- ☐ City box number Recent Reports
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  - ☒ Company (author) name
  - ☒ Report Date
  - ☒ Project name
  - ☒ 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)
  - ☐ Green label
  - ☒ Site address (may be on 1st or 2nd page of text)
- ☐ Executive Summary and associated figures
- ☒ Table of Contents
- ☒ Project Location Plan/Map or Vicinity Map
- ☒ Site Plans, Boring Location Plans, or Exploration Plans
- ☐ Survey
- ☐ Geologic Maps
- ☐ Cross Sections/Subsurface Profiles
- ☐ Fill or Peat Thickness Maps and Contour Maps
- ☐ Boring Logs
- ☐ Geology Text (if no logs)
- ☒ Soil Classification Key/Boring Log Key
- ☐ Probe Logs
- ☐ 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 6/27/00 By Suzanne

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1901 SW Genesee St.

GEOTECHNICAL ENGINEERING STUDY
PROPOSED COOPER ELEMENTARY SCHOOL
SE CORNER OF SW GENESEE STREET & 21ST AVENUE SW
SEATTLE, WASHINGTON

G-0558

Prepared for

Mr. Ralph W. Rohwer
Program Manager
Heery International, Inc.
10900 NE 4th Street, Suite 1110
Bellevue, WA 98004

April 12, 1996

by

Geo Group Northwest, Inc.
13240 NE 20th Street, Suite 12
Bellevue, WA 98005
Phone: (206) 649-8757

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists & Environmental Scientists

April 12, 1996 G-0558

Mr. Ralph Rohwer
Program Manager
Heery International, Inc.
10900 NE 4th Street, Suite 1110
Bellevue, WA 98004

SUBJECT: **GEOTECHNICAL ENGINEERING STUDY**
PROPOSED COOPER ELEMENTARY SCHOOL
SE CORNER OF SW GENESEE STREET & 21ST AVENUE SW
SEATTLE, WASHINGTON

Dear Mr. Rohwer:

We are pleased to submit this report entitled "Geotechnical Engineering Study, Proposed Cooper Elementary School, SE Corner of SW Genesee Street & 21st Avenue SW Seattle, Washington." This report presents our findings of subsurface soil conditions, seismic conditions and geotechnical recommendations for foundation support of buildings, earthwork, drainage, subgrade stabilization for slab-on-grade and pavements, construction considerations for playfields, and recommended setbacks from steep slopes for the proposed development.

The subject site was explored with six drill rig borings on March 22, 1996, in accordance with our proposal dated January 18, 1996. The borings were drilled to a depth of 15 feet. The soils consisted of a variable layer of soft to hard SILT with sand, underlain by a dense to very dense TILL mixture composed of sand, silt and gravel. Groundwater was encountered in Boring B-6 at a depth of 14.5 feet. For a more detailed explanation of the soils, please refer to the report or Boring Logs.

Based on the results of our study, it is our opinion that the level portion of the site is suitable for the proposed development. The proposed building can be supported on conventional footing foundations bearing on the very dense glacial till soils or on structural fill that is placed above competent soils at the site.

We understand that the proposed Cooper Elementary School facilities for the site consist of a building, bus drop-off, access road, parking areas, open space and playfields. The approximate dimensions for the proposed school building are 150 feet by 350 feet. North and south of the proposed buildings and playfields are designated open space areas. Currently, the site is occupied by a residence and other single story and underground structures. Small sheds occupy the open space in the area for the proposed Cooper Elementary developments.

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The site is bordered to the east by steep slopes with a known history of landslide activity. Geo Group Northwest, Inc., recommends minimum building setbacks of 60 feet from the top of the slope and preferably increased to 100 feet where possible. The proposed Cooper Elementary School designs submitted to Geo Group Northwest, Inc., appear to conform to this recommendation.

Our recommendations, along with other geotechnically related aspects of the project, are discussed in more detail in the text of the attached report.

We appreciate this opportunity to have been of service to you on this project. We look forward to working with you in the future. Should you have any questions regarding this report or need additional consultation, please feel free to call us.

Sincerely,
GEO GROUP NORTHWEST, INC.

William Chang

William Chang, PE.
Principal

WILLIAM CHANG
STATE OF WASHINGTON
EXPIRES 2/19/98

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JOB NO. G-0558

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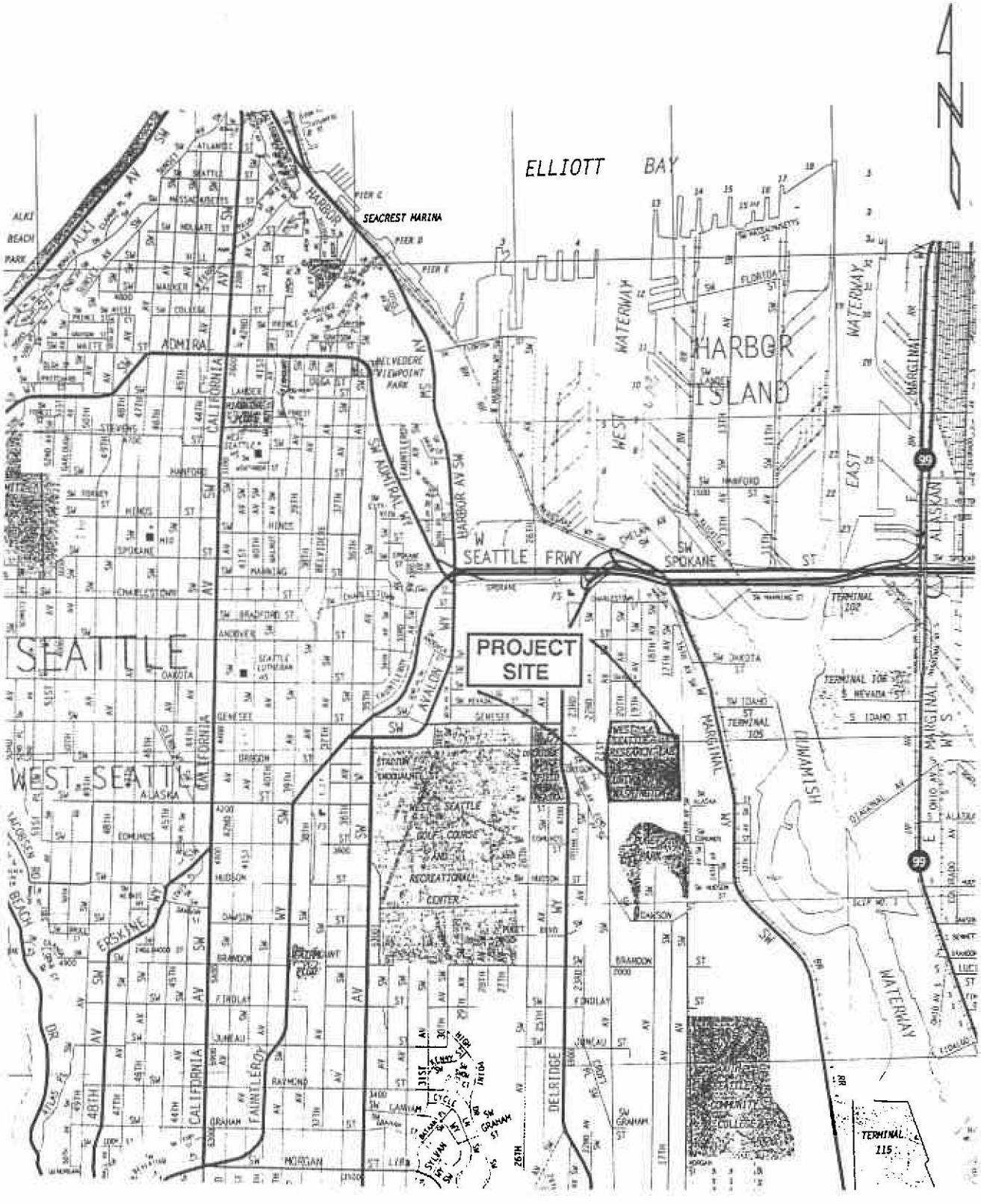

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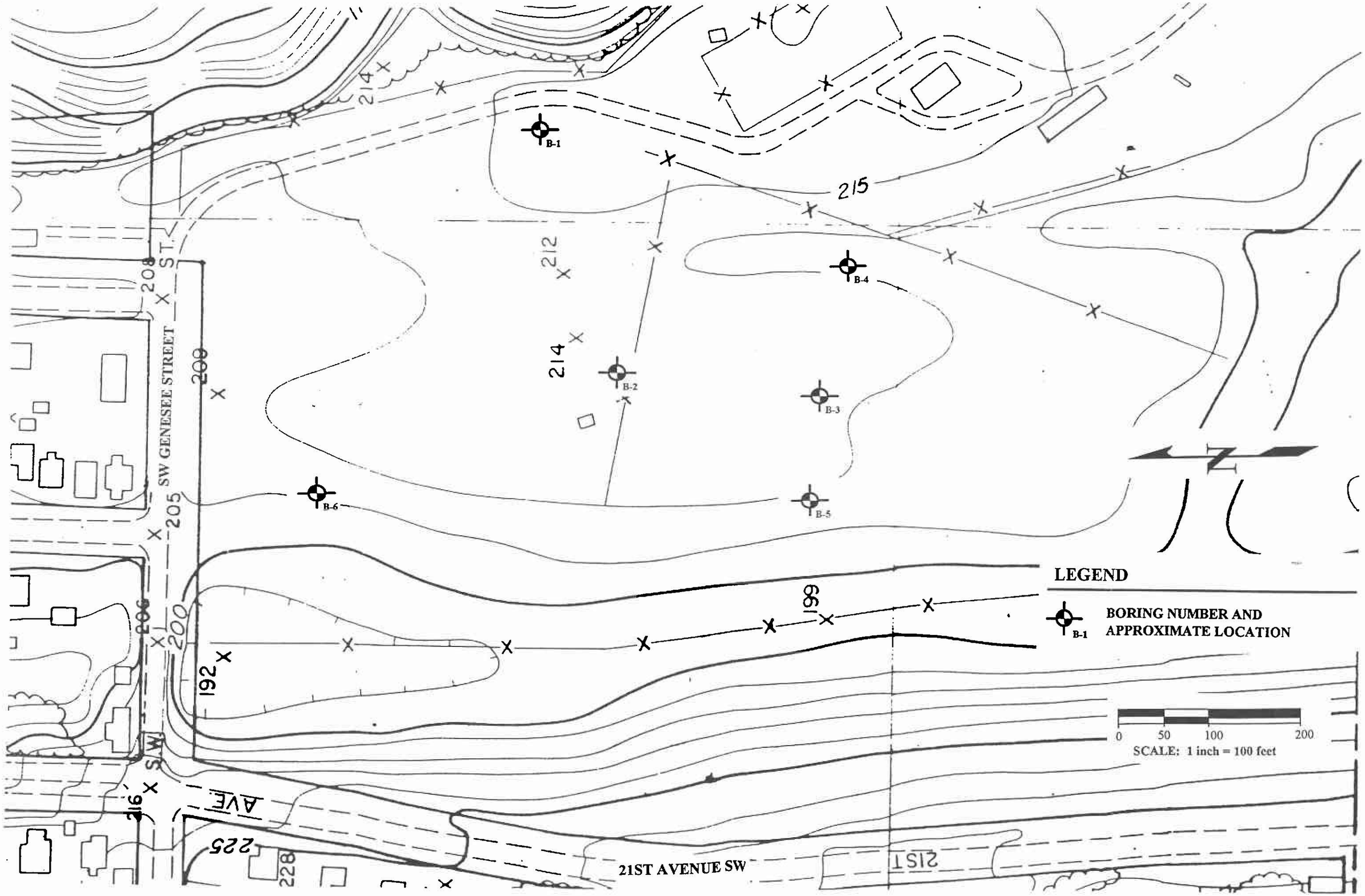
VICINITY MAP

PROPOSED COOPER ELEMENTARY
SEC SW GENESEE ST & 21ST AVE SW
SEATTLE, WASHINGTON

SCALE	DATE	MADE	CHKD	JOB NO.	PLATE
1" = 2400'	3/28/96	TP	WC	G-0558	1



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SITE PLAN - BORING LOCATIONS

PROPOSED COOPER ELEMENTARY
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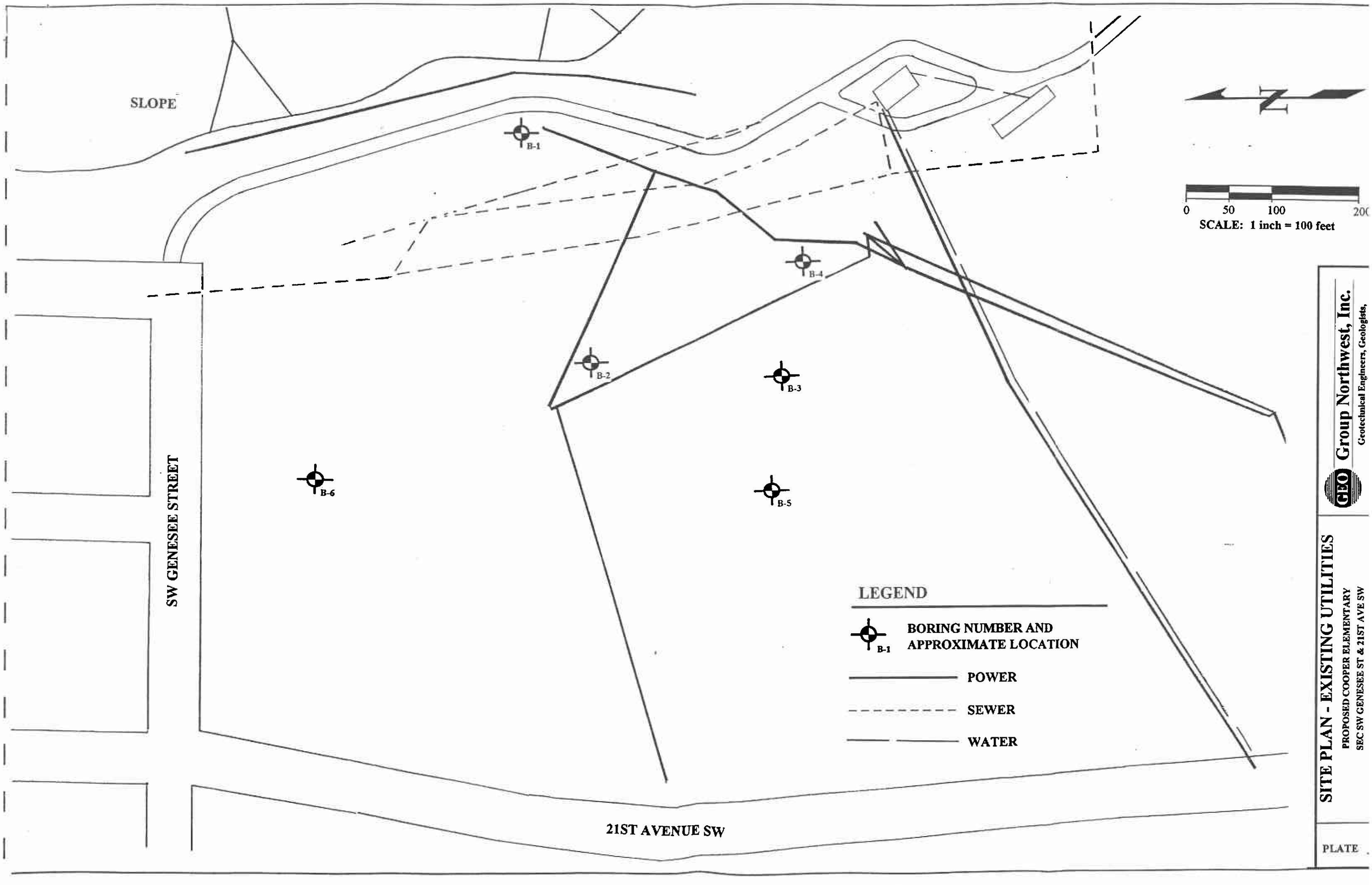
SEATTLE, WASHINGTON

PLATE



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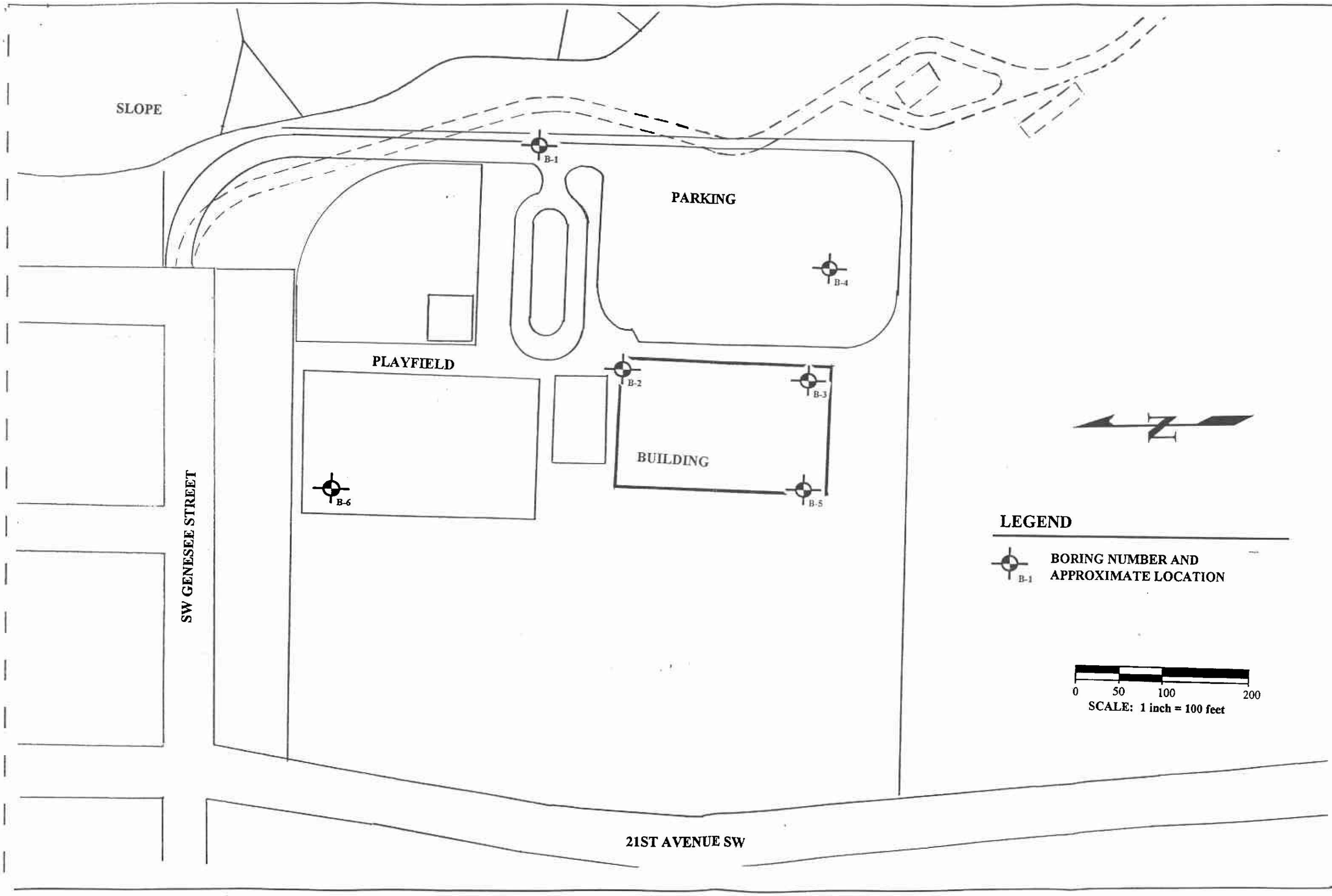
SITE PLAN - EXISTING UTILITIES
PROPOSED COOPER ELEMENTARY
SEC SW GENESEE ST & 21ST AVE SW

PLATE



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SITE PLAN- PROPOSED FACILITIES
PROPOSED COOPER ELEMENTARY
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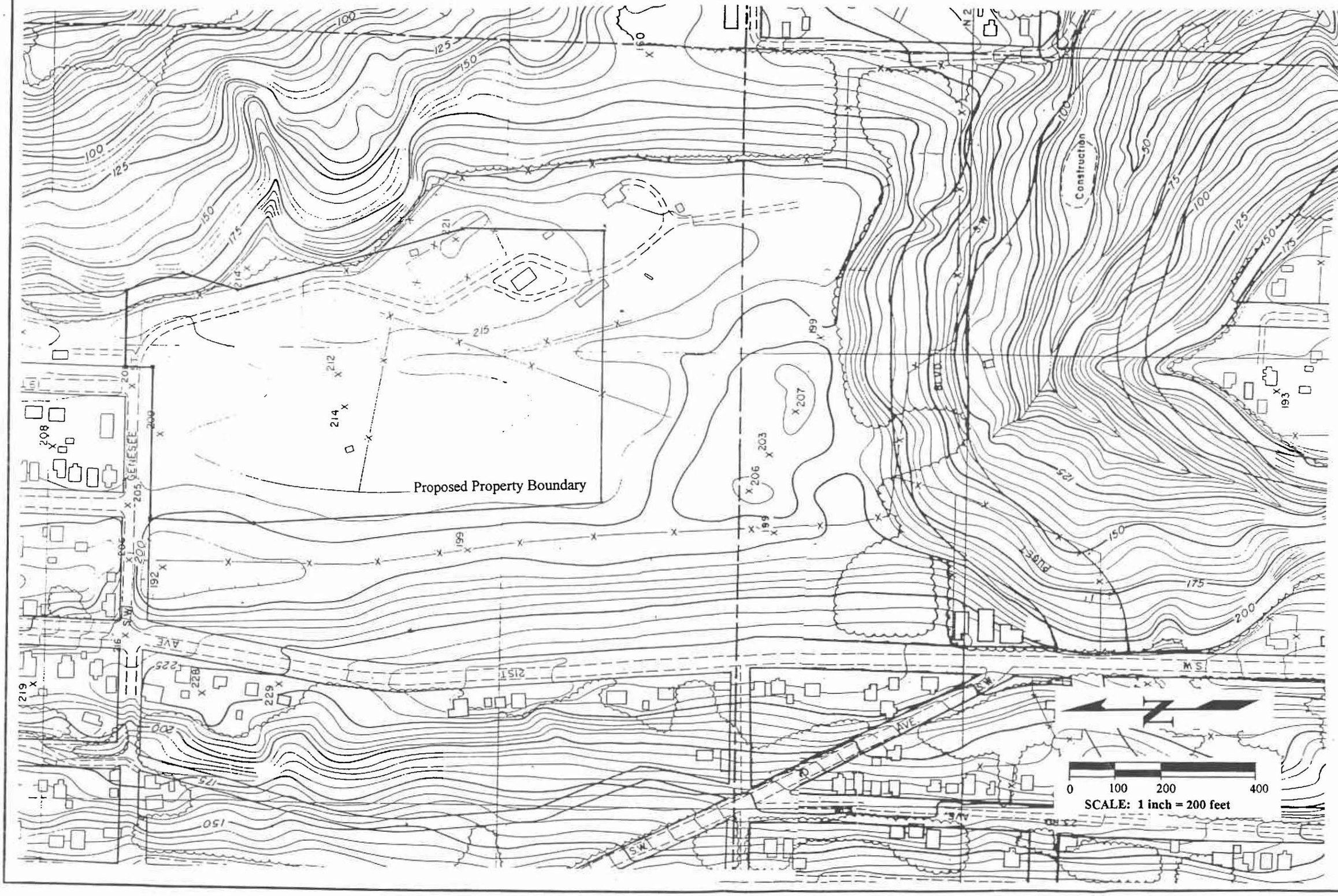
PLATE



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SITE AREA PLAN
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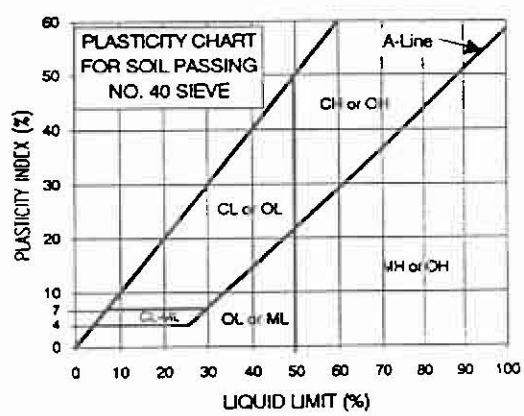
SCALE

PLATE 2D

LEGEND OF SOIL CLASSIFICATION AND PENETRATION TEST

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISION			GROUP SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA		
COARSE GRAINED SOILS More Than Half by Weight Larger Than No. 200 Sieve	GRAVELS (More Than Half Coarse Grains Larger Than No. 4 Sieve)	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURE, LITTLE OR NO FINES	DETERMINE PERCENTAGES OF GRAVEL AND SAND FROM GRAIN SIZE DISTRIBUTION CURVE. COARSE GRAINED SOILS ARE CLASSIFIED AS FOLLOWINGS: < 5% Fine Grained: GW, GP, SW, SP; > 12% Fine Grained: GM, GC, SM, SC; 5 to 12% Fine Grained: use dual symbols.	Cu = (D60 / D10) greater than 4 Cc = (D30 * D30 / D10 / D60) between 1 and 3	
			GP	POORLY GRADED GRAVELS, AND GRAVEL-SAND MIXTURES LITTLE OR NO FINES		NOT MEETING ABOVE REQUIREMENTS	
		DIRTY GRAVELS (WITH SOME FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES		CONTENT OF FINES EXCEEDS 12%	ATTERBERG LIMITS BELOW "A" LINE or P.I. LESS THAN 4
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES			ATTERBERG LIMITS ABOVE "A" LINE or P.I. MORE THAN 7
	SANDS (More Than Half Coarse Grains Smaller Than No. 4 Sieve)	CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES		Cu = (D60 / D10) greater than 6 Cc = (D30 * D30 / D10 / D60) between 1 and 3	
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES		NOT MEETING ABOVE REQUIREMENTS	
		DIRTY SANDS (WITH SOME FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES		CONTENT OF FINES EXCEEDS 12%	ATTERBERG LIMITS BELOW "A" LINE with P.I. LESS THAN 4
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES			ATTERBERG LIMITS ABOVE "A" LINE with P.I. MORE THAN 7
FINE-GRAINED SOILS More Than Half by Weight Smaller Than No. 200 Sieve	SILTS (Below A-Line on Plasticity Chart, Negligible Organic)	Liquid Limit < 50%	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHT PLASTICITY			
		Liquid Limit > 50%	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOIL			
	CLAYS (Above A-Line on Plasticity Chart, Negligible Organic)	Liquid Limit < 30%	CL	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAYS, CLEAN CLAYS			
		Liquid Limit > 50%	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS			
	ORGANIC SILTS & CLAYS (Below A-Line on Plasticity Chart)	Liquid Limit < 50%	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY			
		Liquid Limit > 50%	OH	ORGANIC CLAYS OF HIGH PLASTICITY			
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS			



SOIL PARTICLE SIZE

FRACTION	U.S. STANDARD SIEVE Passing Sieve	Passing Size (mm)	Retained Sieve	Retained Size (mm)
SILT / CLAY	#200	0.075		
SAND				
FINE	#40	0.425	#200	0.075
MEDIUM	#10	0	#40	0.425
COURSE	#4	4.75	#10	2
GRAVEL				
FINE		19	#4	4.75
COURSE		76		19
COBBLES	76 mm to 203 mm			
BOULDERS	> 203 mm			
ROCK FRAGMENTS	> 76 mm			
ROCK	>0.76 cubic meter in volume			

GENERAL GUIDANCE OF SOIL ENGINEERING PROPERTIES FROM STANDARD PENETRATION TEST (SPT)

SANDY SOILS				SILTY & CLAYEY SOILS		
Blow Counts N	Relative Density %	Friction Angle Ø, degree	Description	Blow Counts N	Unconfined Strength Su, tsf	Description
0 - 4	0 -15		Very Loose	< 2	< 0.25	Very soft
4 - 10	15 - 35	26 - 30	Loose	2 - 4	0.25 - 0.50	Soft
10 - 30	35 - 65	28 - 35	Medium Dense	4 - 8	0.50 - 1.00	Medium Stiff
30 - 50	65 - 85	35 - 42	Dense	8 - 15	1.00 - 2.00	Stiff
> 50	85 - 100	38 - 46	Very Dense	15 - 30	2.00 - 4.00	Very Stiff
				> 30	> 4.00	Hard

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PLATE 3

BORING NO. B-1

Logged By: TP Date Drilled: 3/22/96 Surface Elev. 215 feet +/-

Depth ft.	USCS	Soil Description	SAMPLE Type	SAMPLE No.	Blows per 6-inches	SPT N Blows per 1-foot	Water Content %	Other Tests & Comments
	ML	Brown-gray SILT with fine to medium sand and occ. fine gravel, stiff to hard, moist	I	S1	2,3,6	9	20.9	Groundwater seepage not encountered in Boring
5			I	S2	7,16,18	34	17.3	
			I	S3	7,12,15	27	13.3	
	ML	Gray SILT with occ. orange mottling, very stiff, moist	I	S4	5,7,11	18	28.3	
10			I	S5	3,7,16	23	30.7	
15	SM	Gray silty SAND, fine, dense, moist (TILL)	I	S6	11,20,24	44	16.3	
20		End of Boring at 16.5 feet Drilling Method: 7" OD x 3.25" ID Hollow Stem Auger. Sampling Method: 2-inch Split Spoon Sampler driven by a 140 lb. hammer.						
25								
30								
35								
40								

LEGEND:
- I 2" O.D. Split-Spoon Sampler
- II 3" O.D. Shelby-Tube Sampler
- III 3" O.D. California Sampler

GROUNDWATER OBSERVATION WELL:
- seal
- measured water level
- well tip (screen)

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BORING LOG

PROPOSED COOPER ELEMENTARY
SEC SW GENESEE ST & 21ST AVE SW
SEATTLE, WASHINGTON

JOB NO. G-0558 DATE 3/25/96 PLATE 4

BORING NO. B-2

Logged By: TP Date Drilled: 3/22/96 Surface Elev. 212 feet +/-

Depth ft.	USCS	Soil Description	SAMPLE Type	SAMPLE No.	Blows per 6-inches	SPT N Blows per 1-foot	Water Content %	Other Tests & Comments
	ML	Brown to gray SILT with fine to medium sand, soft to very stiff, moist		S1	2,2,2	4	18.9	Groundwater seepage not encountered in Boring
				S2	5,7,11	18	19.8	
5	SM	Brown-gray silty SAND, fine, with fine to coarse gravel, very dense, moist (TILL)		S3	18,40,42	82	12.5	
				S4	50/5"	50/5"	11.3	
10				S5	50/4"	50/4"	14.1	
15	ML	Blue-gray SILT with fine gravel, hard, moist (TILL)		S6	44,50/4"	50/4"	12.1	
		End of Boring at 16.0 feet Drilling Method: 7" OD x 3.25" ID Hollow Stem Auger. Sampling Method: 2-inch Split Spoon Sampler driven by a 140 lb. hammer.						
20								
25								
30								
35								
40								

LEGEND:
- 2" O.D. Split-Spoon Sampler
- 3" O.D. Shelby-Tube Sampler
- 3" O.D. California Sampler

GROUNDWATER OBSERVATION WELL:
- seal
- measured water level
- well tip (screen)

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BORING LOG

PROPOSED COOPER ELEMENTARY
SEC SW GENESEE ST & 21ST AVE SW
SEATTLE, WASHINGTON

JOB NO.	G-0558	DATE	3/25/96	PLATE	5

BORING NO. B-3

Logged By: TP Date Drilled: 3/22/96 Surface Elev. 210 feet +/-

Depth ft.	USCS	Soil Description	SAMPLE Type	SAMPLE No.	Blows per 6-inches	SPT N Blows per 1-foot	Water Content %	Other Tests & Comments
	ML	Brown to gray sandy SILT with occ. orange mottling and trace organics, medium stiff to stiff, moist		S1	5,5,5	10	23.1	Groundwater seepage not encountered in Boring
				S2	2,2,6	8	19.9	
5	SP-SM	Gray fine to medium SAND with silt and occ. fine gravel, medium dense, moist		S3	6,11,12	23	13.6	
	ML	Gray SILT with fine to medium sand and occ. fine gravel, hard, moist (TILL)		S4	13,30, 50/4"	80/10"	13.9	
10				S5	20,43,44	87	12.3	
15	ML	Blue-gray SILT with fine gravel, hard, moist (TILL)		S6	18,30,55	85	11.1	
		End of Boring at 16.5 feet Drilling Method: 7" OD x 3.25" ID Hollow Stem Auger. Sampling Method: 2-inch Split Spoon Sampler driven by a 140 lb. hammer.						
20								
25								
30								
35								
40								

LEGEND:
- 2" O.D. Split-Spoon Sampler
- 3" O.D. Shelby-Tube Sampler
- 3" O.D. California Sampler

GROUNDWATER OBSERVATION WELL:
- seal
- measured water level
- well tip (screen)

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BORING LOG

PROPOSED COOPER ELEMENTARY
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SEATTLE, WASHINGTON

JOB NO. G-0558	DATE 3/25/96	PLATE 6

BORING NO. B-4

Logged By: TP Date Drilled: 3/22/96 Surface Elev. 210 feet +/-

Depth ft.	USCS	Soil Description	SAMPLE Type	SAMPLE No.	Blows per 6-inches	SPT N Blows per 1-foot	Water Content %	Other Tests & Comments
	ML	Brown to gray SILT with occ. orange mottling and trace organics, soft, moist		S1	3,2,1	3	22.6	Groundwater seepage not encountered in Boring
	SM	Gray silty SAND, fine to medium with fine to coarse gravel, very dense, moist (TILL)		S2	10,22,33	55	15.1	
5				S3	15,34,53	87	12.0	
				S4	60/6"	60/6"	11.6	
10				S5	12,20, 50/4"	70/10"	16.4	
15	ML	Blue-gray SILT with sand and fine gravel, hard, moist (TILL)		S6	20,40,53	93	12.0	
		End of Boring at 16.5 feet Drilling Method: 7" OD x 3.25" ID Hollow Stem Auger. Sampling Method: 2-inch Split Spoon Sampler driven by a 140 lb. hammer.						
20								
25								
30								
35								
40								

LEGEND:
- 2" O.D. Split-Spoon Sampler
- 3" O.D. Shelby-Tube Sampler
- 3" O.D. California Sampler

GROUNDWATER OBSERVATION WELL:
- seal
- measured water level
- well tip (screen)

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists, & Environmental Scientists

BORING LOG

PROPOSED COOPER ELEMENTARY
SEC SW GENESEE ST & 21ST AVE SW
SEATTLE, WASHINGTON

JOB NO. G-0558	DATE 3/25/96	PLATE 7

BORING NO. B-5

Logged By: TP Date Drilled: 3/22/96 Surface Elev. 210 feet +/-

Depth ft.	USCS	Soil Description	SAMPLE Type	SAMPLE No.	Blows per 6-inches	SPT N Blows per 1-foot	Water Content %	Other Tests & Comments
	ML	Gray-brown SILT with sand and occ. orange mottling, medium stiff to very stiff, moist	I	S1	1,3,3	6	28.5	Groundwater seepage not encountered in Boring
			I	S2	4,7,14	21	19.0	
5	ML	Gray SILT with fine to medium sand and fine to coarse gravel, hard, moist (TILL)	I	S3	13,13,27	40	16.6	
			I	S4	13,21,40	61	13.0	
10	SP-SM	Gray SAND, fine to medium, with silt and fine to coarse gravel, very dense, moist (TILL)	I	S5	70/6"	70/6"	8.9	
15	SM	Blue-gray SAND, fine to medium with silt and fine to coarse gravel, very dense, moist (TILL)	I	S6	60/5"	60/5"	9.5	
20		End of Boring at 15.5 feet Drilling Method: 7" OD x 3.25" ID Hollow Stem Auger. Sampling Method: 2-inch Split Spoon Sampler driven by a 140 lb. hammer.						
25								
30								
35								
40								

LEGEND:
- I 2" O.D. Split-Spoon Sampler
- II 3" O.D. Shelby-Tube Sampler
- III 3" O.D. California Sampler

GROUNDWATER OBSERVATION WELL:
- seal
- measured water level
- well tip (screen)

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists, & Environmental Scientists

BORING LOG

PROPOSED COOPER ELEMENTARY
SEC SW GENESEE ST & 21ST AVE SW
SEATTLE, WASHINGTON

JOB NO.	G-0558	DATE	3/25/96	PLATE	8

BORING NO. B-6

Logged By: TP Date Drilled: 3/22/96 Surface Elev. 205 feet +/-

Depth ft.	USCS	Soil Description	SAMPLE Type	SAMPLE No.	Blows per 6-inches	SPT N Blows per 1-foot	Water Content %	Other Tests & Comments
	ML	Gray-orange SILT with sand trace organics, soft to very stiff, moist		S1	1,1,1	2	31.1	Groundwater measured at a depth of 14.5 feet, 30 minutes after drilling
				S2	4,9,17	26	16.3	
5	SM	Gray SAND with silt and fine to coarse gravel, very dense, moist (TILL)		S3	15,60/6"	60/6"	10.9	
				S4	60/6"	60/6"	18.1	
10				S5	75/5"	75/5"	7.7	
15				S6	75/6"	75/6"	10.9	
		End of Boring at 15.5 feet Drilling Method: 7" OD x 3.25" ID Hollow Stem Auger. Sampling Method: 2-inch Split Spoon Sampler driven by a 140 lb. hammer.						
20								
25								
30								
35								
40								

LEGEND:
- 2" O.D. Split-Spoon Sampler
- 3" O.D. Shelby-Tube Sampler
- 3" O.D. California Sampler

GROUNDWATER OBSERVATION WELL:
- seal
- measured water level
- well tip (screen)

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JOB NO. G-0558	DATE 3/25/96	PLATE 9