Letter Report

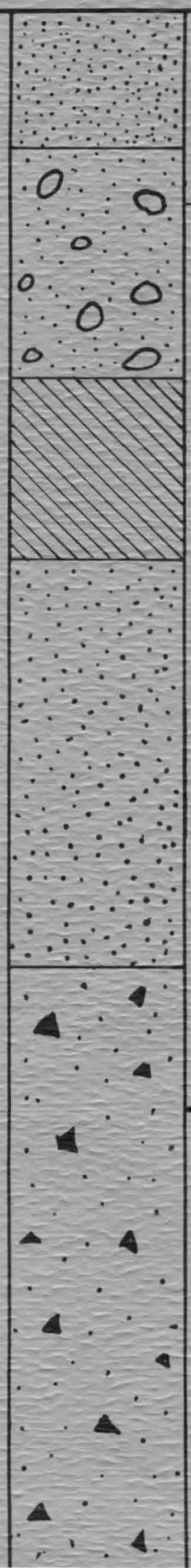
C and L
Development Co.

Olson and Rowe, AIA
architects

Proposed Shopping
Center, Wishkah
and Chehalis Strs.
Aberdeen, Wash.

Soils and
Foundation
Investigation

March 21, 1974



EAST WISHKAH MALL

REPORT NO. 22

NEIL H. TWELKER & ASSOCIATES

CONSULTING SOILS ENGINEERS

RECEIVED
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ENGINEER

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NEIL H. TWELKER & ASSOCIATES

CONSULTING SOILS ENGINEERS

ALASKA TRADE BUILDING
SEATTLE, WASH. 98101

March 21, 1974

C. and L. Development Company
% Olson and Rowe, AIA
Architects and Planners
73 South Sound Center
Lacey, Washington 98503

Attention: Mr. Robert T. Olson
Re: Soils and Foundation Investigation for Proposed Shopping Center Project, Aberdeen, Washington

Gentlemen:

At your request we have conducted a soils and foundation investigation of a site proposed for a shopping center in Aberdeen, Washington. We submit herewith a report of our findings, conclusions and recommendations.

Site Description The Aberdeen site is irregular shaped, measuring approximately 1000 ft east/west by 800 ft north/south, bounded on the north by E. Wishkah Street, the west by Chehalis Street, the east by adjoining property, and on the south by the Chehalis river. It is nearly level and was formerly used as a log storage yard and cedar mill. Remnants of several dilapitated buildings are still present, along with several large areas of asphalt paving. A timber wharf approximately 600 ft along occupies the south border of the property along the river. Remnants of a former bridge approach are present near the southwest corner of the property. Mill waste covers the southwest corner of the property. An industrial water line crosses the approximate center of the property from east to west at shallow depth. The entire site is approximately 5 ft above the level of high tide.

Subsurface Explorations Soil characteristics of the site were determined from a series of four test borings with a truck-mounted hollow stem power auger. Locations of explorations are shown in Fig. 1, attached. Soil samples were taken at 5-ft intervals throughout the depth of the borings by Standard Penetration Tests in which a 2-inch OD split spoon sampler is driven into the undisturbed formation by repeated blows of a 140 lb pin-guided hammer falling 30 inches. Logs of the test borings were combined with topographic information to construct three geologic sections through the site. These are shown in Figs. 2 through 3, attached.

Subsurface Conditions Five principal soil units were encountered at the site and are described briefly as follows:

1. An uppermost layer of fill consisting of mill waste, silt and sand (from river dredging) has a maximum thickness of approximately 12 ft.

2.. A unit of black to gray soft silt containing an occasional thin layer of peat and scattered traces of organic matter has a maximum thickness of approximately 26 ft.

3. A sequence of very loose fine silty sand interbedded with soft gray silt containing traces of organic matter continued to a maximum depth of 43 ft.

4. A unit of loose to moderately dense silty fine sand having an average thickness of approximately 16 ft was encountered at a depth of 43 ft and continued to a maximum depth of 66 ft.

5. The lowermost unit encountered consisted of loose silty fine sand layers interbedded with soft sandy silt containing a few traces of organic matter. This unit was encountered to the maximum explored depth of 90 ft

Groundwater was encountered at depths ranging from a few inches to as much as 6 ft beneath ground surface. We anticipate that some fluctuations would occur, particularly along the seaward margins of the property, in response to tidal fluctuations. The magnitude of groundwater fluctuation was not determined in this study.

Conclusions and Recommendations On the basis of our examination of the site we draw the following principal conclusions:

1. The property is underlain throughtout by extremely soft and/or loose fine silty sand and organic silt. It is believed to be consolidated under present loads; however, the addition of fills or structural loads to the compressilbe soil units would institute a new cycle of compression which could result in substantial settlements.

2. No competent bearing horizon was encountered in explorations which extended to as much as 90 feet below site grade. We anticipate that bedrock (and possibly an overlying layer of dense alluvial sands and gravels) would be encountered between 100 and 200 ft below the site.

3. Commercial buildings of the type we understand to be proposed for this development could conceivably be supported by two alternative methods; (1) the use of low-capacity friction-adhesion piles driven to approximately 60 ft below grade. Both methods are discussed in subsequent paragraphs.

4. The mill waste which covers the southwest portion of the site appears to be approximately 6 ft in thickness. This portion of the site may be separated hydraulically from the adjacent Chehalis river by means of a cut-off trench in which a backfill of impervious silt-clay is placed. The problems to be dealt with in this portion of the site have not been clearly outlined to us; consequently, we should review design proposals with you before the project reaches an advanced stage.

Piling Foundations Piling driven at this site will function as combination friction and adhesion piles. Friction will be developed between piling surface and granular layers or lenses within the foundation soils. Inasmuch as the granular soil units exist in a very loose to moderately loose state, friction will be severely restricted. Similarly, the force available from accumulated adhesion between the pile surface and the surrounding cohesive materials will be limited by the low shear strength of the silt units. Nevertheless, a useful load bearing system could be developed to support light-weight buildings on this site. On the basis of present information it appears that 60 ft piles would support loads of 20 tons, assuming the piling could be well-distributed. A careful analysis would be required to account for the group efficiency of clusters of piling which must support heavy loads. Floors should be structurally supported unless some cracking and/or differential settlement can be tolerated.

Treated timber, or untreated timber cut-off below the water line, appears to be the material most worthy of consideration for this project. Untreated timber could also be employed in the form of composite piling.

We recommend that any modifications to the site grade being done several months in advance of pile driving work in order to mitigate the effects of downdrag forces on the piling. In the event that site fills of more than 1 ft are to be placed these should be accomplished at least 6 months prior to the start of pile driving. Moreover, the progress of settlement should be carefully monitored.

Compensated Foundation Light-weight commercial buildings could be supported without piling foundations provided all building loads are fully compensated. This would entail construction of a crawl space below grade; the removal of the material from the crawl space will more than off-set the load to be added. The building foundation would be provided with sufficient rigidity to bridge possible soft

spots or areas of loss of support in the upper weak soil formation. Precautions to be taken in the execution of a compensated foundation concern mainly the avoidance of concentrated loads near buildings or addition of site fills to the area after buildings are underway or completed. [The same restrictions apply, however, to the use of a piling foundation inasmuch as compressible soil units would underlie piling driven to any feasible depths.

We shall be pleased to provide such additional information on advice as you may request in completing the design and planning of this project, at your convenience.

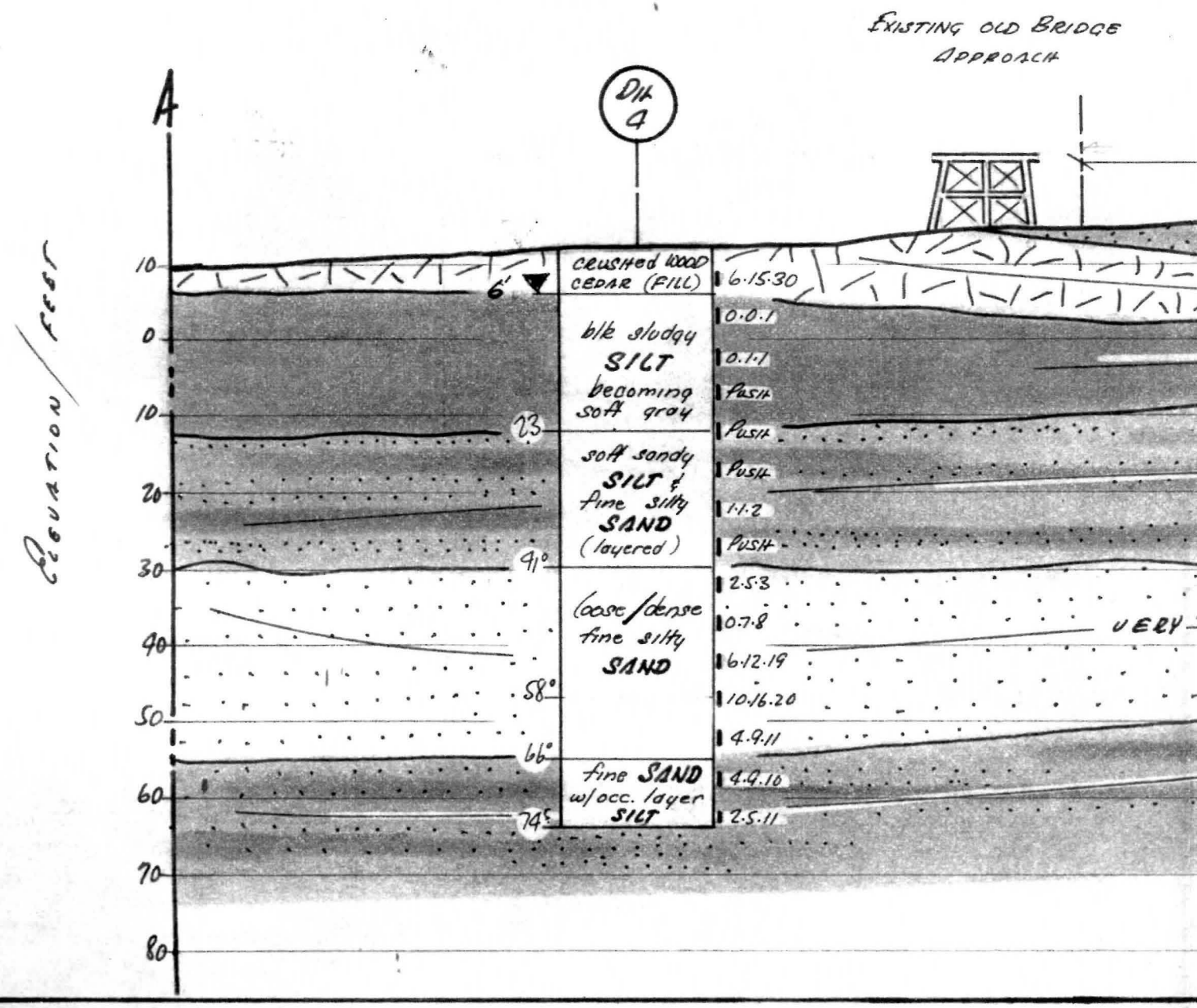
Very truly yours,

NEIL H. TWELKER & ASSOCIATES

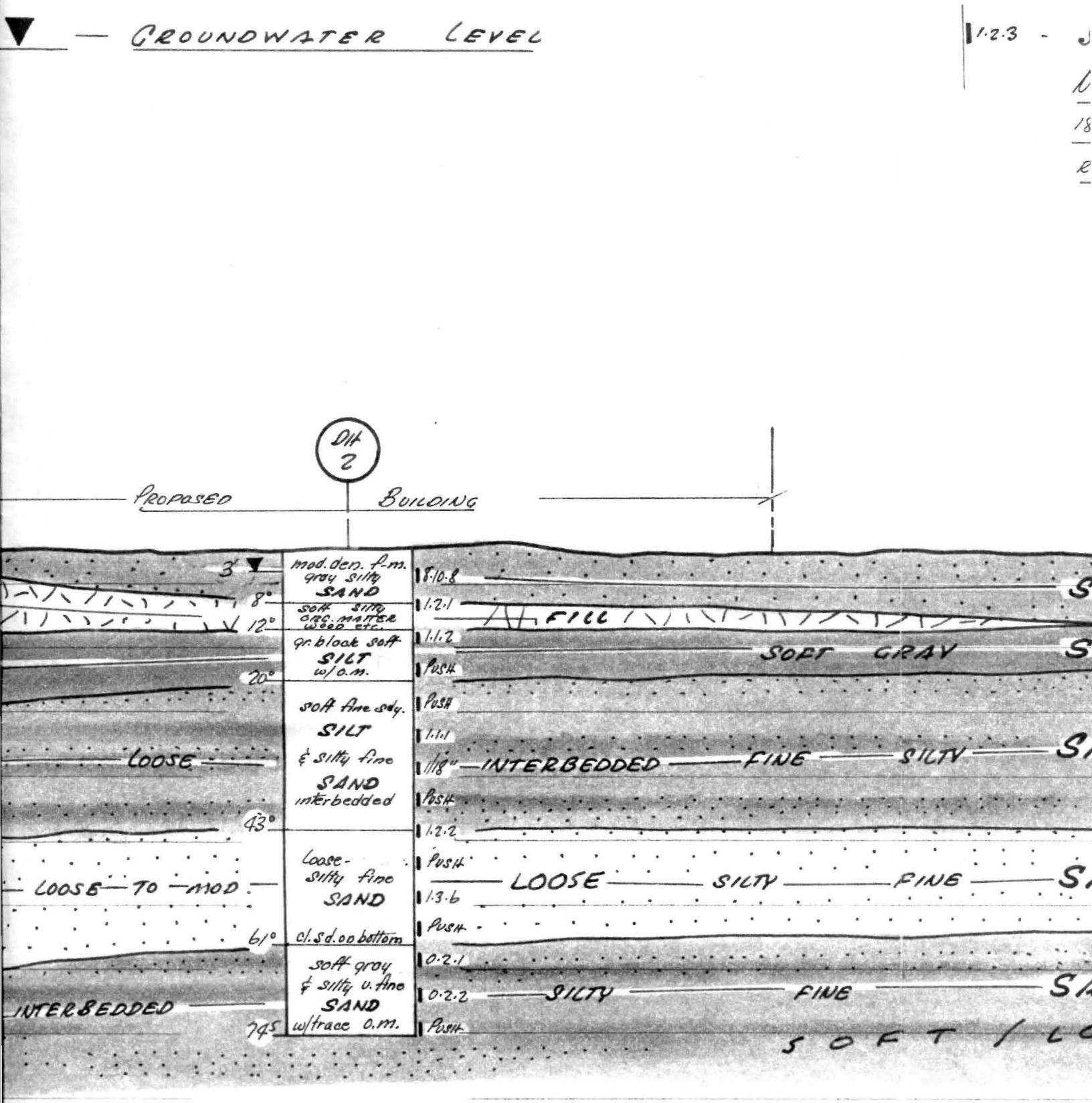
by Neil H. Twelker

Neil H. Twelker

NHT:acm
Includes Figs. 1,2,3


EXISTING OLD BRIDGE APPROACH
A
DH 4
ELEVATION / FEET
10
0
10
20
30
40
50
60
70
80
6'
23
41°
58°
66°
74°
crushed WOOD CEDAR (FILL)
blk sludgy SILT becoming soft gray
soft sandy SILT & fine silty SAND (layered)
loose/dense fine silty SAND
fine SAND w/occ. layer SILT
6.15.30
0.0.1
0.1.1
PUSH
PUSH
PUSH
1.1.2
PUSH
2.5.3
0.7.8
6.12.19
10.16.20
4.9.11
4.9.16
2.5.11
VERY

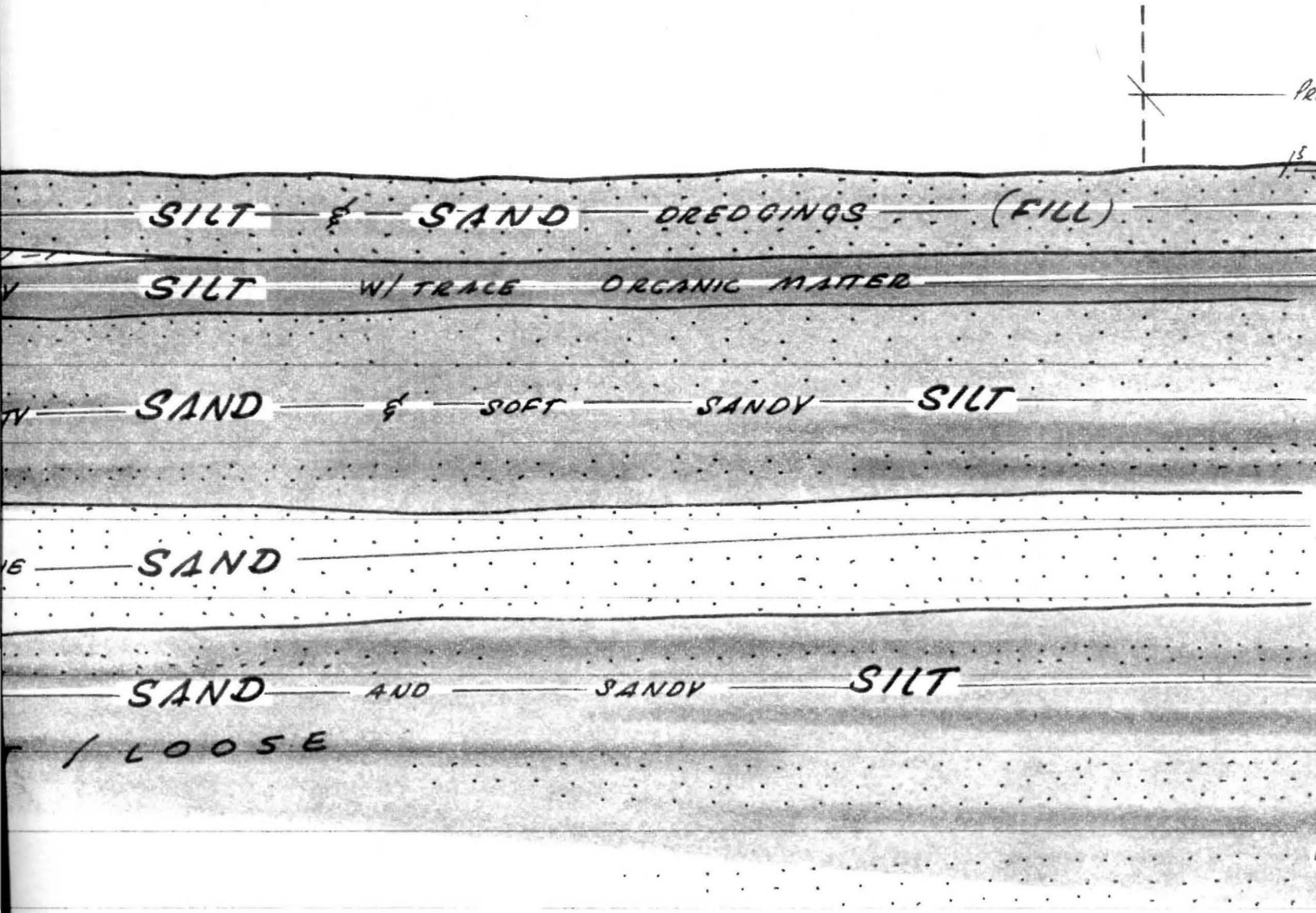
T.2120


GROUNDWATER LEVEL
1.2.3
DH 2
PROPOSED BUILDING
3'
8°
12°
20°
43°
61°
74.5
mod. den. f-m. gray silty SAND
soft silty orc. matter wood etc.
gr. black soft SILT w/o.m.
soft fine sdy. SILT & silty fine SAND interbedded
Loose-silty fine SAND
cl. sd. on bottom
soft gray & silty v. fine SAND w/trace o.m.
LOOSE
LOOSE TO MOD
INTERBEDDED
8.10.8
1.2.1
1.1.2
PUSH
PUSH
1.1.1
1/18"
PUSH
1.2.2
PUSH
1.3.6
PUSH
0.2.1
0.2.2
PUSH
FILL
SOFT GRAY
INTERBEDDED FINE SILTY
LOOSE SILTY FINE
SILTY FINE
SOFT / LO

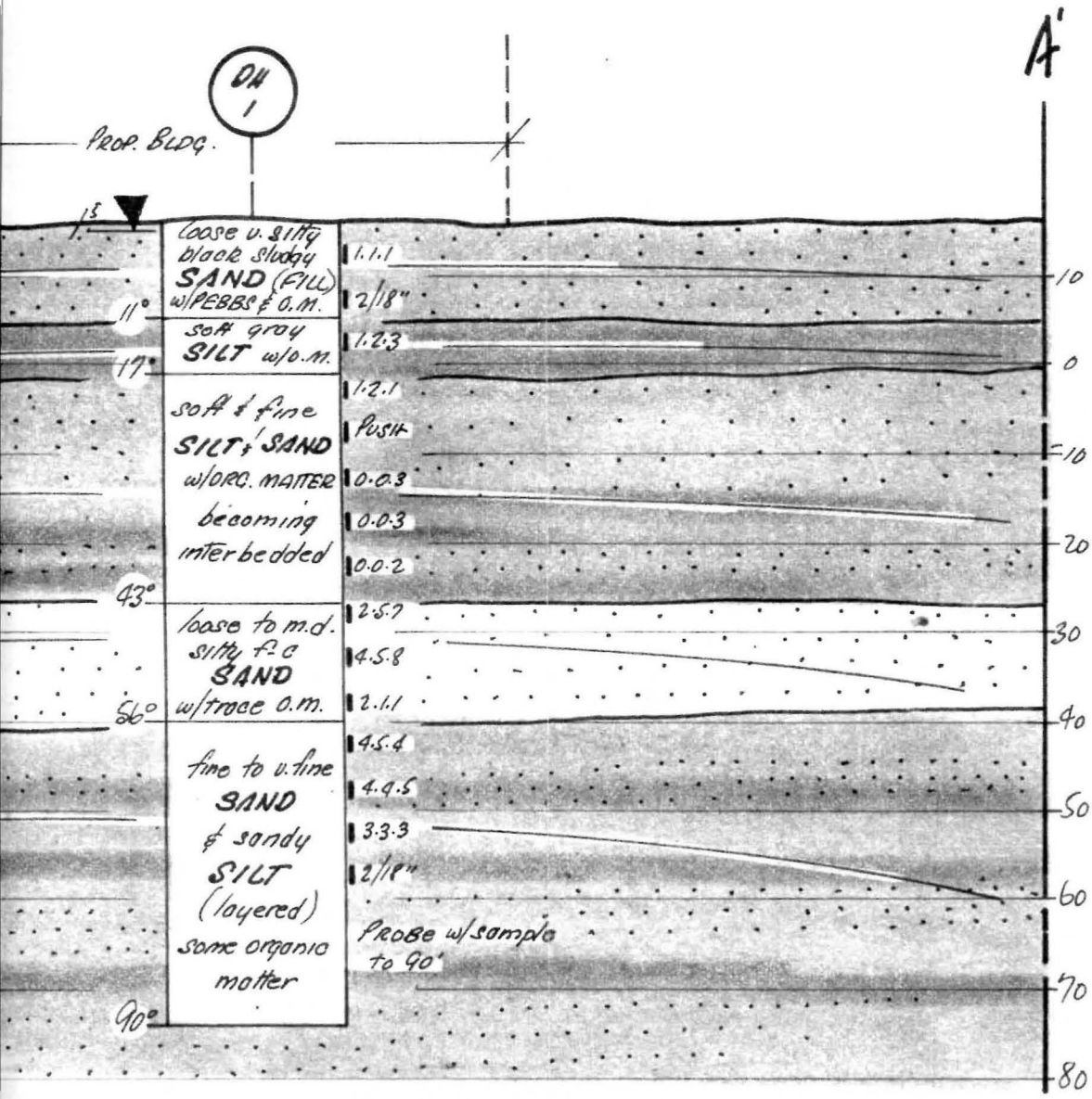
• LEGEND •

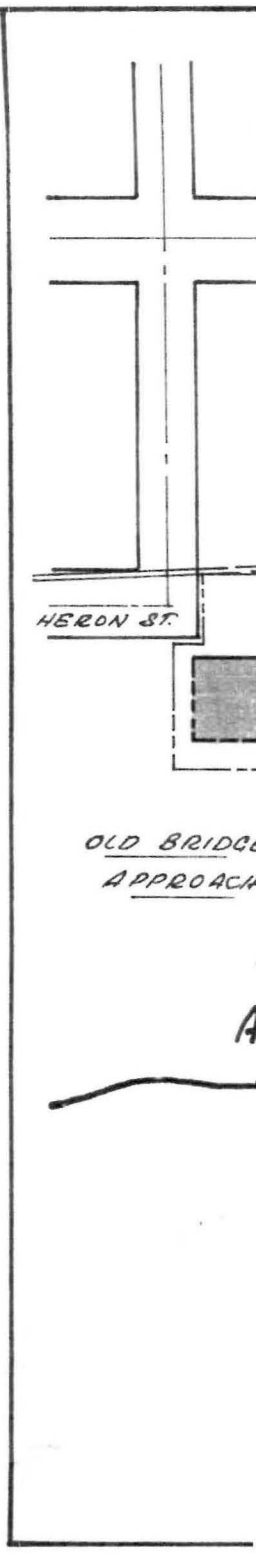
1.2.3 - STANDARD PENETRATION TEST:

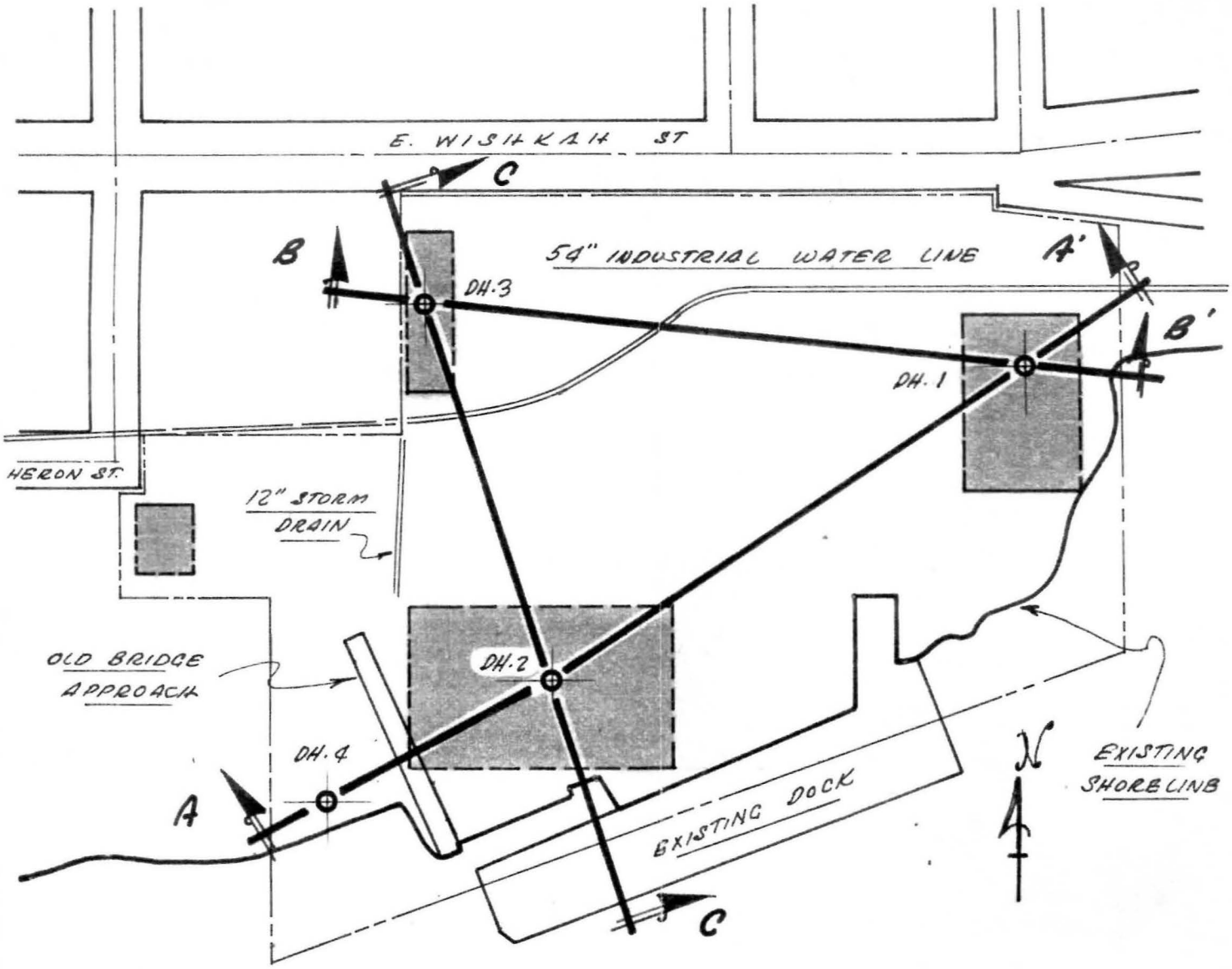
No. OF BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLER 18" WITH 140 lb. WEIGHT FALLING 30". BLOWS ARE RECORDED EVERY 6" OR AS NOTED.



SCALE: HORIZONTAL 1" = 50'
VERTICAL 1" = 20'







SITE PLAN

● — DRILL HOLE LOCATIONS

SCALE 1" = 200'

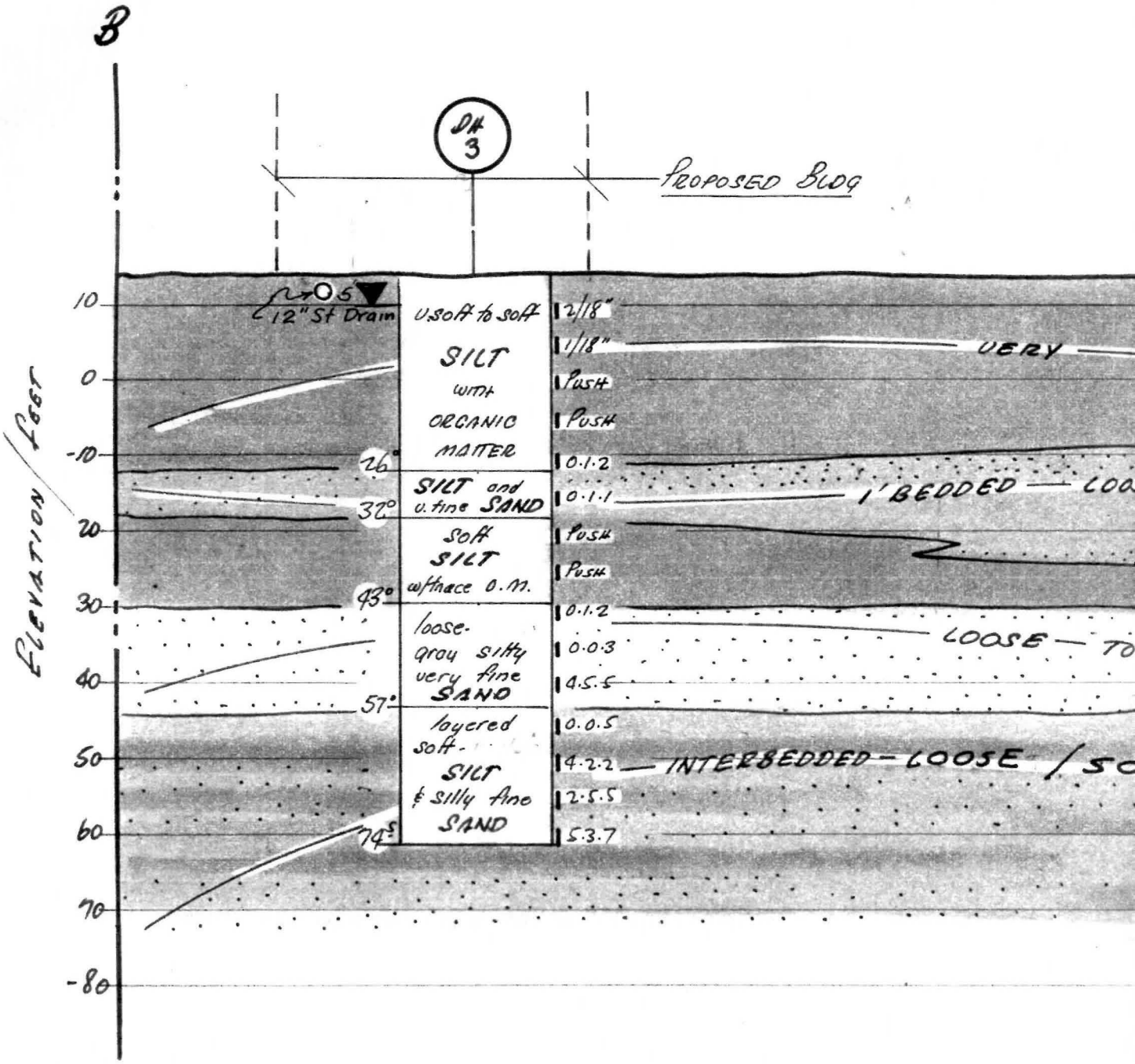
ABERDEEN, WASHINGTON

SHOPPING CENTER

OLSON & ROWE ARCHITECTS

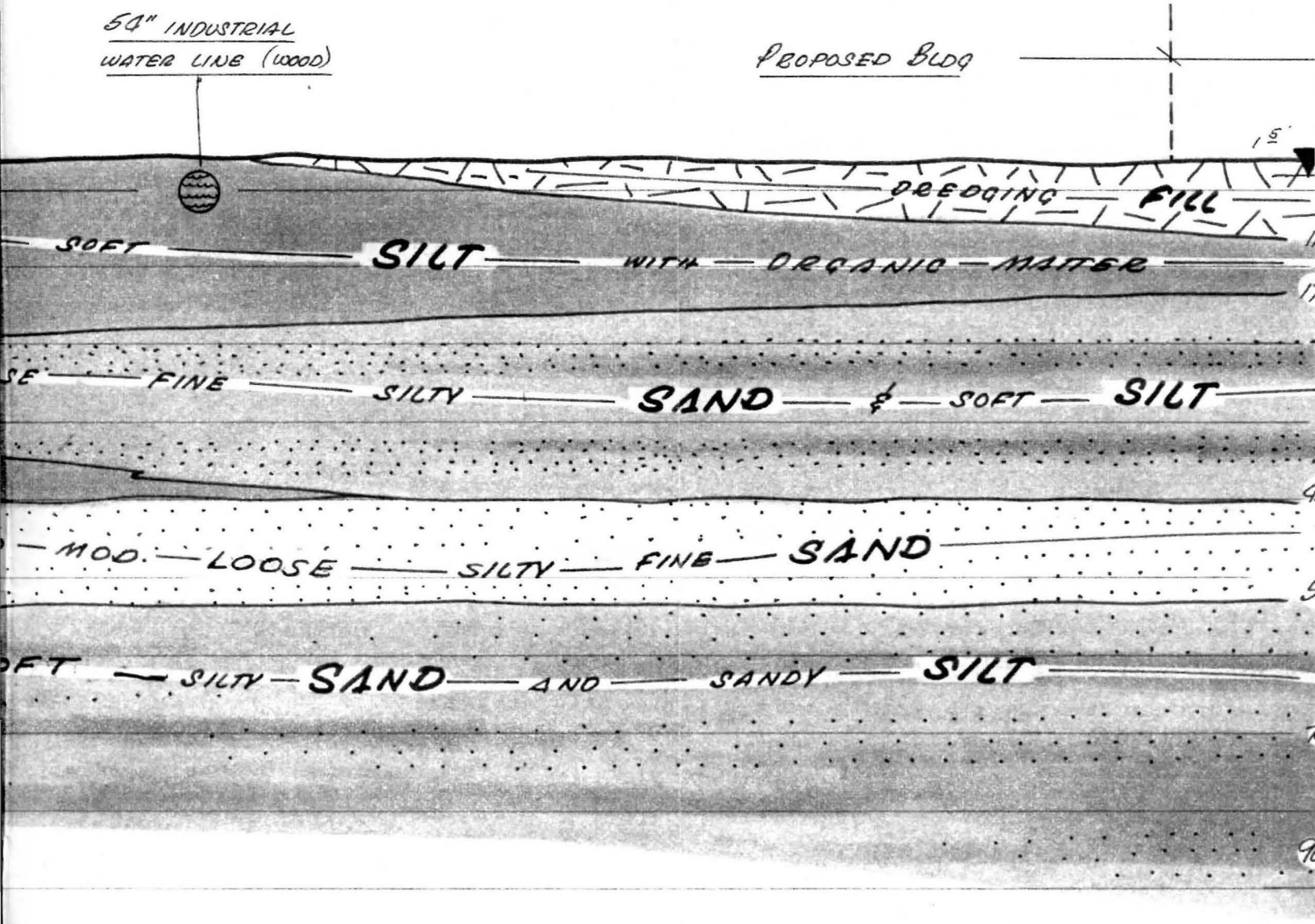
SUBSURFACE EXPLORATION
GEOLOGIC SECTIONS, SITE PLAN
by: NEIL H. TWELKER & ASSOCIATES

FIG. 1

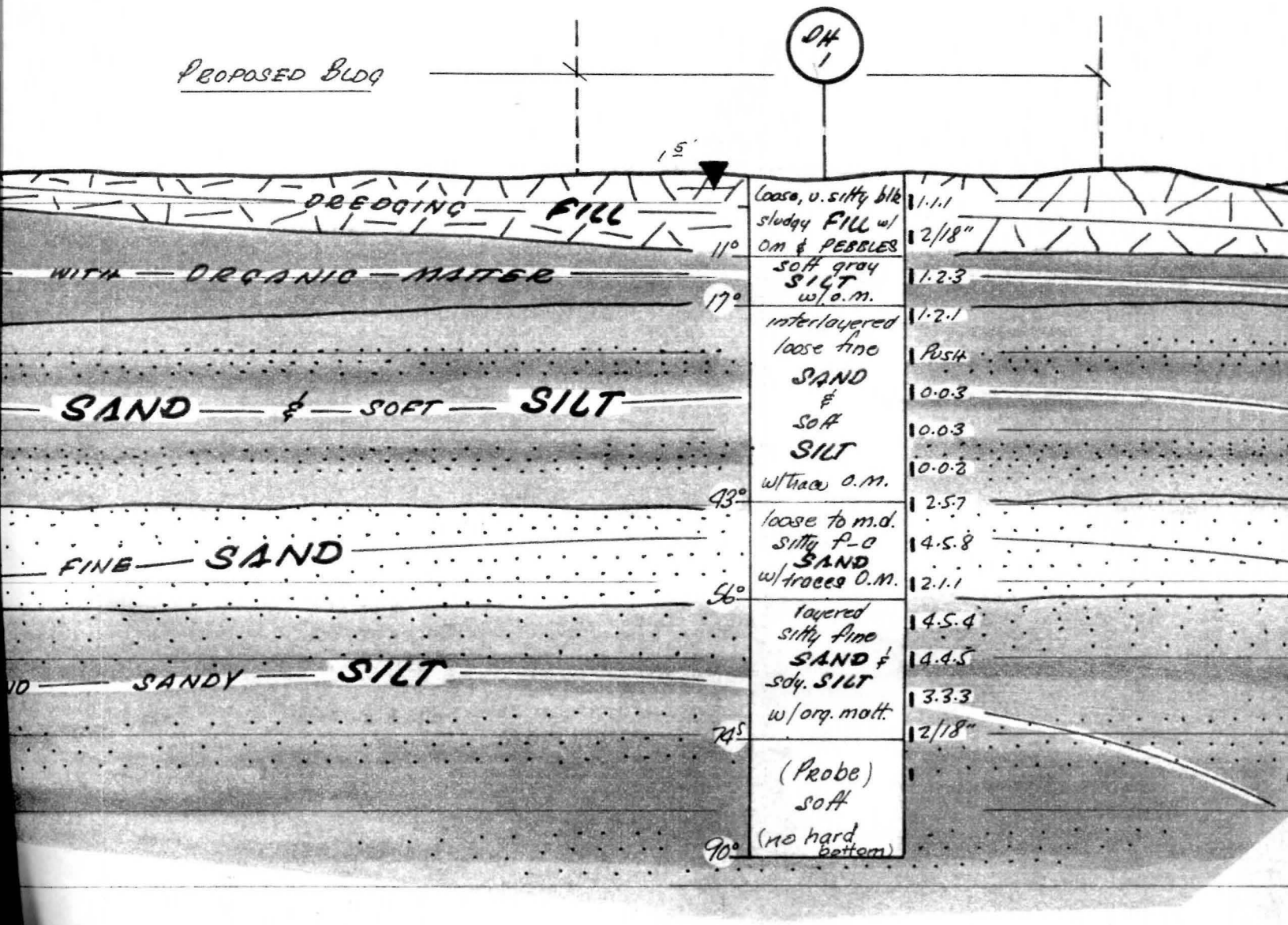

B
DH 3
PROPOSED BLDG
ELEVATION / FEET
10
0
-10
20
30
40
50
60
70
-80
0.5
12" St Drain
U. soft to soft
SILT
with
ORGANIC
MATTER
26°
SILT and
u. fine SAND
32°
Soft
SILT
w/trace O.M.
43°
loose-
gray silty
very fine
SAND
57°
layered
soft-
SILT
& silty fine
SAND
74.5
2/18"
1/18"
Push
Push
0.1.2
0.1.1
Push
Push
0.1.2
0.0.3
4.5.5
0.0.5
4.2.2
2.5.5
5.3.7
VERY
1' BEDDED
LOOSE
INTERBEDDED - LOOSE

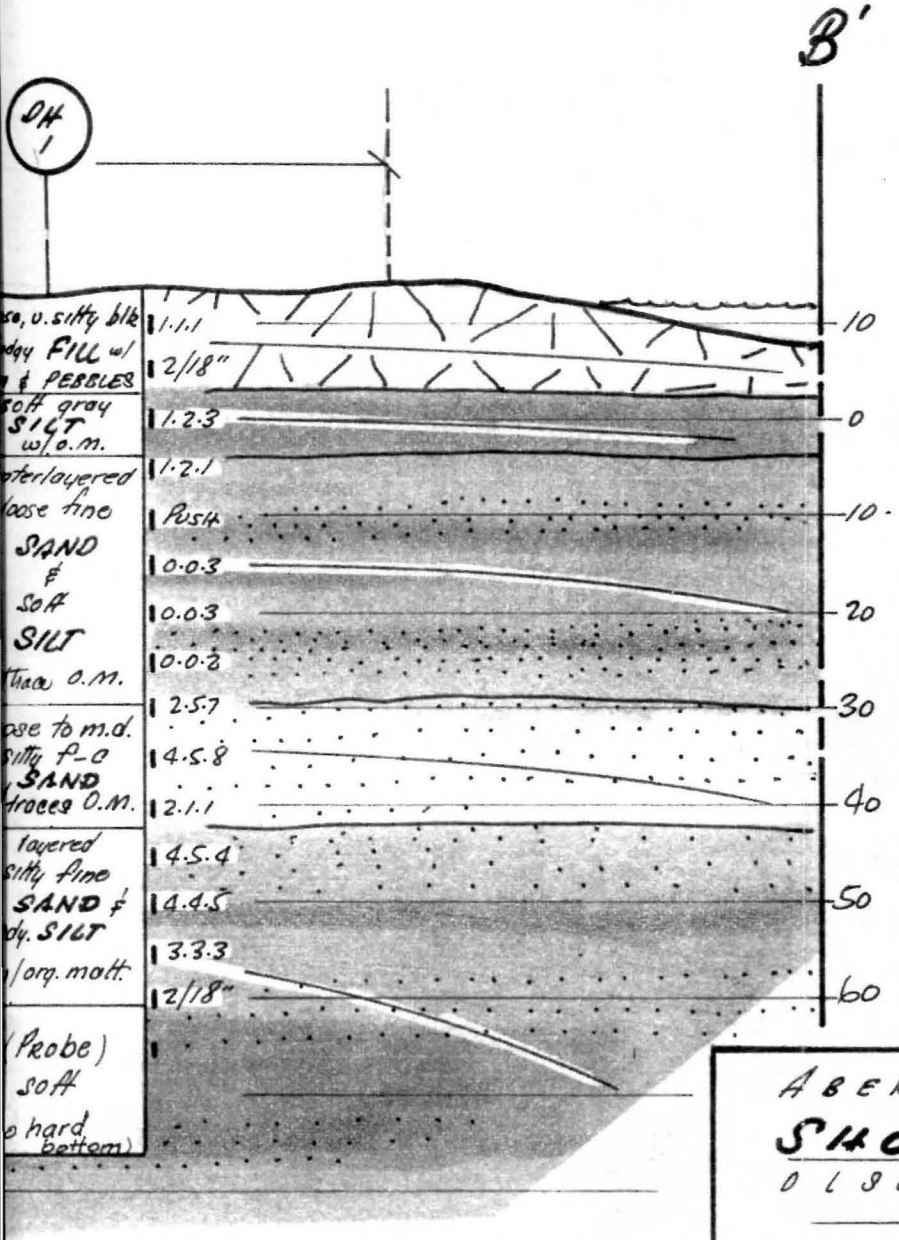
T. 2120

SCALE: HORIZ. 1" = 50' / VERT: 1" =



ALE: HORIZ. 1" = 50' / VERT: 1" = 20'





ABERDEEN WASHINGTON

SHOPPING CENTER

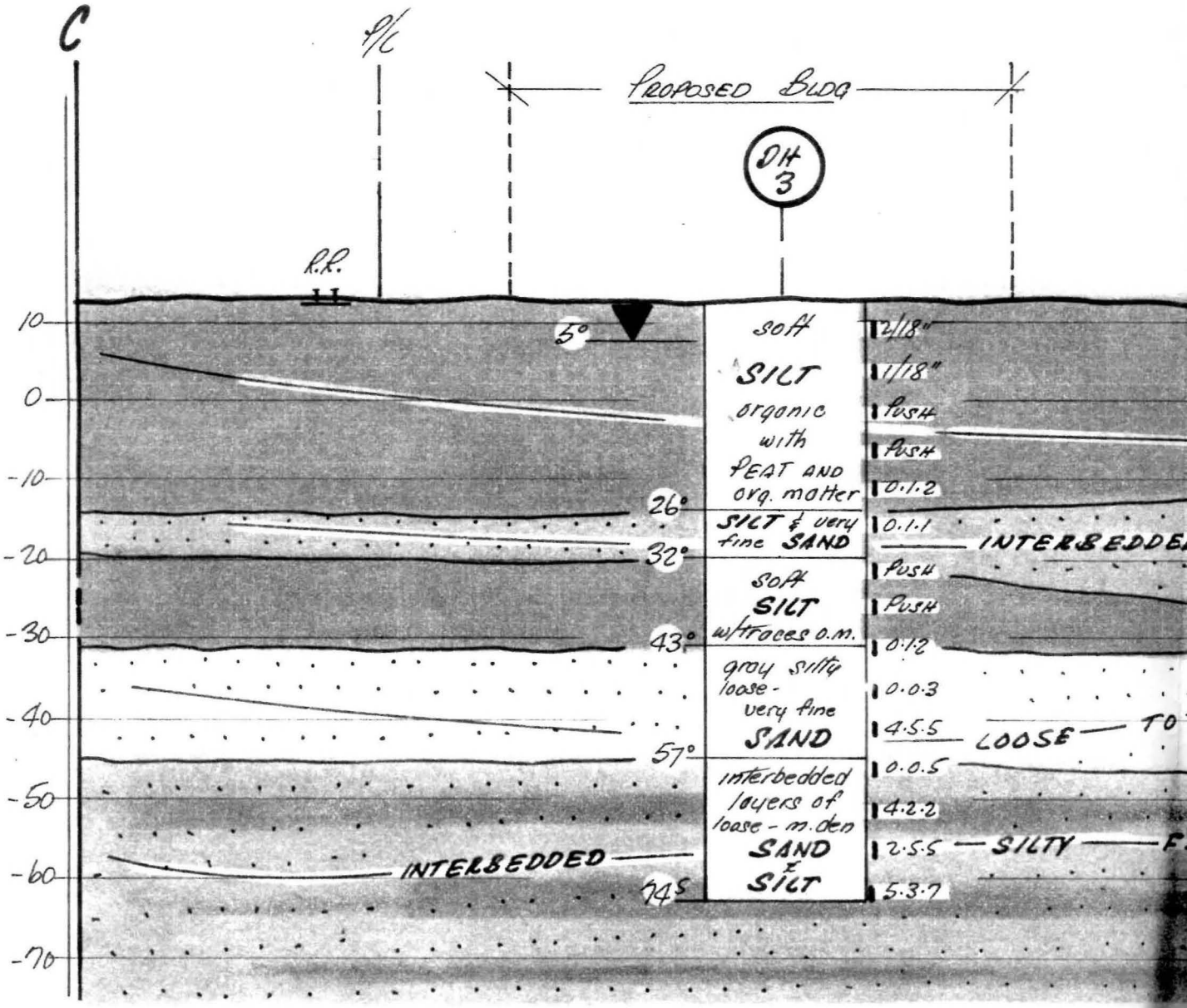
OLSON & ROWE ARCHITECTS

SUBSURFACE EXPLORATION

GEOLOGIC SECTION

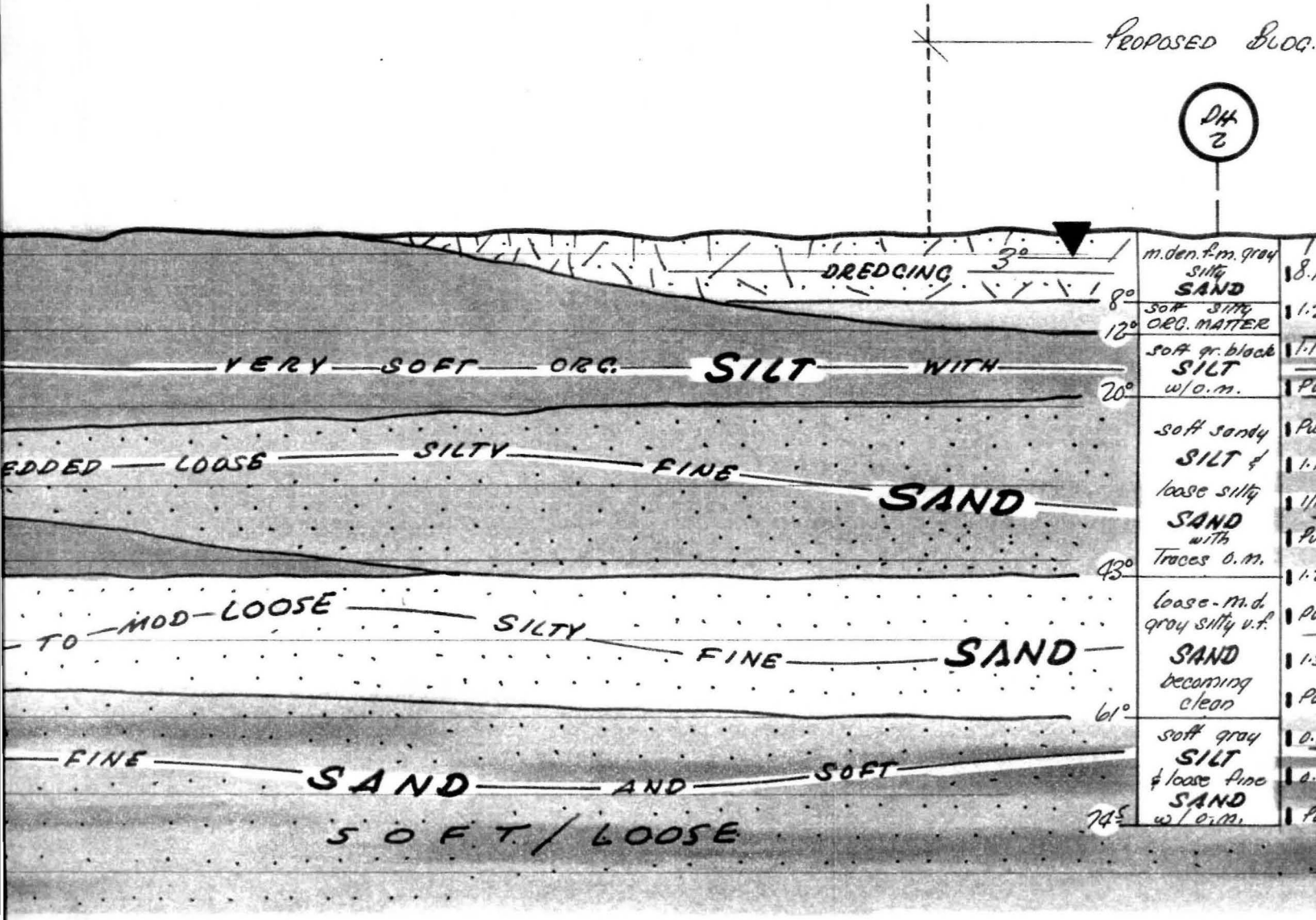
by: NEIL H. TWELKER & ASSOCIATES

FIG. 2


C
℄
PROPOSED BLDG
DH 3
R.R.
10
0
-10
-20
-30
-40
-50
-60
-70
5°
26°
32°
43°
57°
74.5
soft SILT organic with PEAT AND org. matter
SILT & very fine SAND
soft SILT w/traces o.m.
gray silty loose - very fine SAND
interbedded layers of loose - m.den SAND & SILT
INTERBEDDED
2/18"
1/18"
PUSH
PUSH
0.1.2
0.1.1
INTERBEDDE
PUSH
PUSH
0.1.2
0.0.3
4.5.5
LOOSE
TO
0.0.5
4.2.2
2.5.5
SILTY
F
5.3.7

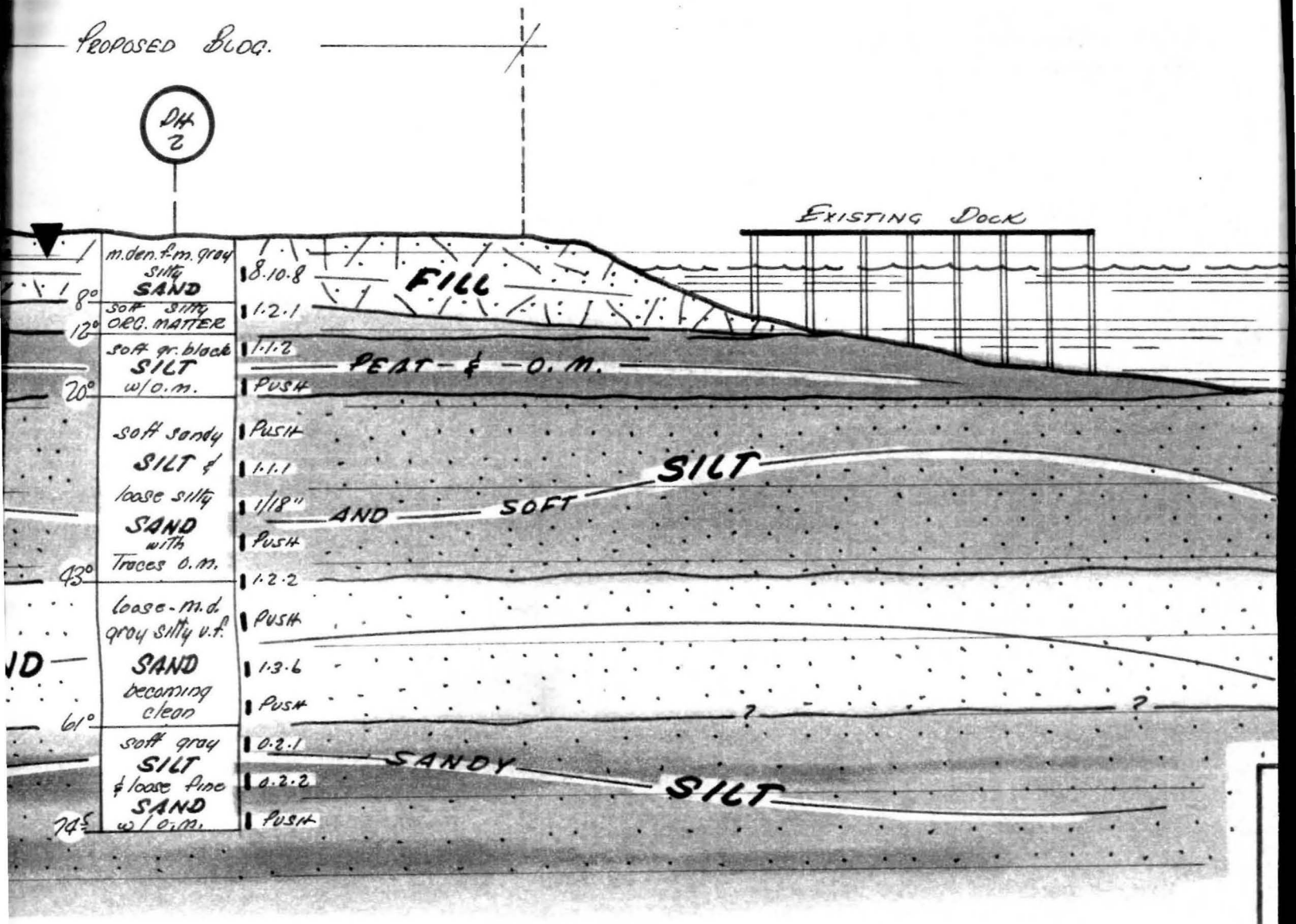
Scale: Horizon

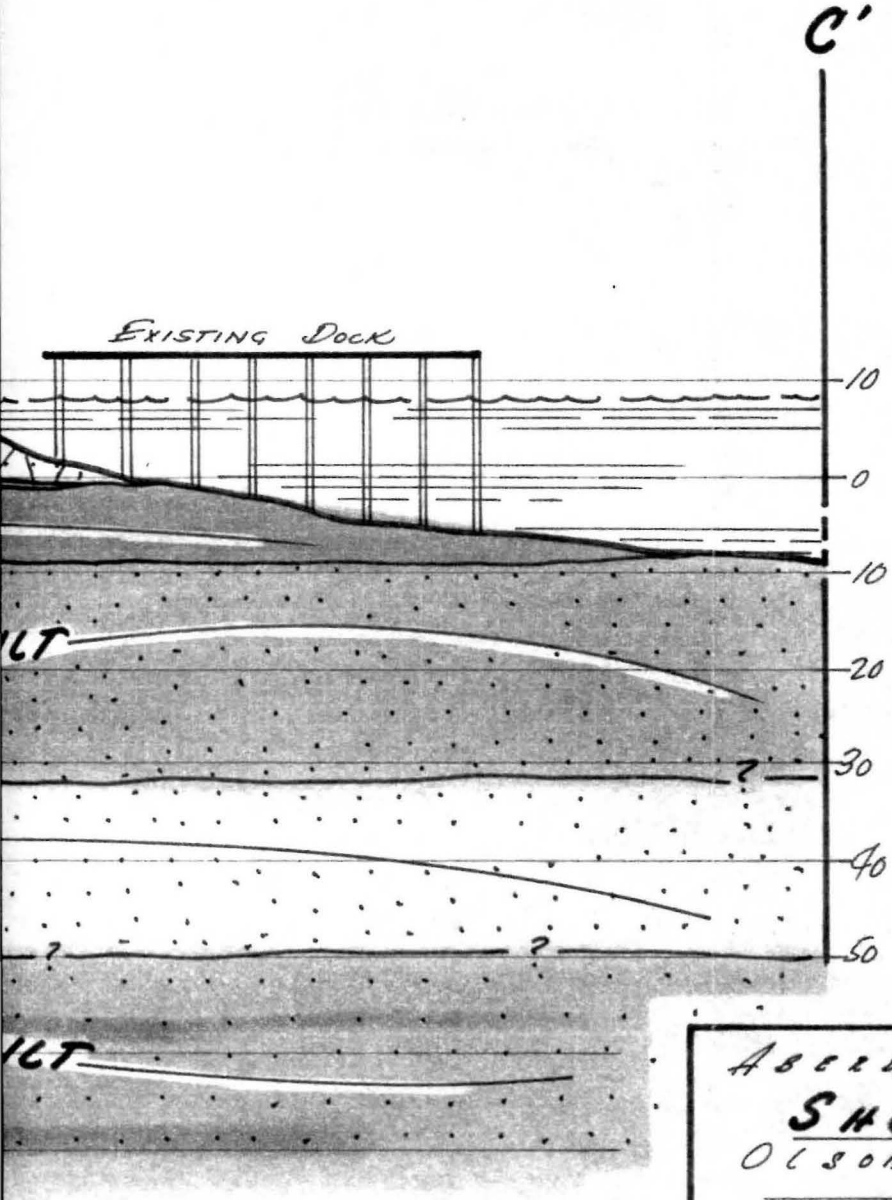
Verti



HORIZONTAL 1" = 50'

VERTICAL 1" = 20'





ABERDEEN, WASHINGTON

SHOPPING CENTER

OLSON & LOWE ARCHITECTS

SUBSURFACE EXPLORATION

GEOLOGIC SECTION

by: NEIL H. TWELKER & ASSOC.

FIG. 3