APPENDIX D

REVISED REPORT, GEOTECHNICAL ENGINEERING SERVICES, PROPOSED BORROW PIT EXPANSION, NATIONAL HEIGHTS AVENUE SITE, CHEHALIS, WASHINGTON

GEOENGINEERS, INC.
SEPTEMBER 17, 2004

RECEIVED
March 8, 2024
Washington Geological Survey

REVISED REPORT
GEOTECHNICAL ENGINEERING SERVICES
PROPOSED BORROW PIT EXPANSION
NATIONAL HEIGHTS AVENUE SITE
CHEHALIS, WASHINGTON

SEPTEMBER 17, 2004

FOR
CONTOURS AND CONCEPTS, INC.

GeoEngineers

File No. 11150-001-00

Revised Geotechnical Engineering Services Report
File No. 11150-001-00

September 17, 2004

Prepared for:

Contours and Concepts, Inc.
P.O. Box 476
Tenino, Washington 98589

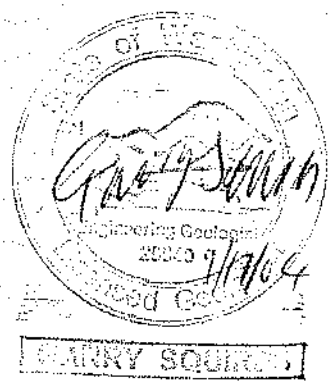
Attention: Dan Budsberg

Prepared by:

GeoEngineers, Inc.
1101 Fawcett Avenue, Suite 200
Tacoma, Washington 98402
(253) 383-4940

9/17/04

Stephen W. Helvey, LG, LEG, LHG
Senior Hydrogeologist



Garry H. Squires, PE, LG, LEG
Associate

SWH:GHS:tt:jm
TACO:\11\11150001\00\Finals\1115000100RevR.doc

TABLE OF CONTENTS

List of Figures

APPENDICES

Appendix A Figures

REVISED REPORT
GEOTECHNICAL ENGINEERING SERVICES
PROPOSED BORROW PIT EXPANSION
NATIONAL HEIGHTS AVENUE SITE
CHEHALIS, WASHINGTON
FOR
CONTOURS AND CONCEPTS, INC.

INTRODUCTION

This revised report presents the results of our geotechnical engineering services for the proposed expansion of an existing borrow site in Chehalis, Washington. We provided a geotechnical report for the project on September 7, 2004. Our report was revised based on new mine plans provided by you on September 13, 2004. Our services were conducted in general accordance with our proposal dated June 30, 2004. You authorized our services on July 7, 2004.

The site is located southwest of the intersection of National Heights Avenue and Coal Creek Road approximately as shown on the Vicinity Map, Figure 1. The original topography at the site comprised a generally northwest to southeast trending ridge with a toe that probably was near the south edge of National Heights Avenue. The ridge has been progressively mined to the south from National Avenue since the 1960s. A relatively flat terrace area has been developed between National Heights Avenue and the existing toe of the cut slope created as a result of prior excavation operations at the site. The existing cut slopes are typically inclined down to the northwest between about 2H:1V (horizontal to vertical) and 2.5H:1V. The cut slopes typically have a thin to absent vegetative cover comprised of grass and occasional small shrubs.

The currently proposed borrow pit expansion area is shown on the Site Plan Figure 2. Based on the preliminary grading contours provided, it appears cuts to establish planned grades could range up to about 70 feet.

We understand one of the objectives of the pit expansion is to increase the width of the terrace between National Heights Avenue and the toe of the cut slope so that this area may be considered for future commercial development. Accordingly, it will be necessary to establish appropriate setback criteria from the toe of the final cut slope.

PURPOSE AND SCOPE OF SERVICES

The purpose of our services was to explore the subsurface conditions at the site as a basis for developing geotechnical design recommendations and criteria for the proposed borrow pit expansion. Specifically, the scope of services completed for this project included the following elements.

1. Subsurface explorations to evaluate soil, rock and groundwater conditions at the site. Four test pits to depths ranging from 1 to 13 feet were completed at the site using a large tracked excavator. Two borings were completed to depths of about 35 feet each in the upland part of the site using core-drilling techniques.
2. Review published geologic information for the site and surrounding vicinity.

3. Geologic reconnaissance of the site slopes to check for indications of slope instability and to obtain dip and strike measurements at selected rock outcrops.
4. Develop typical subsurface profiles illustrating existing slope conditions based on our reconnaissance and subsurface exploration.
5. Perform a slope stability analysis using the geologic information, including strike and dip of rock strata at the site and our knowledge of the proposed mining at the site.
6. Develop recommendations for permanent cut slopes for the proposed expansion of the borrow pit. We include recommendations for minimum setbacks for possible future development on the terrace at the toe of the final cut slope.
7. Provide recommendations for erosion and stormwater drainage control.
8. Prepare a written report containing our observations, conclusions and recommendations along with the supporting data.

SITE CONDITIONS

GENERAL

The site is located east and south of North National Avenue in Chehalis Washington. The site is bordered to the east by Coal Creek Road, residential and undeveloped properties; to the south by undeveloped properties and to the north and east by North National Avenue.

We understand that the site has been periodically used as a borrow source since the 1960s, when material was excavated from this site and used as fill during construction of Interstate 5. We understand the site was most recently operated as a borrow source in the early to mid 1990s.

Presently, the north part of the site consists of a relatively flat area that fronts on National Avenue. The south and east parts of the site are occupied by a slope and two benches that are the result of prior mining. The cut slopes decline to the northwest at about 2H:1V (50 percent). The site ranges from about Elevation 190 feet in the north to about Elevation 330 feet in the southwest. Elevations used in this report refer to topographic contours shown in a Site Plan provided by Contours and Concepts, Inc.

A relatively flat bench area is located in the southwest part of the site. We understand this area was excavated in the early 1990s. This area varies from about Elevation 280 feet to Elevation 290 feet.

The cut slope and benches were vegetated with a thin covering of grass during our site visits. Areas south and southeast of the cut slope were vegetated with a moderate stand of deciduous and fir trees at the time of our site visits. We did not observe the presence of springs or groundwater seepage at the site during the course of our site work. Surface water was observed in a settling pond located in the north part of the site.

PUBLISHED GEOLOGY

Geologic conditions at the site were researched by reviewing a geologic map contained within "Geological Survey Bulletin 1053, Geology and Coal Resources of the Centralia-Chehalis District, Washington, 1958." This map contains information regarding geologic units, geologic structure and the locations of coal mines. We also reviewed data contained in the maps "Slope Stability of the Centralia-

Chehalis Area, Lewis County, Washington, Fiksdal, 1978" and "Geologic Map of Lewis County, Centralia Quad, Schasse, 1987."

Based on the maps, the site and nearby area is underlain by bedrock of the Skookumchuck Formation. This geologic unit consists of marine and non-marine sedimentary rocks that formed in a low-energy depositional environment. Contained in the formation is a sequence of massive to thin-bedded arkosic sandstone and siltstone with coal layers near the top and bottom of the formation. The Mendota, Upper Thompson and Tono No. 1 coal seams are mapped at or south of the site on the 1958 geologic map. An un-named underground coal mine is located south of the site in the 1958 map. Based on the maps, the underground mine is located several hundred feet south of the proposed mine cut.

Rocks in the site area have been uplifted, folded and faulted since deposition and consolidation. Rock unit strikes and dips are contained on the 1958 geologic map. In the site area the Skookumchuck Formation strikes between 270 and 290 degrees and dips to the south-southwest at angles ranging from 33 to 45 degrees. We measured a similar degree of dip and strike orientation on a coal bed in the southwest part of the site during our site visits. The location of our measurement is shown in Figure 2.

An apparent landslide (Qls) is mapped just south and west of the site in the 1978 geologic map. This feature appears to coincide with the flat bench in the southwest part of the site. This area is not mapped as a landslide in the 1958 or 1987 maps. The 1958 map is considerably more detailed than either the 1978 or 1987 maps. Landslides are mapped in other locations on these documents. To further investigate the potential presence of this mapped landslide we reviewed a "stereo-pair" of aerial photographs of the site area. The photographs are dated "1966" and were obtained from Washington State Department of Transportation. An exaggerated expression of site topography is visible when reviewing a stereo-pair of photographs. Some site grading had occurred at the site by 1966, based on the photographs. Based on our review of the stereo-pair photographs, we did not observe indications of a landslide in the location mapped in the 1978 geologic map.

PREVIOUS REPORTS

We reviewed two previously completed geotechnical/geological reports for the site area. The reports consist of the following documents:

- Subsurface Exploration and Geotechnical Engineering Report, Proposed Conwell Pit Borrow Source, Chehalis, Washington, May 1993, RZA AGRA Inc.

- Draft Letter Report, Evaluation of Slope Stability and Retention Alternatives, National Avenue South-Bound Lanes, Segment Immediately South of Chamber of Commerce Lane, Chehalis, Lewis County, Washington, August 4, 2004, Kenneth Neal & Associates.

The AGRA report was completed at the site in support of previously planned mining. AGRA drilled three hollow-stem borings at the site. The borings were drilled to depths ranging from 26 to 51 feet below ground surface. The approximate location of the former explorations is shown in Figure 2. Ground surface elevations were not provided on the boring logs. However, given the position of the borings, significant cuts during mining likely occurred in these areas after the borings were drilled. AGRA encountered sandstone, siltstone and coal beds of the Skookumchuck Formation in the borings. Groundwater was not encountered by AGRA.

The report completed by Kenneth Neal and Associates concerns a small landslide in National Avenue southwest of the subject site. The apparent landslide contained in the 1978 map is not mentioned in the report. The apparent landslide is located directly up hill from the subject area of the report. The report indicates that landsliding on National Avenue is limited to instability of the existing roadway fill prism.

SUBSURFACE EXPLORATIONS

Subsurface conditions at the site were investigated by observing the excavation of four test pit explorations on July 8, 2004 and two borings on July 29 and 30, 2004. The test pits were excavated using a large tracked excavator. These explorations were completed on the existing mine face. The borings were advanced using a trailer-mounted Mobile B-24 core drilling rig. The borings were completed in the southwest part of the "Area to be Tested" indicated by Contours and Concepts, Inc. Details regarding the exploration program are contained in Appendix A of this report. Summary test pit and boring logs are included as Figures A-3 through A-8. Exploration locations are shown in Figure 2. Our interpretation of subsurface conditions is shown in the cross sections, Figures 3 and 4.

SUBSURFACE CONDITIONS

General

Materials encountered in the explorations generally consist of soil (weathered rock) over competent to fractured bedrock. The soil layer varies in thickness from less than 1 foot in Test Pit 2 to about 7.5 feet thick in Boring B-2 and 12.5 feet thick in Boring B-1. The soil typically consists of loose to medium dense silty sand or soft to stiff silt.

Test Pits

The test pits were excavated on the existing mine cut slopes. Soil, consisting of loose sand, medium dense sand with silt and soft silt, was encountered in the test pits. The soil layer at the test pit locations varies in thickness from less than 1 foot in Test Pit 2 to about 7 feet in Test Pit 1. The soil appears to be derived from weathered rock.

The rock in the pits typically consists of siltstone or fine sandstone. Gray, relatively unweathered siltstone was encountered in Test Pits 1 and 2 to the full depth explored. Estimated rock strength increased with depth in these test pits, which were excavated to practical refusal. Tan grading to gray sandstone was encountered beneath soil to the full depth explored in Test Pits 3 and 4. The degree of weathering typically decreases with depth in the test pits.

Borings

Soil consisting of medium dense silty sand or stiff silt was encountered from the ground surface to depths of 12.5 feet in Boring B-1 and 7.5 feet in Boring B-2. The rock encountered in Boring B-1 consists of interbedded layers of siltstone with some coal beds. Most of the rock in this boring was in the "stained state," indicating weathering. Rock Quality Designation (RQD) in this boring varied from 0 to 65 percent. Core recovery ranged from 0 to 100 percent.

Rock encountered in Boring B-2 consists predominantly of siltstone with one sandstone and one coal inter-bed. Rock in this boring is in the "fresh state," indicating a relatively low degree of weathering.

RQD ranges from 0 to 94 percent with the majority between 53 and 100 percent. Core recovery ranges from 0 to 100 percent.

Groundwater was not identified in the borings. Detailed groundwater observations are not possible because water was used as a drilling fluid. The driller reported losing drilling water in Boring B-1 from about 19 to about 25 feet depth. The drilling fluid was likely lost in a zone of fracturing. Fracturing observed in the cores generally appears to be the result of drilling or is along bedding partings.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL

We understand that the owner intends to expand the mine to the south and west. The approximate proposed mine expansion area is shown in the Site Plan, Figure 2.

We understand that material will be cut from the hillside using large bulldozers with rippers. The proposed reclamation plan calls for cut slopes, about 30 feet in vertical height, with gently sloping benches, which are about 10 feet in width. The cut slopes will be inclined at about 2H:1V.

Based on the subsurface data, rock structure and our geologic reconnaissance it is our opinion that the proposed expansion can be mined as envisioned. The rock in the site area strikes to the east – northeast at about 270 to 290 degrees. We measured a rock dip of about 45 degrees to the south in an outcrop west of the site. The USGS measured rock dips at and near the site ranging from 32 to 45 degrees to the south.

We understand that you intend to begin mining in the northeast part of the site and work to the southwest. The soil and rock contains a high percentage of weakly cemented fine-grained particles. This material will soften rapidly if mined during wet weather conditions. In our opinion mining operations should be scheduled for dry weather when possible. The material will likely need to be moisture-conditioned if used as fill during wet weather conditions, particularly if mined in the wet.

SLOPE STABILITY ANALYSIS

We understand that mine slopes are planned to be inclined no steeper than 2H:1V. We also understand that 10-foot-wide benches are planned for every 30 feet of vertical mine-slope height. The benches will have a transverse slope of about 2 to 5 percent. Drainage ditches with rock check dams will be located on the up-slope side of the benches. The material will be mined generally from northeast to southwest and the finish mine face will be typically oriented northeast-southwest.

Based on the rock structure and the results of our subsurface explorations, it is our opinion that the resulting mine slopes should be stable relative to deep-seated instability because the currently proposed mining is expected to develop mine slopes that are oriented so that rock layers dip downward away from the mine cut. We recommend that cuts be oriented so that rock layers dip downward away from the mine cut. If the area is mined as recommended, it is our opinion that the resulting mine slopes will likely be stable relative to deep-seated failure.

Minor sloughing of the cut face is possible during or after mining is complete. We anticipate the sloughs generally will be limited to a thin layer of weathered or disturbed rock material that develops as vegetation is established on the mine face. We recommend that resulting slough scars be revegetated as soon as possible if sloughing occurs.

TEMPORARY AND PERMANENT SLOPES

Temporary cut slopes should be inclined no steeper than about 1-1/2H:1V or as is determined safe by the contractor. Permanent cut slopes should be inclined no steeper than 2H:1V. Permanent slopes should be planted or hydroseeded as soon as practicable after mining. Temporary erosion control measures may be necessary until permanent vegetation is established.

TOE SETBACKS

We understand the owner may develop the lower flat terrace area for commercial purposes. We recommend that a minimum setback for buildings of 15 feet from the toe of the final mine slope be established. We recommend that the setback area remain clear of structures or obstructions. This area should be accessible to earthmoving equipment so that sloughed material from nearby mine cut slopes can be removed, if sloughs occur.

SEDIMENTATION AND EROSION CONTROL

In our opinion, the erosion potential of the on-site, undisturbed and unweathered rock is relatively low. The erosion potential of the on-site weathered rock/soil is moderate to high. Mining activities will expose the rock and soil material to the erosional effects of wind and water. The amount and potential impacts of erosion are partly related to the time of year that mining occurs. Wet weather mining will increase the potential amount and extent of erosion and the potential sedimentation that would result.

We understand the mine reclamation plan consists of slopes no greater in steepness than 2H:1V, benches in the final mine face every 30 feet of vertical slope height with drainage ditches on the upslope side of the benches, sloped at about 2 percent with rock check dams. We recommend a horizontal spacing of 50 feet between the rock check dams. We recommend that erosion protection be established on the final mine faces as mining is being completed. Permanent measures for erosion control include reseeding or replanting the disturbed areas as soon as possible and protecting those areas until new vegetation has been established. New vegetation can consist of ground cover, grass, shrubs and low-growing (dwarf) trees.

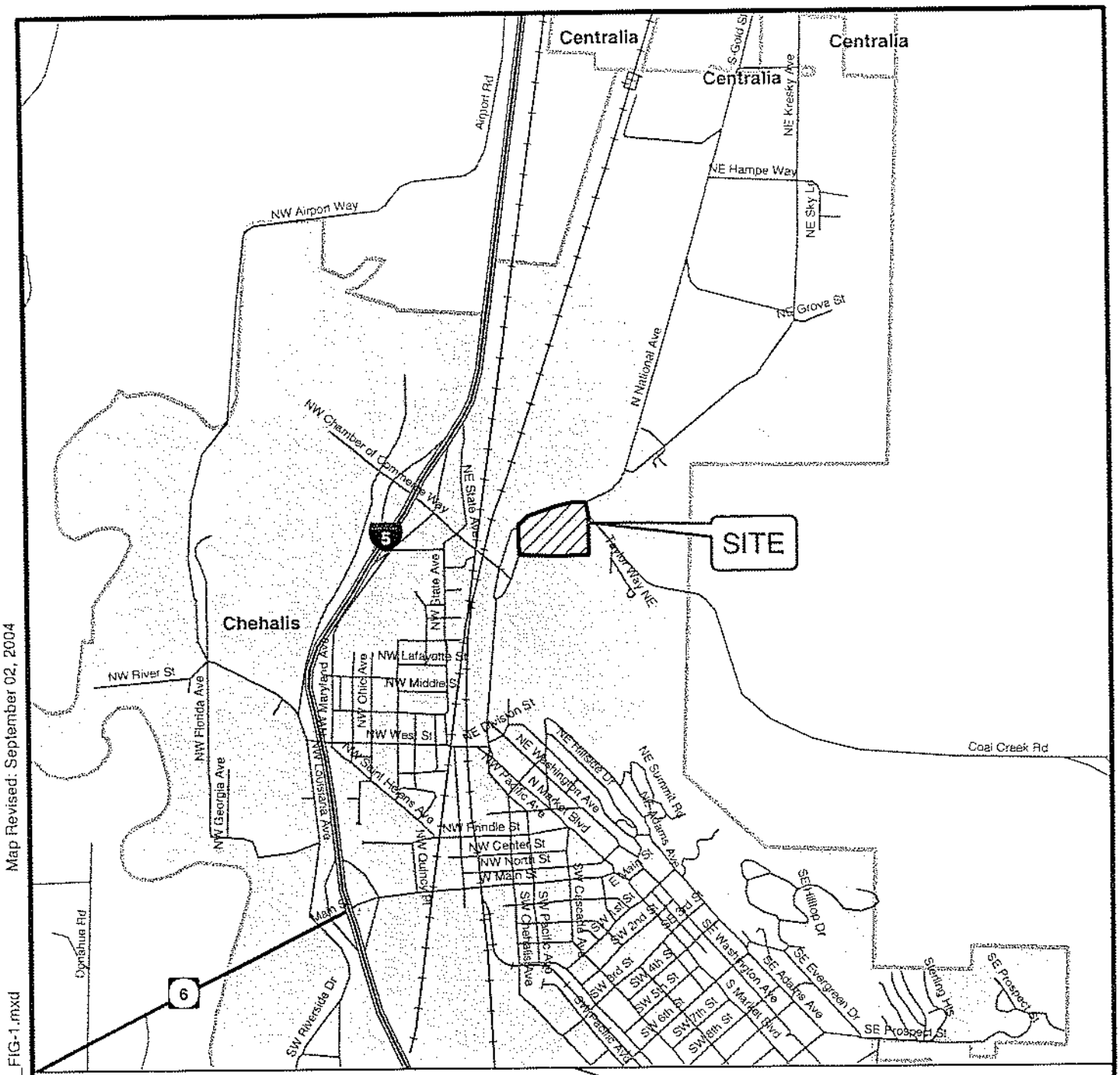
Stormwater runoff should neither be concentrated nor directed to steeply sloped areas. Tightlines or properly constructed ditches should be used, where necessary, to direct storm or other surface water across sloped areas. Collected water should be discharged to appropriate stormwater disposal locations away from the slopes.

LIMITATIONS

We have prepared this report for the exclusive use of Contours and Concepts Inc., and their authorized agents for the National Heights mine project located in Chehalis, Washington.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Please refer to Appendix B, titled "Report Limitations and Guidelines for Use" for additional information pertaining to use of this report.

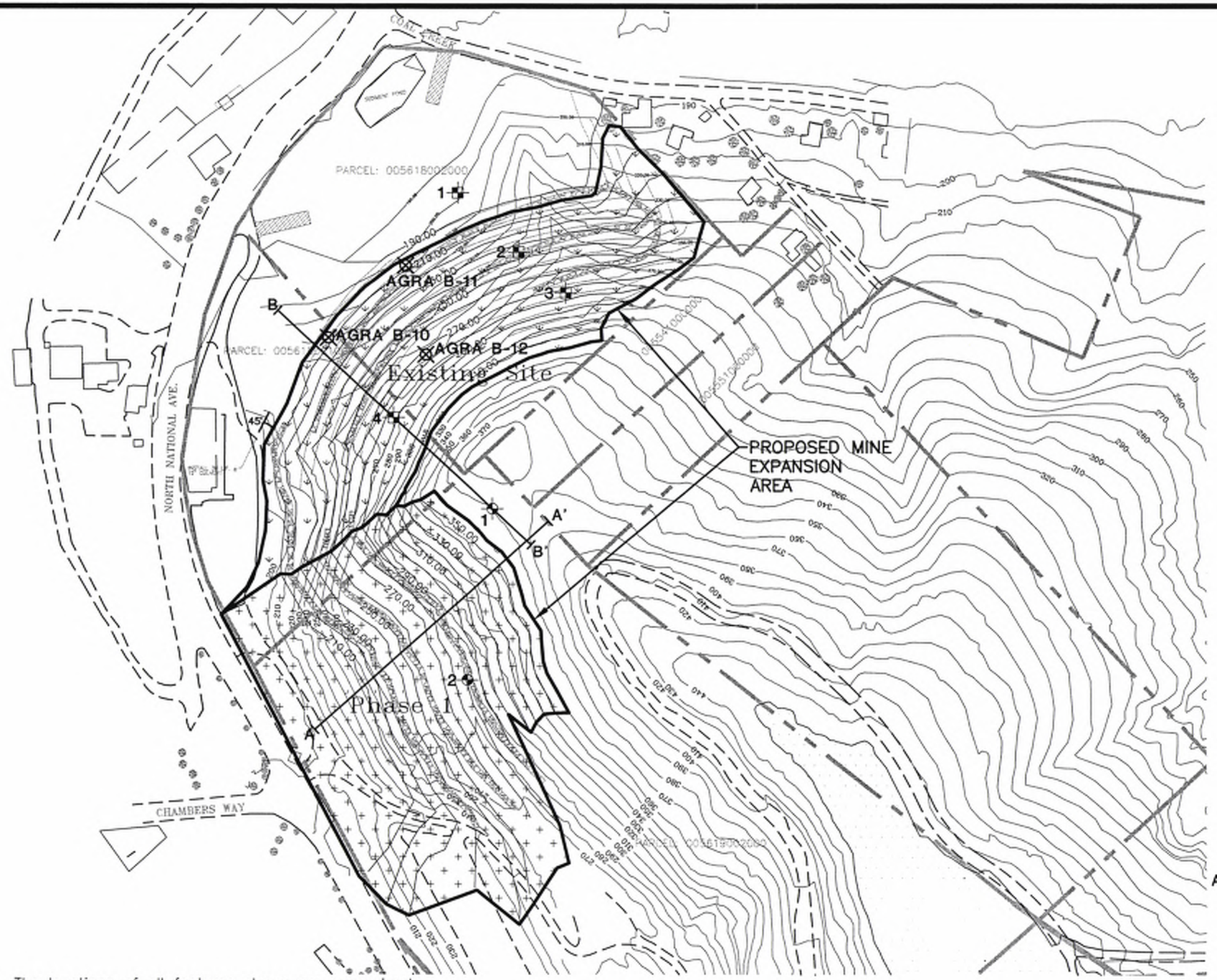


GeoEngineers

VICINITY MAP

FIGURE 1

Office: TAC Path: 11\1115000100\GIS\1115000100_FIG-1.mxd Map Revised: September 02, 2004



EXPLANATION:

- 1 ⊕ BORING NUMBER AND APPROXIMATE LOCATION
- 1 ⊞ TEST PIT NUMBER AND APPROXIMATE LOCATION
- A ——— A' APPROXIMATE CROSS SECTION LOCATION
- 45° MEASURED ROCK STRIKE & DIP
- AGRA B-10 ⊠ NUMBER AND APPROXIMATE LOCATION OF BORINGS COMPLETED BY AGRA IN 1993

0 200 400
APPROXIMATE SCALE IN FEET

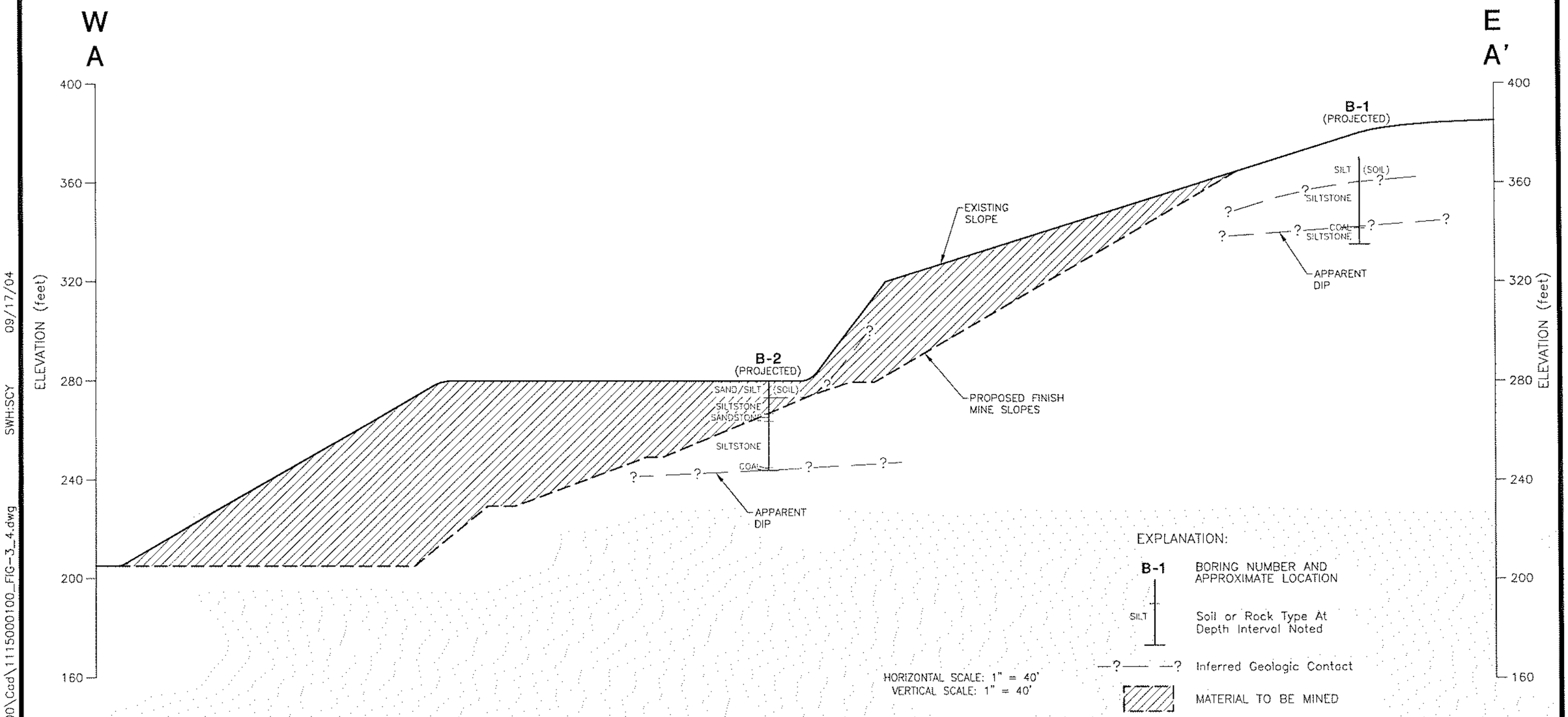
Notes: 1. The locations of all features shown are approximate.
2. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.
Reference: Drawing provided by Contours & Concepts Engineering.

GeoEngineers

SITE PLAN - PROPOSED BORROW PIT EXPANSION

FIGURE 2

09/17/04 SWH:SCY TACO\11\11150001\00\Cad\1115000100_NEW_FIG-2.dwg



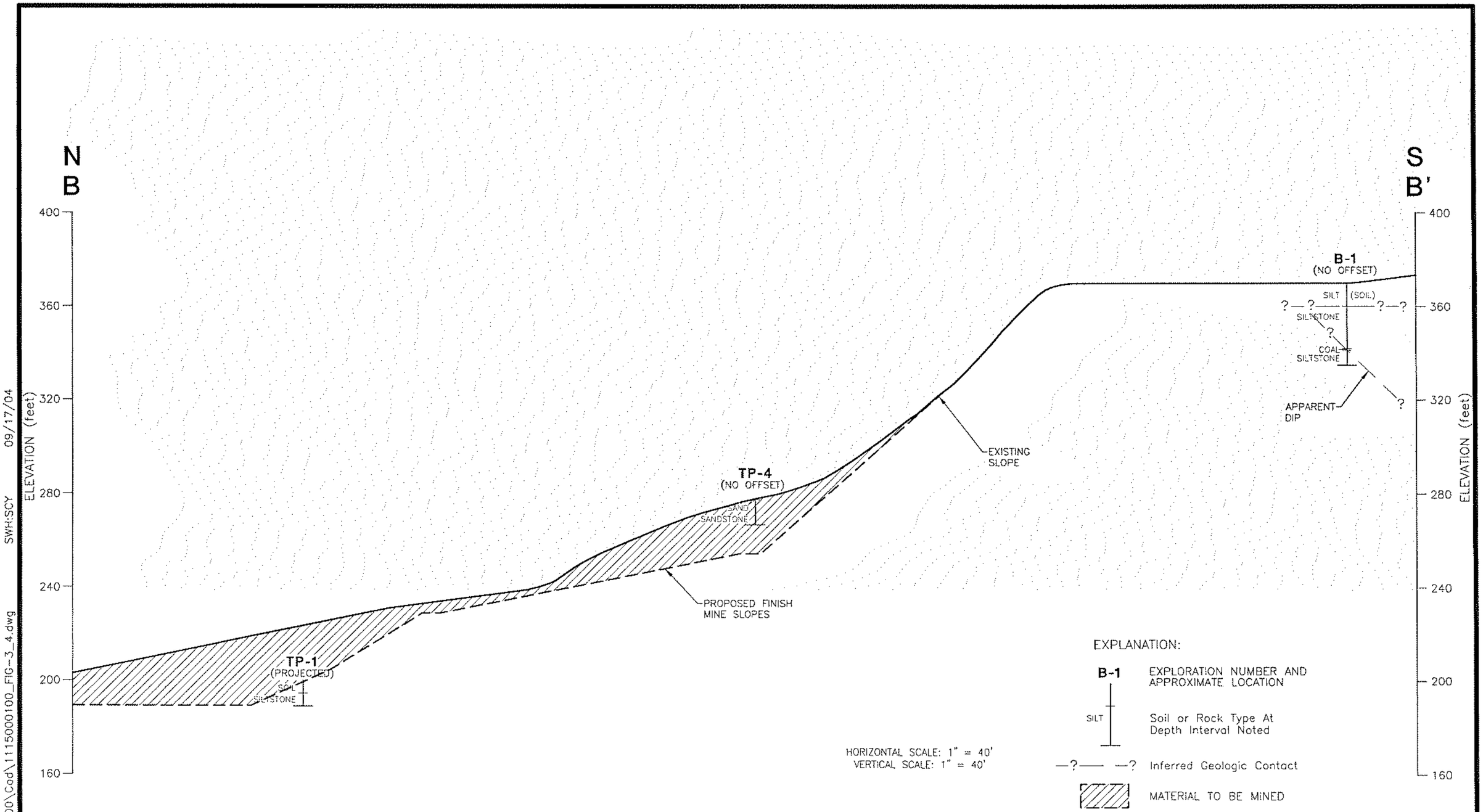
Notes:
1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.
2. Refer to Figure 2 for location of Section.
3. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

GeoEngineers

CROSS SECTION A-A'

FIGURE 3

TACO\11\1115000100\00\Cad\1115000100_FIG-3_4.dwg SWH:SCY 09/17/04



EXPLANATION:

B-1	EXPLORATION NUMBER AND APPROXIMATE LOCATION
SILT	Soil or Rock Type At Depth Interval Noted
—?— —?	Inferred Geologic Contact
	MATERIAL TO BE MINED

HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 1" = 40'

Notes:
1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.
2. Refer to Figure 2 for location of Section.
3. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a reloted document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may hove been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

GeoEngineers

CROSS SECTION B-B'

FIGURE 4

TACO\11\1115000\00\Cad\1115000100_FIG-3_4.dwg SWH:SCY 09/17/04

GeoEngineers

APPENDIX A
FIELD EXPLORATIONS

APPENDIX A
FIELD EXPLORATIONS

GENERAL

Subsurface soil and groundwater conditions at the site were evaluated by observing the excavation of four shallow test pits and drilling of two borings. Test pit and boring elevations were estimated by interpolation between topographic contours on the referenced survey plan. Locations and elevations should be considered accurate to the degree implied by the method used.

The test pits were excavated to depths ranging from 1 to 13.5 feet below ground surface (bgs) on July 8, 2004 using a large tracked excavator. Practical refusal was encountered in each test pit exploration. The test pitting was terminated when it became apparent that the target depths could not be reached using the available equipment.

We remobilized to the site on July 29, 2004 to drill two borings to depths of about 35 feet each. The borings were drilled by Boretec Inc., of Valley Ford, Washington, between July 29 and 30, 2004 using a trailer mounted B-24 drill rig. The soil zone in the borings was drilled using 4-inch hollow-stem augers. Soil samples were obtained by driving a 1.5-inch-inner-diameter split barrel sampler (SPT) with a 140-pound hammer free falling a distance of 30 inches, in general accordance with American Society for Testing and Materials (ASTM) D 1586. The number of hammer blows required to drive the sampler the last 12 inches, or other indicated distances, is shown on the boring log. Beneath the soil zone, continuous rock core was obtained from the borings using a NQ-NX size core barrel.

The borings and test pits were continuously monitored by a representative from our firm who examined and classified the materials encountered, obtained representative soil and rock samples, observed and recorded groundwater conditions where possible and prepared a detailed log of each exploration.

Soils were visually classified in general accordance with the system described in Figure A-1. Rock was classified in general accordance with the Unified Rock Classification System (URCS). Classifications within the URCS system include rock type, weathering, strength, fracture orientation and type, Rock Quality Designation (RQD), and percent core recovery. A key to the boring log symbols is also presented in Figure A-1. Basic elements of the URCS are described in Figure A-2. The logs of the borings and test pits are presented in Figures A-3 through A-8.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% RETAINED ON NO. 200 SIEVE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
				SP	POORLY-GRADED SANDS, GRAVELLY SAND
	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
	CC	Cement Concrete
	AC	Asphalt Concrete
	CR	Crushed Rock/ Quarry Spalls
	TS	Topsoil/ Forest Duff/Sod

- Measured groundwater level in exploration, well, or piezometer
- Groundwater observed at time of exploration
- Perched water observed at time of exploration
- Measured free product in well or piezometer

Stratigraphic Contact

- Distinct contact between soil strata or geologic units
- Gradual change between soil strata or geologic units
- Approximate location of soil strata change within a geologic soil unit

Sampler Symbol Descriptions

- 2.4-inch I.D. split barrel
- Standard Penetration Test (SPT)
- Shelby tube
- Piston
- Direct-Push
- Bulk or grab

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

A "P" indicates sampler pushed using the weight of the drill rig.

Laboratory / Field Tests

%F	Percent fines
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
OC	Organic content
PM	Permeability or hydraulic conductivity
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen
NT	Not Tested

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

KEY TO EXPLORATION LOGS

GeoEngineers

FIGURE A-1

UNIFIED ROCK CLASSIFICATION SYSTEM (URCS)*

BASIC ELEMENTS

DEGREE OF WEATHERING

WEATHERED		ALTERED	REPRESENTATIVE	
SAND SIZE COMPLETELY DECOMPOSED STATE (CDS)	GRAVEL SIZE PARTLY DECOMPOSED STATE (PDS)	STAINED STATE (STS)	VISUALLY FRESH STATE (VFS)	MICRO FRESH STATE (HAND LENSE) (MFS)
E	D	C	B	A
PLASTIC NON-PLASTIC	PLASTIC NON-PLASTIC	COMPARE TO FRESH STATE	UNIT WEIGHT, RELATIVE ABSORPTION	

ESTIMATED STRENGTH

REMOLDING		REACTION TO IMPACT OF 1 LB. BALLPEEN HAMMER		
"MOLDABLE" (FRIABLE) (MBL)	"CRATERS" (SHEARS) (CQ)	"DENTS" (COMPRESSIVE) (DQ)	"PITS" (TENSIONAL) (PQ)	"REBOUNDS" (ELASTIC) (RQ)
E	D	C	B	A
<1,000 PSI (<7 MPa)	1,000 to 3,000 PSI (7 to 21 Ma)	3,000 to 8,000 PSI (21 to 55 MPa)	3,000 to 15,000 PSI (55 to 103 MPA)	>15,000 PSI (>103 MPa)

DISCONTINUITIES

TRANSMITS WATER						
YES	NO	YES	NO	LATENT PLANES OF SEPARATION (LPS)	SOLID-PREFERRED BREAKAGE (SPB)	SOLID-RANDOM BREAKAGE (SRB)
3-DIMENSIONAL PLANES OF SEPARATION (3D)		2-DIMENSIONAL PLANES OF SEPARATION (2D)				
E		D		C	B	A
INTERLOCK		ATTITUDE				

UNIT WEIGHT

LESS THAN 130 LBS/CU FT (2.10 Mg/CU M) (<130)	130 TO 140 LBS/CU FT (2.10 TO 2.25 Mg/CU M) (130)	140 TO 1450 LBS/CU FT (2.25 TO 2.40 Mg/CU M) (140)	150 TO 160 LBS/CU FT (2.40 TO 2.55 Mg/CU M) (150)	GREATER THAN 160 LBS/CU FT (2.55 Mg/CU M) (>160)
E	D	C	B	A

DESIGN NOTATION

WEATHERING	STRENGTH	DISCONTINUITY	WEIGHT
A-E	A-E	A-E	A-E

* Williamson, Douglas A., 1984, Unified Rock Classification System: Association of Engineering Geologists Bulletin, Vol. XXI, No. 3, pp. 345-354

GeoEngineers

ROCK CLASSIFICATION SYSTEM

FIGURE A-2

Date Excavated: 07/08/04 Logged by: VRE

Equipment: Large Trackhoe Surface Elevation (ft): 200

Elevation feet	Depth feet	Sample	Sample Number	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	OTHER TESTS AND NOTES
200	0				SM	Brown silty fine sand (loose, moist)		
			1					
			2		ML	Gray silt with occasional organic (COAL) layers (soft, moist)		
195	5							
			3		BCED	SILTSTONE, gray, visually fresh, dent quality, unit weight estimated not measured		
190	10		4		BABD	SILTSTONE, gray, visually fresh, rebound quality, unit weight estimated not measured		
						Refusal at 10.5 feet Test pit completed at 10.5 feet on 07/08/04 No groundwater seepage observed No caving observed Disturbed soil samples obtained at 2.5, 3.5, 7.5 and 10.5 feet		
185	15							
180	20							
175	25							
170	30							
165	35							
160	40							

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

V6 GTTPIT P:\11\11150\001\00\FINALS\11115000100RC.GPJ GEIV6_1.GDT 9/7/04

LOG OF TEST PIT 1

GeoEngineers

Project: National Heights Borrow Pit
Project Location: Chehalis, Washington
Project Number: 11150-001-00

Figure: A-3
Sheet 1 of 1

Date Excavated: 07/08/04 Logged by: VRE

Equipment: Large Trackhoe Surface Elevation (ft): 245

Elevation feet	Depth feet	Sample	Sample Number	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	OTHER TESTS AND NOTES
245	0		1		CEEE	COAL, black, stained state, moldable quality, highly fractured, unit weight estimated not measured		
			2		BDCD	SILTSTONE, gray, visually fresh, crater quality, unit weight estimated not measured		
						Refusal at 1.2 feet Test pit completed at 1.2 feet on 07/08/04 No groundwater seepage observed No caving observed Disturbed soil samples obtained at 0.3 and 1.2 feet		
240	5							
235	10							
230	15							
225	20							
220	25							
215	30							
210	35							
205	40							

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

V6_GTTPIT_P:\111115000100\FINALS\111150001100RC.GPJ_GEIV6_1.GDT_9/7/04

LOG OF TEST PIT 2

GeoEngineers

Project: National Heights Borrow Pit
Project Location: Chehalis, Washington
Project Number: 11150-001-00

Figure: A-4
Sheet 1 of 1

Date Excavated: 07/08/04 Logged by: VRE

Equipment: Large Trackhoe Surface Elevation (ft): 280

Elevation feet	Depth feet	Sample	Sample Number	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	OTHER TESTS AND NOTES
280	0		1		SP-SM	Brown fine sand with silt, roots, organics (loose, moist)		
					SP-SM	Orange/brown fine to medium sand with silt, trace SILTSTONE chunks (medium dense, moist)		
275	5		2		DECD	SANDSTONE, tan brown-rust mottled, partly decomposed state, moldable, some fracturing, unit weight estimated not measured		
			3		CCCD	SANDSTONE, tan brown-red mottled, stained state, dent quality, some fracturing, unit weight estimated not measured		
270	10		4		CCCC	SANDSTONE, gray, weathered finely laminated, stained state, dent quality, some fracturing, unit weight estimated not measured		
			5		BDCD	SANDSTONE, gray, visually fresh, crater quality, some fracturing, unit weight estimated not measured		
265	15					Test pit completed at 13.5 feet on 07/08/04 No groundwater seepage observed No caving observed Disturbed soil samples obtained at 1, 4.3, 8.2, 11.3 and 12.5 feet		
260	20							
255	25							
250	30							
245	35							
240	40							

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

V6 GTTPIT P:\11\11150001\00\FINALS\11115000100RC.GPJ GEIV6_1.GDT 9/7/04

LOG OF TEST PIT 3

GeoEngineers

Project: National Heights Borrow Pit
Project Location: Chehalis, Washington
Project Number: 11150-001-00

Figure: A-5
Sheet 1 of 1

Date Excavated: 07/08/04 Logged by: VRE

Equipment: Large Trackhoe Surface Elevation (ft): 290

Elevation feet	Depth feet	Sample	Sample Number	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	OTHER TESTS AND NOTES
290	0				SP	Tan fine sand with roots/organics (loose, moist)		
					CDCD	SANDSTONE, tan, weathered, stained state, crater quality, some fracturing, unit weight estimated not measured		
			1					
285	5				CDCD	SANDSTONE, tan with rust coloring, stained state, crater quality, some fracturing, unit weight estimated not measured		
			2					
280	10		3					
275	15							
270	20							
265	25							
260	30							
255	35							
250	40							

Test pit completed at 10.5 feet on 07/08/04
No groundwater seepage observed
No caving observed
Disturbed soil samples obtained at 3.5, 7.2 and 10.5 feet

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

V6 GTTPIT P:\11\11150001\00\FINALS\11115000100RC.GPJ GEIV6_1.GDT 9/7/04

LOG OF TEST PIT 4

GeoEngineers

Project: National Heights Borrow Pit
Project Location: Chehalis, Washington
Project Number: 11150-001-00

Figure: A-6
Sheet 1 of 1

Date(s) Drilled	07/29/04	Logged By	GRL	Checked By	SWH
Drilling Contractor	Boretech	Drilling Method	3-1/4 inch I.D. HSA w/ SPT/then Core	Inclination from Horizontal/Bearing	None
Circulation Fluid	Water	Drill Bit Type	2.357 inch I.D.	Drilling Equipment	B-24
Total Depth (ft)	35	Surface Elevation (ft)	315	Ground Water Level (ft. bgs)	
Vertical Datum	CCE Basemap Drawn 05/03/00	Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	Sample Run	Recovered (in)	RQD %	Fracture Cnt	Blows/foot	Water Level	Graphic Log	Group Symbol Rock Classification	MATERIAL DESCRIPTION	OTHER TESTS AND NOTES
315	0								ML	Brown orange mottled to gray sandy silt (stiff, moist)	
310	5		18			11			ML	Brown orange mottled silt with sand, trace organics (stiff, moist)	
305	10		18			15			CDCE	SILTSTONE, brown, fine grained, stained state, crater quality, unit weight estimated not measured	
300	15		18			15					
		1	28	65	0.5						Drilling induced fractures in core
295	20	2	27	0	3.5				CDBD	SILTSTONE, gray with trace COAL, fine grained, stained state, crater quality, unit weight estimated not measured	
		3	24	29	6				CDBD CDBC	SILTSTONE, sandy brown fine to coarse grained, stained state, crater quality, unit weight estimated not measured	
290	25	4	35	29	3.1				CCDC	SILTSTONE, reddish-brown, fine grained, stained state, crater quality, multiple fractures, no infillings, unit weight estimated not measured	
		5	14	58	0.4				BDBE	SILTSTONE to sandy SILTSTONE, brown, fine to medium grained, stained state, crater to dent quality	
285	30		29	47	2.0				BDBD	COAL, gray to black, organic odor, fine grained, visually fresh, no infillings, crater quality	
		6							BDBD	SILTSTONE, gray, visually fresh state, crater quality, no infilling	
		7	0	0						SILTSTONE, gray, visually fresh state, crater quality, no infilling	
280	35									Boring completed at 35 feet bgs on 07/29/04	
275	40										

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

V6_ROCKCORE_P:\11\11150001\00\FINALS\11115000100RC.GPJ_GEIV6_1.GDT_9/7/04

LOG OF BORING B-1

GeoEngineers

Project: National Heights Borrow Pit
Project Location: Chehalis, Washington
Project Number: 11150-001-00

Figure: A-7
Sheet 1 of 1

Date(s) Drilled	07/30/04	Logged By	GRL	Checked By	SWH
Drilling Contractor	Boretech	Drilling Method	3-1/4 inch I.D. HSA w/ SPT/then Core	Inclination from Horizontal/Bearing	None
Circulation Fluid	Water	Drill Bit Type	2.357 inch I.D.	Drilling Equipment	B-24
Total Depth (ft)	35.5	Surface Elevation (ft)	290	Ground Water Level (ft. bgs)	
Vertical Datum	CCE Basemap Drawn 05/03/00	Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	Sample Run	Recovered (in)	RQD %	Fracture Cnt	Blows/foot	Water Level	Graphic Log	Group Symbol Rock Classification	MATERIAL DESCRIPTION	OTHER TESTS AND NOTES
290	0								SM	Brown silty fine to coarse sand (medium dense, moist)	
			14			14			ML	Gray silt (stiff, moist)	
285	5										
			17			68			BDBD	SILTSTONE, gray, fine grained, visually fresh state, crater quality, unit weight estimated not measured	
		1	28	42	0.46				BDBD	SILTSTONE, gray, with COAL laminae, visually fresh state, crater quality, unit weight estimated not measured	
280	10	2	0	0	0						
			15	0					BDBC	SANDSTONE, gray, visually fresh state, crater quality, unit weight estimated not measured	
275	15	3									
		4	49	87	0.5				BDBC	SILTSTONE, gray, thin organic laminae at ~45 degrees visually fresh state, crater quality, unit weight estimated not measured	
270	20										
		5	60	94	1.2						
265	25										
		6	47	70	1				BDBC	Interbedded SILTSTONE with sandy SILTSTONE, gray, 45 degree bedding, visually fresh state, crater quality, unit weight estimated not measured	Drilling induced fractures
260	30										
		7	44	53	1						
255	35								BDDE	COAL, black, visually fresh state, crater quality, unit weight estimated not measured	
										Boring completed at 35.5 feet bgs on 07/30/04	
250	40										

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

V6_ROCKCORE_P:\11\11150001\001FINALS\11115000100RC.GPJ GEIV6 1.GDT 9/7/04

LOG OF BORING B-2

GeoEngineers

Project: National Heights Borrow Pit
Project Location: Chehalis, Washington
Project Number: 11150-001-00

Figure: A-8
Sheet 1 of 1

GeoEngineers

APPENDIX B
REPORT LIMITATIONS AND GUIDELINES FOR USE

APPENDIX B
REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

This appendix provides information to help you manage your risks with respect to the use of this report.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES, PERSONS AND PROJECTS

This report has been prepared for the exclusive use of Contours and Concepts, Inc., and their authorized agents. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

GeoEngineers structures our services to meet the specific needs of our clients. For example, a geotechnical or geologic study conducted for a civil engineer or architect may not fulfill the needs of a construction contractor or even another civil engineer or architect that are involved in the same project. Because each geotechnical or geologic study is unique, each geotechnical engineering or geologic report is unique, prepared solely for the specific client and project site. Our report is prepared for the exclusive use of our Client. No other party may rely on the product of our services unless we agree in advance to such reliance in writing. This is to provide our firm with reasonable protection against open-ended liability claims by third parties with whom there would otherwise be no contractual limits to their actions. Within the limitations of scope, schedule and budget, our services have been executed in accordance with our Agreement with the Client and generally accepted geotechnical practices in this area at the time this report was prepared. This report should not be applied for any purpose or project except the one originally contemplated.

A GEOTECHNICAL ENGINEERING OR GEOLOGIC REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

This report has been prepared for the proposed expansion of the National Heights mine in Chehalis, Washington. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, do not rely on this report if it was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

For example, changes that can affect the applicability of this report include those that affect:

- the function of the proposed structure(s),
- elevation, configuration, location, orientation or weight of the proposed structure(s),
- composition of the design team, or
- project ownership.

[1] Developed based on material provided by ASFE, Professional Firms Practicing in the Geosciences; www.asfe.org .

If important changes are made after the date of this report, GeoEngineers should be given the opportunity to review our interpretations and recommendations and provide written modifications or confirmation, as appropriate.

SUBSURFACE CONDITIONS CAN CHANGE

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by manmade events such as construction on or adjacent to the site, or by natural events such as floods, earthquakes or groundwater fluctuations. Always contact GeoEngineers before applying a report to determine if it remains applicable.

MOST GEOTECHNICAL AND GEOLOGIC FINDINGS ARE PROFESSIONAL OPINIONS

Our interpretations of subsurface conditions are based on field observations from widely spaced sampling locations at the site. Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied our professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ, sometimes significantly, from those indicated in this report. Our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions.

GEOTECHNICAL ENGINEERING REPORT RECOMMENDATIONS ARE NOT FINAL

Do not over-rely on the preliminary construction recommendations included in this report. These recommendations are not final, because they were developed principally from GeoEngineers' professional judgment and opinion. GeoEngineers' recommendations can be finalized only by observing actual subsurface conditions revealed during construction. GeoEngineers cannot assume responsibility or liability for this report's recommendations if we do not perform construction observation.

Sufficient monitoring, testing and consultation by GeoEngineers should be provided during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether or not earthwork activities are completed in accordance with our recommendations. Retaining GeoEngineers for construction observation for this project is the most effective method of managing the risks associated with unanticipated conditions.

A GEOTECHNICAL ENGINEERING OR GEOLOGIC REPORT COULD BE SUBJECT TO MISINTERPRETATION

Misinterpretation of this report by other design team members can result in costly problems. You could lower that risk by having GeoEngineers confer with appropriate members of the design team after submitting the report. Also retain GeoEngineers to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering or geologic report. Reduce that risk by having GeoEngineers participate in pre-bid and preconstruction conferences, and by providing construction observation.

DO NOT REDRAW THE EXPLORATION LOGS

Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, but recognize that separating logs from the report can elevate risk.

GIVE CONTRACTORS A COMPLETE REPORT AND GUIDANCE

Some owners and design professionals believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering or geologic report, but preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with GeoEngineers and/or to conduct additional study to obtain the specific types of information they need or prefer. A pre-bid conference can also be valuable. Be sure contractors have sufficient time to perform additional study. Only then might an owner be in a position to give contractors the best information available, while requiring them to at least share the financial responsibilities stemming from unanticipated conditions. Further, a contingency for unanticipated conditions should be included in your project budget and schedule.

CONTRACTORS ARE RESPONSIBLE FOR SITE SAFETY ON THEIR OWN CONSTRUCTION PROJECTS

Our geotechnical recommendations are not intended to direct the contractor's procedures, methods, schedule or management of the work site. The contractor is solely responsible for job site safety and for managing construction operations to minimize risks to on-site personnel and to adjacent properties.

READ THESE PROVISIONS CLOSELY

Some clients, design professionals and contractors may not recognize that the geoscience practices (geotechnical engineering or geology) are far less exact than other engineering and natural science disciplines. This lack of understanding can create unrealistic expectations that could lead to disappointments, claims and disputes. GeoEngineers includes these explanatory "limitations" provisions in our reports to help reduce such risks. Please confer with GeoEngineers if you are unclear how these "Report Limitations and Guidelines for Use" apply to your project or site.

GEOTECHNICAL, GEOLOGIC AND ENVIRONMENTAL REPORTS SHOULD NOT BE INTERCHANGED

The equipment, techniques and personnel used to perform an environmental study differ significantly from those used to perform a geotechnical or geologic study and vice versa. For that reason, a geotechnical engineering or geologic report does not usually relate any environmental findings, conclusions or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Similarly, environmental reports are not used to address geotechnical or geologic concerns regarding a specific project.

BIOLOGICAL POLLUTANTS

GeoEngineers' Scope of Work specifically excludes the investigation, detection, prevention, or assessment of the presence of Biological Pollutants in or around any structure. Accordingly, this report includes no interpretations, recommendations, findings, or conclusions for the purpose of detecting, preventing, assessing, or abating Biological Pollutants. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and/or any of their byproducts.