

US ARMY CORPS OF ENGINEERS PORTLAND DISTRICT

Kellogg Creek – Highway 99E Fish Passage Geotechnical Feasibility Study



MILWAUKIE, OREGON

SEPTEMBER 2003

REPORT



Report to:

Corps of Engineers, Portland District P.O. Box 2946 Portland, Oregon 97208-2946

KELLOGG CREEK - HIGHWAY 99E FISH PASSAGE GEOTECHNICAL FEASIBILITY STUDY MILWAULKIE, OREGON

September 2003

Submitted by:

Cornforth Consultants, Inc. 10250 SW Greenburg Road, Suite 111 Portland, OR 97223 Report to:

Corps of Engineers, Portland District P.O. Box 2946 Portland, Oregon 97208-2946

KELLOGG CREEK - HIGHWAY 99E FISH PASSAGE GEOTECHNICAL FEASIBILITY STUDY MILWAULKIE, OREGON

September 2003

Submitted by:

Cornforth Consultants, Inc. 10250 SW Greenburg Road, Suite 111 Portland, OR 97223

TABLE OF CONTENTS

Page
Page

1.	INTRO	DDUCTION
	1.1	General
	1.2	Available Information1-1
	1.3	Scope of Work 1-1
2.	SUBS	URFACE INVESTIGATION
	2.1	General2-1
	2.2	Exploratory Borings
3.	LABO	RATORY TESTING
	3.1	General
	3.2	Soil Classification
	3.3	Natural Moisture Content
	3.4	Unconfined Compression Tests
4.	SUBS	URFACE CONDITIONS
	4.1	Subsurface Conditions
	4.2	Groundwater
	4.3	Geotechnical Cross Section
5.	Cons	TRUCTION FEASIBILITY
	5.1.	General5-1
	5.2.	Option 1 - Channel Excavation With No Structural Reinforcement 5-1
	5.3.	Option 2 - Channel Excavation With Structural Reinforcement 5-1
6.	Conc	LUSIONS AND RECOMMENDATIONS
	6.1	Conclusions
	6.2	Recommendations

LIST OF FIGURES

Figure 1: Vicinity Map

- Figure 2: Site Plan and Longitudinal Cross-Section
- Figure 3: Summary Boring Log DH-1 and Core Photographs
- Figure 4: Summary Boring Log DH-2 and Core Photographs
- Figure 5: Summary Boring Log DH-3 and Core Photographs
- Figure 6: Summary Boring Log DH-4 and Core Photographs
- Figure 7: Summary Boring Log DH-5 and Core Photographs
- Figure 8: Channel Cross-Section and Conceptual Options

APPENDICES

- Appendix A Field Boring Log Sheets
- Appendix B Unconfined Compression Test Results on Selected Cores

1. INTRODUCTION

1.1 General

The information and results presented in this report were prepared in response to the "Detailed Statement of Work for Contract No. DACW57-00-D-0011, Task Order No. 16," dated April 8, 2003. This project involves the geotechnical feasibility study for fish passage improvements at the Highway 99E Kellogg Creek crossing. The proposed project may include notching and/or removal of a barrier (check dam) to restore a more natural stream channel beneath the bridge. The restoration project would restore the stream channel and approximately 14 acres of associated riparian and wetland habitats in the lower 0.75 miles of Kellogg Creek to a more natural state. The project is located in Milwaukie, Oregon, as shown in Figure 1, Vicinity Map.

<u>Objectives</u>. The objectives for this project are:

- Conduct difficult-access subsurface drilling program beneath the bridge.
- Coordinate with ODOT, ODFW and the City of Milwaukee.
- Drill and sample five boring locations to depths of approximately 10 to 25 feet, using HWT Casing Advancer and HQ3 coring methods.
- Perform Standard Penetration Testing (SPT) every $2\frac{1}{2}$ feet in overburden soils.
- Core drill the bedrock with an HQ3-wireline coring system.
- Perform limited laboratory testing, including: water contents on SPT samples and unconfined compression testing on rock samples.
- Reduce lab data and prepare summary boring logs.
- Prepare a geotechnical feasibility study.

1.2 Available Information

The Portland District Corps of Engineers (NWP) provided a site plan and cross sections of the site.

1.3 Scope of Work

Permits

Work was delayed several months due to the need to obtain permits and permissions prior to the start of drilling. Verbal permission was obtained from ODOT to work within the structure. Through coordination and assistance by the Portland District, permissions were obtained for the work from Oregon Fish and Wildlife, NOAA and the City of Milwaukee, Oregon. It was determined, however, that the work must be performed during the in-water work period, requiring a delay of drilling until July, 2003. In addition, the drilling subcontractor filed geotechnical hole reports for each boring with Oregon Water Resources Department upon completion of the exploration program.

Coordination

Cornforth Consultants, Inc. provided the resources for all coordination efforts required for the task order, including the following:

- John Sager was the Project Manager (PM) and served as a single-point of contact and liaison between Portland District and Cornforth Consultants, Inc. Kenji Yamasaki worked on completing this report.
- Cornforth Consultants, Inc. provided all coordination and management of the work for the Corps of Engineers, Portland District.
- Corps of Engineers Portland District contacts were as follows:
 P.O.C.: Dave Scofield and Tim Kuhn

Explorations

A drilling and sampling program was completed that included logging of SPT and core samples. Details of the drilling program are presented in Section 2, Subsurface Investigation.

Inspection and Logging

An experienced geotechnical engineer logged the drilling action and samples retrieved from the borings, in accordance with EM 1110-1-1804. Classification of subsurface materials utilized ASTM D-2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) and Portland District approved methods for rock core logging.

Laboratory Testing

Laboratory testing was performed to define static properties of subsurface materials in accordance with EM 1110-2-1906, Laboratory Testing Procedures. Details of laboratory testing program are presented in Section 3, Laboratory Testing.

<u>Data Analysis</u>

Summary boring logs were prepared for all subsurface explorations. The summary logs present our interpretation of the geology at boring locations. Logging procedures followed Portland District classification standards and practices. Laboratory results were summarized and used to develop appropriate soil parameters. A cross-section was developed to show subsurface conditions and approximate bedrock locations.

Engineering Analyses of Construction Option Feasibility

Geotechnical engineering analyses were performed to recommend options for constructing a deeper channel section for two options: (1) the south side of the structure only, and (2) the entire width of the structure.

Checkpoint Meetings

The following coordination meetings were held during the progress of this study:

- Checkpoint Meeting No. 1 reviewed the proposed field investigation for approval and included the Site Safety Plan.
- Checkpoint Meeting No. 2 preliminary review of findings and presentation of the field results.
- Checkpoint Meeting No. 3 follow-up to the submitted draft report

2. SUBSURFACE INVESTIGATION

2.1 General

The drilling program for this project included a total of five borings. Crux Subsurface of Spokane, Washington, Oregon, performed the exploratory drilling on July 14 through 18, 2002, using a skid/roller-mounted Burley 2000 drill rig. The boring locations where accessed by lowering the drilling equipment with a boom truck from a bridge located on a frontage road immediately adjacent to the box culvert that supports the Hwy 99E bridge deck.

2.2 Exploratory Borings

Five exploratory borings, DH-1 through DH-5 were performed within the box culvert underneath Highway 99E, which also serves as a fish passage structure. The locations of the borings and the fishway are shown on the Site Plan, Figure 2. The boreholes were drilled vertically to depths ranging from 20 to 25 feet. During drilling operations, the portable rig was anchored to the base of the concrete slab in the box culvert using 6-inch long "red head" wedge anchors. The borings were advanced using HWT casing-advancer and HQ3-wireline core drilling techniques. Disturbed samples were obtained in conjunction with Standard Penetration Tests (SPT) performed at approximately 2½-foot intervals. When competent rock was reached, HQ3-wireline coring was used for the remainder of each hole. Details of the exploratory borings, including soil descriptions and core photographs are presented on the Summary Boring Logs, Figures 3 through 7. Refer to Table 1 for a supplemental legend for the summary boring logs. Copies of field boring logs are included in Appendix A.

3. LABORATORY TESTING

3.1 General

Laboratory testing was performed to determine soil index and engineering properties. Moisture content tests and soil classifications were performed at Cornforth Consultants soil laboratory in Portland, Oregon in accordance with EM 1110-2-1906, Laboratory Testing Procedures. Unconfined Compressive Strength tests were performed on two samples by the Oregon Department of Transportation Materials Laboratory.

3.2 Soil Classification

Soil and rock core samples obtained from the field exploration program were visually re-examined in the laboratory to confirm field classifications using ASTM D-2488. Together with the results of additional laboratory testing, final soil descriptions were prepared using ASTM D-2488. Final soil classifications and descriptions are presented on the Summary Boring Logs, Figures 3 through 7.

3.3 Natural Moisture Content

Moisture contents were determined on all SPT samples retrieved from the field explorations in general accordance with ASTM D-2216. The results of all moisture content tests are shown on the Summary Boring Logs.

3.4 Unconfined Compression Tests

Two unconfined compression tests were performed on rock core specimens from borings DH-1 and DH-2. The Materials Laboratory of the Oregon Department of Transportation performed the tests. The reported unconfined compressive strength of each test is the ultimate deviator stress, calculated by dividing the ultimate applied axial load by the initial specimen cross-sectional area. The tests were performed in accordance with ASTM D-2938. The results of the unconfined compression tests are summarized in the following table and the details are included in Appendix B.

Boring No., Sample No.,		Unit W		Moisture Content	Rock Unconfined Compressive
Depth (ft)	Soil/Rock Description	Sat.	Dry	(%)	Strength (psi)
DH-1, R-2, 22.7 to 23.7	BASALT, fresh, RQ, HARD, highly fractured	167	159	4.6	7442
DH-2, R-3, 17.6 to 18.3	BASALT, fresh, RQ, HARD, highly fractured	161	151	5.9	8611

Summary of Unconfined Compression Tests

4. SUBSURFACE CONDITIONS

4.1 Subsurface Conditions

All borings were started by coring through the concrete slab that forms the base of the culvert. Refer to Figures 3 through 7 for summary boring logs. The concrete slab was determined to be $4\frac{1}{2}$ to 6 inches thick. A layer of dense to very dense gravelly sand (very highly weathered basalt), was encountered immediately beneath the concrete in borings DH-2, DH-4 and DH-5 and graded to highly weathered basalt at approximately 7, 10 and $12\frac{1}{2}$ feet, respectively. At these locations, it is estimated that the dense to very dense layer of gravelly sand is predominantly a residual soil resulting from weathering of basalt bedrock.

Borings DH-1 and DH-3, located at the upstream end (east side) of the box culvert, encountered loose materials below the base slab. In fact, Boring DH-1 encountered a 2-foot void beneath the slab before encountering loose gravelly sand $(2\frac{1}{2}$ to 9 feet) and then a medium dense to dense gravelly silty sand (9 to $14\frac{1}{2}$ feet) with some zones of higher silt and clay content. Below $14\frac{1}{2}$ feet, boring DH-1 encountered very dense gravelly sand (very highly weathered basalt) grading to highly weathered basalt to a depth of 25 feet. Beneath the slab, DH-3 encountered very loose sandy silt to a depth of 14 feet. Below 14 feet, DH-3 encountered very dense silty gravelly sand (very highly weathered basalt) grading to only slightly less weathered basalt with clayey zones of completely decomposed rock to a depth of 26 feet. It is estimated that the loose soils at these locations are transported soils and/or reworked residual soils. The dense and very dense soils are estimated to be residual soils resulting from weathering of basalt bedrock.

Unconfined compression tests were performed on two intact basalt samples. Results of these strength tests are summarized in table 3.1 and indicate that the basalt tested was about 8000 psi (hard to medium hard rock). Due to the overall poor quality of the rock mass, only fresh basalt core samples could be tested, therefore, the rock tested is not representative of the entire rock mass. The strength of the rock mass would be primarily governed by the weak, very highly weathered rock and clay zones.

4.2 Groundwater

Borings DH-1 and DH-3 encountered artesian groundwater flows immediately beneath the concrete slab. The artesian flows and the loose material/void space beneath the slab likely indicate that the water behind the impoundment wall has been seeping around the wall for some time, and is likely the cause of the large voids beneath the slab. The artesian flows did not dissipate by the time the holes were sealed, therefore, a special steel plate with a neoprene gasket was required to seal the hole following drilling. Groundwater levels in DH-2, DH-4, and DH-5 were about 10 feet below the slab, except in DH-5 the level varied up to 15 feet below the slab.

4.3 Geotechnical Cross Section

A generalized longitudinal cross-section was developed through the box culvert as shown in Figure 2. The five boring locations are projected on this figure.

5. CONSTRUCTION FEASIBILITY

5.1 General

The Detailed Statement of Work lists two main options to be assessed for construction feasibility of lowering the stream channel approximately 10 feet. This would require excavation directly adjacent to the existing bridge footings as shown in Figure 8. The two options requested for review are: (1) leaving the existing footings asis as the channel is excavated, and (2) underpinning and/or reinforcement of footings for channel excavation. Both of these options are evaluated for two scenarios, namely, excavation of only the south half of the channel (area of existing trench) and excavation of the entire width of the channel. It is assumed for design that the upstream impoundment area would be dewatered, all sediments removed from against the impoundment wall and stream flows bypassed through the work area.

The existing foundation of the highway overpass is a large box-culvert with strip footings beneath the exterior walls and small spread footings beneath the interior columns. The exterior wall strip footings are shown as approximately $3\frac{1}{2}$ -feet square in cross-section with the top of the footing level with the top of the concrete base slab. The interior spread footings appear to be $3\frac{1}{2}$ -feet square in plan view and 2 feet deep, with the top of the footing even with the base slab except for the two upstream-most columns. It appears that the two upstream columns extend 4 to 8 feet below the base slab. The lower footings are likely a result of encountering poor foundation materials, as confirmed in Borings DH-1 and DH-3 at the upstream end of the structure.

5.2 Option 1 - Channel Excavation With No Structural Reinforcement

This option is not feasible for either channel width scenario, due to the vertical and lateral forces acting on the existing foundation elements and the type of subsurface materials. Foundation subsurface materials consist of loose soils with voids and highly weathered rock with clay seams. These materials are not adequate to support the excavation of a 10-foot deep channel immediately adjacent to the existing foundation. The existing box culvert has regularly spaced struts built into the base slab to resist lateral movements at the existing foundation level. Removing these struts and excavating the new channel will require the addition of structural elements to limit the risk of permanent deformations and/or failure of the structure.

5.3 Option 2 - Channel Excavation With Structural Reinforcement

Structural reinforcement of the existing foundation elements is required for channel excavation. Feasible construction options discussed below are: first, excavation of only the south half of the channel and secondly, excavation of the entire channel width.

<u>Option 2A - Excavation of the South-Half of the Channel.</u> Structural elements must be added to minimize horizontal and vertical movements of the existing culvert sidewalls and foundation. A horizontal force is required at the existing foundation level to resist lateral movements during construction and for long-term loading conditions. This force could be applied by the use of tiebacks, and may require modification to the existing foundation. Tiebacks could be steel bars grouted in drilled holes and tensioned to apply force to the face of walls. Tiebacks would have to be installed with specialized equipment due to the limited room in the culvert. Tiebacks would need to be anchored into the decomposed basalt or highly weathered basalt, and need to be designed accordingly. Tieback elements would eliminate the need for lateral beam support and allow for open channel excavation during construction and provide permanent open channel flow without obstructions. An alternative to the tieback system is the use of internal bracing such as struts to permanently resist lateral movement of the new channel walls.

To resist vertical movements of the existing foundation, a structural system should be employed to transfer the existing vertical loads to the deeper rock strata. This is of more significant importance at the upstream end of the excavation area due to the loose subsurface materials. Also, since the structure continues upstream for another 35 feet from the area of the channel excavation, differential settlements between the two sections must be limited to very small amounts.

Structural systems that could be utilized are: small diameter cast-in-place piles and micropiles. Micropiles are small diameter, bored piles in which steel bars or pipes are grouted into boreholes to form the piles. These pile systems would be designed to resist the vertical loads due to the overpass structure, and structurally connected to the existing foundation. The selected pile system must also resist lateral loads associated with the excavation and construction of the new channel. The new channel would be overexcavated and a new channel base slab, which would be a structural member, would be constructed to withstand the lateral forces at the lower wall area of the permanent structure. Once these elements are constructed, temporary supports, if utilized, could be removed. The base slab could be covered with boulders and gravel to provide a more natural stream channel appearance and function.

The Interior columns would be structurally supported by the same method utilized on the exterior wall, but some longitudinal bracing and foundation modifications may be required. <u>Option 2B - Excavation of the Entire Channel Width.</u> Excavation of the entire channel width could utilize the same construction method as discussed for Option 2A for the exterior walls. In addition, interior columns would be required to be extended downward to the new channel base. To do this the existing structure would need to be temporarily supported during construction.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 General

It is our opinion that feasible construction options are available to perform the channel deepening of the Kellogg Creek – Highway 99E Fish Passage. To perform this work, the existing overpass/culvert structure must be structurally underpinned. A method for performing this work has been summarized in Section 5 and includes tiebacks and pile elements.

6.2 Recommendations

Further geotechnical studies for this project would involve the final design of tieback and pile systems to resist lateral and vertical loads for construction and long-term loading. The assistance of a structural engineer is required to determine proper design of existing and proposed foundation structural elements of the overpass/culvert structure.

CORNFORTH CONSULTANTS, INC.

By _____

Kenji Yamasaki, P.E. Associate Engineer

By _____

John Sager, C.E.G. Senior Associate Engineering Geologist

Limitations in the Use and Interpretation of This Geotechnical Report

Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

The geotechnical report was prepared for the use of the Owner in the design of the subject facility and should be made available to potential contractors and/or the Contractor for information on factual data only. This report should not be used for contractual purposes as a warranty of interpreted subsurface conditions such as those indicated by the interpretive boring and test pit logs, cross-sections, or discussion of subsurface conditions contained herein.

The analyses, conclusions and recommendations contained in the report are based on site conditions as they presently exist and assume that the exploratory borings, test pits, and/or probes are representative of the subsurface conditions of the site. If, during construction, subsurface conditions are found which are significantly different from those observed in the exploratory borings and test pits, or assumed to exist in the excavations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary. If there is a substantial lapse of time between the submission of this report and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, this report should be reviewed to determine the applicability of the conclusions and recommendations considering the changed conditions and time lapse.

The Summary Boring Logs are our opinion of the subsurface conditions revealed by periodic sampling of the ground as the borings progressed. The soil descriptions and interfaces between strata are interpretive and actual changes may be gradual.

The boring logs and related information depict subsurface conditions only at these specific locations and at the particular time designated on the logs. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the soil conditions at these boring locations.

Groundwater levels often vary seasonally. Groundwater levels reported on the boring logs or in the body of the report are factual data only for the dates shown.

Unanticipated soil conditions are commonly encountered on construction sites and cannot be fully anticipated by merely taking soil samples, borings or test pits. Such unexpected conditions frequently require that additional expenditures be made to attain a properly constructed project. It is recommended that the Owner consider providing a contingency fund to accommodate such potential extra costs.

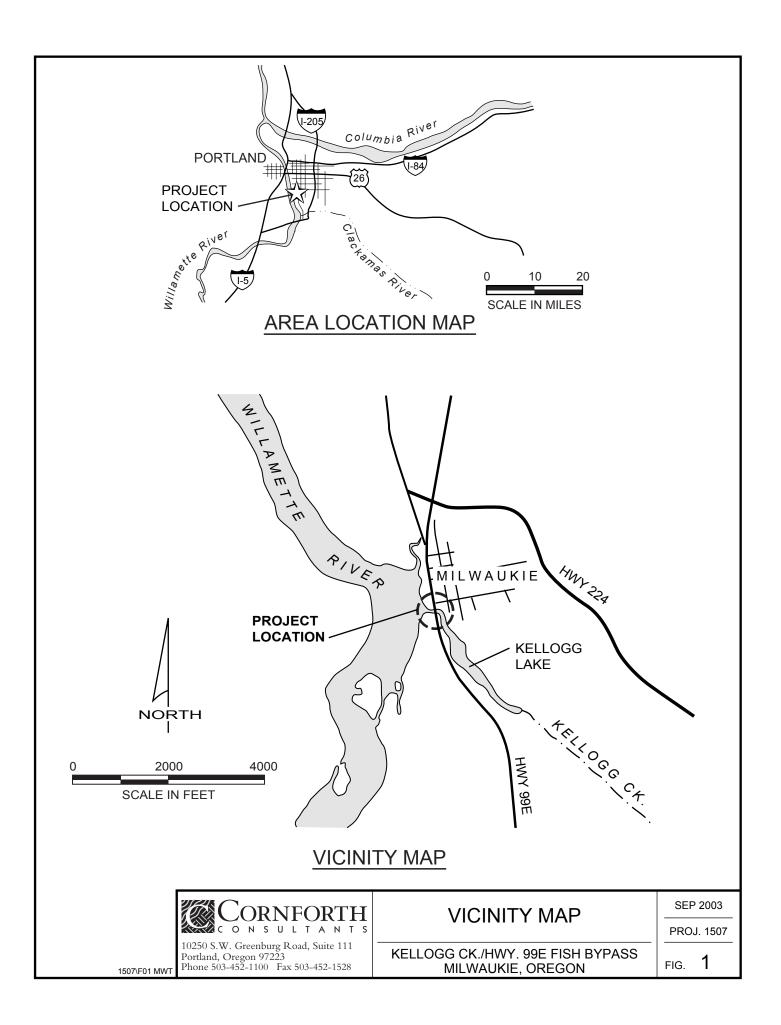
This firm cannot be responsible for any deviation from the intent of this report including, but not restricted to, any changes to the scheduled time of construction, the nature of the project or the specific construction methods or means indicated in this report; nor can our firm be responsible for any construction activity on sites other than the specific site referred to in this report.

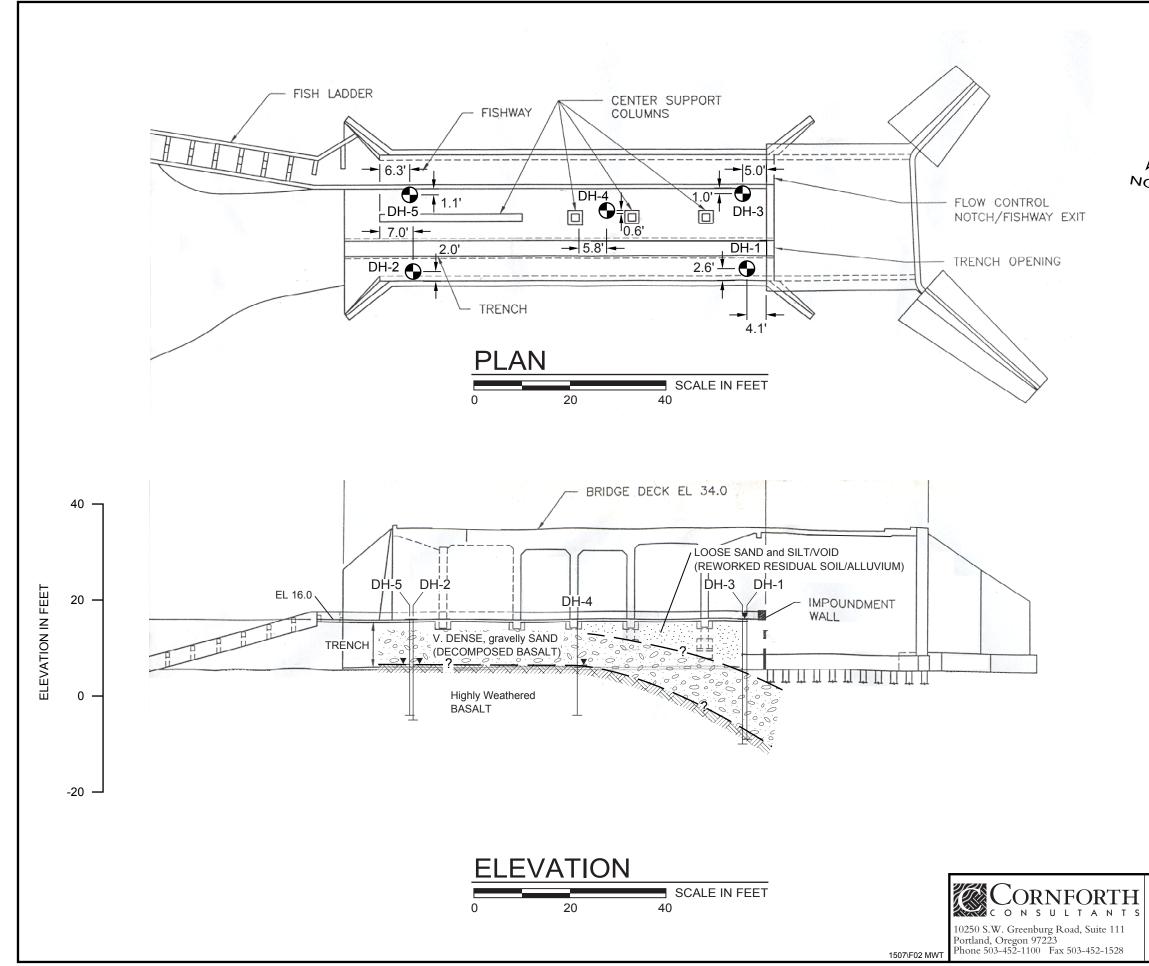
Table 1Supplemental Legend for Summary Boring LogsFigures 3 through 7

- 1. Subsurface material classifications were performed in general accordance with ASTM D 2487 (USCS = Unified Soil Classification System) and ASTM D 2488 (Visual-Manual Procedure), and Portland District approved methods.
- 2. <u>Plasticity Descriptions of Soils</u>
 - PLASTIC The ability to roll the soil into a 1/8-inch string at some moisture content.
 - APL Above the Plastic Limit. Refers to the natural moisture content of the material. Able to roll the soil into a 1/8-inch string without adding water.
 - BPL Below the Plastic Limit. The soil cannot be rolled into a 1/8-inch string without the addition of water.
 - NP Non Plastic. Cannot roll the soil into a 1/8-inch string at any moisture content.
- 3. <u>Rock Core Quality Descriptors</u>
 - CORE RECOVERY The ratio of the total length of recovered cores to the length of the core run.
 - RQD (Rock Quality Designation) The ratio of the total length of core pieces greater than 4 inches in length to the length of the core run.
- 4. <u>Field Compressive Strength of Rock</u>

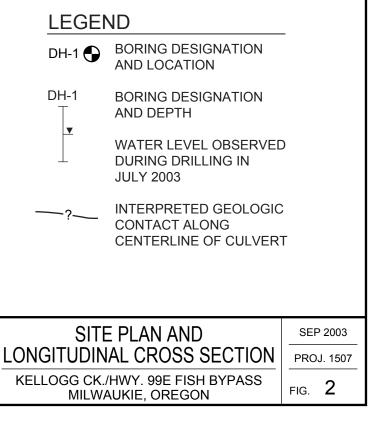
Based on reactions to impact loading by means of a one-pound ball-peen hammer (or a well rounded pick end of a G-hammer).

- MQ Moldable Quality. The rock material is moldable, and therefore must be completely to partly decomposed.
- CQ Crush Quality. A reaction under the point of impact producing a shearing and upthrusting of adjacent mineral grains.
- DQ Dent Quality. A reaction under the point of impact producing a dent or depression. It indicates the presence of "pore space" between the mineral grains.
- PQ Pit Quality. A reaction under the point of impact producing a "shatter cone" and an explosive departure of mineral fragments. Results in a shallow rough pit.
- RQ Rebound Quality. A reaction under the point of impact in which there is no reaction by the rock.





NORTH

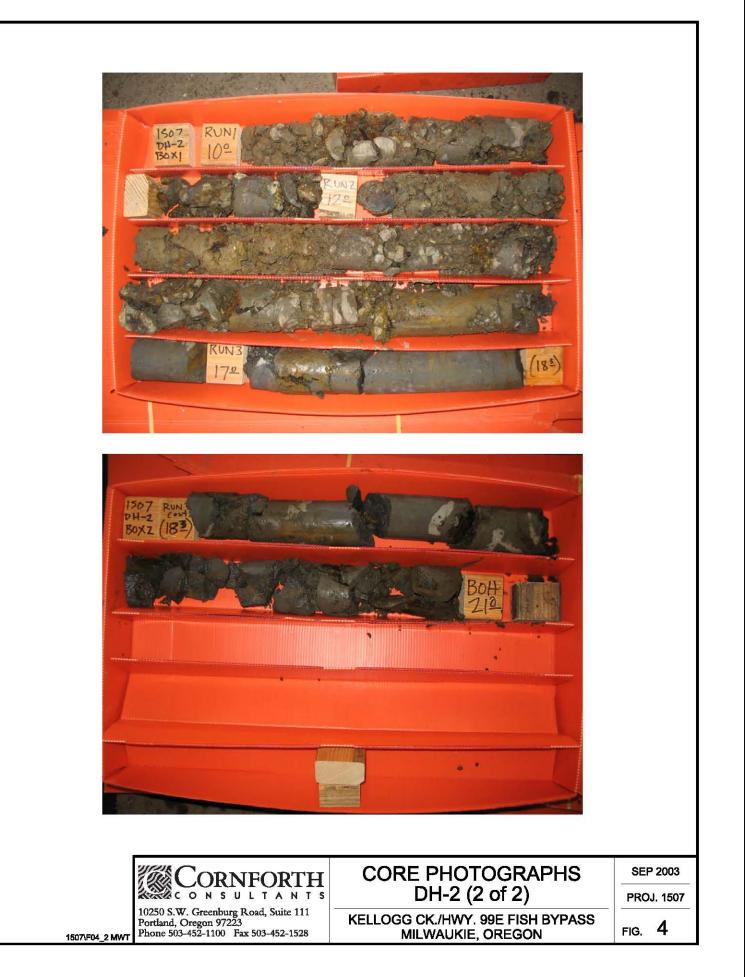


ELEW # 10 bit dot # 10 bit		ΞĒ	SS	MATERIAL DESCRIPTIO	•	SA	MPLES	GROUND	STANDAF PENETRATION			LEGEND	<u> </u>
13 1 1 NOTE 2 2 8.1.1.2.1.4.1.VID 13 10 Growely SAND, tesselling on yobrow, TODSE, with 3 10 10 Same 10.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	ELEV.	NEP	USC		а Ха			WATER DEPTH	BLOWS PER	RFOOT			
13 2 Ist. b 2 10 Ist. b 2	153	1.00	0		/	1	5.P.I.					2" S.	P.T. SAMPLE
7 9 Grewey SARD, Tead all, gelystocen, TOOSE, with a second seco	13 <u>1</u>	21/2										129-12	
SP MP (REWORKED RESIDUALUVUU) 3 10 6 0				Gravelly SAND, trace slit, gray/brow	n, LOOSE, wet,	2	X						
7 9 Gravely Bity SMD, proving with DENSE, with M ² 4 9 0 SAMPLE 14 9 Gravely SAND, for out of SIGN days with SAND, BPL. 0 6 27 4 4 9 4 4 9 4 4 9 4 9 4 4 4 4 4 4 4 4 4 9 4 4 4 4 4 4 4 4 4 4 4 4			SP	NP (REWORKED RESIDUAL SOIL	ALLUVIUM)	3	10	5				1000 ED 500000ED	
7 8 9			0						. <i> </i> . <i> </i> . .				
SP-SM (COMPOSED BEDROCK) SP-SM (COMPOSED BEDROCK) SP (COMPOSED BED						4	6					the second se	
13 14 Greenely SAND, Teace ald, grey/more VERY 8 43 15 3 21 BASALT, grey, Feelh to completely decomposed, RR, ND, Tacce and Greenely Teace and the completely decomposed, RR, ND, Tacce and Greenely Teace and the completely decomposed, RR, ND, Tacce and Completely decompletely d	7	9		Grouply sith SAND groutbraup D		5	27					H	
13 14 Greenely SAND, Teace ald, grey/more VERY 8 43 15 3 21 BASALT, grey, Feelh to completely decomposed, RR, ND, Tacce and Greenely Teace and the completely decomposed, RR, ND, Tacce and Greenely Teace and the completely decomposed, RR, ND, Tacce and Completely decompletely d				with a zone of slightly clavey silty S		6	X	10		T		影 IMPE	RVIOUS SEAL
13 14 14 15 Envely SANU, THEOS BILL, DEPUNDIVENT, VERY DENSE, wel, NP (DECOMPOSED BEDROCK) 9 8 43 15 -5 21 BASALT, Grey, Teeh to completely decomposed, RM, NO, NO, HARD, SORT, CORE, TARK, TARK, SORT, RECV, 20 START HQ WITELINE 25 START HQ WITELINE 25 -6 21 BASALT, Grey, Teeh to completely decomposed, RM, NO, DR, 10 7 10 Sort, RECV, 20 -6 21 BASALT, Grey, Teeh to completely decomposed, RM, NO, DR, 10 7 10 Sort, RECV, 20 -7 25 Botion of Boring: 25 feet Sort, RECV, 20 Sort, RECV, 20 Sort, RECV, 20 -8 25 Botion of Boring: 25 feet Sort, RECV, 20 Sort, RECV, 20 Sort, RECV, 20 -8 26 Botion of Boring: 25 feet Sort, RECV, 20 Sort, RECV, 20 Sort, RECV, 20 -9 26 Botion of Boring: 25 feet Sort, RECV, 20 Sort, RECV, 20 Sort, RECV, 20 -9 26 Botion of Boring: 25 feet Sort, RECV, 20 Sort, RECV, 20 Sort, RECV, 20 -9 26 Botion of Boring: 25 feet Sort, RECV, 20 Sort, RECV, 20 Sort, RECV, 20 -9 26 Botion of Boring: 25 feet Sort, RECV, 20 Sort, RECV, 20 Sort, RECV, 20 -9 27			SP-SM	(DECOMPOSED BEDROCK)		7	44					4	
13 143 Envelop SAND, Teero sit, gray, freeh to completely decomposed, RG, RL, ND, 11 B 2004, FRECV, 20 15 PIEZORERT ITP -5 21 BASALT, gray, freeh to completely decomposed, RG, RL, 100 NO. 11, 2004, RECV, 20 STATE HO, WIRELINE 25 State to many state to completely decomposed, RG, RL, 100 NO. 11, 2004, RECV, 20 STATE HO, WIRELINE 25 WATER CONTENT NOTES -9 25 Botion of Boring: 25 feel 27 NOTES NOTES NOTES -9 25 Botion of Boring: 25 feel 27 NOTES NOTES NOTES -9 26 Botion of Boring: 25 feel 27 NOTES NOTES NOTES -9 26 Botion of Boring: 25 feel 00 28 NOTES NOTES -9 26 Botion of Boring: 25 feel 00 28 NOTES 15 -9 26 Botion of Boring: 25 feel 15 16 16 16 -9 26 Botion of Boring: 25 feel 16 16 16 16 27 Botion of Boring: 25 feel 16 16 16 16 16						8	43		· · · · · · · · · · · · · · · · · · ·	:: 4			
-5 21 BABALT. Jiny, Testin completely decomposed, RG	1 1	14 1						15		$-\lambda$		PIEZ	OMETER TIP
-5 21 Run 10 Boder Goder Sold Rox Watter -5 21 BABALT.gray, fresh to completely decomposed. Right Sold Sold Rox Sold Rox Rox Sold Rox Rox Sold Rox Rox<			2012-15	DENSE, wet, NP (DECOMPOSED	BEDROCK)		2 ⁰⁴		: : : :¶ :	::: `	64		
-5 21 RUN 11 Source (CRE) 20 CONTENT Poor CONTENT BABALT_Target, fresh to completely decomposed, RQ 11 Source (Re) 11 Source (Re) START HO WIRELINE 25 9 25 Boltom of Boring: 25 feet R2 100 500* START HO WIRELINE 25 9 25 Boltom of Boring: 25 feet R2 100 25 NOTES 9 26 Boltom of Boring: 25 feet R2 100 25 NOTES 9 26 Boltom of Boring: 25 feet R2 100 25 NOTES 9 26 Boltom of Boring: 25 feet R2 100 25 NOTES 9 26 Boltom of Boring: 25 feet R2 100 26 NOTES 9 26 Boltom of Boring: 25 feet R2 100 26 NOTES 9 26 Boltom of Boring: 25 feet R2 100 100 100 9 26 Boltom of Boring: 25 feet R2 100 100 100 9 10 100 100 100 100 100 100 9 10 100 100 100 100 </td <td></td> <td></td> <td>SP</td> <td></td> <td></td> <td>40</td> <td>77 50/51</td> <td></td> <td> · · · <u> </u> ·</td> <td></td> <td>50/5</td> <td></td> <td></td>			SP			40	77 50/51		· · · <u> </u> ·		50/5		
-5 21 BASALT_gray, fresh to completely decomposed, RR b MG, HARD IS SOT, Inghly fractured (HGHLY WEATHERDE DECINCOVENT Bottom of Boring: 25 feet Bottom of Boring: 25 feet DECOMPOSITIONS AND INTERPACES ARE MOTES Bottom of Boring: 25 feet DECOMPOSITIONS AND INTERPACES ARE MOTES Bottom of Boring: 25 feet DECOMPOSITIONS AND INTERPACES ARE MOTES BOTTONS AND INTERPACES ATTESAN GROUNDWATER FLOW EDING AND DERILING. BOTTONS AND INTERPACES BOTTONS AND INTERPACES BOTTONS BOTTONS AND INTERPACES BOTTONS AND INTERPACES BOTTONS BOTTONS BOTTONS BOTTONS AND INTERPACES BOTTONS BOTTO						19925 - 5		CORE		· · · 1	50/4"	POD	CONTENT
-9 25 Betom of Boring: 25 feet -9 26 20 3 Betom of Boring: 25 20 3 B	-5	21		BASALT gray fresh to completely		1			START HO WIE		51		- PLASTIC LIMIT
9 25 Bottom of Boring: 25 feet 9 25 Bottom of Boring: 25 feet 1 WATHERED BEDROCK) 12 R-2 100 25 Bottom of Boring: 25 feet 1 WATHERAD DESCRIPTIONS AND INTERACES ARE 1 AMTERAL DESCRIPTIONS AND INTERACES ARE 1 AMTERAL DESCRIPTIONS AND INTERACES ARE 1 AMTERAL DESCRIPTIONS AND INTERACES ARE 1 AMTERAL DESCRIPTIONS 1 AMTERACES ARE 1 AMTERAL DESCRIPTIONS 1 AMTERACES 2 AMTERAL DESCRIPTIONS 1 AMTERACES 1 AMTERAL DESCRIPTIONS 1 AMTERACES 1 AMTERAL DESCRIPTIONS 1 AMTERACES 1 AMTERACES 1 AMTERACES 1 AMTERACES 1 AMTERACES 1 AMTERACES 1 AMTERACES 1 AMTERAL DESCRIPTIONS 1 AMTERACES 1 AMTER				to MQ, HARD to SOFT, highly fract	ured (HIGHLY	R-1	100	50/78			25 50/3		
Detom of Boring: 25 feet NOTES 1. MATERIAL DESCRIPTIONS INTERPRETIVE AND GRADUAL. CHANGES MAY BE GRADUAL. 2. APTESMA GRADUADES GRADUAL. 2. APTESMA GRADUNOVATER GRADUAL. 2. APTESMA GRADUNOVATER GRADUAL. 3. SEE TABLE 10 REPORT DRILLER: CRUX SUBSURFACE JATE STATT: 7/14/03 1507Berings MWT SILLER: CRUX SUBSURFACE JATE STATT: 7/14/03 FINISH: 7/15/03 FINISH: 7/15/03		11.00		WEATHERED BEDROCK)	12-	R-2	100						
PRILLER: CRUX SUBSURFACE DRILLER: CRUX SUBSURFACE DATE START: T/1403 FINISH: 7/15/03 SUBMC THY Casing advancer SUMMARY BORING LOG DH-1 (1 of 2) PRO.1 187 VECTORED THO 2 NUME TENT MASSAGE DRILLING TECHNIQUE: HWT Casing advancer DRILLING TECHNIQUE: HWT Casing advancer DRILLING TECHNIQUE: HWT Casing advancer DRILLOR TECHNIQUE: HWT Casing advancer DRILLOR TECHNIQUE: HWT Casing advancer	-9	25		Bottom of Boring: 25 feet				25				NOTES	
AND INTERACES ARE AND INTERACES DISECUENT TO DILLING. 3 SEE TABLE 1 OF REPORT FOR SUPPLEMENTAL LOGIND. 1075Borlings MWT 1075Borlings MWT 107												NULES	1.000
PRILER: CRUX SUBSURFACE DATE START: FINISH: 7/15/03 STRE START: FINISH: 7/15/03													
ORADUAL. 2. ARTESIAN GROUNDWATER FLOWS DURING AND SUBSCUENT TO DRILING. SEE TABLE 1 OF REPORT OR SUPPLEMENTAL LEGEND. 3. SEE TABLE 1 OF REPORT FOR SUPPLEMENTAL LEGEND. SIMULER: CRUX SUBSURFACE DATE START: 7/14/03 INISH: 7/15/03 FINISH: 7/												INTERPR	ETIVE AND
PRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINSH: 7/15/03 SRILLING TECHNIQUE: HWT Casing advenore TRILLING TECHNIQUE: HWT Casing advenore													
Price CONSIDERT TO SUBSURFACE SEE TABLE 10F REPORT FOR SUBSURFACE DRILLER: CRUX SUBSURFACE DATE START: FINISH: TIGO SW. Greenburg Road, Suite 111 MELLONG CK.HWY SPE FISH PASSAGE TOR TOR													
DRILLING. S. SEE TABLE 1 OF REPORT FOR SUPPLEMENTAL LEGEND. DRILLING. S. SEE TABLE 1 OF REPORT FOR SUPPLEMENTAL LEGEND. SUMMARY BORING LOG DH-1 (1 of 2) RILLING. S. SEE TABLE 1 OF REPORT FOR SUPPLEMENTAL SUMMARY BORING LOG DH-1 (1 of 2) RILLING. S. SEE TABLE 1 OF REPORT FOR SUPPLEMENTAL SUMMARY BORING LOG DH-1 (1 of 2) RELING. SEP 2003 PROJ. 1507 ROU. 1507 ROU. 1507 ROU. 1507 RULING. S. SEE TABLE 1 OF REPORT FOR SUPPLEMENTAL SUMMARY BORING LOG DH-1 (1 of 2) RELING. SEP 2003 PROJ. 1507 ROU. 1507													
DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINISH: 7/15/03 DATE START: 7/15/03 DATE START: 7/15/03 DATE START: 7/15/04 DATE START: 7/15/05 DATE START: 7/15/05 DATE START: 7/15/05 <													
DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINISH: 7/15/03 SRILLING TECHNIQUE: HWT Cesing advencer 10250 S.W. Greenburg Road, Suite 111 SRILLING TECHNIQUE: HWT Cesing advencer													
DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Cesing advencer DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Cesing advencer DATE START: 7/15/03 DRILLING TECHNIQUE: HWT Cesing advencer DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Cesing advencer DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Cesing advencer DATE START: 7/15/03 DRILLING TECHNIQUE: HWT Cesing Adven													
DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer and HO3 wireline Brotland, Oregon 97223 START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer													
DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer and HO3 wireline Brotland, Oregon 97223 START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer													
DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer and HO3 wireline Brotland, Oregon 97223 START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer													
DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer and HO3 wireline Brotland, Oregon 97223 START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer													
DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer and HO3 wireline Brotland, Oregon 97223 START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer													
DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer and HO3 wireline Brotland, Oregon 97223 START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer													
DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer and HO3 wireline Brotland, Oregon 97223 START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer													
DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer and HO3 wireline Brotland, Oregon 97223 START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer													
DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer and HO3 wireline Brotland, Oregon 97223 START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer													
DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer and HO3 wireline Brotland, Oregon 97223 START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer													
DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer and HO3 wireline Brotland, Oregon 97223 START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer													
DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer and HO3 wireline Brotland, Oregon 97223 START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer													
DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer and HO3 wireline Brotland, Oregon 97223 START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer													
DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer and HO3 wireline Brotland, Oregon 97223 START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer													
DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer and HO3 wireline Brotland, Oregon 97223 START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer													
DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer and HO3 wireline Brotland, Oregon 97223 START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer													
DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer and HO3 wireline Brotland, Oregon 97223 START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer													
DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer and HO3 wireline Brotland, Oregon 97223 START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer													
DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer and HO3 wireline Brotland, Oregon 97223 START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer													
DRILLER: CRUX SUBSURFACE DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer and HO3 wireline Brotland, Oregon 97223 START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer													1507\Borings MWT
DATE START: 7/14/03 FINISH: 7/15/03 DRILLING TECHNIQUE: HWT Casing advancer and HO3 wireline Brotland, Oregon 97223					7/1/2/1							<u> </u>	1201-001 MORENES
DRILLING TECHNIQUE: HWT Casing advancer 10250 S.W. Greenburg Road, Suite 111 Portland, Oregon 97223						RN	VFC	RTH	I MARGARE ANALYSING TO BE OF MAR				
and HO3 wireline Portland, Oregon 97223 KELLOGG CK, HWY 99E FISH PASSAGE									• <u> </u>	1 -1 (1	<u>of 2</u>)	PROJ. 1507
and HQ3 wireline Phone 503-452-1100 Fax 503-452-1528 MILWAUKIE, OREGON FIG. 3				QUE: HWI Casing advancer				uite 111					
	and H	103 1	vireline		Phone 503-452-11	00 F	ax 503-4	52-1528	MIL	WAUKIE, C	REGO	N	FIG. J

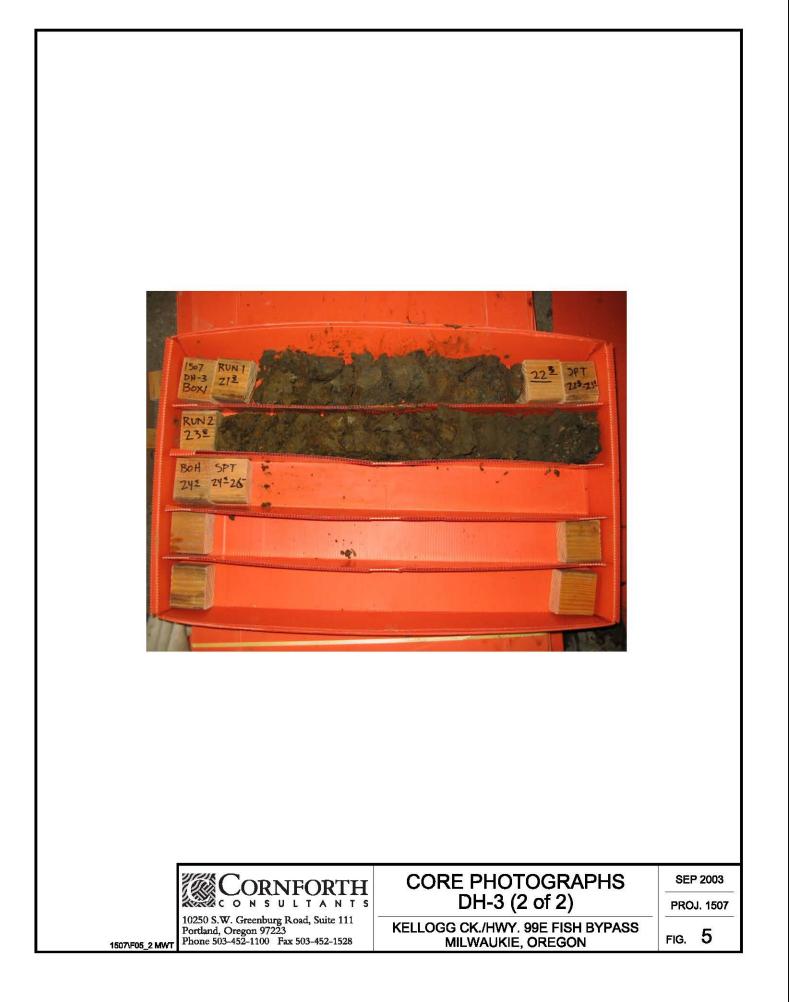




	포뇨	5°S	MATERIAL DESCRIPTION	N	SA	MPLES	GROUND	AVC/871901992			LEĞENI	
ELEV.	DEPTH IN FEET	USCS SYMBOL					WATER DEPTH	A BLOWS				<u>ر</u>
15]	⊔∠ }	_ N	SURFACE ELEV. (FT.) 16 (approx.	.)	NO.	S.P.T.	DEFIN	0 10 20	30 40		2" S	B.P.T. SAMPLE
102	2	SP	 4½ in. concrete Silty, gravelly SAND, gray/brown, V wet, NP with zones of silty clayey S (DECOMPOSED BEDROCK) 		2 3	z 50/5½"	5			50/5 ¹	* SAN REC	MPLE NOT COVERED NCRETE CORE
9	7		BASALT, gray/brown, fresh to comp decomposed, RQ to MQ, HARD to highly fractured (HIGHLY WEATHE BEDROCK)	SOFT, RUN	4 5 R-1	82/11 <u>1</u> 250/5 <u>1</u> 7	CORE RECV. % 7/15/03	START HQ	WIRELINE	82/11 ¹ 50/5 ¹ RQD % 0	G GR/	MPLE AB SAMPLE ERVIOUS SEAL
					R-2		15		T 10 FEET	8		TER LEVEL ZOMETER TIP
			near vertical slickensides at approx	. 20 to 21 feet	R-3	100	20			40	R	LIQUID LIMIT NATURAL WATER CONTENT
-5	21		Bottom of Boring: 21 feet				20		10 10			- PLASTIC LIMIT
							25		-			ER CONTENT ERCENT
											NOTES	
											AND INT INTERPE ACTUAL GRADUA 2. WATER I	LEVEL IS FOR
												IOWN AND MAY ITH TIME OF YEAR.
												BLE 1 OF REPORT PPLEMENTAL
												45070
								L		<u> </u>	l	1507\Borings MWT
			SUBSURFACE	Co	RN	JFO	RTH	-	IARY BO			10-00-0042
DATE : DRILLI				A A CON	sι	JLT	ANTS	i]	DH-2 (1			PROJ. 1507
1		vireline		10250 S.W. Gree Portland, Oregon Phone 503-452-11	9722	3			CK./HWY 9 MILWAUKIE,			FIG. 4



	ᆂᇤ	د م	MATERIAL DESCRIPTION		0.41	MPLES	GROUND	STAND	11 1 1 1 1 1			
ELEV.	DEPTH IN FEET	USCS	MATERIAL DESCRIPTION				WATER	PENETRAT BLOWS F			LEGEND	
		<u> </u>	SURFACE ELEV. (FT.) 16 (approx.	.)	NO.	S.P.T.	DEPTH		30 40		2" S.	P.T. SAMPLE
157	ź		6 in. concrete Sandy SILT, trace clay, gray, VERY BPL with layers of clayey SILT, wet APL (REWORKED RESIDUAL SOI	, moist, SOFT,			NOTE 2	· · · · ·	· · · · · · · · · · · · · · ·		* SAM	PLE NOT OVERED
		SM-ML			1 2	2 2	5	1 :::::	· · · · · ·		SAM	CRETE CORE PLE B SAMPLE
			becomes gravelly at 11 feet		3	2	10		::/:		4	RVIOUS SEAL
2	14		Silty, gravelly SAND, gray/brown, D	ENSE to VERY	4	3	45	····	: /			ER LEVEL OMETER TIP
		SP-SM	DENSE, wei, NP (DECOMPOSED	BEDROCK) RUN	5 6	36 79	,CORE				\checkmark	LIQUID LIMIT NATURAL WATER CONTENT
				NO.	7 R-1	64 / 100	RECV.20			0	RQD %	
-8	24		BASALT, brown/gray, completely do	acomposed, MQ,	8 R-2	40 100 70/9] "	25		▲●	0		RCENT
-10	26		SOFT, highly fractured with clayey i fractures (DECOMPOSED TO HI WEATHERED BEDROCK)	material in IGHLY	9 10	50/4"*				70/9] 50/] "	NOTES	
			Bottom of Boring: 26 feet				30		_		AND INTE	L DESCRIPTIONS RFACES ARE ETIVE AND CHANGES MAY BI
											21.3 TO 2 AND FRO	
												LE 1 OF REPORT PLEMENTAL
												1507\Borings MW1
			SUBSURFACE	Co	RN	VFC	RTH	SUMM				SEP 2003
		T: 7/15 ECHNI		10250 S.W. Green	S U iburg	JLT Road, S	ANTS)H-3 (1			PROJ. 1507
and H	HQ3 v	vireline		Portland, Oregon Phone 503-452-11	9722: 00 F	3 ⁵ ax 503–4	-52-1528		IILWAUKIE, (FIG. 5



LEV.	DEPTH IN FEET	USCS	MATERIAL DESCRIPTION	4	SAM	IPLES	GROUND WATER	PENETRA	DARD TION TEST		LEGEND	
	ΞĽ	S S	SURFACE ELEV. (FT.) 16 (approx.	л I	NO.	S.P.T.	DEDTU	▲ BLOWS 0 10 20	PER FOOT 30 40			
15]	÷.		6 in. concrete Silty, gravelly SAND, brown/gray, D with zones of silty, clayey SAND, Bl (DECOMPOSED BEDROCK)	ENSE, wet, NP	1	33	5		· · · · · · · · · · · · · · · · · · ·		* SAM REC	P.T. SAMPLE PLE NOT OVERED
6	10	SP				39	7/17/03 ▼ 10	· · · · ·		54	SAM	CRETE CORE PLE B SAMPLE
			BASALT, brown/gray, partly to com decomposed, CQ to MQ, SOFT to V intensely fractured, dayey material smaller zones to 20 feet (HIGHLY V BEDROCK)	/ERY SOFT, 14 to 15 feet and	4	64/11 ¹ 2	15		· · · · · · · · · · · · · · · · · · ·	50/4 <u>1</u> " 64/11 <u>1</u> "	¥ ₩ WAT	RVIOUS SEAL ER LEVEL OMETER TIP
4	20			RUN NO. \	R-1	100	CORE RECV. %	(SEE N	IOTE 4)	65/11 <u>1</u> RQD % 0 50/5 <u>1</u> "	\swarrow	 LIQUID LIMIT NATURAL WATER CONTENT PLASTIC LIMIT
			Bottom of Boring: 20.3 feet				25					ER CONTENT RCENT
							20				NOTES	
											AND INTE INTERPRI ACTUAL (GRADUAL	L DESCRIPTIONS IRFACES ARE ETIVE AND CHANGES MAY B EVEL IS FOR
											VARY WI	OWN AND MAY TH TIME OF YEAF OF DRILLING
												APPROX. 10-259
											16.2 TO 1	
												LE 1 OF REPORT PLEMENTAL
								1				1507\Borings MW
		RUX (T: 7/16	SUBSURFACE 3/03	CO	RN	JFO						10-12-12-14-14-14-14-14-14-14-14-14-14-14-14-14-
		ECHNI		10250 S.W. Green				<u> </u>	DH-4 (1		a	PROJ. 1507
and H	IQ3 w	ireline		Portland, Oregon Phone 503-452-110	97223	5		RELLOGG	CK./HWY 99 MILWAUKIE,	E FISH	TASSAGE	FIG. 6



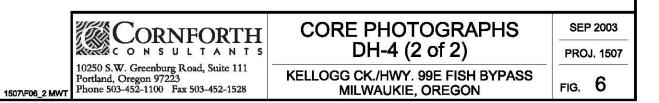
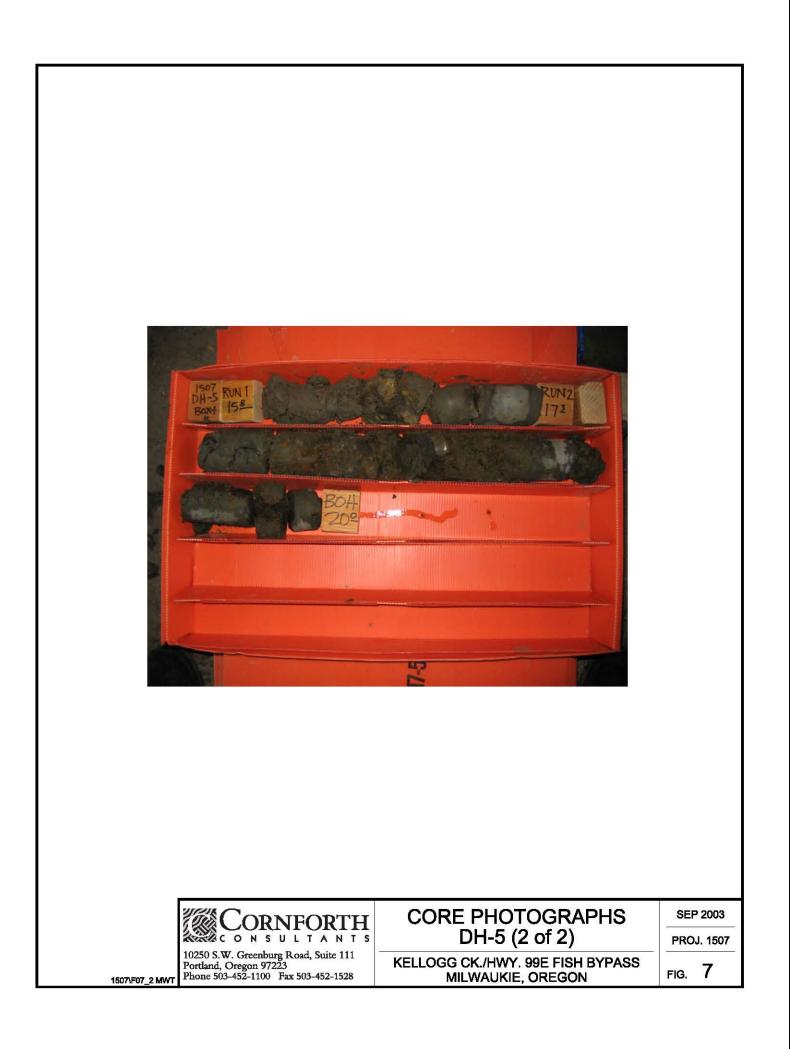
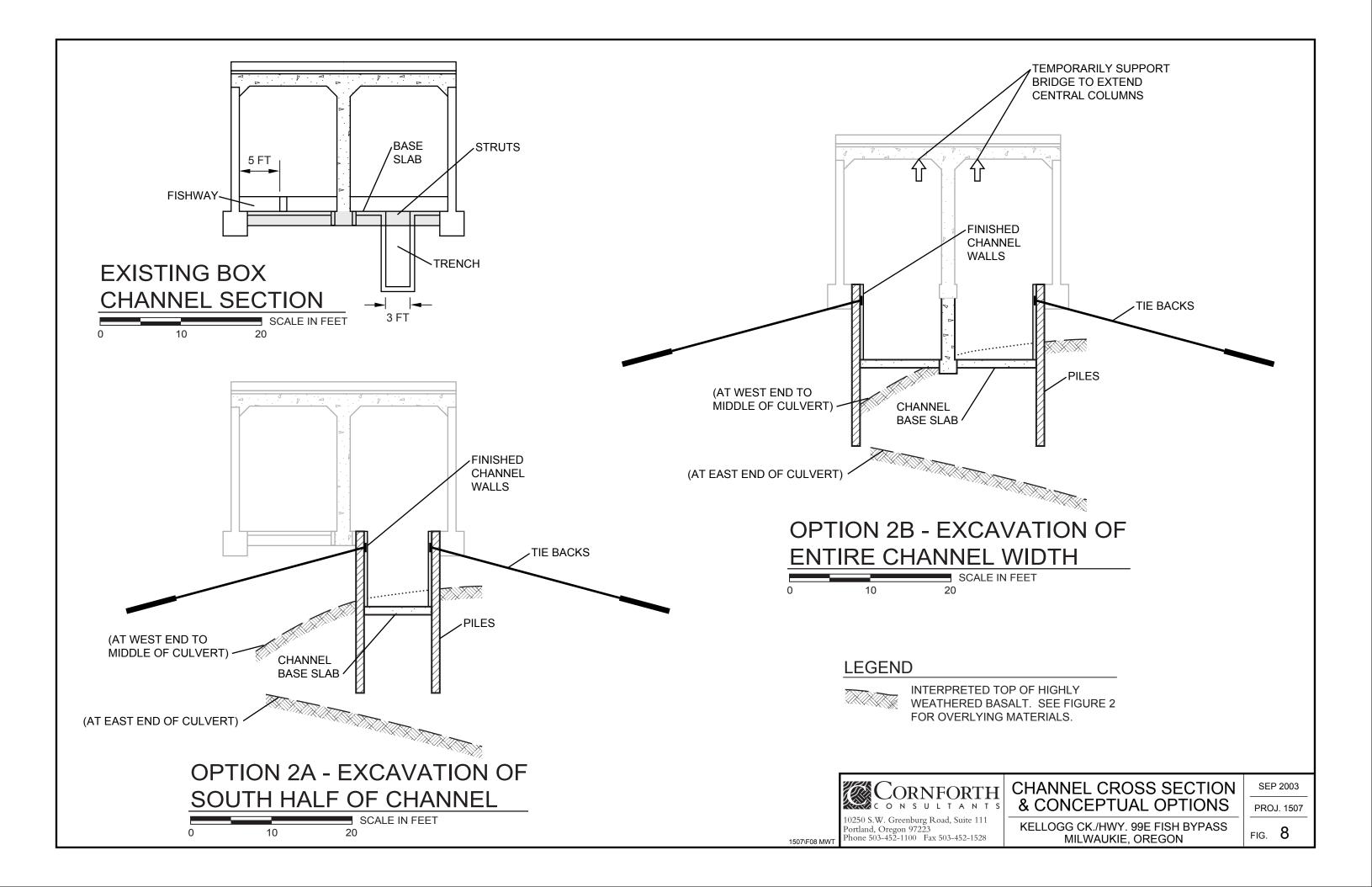


	표	SS	MATERIAL DESCRIPTION		SAM	MPLES	GROUND	STAN PENETRAT	ARE 1998 (LEGEND	
ELEV.	DEPTH IN FEET	USCS		- 	NO.	S.P.T.	WATER DEPTH	A BLOWS	PER FOOT		11	C
152	-=		SURFACE ELEV. (FT.) 16 (approx. 6 in. concrete Silty, gravelly SAND, brown/gray, VI moist, NP, w/ zones of higher silt co (DECOMPOSED BEDROCK)		1		5	0 10 20 · · · · · · · · · · · · · ·	30 40	95/9"	* SAMF RECO	P.T. SAMPLE PLE NOT OVERED CRETE CORE
-1	F	SP		DUN	з	86 85 50/5½"	7/17/03 ▼ 10 CORE RECV. %	(NOTE 2)		86 85 50/5 ¹ ″		3 SAMPLE RVIOUS SEAL ER LEVEL
31/2	12 1 20		BASALT, gray/brown, fresh to comp decomposed, RQ to MQ, HARD to s fractured (HIGHLY WEATHERED B Bottom of Boring: 20.0 feet	SOFT, highly	5 R-1 R-2	100	7/18/03 ¹⁵ (NOTE 2)	START HQ CORE AT	WIRELINE 15.8 FEET	40 33	RQD %	DMETER TIP - LIQUID LIMIT - NATURAL WATER CONTENT - PLASTIC LIMIT
							25		-			R CONTENT RCENT
											AND INTER INTERPRE ACTUAL C GRADUAL 2. GROUNDY VARIED FI	RFACES ARE TIVE AND HANGES MAY BE VATER LEVEL ROM 10 TO 15
											3. NO RETUR FLUIDS FR 1 TO 12 FT 20% RETU	OW SURFACE. RN OF DRILLING ROM APPROX. . AND APPROX. JRN 12 TO 20 FT. E 1 OF REPORT
												PLEMENTAL
												1507\Borings MWT
DRILLE DATE :			SUBSURFACE %03		RN s u	JFO		SUMM	ARY BO DH-5 (1			SEP 2003 PROJ. 1507
DRILLI and H		ECHNI /ireline	QUE: HWT Casing advancer	10250 S.W. Green Portland, Oregon Phone 503-452-110	iburg 97223	Road, S 3	uite 111	KELLOGG	CK./HWY 99 MILWAUKIE, (E FISH	PASSAGE	FIG. 7





Appendix A

Field Boring Log Sheets

Landslide Technology 10250 SW Greenburg Road Portland, Oregon 97223 JOB NO. ______ 50 7 JOB Kellogg Creek REPORT OF EXPLORATION CLIENT_USACOE Harris ~ FIELD OBSERVER _ BORING NO. DH-Celli SHT. DRILL CONTRACTOR 2000 burley SE correr of LOCATION ON SITE DRILL RIG lasny Adv $1+\omega T$ DRILLING METHOD conc. slab, over Sizo DRILL BIT GROUND ELEVATION K MUD -14-02 D NONE WATER CIRCULATION: DATE SAMPLE DATA LENGTH SAMPLE (FT.) TYPE OF SAMPLE DRIVING RESISTANCE BLOWS/6 IN. SAMPLE NO. DEPTH OF SAMPLE (FT.) FIELD DESCRIPTION FROM то Drill Lagine ALV OD^{-} water flows A. 1 54 m 00 Sw. cobble asyshee 24 11 to sea 31/2 0, Granks 10 e Vlow mar 9 S 5P7 12 わら Gray 6 6 1 7 SPT 6. gravelli М. Very DENSE Z 86 SPT -5 4"-18" NRF M.D Sil rain 1 2000 Viller note: much Smerthand DEPTH (FT.) SUMMARY FIELD BORING LOG FIELD INSTRUMENTATION FROM то rd OBSERVATION WELL 1-- BACKFILL - SEAL TIP TYPE ____ - STANDPIPE . SURROUND TIP LENGTH _____ FT. DEPTH ____ БT TIP d =____ t =___ SURROUND MATERIAL SEAL BACKFILL SURFACE SEAL INCLINOMETER CASING (BUTT JOINTS) DIA. IN. LENGTH. FΤ BACKFILL ____ STICKUP_ - FT. FIRST JOINT AT_ FT GROUNDWATER TIME CHARGES BY DRILLER GROUNDWATER HIT AT_ (DRILLER ESTIMATE) NO FREE GROUNDWATER OBSERVED _ FT. DETAILS _

Landslide Technology 10250 SW Greenburg Road Portland, Oregon 97223 JOB NO. ____ 1507 Kellogg Creek REPORT OF EXPLORATION AOL USACOE CLIENT 1 Harris FIELD OBSERVER _ (RUX BORING NO. DH -SHT. 2 / DRILL CONTRACTOR Kuulen 2000 SELOC LOCATION ON SITE . DRILL RIG lore N DRILLING METHOD diam. Rock mpres, slab (apple DRILL BIT GROUND ELEVATION -14-03 AIR ~ CIRCULATION: . MUD WATER DATE SAMPLE DATA LENGTH SAMPLE (FT.) SAMPLE NO. DEPTH OF SAMPLE (FT.) DRIVING RESISTANCE BLOWS/6 IN. TYPE OF S-W. Funto HOFIELD DESCRIPTION FROM то <u>_</u> 1:30 Drebbs 60 Casily adv. 415 /1 12 6-6 Q redri ≥ 5-6 is mill C 9 Vere Inose 12.6 DENSE avar Sil 19 125 11-10 3 SPT 44 2 A)26-133 , any bla svarelly Sand 126 14-И. /17 5-8 SPT ours nes (B)13-Slighter CA QL 5;1 process, 10-20 64 brown to greing SPT 64 141 rock 13/27 3 avaro w DEPTH (FT.) SUMMARY FIELD BORING LOG FIELD INSTRUMENTATION FROM то /d PIEZOMETER O OBSERVATION WELL - BACKFILL - SEAL TIP TYPE - STANDPIPE - SUBROUND TIP LENOTH ----FT. DEPTH TIP d =EM. 1 = SURROUND MATERIAL SEAL . BACKFILL_ SURFACE SEAL INCLINOMETER CASING (BUTT JOINTS) DIA IN. LONGTH BACKFILL STICKUP. E1 BADDY JUBSY A. GROUNDWATER TIME CHARGES BY DRILLER NO FREE GROUNDWATER OBSERVED GROUNDWATER HIT AT (DRILLER ESTIMATE) F I DETAILS __ -----

	0250 SW Green ortland, Oregon	burg Road 97223						1507
see Cartender (1969)			T OF EXPLORAT	NOL	108 <u>-</u>	Kelloy	Creek	
	J. H.	arris			CLIEN	Τ		
FIELD OBSERVER					B	DRING NO. DH		> 4
DRILL CONTRACTOR	Burley	2000			- L			sht. <u>3</u> / <u>У</u>
	10		a		- LOCA	TION ON SITE		
DRILLING METHOD _	Dix di	rill (tock bit)	<u></u>				
DRILL BIT	light ez w	MUA WATER		NONE		ND ELEVATION	14-03	
		WATER	· · · · · · · · · · · · · · · · · · ·					
SAMPLE TYPE O		SAMPLE (FT.)	DRIVING RESISTANCE	SAMPL	E DAT.	Α		
NO. SAMPLE		TO	BLOWS/6 IN.	SAMPLE (FT.)	41 000 2			
					HQU		<u>n) 142-16</u>	I blocked off
			1		Vuj n aven	o'ved-brown,'	V. Dense,	slightly sitte
3-10 SPT	174	184	35/50	02	grav	elloy sand		2000 <u>- J</u>
			312		relic v	IOCK texture	y csic fin	
					temo	- otte of	+ Juris C	uring
-11 CD-	r 1a9	208	110 1-01	24	gray	sity grall	y Sand A)-15× fres
5-11 SP		20 -	40 / 50/4"	0-	wee	Fleved B	ASALT	>prost
A 5	y teh.	to He	SP		see (one log		
		9	Ch /	_ 1	given -	brown siltu	ava ell-	Sand, V. Deny
-12 SPT	224	227	50/3	0 ² -	gray -	brown silty h. BASAL	$\frac{\alpha}{T}$, ≤ 10	Sand, V. Dens
	22±	227	50/311	0 ² -	gray - weed See (brown silty h. BASAL	\tilde{T}, \tilde{Z}	Sand, V. Dens fræs
	224 - BOH	227 © 29	50/311 5	0 ²	grey - ween See (brown silty h. BASAL	<i>quasell</i> , T, ∠ D}	Sand, V. Dens
	T *	227 © 25	50/311 5 FIELD BORING	0-	gray - Jee (<i>quaell</i> <i>T</i> , ∠ D D NSTRUME	
DEPTH (FT.)	T *	227 © 25	50/311 5 FIELD BORING	0-	grey - Jee (Ţ; ∠ ⁄∅Į	NTATION
DEPTH (FT.)	T *	227 © 25	50/3 S	0-	grey - Jee (FIEL	T, 2 10 D INSTRUME	
DEPTH (FT.)	T *	227 © 25	50/311 S FIELD BORING	0-	grey - pres	FIELD d backfill	T Z D D INSTRUME INSTRUME INSTRUME INSTRUME	
DEPTH (FT.)	T *	227 © 25	50/311 S FIELD BORING	0-	gray - Jee (FIELD 	T , 2 /10 § D INSTRUME	NT A TION OBSERVATION WED FT. DEPTHF
DEPTH (FT.)	T *	227 © 25	50/311 S FIELD BORING	0-	gray - Jee (FIELD BACKFILL SEAL STANDPIPE SUBROUND TIP	T , 2 / 0 § D INSTRUME D PIEZOMETER TIP TYPE TIP LENOTH d =	NT A TION OBSERVATION WEI FT. DEPTHF
DEPTH (FT.)	T *	227 © 25	50/311 S FIELD BORING	0-	gray - Jee (FIELD G BACKFILL SEAL STANDPIPE SURROUND SURROUND MATERIAL	T, 2 /10 { D INSTRUME Instrum Instrume <	NTATION Observation weight FT. DEPTHF IN. 1 =F
DEPTH (FT.)	T *	227 © 25	50% S FIELD BORING	0-	gray - Jee (FIELD BACKFILL SEAL STANDPIPE SURROUND SURROUND MATERIAL SEAL	T / 2 //D { D INSTRUME INSTRUME PIEZOMETER TIP TYPE TIP LENOTH d =	NTATION OGSERVATION WEI FT. DEPTHF IN. ! =F
DEPTH (FT.)	T *	227 © 25	50% S FIELD BORING	0-	gray - per	FIELD BACKFILL SEAL STANDPIPE SURROUND SURROUND MATERIAL SEAL	T / 2 //D § D INSTRUME INSTRUME PIEZOMETER TIP TYPE TIP LENOTH d =	NTATION OBSERVATION WEL FT. DEPTHFT. IN. t =FT.
DEPTH (FT.)	T *	227 © 25	50% FIELD BORING	0-	gray - Jee (FIELI d BACKFILL SEAL STANDPIPE SURROUND TIP SURROUND MATERIAL SEAL BACKFILL SURFACE SEAL	T / 2 //D § D INSTRUME □ PIEZOMETER TIP TYPE TIP LENOTH d =	NTATION Observation web FT. DEPTH FT. IN. t
DEPTH (FT.)	T *	227 © 25	50% III S FIELD BORING	0-	gray - Jee (FIELD BACKFILL SEAL SURROUND MATERIAL SEAL BACKFILL SURFACE SEAL INCLINOMETER CA	T / 2 //D { D INSTRUME □ PIEZOMETER TIP TYPE TIP LENOTH d = ASING (BUTT JOINTS)	NTATION OBSERVATION WEL FT. DEPTHF IN. 1 =F
DEPTH (FT.)	T *	227 © 25	50/3 ··· FIELD BORING	0-	gray - Jee (FIELD BACKFILL SEAL SURROUND SURROUND MATERIAL SEAL BACKFILL SURFACE SEAL INCLINOMETER CA	T / T // D INSTRUME Instrume Instrume TIP LENOTH d = ASING (BUTT JOINTS) Instrume LOHOF	NTATION OGSERVATION WEL F7. DEPTHF IN. t =F
DEPTH (FT.)	T *	227 © 25	50%	0-	grag -	FIELD BACKFILL SEAL SURROUND MATERIAL SURROUND MATERIAL SEAL BACKFILL INCLINOMETER CA DIA.	T / D INSTRUME □ □ PIEZOMETER TIP TYPE TIP LENOTH d =	NTATION OBSERVATION WEL FT. DEPTHFT. IN. t =FT. IN. t =FT. IN. t =FT.
DEPTH (FT.)	SI	227 © 22		0-	gveg -	FIELD BACKFILL SEAL SURROUND MATERIAL SURROUND MATERIAL SEAL BACKFILL INCLINOMETER CA DIA.	T / 2 //0 { D INSTRUME □ PIEZOMETER TIP TYPE TIP LENOTH d =	NTATION Observation wel FT. DEPTHFT IN. 1 =FT

Hole No. DIVISION INSTALLATION SHEET Ţ DRILLING LOG OF 4 DH -1 SHEETS 1. PROJECT 10. SIZE AND TYPE OF BIT Kellogg Creek 11. DATUM FOR ELEVATION SHOWN (TBM or MSL) concestab. 2. LOCATION (Geordinates or Station) Underpass alex passage 12. MANUFACTURER'S DESIGNATION OF DRILL 3. DRILLING AGENCY Burley 2000 TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN 13. DISTURBED UNDISTURBED 4. HOLE NO. (As shown on drawing title and file number) 7 14. TOTAL NUMBER CORE BOXES 5. NAME OF DRILLER Chistopher Brown 15. ELEVATION GROUND WATER artesian COMPLETED 6. DIRECTION OF HOLE STARTED 16. DATE HOLE 7-14-03 7-15-03 VERTICAL DINCLINED DEG. FROM VERT. 17. ELEVATION TOP OF HOLE Conc. Slab 7. THICKNESS OF OVERBURDEN 18. TOTAL CORE RECOVERY FOR BORING % 100 8. DEPTH DRILLED INTO ROCK 19. SIGNATURE OF INSPECTOR 250 4 ms 9. TOTAL DEPTH OF HOLE % CORE RECOV-ERY BOX OR SAMPLE NO. CLASSIFICATION OF MATERIALS (Description) REMARKS ELEVATION DEPTH LEGEND (Drilling time, water lose, depth of weathering, etc., if significant) đ f . a 20 208 -50FT (P2) +1 Zaesof(RD), 51, +0 BOXT 21 D=1.6 mod. neathered BASALT some vesicles, highy Jonned J-soil (PO) worth, fuart gray /brow 100% RUNI RUP= 25% 2=1,6 22 Q=0.4 224 -SP SPT X 223 med. R3 to Hard R4. 51. RUNZ 100% 23 $p=2^3$ weathered to fresh BASALT mod. jointed, some vericles R=23 (small - so; 1- \$ike (e) verting 24 Q=2° £60=87% zac) gray-brow 250 25 BOH @ 25'

Landslide Technology 10250 SW Greenburg Road Portland, Oregon 97223 1507 JOB NO REPORT OF EXPLORATION Kollogs Creek 108 USA-COE J. Harris CLIENT FIELD OBSERVER BORING NO. /xux DRILL CONTRACTOR SHT. Burley 2000 Sw Ornevo DRILL RIG LOCATION ON SITE Ceving Ad 5 Þ Har DRILLING METHOD Slab. D Casi t/noTriene AWT GROUND ELEVATION DRILL BIT -15-03 CIRCULATION: D MUD DATE SAMPLE DATA LENGTH SAMPLE (FT.) TYPE OF SAMPLE DRIVING RESISTANCE BLOWS/6 IN, SAMPLE DEPTH OF SAMPLE (FT.) DESCRIPTION NO. FROM 1/2 OD то 41/2" crett Cen (\mathcal{O}) CONC 710 Cort Vne 1 cart silly claney sa ARD. brown YS 10050 2 zio w 15-70 proun - Grang saie 9 ξź 45 29 SPT 2/1-> ast veck AVA 49 6 eìì Sam SP. grey 04 5 SPT ine walt. Avil wites Coring of Switch to HQ DEPTH (FT.) SUMMARY FIELD BORING LOG FIELD INSTRUMENTATION FROM то ∕d OBSERVATION WELL BACKFILL TIP TYPE ___ - STANDPIPE ~ SURROUND TIP LENGTH ____FT. DEPTH __ TIP d =_____ IN. t =___ SURROUND MATERIAL SEAL ___ BACKFILL_ SURFACE SEAL . INCLINOMETER CASING (BUTT JOINTS) DIA. _____ ___ IN. LENGTH _____ ___ ET BACKFILL STICKUP __ FT. FIRST JOINT AT. FT GROUNDWATER TIME CHARGES BY DRILLER NO FREE GROUNDWATER OBSERVED GROUNDWATER HIT AT (DRILLER ESTIMATE) ___ FT. Ш DETAILS.

Hole No. INSTALLATION SHEET 7 DIVISION DRILLING LOG DH-1002 OF 2 SHEETS 1. PROJECT 10. SIZE AND TYPE OF BIT Kellogg Creek 11. DATUM FOR ELEVATION SHOWN (TBM or MSL) Slab. 2. LOCATION (Coordinates or Station) SW Gab awea 12. MANUFACTURER'S DESIGNATION OF DRILL Burley 2000 3. DRILLING AGENCY XVX. 13. TOTAL NO. OF OVER- DISTURBED BURDEN SAMPLES TAKEN UNDISTURBED 4. HOLE NO. (As shown on drawing title and file number) DH-1002 Z 14. TOTAL NUMBER CORE BOXES 5. NAME OF DRILLER Christopher Brown 15. ELEVATION GROUND WATER ~10 STARTED 5. DIRECTION OF HOLE COMPLETED -03 7-15-03 16. DATE HOLE 7-1 DEG. FROM VERT. VERTICAL DINCLINED Eone Slab 17. ELEVATION TOP OF HOLE Conc 5"/soils"-10" 7. THICKNESS OF OVERBURDEN 18. TOTAL CORE RECOVERY FOR BORING 19. SIGNATURE OF INSPECTOR W 8. DEPTH DRILLED INTO ROCK £ 9. TOTAL DEPTH OF HOLE 2 BOX OR SAMPLE NO. % CORE RECOV-ERY REMARKS CLASSIFICATION OF MATERIALS (Description) ELEVATION DEPTH LEGEND (Drilling time, water loss, depth of weathering, etc., if significant) 10° b 4 a . g 12:10-12:30 med. Hard (R4), highly Boxl DZZ 100 RUN neathered BASALT 22 С highly to V. highly joinfeed some resicularity green Sinfed pav= pr $Q \mathcal{O}$ yellow minoralization m 120med. Hand (R4) hishly meadly BASALT, V. highly joinsed 50 st 2135-100 RUNZ vegicular, (save Bares 04 of RI-RZ weathered rock 1000=8% 17 med. Hard (BY) BASAT RUNZ 1.00 ψe -1,20 highly weath, highly to y. highly jointed, vesizute ÿ2 Du 18 BOX2 6 (Boregot DZ-k1 more highly reathered matt.) Rean= 40× -slideensides observed. BOH- 21° 210

	1025	hnology :0 SW Greent and, Oregon	97223	OF EXPLORAT	10N	JOB	12ellogg creek
FIELD OBS	ERVER	1.	Harri	5		CLIENT	IT_US_COE_PDX
DRILL CON		Cr				вс	ORING NO. DH-3 SHT. 14
DRILL RIG		Burle	y 20	00		LOCAT	TION ON SITE NE CONMAN O F Slab and
DRILLING N		•	J			OV	itside fishway
DRILL BIT						GROUN	
	DN: X MU	phtez.	water		NONE	DATE .	7-15-03
		·····		[SAMPL	E DAT/	Α
SAMPLE NO.	TYPE OF SAMPLE	DEPTH OF S	AMPLE (FT.) TO	DRIVING RESISTANCE BLOWS/6 IN.	LENGTH SAMPLE (FT.)	-	FIELD DESCRIPTION
5.1		4 <u>8</u>	63		~6	0-6" -6"- SOFT	"Lonc - no plug ve covered - water flow 48 loose granular wath = duillen com to very Loose sandy SILT, 359 e marker to class and
//	5PT	<u> </u>	6-			very	ver loose duilling 48-60-73 be Void 48-73
5-2	SPT	73	85	1/1/1	15	VERY	1605E, Sardy SILT, 35TX TO , alluvium tr. rounded gravel 1 >> yen softwall no registary
,-3	spt	98	113	1/1/1	15(A)98- 5 and 3) 105 50F	-105 Gray, ViLoose, SI. Clayey dy SILT, Hr. Org. ??, SOX fines 2-113 Brown, Strong, S. ty CLA T to V. SOPT. The COURSE Grand
				$\overline{\alpha}$	(100)	+ 50	solt drill m -> still drils very eas
-9	SPT	12^{3}	138	5/1/2	08	Fine	nextleved rock gravell
DEPTH FROM	н (FT.) то	SL	JMMARY	FIELD BORIN	G LOG	<u> </u>	FIELD INSTRUMENTATION
							d PIEZOMETER OBSERVATION W standpipe THE TYPE THE TYPE t SURROUND TIP LENGTH FT. DEPTH d IN. t = IN. t =
		·					SEAL
							DIA IN. LENGTH BACKFILL
							STICKUPFT. FIRST JOINT AT
		(GROUND	WATER	_		

Landslide Technology 10250 SW Greenburg Road Portland, Oragon 97223 1507 JOB NO. Kellogg REPORT OF EXPLORATION Creek 108 US OP CLIENT Harris FIELD OBSERVER BORING NO. SHT. 2 DRILL CONTRACTOR 2000 Corver LOCATION ON SITE _ DRILL RIG DRILLING METHOD NOCK GROUND ELEVATION DBILL BIT light ez-mid. -15-MUD MUD WATER DATE CIRCULATION: SAMPLE DATA LENGTH SAMPLE (FT.) SAMPLE TYPE OF SAMPLE DEPTH OF SAMPLE (FT.) DRIVING RESISTANCE BLOWS/6 IN. FIELD DESCRIPTION NO. FROM то ENG 45 stiglaren, SII. my 3 3 horn 8 SP SA 4 Ь 6 NC SAU h ent d SP 3 vock 405 L less Deise gravelly velic rock 51 AND 3 88 18 Strve 3 SP < 15 12 6var grau 213 Z SPT rei 24 100 avelly SALD 2 SP weath BAS 2 Sand gravelly Krawn uyes 40 Ser G 51 1 P 7.6 21 Deuse ey 5 o Sha 9 weath. BASA Shoe in roč DEPTH (FT.) SUMMARY FIELD BORING LOG FIELD INSTRUMENTATION FROM то , d OBSERVATION WELL - BACKFILL - SEAL TIP TYPE **||**|| SURROUND t TIP LENGTH _____ FT. DEPTH ____ FT тір d =____ t =__ IN. FT. SURROUND MATERIAL SEAL_ BACKFILL SURFACE SEAL . INCLINOMETER CASING (BUTT JOINTS) DIA. ___ LENGTH ____ _ IN. FT. BACKFILL _ STICKUP_ _ FT. FIRST JOINT AT. FT. GROUNDWATER TIME CHARGES BY DRILLER GROUNDWATER HIT AT _ (DRILLER ESTIMATE) NO FREE GROUNDWATER OBSERVED DETAILS ____

	Con Con	nforth Isultants, #		PORT OF EXPL	ORATION	1	18-0-7
		50 SW Greent and, Oregon					Lellogs Creek
	09712	-					Kellogs Creek USA & COE PDX
FIELD OB	SERVER		Havris				
DRILL COM	TRACTOR		×			BC	DRING NO. DH-3 SHT. 3/4
DRILL RIG		3/w ley	2000	, 	A		ION ON SITE SE COMPER
DRILLING	METHOD	the a	ore	SPT Sur	sles		
DRILL BIT	[]	Q voc	K Curr	<u>bi</u> F		GROUN	NO ELEVATION COAC. SLAG
CIRCULATI			WATER	bit	NONE	DATE _	7-16-03
	,				SAMPLE	E DATA	4
SAMPLE NO.	TYPE OF SAMPLE	DEPTH OF S	TO	DRIVING RESISTANCE BLOWS/G IN	LENGTH SAMPLE (FT.)		FIELD DESCRIPTION
5-10	SPT	26-	26-	50/4/4"	Ø	no r	tcorry
			7	- /1	/		
	Boi	+ 26,					
					-		
		*				 	
			·	· · · · · · · · · · · · · · · · · · ·			
DEPT FROM	H (FT.) TO	SI	JMMARY	FIELD BORIN	G LOG		FIELD INSTRUMENTATION
							d DIEZOMETER OBSERVATION WELL
							T BACKFILL
	_						t SURROUND TIP LENGTH FT. DEPTHFT.
	_						d=i, t=ft.
							SURROUND MATERIAL
							SEAL
	-				· · · · · · · · · · · · · · · · · · ·		BACKFILL
	-						SURFACE SEAL
							DIA IN. LENGTH FT.
							DIA. IN. LENGTH FT. BACKFILL
							BACKFILL
		(GROUND	WAIER			TIME CHARGES BY DRILLER
C NO FRE	E GROUNDW	ATER OBSERVE	D	GROUNDWATER HIT A	,Τ	FT.	DETAILS

Hole No. DIVISION INSTALLATION SHEET L DRILLING LOG DH-3 4 SHEETS OF 1. PROJECT 10. SIZE AND TYPE OF BIT reek Kellogn 11. DATUM FOR ELEVATION SHOWN (TBM or MSL) 2. LOCATION (Coordinates or Station) 12. MANUFACTURER'S DESIGNATION OF DRILL NE Corver of Slab BurleyZooo 3. DRILLING AGENCY DISTURBED 4. HOLE NO. (As shown on drawing title and file number) 13. TOTAL NO. OF OVER UNDISTURBED 1 14. TOTAL NUMBER CORE BOXES 5. NAME OF DRILLER Christopher Brown 15. ELEVATION GROUND WATER autosian (5/ight 6. DIRECTION OF HOLE STARTED COMPLETED 16. DATE HOLE 03 7-15-03 7-15 VERTICAL DINCLINED DEG. FROM VERT. 17. ELEVATION TOP OF HOLE 145 7. THICKNESS OF OVERBURDEN 18. TOTAL CORE RECOVERY FOR BORING 100 % 19. SIGNATURE OF INSPECTOR 100 8. DEPTH DRILLED INTO ROCK 94 245 9. TOTAL DEPTH OF HOLE % CORE RECOV-ERY BOX OR SAMPLE NO. CLASSIFICATION OF MATERIALS (Description) REMARKS (Drilling time, water lose, depth of weathering, etc., if significant) ELEVATION DEPTH LEGEND a Ь . f с 9 212 (RZ) SOFT Kerythisty weath, 100% Box 100 BASALT, whishly Fract, Ring 223 5-8 SPT 14/17/23 SPT RO EXREMELY SOFT to PI SOFT, ROCK, Clayey SILT Wen rounded grace & weathers I 07 RUNZ 100% Bosal (fring. 59 SPT 21/20/50 31/2" SP U 5PT 50/fo X44 11

(Par	Con Con	nforth nsultants, i	REI	PORT OF EXPL	ORATION	1	JOB NO. 1507
	1028 Porti	50 SW Green and, Oregon	burg Road 97223			100	
а.,						JOB	Kelloyg ereek VS COE PDX
FIELD OB	SERVER	JiHa	veis_			CLIEN7	
	NTRACTOR	Cru				ВС	ORING NO. DH-4 SHT4
DRILL RIG	·t	Surley	2000	>		LOCAT	TION ON SITE Carte ofslab.
DRILLING	METHOD	HWF	w co	uning slore "	17/8"	lim	
	10	with 5	hoe				ND ELEVATION
CIRCULAT	IN: MM	exercise	WATER		NONE		7-15-03
			······································	948	SAMPLE		
SAMPLE	TYPE OF	DEPTH OF	SAMPLE (FT.)	DRIVING RESISTANCE	LENGTH		
NO.	SAMPLE	FROM	то	BLOWS/6 IN.	SAMPLE (FT.)	concre	7500 / 1 Mar M
						Concre	
. <u>.</u>						duille	avarely & cobbley-likely w/save
				• !		to al	bout 21/2 fee deed,
						Switz	d to AQC 22 / 40 to 42
- 1	SPT	45	62	10/1-1/1	15	- Drow	in & draw, silty gravelly sound, lay, velic rock struct. Densi
5-1	7PT	9-	D	10/17/6	1-	wee	an BASALT?
						dritte	lost return 75 to82
							parkes2
-			01	_/	,5	/ DT	1-72, M. SOFT POD, Silty Clay, 8 Fras, relice mudistane or
5-2	SPI	72	84	5/15/24	1-/	<u> </u>	to fines, relite mudistale or I
			-	1-1-39	\	B 7	1382, DENSE, Bran-bran
		1				15	totas sitty gravelley to sand
			:			Ivera	wock, wheath BASALT
						,	
 DEPT	ГН (FT_)		!	L	L]]	
FROM	то	S	UMMARY	FIELD BORIN	G LOG		FIELD INSTRUMENTATION
							DIEZOMETER OBSERVATION WELL
							BACKFILL
							STANDPIPE
							t t SURROUND TIP LENGTH FT. DEPTH FT.
				An - and y and a - and a - and -			$d = \underline{\qquad } t = $
							SURROUND MATERIAL
	· -						SEAL
	-		·····				BACKFILL
							SURFACE SEAL
		· · · · ·		an baab ahaan ah			INCLINOMETER CASING (BUTT JOINTS)
							DIA IN. LENGTH FT.
							BACKFILL
				nana ay ang			STICKUPFT. FIRST JOINT ATFT.
	<u></u>	1	GROUND	WATER			
							TIME CHARGES BY DRILLER
NO FRE	E GROUNDW	ATER OBSERVE	ED	GROUNDWATER HIT / (DRILLER ESTIMATE)	AT	FT.	DETAILS

	Co Co	rnforth nsultants,	: RE	PORT OF EXPL	ORATIC	JOB NO 1507
	102 Port	50 SW Green land, Oregon	burg Road 97223			JOB_ Kelloss Creek
			farris			CLIENT US COE
	BSERVER		(rux			BORING NO. DH-4 SHT. 2/4
DRILL CC		Burley		\$		LOCATION ON SITE CONTRACS Ab
	METHOD	HQ	are			
DRILL BIT		HQ	Rock	lary bit		GROUND ELEVATION
CIRCULAT			WATER		NONE	DATE
					SAMPL	E DATA
SAMPLE NO.	TYPE OF SAMPLE	DEPTH OF S	TO	DRIVING RESISTANCE BLOWS/6 IN.	LENGTH SAMPLE (FT.)	FIELD DESCRIPTION
5-3	SPT	95	11-	29/50	12	V. DENSE, svarely-s. My sad greating to sittly cand gravell, relic rock, V. high- need-flevoor 13ASALT, 122 vock in shoe
				1-12		gray/brown More voley - little hander - moster to did
						V. DENSE, Silly Starelly Sand, grey & brown
5-4	SPT	12-	135	22/14/50	12	weather BASALT
				5/2	-	suitchbord to Hur- recurto 101/2" revean
						Hato 142 -> ClareyZore 131/2 \$145 feet and alone subering Casing -
45	SPT	145	16-	18 15/50	-12	V. Dowse, Silty gravelly sand, weather vock, close fines, velic rock
			_{ <u>v</u>	FSV		textine
						-isasult muratrix of soft chy
676	SHE	FR				may be on vertical fractione & fract
DEPTI	H (FT.)					AQ to 163 -> cannot get Prist vol. trad. on k
FROM	то	SU	MMARY	FIELD BORING	G LOG	FIELD INSTRUMENTATION bit how with
	-					BACKFILL PIEZOMETER OBSERVATION WELL
	-		<u></u>			SEAL TIP TYPE
						FT. DEPTHFT.
						$d = \underline{\qquad in. t = \underline{\qquad ft.}}$
						SEAL
						BACKFILL
				n	د 	SURFACE SEAL
			n - 187 -			INCLINOMETER CASING (BUTT JOINTS)
	1 					DIA IN. LENGTH FT.
			2 F 1 7 1			BACKFILL
					······································	STICKUPFT. FIRST JOINT ATFT.
		G	ROUNDW	ATER		TIME CHARGES BY DRILLER
NO FREE	GROUNDWAT	ER OBSERVED		GROUNDWATER HIT AT. (DRILLER ESTIMATE)		ET. DETAILS
				CONIECEN ESTIMATES		

10260 SW Greenburg Read Jon Hellogs C.cae K		Cor Cor	nforth Isultants, I	: REI	PORTO	FEXPLO	ORATION	1	JOB NO. 1507
Fig. Section / (U)X DORING NO. DH-H SHT. 3. / Y Back Contractors Bark (g) 2000 LORING NO. DH-H SHT. 3. / Y Observed on the mean of t									Kellog Check
Fig. Section / (U)X DORING NO. DH-H SHT. 3. / Y Back Contractors Bark (g) 2000 LORING NO. DH-H SHT. 3. / Y Observed on the mean of t			-	-				JOB	US COE
ОПТ. С									
Definition multiple Huild State (1) Huild State (1) Definition (1) Definition (1) Name And SAMPLE DATA Conce, Sia (1) State Press Conce, Sia (1) SAMPLE DATA FIELD DESCRIPTION State Press Conce, Sia (1) SAMPLE DATA FIELD DESCRIPTION State Press Sample DATA FIELD DESCRIPTION State Press Sample DATA Sample DATA State Press Sample DATA FIELD DESCRIPTION State Press Sample DATA Sample DATA State Press Sample DATA Sample DATA State Press Sample DATA Sample DATA State Press Press Press Press Sample DATA Press Press Press	DRILL COM	NTRACTOR _	Crux					BC	DRING NO. DH-4 SHT. 3 /
DIRL BIT Y // // (La bit (Abit // HQ 3/4/2) (1/2 month of the main of the state // for the state // fo	DRILL RIG	<u></u> B	wrkyza	200	1.10	1107	> / .		110N ON SITE
CREDINATION WILE AIT INDE DATE Zet	DRILLING	METHOD	HWT (asing p	<u>av/a</u>	<u>. HQ :</u>	s caring	orle	en l l.
CARCULATION A VID A VID <tha th="" vid<=""> A VID A VID</tha>	DRILL BIT		e mon	asing Ad		MU	SAC	FGROUN	ND ELEVATION COME 1 STAD
Service Description Stands FIELD DESCRIPTION MOD TO TO Stands FIELD DESCRIPTION Stands TO Stands FIELD DESCRIPTION Stands Stands Stands FIELD DESCRIPTION Both 202 Stands Stands FIELD DESCRIPTION Both 202 Stands Stands FIELD Image: Stands FIELD DESCRIPTION Both 202 Stands Stands Stands FIELD DESCRIPTION Stands To SUMMARY FIELD BORING LOG FIELD Image: Stands FIELD Image: Stands	CIRCULAT		 au	WATER			NONE	DATE .	
NO SARDE FREU TO ED00274 ML Sarding FIELD DESCRIPTION S56 FRT 112 102 59/45 50 117 HWT Caring of r from 102 to S56 FRT 112 102 59/45 50 02 Field genet. Gravel from 102 to B01 202 59/45 50 02 Field genet. Gravel from 51/100 B01 202 59/45 50 02 Field genet. Gravel from 51/100 B01 202 59/45 50 02 Field genet. BASALT, income 51/100 B01 202 59/45 50 02 Field genet. BASALT, income 51/100 B01 202 59/45 50 02 Field instrumentation BASALT, income 51/100 B01 70 SUMMARY FIELD BORING LOG FIELD INSTRUMENTATION Field genet. Field ge		T			· · · · · · · · · · · · · · · · · · ·		SAMPLE	E DAT	A
STG PT 112 202 5% // 5% 02 9000 // 50 // 5% 9000 // 50 // 5% BOTH 202 5% // 5% 02 9000 // 5% 9000 // 5% 9000 // 5% BOTH 202 5% // 5% 02 9000 // 5% 9000 // 5% 9000 // 5% BOTH 202 5% // 5% 5% 02 9000 // 5% 9000 // 5% 9000 // 5% BOTH 202 5% // 5% 5% 02 9000 // 5% 9000 // 5% 9000 // 5% BOTH 70 SUMMARY FIELD BORING LOG FIELD INSTRUMENTATION Import 10 5% // 5% 9000 // 5% 9000 // 5% 9000 // 5% 9000 // 5% Import 10 10 9000 // 5% 90000 // 5% 90000 // 5% 90				1			SAMPLE		FIELD DESCRIPTION
STG T1 PI2 202 3%% 3%		PIED DESCRIPTION DORING NO. DH-4 SHT. 3./ DIRL ROW THOS. NO. DH-4 SHT. 3./ DORL ROW Burkley 2000 LOOLING NO. DH-4 SHT. 3./ DORL ROW HU2 T. Casing Adv / 2 HQ 3 (and set of the case of the c	+ with Hut casing adv from 102 to						
STG T1 PI2 202 3%% 3%								$H\alpha$	153 to 192
BOTH 203 BOTH 203 BOTH 203 BOTH 203 DEPTH (FT) SUMMARY FIELD BORING LOG FROM TO SUMMARY FIELD BORING LOG FIELD INSTRUMENTATION C C SUMMARY FIELD BORING LOG FIELD INSTRUMENTATION SUMMARY FIELD BORING LOG FIELD INSTRUMENTATION C C SUMMARY FIELD BORING LOG FIELD INSTRUMENTATION C SUMMARY FIELD BORING LOG SUMMARY FIELD BORING LOG FIELD INSTRUMENTATION SUMARY FIELD BORING LOG FIELD INSTRUMENTATION <td>5-6</td> <td>SPT</td> <td>195</td> <td>103</td> <td>50/4</td> <td>50</td> <td>NZ</td> <td>gray</td> <td>, Silty Sardy Gravel, V. DBNSP -</td>	5-6	SPT	195	103	50/4	50	NZ	gray	, Silty Sardy Gravel, V. DBNSP -
		/.]		10	1sh	<u> </u>	U		, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,
		por	Destat	203					
FROM TO SUMMARY FIELD BORING LOG FIELD INSTRUMENTATION FROM TO FIELD INSTRUMENTATION PIEZOMETER OBSERVATION WELL Image: Strange Presson Image: Strange Image: Strange Presson			Doti	00-	CTARGE STREET,				
FROM TO SUMMARY FIELD BORING LOG FIELD INSTRUMENTATION FROM TO FIELD INSTRUMENTATION PIEZOMETER OBSERVATION WELL Image: Strange Presson Image: Strange Image: Strange Presson									
FROM TO SUMMARY FIELD BORING LOG FIELD INSTRUMENTATION FROM TO FIELD INSTRUMENTATION PIEZOMETER OBSERVATION WELL Image: Strange Presson Image: Strange Image: Strange Presson									
FROM TO SUMMARY FIELD BORING LOG FIELD INSTRUMENTATION FROM TO FIELD INSTRUMENTATION PIEZOMETER OBSERVATION WELL Image: Strange Presson Image: Strange Image: Strange Presson					 				· · · · · · · · · · · · · · · · · · ·
FROM TO SUMMARY FIELD BORING LOG FIELD INSTRUMENTATION FROM TO FIELD INSTRUMENTATION PIEZOMETER OBSERVATION WELL Image: Strange Presson Image: Strange Image: Strange Presson									
FROM TO SUMMARY FIELD BORING LOG FIELD INSTRUMENTATION FROM TO FIELD INSTRUMENTATION PIEZOMETER OBSERVATION WELL Image: Strange Presson Image: Strange Image: Strange Presson									
FROM TO SUMMARY FIELD BORING LOG FIELD INSTRUMENTATION FROM TO FIELD INSTRUMENTATION PIEZOMETER OBSERVATION WELL Image: Strange Presson Image: Strange Image: Strange Presson									
PHOM ID ID ID <td></td> <td>· · · · · · · · · · · · · · · · · · ·</td> <td> SI</td> <td></td> <td>FIELD</td> <td>BORIN</td> <td>G 1 0 G</td> <td></td> <td>FIELD INSTRUMENTATION</td>		· · · · · · · · · · · · · · · · · · ·	 SI		FIELD	BORIN	G 1 0 G		FIELD INSTRUMENTATION
Image: Second	FROM	то							
Image: Standpipe Subround material Image: Standpipe Subround material									BACKFILL
Image: Second									
		-				:			TIP LENGTHFI. DEPTHFI.
SEAL BACKFILL BACKFILL BACKFILL SURFACE SEAL INCLINOMETER CASING (BUTT JOINTS) DIA. INCLINOMETER CASING (BUTT JOINTS) DIA. IN. LENGTH FT. BACKFILL STICKUP STICKUP FT. GROUND WATER FT. GROUND WATER HIT AT FT. Details Details		-							
BACKFILL									
SURFACE SEAL INCLINOMETER CASING (BUTT JOINTS) DIA. INCLINOMETER CASING (BUTT JOINTS) INCLINOMETER CASING (BUTT JOINT AT INCLINOMETER OBSERVED GROUND WATER HIT AT FT. DETAILS								,	
INCLINOMETER CASING (BUTT JOINTS) IAIN. LENGTHFT. BACKFILL STICKUPFT. FIRST JOINT ATFT. GROUNDWATER MIT ATFT. DETAILS DETAILS									
DIA. IN. LENGTHFT. BACKFILL FT. BACKFILLFT. STICKUP FT. FIRST JOINT ATFT. GROUNDWATER FT. FILLER									
BACKFILL									INCLINOMETER CASING (BUTT JOINTS)
									DIA IN. LENGTH FT.
GROUNDWATER OBSERVED GROUNDWATER HIT ATFT. DETAILS									
Image: NO FREE GROUND WATER OBSERVED GROUND WATER HIT ATFT. DETAILS									STICKUPFT. FIRST JOINT ATFT.
NO FREE GROUND WATER OBSERVED GROUND WATER HIT ATFT. DETAILSFT.				GROUND	WATER				TIME CHARGES BY DRILLER
	NO FRE	E GROUNDW	ATER OBSERVE	D	GROUND (DRILLEI	WATER HIT A R ESTIMATE)	A T		DETAILS

,

for the second s	والمتكاف بالبلا المتحد والتربي والمتعاقدات			ويركل الأخبر المرجولي وأدرات الأ			Luce	(annona			nois No.		Contraction of the local division of the loc	
DRIL	LING LOG	D	IVISION				INSTA	LL		A-4		SHEET	SHEETS	-
1. PROJECT	1/ 1	<u>I</u>	r. mil	/					AND TYPE	OF BIT		- 1		
2. LOCATIO	K-el	109	Creek		c		1				SHOWN (TBM or MSL)		
	Portin	Lo	k		\bigvee		12. MA	NU	FACTURE	R'S DESI	Slab GNATION OF DRILL			-
3. DRILLING	CV4×								<u>Bu</u>	ivley	2000			
4. HOLE NO. and file nu	(As shown o		ing title		`		13. TO BU	IRD	L NO. OF	OVER-		UNDIST	URBED	
5. NAME OF	DRILLER	Clar	sals.	iter 3	v 821 J 1	<u>л</u>			L NUMBE					_
6. DIRECTIO		014	Nor V							STA	RTED C	MPLETE		-
VERTI		LINE	·		DEG. I	FROM VE	RT.		ATION TO	i		7-17	-03	_
7. THICKNES	SS OF OVER	BURDE										100		_
8. DEPTH DE	RILLED INT	O ROCI		3					TURE OF	INSPECT	OR .		······ - · '	-
9. TOTAL DE	EPTH OF HO	LE	20	2						ny			·	
ELEVATION	DEPTH L	EGEND c		CLASSIFIC	CATION (Descrip		RIALS		% CORE RECOV- ERY	BOX OR SAMPLE NO.	REMA (Drilling time, wat weathering, etc., q	or loss. d	epth of cant)	
	162-2													1
	i te	ē.	(R4)	HARD	, sel	nizhb	venth ntrixo (clay) une.		100	BOX! RUNI	32			þ
		ž.	P3t	SALT	in	a ho	atrixo	¢.		P-viv I	33			
1		2	RO	exhe	enk	soft	(clay)				Ø			E
			for	- 30	¥ 6	fvol	une.							F
		2	vesi	cular	Basel	E al	tearing							ł
		Ŕ		Very	an	ويتعرينهم لإيلي					· ·			
			- 14	my sh	all ver	anar	tof							
	195-30	CPT	11	59	A. 15		nanyakitin Assanda Bibbbi	annes (A)	CALIFY CONTRACTOR	n dan di sana sa	and a second second statistic of a second			Ť
	202	120	5-0	and the second se	5/2									ţ
														Þ
														F
														E
														F
										*				F
		1												þ
														ļ
														F
1														E
														Ł
														ļ
														t
									:					þ
														ľ
		,												
						-								
						7	•							Ļ
										۱ ۱				
														directory.
			I					ł		l	ł			5

Cornforth Consultants, Inc. REPORT OF EXPLORATION 1507 JOB NO. 10250 SW Greenburg Road Portland, Oregon 97223 Kellogg. Creek . JOB_ US COE CLIENT. J. Harris FIELD OBSERVER VUX BORING NO. -5 SHT. DRILL CONTRACTOR Burley 2000 Slab area LOCATION ON SITE 03600 Adv Q.___ Cat. DRILLING METHOD Slab ACTO 100 Conc GROUND FLEVATION DRILL BIT ex-h 03 NONE CIRCULATION: DATE SAMPLE DATA TYPE OF SAMPLE DRIVING RESISTANCE BLOWS/6 IN. SAMPLE DEPTH OF SAMPLE (FT.) LENGTH FIELD DESCRIPTION SAMPLE (FT.) NO. FROM то Concrete 0-6 pretu 4 55 5 y D 5-1 SPT so U cost VP りょい wood parte PEN 88 CLEAR C.H. 5 SPT O kelic rock vass THE . SP in Cat 10 8 ζ Ø\$ 5 UKA Ζ ver diff 20re 3 DEPTH (FT.) SUMMARY FIELD BORING LOG FIELD INSTRUMENTATION FROM то 4Cd OBSERVATION WELL PIEZOMETER 11-1 - BACKFILL - SEAL TIP TYPE STANDPIPE 1 - SURROUND t FT. DEPTH TIP LENGTH -----TIP d =_ _ IN. t = ___ 1 SURROUND MATERIAL SEAL BACKFILL SURFACE SEAL INCLINOMETER CASING (BUTT JOINTS) LENGTH_ DIA. IN. BACKFILL _ STICKUP_ FIRST JOINT AT_ FT. GROUNDWATER TIME CHARGES BY DRILLES GROUNDWATER HIT AT (DRILLER ESTIMATE) . . NO FREE GROUNDWATER OBSERVED DETAILS 1

	Conforth REPORT OF EXPLOR	RATION	JOB NO 1507
	0250 SW Greenburg Road ortland, Oregon 97223	JOB	Kellogg Creek
· v		JUB	
FIELD OBSERVER _	J. Havis		
DRILL CONTRACTO	autora ti	B	NW Carren SHT. 2/3
DRILL RIG	Burley 2000	LOCA	TION ON SITE NW Carver
DRILLING METHOD	Has lasing / coring		
	He ez-mund.		ND ELEVATION CONC. SLAD.
CIRCULATION:		DATE	
		AMPLE DAT	Α
SAMPLE TYPE C NO. SAMPL	OF DEPTH OF SAMPLE (FT.) DRIVING RESISTANCE LE FROM TO BLOWS/6 IN.	LENGTH SAMPLE (FT.)	FIELD DESCRIPTION
5-5 98	THE KANAVANA	First	washing the 12" herestough
	122 153 32	duille	
	12 spectruckole	Cuitelito	HQ logg rg@ 152
/			
·			
1977 - 1980 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 - 1990 -			
DEPTH (FT.) FROM TO	SUMMARY FIELD BORING	LOG	FIELD INSTRUMENTATION
			DIEZOMETER OBSERVATION WELL
			SEAL TIP TYPE
			t SURROUND TIP LENGTH FT. DEPTH FT.
			$d = \underline{\qquad} IN, t = \underline{\qquad} FT.$
			SURROUND MATERIAL
	· ·		SEAL
			BACKFILL
	·		SURFACE SEAL
			INCLINOMETER CASING (BUTT JOINTS)
	<u>¥</u>		DIA IN. LENGTH FT.
			STICKUPFT. FIRST JOINT ATFT.
	GROUNDWATER		TIME CHARGES BY DRILLER
NO FREE GROUN	DWATER OBSERVED GROUNDWATER HIT AT . (DRILLER ESTIMATE)	FT.	DETAILS

Hole No. INSTALLATION SHEET 2 DIVISION DRILLING LOG OF 3 SHEETS 1. PROJECT 10. SIZE AND TYPE OF BIT HO TOCK CONTENT Kellogg Creek Concerte Slab 2. LOCATION (Coordinates or Station) 12. MANUFACTURER'S DESIGNATION OF DRILL 3. DRILLING AGENCY Burley2000 (vux 13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN DISTURBED UNDISTURBED 4. HOLE NO. (As shown on drawing title and file number) DH - S14. TOTAL NUMBER CORE BOXES 5. NAME OF DRILLER 15. ELEVATION GROUND WATER () Wistopher Brown 6. DIRECTION OF HOLE STARTED COMPLETED 16. DATE HOLE 7-17 7-12-03 DEG. FROM VERT. WERTICAL DINCLINED 17. ELEVATION TOP OF HOLE (onc. Slah 7. THICKNESS OF OVERBURDEN 18. TOTAL CORE RECOVERY FOR BORING 100% % 8. DEPTH DRILLED INTO ROCK 19. SIGNATURE OF INSPECTOR nst 9. TOTAL DEPTH OF HOLE % CORE RECOV-ERY BOX OR SAMPLE NO. REMARKS CLASSIFICATION OF MATERIALS (Description) (Drilling time, water loss, depth of weathering, etc., if significant) ELEVATION DEPTH LEGEND d f a Ь . g 153 RY, HARD, Slightly negth. BASAC D=10 1000 BoxI RUN 1 V.h. to hoghy journed, Gray, C=10 w/ yellow -green, wrone alist Q= 04 RY, HARD, SI weath BASALT Kern his hig jointed, Gray 100× RUNL っこ D 22 C v/some day infilligot jourts 20² Boyle 20=

Appendix B

Unconfined Compression Test Results on Selected Cores

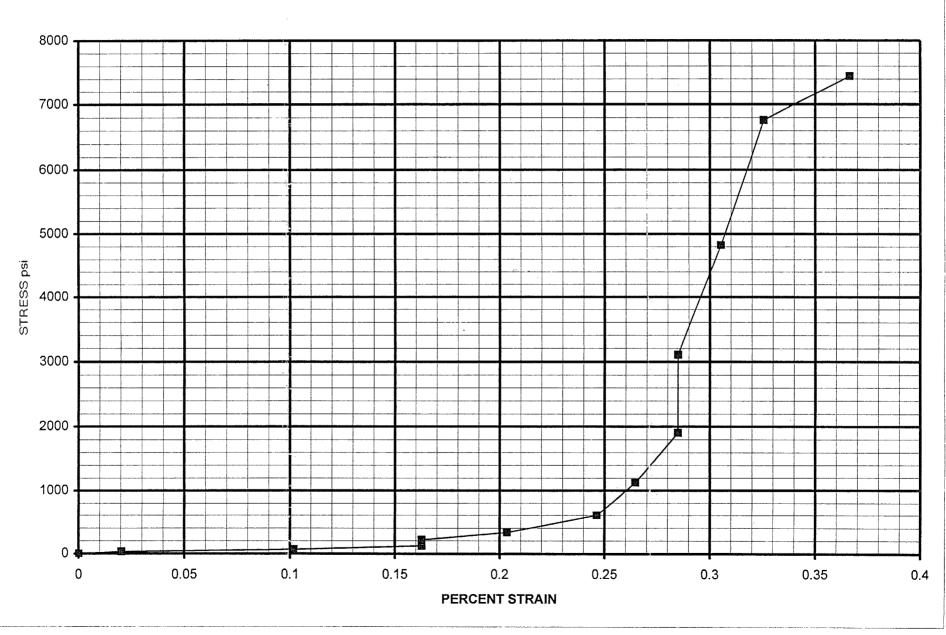
PAGE 217 3

	UNCONFINED CO	MPRESSIVE STR	ENGTH o	FINTACT ROCH	CORE	17.00	
		ASTM D 2938-95					
PROJECT	Kellogg Creek			LAB NUMBER		03-3636	
SAMPLE #	DH-1			DEPTH		22.7'-23.7'	
HEIGHTin	4.9135			INITIAL WET WT	. g	967.20	
DIAMETER in	2.3928			FINAL DRY WT.	9	925.04	
AREA in ²	4.497			MOISTURE %		4.6	
*Length to Diam		2.053		WET DENSITY Ib	/ft ³	166.8	
Maximum Stress	s= 7442 psi	%STRAIN RATE	=0.122%/N	lin			
TIME min	LOAD lb	DIAL READING in	% STRAIN	STRESS psi			
0	0.0	0	0	0			
0.25	141.5	0.001	0.0	31			
0.5	298.5	0.005	0.1	66			
0.75	555.6	0.008	0.2	124			
1	967.5	0.008	0.2	215	· · · · · / · · · · · · · · · · · · · ·		
1.25	1479.0	0.01	0.2	329			
1.5	2695.0	0.0121	0.2	599			
1.75	5062.0	0.013	0.3	1126			
2	8570.0	0.014	0.3	1906			
2.25	13970.0	0.014	0.3	3107			
2.5	21695.0	0.015	0.3	4825		· · · · · ·	
2.75	30400.0	0.016	0.3	6761			
3	33465.5	0.018	0.4	7442			
3.25	00100.0	0.010	0.1	1112		-	
3.5							
3.75						-	
4						-	
4.25							
4.5		· · · · · · · · · · · · · · · · · · ·					
4.75							
5							· · · · · · · · · · · · · · · · · · ·
5.25						-	
5.5							
5.75						-	
6							
6.25							
6.5					:		
6.75						-	
7							
7.25							
7.5							
7.75							
8							
8.25							
8.5		•					
8.75							
9							
9.25							
9.5							· · · · · · · · · · · · · · · · · · ·
9.75							



PAGE SOF 3

DH-1 22.7'-23.7' UNCONFINED COMPRESSIVE STRENGTH

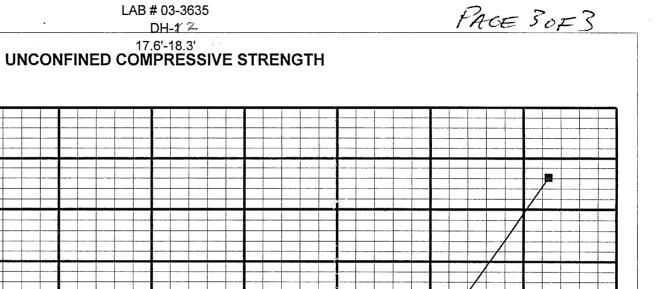


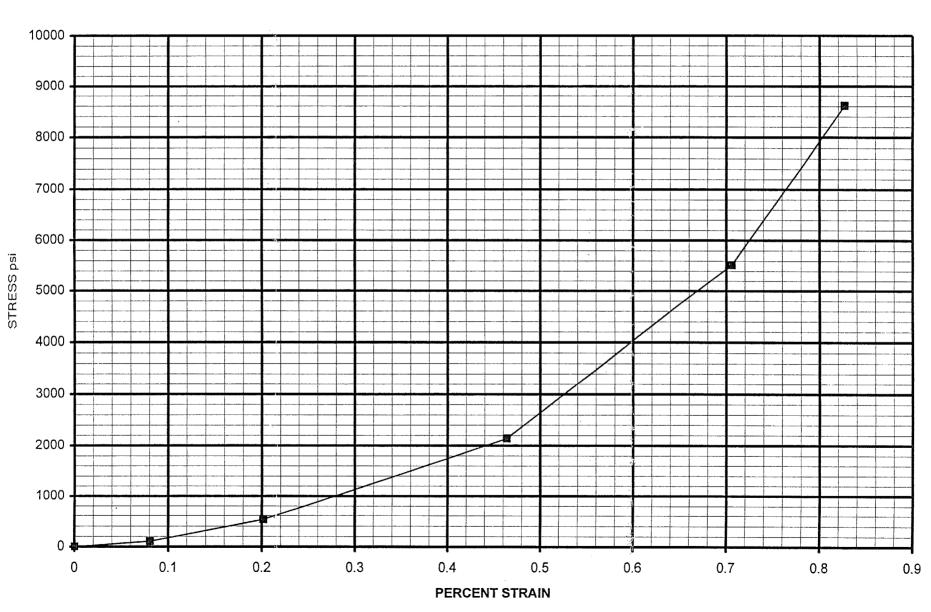
PEAK STRESS 13.255 psi

LAB # 03-3635

				A INTA OT DOOL		PAGE	-01
	UNCONFINED C	OMPRESSIVE STR ASTM D 2938-95		TINTACT ROCK	CORE		
		ASTM D 2930-95				00.0005	
PROJECT SAMPLE #	Kellogg Creek DH-1/2			LAB NUMBER DEPTH		03-3635	
······································	4.9595			- · · · · · · · · · · · · · · · · · ·	~	952.10	
HEIGHTin	2.4020			INITIAL WET WT.			
DIAMETER in				FINAL DRY WT.	}	899.22	
AREA in ²	4.531			MOISTURE %		5.9	
*Length to Diam	eter (L/D) ratio =	2.065		WET DENSITY Ib	/ft ³	161.4	
Maximum Stress	s= 8611 psi	%STRAIN RATE	=0.661%/M	/lin			-
TIME min	LOAD Ib	DIAL READING in	% STRAIN	STRESS psi			
0	0.0	0	0	0			-
0.25	477.0	0.004	0.1	105			
0.5	2390.0	0.01	0.2	527			
0.75	9700.0	0.023	0.5	2141			
1	25008.0	0.035	0.7	5519			
1.25	39020.5	0.041	0.8	8611		+	
1.5							
1.75							
2							
2.25							
2.5							
2.5							
2.75		·····		· · · · · · · · · · · · · · · · · · ·			
			·				
3.25							
3.5							_
3.75							
4							
4.25							
4.5							
4.75							
5				•			
5.25							
5.5		· ·					
5.75							
6							
6.25							
6.5							
6.75							
7							
7.25							
7.5							
7.75							
8							+
8.25						-	· ·
8.5						+	
8.75						-	
9							
9.25							
9.25							
9.0							







PEAK STRESS 13.255 psi