- [ ] City box number Lander
- [ ] Title/cover page w/the following info:
  - [x] Company (author) name
  - [x] Report Date
  - [x] Project name
  - [x] Company's job number
  - [ ] City DCLU project number (7-digit number)
  - [ ] City Permit number (6-digit number)
  - [ ] Kroll map index number (3-digit number, w?/E,W,N,S)
  - [x] Green label
  - [x] Site address (may be on 1st or 2nd page of text)
- [ ] Executive Summary and associated figures
- [x] Table of Contents (attachments
- [x] Project Location Plan/Map or Vicinity Map
- [x] Site Plans, Boring Location Plans, or Exploration Plans
- [ ] Survey
- [ ] Geologic Maps
- [ ] Cross Sections/Subsurface Profiles
- [ ] Fill or Peat Thickness Maps and Contour Maps
- [x] Boring Logs
- [ ] Geology Text (if no logs)
- [x] Soil Classification Key/Boring Log Key
- [ ] Probe Logs
- [x] Test Pit Logs
- [ ] Monitoring Well Logs
- [ ] Cone Penetrometer Logs
- [ ] Shear Wave Velocity Measurements
- [ ] Groundwater Maps
- [ ] GW Elevation Tables/Data
- [ ] Soils Lab Testing (Geotechnical) Summary Tables
  - [ ] Grain Size Analyses/Hydrometer Analyses
  - [ ] Atterberg Limits
  - [ ] Strength tests: Triaxial, Unconfined, Direct Shear
  - [ ] Organic Content
  - [ ] ^{14}C or Radiocarbon Testing
  - [ ] Other_____
- [ ] Soil Chemical Analytical Testing Summary Tables
- [ ] Water/Groundwater Chemical Analytical Summary Tables
- [ ] Comments_____

- [ ] Date Copied 3-30-99 By CM

2/9/99

HARTCROWSER
Environmental Technologies

Hart Crowser, Inc.
1910 Fairview Avenue East
Seattle, Washington 98102
FAX 206.328.5581
206.324.9530

000966770 SEATTLE PARKS DEPT 13035 LINDEN PROJECT NR: 9400362 HV N
BUILDING ID S 0 CCP (LU) PMC (PS)
EC ESTABLISH USE OF NEW BUILDING AS COMMUNITY CENTER CN: 940125 LU: 940125
N CONSTRUCT NEW COMMUNITY CENTER BUILDING AND OCCUPY REV NR
O PER PLANS REV
REV

J-3862

July 27, 1993

Mr. Byron Rice
Suzuki Associates Architects
317 - 17th Avenue South
Seattle, Washington 98114

Re: Geotechnical Engineering Design Study
Bitter Lake Community Center
Seattle, Washington

Dear Mr. Rice:

This letter report presents the results of our geotechnical engineering design study for the proposed Bitter Lake Community Center in Seattle, Washington. This report is organized as follows:

- Our Understanding of the project;
- Scope of Work;
- Limitations of Our Work;
- Subsurface Conditions;
- Geotechnical Engineering Conclusions and Recommendations;
- Recommendations for Continuing Services; and
- Appendices Addressing Field Exploration Methods and Laboratory Analysis.

OUR UNDERSTANDING OF THE PROJECT

Figure 1 is a vicinity map; Figure 2 is a Site and Exploration Plan showing the location of the proposed structure and parking area. Borings locations completed for a preliminary study and test pits excavated for the current study are also shown on Figure 2.

We trust this report meets your current needs. If you have any questions or if we can be of further assistance, please call at your earliest convenience.

Sincerely,

HART CROWSER, INC.

JOHN R. VERDUIN III
STATE OF WASHINGTON
#27870
REGISTERED
PROFESSIONAL ENGINEER
7/27/93
EXPIRES: 7/16/95

JAMES H. KLEPPE
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Project Engineer

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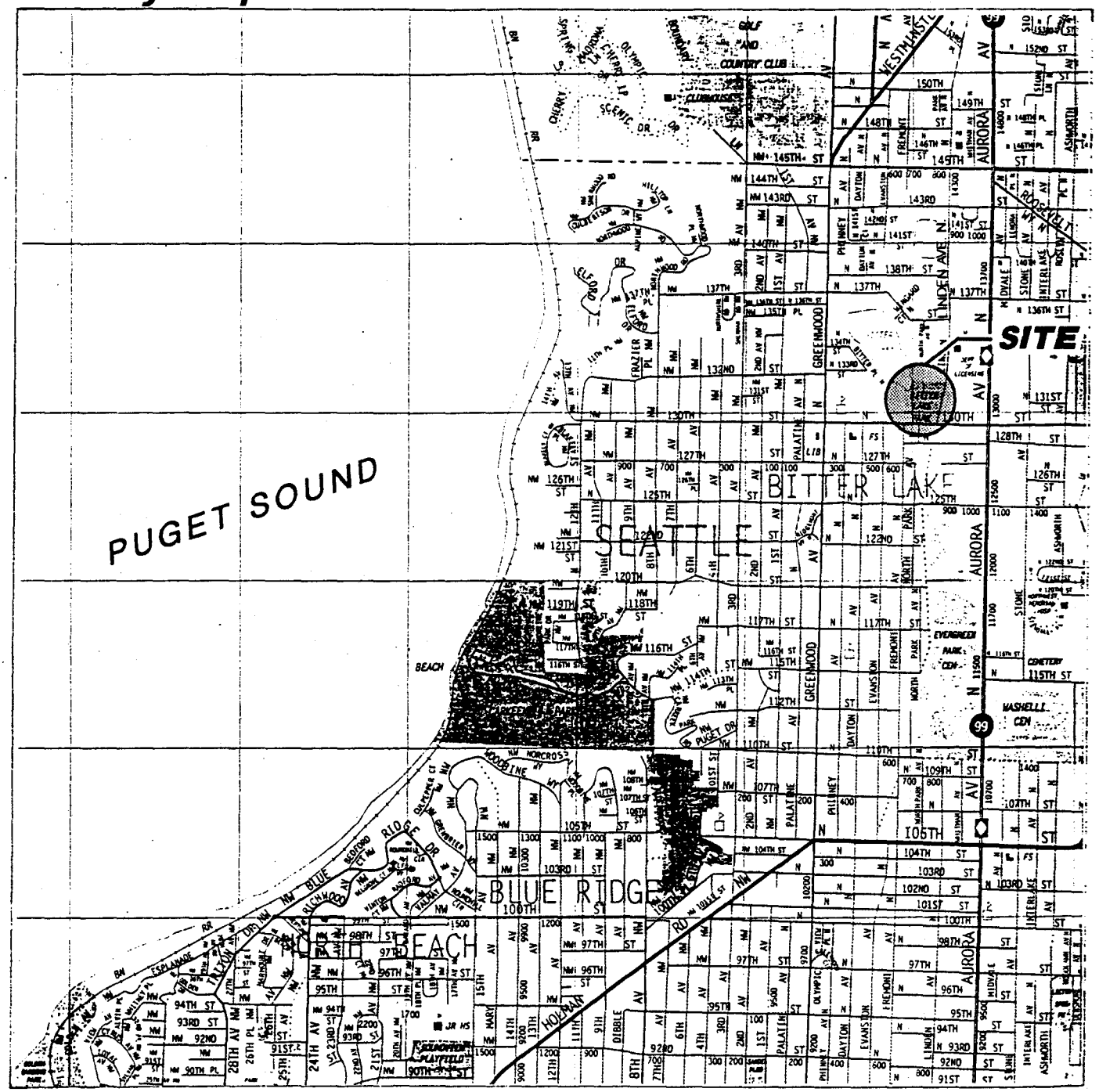
Paula M Estornell
PAULA M. ESTORNELL
Staff Geotechnical Engineer

JRV/JHK/PME:sde/cmj/tml
BITTLAKE.lr

Attachments:
Figure 1 - Vicinity Map
Figure 2 - Site and Exploration Plan
Figure 3 - Rockery Detail
Appendix A - Field Explorations Methods and Analysis
Figure A-1 - Key to Exploration Logs
Figure A-2 through A-4 - Test Pit Log TP-1 through TP-7
Figure A-5 - Boring BL-1
Figure A-6 - Boring BL-2
Appendix B - Laboratory Testing Program
Figure B-1 - Unified Soil Classification (USC) System)

Vicinity Map



0 1/2 1

Scale in Miles

N

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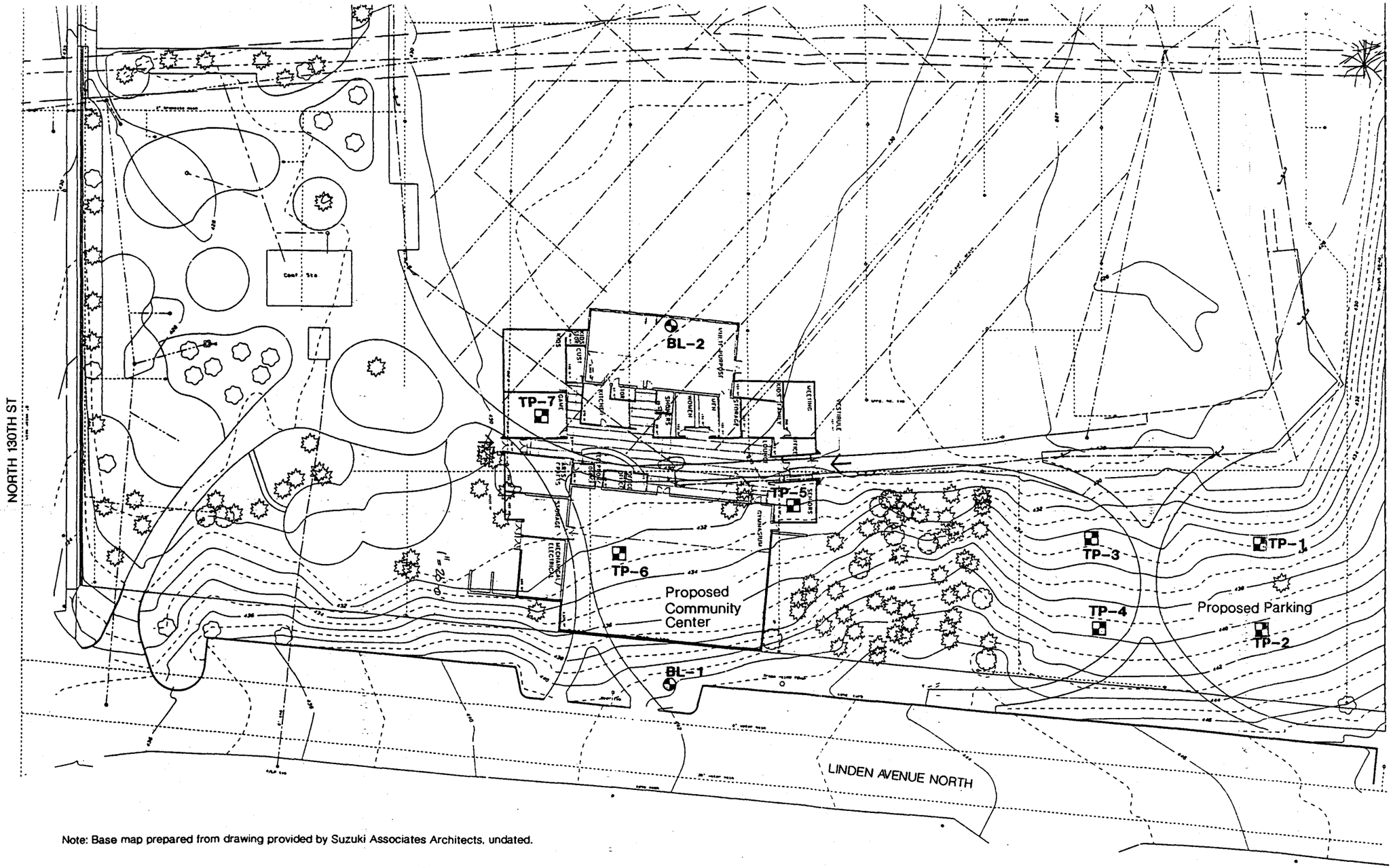
Figure 1

Site and Exploration Plan



Note: Base map prepared from drawing provided by Suzuki Associates Architects, undated.

TP-1 Test Pit Location and Number (Hart Crowser, Current Study)

BL-1 Boring Location and Number (GeoEngineers, September 21, 1992)

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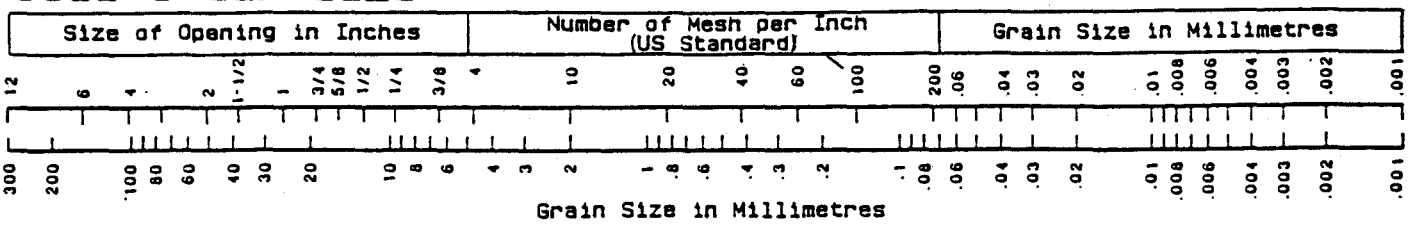
Figure 2

Unified Soil Classification (USC) System

Soil Grain Size



COBBLES	GRAVEL	SAND	SILT and CLAY
Coarse-Grained Soils			Fine-Grained Soils

Coarse-Grained Soils

G W	G P	G M	G C	S W	S P	S M	S C
Clean GRAVEL <5% fines		GRAVEL with >12% fines		Clean SAND <5% fines		SAND with >12% fines	
GRAVEL >50% coarse fraction larger than No. 4				SAND >50% coarse fraction smaller than No. 4			
Coarse-Grained Soils >50% larger than No. 200 sieve							

G W and S W $\left(\frac{D_{60}}{D_{10}}\right)$ >4 for G W, >6 for S W & $1 \leq \left(\frac{(D_{30})^2}{D_{10} \times D_{60}}\right) \leq 3$

G P and S P Clean GRAVEL or SAND not meeting requirements for G W and S W

G M and S M Atterberg limits below A Line with PI <4

G C and S C Atterberg limits above A Line with PI >7

* Coarse-grained soils with percentage of fines between 5 and 12 are considered borderline cases requiring use of dual symbols.

D_{10}, D_{30}, and D_{60} are the particle diameter of which 10, 30, and 60 percent, respectively, of the soil weight are finer.

Fine-Grained Soils

M L	C L	O L	M H	C H	O H	Pt
SILT	CLAY	Organic	SILT	CLAY	Organic	Highly Organic Soils
Soils with Liquid Limit <50%			Soils with Liquid Limit >50%			
Fine-Grained Soils >50% smaller than No. 200 sieve						

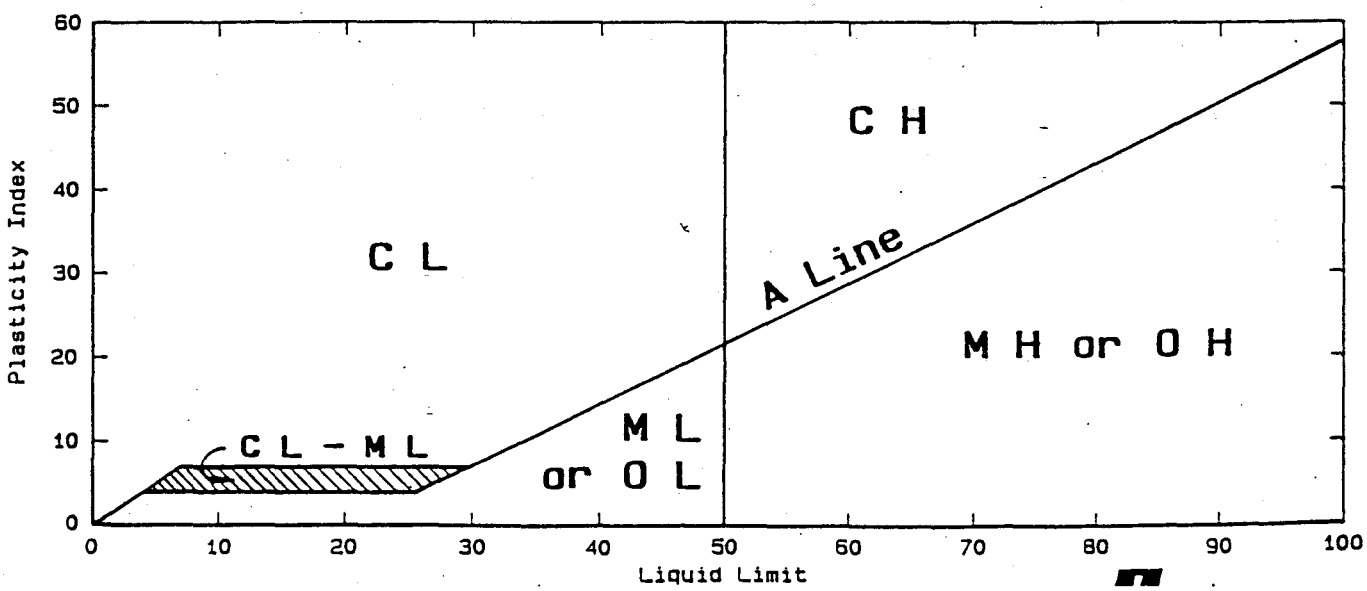


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Figure B-1

Key to Exploration Logs

Sample Description

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual–manual classification methods of ASTM D 2488 were used as an identification guide.

Soil descriptions consist of the following:
Density/consistency, moisture, color, minor constituents, MAJOR CONSTITUENT, additional remarks.

Density/Consistency

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance.
Soil density/consistency in test pits is estimated based on visual observation and is presented parenthetically on the test pit logs.

SAND or GRAVEL Density	Standard Penetration Resistance (N) in Blows/Foot	SILT or CLAY Consistency	Standard Penetration Resistance (N) in Blows/Foot	Approximate Shear Strength in TSF
Very loose	0 – 4	Very soft	0 – 2	<0.125
Loose	4 – 10	Soft	2 – 4	0.125 – 0.25
Medium dense	10 – 30	Medium stiff	4 – 8	0.25 – 0.5
Dense	30 – 50	Stiff	8 – 15	0.5 – 1.0
Very dense	>50	Very stiff	15 – 30	1.0 – 2.0
		Hard	>30	>2.0

Moisture

Dry	Little perceptible moisture
Damp	Some perceptible moisture, probably below optimum
Moist	Probably near optimum moisture content
Wet	Much perceptible moisture, probably above optimum

Minor Constituents

	Estimated Percentage
Not identified in description	0 – 5
Slightly (clayey, silty, etc.)	5 – 12
Clayey, silty, sandy, gravelly	12 – 30
Very (clayey, silty, etc.)	30 – 50

Legends

Sampling Test Symbols

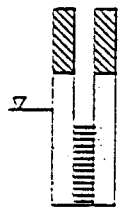
BORING SAMPLES

- ☒ Split Spoon
- ⧅ Shelby Tube
- ▥ Cuttings
- ◫ Core Run
- * No Sample Recovery
- P Tube Pushed, Not Driven

TEST PIT SAMPLES

- ☒ Grab (Jar)
- ⧄ Bag
- ⧅ Shelby Tube

Groundwater Observations



Surface Seal

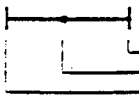
Groundwater Level on Date (ATD) At Time of Drilling

Observation Well Tip or Slotted Section

Groundwater Seepage (Test Pits)

Test Symbols

GS	Grain Size Classification
CN	Consolidation
TUU	Triaxial Unconsolidated Undrained
TCU	Triaxial Consolidated Undrained
TCD	Triaxial Consolidated Drained
QU	QU
DS	Direct Shear
K	Permeability
PP	Pocket Penetrometer Approximate Compressive Strength in TSF
TV	Torvane Approximate Shear Strength in TSF
CBR	California Bearing Ratio
MD	Moisture Density Relationship
AL	Atterberg Limits



Water Content in Percent
Liquid Limit
Natural
Plastic Limit

PID	Photoionization Reading

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Figure A-1

Test Pit Log TP-1

Sample	Water Content in Percent	Lab Tests	Depth in Feet	SOIL DESCRIPTIONS Approximate Ground Surface Elevation in Feet 434
S-1	4		0	(Medium dense), dry, gray, silty, gravelly SAND. (FILL)
S-2	6		1–2	(Very dense), dry, gray, slightly silty, gravelly SAND with cobbles. (TILL)
			3–9	Bottom of Test Pit at 2–1/2 Feet. Completed 7/14/93.

Note: No groundwater encountered.

Test Pit Log TP-2

Sample	Water Content in Percent	Lab Tests	Depth in Feet	SOIL DESCRIPTIONS Approximate Ground Surface Elevation in Feet 440
S-1	4		0	(Medium dense), dry, gray, slightly gravelly, silty SAND. (FILL)
S-2	5		1–3	(Very dense), damp, gray, slightly silty, gravelly SAND with cobbles.
			4–9	Bottom of Boring at 3 Feet. Completed 7/14/93.

Note: No groundwater encountered.

Test Pit Log TP-3

Sample	Water Content in Percent	Lab Tests	Depth in Feet	SOIL DESCRIPTIONS Approximate Ground Surface Elevation in Feet 435
S-1	5		0	(Medium dense), dry, gray, silty, fine SAND. (FILL)
S-2	5		1–3	(Very dense), dry, gray, silty, gravelly SAND with occasional cobbles and fine, sandy SILT lenses. (TILL)
			4–9	Bottom of Test Pit at 3–1/2 Feet. Completed 7/14/93.

Note: No groundwater encountered.

1. Refer to Figure A–1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at time of excavation. Conditions may vary with time.

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Figure A-2

Test Pit Log TP-4

Sample	Water Content in Percent	Lab Tests	Depth in Feet	SOIL DESCRIPTIONS Approximate Ground Surface Elevation in Feet 439
S-1	10		0	(Medium dense), dry, gray, silty, fine SAND. (FILL)
			1	(Very dense), dry, gray, slightly silty, gravelly SAND. (TILL).
			2	
S-2	3		3	
			4	Bottom of Test Pit at 3-1/2 Feet. Completed 7/14/93.
			5	
			6	
			7	
			8	
			9	Note: No groundwater encountered.

Test Pit Log TP-5

Sample	Water Content in Percent	Lab Tests	Depth in Feet	SOIL DESCRIPTIONS Approximate Ground Surface Elevation in Feet 432 Looking South
			0	(Loose), dry, brown, silty SAND with organics. (FILL)
			1	(Medium dense), dry, brown, slightly silty, gravelly SAND. (FILL)
			2	
S-1	6		3	
			4	(Very dense), damp, gray, slightly silty, gravelly SAND. (TILL)
			5	
S-2	4		6	
			7	Bottom of Test Pit at 6-1/2 Feet. Completed 7/14/93.
			8	8 Feet
			9	

Note: No groundwater encountered.

Test Pit Log TP-6

Sample	Water Content in Percent	Lab Tests	Depth in Feet	SOIL DESCRIPTIONS Approximate Ground Surface Elevation in Feet 433 Looking South
			0	(Loose), dry, brown, silty SAND with organics. (FILL)
			1	(Medium dense), dry, brown, slightly silty, gravelly SAND. (FILL)
			2	
S-1	3		3	(Very dense), damp, gray, slightly silty, gravelly SAND. (TILL)
			4	
S-2	6	GS	5	
			6	Bottom of Test Pit at 5 Feet. Completed 7/14/93.
			7	
			8	8 Feet
			9	

Note: No groundwater encountered.

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at time of excavation. Conditions may vary with time.

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Figure A-3

TEST DATA

BORING BL-1

Lab Tests	Moisture Content (%)	Dry Density (pcf)	Blow Count	Samples	Group Symbol	DESCRIPTION Surface Elevation (ft.) :
					SM	Gray silty fine to medium sand with gravel (medium dense, moist) (fill)
					SP–SM	Brown fine to medium sand with fine to coarse gravel, silt and occasional coarse sand and cobbles (medium dense to very dense, moist) (fill?)
MD	4	121	53	■		
MD	3	125	60/4"	■		
					SM	Brownish gray silty fine sand with occasional medium to coarse sand and gravel (very dense, moist) (glacial till)
SM	6		50/1.5"	⊠		
			50/3"	◨		Cobbles at 13 feet
			50/5.5"	◨		
			50/2"	◨		
			50/0.5"	◨		

DEPTH IN FEET: 0, 5, 10, 15, 20, 25, 30, 35, 40

Boring completed at 31.0 feet on 08/27/92
No ground water encountered while drilling

Note: See Figure 3 for explanation of symbols

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LOG OF BORING

FIGURE A–5

TEST DATA

BORING BL-2

Lab Tests	Moisture Content (%)	Dry Density (pcf)	Blow Count	Samples	Group Symbol	DESCRIPTION Surface Elevation (ft.) :
					SW	Brown fine to coarse sand with silt and occasional gravel (medium dense, moist) (topsoil)
					SM	Brown silty fine to medium sand with occasional gravel (very dense, moist) (glacial till)
MD	8	117	50/5"	■		
SM	5		60/3"	■		Becomes gray with occasional coarse sand at 6.5 feet
SM	3		60/5"	⊠		
			50/5.5"	◨		
			50/5.5"	◨		
			50/5.5"	◨		
			50/3"	◨		
			50/2.5"	◨		

DEPTH IN FEET: 0, 5, 10, 15, 20, 25, 30, 35, 40

Boring completed at 33.5 feet on 08/27/92
No ground water encountered while drilling

Note: See Figure 3 for explanation of symbols

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LOG OF BORING

FIGURE A-6