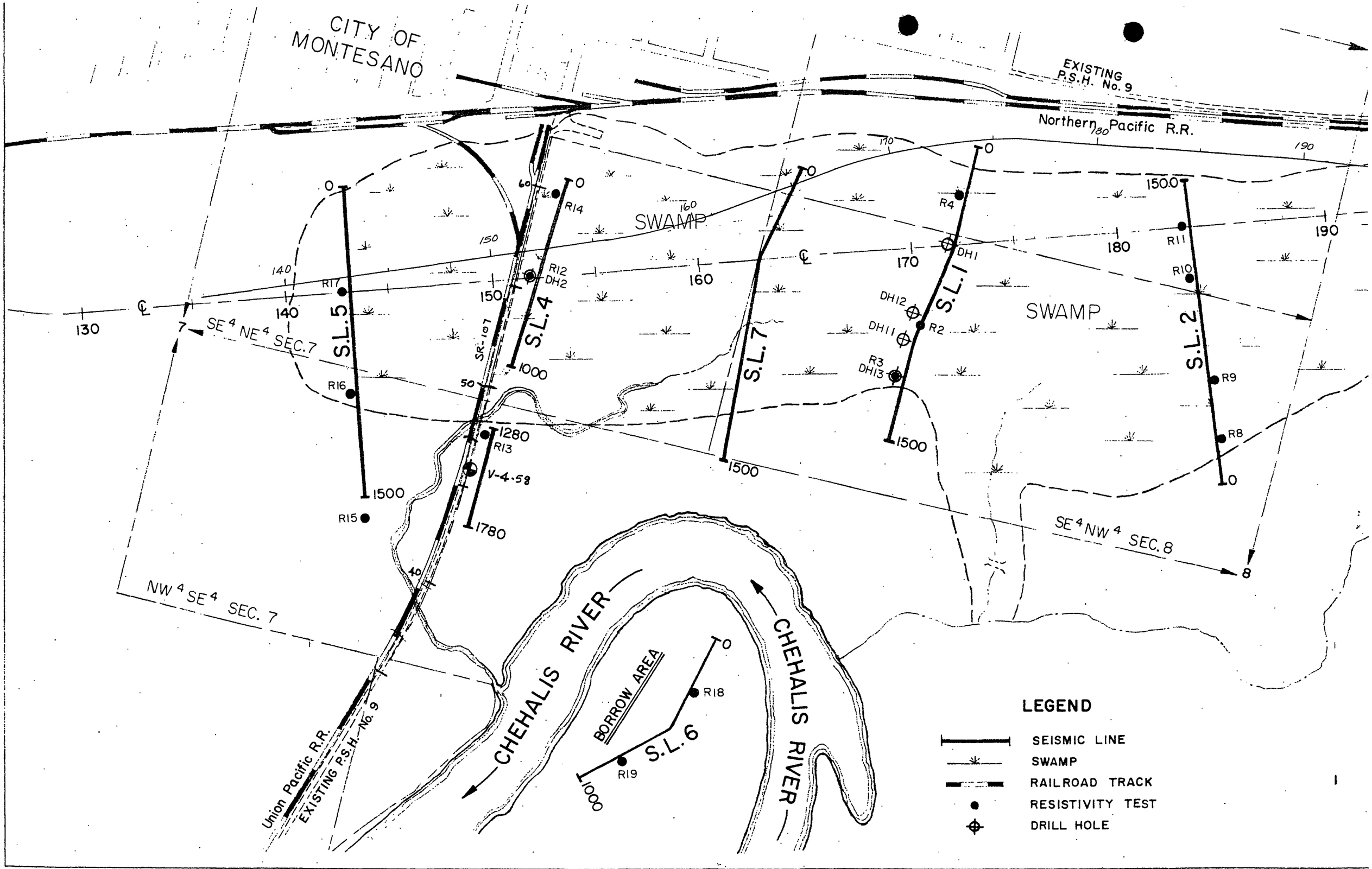
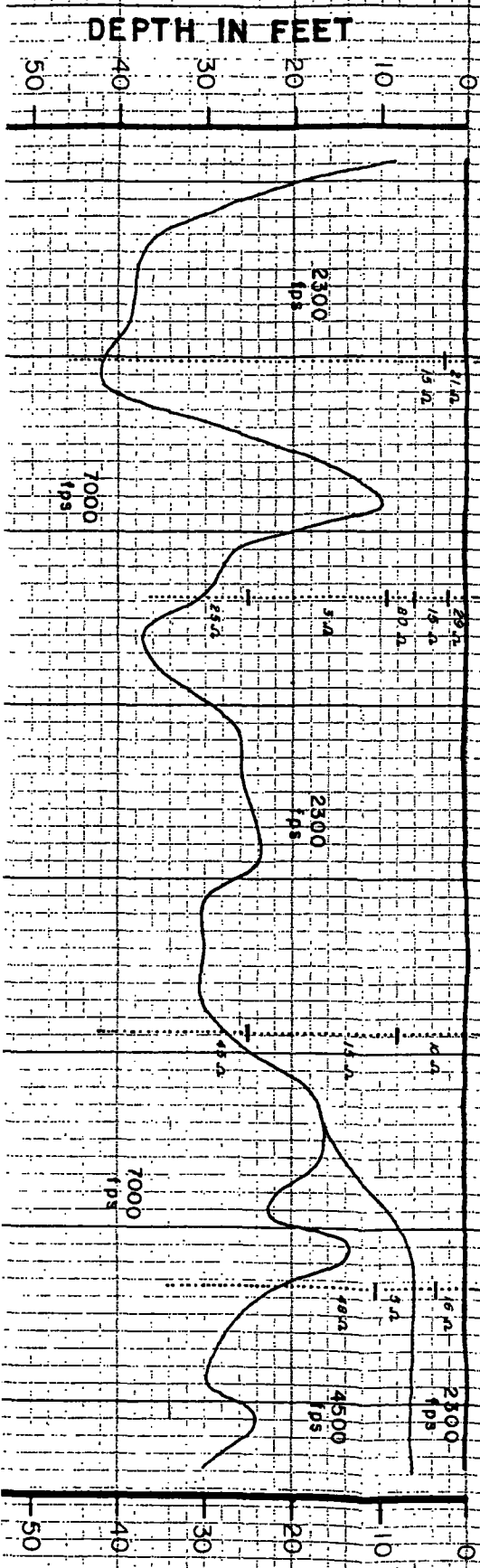
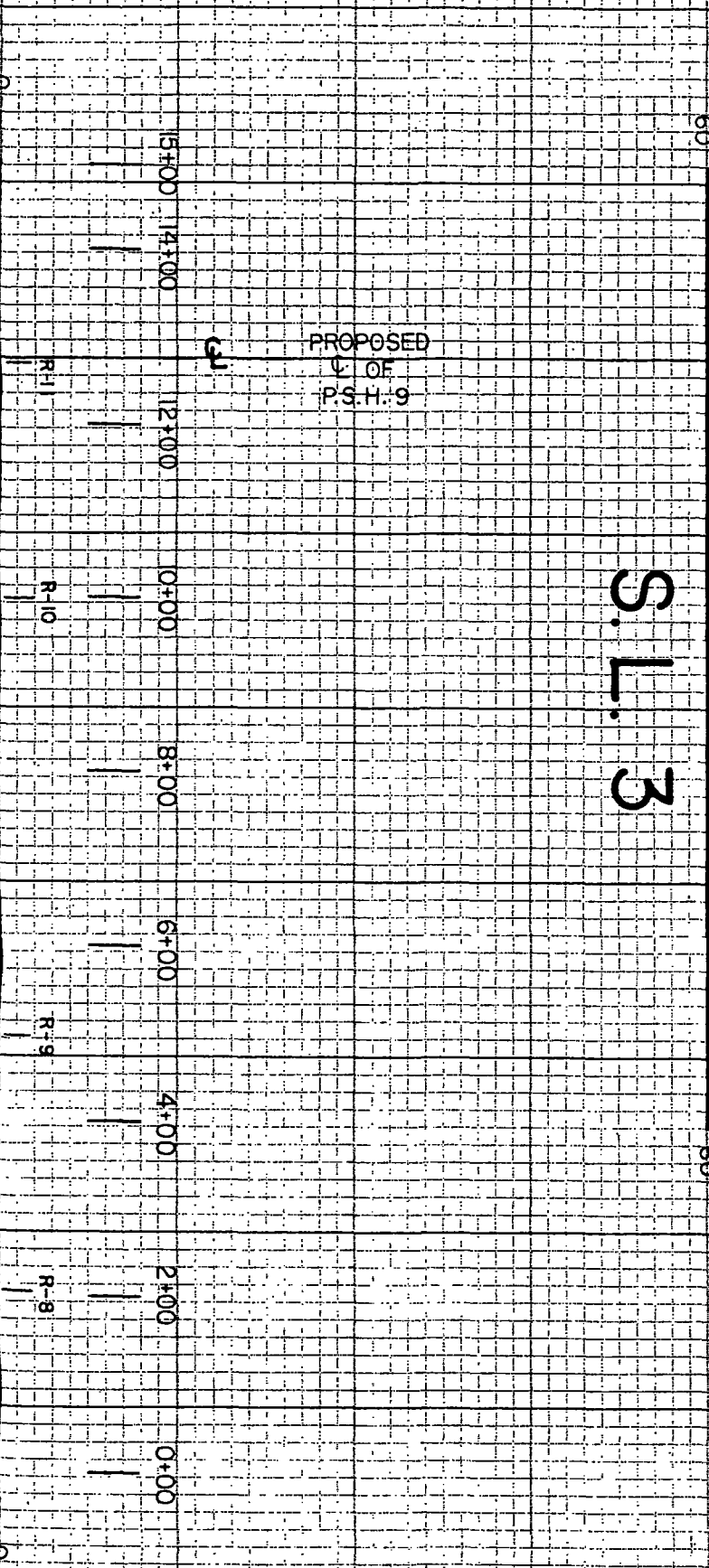
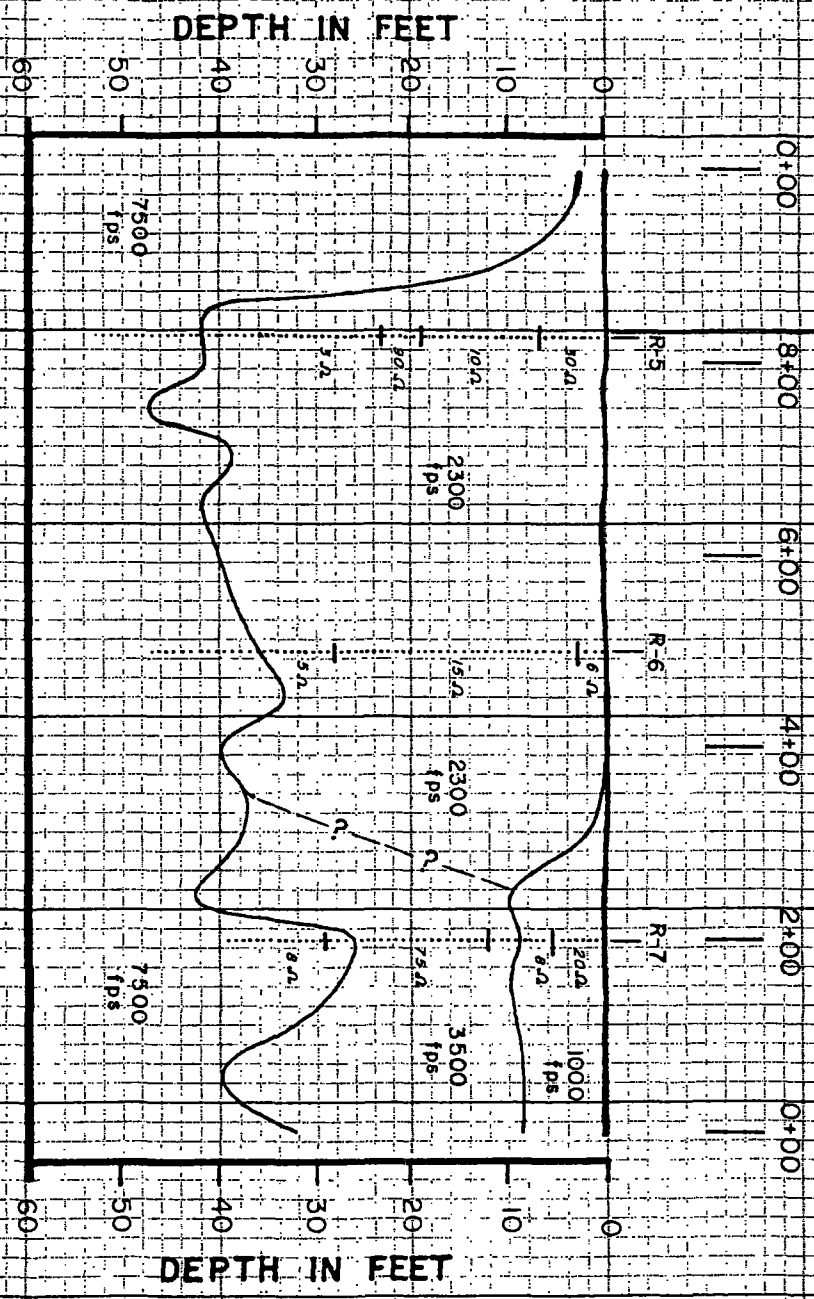
SEATTLE

FIG. 1


CITY OF MONTESANO
EXISTING P.S.H. No. 9
Northern Pacific R.R.
SWAMP
SWAMP
S.L.1
S.L.2
S.L.4
S.L.5
S.L.6
S.L.7
SR-107
SE 4 NE 4 SEC. 7
SE 4 NW 4 SEC. 8
NW 4 SE 4 SEC. 7
CHEHALIS RIVER
CHEHALIS RIVER
BORROW AREA
Union Pacific R.R.
EXISTING P.S.H. No. 9
R1
R2
R3
R4
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
DH1
DH2
DH11
DH12
DH13
V-4-58
LEGEND
SEISMIC LINE
SWAMP
RAILROAD TRACK
RESISTIVITY TEST
DRILL HOLE







S.L. 3

LEGEND

VELOCITY fps	RESISTIVITY OHM FEET	PROBABLE CLASSIFICATION
900-2300	5-30 (40-70 BORROW AREA)	SOFT ORGANIC MATERIAL: CLAY, SILT & SILTY SAND
3500-4500	48-90 (145-400 BORROW AREA)	FAIRLY DENSE SILTY SAND, OR SAND & GRAVEL
5900-6600	65-2000	DENSE SAND & GRAVEL
7000-7900	3-25	BEDROCK (SILTSTONE ?)

S.L. 1	SEISMIC LINE
000 fps	SEISMIC VELOCITY
DH-5	DRILL HOLE
R-7	ELECTRICAL RESISTIVITY TEST
10 Ω	OHM-FEET

SCALE: 1" = 200' HORIZONTAL
1" = 20' VERTICAL

GEOPHYSICAL PROFILES

P.S.H. NO. 9 — MONTESANO, WASH.

GEO RECON INC. SEATTLE

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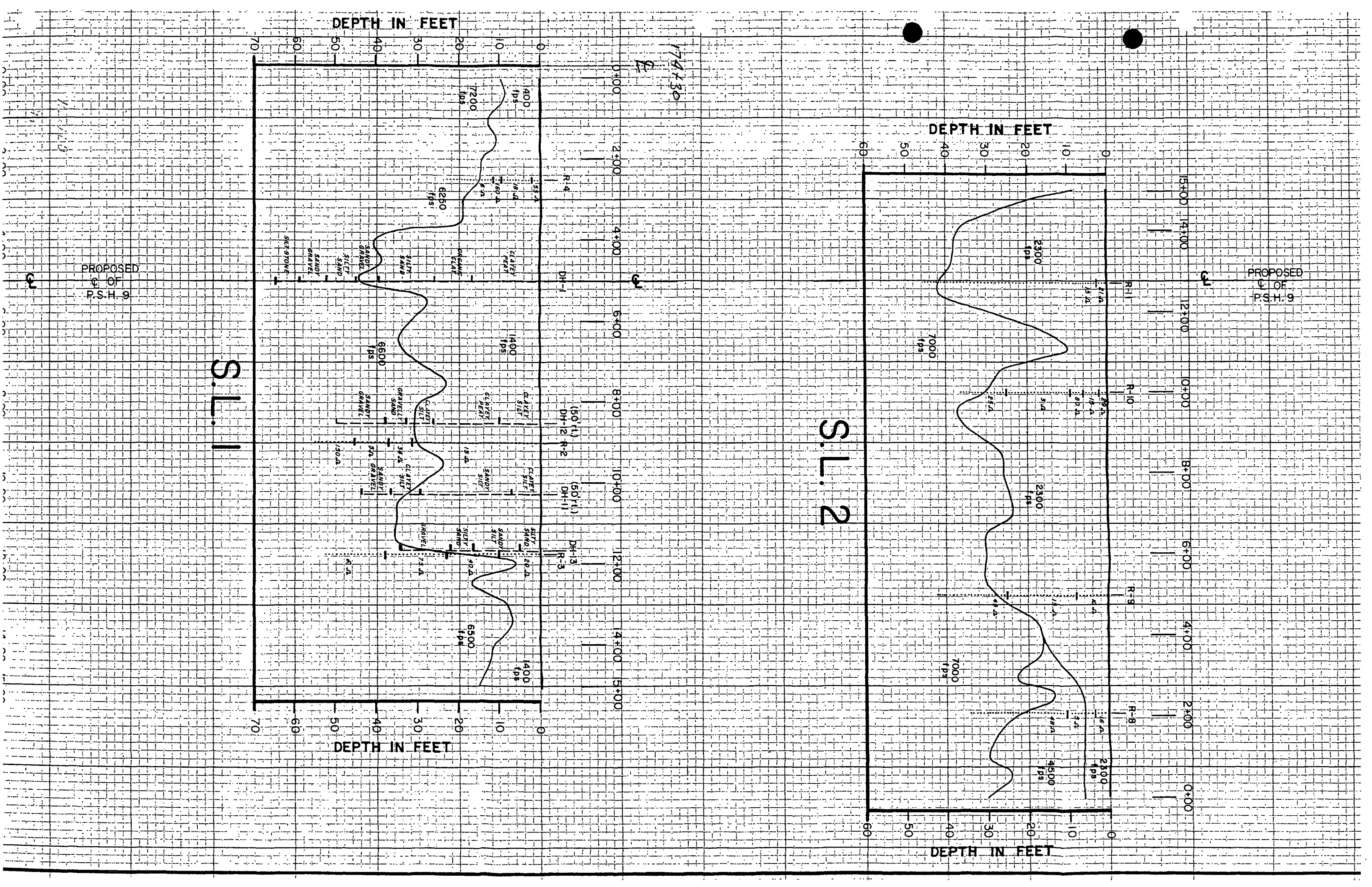
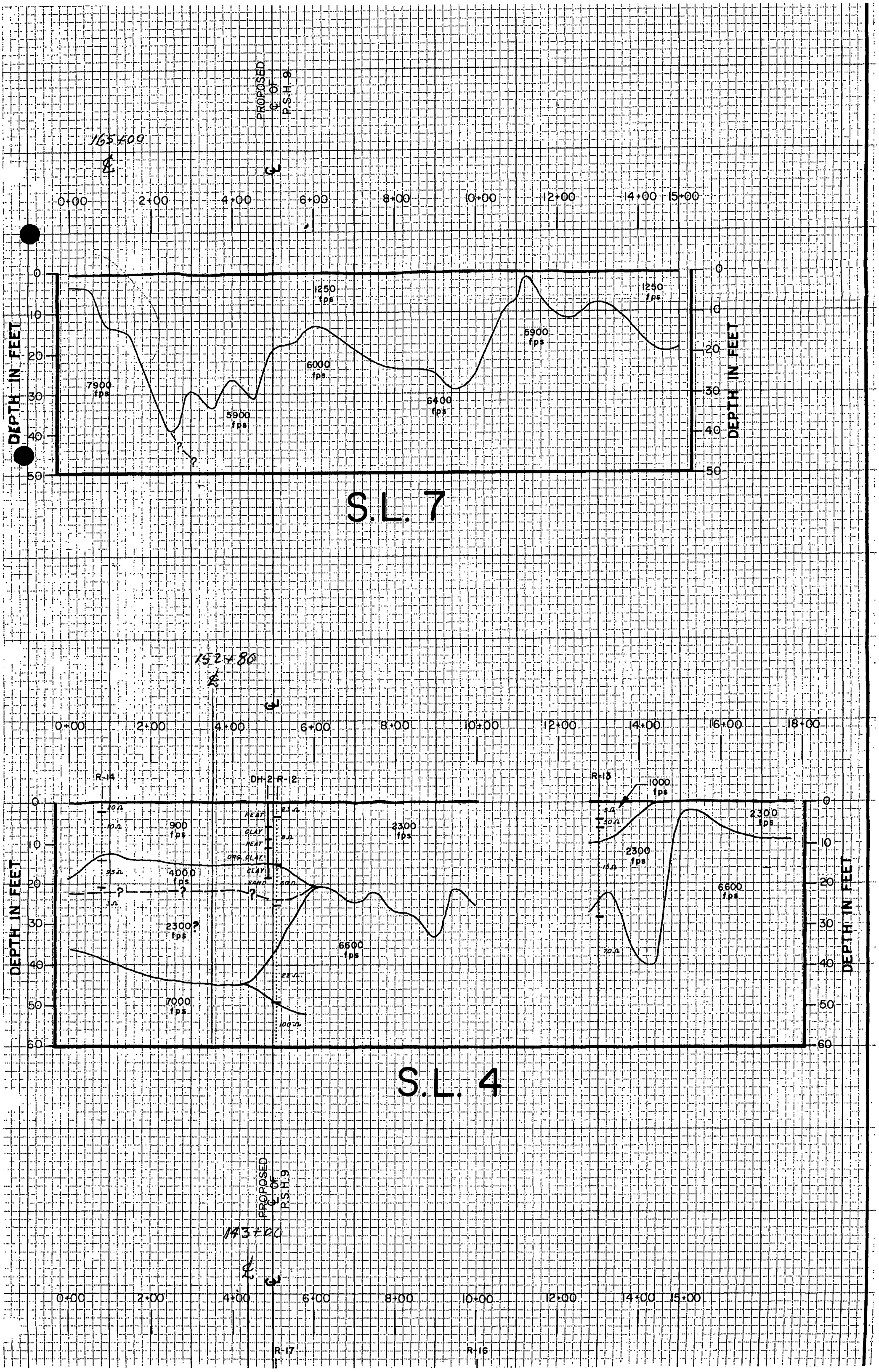
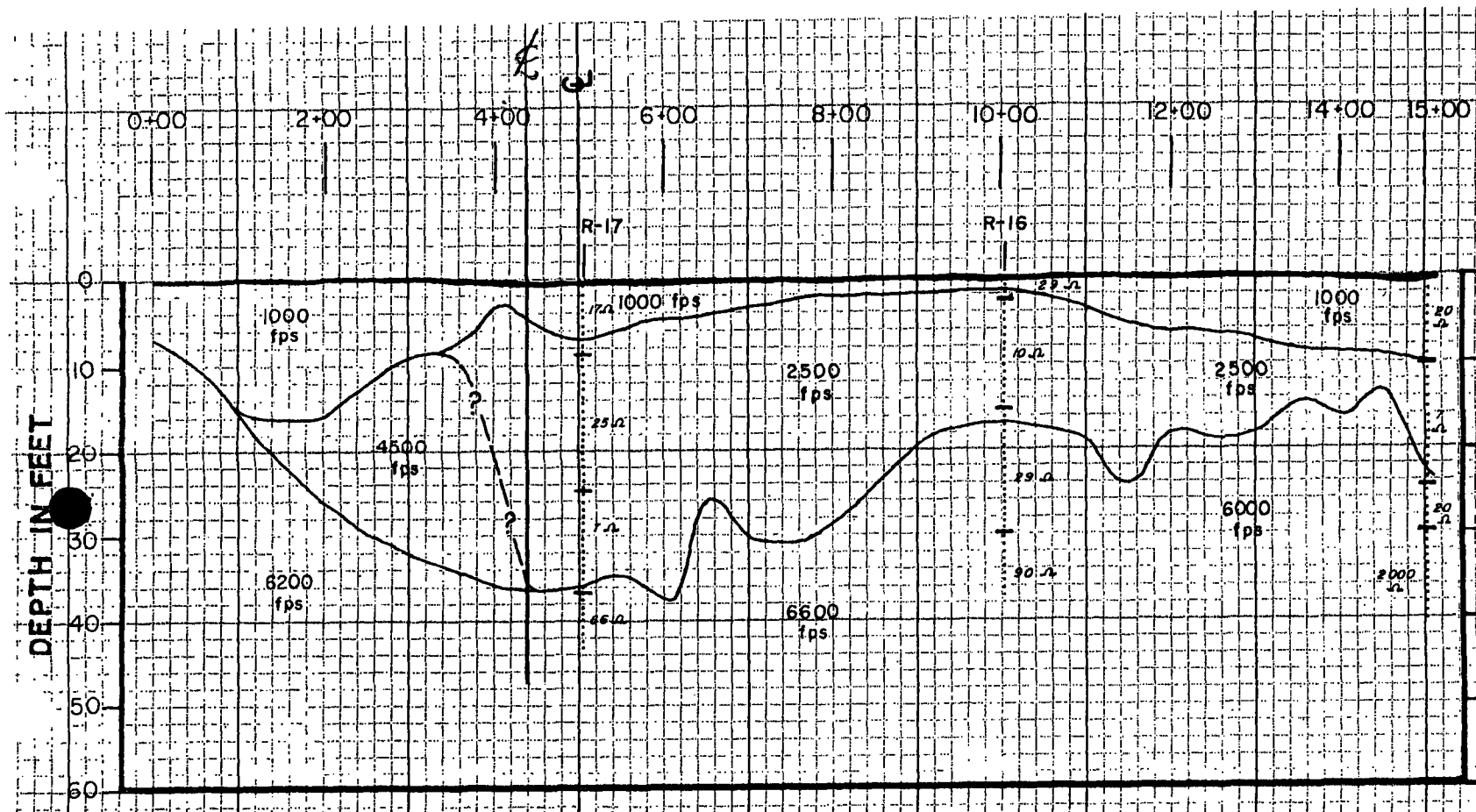
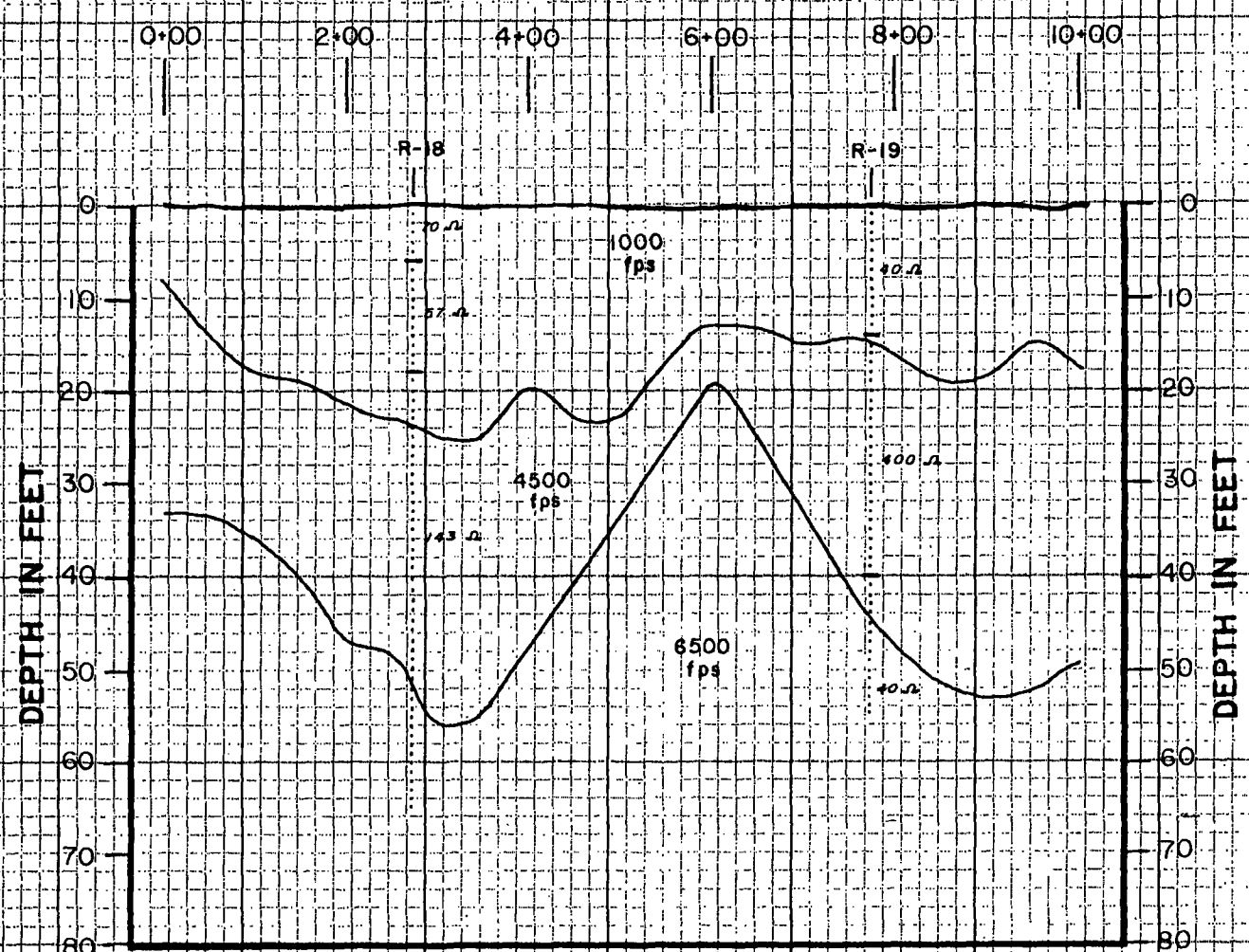
FIG. 2


DEPTH IN FEET
PROPOSED ℄ OF P.S.H. 9
S.L. 1
S.L. 2
DH-1
DH-2
DH-3
R-1
R-3
R-4
R-8
R-9
R-10
400 fps
7200 fps
6250 fps
6600 fps
1400 fps
6500 fps
2300 fps
7000 fps
4500 fps
SILTSTONE
SANDY GRAVEL
SILTY SAND
SANDY GRAVEL
SILTY SAND
ORGANIC CLAY
CLAYEY PEAT
CLAYEY SILT
GRAVELLY SAND
PROBE
SANDY SILT
0+00
2+00
4+00
6+00
8+00
10+00
12+00
14+00
15+00


165+00
℄
PROPOSED ℄ OF P.S.H. 9
0+00
2+00
4+00
6+00
8+00
10+00
12+00
14+00
15+00
DEPTH IN FEET
0
10
20
30
40
50
7900 fps
5900 fps
1250 fps
6000 fps
6400 fps
5900 fps
1250 fps
S.L. 7
152+80
℄
0+00
2+00
4+00
6+00
8+00
10+00
12+00
14+00
16+00
18+00
R-14
DH-2 R-12
R-13
DEPTH IN FEET
0
10
20
30
40
50
60
10Ω
10Ω
900 fps
23Ω
PEAT
CLAY
PEAT
ORG. CLAY
CLAY
SAND
8Ω
2300 fps
95Ω
4000 fps
60Ω
3Ω
2300? fps
6600 fps
22Ω
7000 fps
100Ω
1000 fps
5Ω
50Ω
2300 fps
15Ω
2300 fps
6600 fps
70Ω
S.L. 4
PROPOSED ℄ OF P.S.H. 9
143+00
℄
0+00
2+00
4+00
6+00
8+00
10+00
12+00
14+00
15+00
R-17
R-16

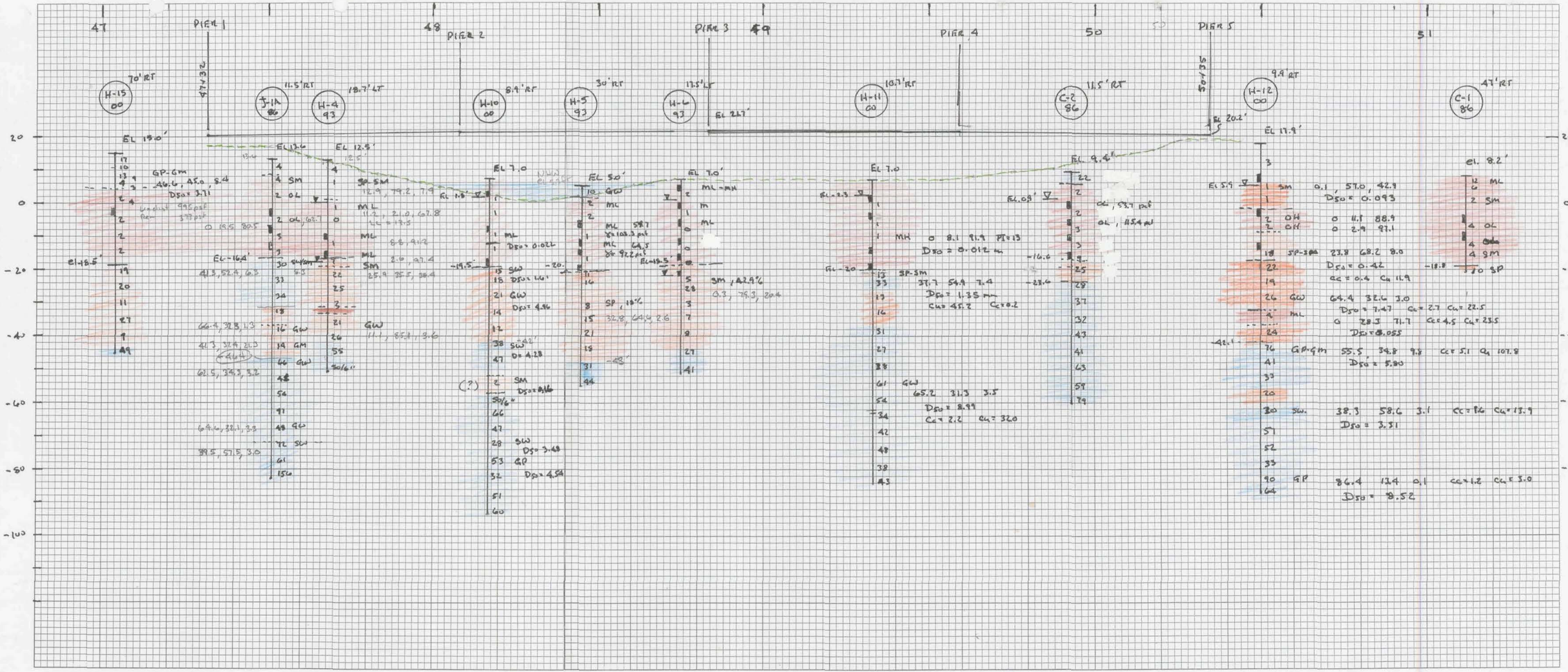


S.L. 5



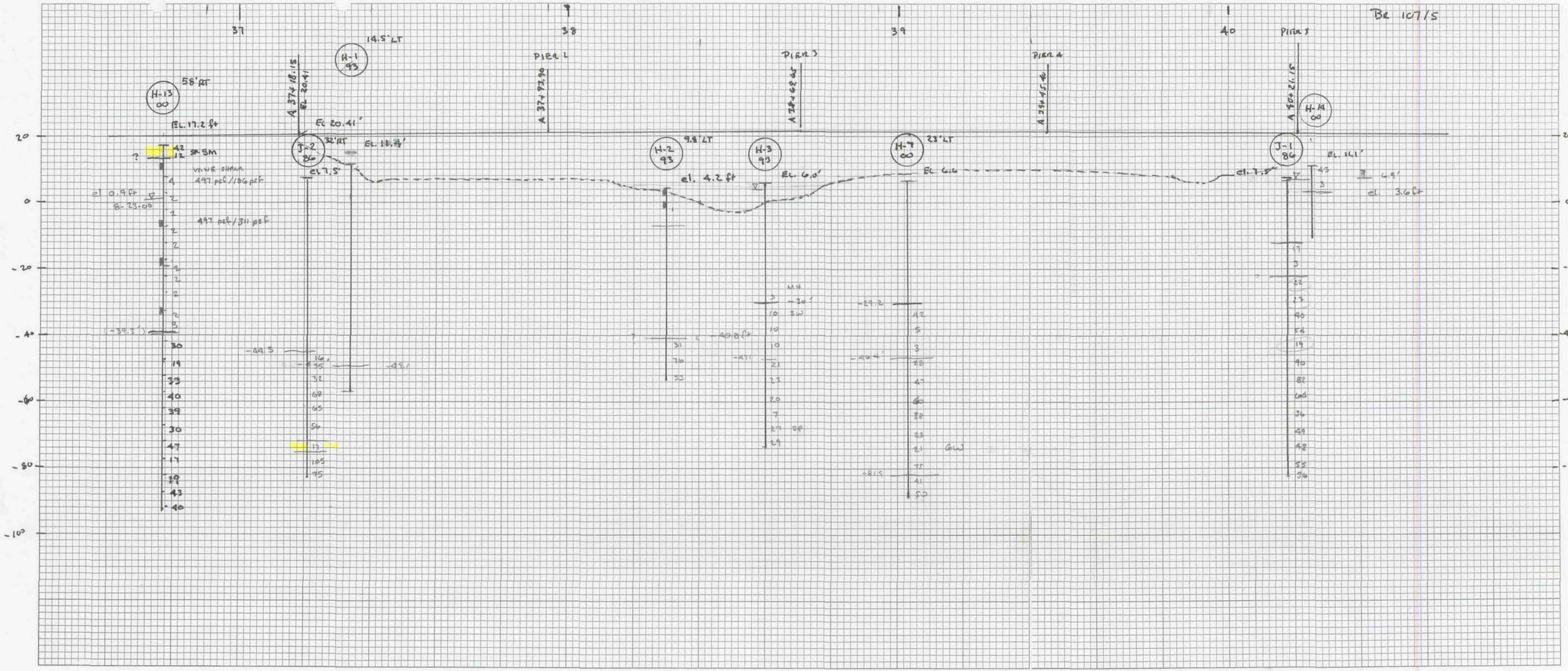
S.L. 6

BORROW AREA



K&E 10 X 10 TO THE INCH • 10 X 15 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A.

47 0700



K+E 10 X 10 TO THE INCH • 10 X 15 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A.

47 0700