

- City box number Misc.
- Title/cover page w/the following info:
- Company (author) name
- Report Date
- Project name
- Company's job number
- City DCLU project number (7-digit number)
- City Permit number (6-digit number)
- Kröll 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
- ¹⁴C or Radiocarbon Testing
- Other _____
- Soil Chemical Analytical Testing Summary Tables
- Water/Groundwater Chemical Analytical Summary Tables
- Comments _____
- Date Copied 8-12-99 By AB

2398

X-sec

Bonair Dr

**Geotechnical Report
Proposed Watermain Installation
Bonair Drive Southwest
Seattle, Washington**

2398

XXXI

**City of Seattle
Engineering Department
Municipal Building
Seattle, WA 98104**

January 1984

SHANNON & WILSON, INC.

W-4194-01

SUMMARY

This report contains the results of our geotechnical studies for the proposed watermain installation along Bonair Drive SW between 52nd Avenue SW and Clamar Place SW in Seattle, Washington. Numerous landslides have occurred in and near the project area in the past, and many are believed to have been related to the general stratigraphy of the hillside; i.e., permeable Esperance Sand overlying a thick deposit of impermeable Lawton Clay. Groundwater on top the Clay emerges on the slope at the Sand/Clay contact as springs. During periods of high precipitation, increased groundwater flows cause instability on the slope.

Groundwater springs were observed at the Sand/Clay contact on the slope below the project area during our geologic reconnaissance, and samples from borings indicated that the upper 15 feet of soil below the proposed watermain route has most likely moved in the past. Near the north end of the project, past movement is believed to have extended to a depth of about 30 feet.

It is our opinion that if the waterline is installed without including measures for increasing the stability of the project area, there is a high risk that a future slide will damage the waterline. In order to reduce this risk, we recommend that a groundwater interceptor drain be installed in conjunction with the watermain.

Past soil movements have fractured and disturbed the upper portions of the Clay that underlies the project area. The interceptor drain will reduce movements in this fractured zone; however, slow long-term movement (creep) may still occur. Therefore, we recommend that the joints of the watermain be designed to withstand small differential movements. In addition, we recommend that the installation of a valve that would automatically shut off the water in the event a sudden flow associated with a break in the line be considered. The fire department should be notified of such a valve installation.

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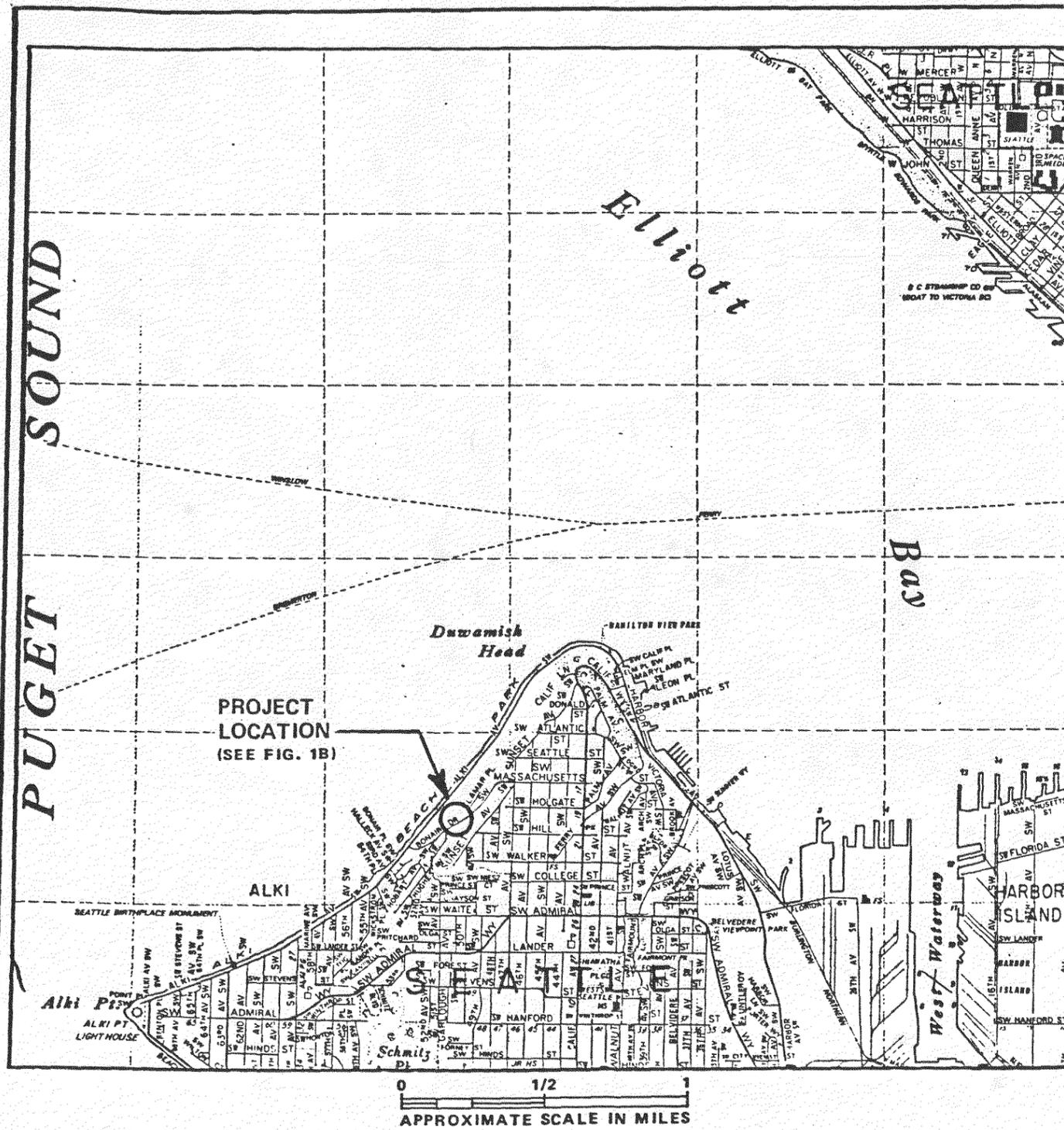


FIG. 1A - Vicinity Map

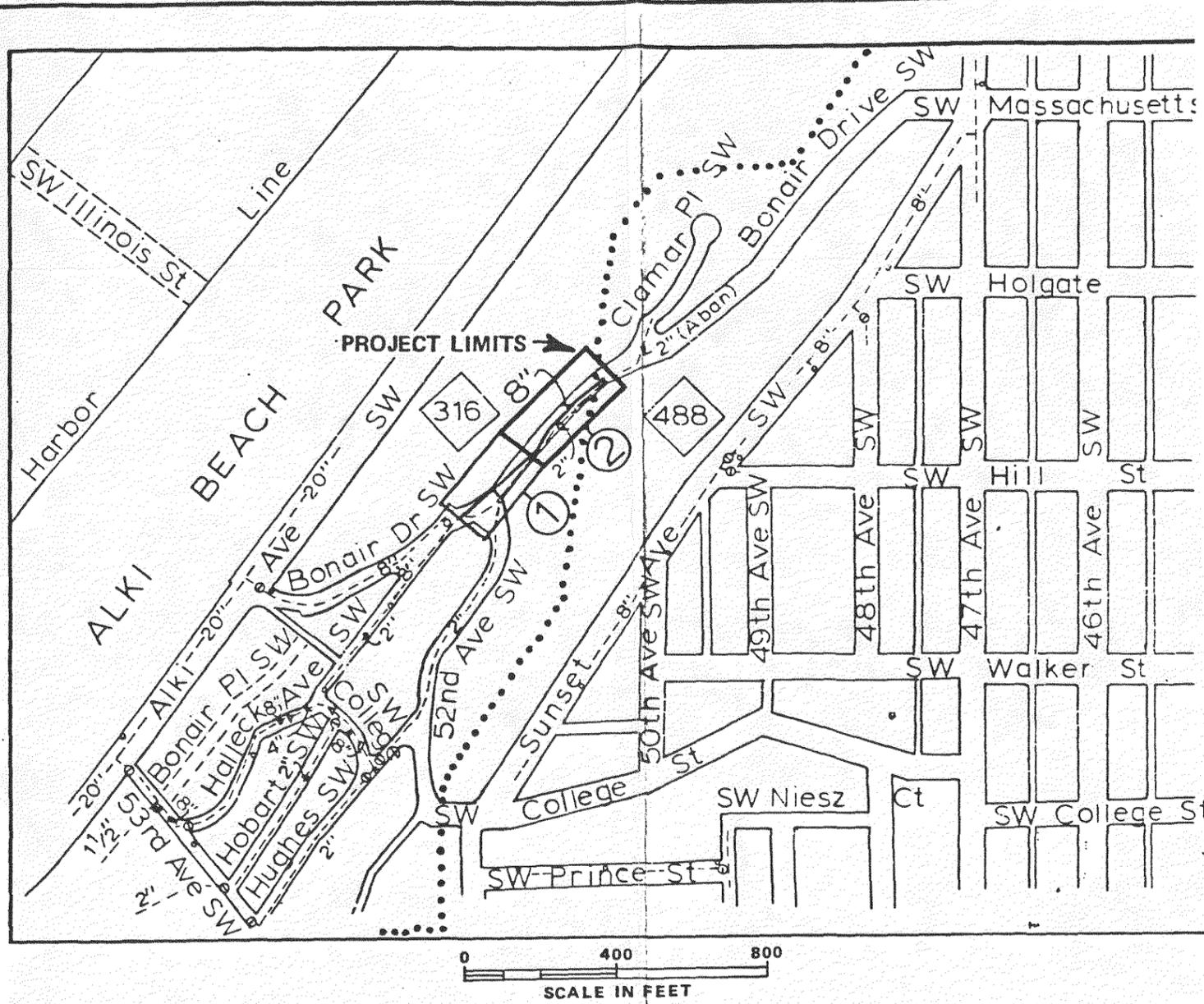
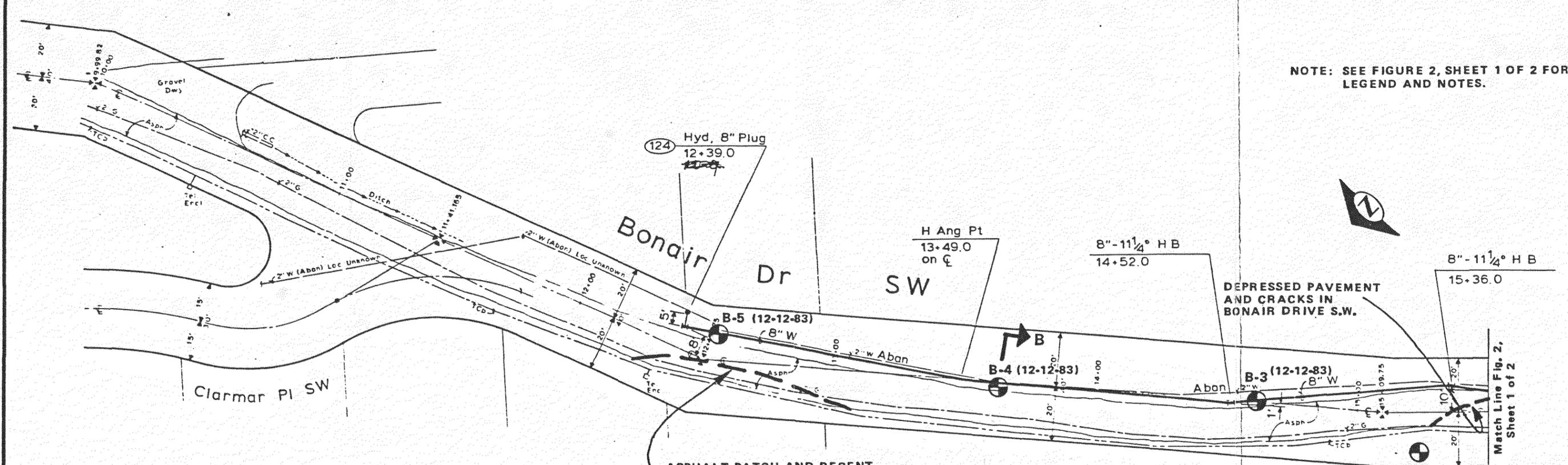
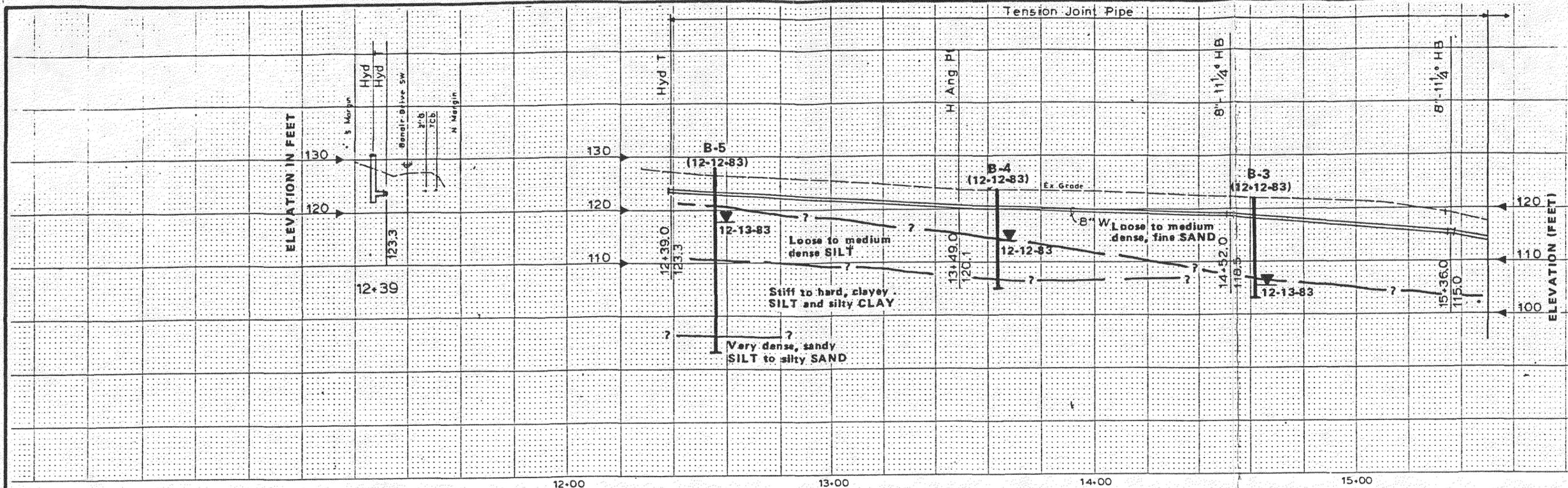


FIG. 1B - Vicinity Map

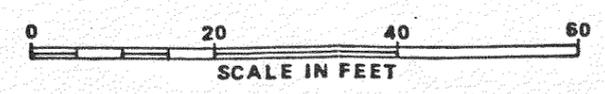
NOTE

FIGURE 1A TAKEN FROM THOMAS BROS. MAPS. FIGURE 1B TAKEN FROM DRAWINGS BY THE CITY OF SEATTLE WATER DEPARTMENT TITLED "BONAIR DRIVE SW WATERMAINS," SHEET 1 OF 3, VAULT PLAN NO. 869-54.

WATERMAIN INSTALLATION BONAIR DRIVE SOUTHWEST SEATTLE, WASHINGTON	
VICINITY MAPS	
DECEMBER 1983	W4194-01
SHANNON & WILSON, INC.	FIG. 1



NOTE: SEE FIGURE 2, SHEET 1 OF 2 FOR LEGEND AND NOTES.



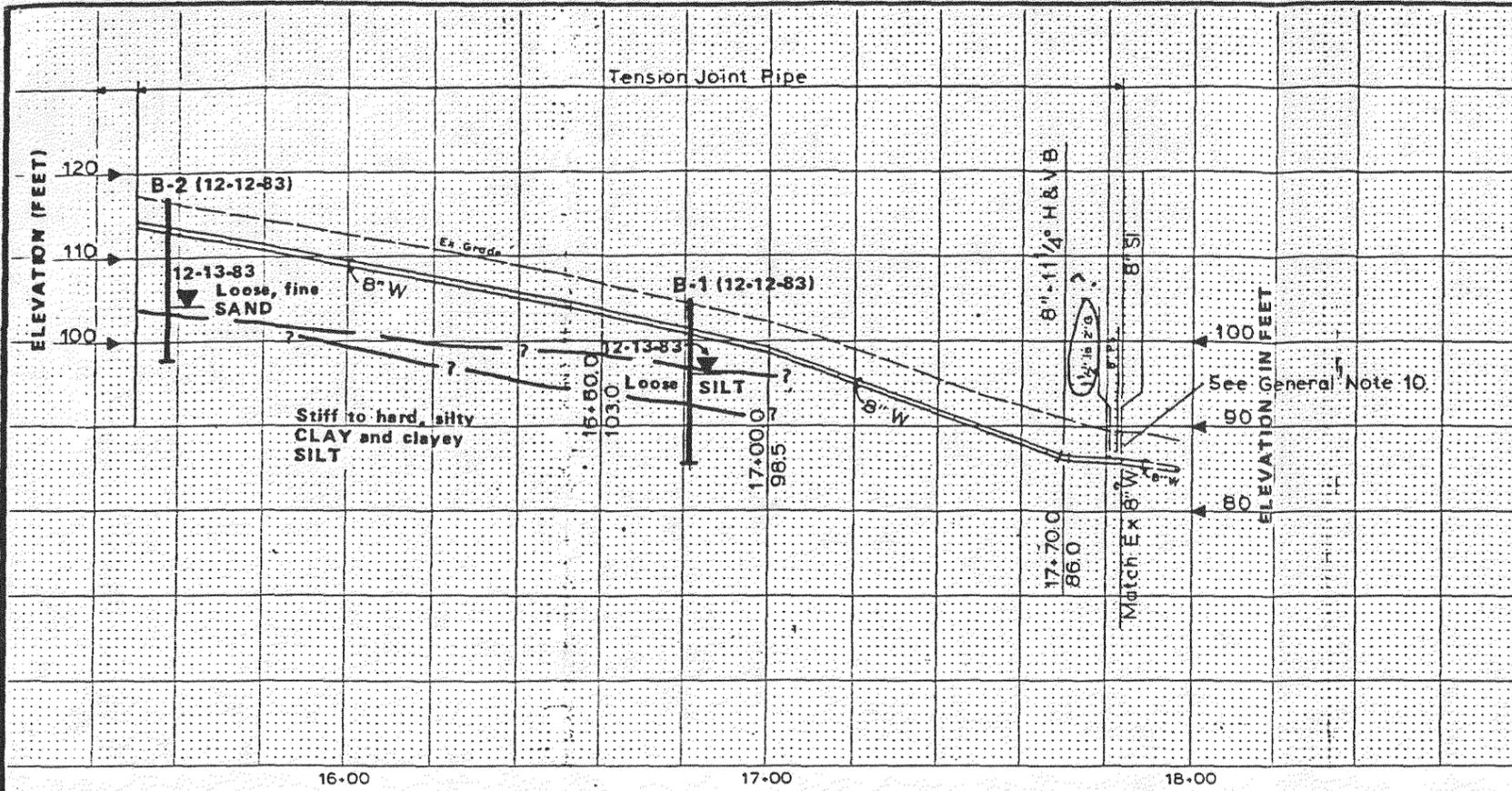
**WATERMAIN INSTALLATION
BONAIR DRIVE SOUTHWEST
SEATTLE, WASHINGTON**

PROFILE AND SITE PLAN

JANUARY 1984 W-4194-0

SHANNON & WILSON, INC. **FIG. 2**

Geotechnical Consultants Sheet 2 of

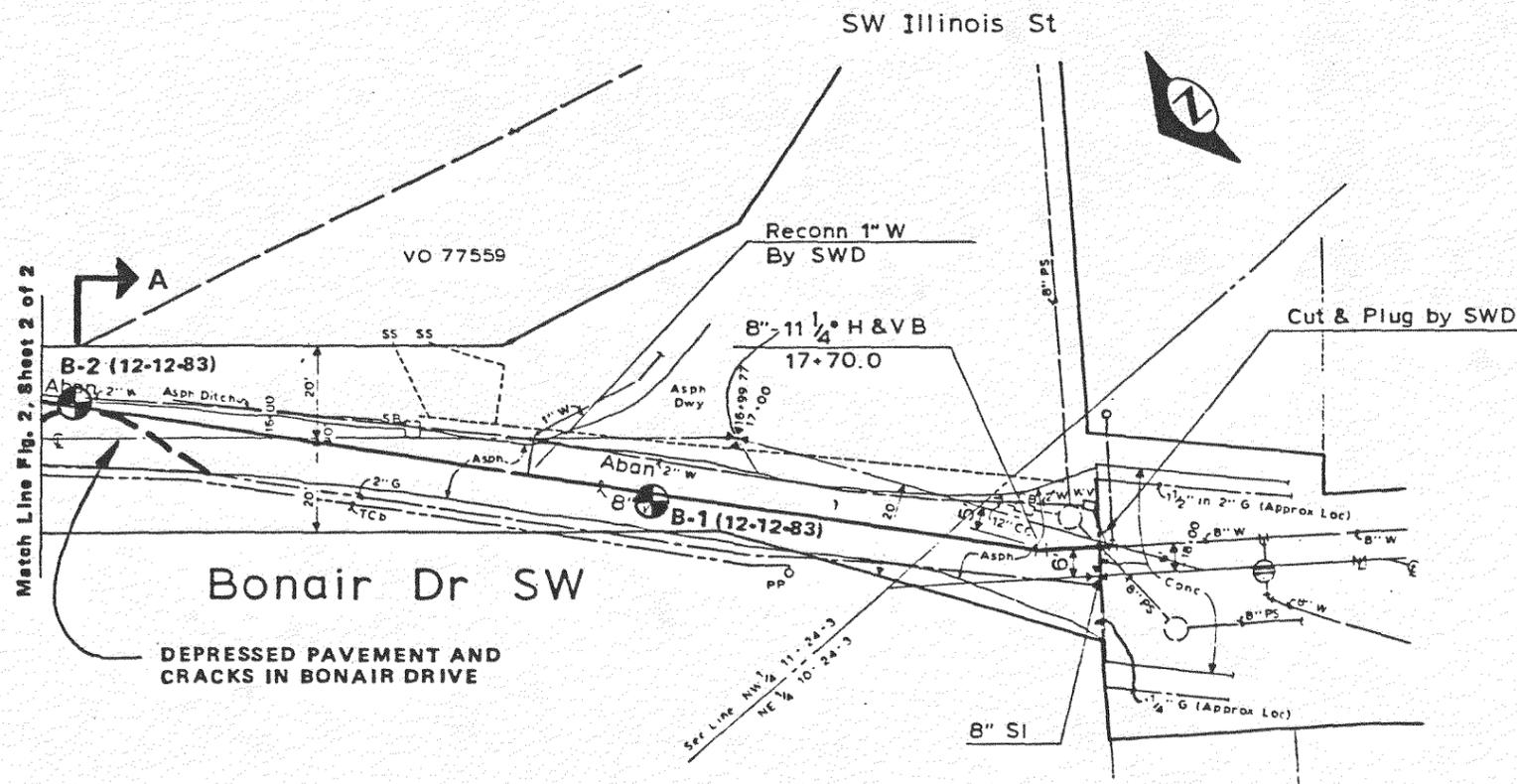


NOTES

1. THE PLAN & PROFILE IN THIS FIGURE 2 (2 SHEETS) ARE TAKEN FROM PRELIMINARY DRAWINGS TITLED "BONAIR DRIVE SW WATERMAINS" VAULT PLAN NO. 869-54, BY THE CITY OF SEATTLE WATER DEPARTMENT.
2. THE SUBSURFACE INFORMATION ON THE PROFILE IS GENERALIZED FROM MATERIALS ENCOUNTERED IN THE BORINGS, AND VARIATIONS BETWEEN THE PROFILE AND ACTUAL CONDITIONS MAY EXIST.

LEGEND

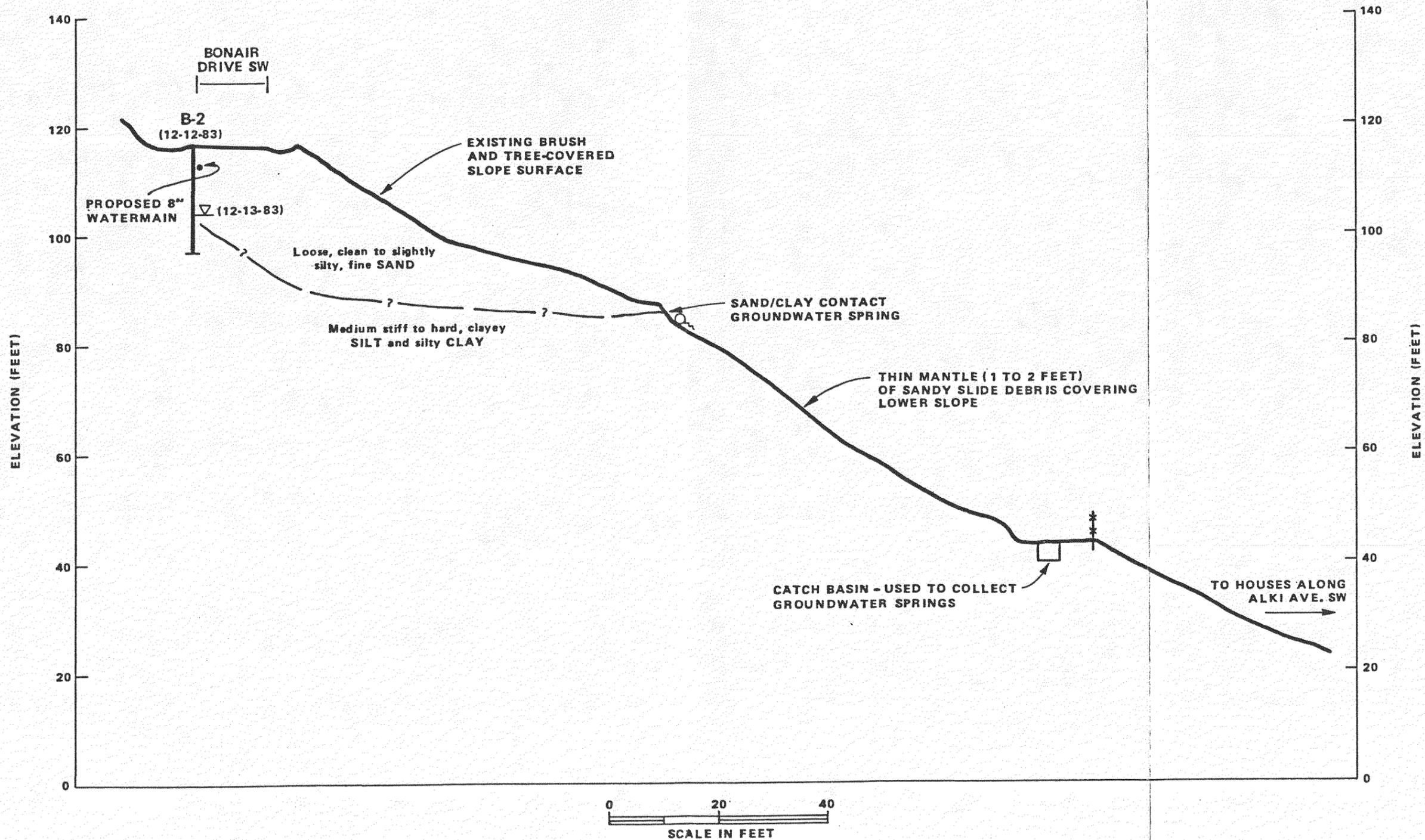
- (12-12-83) B-2
- BORING DESIGNATION AND DATE DRILLED
 - ▼ 12-13-83 INDICATES GROUNDWATER LEVEL AND DATE MEASURED



WATERMAIN INSTALLATION
BONAIR DRIVE SOUTHWEST
SEATTLE, WASHINGTON

PROFILE AND SITE PLAN

JANUARY 1983 W-4194-01
SHANNON & WILSON, INC. FIG. 2
Geotechnical Consultants Sheet 1 of 2



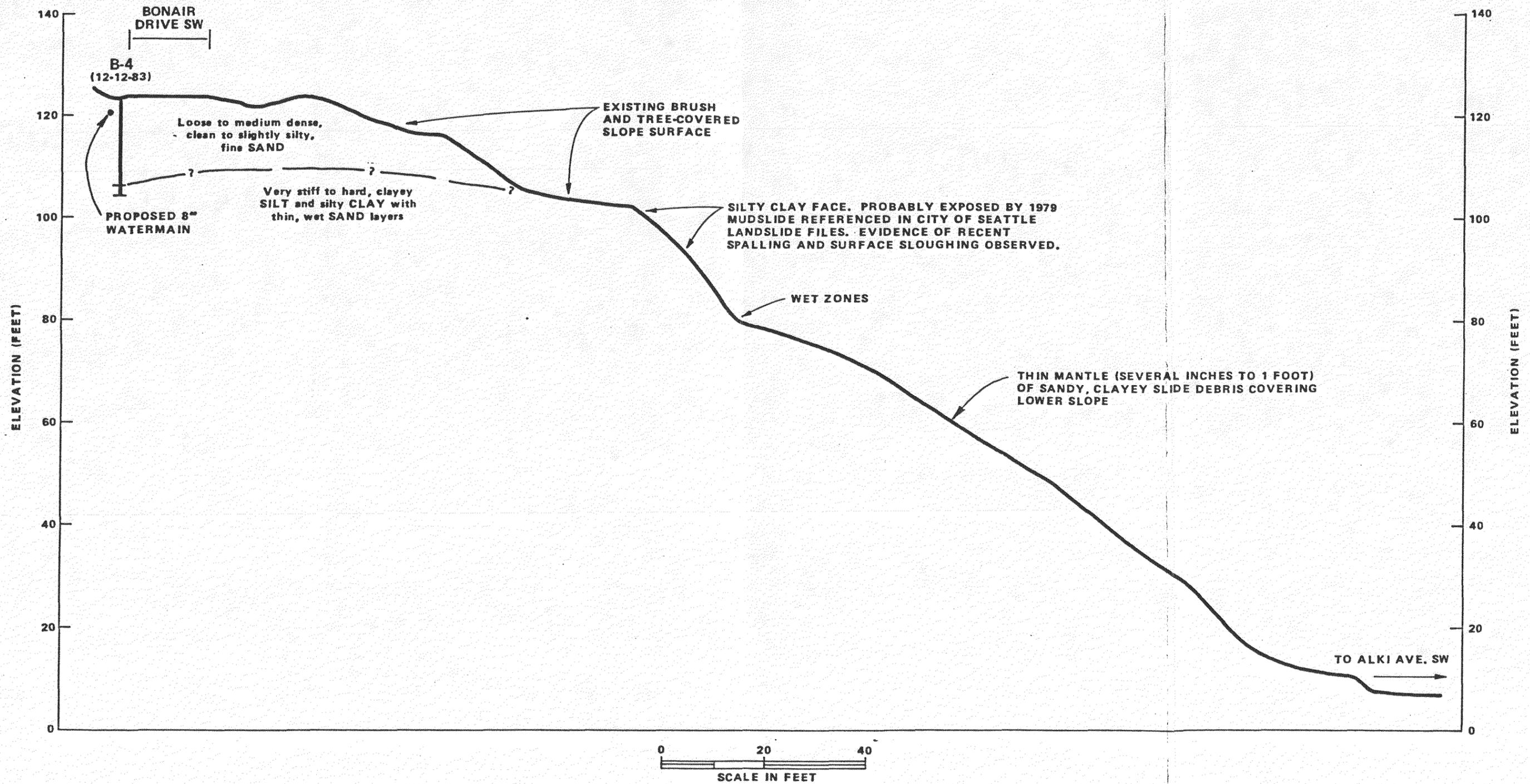
LEGEND

- B-2**
(12-12-83) TRUCK BORING DESIGNATION AND DATE DRILLED
- ▽ 12-13-83 GROUNDWATER LEVEL AND DATE RECORDED
- ? INDICATES GROUNDWATER SEEPAGE

NOTES

- 1) THIS PROFILE IS BASED ON A HAND LEVEL AND CLOTH TAPE SURVEY AND SHOULD BE CONSIDERED APPROXIMATE.
- 2) THE SUBSURFACE INFORMATION ON THIS PROFILE IS GENERALIZED FROM MATERIALS AND INFORMATION OBTAINED FROM THE BORINGS AND GEOLOGIC RECONNAISSANCE, AND VARIATIONS BETWEEN THE PROFILE AND ACTUAL CONDITIONS MAY EXIST.

WATERMAIN INSTALLATION BONAIR DRIVE SOUTHWEST SEATTLE, WASHINGTON	
TOPOGRAPHIC PROFILE A-A	
DECEMBER 1983	W-4194-01
SHANNON & WILSON, INC. Geotechnical Consultants	FIG. 3



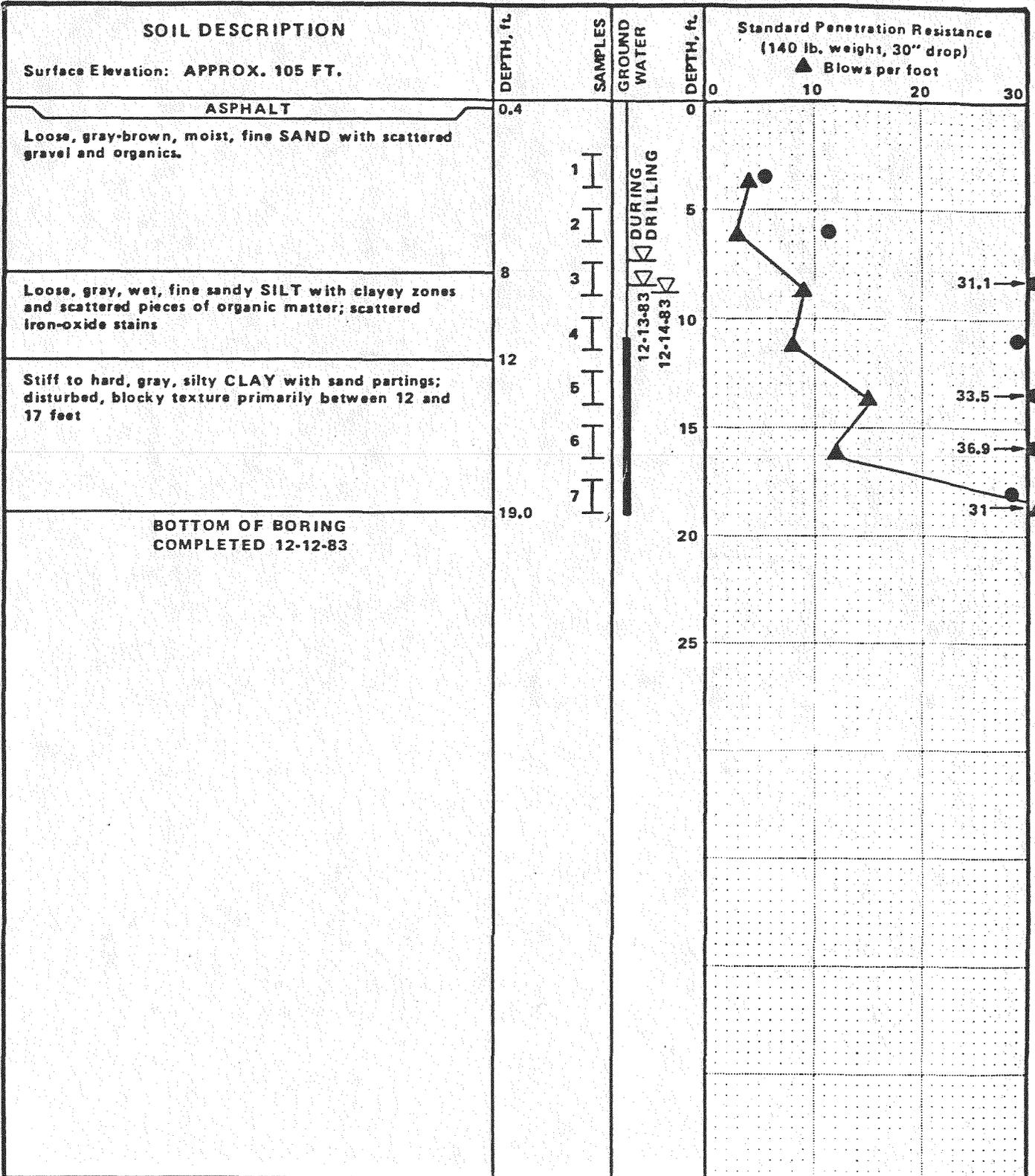
LEGEND

- B-4** (12-12-83) TRUCK BORING DESIGNATION AND DATE DRILLED
- ∇ (12-13-83) GROUNDWATER LEVEL AND DATE RECORDED

NOTES

- 1) THIS PROFILE IS BASED ON A HAND LEVEL AND CLOTH TAPE SURVEY AND SHOULD BE CONSIDERED APPROXIMATE.
- 2) THE SUBSURFACE INFORMATION ON THIS PROFILE IS GENERALIZED FROM MATERIALS AND INFORMATION OBTAINED FROM THE BORINGS AND GEOLOGIC RECONNAISSANCE, AND VARIATIONS BETWEEN THE PROFILE AND ACTUAL CONDITIONS MAY EXIST.

WATERMAIN INSTALLATION BONAIR DRIVE SOUTHWEST SEATTLE, WASHINGTON	
TOPOGRAPHIC PROFILE B-B	
DECEMBER 1983	W-4194-01
SHANNON & WILSON, INC. Geotechnical Consultants	FIG. 4

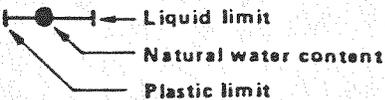


LEGEND

- I 2" O.D. split spoon sample
- II 3" O.D. thin-wall sample

*Sample not recovered

Atterberg Limits:



- ⊥ Impervious seal
- ▽ Water level
- ⊥ Piezometer tip
- P Sample pushed

NOTE; The stratification lines represent the approximate boundaries between soil types and the transition may be gradual.

WATERMAIN INSTALLATION
BONAIR DRIVE SOUTHWEST
SEATTLE, WASHINGTON

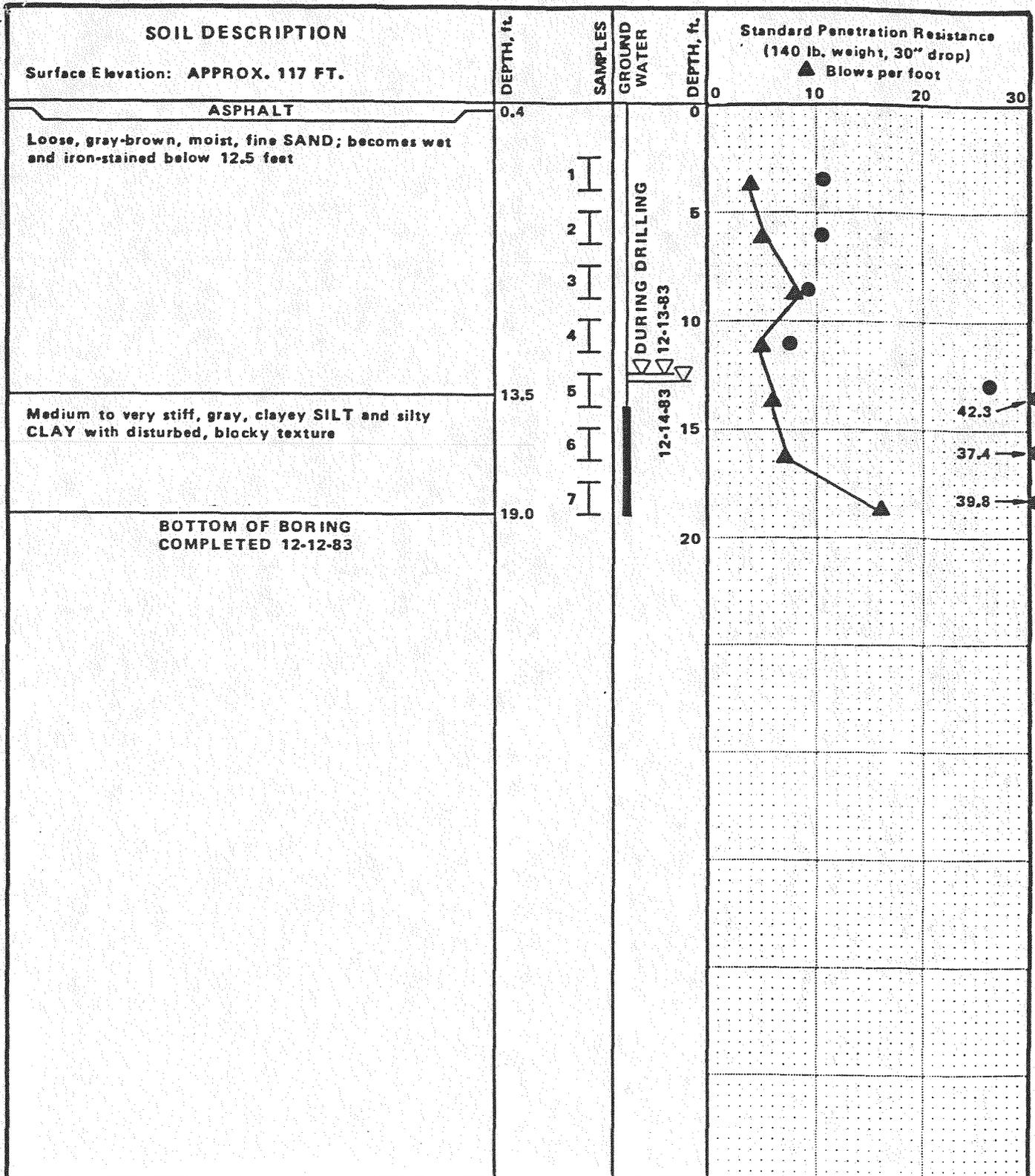
LOG OF BORING B-1

DECEMBER 1983

W-4194-01

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Geotechnical Consultants

FIG. 5

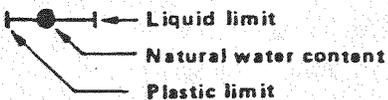


LEGEND

- I 2" O.D. split spoon sample
- II 3" O.D. thin-wall sample

*Sample not recovered

Atterberg Limits:



NOTE: The stratification lines represent the approximate boundaries between soil types and the transition may be gradual.

- Impervious seal
- Water level
- Piezometer tip
- P Sample pushed

WATERMAIN INSTALLATION
BONAIR DRIVE SOUTHWEST
SEATTLE, WASHINGTON

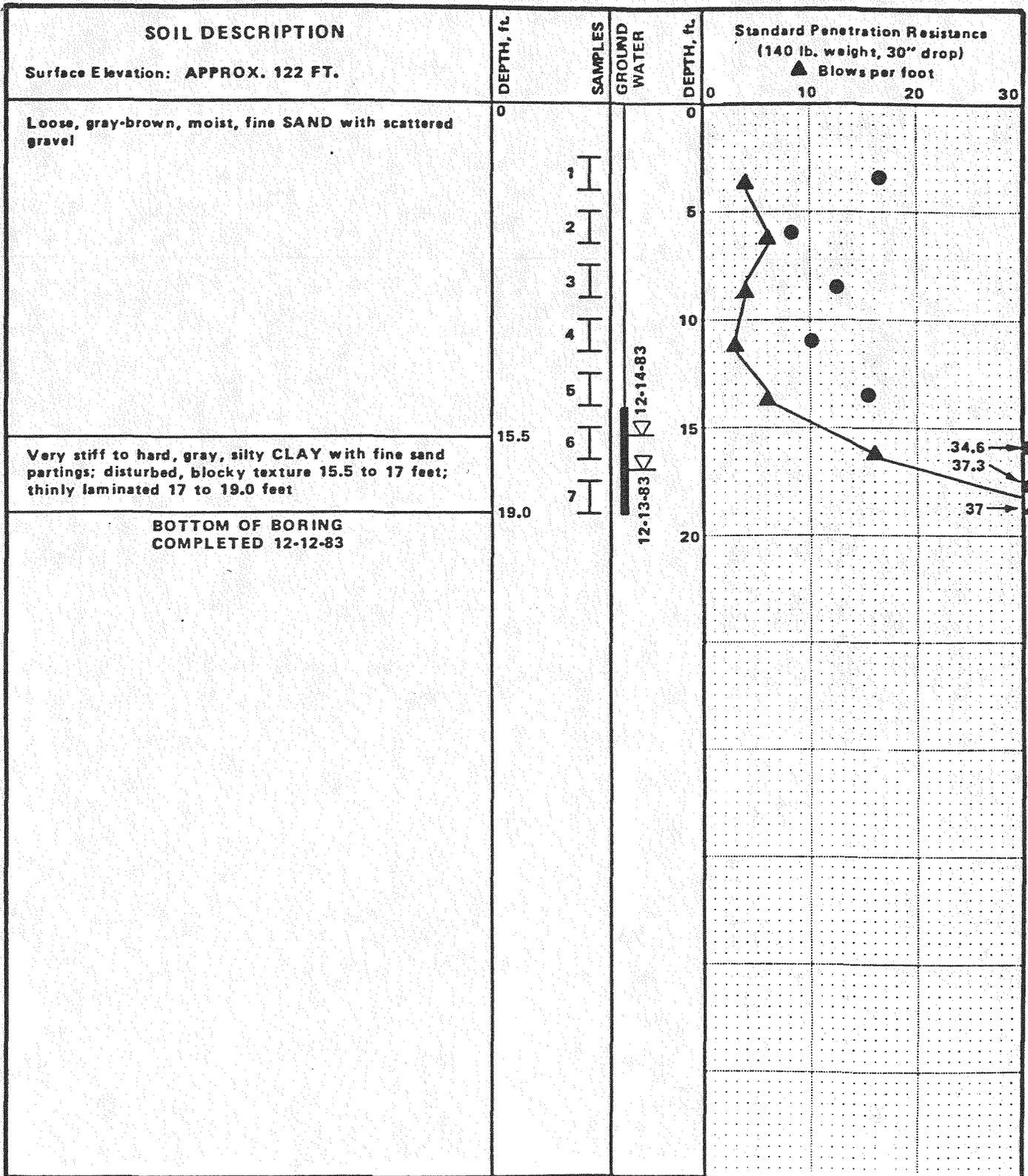
LOG OF BORING B-2

DECEMBER 1983

W-4194-01

SHANNON & WILSON, INC.
Geotechnical Consultants

FIG. 6

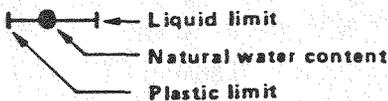


LEGEND

- I 2" O.D. split spoon sample
- II 3" O.D. thin-wall sample

*Sample not recovered

Atterberg Limits:



- Impervious seal
- Water level
- Piezometer tip
- Sample pushed

● % Water content

WATERMAIN INSTALLATION
BONAIR DRIVE SOUTHWEST
SEATTLE, WASHINGTON

LOG OF BORING B-3

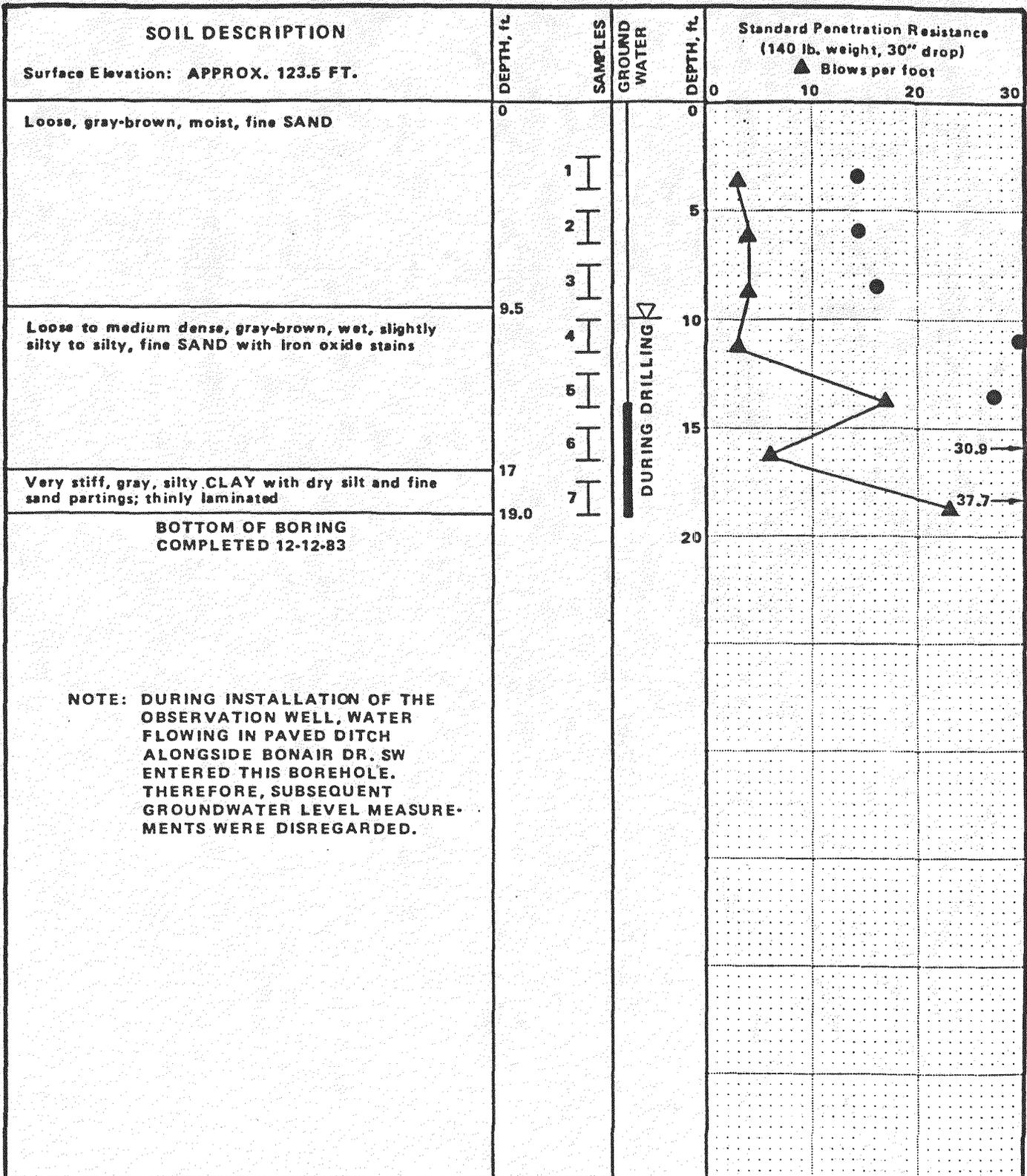
DECEMBER 1983

W-4194-01

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FIG. 7

NOTE: The stratification lines represent the approximate boundaries between soil types and the transition may be gradual.

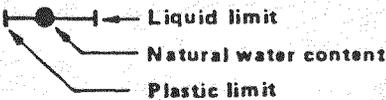


LEGEND

- I 2" O.D. split spoon sample
- II 3" O.D. thin-wall sample

*Sample not recovered

Atterberg Limits:



- ▲ Impervious seal
- ▽ Water level
- Piezometer tip
- P Sample pushed

WATERMAIN INSTALLATION
BONAIR DRIVE SOUTHWEST
SEATTLE, WASHINGTON

LOG OF BORING B-4

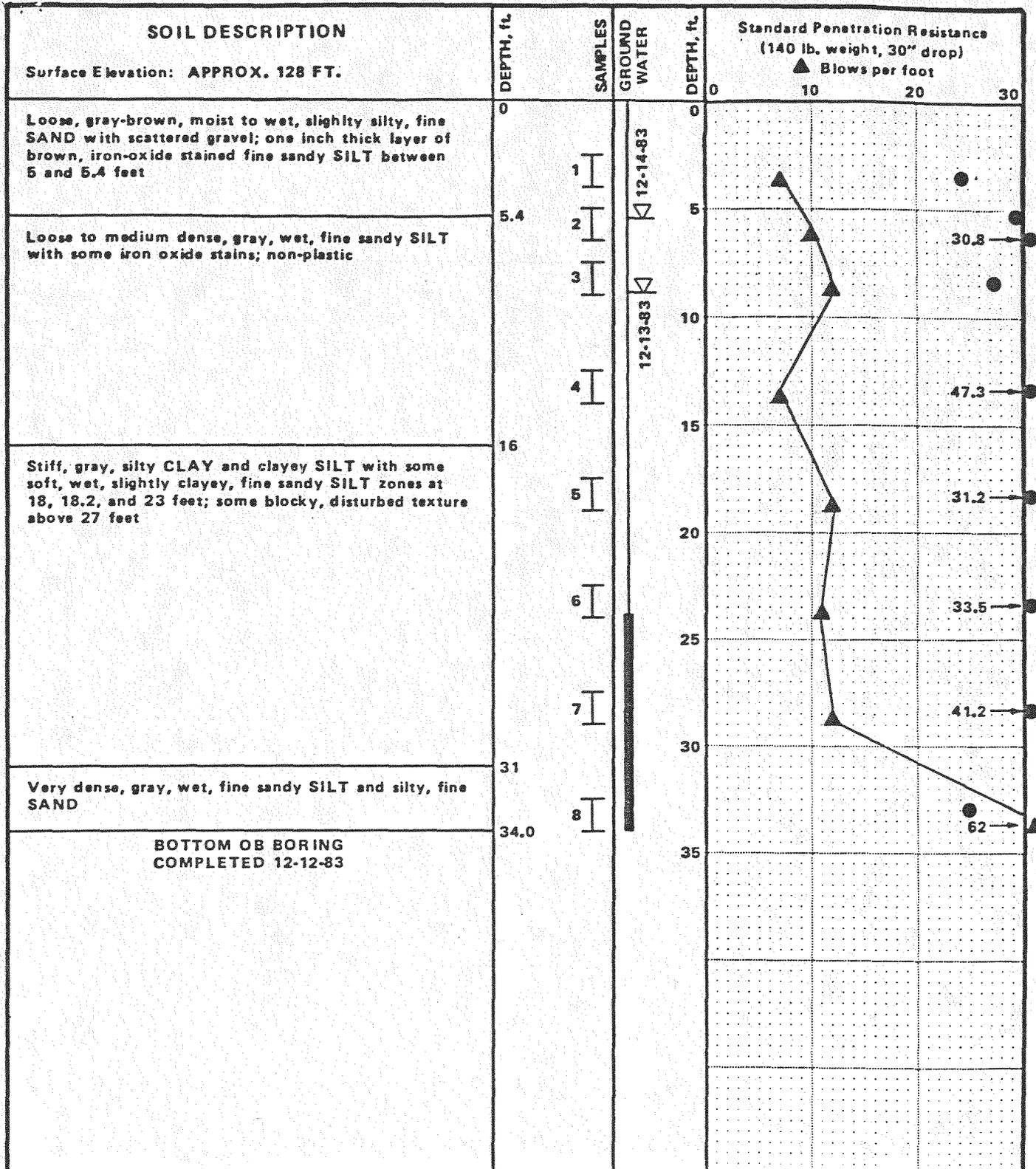
DECEMBER 1983

W-4194-01

NOTE: The stratification lines represent the approximate boundaries between soil types and the transition may be gradual.

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FIG. 8



LEGEND

- I 2" O.D. split spoon sample
- II 3" O.D. thin-wall sample
- *Sample not recovered
- Atterberg Limits:
 - Liquid limit
 - Natural water content
 - Plastic limit
- ▲ Impervious seal
- ▽ Water level
- Piezometer tip
- P Sample pushed

NOTE: The stratification lines represent the approximate boundaries between soil types and the transition may be gradual.

WATERMAIN INSTALLATION
BONAIR DRIVE SOUTHWEST
SEATTLE, WASHINGTON

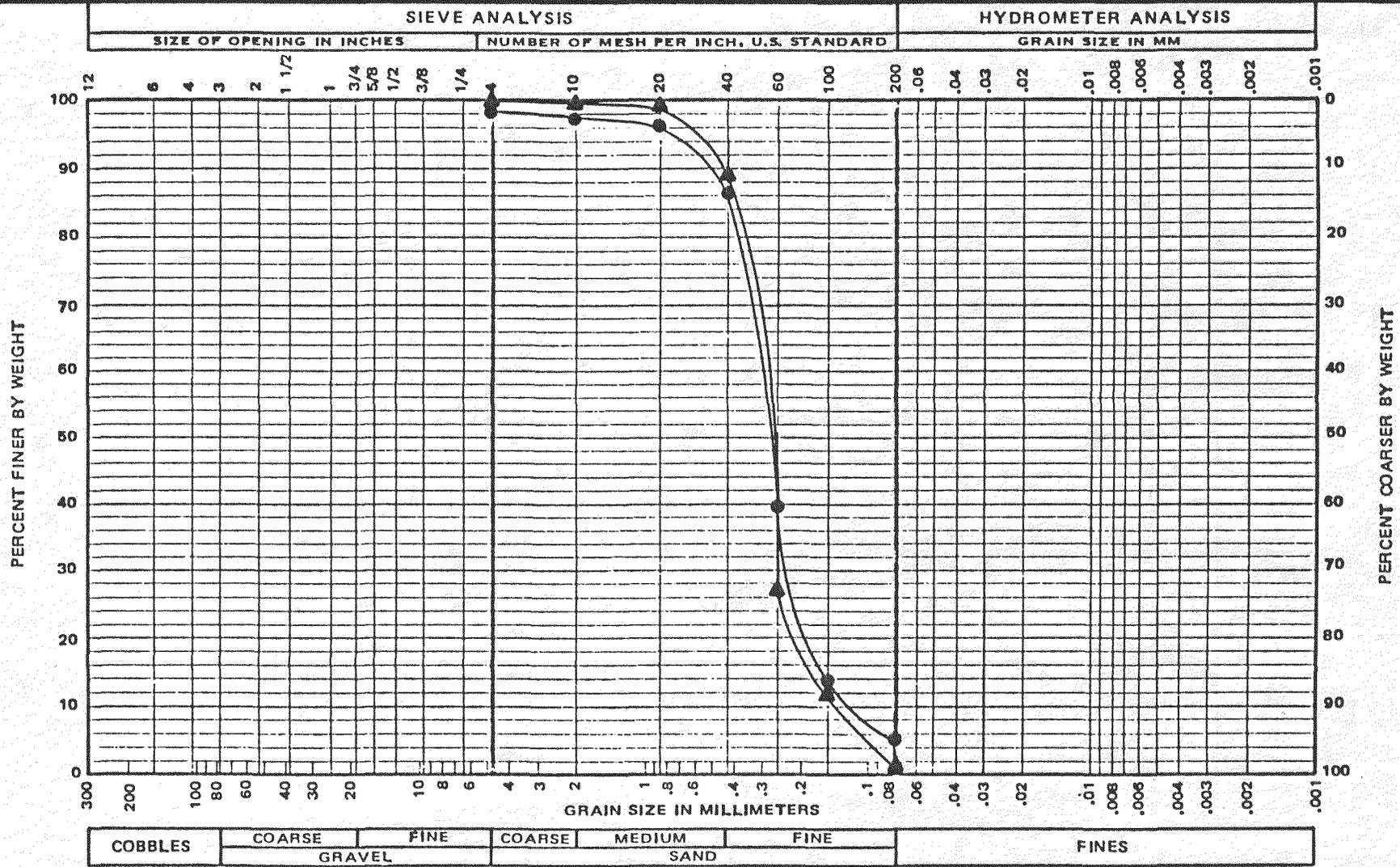
LOG OF BORING B-5

DECEMBER 1983

W-4194-01

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Geotechnical Consultants

FIG. 9



SAMPLE NO.	DEPTH-FT.	U.S.C.	CLASSIFICATION	NAT. W.C. %	LL	PL	PI	WATERMAIN INSTALLATION BONAIR DRIVE SOUTHWEST SEATTLE, WASHINGTON GRAIN SIZE DISTRIBUTION JANUARY 1983 SHANNON & WILSON, INC. Geotechnical Consultants
B-1, S-1	2.5-4.0	SP	Gray, brown, fine SAND	5.3				
B-3, S-2	5.0-8.5	SP	Gray-brown fine SAND	17.8				
B-5, S-3	7.5-9.0	ML	NOTE: A MECHANICAL SIEVE ANALYSIS WAS PERFORMED ON B-5, S-3. THE ANALYSIS SHOWED 98 PERCENT WAS FINER THAN THE NO. 200 SIEVE. THIS SAMPLE WAS CLASSIFIED AS GRAY SILT.	27.5			N.P.	

FIG. 10

FIG. 10