

4745

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## LEGACY PARKWAY

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State of Utah  
 DEPARTMENT OF TRANSPORTATION

**Michael O. Leavitt** Governor  
**John R. Njord** Executive Director  
**Carlos Braceras** Deputy Director

January 26, 2002

Mr. Greg McDonald  
 Utah Geologic Survey  
 1594 W. North Temple  
 Salt Lake City, UT 84116

Re: Snowbasin Exploratory Boring Information

Dear Greg:

As you requested, I have copied the information relating to the exploratory borings for which Leslie Heppler in the UDOT Geotechnical Division, transferred the core samples to the UGS.

In reviewing the Snowbasin Materials Report (3/99) prepared by our final geotechnical consultant on the project (Landslide Technology/Portland, OR), in addition to Borings B-205 and B-209 that you indicated you had received core samples for, I felt that all 7 borings drilled by them in the vicinity of the alignment might be useful for your records; so included are the logs for Borings B-203 through B209. Also provided are the two site plans showing the borehole locations, the Overall Site Plan showing their relative locations along the alignment, and the core sample photographs for the specific borings (3 photos of each).

Lastly, regarding the associated lab testing you requested. I have provided the text of the Laboratory Testing section, and the individual lab summary table that addresses the tests performed for Borings B-205 and B-209. As you can see, it appears that the only lab tests performed on the two borings consisted of an expansion/reactivity test, and 5 point-load tests. However, the Plasticity Chart and other lab testing information that I've provided on other explorations may be of some general use in relation to those two borings.

Hope this information is of use to you.

Sincerely,

Jim Higbee  
 Geotechnical Oversight Engineer

cc: Leslie Heppler

## 4. LABORATORY TESTING

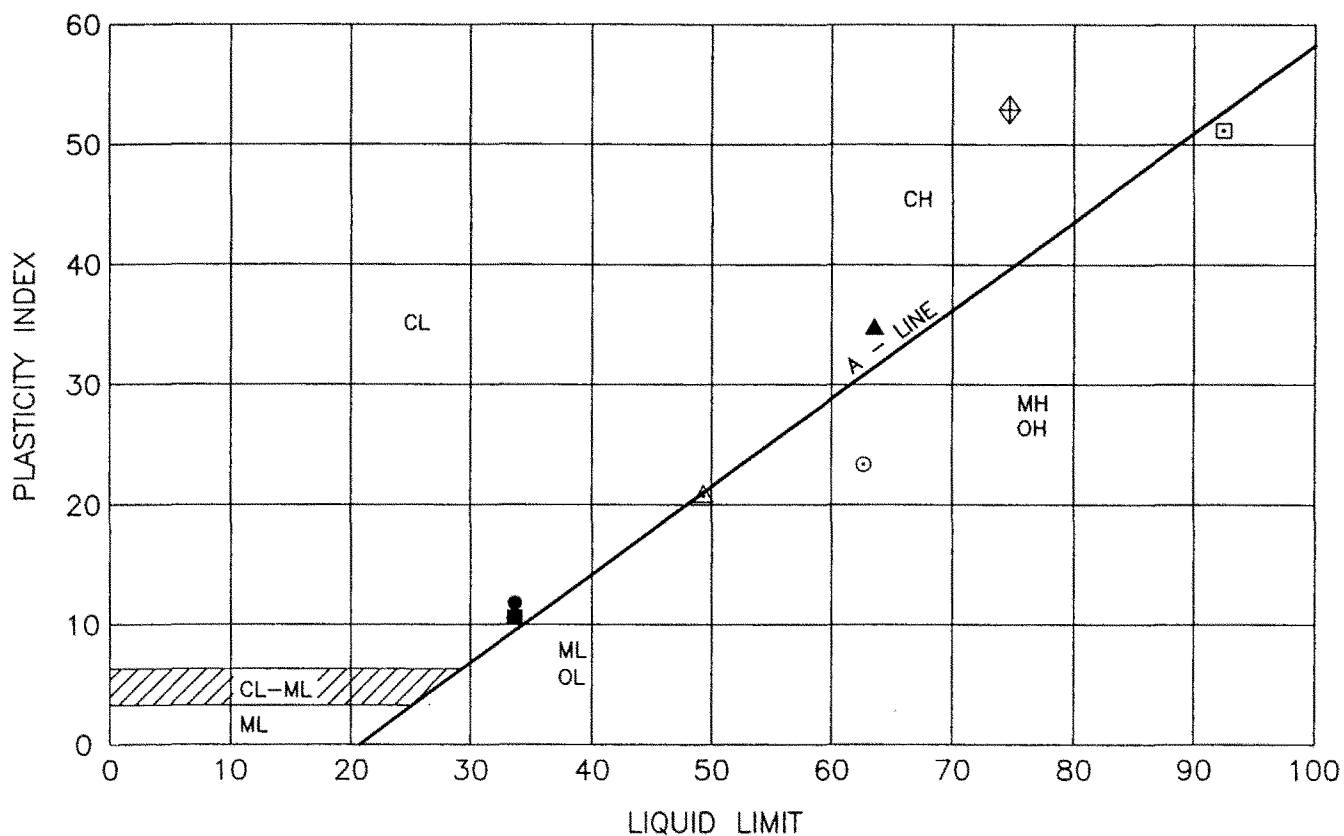
Laboratory testing was performed on samples taken from the field borings and test pits. The results of those tests are shown on the Summary Boring Logs and the Summary Test Pit Logs and within this appendix. Samples obtained from the exploratory borings and test pits were visually re-examined in the laboratory to confirm the field classifications. In addition to visual classification, other classification tests included: natural moisture contents, plastic and liquid limits (Atterberg Limits) on selected soil and tuff samples, and pocket penetrometer in the overburden materials. The bedrock core was tested by performing point Load Strength Index testing, slake durability and ethylene glycol testing for expansive clays/claystone. The slake durability testing was performed by the Oregon Department of Transportation Materials Laboratory in Salem, Oregon. All of the other testing was accomplished in Landslide Technology's own laboratory.

Laboratory testing performed by REI (which has been made available) is contained in Appendix B. Tests included Atterberg Limits, gradation analyses, pH/corrosivity, R-value, consolidation, unconfined compressive strength, direct shear strength, swell-consolidation, and permeability.

Additional laboratory test results are contained in Appendices C, D and E for Cache Road and the intersection area at Trappers Loop Highway.

### 4.1. Atterberg Limits

Atterberg Limits tests were performed on eight samples taken from the test pits and were determined in general accordance with ASTM D 423 Standard Test Method. Liquid limit, plastic limit and plasticity index values are shown on the Summary Test Pit Logs, in the "Summary of Laboratory Tests" table, and plotted on the Plasticity Chart (Fig. 4-1).



## LEGEND

### TEST PITS

### SYMBOLS

- TP-303, @ 3.96m, CLAYEY SILT (MH)
- △ TP-306, @ 1.2-1.8m, SILTY CLAY (CL/CH)
- TP-310, @ 4.27m, FAT CLAY (CH)
- TP-314, @ 5.03m, SANDSTONE (CL) TUFF
- ▲ TP-315, @ 1.22m SILTY CLAY (CH)
- TP-320, @ 2.89m, SILTSTONE (CL) TUFF
- ◇ TP-322, @ 0.91m, SILTY CLAY (CH)



TITLE  
**PLASTICITY CHART**

JOB  
SNOWBASIN ACCESS ROAD  
WEBER COUNTY, OREGON

1148/PLSTCTY1

DATE  
MAR 1999

JOB NO.  
1148

FIG. 4-1

#### 4.2. Slake Durability Tests

A total of three slake durability tests were performed on samples of the Norwood Tuff bedrock to determine their slake durability classification. Slake durability index is the percentage, by dry mass, of a collection of rock pieces retained on a No. 10 sieve after two cycles of oven drying and 10 minutes of soaking in water with standard tumbling and abrasion action. The slake durability tests were performed by the Oregon Department of Transportation Materials Laboratory in Salem, Oregon on three composite samples:

- Sample A – silty sandstone pieces taken from TP-314, TP-319 and TP-322.
- Sample B – slightly clayey, sandy siltstone pieces taken from TP-320 and TP-323.
- Sample C – slightly sandy, clayey siltstone pieces taken from TP-316 and TP-325.

The test results are summarized below:

TABLE 4-1  
Slake Durability Test Results

| Sample              | Water Content | Slake Durability, Id |
|---------------------|---------------|----------------------|
| A: Silty SANDSTONE  | 5%            | 49.9%                |
| B: Sandy SILTSTONE  | 20.9%         | 0.1%                 |
| C: Clayey SILTSTONE | 21.2%         | 20.4%                |

The slake durability index is a means to compare the relative weathering resistance of clay-bearing rocks. It is also an indication of the possibility for slaking upon being exposed to air and to alternating cycles of wetting and drying. The index is also used to assess the durability of the rock when used in structural fills and may be represented as follows (Gamble):

| Slake Durability Id | Classification         |
|---------------------|------------------------|
| < 98%               | Very high durability   |
| 95–98%              | High durability        |
| 85–95%              | Medium high durability |
| 60–85%              | Medium durability      |
| 30–60%              | Low durability         |
| < 30%               | Very low durability    |

The test results indicate the tuff rock materials to have very low to low durability. There may be layers of more resistant rock which were not tested. However, it should be anticipated that the tuff, in general, would not be durable and would need special treatment if exposed in steep cut slopes or used in embankment fills.

#### 4.3. Expansive/Reactive Clay Test

Reactive clay minerals such as montmorillonite have a crystalline structure with an affinity for water that can create excessive volume change within the parent rock. Ethylene glycol is one of the materials that reacts with the swelling clays of the montmorillonite group to form an organo-clay complex having a larger basal spacing than that of the clay mineral itself. A sample of stone containing swelling clay of the montmorillonite group will be expected to undergo expansive breakdown upon soaking in ethylene glycol. If such a breakdown occurs, it may be expected that similar breakdown may occur if similar rock is exposed, for longer times, to wetting and drying or freezing and thawing in a saturated condition.

The test procedure was done in general accordance with Corps of Engineers, CRD-C 148-69, "Method of Testing Stone for Expansive Breakdown on Soaking in Ethylene Glycol." Three samples were subjected to ethylene glycol soaking. The samples consisted of:

- claystone taken from boring B-205;
- sandstone taken from boring B-206; and
- a composite sample consisting of decomposed tuff taken from test TP-314, S-2, and clayey silt (decomposed tuff) taken from test pit TP-316, S-2.



The samples from B-205, B-206 and TP-314 had little to no reaction after soaking. The sample from TP-316 did undergo expansive breakdown upon soaking in ethylene glycol. This latter test may indicate the presence of swelling clay of the montmorillonite group; however, it should be noted that the clayey silt could experience the same behavior after prolonged soaking in water. Based on the test results from the slake durability tests (section 4.2), some of the materials present at the site are not durable. Considering this, and observations from the ethylene glycol soaking, the materials tested above may need special treatment if exposed in steep cut slopes or used in embankment fills.

#### 4.4. Point Load Tests

A total of 11 point load strength index tests were performed on the bedrock tuff core samples. The point load strength index is an indicator of strength obtained by subjecting a rock specimen to an increasingly concentrated point load, applied through a pair of truncated, conical platens, until failure. The failure load is used to calculate the point load test strength index and to estimate the uniaxial compressive strength of the rock core sample. All tests were performed diametral (load applied along the axis of the diameter) with the core samples length/diameter ratio greater than one. It should be noted that the load applied to the tuff cores was in the direction of the laminations present in the rock. Testing was performed in accordance with the procedures of ASTM D 5731-95. The test results are presented in Table 4-2.

**TABLE 4-2**  
**Point Load Test Results**

| Boring No. | Depth (m)   | Rock Type      | Point Load Strength Index Is (MPa) | Size-corrected Point Load Strength Index Is(50) (MPa) | Estimated Uniaxial Compressive Strength |       |
|------------|-------------|----------------|------------------------------------|---|---|-------|
|            |             |                |                                    |   | (MPa)                                   | (psi) |
| B-205      | 16.52–16.73 | Tuff           | 0.084                              | 0.105   | 2.625                                   | 380   |
| B-205      | 19.23–19.45 | Claystone Tuff | 0.068                              | 0.087   | 2.175                                   | 320   |
| B-206      | 13.99–14.11 | Claystone Tuff | 0.077                              | 0.097   | 2.425                                   | 350   |
| B-206      | 15.09–15.24 | Claystone Tuff | 0.083                              | 0.105   | 2.625                                   | 380   |
| B-206      | 16.67–16.82 | Sandstone Tuff | 0.104                              | 0.132   | 3.300                                   | 480   |
| B-208      | 13.72–13.87 | Tuff           | 0.081                              | 0.096   | 2.400                                   | 350   |
| B-208      | 15.70–15.85 | Claystone Tuff | 0.064                              | 0.080   | 2.000                                   | 290   |
| B-208      | 16.70–16.89 | Tuff           | 0.101                              | 0.127   | 3.175                                   | 460   |
| B-209      | 14.94–15.12 | Siltstone Tuff | 0.038                              | 0.048   | 1.200                                   | 170   |
| B-209      | 15.45–15.61 | Siltstone Tuff | 0.069                              | 0.087   | 2.175                                   | 320   |
| B-209      | 16.67–16.86 | Siltstone Tuff | 0.141                              | 0.178   | 4.450                                   | 650   |

Note: All rock cores were classified according to relative hardness as “Extremely Soft” or “Very Soft” in accordance with the ODOT Soil and Rock Classification Manual.

#### 4.5. Summary of Test Results

Table 4-3 summarizes the test results obtained by Landslide Technology for samples of overburden materials and Norwood Tuff. For “Type of Test”: W = Natural Moisture Content, LL = Liquid Limit moisture content, PL = Plastic Limit moisture content, PI = Plasticity Index (LL-PL), and PP = Pocket Penetrometer, approximate unconfined compressive strength ( $Q_u$ ).



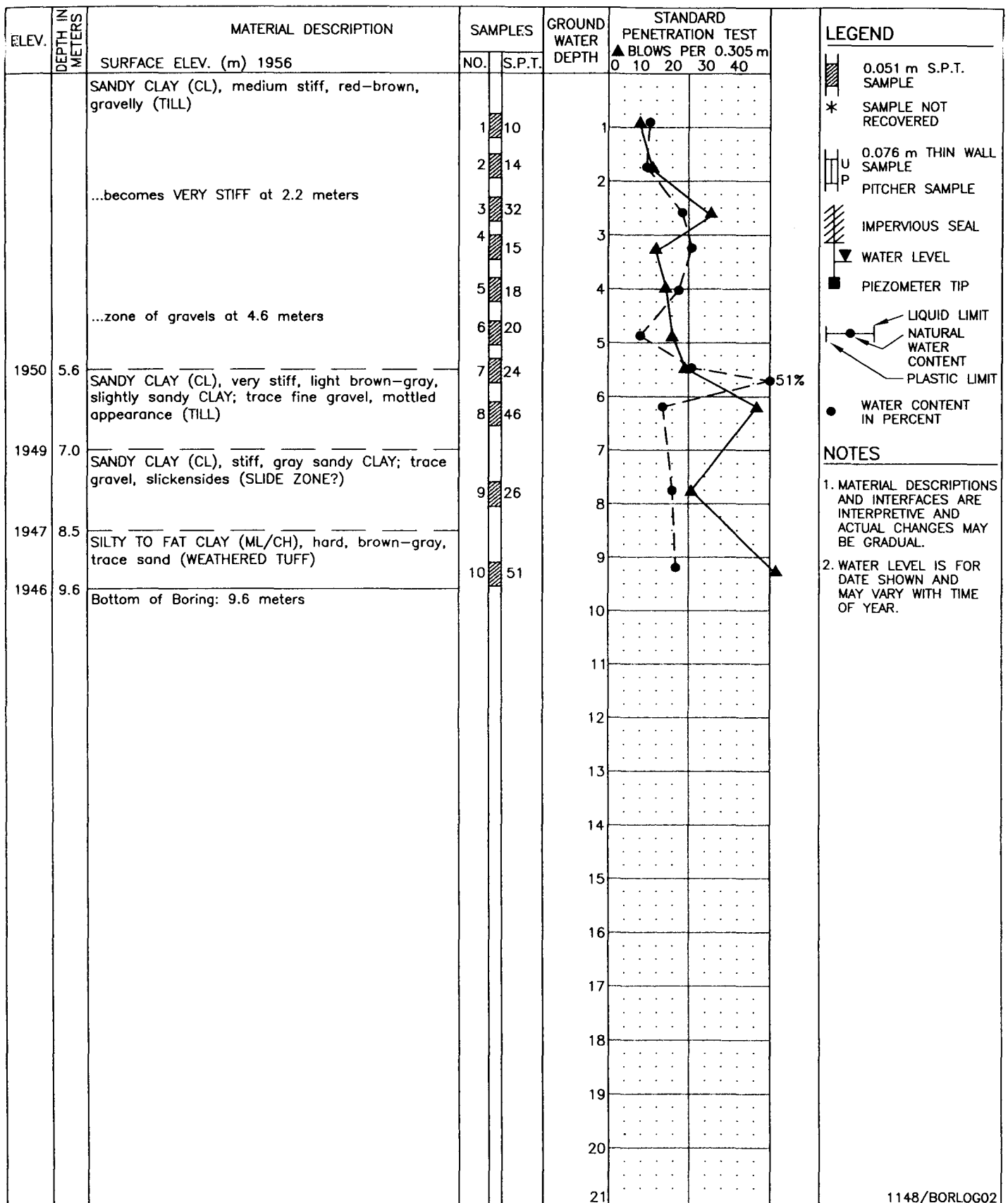
**TABLE 4-3**  
**Summary of Laboratory Tests**  
 (cont'd)

| Boring/<br>Test Pit<br>No. | Sample No.<br>(depth, m) | Material         | Type of<br>Test* | Results |
|----------------------------|--------------------------|------------------|------------------|---------|
| B-205                      | R-2 (16.52–16.73)        | Tuff             | Point Load       | 2.6 MPa |
| B-205                      | R-4 (19.23–19.45)        | Claystone Tuff   | Point Load       | 2.2 MPa |
| B-206                      | R-1 (13.99–14.11)        | Claystone Tuff   | Point Load       | 2.4 MPa |
| B-206                      | R-2 (15.09–15.24)        | Claystone Tuff   | Point Load       | 2.6 MPa |
| B-206                      | R-3 (16.67–16.82)        | Sandstone Tuff   | Point Load       | 3.3 MPa |
| B-207                      | S-5 (6.6–7.2)            | SANDY CLAY (CL)  | W                | 23%     |
| B-207                      | S-8B (10.8–10.9)         | CLAYEY SAND (SC) | W                | 12%     |
| B-207                      | S-8A (10.7–10.8)         | SANDY CLAY (CL)  | W                | 19%     |
| B-207                      | S-16 (19.8)              | Sandstone Tuff   | W                | 11%     |
| B-207                      | S-19 (22.9–23.1)         | Claystone Tuff   | W                | 15%     |
| B-208                      | S-3 (3.1–3.7)            | SILTY CLAY (CL)  | W                | 22%     |
| B-208                      | S-6 (6.1–6.7)            | SILTY CLAY (CL)  | W                | 25%     |
| B-208                      | S-9 (9.1–9.8)            | SILTY CLAY (CL)  | W                | 23%     |
| B-208                      | S-12A (12.2–12.6)        | CLAY (CL)        | W                | 22%     |
| B-208                      | S-12B (12.6–12.8)        | Tuff             | W                | 21%     |
| B-208                      | R-1 (13.72–13.87)        | Tuff             | Point Load       | 2.4 MPa |
| B-208                      | R-2 (15.70–15.85)        | Claystone Tuff   | Point Load       | 2 MPa   |
| B-208                      | R-3 (16.70–16.89)        | Tuff             | Point Load       | 2 MPa   |
| B-209                      | R-4 (14.94–15.12)        | Siltstone Tuff   | Point Load       | 1.2 MPa |
| B-209                      | R-4 (15.45–15.61)        | Siltstone Tuff   | Point Load       | 2.2 MPa |
| B-209                      | R-5 (16.67–16.86)        | Siltstone Tuff   | Point Load       | 4.5 MPa |



1148/BORLOG01

FIG. 3-1



#### NOTES

1. MATERIAL DESCRIPTIONS AND INTERFACES ARE INTERPRETIVE AND ACTUAL CHANGES MAY BE GRADUAL.
2. WATER LEVEL IS FOR DATE SHOWN AND MAY VARY WITH TIME OF YEAR.

1148/BORLOG02

DRILLER PC Explorations  
 DATE START 1/29/99 FINISH 1/29/99  
 DRILLING TECHNIQUE 0.127m O.D. TUBEX SYSTEM



**Landslide Technology**

10250 S.W. Greenburg Rd.  
 Portland, OR 97223

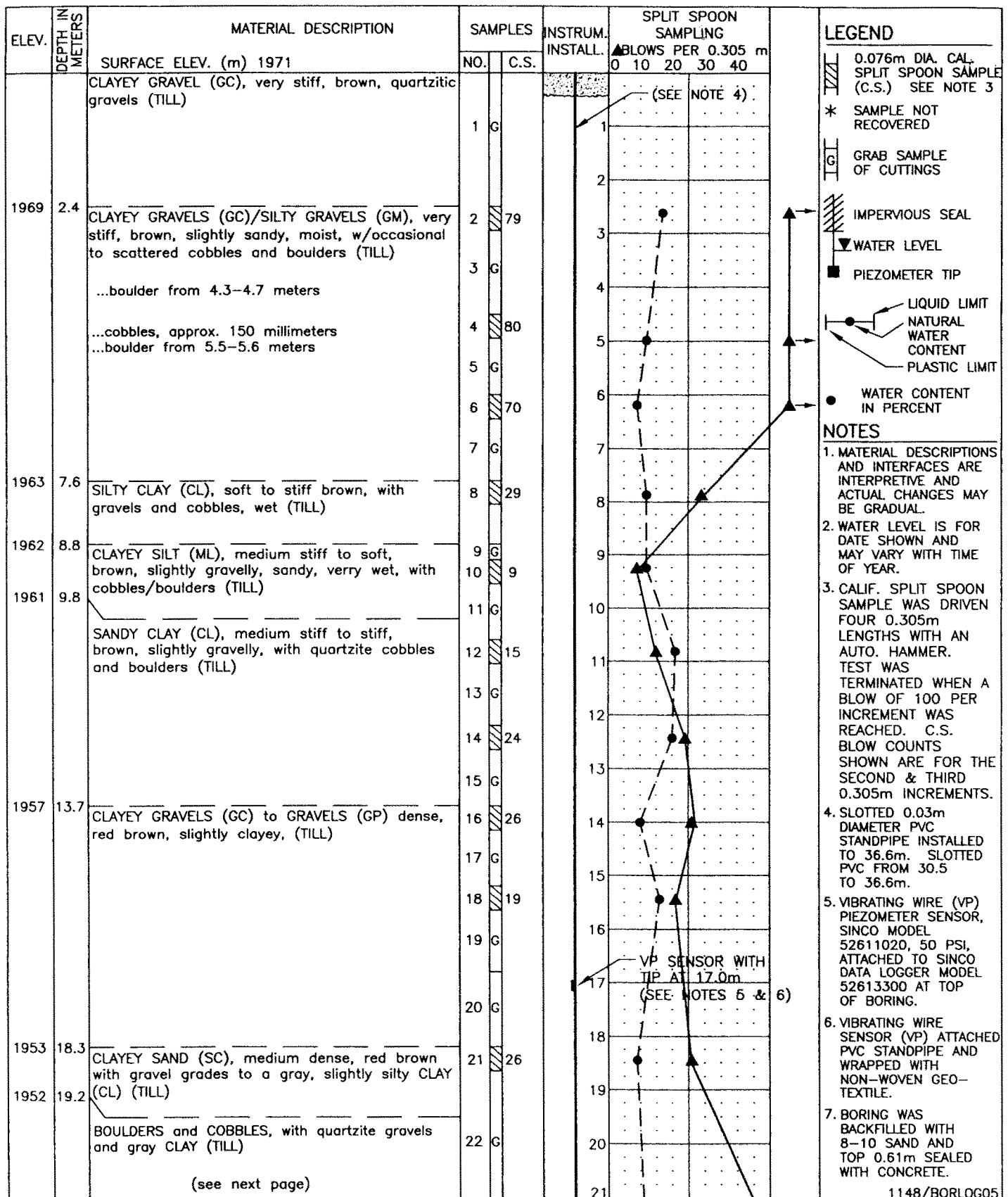
TITLE  
**SUMMARY BORING LOG  
 B-202**

JOB SNOWBASIN ACCESS ROAD  
 WEBER COUNTY, UTAH

DATE  
 FEB 1999

JOB NO.  
 1148

FIG. 3-2



- LEGEND**
- 0.076m DIA. CAL. SPLIT SPOON SAMPLE (C.S.) SEE NOTE 3
  - \* SAMPLE NOT RECOVERED
  - GRAB SAMPLE OF CUTTINGS
  - IMPERVIOUS SEAL
  - WATER LEVEL
  - PIEZOMETER TIP
  - LIQUID LIMIT
  - NATURAL WATER CONTENT
  - PLASTIC LIMIT
  - WATER CONTENT IN PERCENT
- NOTES**
1. MATERIAL DESCRIPTIONS AND INTERFACES ARE INTERPRETIVE AND ACTUAL CHANGES MAY BE GRADUAL.
  2. WATER LEVEL IS FOR DATE SHOWN AND MAY VARY WITH TIME OF YEAR.
  3. CALIF. SPLIT SPOON SAMPLE WAS DRIVEN FOUR 0.305m LENGTHS WITH AN AUTO. HAMMER. TEST WAS TERMINATED WHEN A BLOW OF 100 PER INCREMENT WAS REACHED. C.S. BLOW COUNTS SHOWN ARE FOR THE SECOND & THIRD 0.305m INCREMENTS.
  4. SLOTTED 0.03m DIAMETER PVC STANDPIPE INSTALLED TO 36.6m. SLOTTED PVC FROM 30.5 TO 36.6m.
  5. VIBRATING WIRE (VP) PIEZOMETER SENSOR, SINCO MODEL 52611020, 50 PSI, ATTACHED TO SINCO DATA LOGGER MODEL 52613300 AT TOP OF BORING.
  6. VIBRATING WIRE SENSOR (VP) ATTACHED PVC STANDPIPE AND WRAPPED WITH NON-WOVEN GEO-TEXTILE.
  7. BORING WAS BACKFILLED WITH 8-10 SAND AND TOP 0.61m SEALED WITH CONCRETE.
- 1148/BORLOG05

DRILLER Lang Exploratory Drilling  
 DATE START 2/5/99 FINISH 2/9/99  
 DRILLING TECHNIQUE Reverse Circulation, with  
0.133m Tricone bit and 0.076m California Split Spoon Sampler

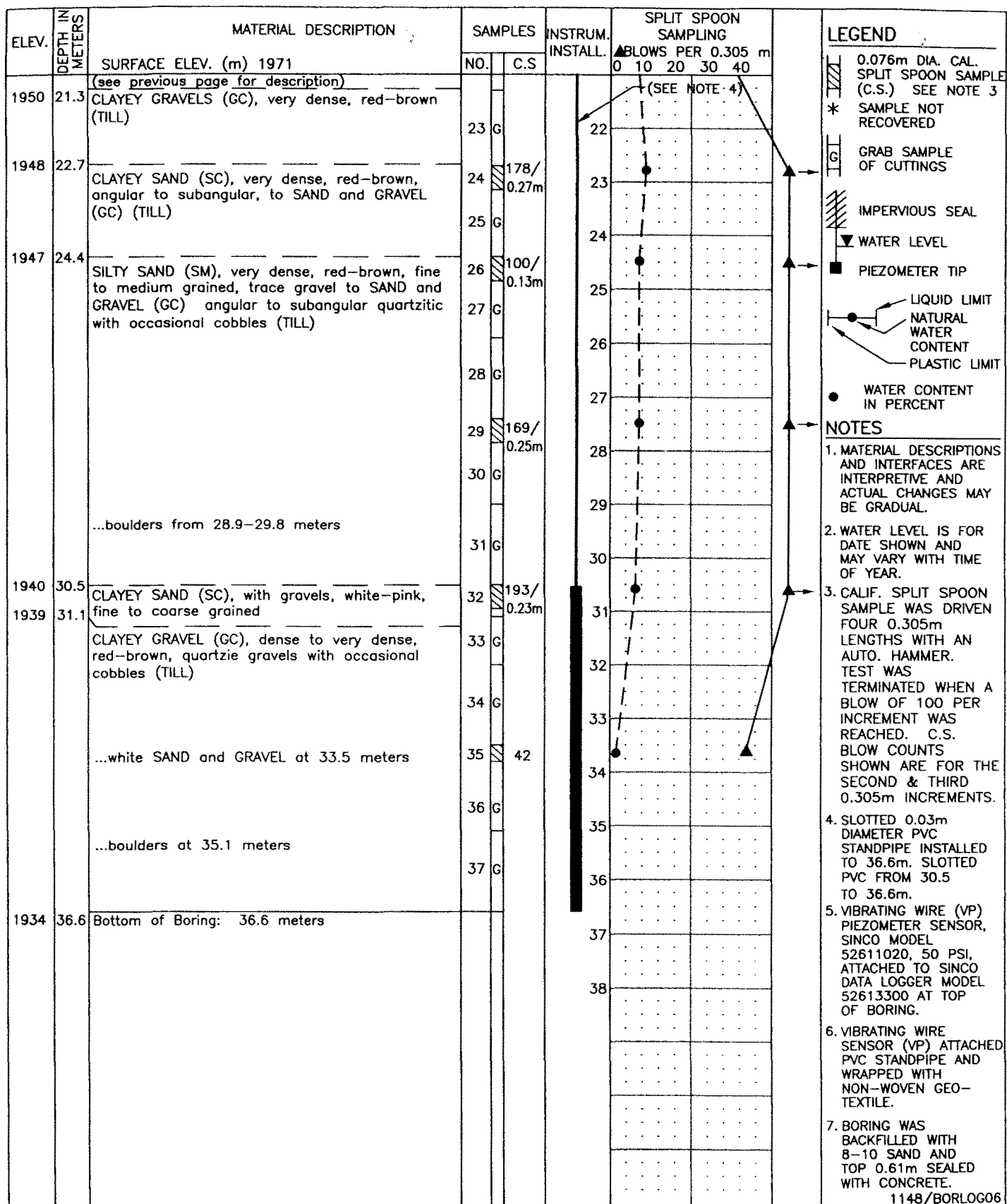


**Landslide Technology**  
 10250 S.W. Greenburg Rd.  
 Portland, OR 97223

TITLE  
**SUMMARY BORING LOG**  
**B-203 (1 of 2)**  
 JOB **SNOWBASIN ACCESS ROAD**  
**WEBER COUNTY, UTAH**

DATE  
**FEB 1999**  
 JOB NO.  
**1148**  
**FIG. 3-3A**





DRILLER Lang Exploratory Drilling  
 DATE START 2/5/99 FINISH 2/9/99  
 DRILLING TECHNIQUE Reverse Circulation, with 0.133m tricone bit and 0.076m California Split Spoon Sampler



**Landslide Technology**

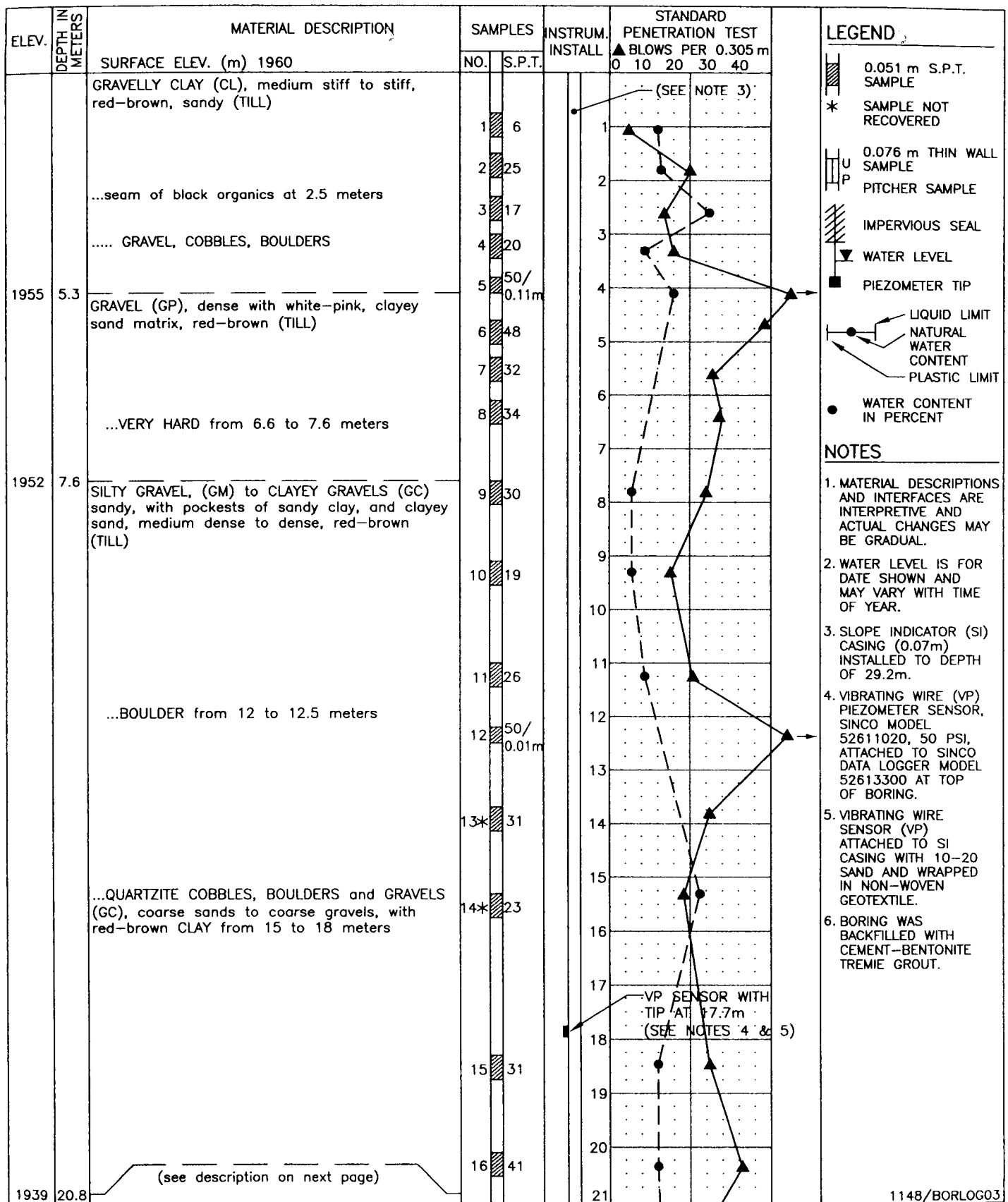
10250 S.W. Greenburg Rd.  
Portland, OR 97223

TITLE  
**SUMMARY BORING LOG  
B-203 (2 of 2)**

JOB **SNOWBASIN ACCESS ROAD  
WEBER COUNTY, UTAH**

DATE  
**FEB 1999**  
JOB NO.  
**1148**

FIG. **3-3b**



DRILLER PC Explorations  
 DATE START 1/29/99 FINISH 2/4/99  
 DRILLING TECHNIQUE 0.127m O.D. TUBEX SYSTEM



**Landslide Technology**

10250 S.W. Greenburg Rd.  
 Portland, OR 97223

TITLE  
**SUMMARY BORING LOG**  
 B-204 (1 of 2)

JOB SNOWBASIN ACCESS ROAD  
 WEBER COUNTY, UTAH

DATE  
 FEB 1999

JOB NO.  
 1148

FIG. 3-4a

1148/BORLOG03

1148/BORLOG04

FIG. 3-4b







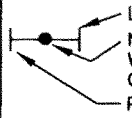

DRILLER Long Exploratory Drilling  
DATE START 2/3/99 FINISH 2/3/99  
DRILLING TECHNIQUE Reverse Circulation, with  
0.133m tricone bit and 0.102m "p" core barrel.



10250 S.W. Greenburg Rd.  
Portland, OR 97223

JOB SNOWBASIN ACCESS ROAD  
WEBER COUNTY, UTAH

1148  
FIG. 3-5

| ELEV. | DEPTH IN METERS | MATERIAL DESCRIPTION   | SAMPLES |      | INSTRUM. INSTALL. | SPLIT SPOON SAMPLING |    |    |    |    | LEGEND  |  |
|-------|-----------------|--|---------|------|-------------------|----------------------|----|----|----|----|---|--|
|       |                 |  | NO.     | C.S. |                   | BLOWS PER 0.305 m    |    |    |    |    |   |  |
|       |                 | SURFACE ELEV. (m) 1996   |         |      |                   | 0                    | 10 | 20 | 30 | 40 |   |  |
| 1995  | 1.4             | SILTY CLAY (CL) dark brown, silty, occasional gravel, organics   | 1       | G    |                   |                      |    |    |    |    |   | <div>* SAMPLE NOT RECOVERED</div> <div> GRAB SAMPLE OF CUTTINGS</div> <div> IMPERVIOUS SEAL</div> <div> WATER LEVEL</div> <div> PIEZOMETER TIP</div> <div> LIQUID LIMIT<br/>NATURAL WATER CONTENT<br/>PLASTIC LIMIT</div> <div> WATER CONTENT IN PERCENT</div> |
|       |                 | GRAVELLY CLAY (CL), with occasional cobbles and boulders (quartzite), light gray (OLD LANDSLIDE DEBRIS)  | 2       | G    |                   |                      |    |    |    |    |   |  |
|       |                 |  | 3       | G    |                   |                      |    |    |    |    |   |  |
|       |                 | ...BOULDER from 4-4.6 meters   | 4       | G    |                   |                      |    |    |    |    |   |  |
|       |                 |  | 5       | G    |                   |                      |    |    |    |    |   |  |
|       |                 | ...relatively soft and wetter from 5.7 to 6.7 meters - based on drilling action  | 6       | G    |                   |                      |    |    |    |    |   |  |
|       |                 |  | 7       | G    |                   |                      |    |    |    |    |   |  |
|       |                 | ...COBBLES from 7.3 to 8.5 meters, CLAY includes frequent cobbles and gravels based on drilling action could be a CLAYEY GRAVEL (GC)                             | 7       | G    |                   |                      |    |    |    |    |   |  |
|       |                 |  | 8       | G    |                   |                      |    |    |    |    |   |  |
|       |                 |  | 9       | G    |                   |                      |    |    |    |    |   |  |
|       |                 |  | 10      | G    |                   |                      |    |    |    |    |   |  |
|       |                 |  | 11      | G    |                   |                      |    |    |    |    |   |  |
| 1985  | 11              | gray clayey, WEATHERED TUFF, dry   | 9       | G    |                   |                      |    |    |    |    | <div><b>NOTES</b></div> <div>1. MATERIAL DESCRIPTIONS AND INTERFACES ARE INTERPRETIVE AND ACTUAL CHANGES MAY BE GRADUAL.</div> <div>2. WATER LEVEL IS FOR DATE SHOWN AND MAY VARY WITH TIME OF YEAR.</div> <div>3. CORE DRILLED FROM 13.7-17.4m.</div> <div>4. SLOPE INDICATOR (SI) CASING (0.07m) INSTALLED TO DEPTH 24.4m.</div> <div>5. VIBRATING WIRE (VP) PIEZOMETER SENSOR, SINCO MODEL 52611020, 50 PSI, ATTACHED TO SINCO DATA LOGGER MODEL 52613300 AT TOP OF BORING.</div> <div>6. VIBRATING WIRE SENSOR (VP) ATTACHED TO SI CASING WITH 10-203 AND WRAPPED WITH NON-WOVEN GEOTEXTILE.</div> <div>7. BORING WAS BACKFILLED WITH CEMENT-BENTONITE GROUT.</div> |  |
|       |                 |  | 10      | G    |                   |                      |    |    |    |    |   |  |
|       |                 |  | 11      | G    |                   |                      |    |    |    |    |   |  |
| 1983  | 12.5            | CLAYSTONE, extremely SOFT to VERY SOFT (R-0 TO R-1), brown green, slightly weathered, (NORWOOD TUFF), highly fractured, laminations at 30' from horizontal, damp | 12      | G    |                   |                      |    |    |    |    |   |  |
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DRILLER Lang Exploratory Drilling  
 DATE START 2/5/99 FINISH 2/9/99  
 DRILLING TECHNIQUE Reverse Circulation, with  
0.133m tricone bit and 0.102m "P" core barrel



**Landslide Technology**

10250 S.W. Greenburg Rd.  
Portland, OR 97223

TITLE  
**SUMMARY BORING LOG**  
**B-206 (1 of 2)**

JOB **SNOWBASIN ACCESS ROAD**  
**WEBER COUNTY, UTAH**

DATE  
**FEB 1999**

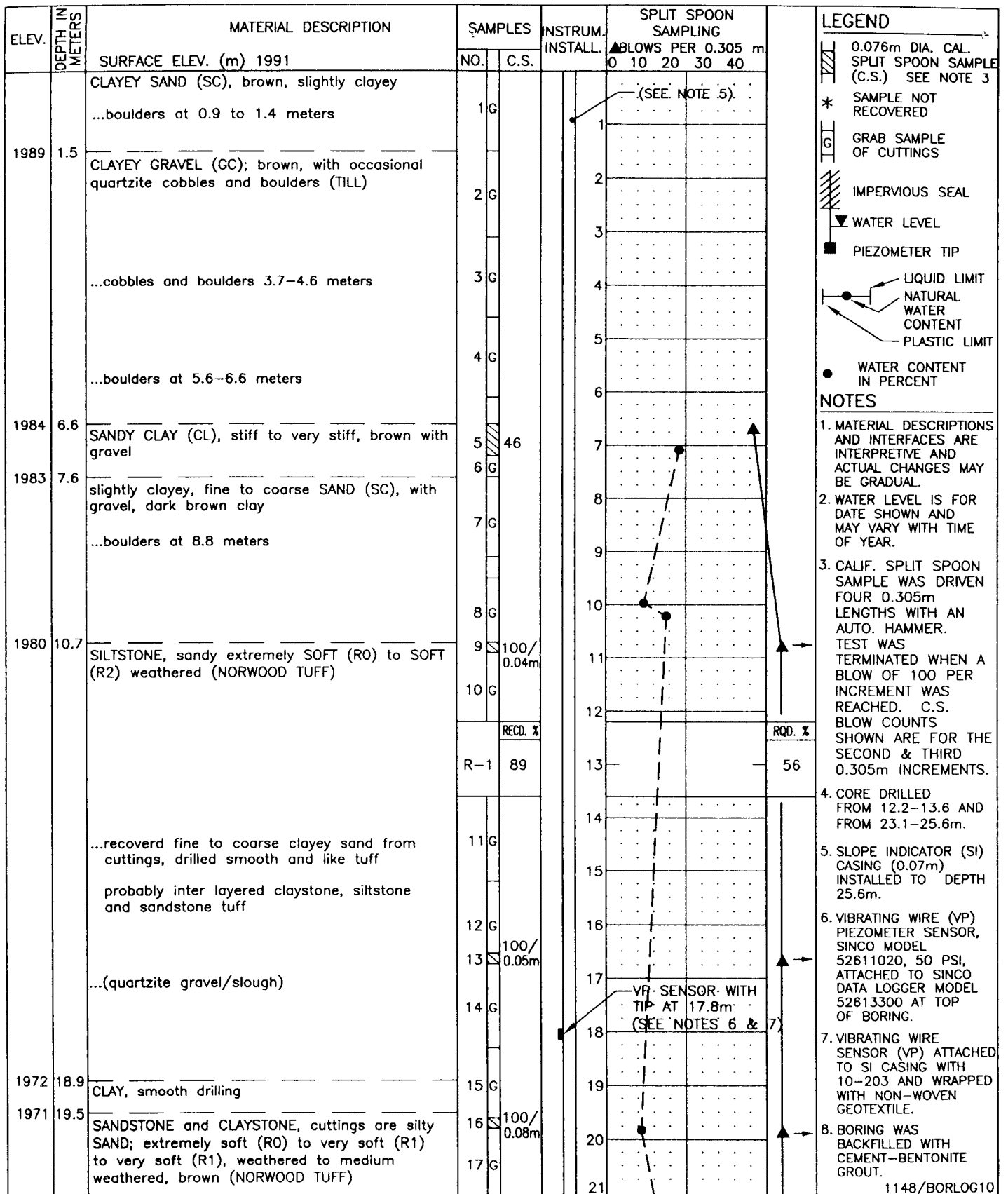
JOB NO.  
**1148**

FIG. **3-6a**

1148/BORLOG08







DRILLER Lang Exploratory Drilling  
 DATE START 2/10/99 FINISH 2/12/99  
 DRILLING TECHNIQUE Reverse Circulation, with 0.133m tricone bit and 0.102m "P" core barrel.



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Portland, OR 97223

TITLE  
**SUMMARY BORING LOG**  
**B-207 (1 of 2)**  
 JOB **SNOWBASIN ACCESS ROAD**  
**WEBER COUNTY, UTAH**

DATE **FEB 1999**  
 JOB NO. **1148**  
 FIG. **3-7a**

1148/BORLOG10

| ELEV. | DEPTH IN METERS | MATERIAL DESCRIPTION  | SAMPLES |                          | INSTRUM. INSTALL. | SPLIT SPOON SAMPLING               |  |  |  |  | RQD. %       | LEGEND   |
|-------|-----------------|---|---------|--------------------------|-------------------|------------------------------------|--|--|--|--|--------------|--|
|       |                 |   | NO.     | C.S.                     |                   | BLOWS PER 0.305 m<br>0 10 20 30 40 |  |  |  |  |              |  |
| 1965  | 25.6            | SURFACE ELEV. (m) 1991<br><br>SANDSTONE and CLAYSTONE, cuttings are silty SAND; extremely soft (R0) to very soft (R1), weathered to medium weathered, brown (NORWOOD TUFF)<br>...silty SAND in cuttings<br>...slightly sandy CLAY in cuttings<br>...SOFT (R2), brown with gray SANDSTONE thinly bedded with inclinations 18' to 22' from horizontal | 18      | G                        |                   | 21                                 |  |  |  |  | 68<br><br>96 | 0.076m DIA. CAL. SPLIT SPOON SAMPLE (C.S.) SEE NOTE 3<br>* SAMPLE NOT RECOVERED<br>GRAB SAMPLE OF CUTTINGS<br>IMPERVIOUS SEAL<br>WATER LEVEL<br>PIEZOMETER TIP<br>LIQUID LIMIT<br>NATURAL WATER CONTENT<br>PLASTIC LIMIT<br>WATER CONTENT IN PERCENT |
|       |                 |   | 19      | 100/<br>0.10m<br>RECD. % |                   | 22                                 |  |  |  |  |              |  |
|       |                 |   | R-2     | 81                       |                   | 23                                 |  |  |  |  |              |  |
|       |                 |   | R-3     | 100                      |                   | 24                                 |  |  |  |  |              |  |
|       |                 |   |         |                          |                   | 25                                 |  |  |  |  |              |  |
|       |                 | Bottom of Boring: 25.6 meters   |         |                          | 26                |                                    |  |  |  |  |              |  |

- NOTES**
1. MATERIAL DESCRIPTIONS AND INTERFACES ARE INTERPRETIVE AND ACTUAL CHANGES MAY BE GRADUAL.
  2. WATER LEVEL IS FOR DATE SHOWN AND MAY VARY WITH TIME OF YEAR.
  3. CALIF. SPLIT SPOON SAMPLE WAS DRIVEN FOUR 0.305m LENGTHS WITH AN AUTO. HAMMER. TEST WAS TERMINATED WHEN A BLOW OF 100 PER INCREMENT WAS REACHED. C.S. BLOW COUNTS SHOWN ARE FOR THE SECOND & THIRD 0.305m INCREMENTS.
  4. CORE DRILLED FROM 12.2-13.6 AND FROM 23.1-25.6m.
  5. SLOPE INDICATOR (SI) CASING (0.07m) INSTALLED TO DEPTH 25.6m.
  6. VIBRATING WIRE (VP) PIEZOMETER SENSOR, SINCO MODEL 52611020, 50 PSI, ATTACHED TO SINCO DATA LOGGER MODEL 52613300 AT TOP OF BORING.
  7. VIBRATING WIRE SENSOR (VP) ATTACHED TO SI CASING WITH 10-203 AND WRAPPED WITH NON-WOVEN GEOTEXTILE.
  8. BORING WAS BACKFILLED WITH CEMENT-BENTONITE GROUT.

1148/BORLOG11

DRILLER Lang Exploratory Drilling  
 DATE START 2/10/99 FINISH 2/12/99  
 DRILLING TECHNIQUE Reverse Circulation, with 0.133m tricone bit and 0.102m "P" core barrel.



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 Portland, OR 97223

TITLE  
**SUMMARY BORING LOG**  
**B-207 (2 of 2)**

JOB **SNOWBASIN ACCESS ROAD**  
**WEBER COUNTY, UTAH**

DATE  
**FEB 1999**  
 JOB NO.  
**1148**

FIG. **3-7b**







| ELEV. | DEPTH IN METERS | MATERIAL DESCRIPTION  | SAMPLES |               | INSTRUM. INSTALL. | SPLIT-SPOON SAMPLING |    |    |    |    | LEGEND       |
|-------|-----------------|---|---------|---------------|-------------------|----------------------|----|----|----|----|--------------|
|       |                 |   | NO.     | C.S.          |                   | BLOWS PER 0.305 m    |    |    |    |    |              |
|       |                 | SURFACE ELEV. 1905  |         |               |                   | 0                    | 10 | 20 | 30 | 40 |              |
|       |                 | SILTY CLAY (CL), stiff to very stiff, brown, with gravel, cobbles and boulders (scattered and in layers), drills to sand and gravel sized quartzite rock fragments (OLD LANDSLIDE DEBRIS) | 1 G     |               |                   |                      |    |    |    |    | (SEE NOTE 5) |
|       |                 |   | 2 G     |               |                   |                      |    |    |    |    |              |
|       |                 |   | 3 *     | 100/<br>0.31m |                   |                      |    |    |    |    |              |
|       |                 |   | 4 G     |               |                   |                      |    |    |    |    |              |
|       |                 |   | 5 G     |               |                   |                      |    |    |    |    |              |
|       |                 |   | 6       | 100/<br>0.31m |                   |                      |    |    |    |    |              |
|       |                 |   | 7 G     |               |                   |                      |    |    |    |    |              |
|       |                 |   | 8 G     |               |                   |                      |    |    |    |    |              |
|       |                 | ...increasing rock fragments of weathered, clayey, SILTSTONE, gray-green  | 9       | 24            |                   |                      |    |    |    |    |              |
|       |                 |   | 10 G    |               |                   |                      |    |    |    |    |              |
|       |                 |   | 11      |               |                   |                      |    |    |    |    |              |
|       |                 |   |         | REC'D. %      |                   |                      |    |    |    |    |              |
|       |                 |   | R-1     | 80            |                   |                      |    |    |    |    |              |
|       |                 | ...gravels and cobbles in clayey silt matrix  | R-2     | 100           |                   |                      |    |    |    |    |              |
|       |                 |   | R-3     | 100           |                   |                      |    |    |    |    |              |
|       |                 | SILTSTONE, extremely SOFT (R0) to VERY SOFT (R1), brown and gray moderately weathered to predominately decomposed (OLD LANDSLIDE DEBRIS)  |         |               |                   |                      |    |    |    |    |              |
|       |                 |   | R-4     | 100           |                   |                      |    |    |    |    |              |
|       |                 | SILTSTONE, extremely soft (R0) to soft (r1), predominately decomposed grading to moderately weathered, close to moderately close bedding inclined at 20° from horizontal (NORWOOD TUFF)   |         |               |                   |                      |    |    |    |    |              |
|       |                 |   | R-5     | 88            |                   |                      |    |    |    |    |              |
|       |                 |   |         |               |                   |                      |    |    |    |    |              |
|       |                 |   | 12 G    |               |                   |                      |    |    |    |    |              |
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DRILLER Lang Exploratory Drilling  
DATE START 2/15/99 FINISH 2/17/99  
DRILLING TECHNIQUE Reverse Circulation, with  
0.133m tricone bit and 0.102m "P" core barrel.



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10250 S.W. Greenburg Rd.  
Portland, OR 97223

TITLE  
**SUMMARY BORING LOG**  
**B-209**


JOB SNOWBASIN ACCESS ROAD  
WEBER COUNTY, UTAH

DATE  
FEB 1999

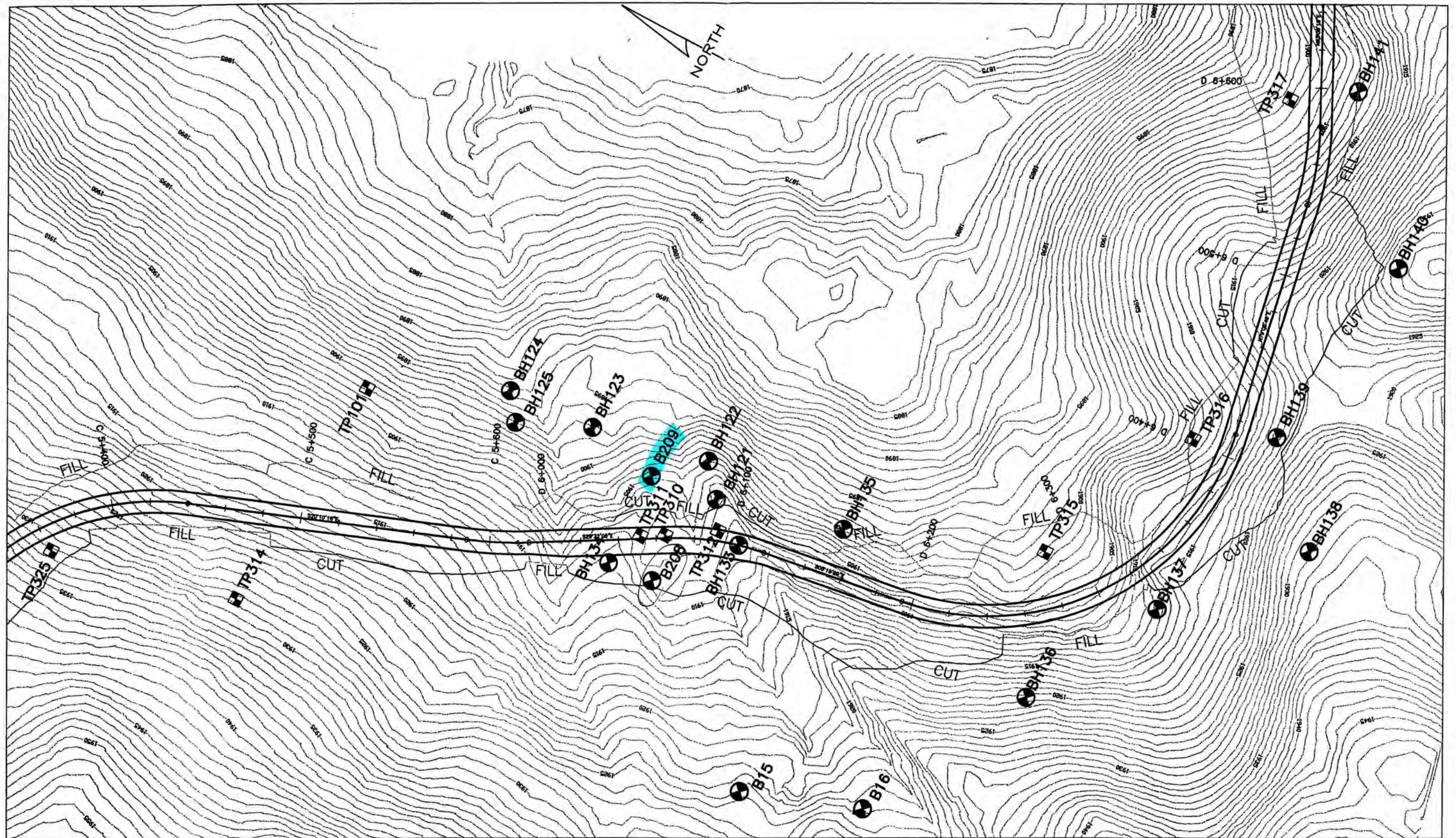
JOB NO.  
1148

FIG. 3-9





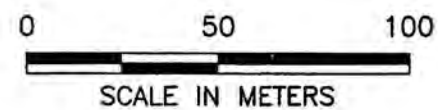
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|---|-------|---|------------------|
|  <b>Landslide Technology</b><br>10250 S.W. Greenburg Rd.<br>Portland, OR 97223 | TITLE | OVERALL SITE PLAN                           | 1148/MAP1        |
|   | JOB   | SNOWBASIN ACCESS ROAD<br>WEBER COUNTY, UTAH | DATE<br>MAR 1999 |
|   |       |   | JOB NO.<br>1148  |
|   |       |   | FIG. 2-0         |





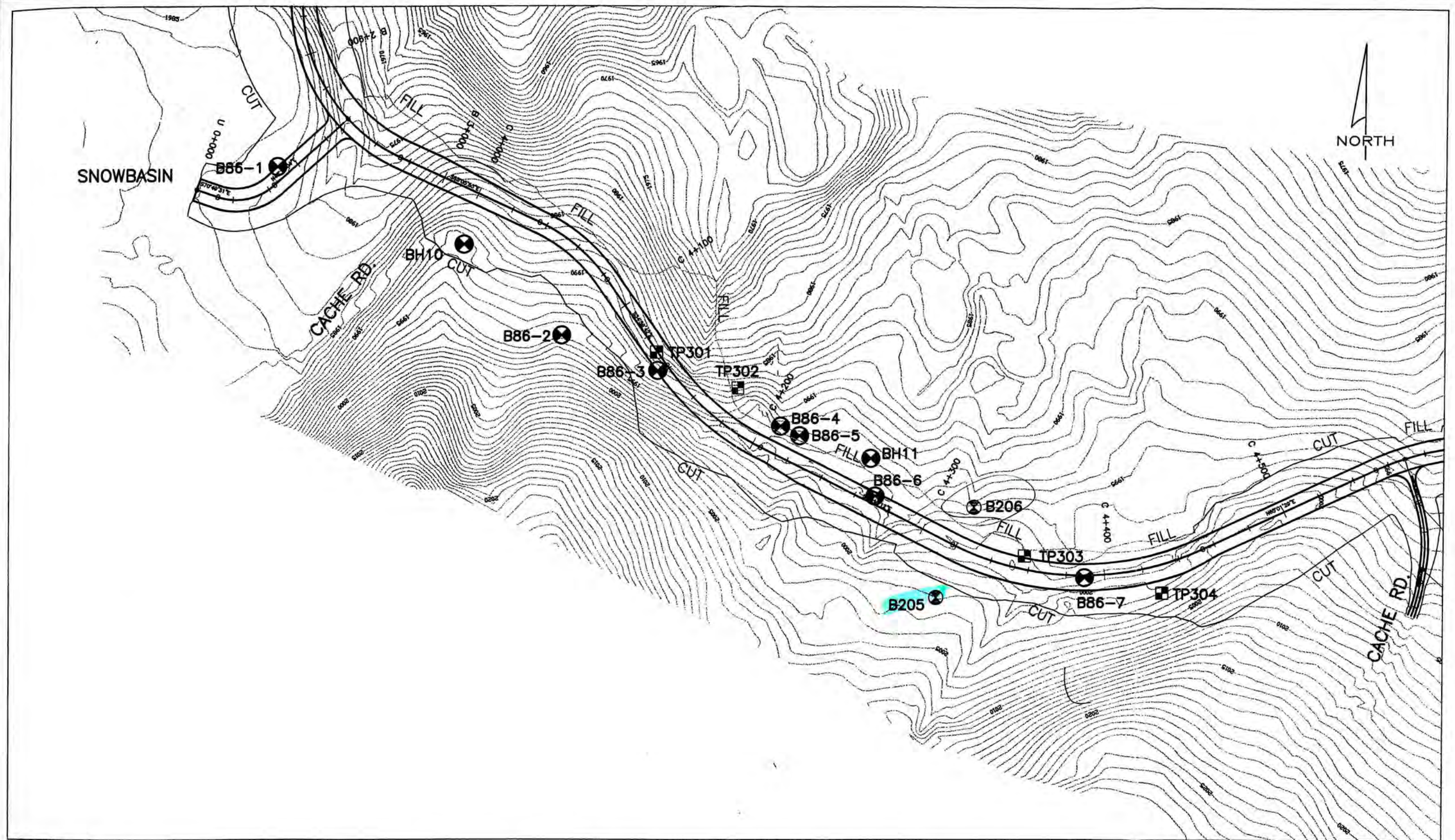
# **LEGEND**

-  BORINGS
-  TEST PITS



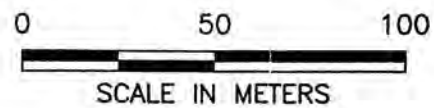
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|---|--|------------------|
| TITLE                                       |  | 1148/MAP5        |
| SITE PLAN 5                                 |  | DATE<br>MAR 1999 |
| JOB   |  | JOB NO.<br>1148  |
| SNOWBASIN ACCESS ROAD<br>WEBER COUNTY, UTAH |  | FIG. 2-5         |





# LEGEND

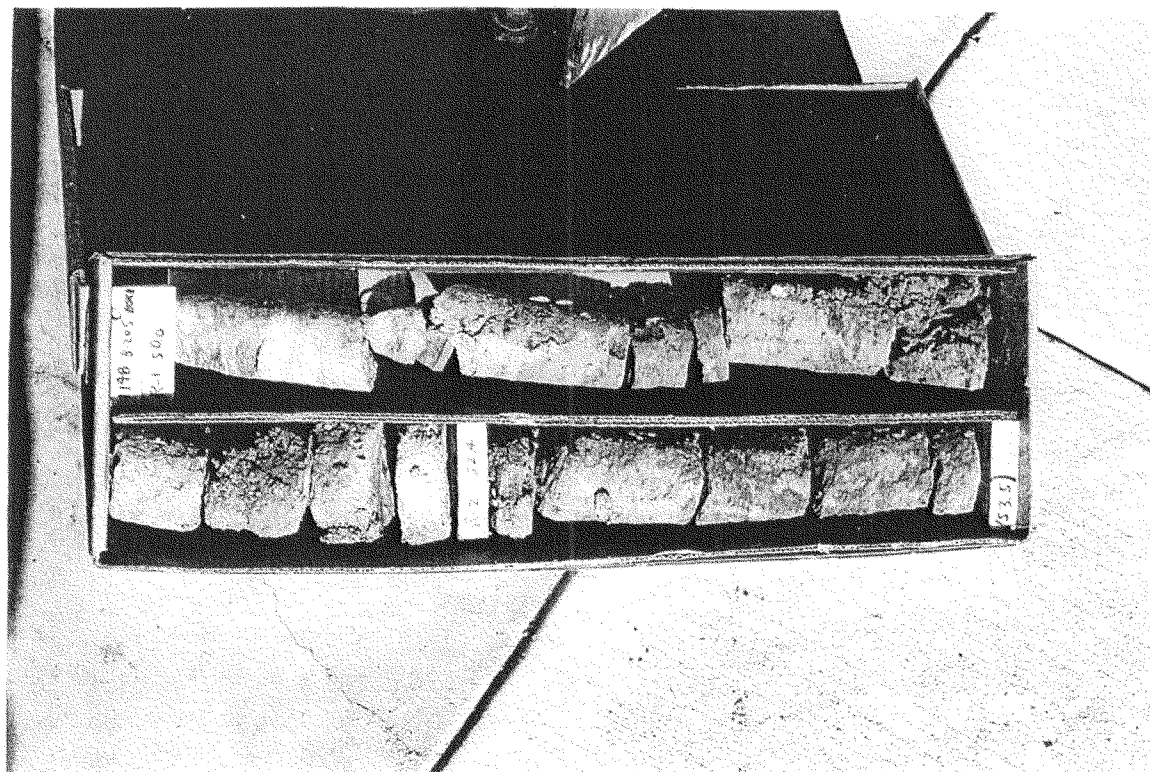
- BORINGS
- TEST PITS



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|       |   |  |   |
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| TITLE | SITE PLAN 3                                 |  | 1148/MAP3                                       |
|       | SNOWBASIN ACCESS ROAD<br>WEBER COUNTY, UTAH |  | DATE<br>MAR 1999<br>JOB NO.<br>1148<br>FIG. 2-3 |





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**CORE PHOTOGRAPHS  
BORING B-205**

JOB

**SNOW BASIN ACCESS ROAD  
WEBER COUNTY, UTAH**

DATE

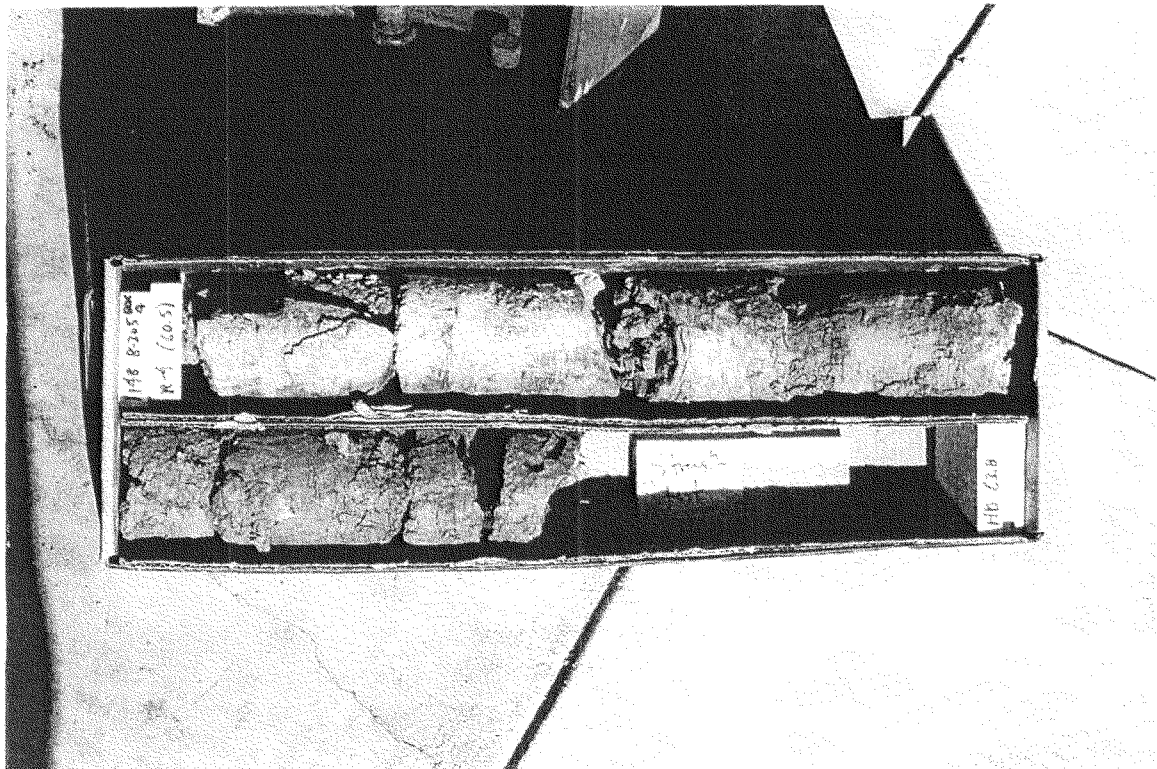
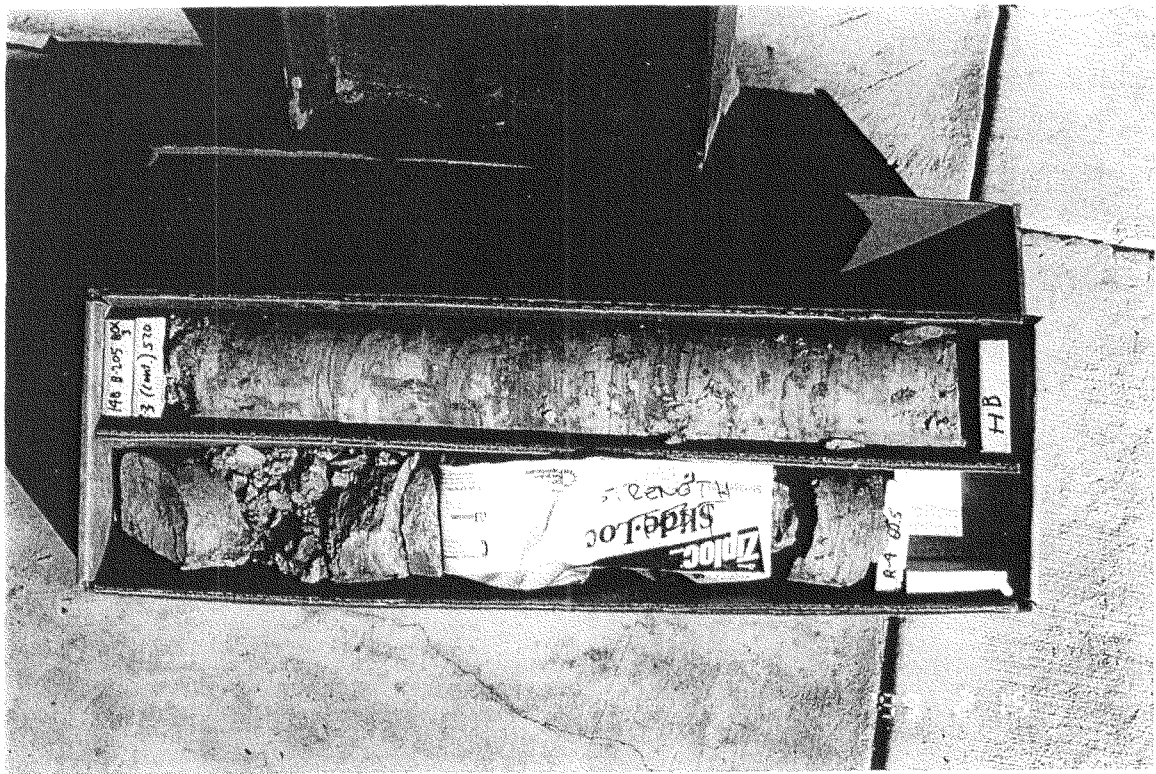
**MAR 1999**

JOB NO.

**1148**

FIG.

**3-10**



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**CORE PHOTOGRAPHS  
BORING B-205**

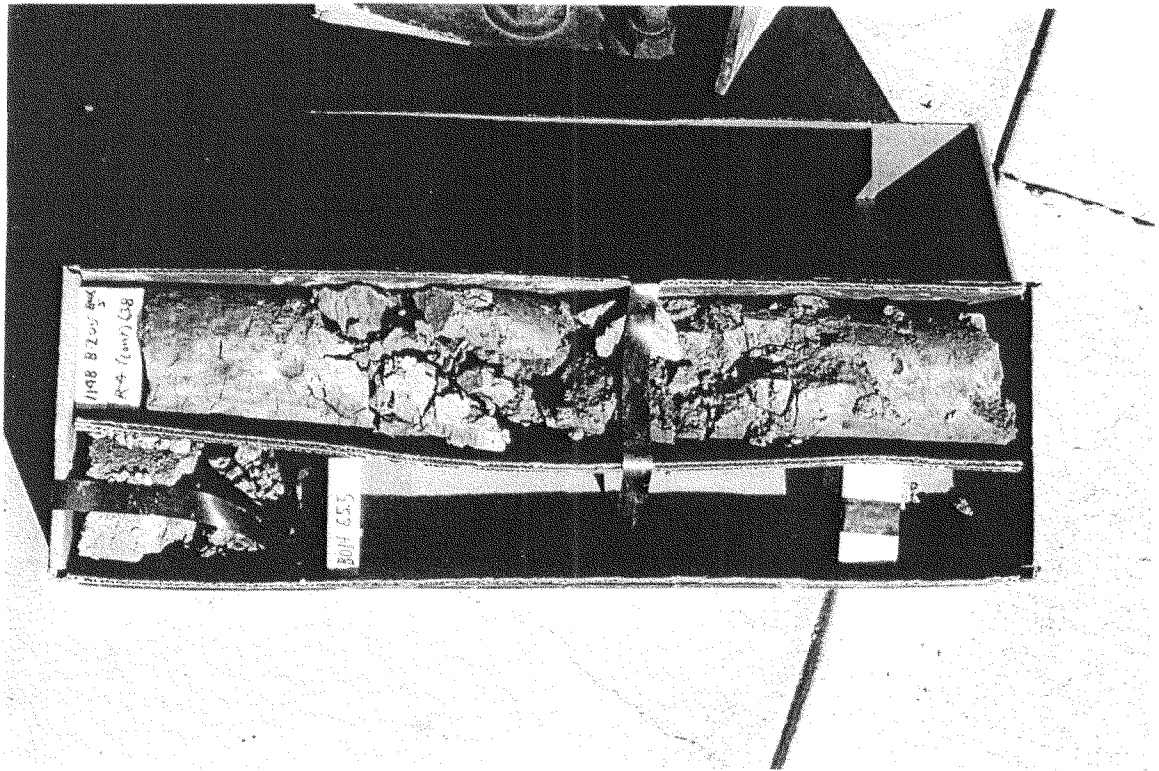
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WEBER COUNTY, UTAH**

DATE  
MAR 1999

JOB NO.  
1148

FIG.  
3-11



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**CORE PHOTOGRAPHS  
BORING B-205**

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WEBER COUNTY, UTAH**

DATE

**MAR 1999**

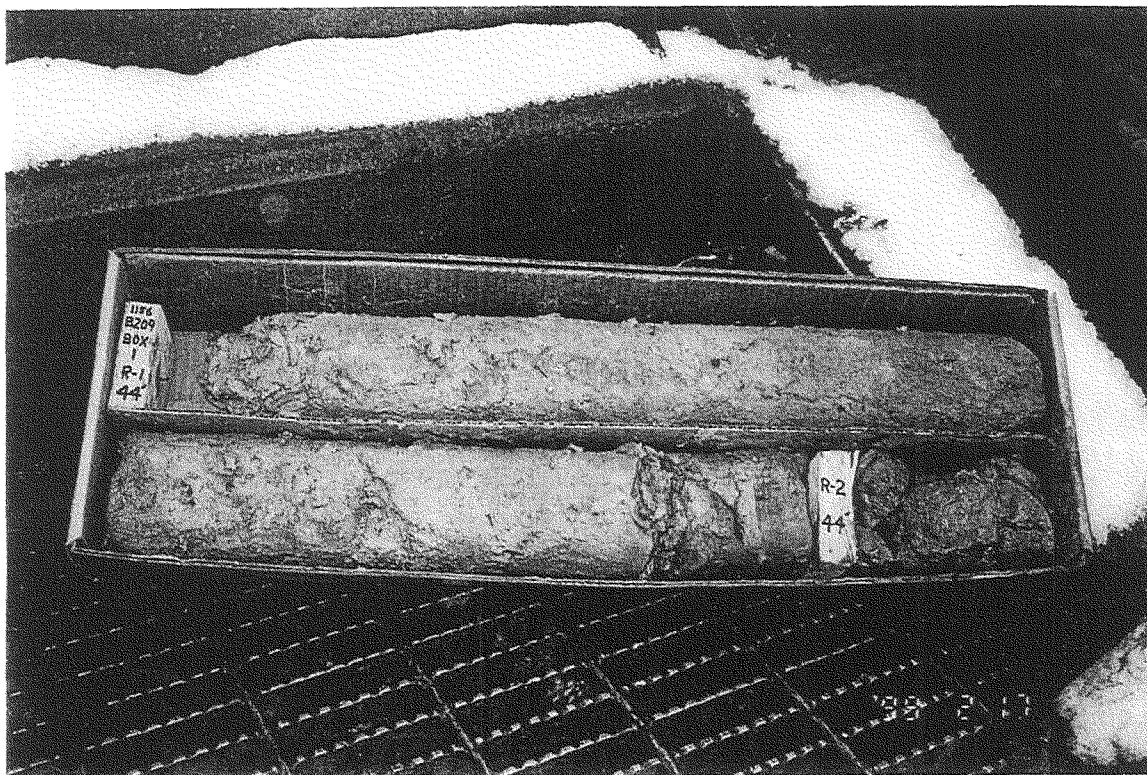
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**1148**

FIG.

**3-12**





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WEBER COUNTY, UTAH**

DATE

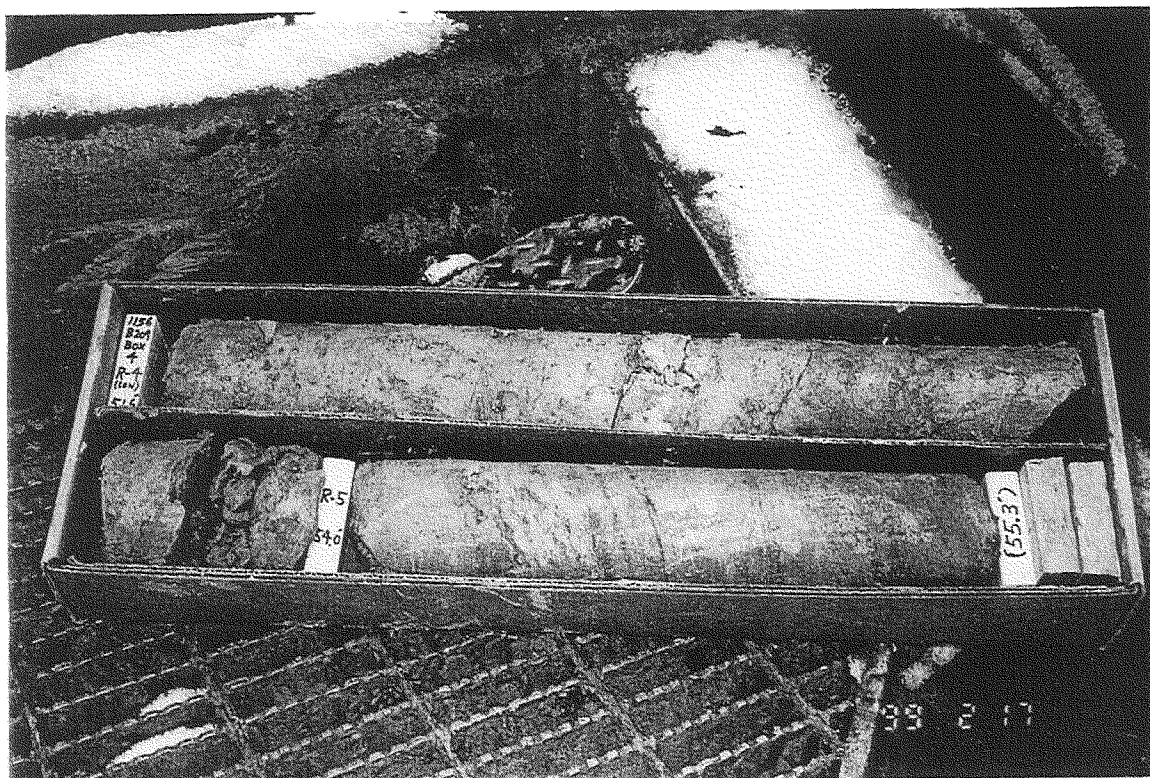
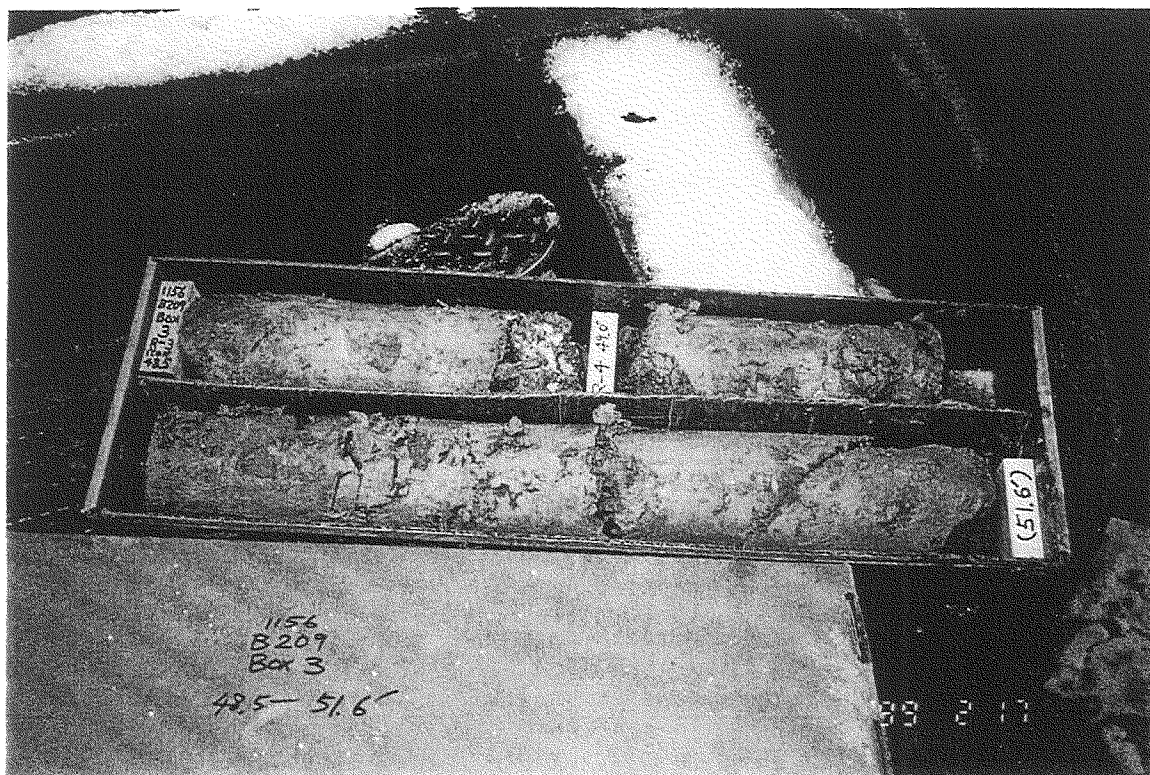
**MAR 1999**


JOB NO.

**1148**

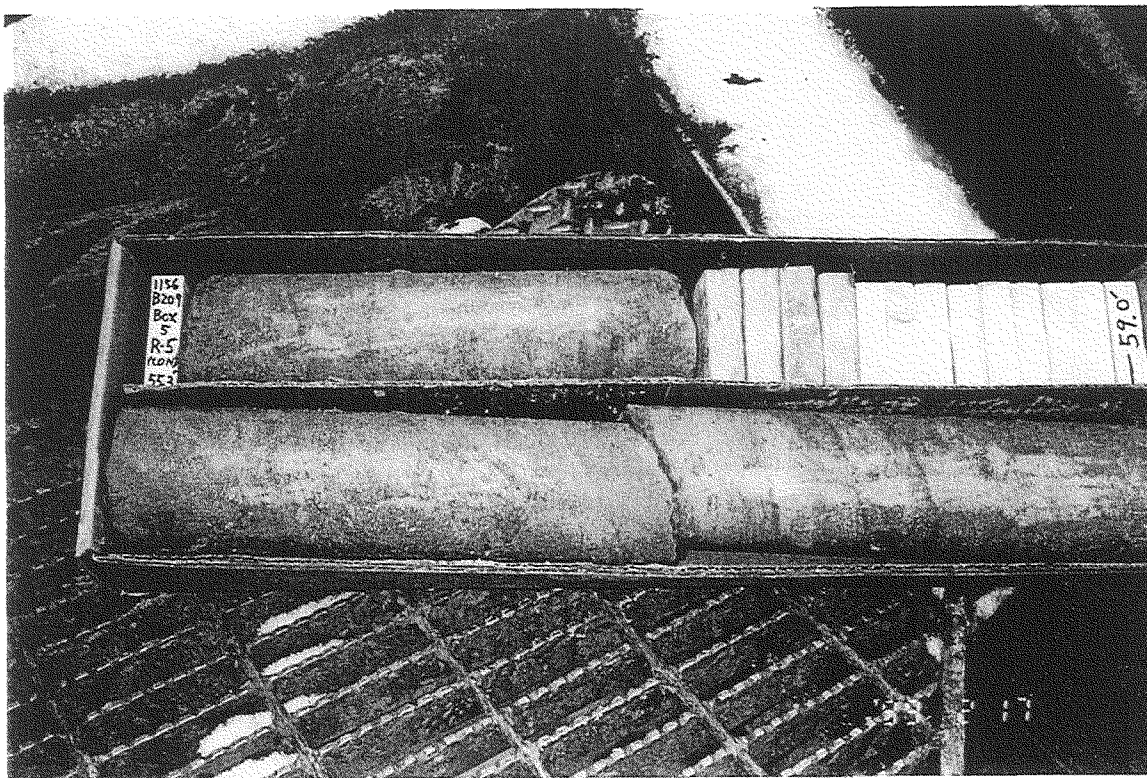
FIG.


**3-20**



|   |   |   |                  |
|---|---|---|------------------|
|  | <b>Landslide Technology</b><br>10250 S.W. Greenburg Rd.<br>Portland, OR 97223 | TITLE<br><b>CORE PHOTOGRAPHS<br/>BORING B-209</b>           | DATE<br>MAR 1999 |
|   |   | JOB<br><b>SNOW BASIN ACCESS ROAD<br/>WEBER COUNTY, UTAH</b> | JOB NO.<br>1148  |
|   |   | FIG.<br><b>3-21</b>   |                  |





|   |   |       |  |                                 |
|---|---|-------|--|---------------------------------|
|  | <b>Landslide Technology</b><br>10250 S.W. Greenburg Rd.<br>Portland, OR 97223 | TITLE | <b>CORE PHOTOGRAPHS<br/>BORING B-209</b>             | DATE<br>MAR 1999                |
|   |   | JOB   | <b>SNOW BASIN ACCESS ROAD<br/>WEBER COUNTY, UTAH</b> | JOB NO.<br>1148<br>FIG.<br>3-22 |