# APPENDIX A

# FIELD EXPLORATION PROCEDURES AND LOGS

## APPENDIX A
## FIELD EXPLORATION PROCEDURES AND LOGS
## 9-91M-13123-0

The following paragraphs describe our procedures associated with the field explorations and field tests that we conducted for this project. Descriptive logs of our explorations are enclosed in this appendix.

### Mud Rotary Boring Procedures

Our exploratory borings were advanced with a 4 7/8" tri-cone drill bit, using a truck-mounted drill rig operated by an independent drilling firm working under subcontract to AMEC. This drilling technique involved circulating a bentonite slurry or synthetic drilling mud through the hollow center of the drilling rods. The drilling fluid coats the borehole as it flows back up to the surface, carrying cuttings from the tri-cone drill bit. The cuttings and fluid flow into a tank around the drilling rods, where the cuttings are separated from the fluid. No outer casing was used as the mud was used to only to prevent heave. A geotechnical specialist from our firm continuously observed the borings, logged the subsurface conditions, and collected representative soil samples. All samples were stored in watertight containers and later transported to our laboratory for further visual examination and testing. After each boring was completed, the borehole was backfilled with a mixture of bentonite chips and soil cuttings, and the surface was patched with asphalt or concrete (where appropriate).

Throughout the drilling operation, soil samples were obtained at 2½ or 5-foot depth intervals by means of the Standard Penetration Test (SPT) per ASTM:D-1586. This testing and sampling procedure consists of driving a standard 2-inch-diameter steel split-spoon sampler 18 inches into the soil with a 140-pound hammer free-falling 30 inches. The number of blows required to drive the sampler through each 6-inch interval is counted, and the total number of blows struck during the final 12 inches is recorded as the Standard Penetration Resistance, or "SPT blow count." If a total of 50 blows are struck within any 6-inch interval, the driving is stopped and the blow count is recorded as 50 blows for the actual penetration distance. The resulting Standard Penetration Resistance values indicate the relative density of granular soils and the relative consistency of cohesive soils.

The enclosed *Boring Logs* describe the vertical sequence of soils and materials encountered in each boring, based primarily on our field classifications and supported by our subsequent laboratory examination and testing. Where a soil contact was observed to be gradational, our logs indicate the average contact depth. Where a soil type changed between sample intervals, we inferred the contact depth. Our logs also graphically indicate the blow count, sample type, sample number, and approximate depth of each soil sample obtained from the borings, as well as any laboratory tests performed on these soil samples. Groundwater depth estimates are typically based on the moisture content of soil samples.

### Well Installation Procedures

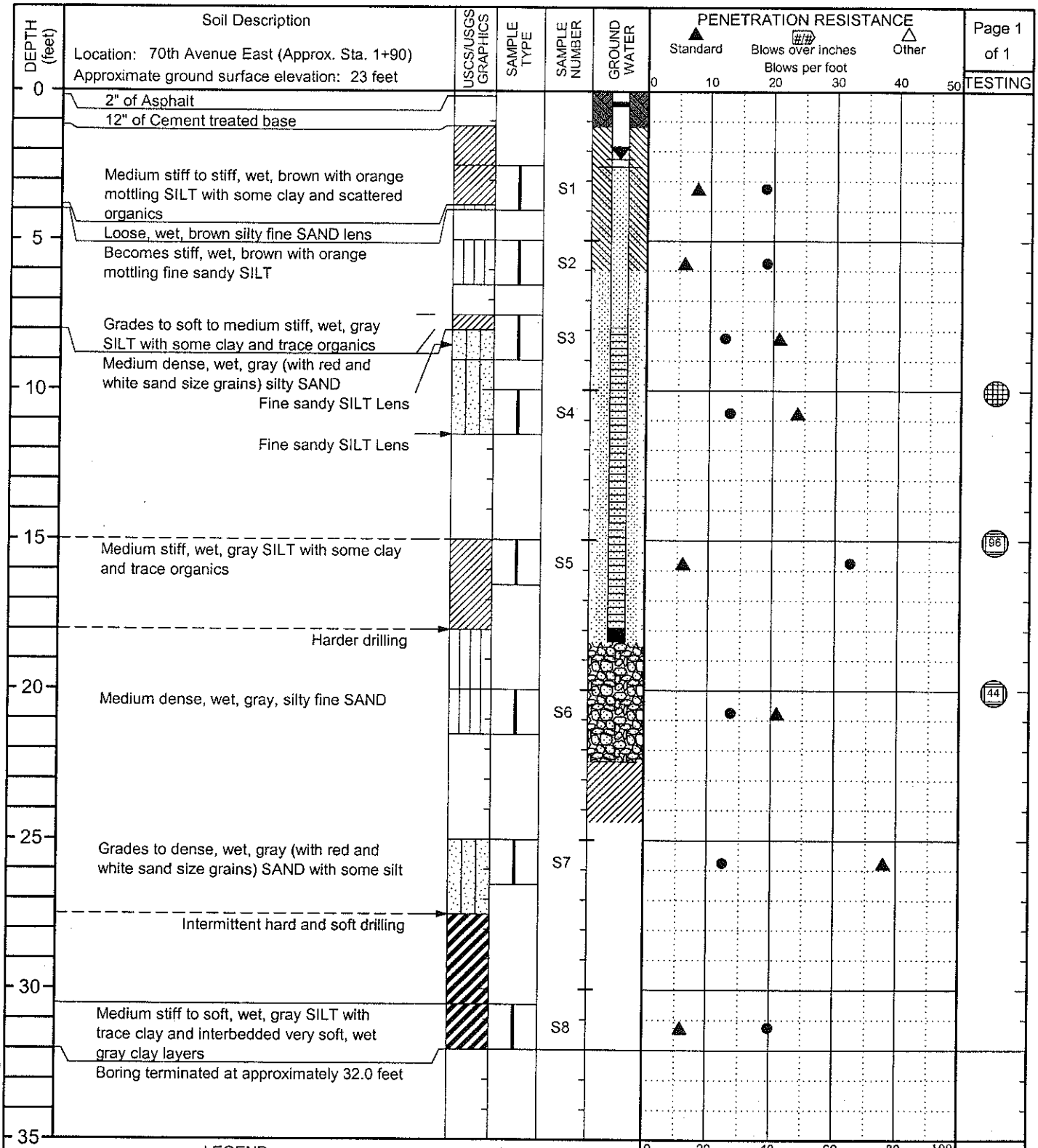
Our groundwater observation wells consist of 2-inch-diameter PVC pipe, the lower 10 feet of which is finely slotted. The annular space around the slotted segment was backfilled with clean sand and gravel, and the upper portion of annulus was sealed with bentonite chips and concrete. A flush-

mounted monument was placed over the top of each wellhead for protection. The as-built configuration of each observation well is illustrated on the respective *Boring Log*. Our logs also show any post-drilling groundwater levels measured in the wells, along with the date of measurement.

**Backhoe Test Pit Procedures**

Backhoe test pits were made across the South Oxbow area using a rubber-tired, extendable boom backhoe. Each test pit was continuously logged and observed by an experienced geotechnical engineer from our firm. Interpretive logs noting soil conditions encountered in the test pits are enclosed. The depths shown on the test pit logs are based on the inspection of the samples secured and the field logs.

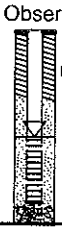
PROJECT: *City of Fife LID 98-2 Contract 3* W.O. *9-91M-13123-A* BORING No. *B-1*




LEGEND

- 2.00-inch OD split-spoon sampler
- Observed groundwater level
- Grain Size Analysis
- 200 Wash (percent fines shown)

Observation well:

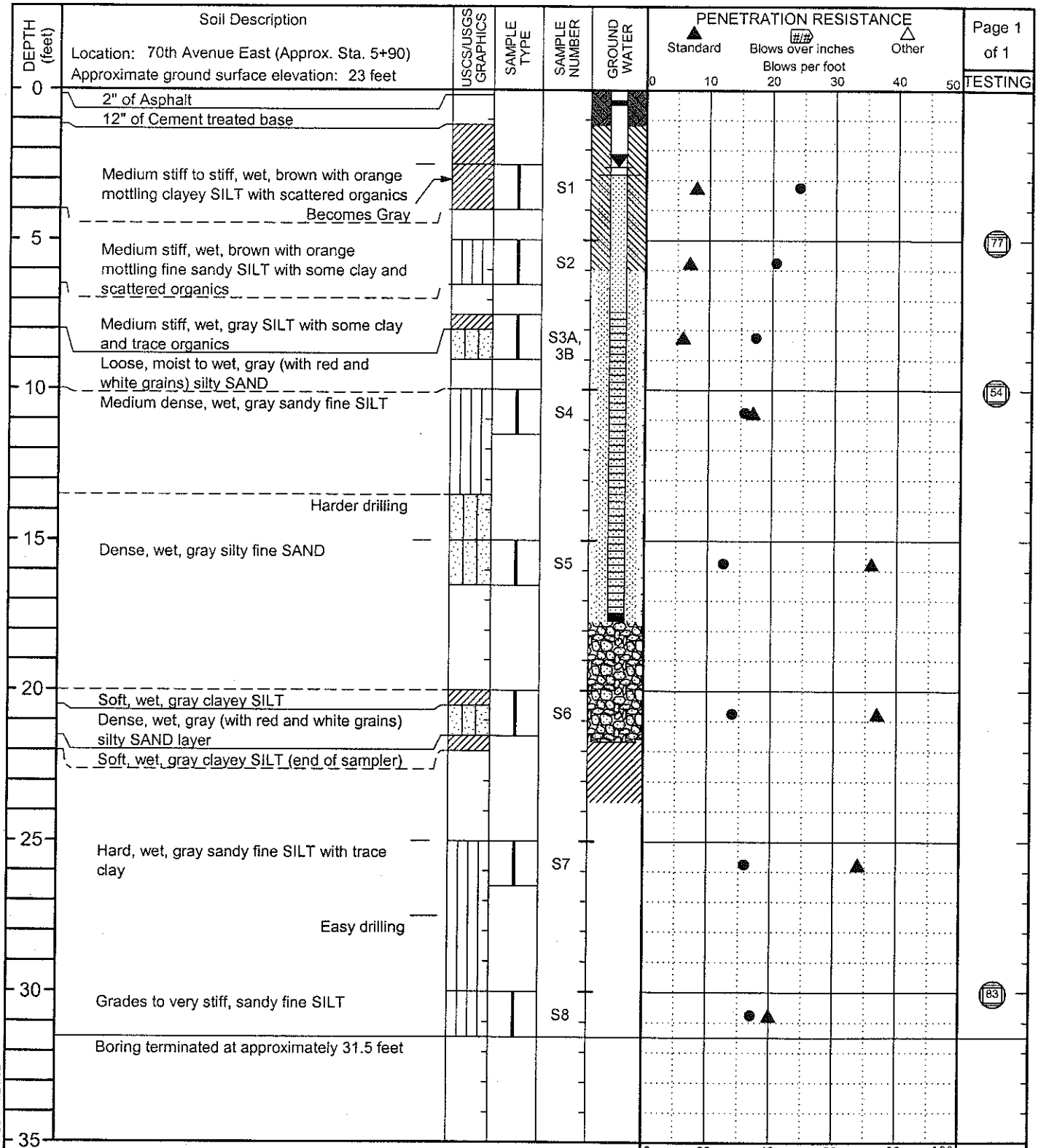



amec
11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling Method: Mud Rotary Hammer type: Cathead Date drilled: *December 20, 2001* Logged By: *ARC*

4IN1 13123A.GPJ WA4IN1.GDT 1/24/02

PROJECT: *City of Fife LID 98-2 Contract 3* W.O. *9-91M-13123-A* BORING No. *B-2*




LEGEND

- 2.00-inch OD split-spoon sampler
- Observed groundwater level
- 200 Wash (percent fines shown)

Observation well:

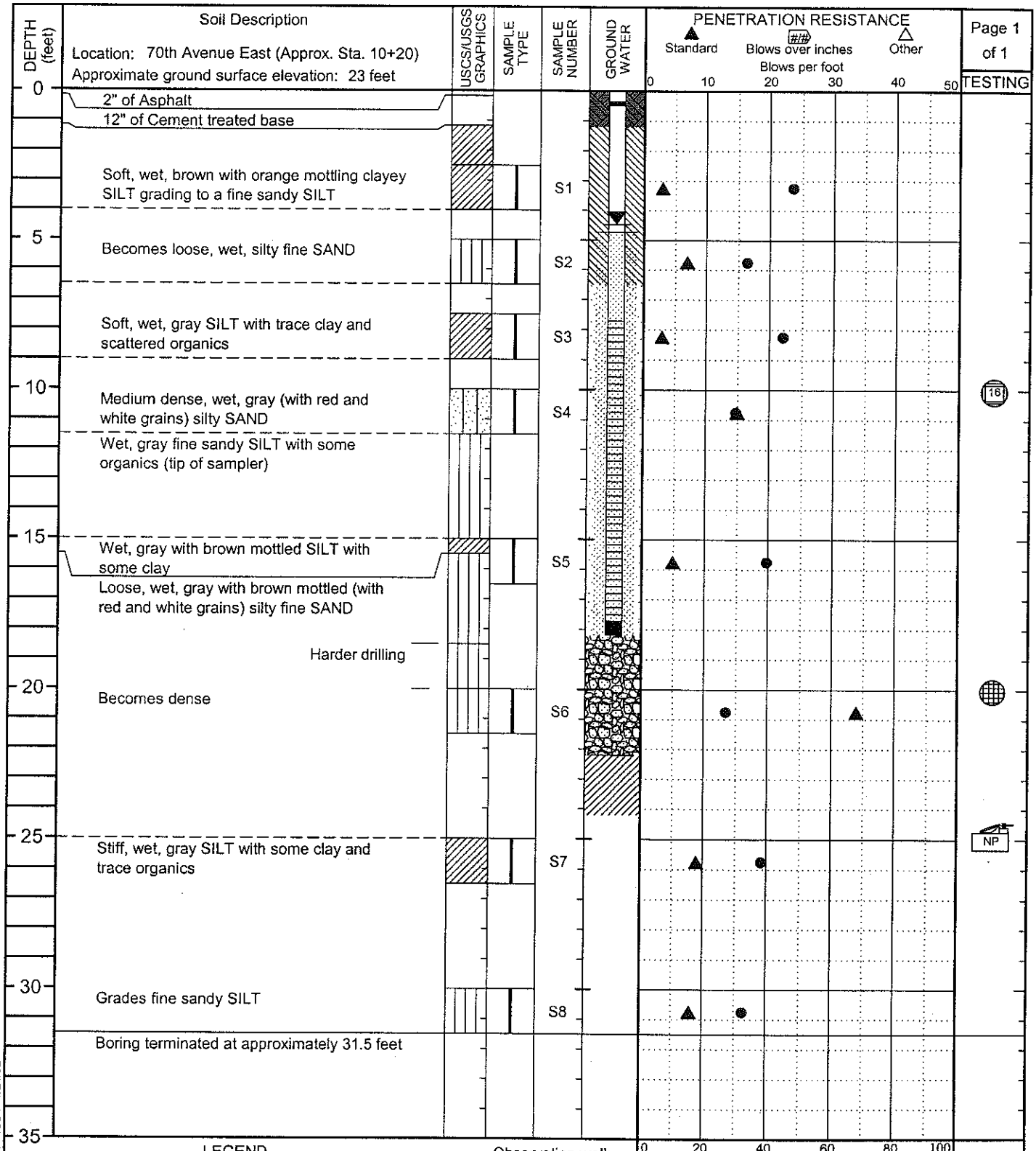
- Monument
- Bentonite Fill with PVC Pipe
- Groundwater Level
- Sand Fill with Slotted PVC Pipe
- Pipe Cap
- Slough at Bottom of Hole


amec
11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913


Drilling Method: Mud Rotary Hammer type: Cathead Date drilled: *December 21, 2001* Logged By: *ARC*

4IN1_13123A.GPJ WA4IN1.GDT 1/24/02

PROJECT: *City of Fife LID 98-2 Contract 3* W.O. *9-91M-13123-A* BORING No. *B-3*




LEGEND

- 2.00-inch OD split-spoon sampler
- Observed groundwater level
- 200 Wash (percent fines shown)
- Grain Size Analysis
- Atterberg Test (with plasiticity index shown)

Observation well:

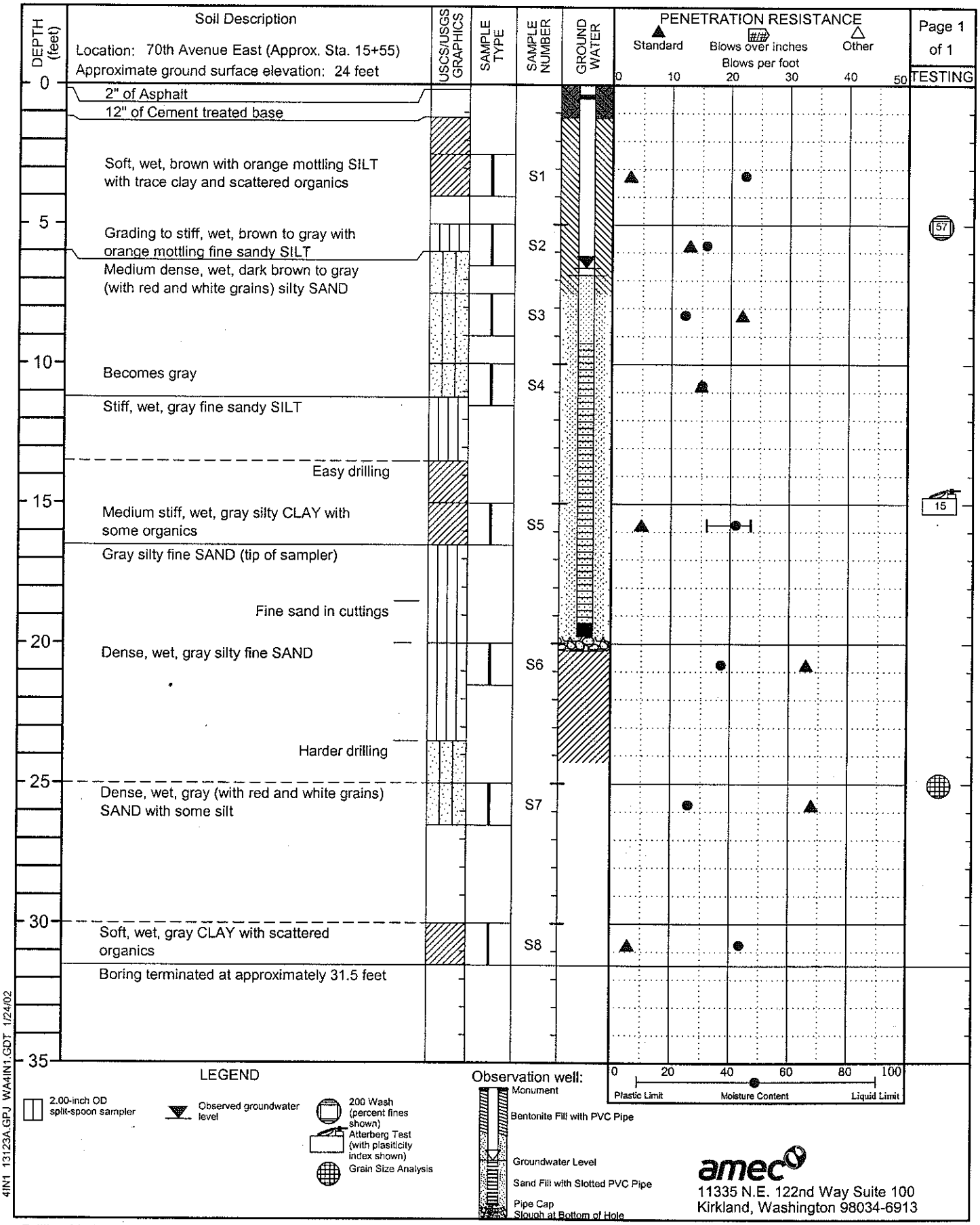
- Monument
- Bentonite Fill with PVC Pipe
- Groundwater Level
- Sand Fill with Slotted PVC Pipe
- Pipe Cap
- Slough at Bottom of Hole

amec
11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling Method: Mud Rotary Hammer type: Cathead Date drilled: *December 21, 2001* Logged By: *ARC*

4IN1 13123A.GPJ WA4IN1.GDT 1/24/02

PROJECT: *City of Fife LID 98-2 Contract 3* W.O. *9-91M-13123-A* BORING No. *B-4*




LEGEND

- 2.00-inch OD split-spoon sampler
- Observed groundwater level
- 200 Wash (percent fines shown)
- Atterberg Test (with plasitlcity index shown)
- Grain Size Analysis

Observation well:

- Monument
- Bentonite Fill with PVC Pipe
- Groundwater Level
- Sand Fill with Slotted PVC Pipe
- Pipe Cap
- Slough at Bottom of Hole


amec
11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913


Drilling Method: Mud Rotary Hammer type: Cathead Date drilled: *December 22, 2001* Logged By: *ARC*

4IN1 13123A.GPJ WA4IN1.GDT 1/24/02

# TEST PIT LOGS

9-91M-13123-0

| Depth (feet) | Material Description | Sample No. |
|---|---|---|
| | **Test Pit ATP-1** | |
| | Location: Property corner, east of oxbow<br>Approximate ground surface elevation: 20 feet | |
| 0.0 - 4.5 | Loose to medium dense, moist, dark brown, silty SAND with scattered organics | |
| 4.5 - 8.0 | Medium dense, moist, dark brown, medium SAND with trace silt | G-1 |
| 8.0 - 9.0 | Medium dense to dense, wet, dark brown with iron oxide stains, clayey silty SAND | |
| | Test pit terminated at approximately 9.0 feet<br>Severe caving at 4.5 feet<br>Slow seepage at 8 feet | |
| | **Test Pit ATP-2** | |
| | Location: Fence-line, east of oxbow<br>Approximate ground surface elevation: 20 feet | |
| 0.0 - 1.0 | Very loose to loose, moist, dark brown, silty SAND with prevalent organics | |
| 1.0 - 5.0 | Very loose to loose, moist, dark brown, silty SAND with scattered organics | |
| 5.0 - 8.5 | Medium dense, moist, dark brown, fine to medium SAND with trace silt | G-1 |
| 8.5 -9.0 | Medium dense to dense, saturated, dark brown, silty sandy GRAVEL/ gravelly SAND | G-2 |
| | Test pit terminated at approximately 9.0 feet<br>Severe caving at 1 foot<br>Slow seepage at 8.5 feet | |

| Depth (feet) | Material Description | Sample No. |
|---|---|---|

Test Pit ATP-3

Location: East side of oxbow
Approximate ground surface elevation: 14 feet

| | | |
|---|---|---|
| 0.0 - 3.0 | Soft/loose, moist to wet, dark brown, sandy SILT/silty SAND with some organics | G-1 |
| 3.0 - 4.0 | Loose to medium dense, saturated, dark brown, silty SAND | |

Test pit terminated at approximately 4.0 feet
Severe caving at 1.0 foot
Rapid seepage at 3.0 feet

Test Pit ATP-4

Location: West side of oxbow
Approximate ground surface elevation: 16 feet

| | | |
|---|---|---|
| 0.0 - 2.0 | Very loose to loose, moist, dark brown, silty SAND | |
| 2.0 - 3.0 | Loose, moist, gravelly coarse SAND with trace silt | |
| 3.0 - 8.5 | Loose to medium dense, moist to wet, dark brown, medium to fine SAND with trace silt | G-1 |

Test pit terminated at approximately 8.5 feet
Severe caving at 2.0 feet
Moderate to Rapid seepage at 8.5 feet

| Depth (feet) | Material Description | Sample No. |
|---|---|---|

Test Pit ATP-5

Location: Fence-line west of oxbow
Approximate ground surface elevation: 15 feet

| | | |
|---|---|---|
| 0.0 - 1.5 | Medium stiff/loose to medium dense, moist, dark brown, sandy SILT/silty SAND with scattered organics | |
| 1.5 - 2.0 | Loose to medium dense, wet, dark brown, coarse SAND with trace silt | |
| 2.0 - 4.0 | Medium dense, saturated, dark brown, medium to fine SAND with trace silt | G-1 |

Test pit terminated at approximately 4.0 feet
Severe caving at 2 feet
Rapid seepage at 2 feet

Test Pit ATP-6

Location: Top of slope, west of oxbow
Approximate ground surface elevation: 23 feet

| | | |
|---|---|---|
| 0.0 - 1.0 | Loose, moist, dark brown, silty sand with prevalent organics | |
| 1.0 - 7.0 | Loose to medium dense, moist, dark brown, silty SAND with trace organics | G-1 |
| 7.0 - 10.0 | Medium dense, moist, dark brown/black, medium SAND with trace silt | G-2 |
| 10.0 – 14.0 | Medium dense, moist, dark brown/black, medium to coarse SAND with trace silt | |

Test pit terminated at approximately 14 feet
Moderate to Severe caving at 7.0 feet
No seepage observed

| Depth (feet) | Material Description | Sample No. |
|---|---|---|
| | **Test Pit ATP-7** | |
| | Location: Fence-line, south of gravel driveway<br>Approximate ground surface elevation: 24 feet | |
| 0.0 - 7.0 | Loose, moist, dark brown, silty SAND with some organics | G-1 |
| 7.0 - 11.0 | Medium Stiff, moist to wet, brown with iron oxide stains, silty CLAY with some fine sand | G-2 |
| 11.0 - 14.0 | Medium dense to dense, moist to wet, dark brown/black, medium SAND with trace silt | |
| | Test pit terminated at approximately 14.0feet<br>Moderate caving at 11.0 feet<br>Moderate seepage at 14.0 feet | |
| | **Test Pit ATP-8** | |
| | Location: Field, west of brick house<br>Approximate ground surface elevation: 24 feet | |
| 0.0 - 1.0 | Loose, moist, dark brown, silty SAND with prevalent organics | |
| 1.0 - 6.0 | Loose, moist, dark brown, silty SAND with scattered organics | |
| 6.0 - 11.0 | Medium Stiff, moist to wet, brown with iron oxide stains, silty CLAY with some fine sand | G-1 |
| 11.0 - 14.0 | Medium dense to dense, wet to saturated, dark brown/black, medium SAND with trace silt | G-2 |
| | Test pit terminated at approximately 14.0 feet<br>Moderate to Severe caving at 12.0 feet<br>Moderate to Rapid seepage at 12.0 feet | |

| Depth (feet) | Material Description | Sample No. |
|---|---|---|

Test Pit ATP-9

Location: Field, North of Crowell residence
Approximate ground surface elevation: 24 feet

| | | |
|---|---|---|
| 0.0 - 7.0 | Loose, moist, dark brown, silty SAND with scattered organics | |
| 7.0 - 10.0 | Medium Stiff, moist to wet, brown with iron oxide stains, silty CLAY with some fine sand | G-1 |
| 10.0 - 13.5 | Medium dense to dense, wet, dark brown/black, medium SAND with some silt | |

Test pit terminated at approximately 13.5 feet
Moderate caving at 10.0 feet
Moderate seepage at 13.0 feet

Test Pit ATP-10

Location: Field, North Crowell property line
Approximate ground surface elevation: 24 feet

| | | |
|---|---|---|
| 0.0 - 6.5 | Loose, moist, dark brown, silty SAND with scattered organics (root at 4 feet) | |
| 6.5 - 7.5 | Medium Stiff, moist to wet, brown with iron oxide stains, silty CLAY with some fine sand | G-1 |
| 7.5 - 10.0 | Medium dense to dense, wet, dark brown/black, medium SAND with trace silt | G-2 |
| 10.0 – 11.0 | Medium stiff, wet, tan/brown/orange, sandy SILT | |
| 11.0 – 13.0 | Dense, saturated, dark brown/black, medium SAND with trace silt | |

Test pit terminated at approximately 13.0 feet
Moderate to Severe caving at 4.0 feet
Moderate seepage at 10.0 feet

Date Excavated: 20.February.2002

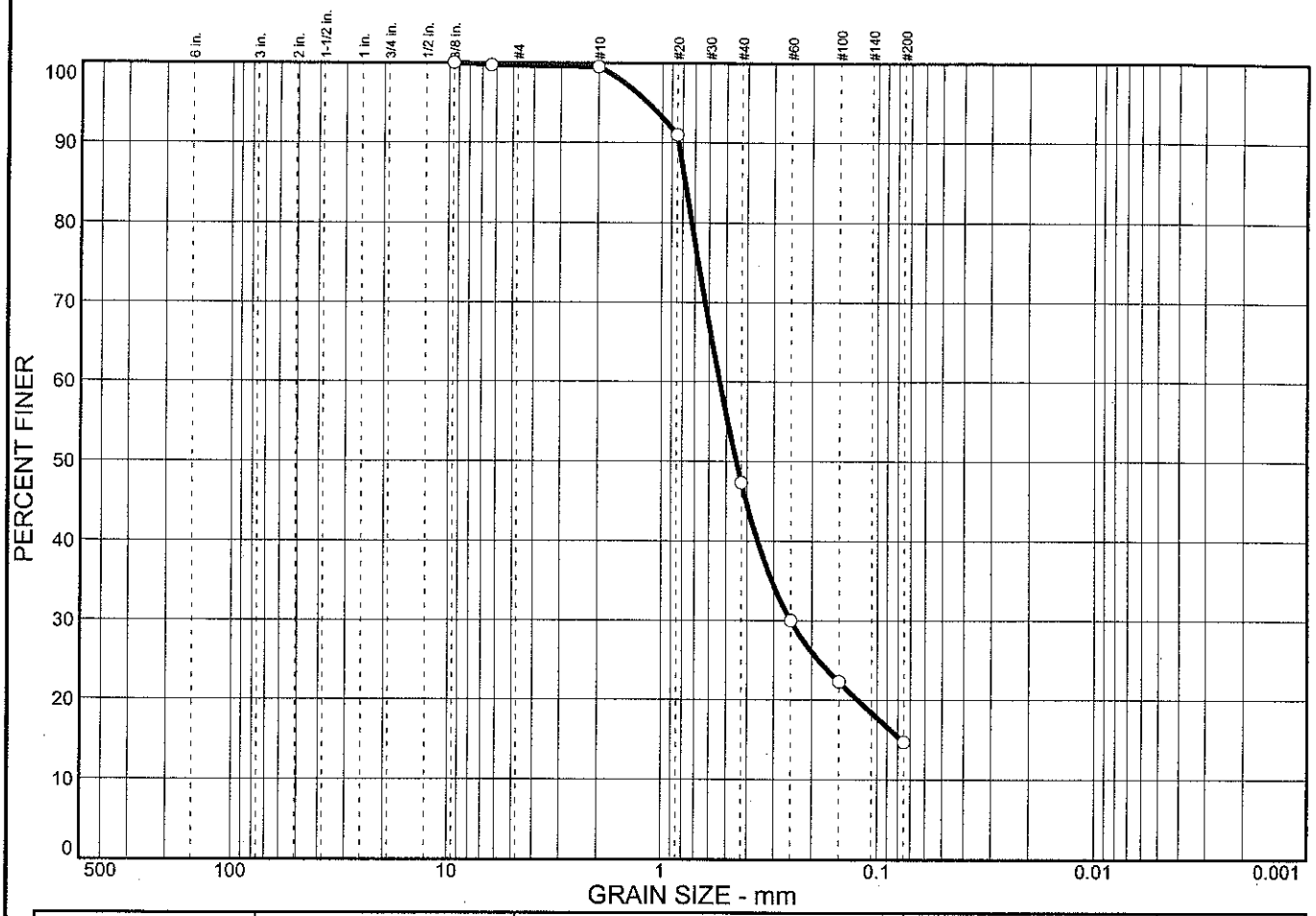
Logged by: JCR

# Appendix B

# APPENDIX B

# LABORATORY TESTING PROCEDURES AND RESULTS

# Particle Size Distribution Report




| % COBBLES | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|
| 0.0 | 0.4 | 85.0 | 14.6 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| .375 in. | 100.0 | | |
| .25 in. | 99.7 | | |
| #10 | 99.5 | | |
| #20 | 91.0 | | |
| #40 | 47.3 | | |
| #60 | 30.0 | | |
| #100 | 22.3 | | |
| #200 | 14.7 | | |

* (no specification provided)

**Soil Description**

Reddish brown silty sand
Moisture=26.5%

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{85}$= 0.779 $D_{60}$= 0.535 $D_{50}$= 0.449
$D_{30}$= 0.250 $D_{15}$= 0.0772 $D_{10}$=
$C_u$= $C_c$=

**Classification**

USCS= AASHTO=

**Remarks**

Tested by: SS/YY Reviewed by: ML
ASTM: C136, D1140, D2216
Sampled: 1/03/02

**Sample No.:** 4785.4 **Source of Sample:** **Date:** 1/07/01
**Location:** B-1, S-4 **Elev./Depth:** 10'

amec

**Client:** City of Fife
**Project:** Fife Lid 98-2

**Project No:** 9-91M-13123-O **Plate**

# Particle Size Distribution Report


| % COBBLES | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|
| 0.0 | 0.0 | 63.4 | 36.6 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #10 | 100.0 | | |
| #20 | 99.1 | | |
| #40 | 99.1 | | |
| #60 | 95.9 | | |
| #100 | 78.3 | | |
| #200 | 36.6 | | |

* (no specification provided)

**Soil Description**

Brown silty sand
Moisture=27.0%

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{85}$= 0.176 $D_{60}$= 0.107 $D_{50}$= 0.0917
$D_{30}$= $D_{15}$= $D_{10}$=
$C_u$= $C_c$=

**Classification**

USCS= SM AASHTO=

**Remarks**

Tested by:SS/YY Reviewed by: ML
ASTM: C136, D1140, D2216
Sampled: 1/03/02

**Sample No.:** 4785.22 **Source of Sample:** **Date:** 1/07/02
**Location:** B-3, S-6 **Elev./Depth:** 20'

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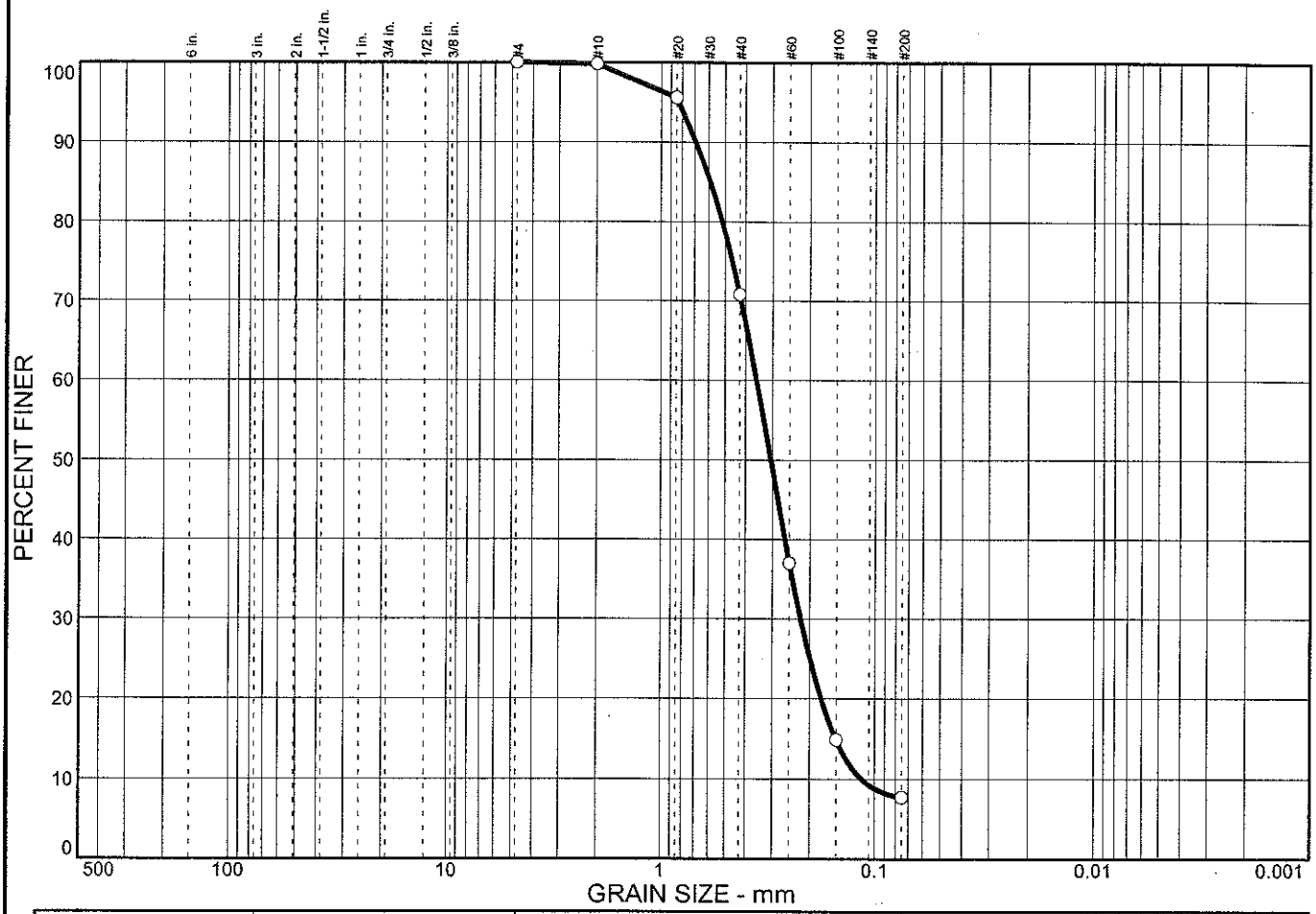
**Client:** City of Fife
**Project:** Fife Lid 98-2

**Project No:** 9-91M-13123-O **Plate**

# Particle Size Distribution Report




| % COBBLES | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|
| 0.0 | 0.0 | 92.3 | 7.7 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| #4 | 100.0 | | |
| #10 | 99.8 | | |
| #20 | 95.6 | | |
| #40 | 70.8 | | |
| #60 | 37.0 | | |
| #100 | 14.9 | | |
| #200 | 7.7 | | |

* (no specification provided)

**Soil Description**

Dark brown sand some fines
Moisture=26.0%

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{85}$= 0.589 $D_{60}$= 0.356 $D_{50}$= 0.306
$D_{30}$= 0.221 $D_{15}$= 0.151 $D_{10}$= 0.115
$C_u$= 3.10 $C_c$= 1.19

**Classification**

USCS= SP-SM AASHTO=

**Remarks**

Tested by: SS/YY Reviewed by: ML
ASTM: C136, D1140, D2216
Sampled: 1/03/02

**Sample No.:** 4785.31 **Source of Sample:** **Date:** 1/07/02
**Location:** B-4, S-7 **Elev./Depth:** 25'

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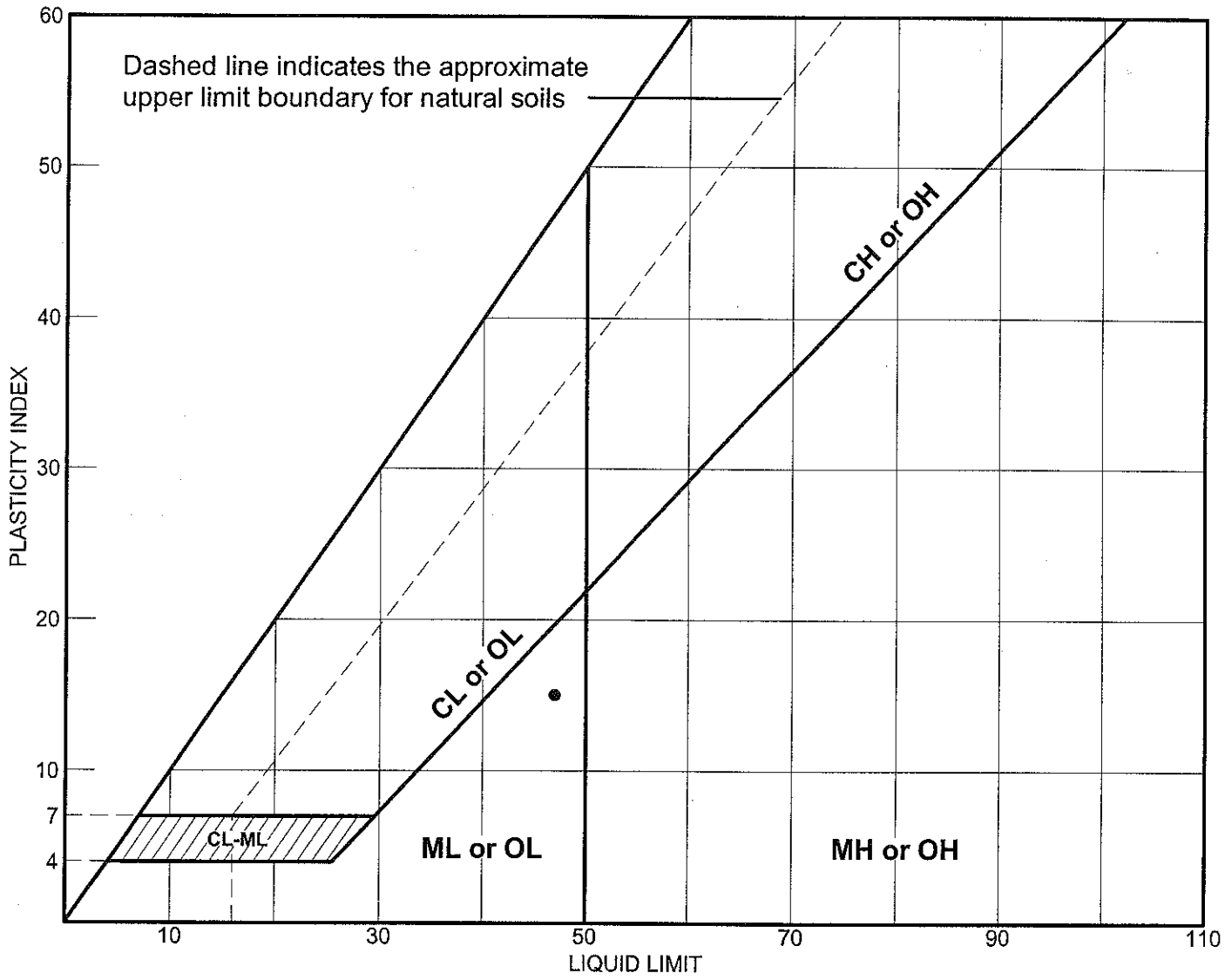
**Client:** City of Fife
**Project:** Fife Lid 98-2

**Project No:** 9-91M-13123-O **Plate**

# LIQUID AND PLASTIC LIMITS TEST REPORT




| SOIL DATA | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | NATURAL WATER CONTENT (%) | PLASTIC LIMIT (%) | LIQUID LIMIT (%) | PLASTICITY INDEX (%) | USCS |
| ● | B4, S5 | 4785.29 | 15' | 41.9 | 32 | 47 | 15 | |

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**Client:** City of Fife
**Project:** Fife Lid 98-2

**Project No.:** 9-91M-13123-O

**Plate**

# MOISTURE CONTENT AND INPLACE DENSITY

**ASTM: D2216-92, D1140-97, D2937-94**

Job Name: Fife Lid 98-2 Client: City of Fife
Job Number: 9-91M-13123-O
Date: 1/04/02
DateSampled: 1/03/02

| ID Number: | 4785.1 | 4785.2 | 4785.3 | 4785.7 | 4785.8 | 4785.9 | 4785.11 | 4785.13 |
|---|---|---|---|---|---|---|---|---|
| Exploration: | B-1 | B-1 | B-1 | B-1 | B-1 | B-2 | B-2 | B-2 |
| Sample Number: | S-1 | S-2 | S-3 | S-7 | S-8 | S-1 | S-3 | S-5 |
| Depth: | 2.5' | 5.0' | 7.5' | 25' | 30.5' | 2.5' | 7.5' | 15' |
| Sample Description: | Reddish brown silty sand | Reddish brown sandy silt | Brown silty sand | Dark brown silty sand | Gray sandy silt | Brown sandy silt | Reddish brown silty sand | Dark brown silty sand |
| Wet sample + tare: | 643.9 | 552.3 | 560.5 | 651.0 | 488.1 | 581.6 | 472.2 | 712.6 |
| Dry sample + tare: | 528.8 | 460.7 | 493.2 | 564.9 | 412.2 | 463.1 | 407.9 | 614.0 |
| Water: | 115.1 | 91.6 | 67.3 | 86.1 | 75.9 | 118.5 | 64.3 | 98.6 |
| Tare: | 221.1 | 218.1 | 221.8 | 220.4 | 220.8 | 219.4 | 222.8 | 219.7 |
| Moisture Content: | 37.4% | 37.8% | 24.8% | 25.0% | 39.7% | 48.6% | 34.7% | 25.0% |

| ID Number: | 4785.14 | 4785.15 | 4785.17 | 4785.18 | 4785.19 | 4785.21 | 4785.23 | 4785.24 |
|---|---|---|---|---|---|---|---|---|
| Exploration: | B-2 | B-2 | B-3 | B-3 | B-3 | B-3 | B-3 | B-3 |
| Sample Number: | S-6 | S-7 | S-1 | S-2 | S-3 | S-5 | S-7 | S-8 |
| Depth: | 20' | 25' | 2.5' | 5' | 7.5' | 15' | 25' | 30' |
| Sample Description: | Brown silty sand | Brown silty sand | Brown sandy silt | Brown sandy silt | Brown silt | Brown and gray silt | Grayish brown sandy silt | Brown silt |
| Wet sample + tare: | 779.2 | 702.0 | 544.7 | 476.9 | 664.6 | 747.0 | 62.5 | 571.1 |
| Dry sample + tare: | 643.2 | 577.9 | 420.0 | 397.3 | 508.5 | 579.5 | 45.8 | 469.1 |
| Water: | 136.0 | 124.1 | 124.7 | 79.6 | 156.1 | 167.5 | 16.7 | 102.0 |
| Tare: | 156.7 | 188.3 | 155.8 | 155.4 | 155.2 | 156.1 | 2.3 | 157.5 |
| Moisture Content: | 28.0% | 31.9% | 47.2% | 32.9% | 44.2% | 39.6% | 38.4% | 32.7% |
| Notes: | | | | | | | Non-plastic | |

| ID Number: | 4785.25 | 4785.27 | 4785.28 | 4785.30 | 4785.32 | | | |
|---|---|---|---|---|---|---|---|---|
| Exploration: | B-4 | B-4 | B-4 | B-4 | B-4 | | | |
| Sample Number: | S-1 | S-3 | S-4 | S-6 | S-8 | | | |
| Depth: | 2.5' | 7.5' | 10' | 20' | 30' | | | |
| Sample Description: | Brown sandy silt | Reddish brown silty sand | Reddish brown silty sand | Brown sandy silt | Brown silt | | | |
| Wet sample + tare: | 556.2 | 590.8 | 531.1 | 649.6 | 793.1 | | | |
| Dry sample + tare: | 432.2 | 505.8 | 445.3 | 519.0 | 599.9 | | | |
| Water: | 124.0 | 85.0 | 85.8 | 130.6 | 193.2 | 0.0 | 0.0 | 0.0 |
| Tare: | 156 | 159.1 | 162.4 | 165.9 | 156.6 | | | |
| Moisture Content: | 44.9% | 24.5% | 30.3% | 37.0% | 43.6% | | | |

Reviewed by: _____

AMEC Earth and Environmental, Inc.

# MOISTURE CONTENT AND MINUS 200 WASH

**ASTM: D2216-92, D1140-97, D2937-94**

Job Name: Fife Lid 98-2
Job Number: 9-91M-13123-O
Date Sampled: 1/03/02

| ID Number: | 4785.5 | 4785.6 | 4785.10 | 4785.12 | 4785.16 | 4785.20 | 4785.26 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Exploration: | B-1 | B-1 | B-2 | B-2 | B-2 | B-3 | B-4 | | | |
| Sample Number: | S-5 | S-6 | S-2 | S-4 | S-8 | S-4 | S-2 | | | |
| Depth: | 15' | 20' | 5' | 10' | 30' | 10' | 15' | | | |
| Sample Description: | Brown silt | Dark brown silty sand | Brown & orange streaked silt | Dark brown sandy silt | Brown sandy silt | Dark brown silty sand | Brown sandy silt | | | |
| Wet sample + tare: | 760.5 | 758.2 | 443.0 | 490.5 | 479.1 | 470.3 | 519.2 | | | |
| Dry sample + tare: | 628.2 | 681.4 | 368.6 | 417.7 | 405.3 | 405.5 | 439.4 | | | |
| Water: | 132.3 | 76.8 | 74.4 | 72.8 | 73.8 | 64.8 | 79.8 | | | |
| Tare: | 424.1 | 400.1 | 187.9 | 186.0 | 188.7 | 186.6 | 187.5 | | | |
| Moisture Content: | 64.8% | 27.3% | 41.2% | 31.4% | 34.1% | 29.6% | 31.7% | | | |
| Washed sample + tare | 431.4 | 557.9 | 228.7 | 292.5 | 225.2 | 370.7 | 295.7 | | | |
| % -200 Wash | 96.4% | 43.9% | 77.4% | 54.0% | 83.1% | 15.9% | 57.0% | | | |

Reviewed by: _____

AGRA Earth and Environmental, Inc.

# APPENDIX C
# GEORESOURCES REPORT
# ON CMC - HEARTLAND PROPERTY

**GeoResources**
4924 - 109th St. SW
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September 7, 1998

CMC Heartland Partners
597 West Jackson Blvd, Suite 1510
Chicago, IL 60661

Attention: Mr. Gary Carlson

Report
Geotechnical Engineering Services
Proposed Wapato Site Development
Pierce County near Fife, Washington
Job: CMC.01

## INTRODUCTION

This report presents the results of our geotechnical engineering and hydrogeologic services for the Wapato residential community site to be located near Fife, Washington. The project site is generally located between 54th and 72nd Avenue East, and Levee Road North and the UP Railroad tracks in Pierce County near Fife, Washington. The location of the site is shown on the Vicinity Map, Figure 1.

Our understanding of the project is based on our meetings and discussions with you and Mr. Larry Petersen of ESM, our experience in the area and our site observations. We understand that you propose to develop the site generally for residential uses with possible select areas of commercial facilities. We expect that associated roadways and utilities will be provided.

## SCOPE

The purpose of our services is to evaluate the surface and subsurface conditions at the site as a basis for providing conceptual geotechnical recommendations and design criteria for the construction of the proposed site development. In addition, we address applicable critical area regulations.

Our work to date includes the proposed Phase 1 and 2 work presented in our April 27, 1998 proposal. Specifically, our scope of services for these phases of the project includes the following:

**Phases 1 & 2**

1. Review the available geologic and geotechnical data for the site area.
2. Conduct a geologic reconnaissance of the site area.
3. Explore the shallow subsurface conditions at the site by monitoring the excavation of track-hoe test pits. We expect approximately 2 days of track-hoe services will be required.
4. Conduct CPTs at select locations at the site to evaluate the deeper subsurface conditions. We expect 4 to 6 tests can be completed concurrently with the track-hoe test pit excavations. Piezometers will be constructed in select cone test openings where possible.
5. Presentation of our site observations and preliminary conclusions in a technical memo and project meeting.

Based on our discussions at the June project meeting, it was determined that the construction of shallow utilities may be feasible at the site. Therefore, the Phase 3 portion of our proposal was determined to not be necessary at this time, and that the report should be completed with the existing data. An environmental site evaluation is currently underway and will forwarded under separate cover.

Fraser glaciation, approximately 15,000 to 13,500 years ago. Weathering and erosion that has occurred since that time has resulted in the formation of a surficial soil layer, but has not significantly modified topography at the site. A description of the surficial soils is included in the "**Site Soils**" section of this report.

The soils at the site generally consist of alluvial fine to medium sand with variable silt content. Lenses of silt, sandy silt, sand with gravel and occasional peat or organic silt occur at depth. In addition, localized areas with logs and other large organic debris were encountered in our test pit excavations. The large organic debris was encountered at depths of 12 to 16 feet below the existing ground surface. We expect that these materials were deposited during significant ancient flood events of the Puyallup River.

**SITE SOILS**

The SCS (Pierce County Soil Conservation Survey) soil maps indicate that the soils at the site generally consist of Sultan silt loam (42A) and Puyallup fine sandy loam (31A). A localized area of Puget silty clay loam occurs in the west portion of the site. Pilchuck fine sand is mapped in the wetland and old ox-bow areas along the southern margin of the site. These soils (29A, 30A, 31A and 42A) typically form in mixed alluvial soils and have no to a slight erosion hazard. A copy of the SCS soils map for the site area is included as Figure 3.

A building site development guideline is identified in the SCS related to high soil moisture content of most of these soils. Typically, slabs-on-grade constructed on these soils require soil moisture barriers.

We observed no evidence of active erosion on the site during our reconnaissance. Based on our observations, the site soils appear to have a low to moderate susceptibility to erosion under the existing vegetated conditions.

**SUBSURFACE CONDITIONS**

The soil and ground water conditions at the site were evaluated by observing the excavation 26 track-hoe test pits, advancing 5 CPT's (Cone Penetrating Petrometers) and reviewing the available water well logs for the site area. The test pits ranged in depth from 8.5 feet to 17 feet below the existing ground surface. The CPT probes extended to 60 feet below the existing site grades. The approximate locations of the test pit explorations are shown on Figure 2 and 3. Logs of the conditions encountered in the test pits are presented in Appendix A.

CPT's were advanced at five locations across the site to evaluate the deeper subsurface conditions. The CPT's advanced at the siter anged in depth from approximately 28 to 60 feet below the existing ground surface. The approximate locations of the CPT's is shown on Figure 2 and 3. Logs of the conditions encountered in the CPT's are presented in Appendix B with a brief description of the CPT procedure.

We also reviewed 38 water well logs identified within approximately ½- mile radius of the site from ECOLOGY (Washington State Department of Ecology) files. The well logs indicate that the water wells in the site area extend to depths of 30 to 338 feet below the adjacent ground surface. Many of the deeper wells have static water levels within several 10's of feet from the ground surface, indicating a confined or semi-confined condition. Several of the deeper wells were noted as having flowing or artesian conditions. Copies of the well logs are presented in Appendix C.

Based on published geologic maps of the area, our site observations and the subsurface data, the site is generally underlain by alluvial deposits. The soils encountered in the subsurface explorations generally consist of fine to medium sand with variable silt and occasional gravel, and silt with variable fine sand and occasional organic debris. The soils are interbedded or layered which is typical of alluvial deposits.

A surficial mantling of organic rich silty sand and sandy silt occurs on portions of the site, typically associated with areas of heavy vegetation. The thickness of the organic rich soil, where present, ranges from about 3 to 12 inches. We expect that the thickness of this material will increase in the low areas of the site. Based on our experience up to 3 feet of organic rich soils may occur near or in the wetland areas.

Specifically, the site area can be divided into two areas based on the soil conditions encountered. The area north of Wapato Creek (northeast portion of the site) consists of loose to medium dense, fine to

**Ground Water Flow**

Ground water flow has both vertical and horizontal components. In the Wapato project area, the primary vertical component of flow is downward percolation into the relatively permeable weathered alluvial deposits. A portion of the infiltrated water is perched on the shallow silty soils and likely flows laterally. Where the silty soils area absent, or over time, the infiltrated water percolates through the native soil deposits and into (recharging) the deeper alluvial aquifer system.

The horizontal direction of ground water flow for the two aquifer systems in the site area is likely to the south west towards the Puyallup River, with the exception of the northeast portion of the site where flow is likely to wards Wapato Creek. Local variations in the flow direction may occur, primarily because of the influence of local surface topography, Wapato Creek, wetlands and/or soil lithology.

**Water Budget**

A water budget quantitatively describes the relationship between the input of water (primarily precipitation or irrigation) and the loss of water (mainly by storm water runoff, evapotranspiration, overland flow, shallow subsurface storm flow, and ground water recharge). As the site is developed, some of the existing vegetative cover and agricultural areas at the site will be replaced by hard/impervious surfaces (houses, streets, sidewalks) and landscape areas (grass, flowers and shrubs). The potential net effect of these changes on surface water runoff, evapotranspiration and ground water recharge was evaluated by calculating a preliminary water budget for the site.

A water budget for a typical water year (October to September) was calculated using weather data observed at the Puyallup experiment station, the soil and vegetation at the site, information on land use in the vicinity of the site and the proposed development plan. Evapotranspiration values for the water budget are based on monthly precipitation, temperature and vegetation/soil data. Storm runoff values are based on SCS soil properties for site soils and our site observations.

An average of 35.6 inches of precipitation is estimated to fall in the site area, based on historic rainfall data for the general site area (NOAA).

Under the existing conditions, we estimate that significant storm events may result in as much as 1.0 inch of surface water runoff. Approximately 16.4 inches of water is potentially removed from the infiltrated water as evapotranspiration by vegetation under existing conditions. Therefore, under existing conditions, the remaining 18.2 inches of precipitation per year is retained within the soil and potentially recharges the aquifer.

**Water Budget-Existing Conditions**

| | |
|---|---|
| Annual Precipitation | 35.6 inches |
| Approximate Distribution | Amount |
| Surface Water Runoff | 1.0 inch |
| Evapotranspiration | 16.4 inches |
| Potential Ground Water Recharge | 18.2 inches |
| | 35.6 inches Total |

The south and southwest portions of the site (wetland areas) will likely remain undisturbed. In addition, the areas adjacent to Wapato Creek will be left undisturbed. We estimate that approximately 30 acres of the site will remain as undisturbed wetland, riparian zone, wildlife habitat area and associated buffers. No changes in runoff or groundwater recharge are expected in these areas. A portion of the site will likely remain as open space with some modification of the vegetative cover (active open space and landscape areas). Change in these areas will be minimal.

There is likely little or no surface water runoff (overland flow) at the site under the existing conditions. Based on the current proposal, a portion of the site will be converted to impervious surface as

values and SPT blow counts, some of the soils are in a loose condition and saturated with groundwater. These conditions are typical of alluvial valley soils throughout the Puget Sound region. Loose saturated sandy soils have a significant risk of liquefaction during a strong motion earthquake. The potential liquefaction impacts are discussed in detail in the "**Liquefaction**" section of this report.

Based on our discussion with Mr. Larry Peterson of ESM, Inc. and our review of the site plans, minimal grading is required to reach design grades at the site. The shallow native soils at the site generally consist of silty sand and sandy silt. This material is suitable for use as structural fill under dry weather conditions. Many of the shallow site soils have moisture contents that at or above the optimum moisture content in their current condition. Areas of significant groundwater seepage were encountered in our subsurface explorations. It may be necessary to dry or moisture condition the soils to achieve the recommended compaction.

Wet weather conditions will result in above optimum moisture content and make it difficult if not impossible to achieve the recommended compaction. To reduce grading and construction costs, we recommend that earthwork be undertaken during dry weather conditions. This is discussed in further detail in the "**Structural Fill**" section of this report.

We recommend that residential and light weight commercial structures be supported on shallow spread and/or strip footings founded on a minimum of 1.5 feet of adequately compacted sand and gravel (minimum 15 percent plus ¾-inch and 0 percent plus 4 inches). The imported fill material should be placed over a geotextile fabric.

Roadway subgrade construction will likely require the import of a pit run sand and gravel material to achieve the appropriate support and drainage. Specific recommendations are provided in the "**Pavement Subgrade**" section of this report.

It is our opinion that the site can be developed as proposed without significantly affecting existing ground water conditions at the site or the adjacent area. Seasonal variations in precipitation and the resultant ground water fluctuations are likely to have a greater impact on the local and/or regional ground water table than the proposed development. Potential changes in the site area ground water recharge and flow direction will be dependent on the amount of on-site stormwater infiltrated. If the post-development ground water recharge conditions are equivalent to the existing conditions, no impacts to ground water are expected.

Our specific geotechnical recommendations for the site are discussed in detail in the following sections.

## SLOPE STABILITY

Slopes at the site are generally flat to gently sloping. Localized areas of steeper slopes, typically between 15 and 50 percent occur near the wetlands, ox-bow and Wapato Creek areas. The slopes in these areas generally have less than 10 feet of vertical relief. Therefore, these slope areas do not meet the technical criteria of a Landslide Erosion Hazard Area per Pierce County Title 21 or City of Fife regulations.

## LIQUIFACTION

Liquefaction is a temporary loss of shear strength in a saturated soil mass subjected to cyclical shaking. Ground shaking of sufficient magnitude and duration must occur to induce liquefaction of the soil. As a general practice, a design earthquake of Magnitude 6.5 with a peak acceleration of 0.2g (a one in 100 year seismic event) has been adopted by the Seattle DCLU.

The effects of liquefaction may be manifested by sand boils, lateral spreading, slope failures, or seismically induced aerial settlement. Because of the site grades and surrounding grades, it is our opinion that the risk of lateral spreading or slope failure appears to be minimal at this site. Heavily loaded foundations supported directly above liquefiable soils may suffer from large total and differential settlement during and following a seismic event of sufficient magnitude.

Shallow foundation techniques such as recommended in our report entail the support of the building foundations above the prism of structural fill. We recommend in our report that the prism of structural fill be compacted. Accordingly those soils providing direct support of the structures are not considered to be

Wapato Creek is located in the northeast portion of the site. To reduce the risk of potential impact to the creek waters, we recommend that during construction stormwater runoff from the disturbed areas be collected and retained way from this area. The relatively permeable surface and near-surface soils at the site are suitable and have adequate storage capacity for the infiltration of some stormwater. Temporary facilities can be used during construction until the final location and design of the permanent stormwater control facilities are completed. The native granular soils at the site will filter the infiltrated water before it reaches ground water resources.

## EARTHWORK

### Site Preparation

All areas to be graded should be cleared of surface and subsurface deleterious matter including any existing structures, foundations, abandoned utility lines, debris, trees and associated stumps and roots, and underbrush. Graded areas should be stripped of any remaining forest duff and organic-laden soils. Based on our explorations, we estimate that stripping on the order of 1 to 3 inches in the active agricultural area and 3 to 12 inches in the generally undisturbed areas may be necessary to remove the root zone and remaining surficial soils containing organics. Areas with deeper, unsuitable organics should be expected in low lying, drainage or wetland areas. Stripping depths of up to 3 feet are likely in these areas.

If the clearing operations cause excessive disturbance, additional stripping depths may be necessary. Disturbance to a greater depth should be expected if site preparation work is done during periods of wet weather, or if the surficial soil is over optimum.

The organic-laden strippings can be stockpiled on-site and used later for landscaping purposes. Materials which cannot be used for landscaping should be removed from the project site and wasted.

Prior to placement of fill, the exposed subgrade areas should then be compacted to a firm and unyielding surface. In fill areas, we recommend that trees be removed by overturning so that a majority of the roots are removed. Excavations for tree stump removal should be backfilled with structural fill compacted to the densities described in the "Structural Fill" section of this report.

We recommend that a member of our staff evaluate the exposed subgrade conditions after removal of vegetation and topsoil stripping is completed and prior to placement of structural fill in the building and pavement areas. The exposed subgrade soil should be proofrolled with heavy rubber-tired equipment during dry weather or probed with a 1/2-inch-diameter steel rod during wet weather.

Any soft, loose or otherwise unsuitable areas delineated during proofrolling or probing should be recompacted, if practical, or overexcavated and replaced with structural fill, based on the recommendations of our site representative.

### Structural Fill

All fill beneath structures or pavements, within utility trenches (below structures or pavements), and backfill adjacent to structures should be placed as structural fill. Structural fill material should be free of debris, organic contaminants and rock fragments larger than 6 inches. All structural fill 2 feet or more below the structural support depth (i.e. footing subgrade) should be uniformly compacted to at least 90 percent of the MDD (maximum dry density) determined in accordance with ASTM D-1557. We recommend that structural fill material within 2 feet of bearing subgrade be compacted to 95 percent of the MDD determined in accordance with ASTM D-1557.

The lift size used during placement and compaction will depend on the moisture and gradation characteristics of the soil and the type of compaction equipment being used. We recommend that the appropriate lift thickness be evaluated by our field representative during construction.

If necessary, the fill material should be moisture conditioned to near-optimum moisture content prior to compaction. During fill and backfill placement, sufficient testing of in-place density should be performed to verify that adequate compaction is being achieved.

### Suitability of On-Site Materials as Fill

During dry weather construction, any nonorganic on-site soil may be considered for use as structural fill, provided it meets the criteria described above in the structural fill section and can be compacted as

break material should be connected to a suitable outlet to provide an exit for any accumulated seepage. A vapor barrier, such as a polyethylene liner, should be used. A thin layer of "clean" sand may be placed over the vapor barrier and immediately below the slab to protect the polyethylene liner during steel and/or concrete placement.

A subgrade modulus of 250 kcf (kips per cubic foot) may be used for design. We estimate that settlement of the floor slabs designed and constructed as recommended, will be 1/2 inch or less over a span of 50 feet.

**LATERAL RESISTANCE**

Lateral loads may be resisted by friction on the base of footings and floor slabs and as passive pressure on the sides of footings. We recommend using a coefficient of friction of 0.4 for friction between the concrete and silty soils, and a value of 0.5 for sandy soils.. Passive pressure may be determined using an equivalent fluid weight of 400 pcf (pounds per cubic foot). This assumes that structural fill is placed against the sides of the footings. A safety factor of 1.5 should be applied to these values.

**RETAINING AND SUBGRADE WALLS**

Retaining and/or subgrade walls can be supported on shallow footings founded on medium dense to dense native soils or structural fill, if properly prepared. Footings bearing on undisturbed native soils or structural fill as described above can be designed using an average allowable bearing value of 1,500 psf with a maximum toe pressure of 2,000 psf. We recommend that all footing excavations be evaluated by a member of our staff to determine that suitable bearing soils are present. Design values for retaining structures on steep slopes can be provided at your request when the final plat layout is completed.

Lateral loads on retaining structures founded as described above may be resisted by friction on the base of the wall footings and as passive pressure on the sides of footings. We recommend using a coefficient of friction of 0.4 to calculate friction between the concrete and silty native soils or 0.5 on sandy soils or properly prepared structural fill. Passive pressure may be determined using an equivalent fluid weight of 400 pcf. This assumes that structural fill is placed against the sides of the footings. A safety factor of 1.5 should be applied to these values.

The lateral active soil pressures acting on reinforced concrete retaining walls depend on the nature, density and configuration of the soil behind the wall. We recommend that walls supporting horizontal backfill be designed using an equivalent fluid density of 35 pcf for a level backslope behind the wall. This pressure is based on backfill placed within 2 feet of the wall being compacted by hand-operated equipment to a density of 90 percent of the MDD and consisting of sand or sand and gravel. The recommended pressure does not include the effects of surcharges from surface loads.

We estimate that the settlement of the wall footings will be on the order of 1/2 inch or less. Most of this settlement is expected to occur as soon as the loads are applied. Differential settlement along the walls is expected to be 1/2 inch or less over a 50-foot span.

We recommend that footings founded near fill slopes be a minimum of 2 feet in width and have a minimum 2 feet of embedment. Also, the bottom edge of the footing should be located such that there is a minimal 6 feet (projected horizontally) between the footing and the face of the slope. Footings bearing on fill slopes can be designed using an average allowable bearing value of 2,000 psf. We recommend the design incorporate an active lateral pressure of 40 pcf (equivalent fluid density) and a passive pressure of 170 pcf (equivalent fluid density) for drained conditions. We recommend a coefficient of friction of 0.4 to calculate friction between the concrete and till fill. A factor of safety of 1.5 has been applied to these values.

Adequate drainage behind any retaining structure is imperative. We recommend that a drainage system consisting of a minimum 18 inches of clean, free-draining material, such as washed sand and gravel with less than 3 percent fines, be placed along the back of the wall. In addition, a drainage collector system consisting of 4-inch minimum PVC perforated pipe should be installed behind the wall or weepholes be constructed through the wall to provide an outlet for any accumulated water. If weepholes are used, they should be constructed at 5-foot centers on the face of the wall, above the footings. To limit clogging of the weepholes, portions of the wall behind and up to the elevation of the weepholes should be

Permanent drainage systems should be installed at the top and/or bottom of cut and fill slopes to intercept surface runoff to prevent it from flowing in an uncontrolled manner across the ground surface or slopes. Surface water should not be discharged over the undisturbed slopes outside the grading areas.

## STORMWATER CONTROL

Based on our observations, a large portion of the precipitation on the site currently percolates into the surficial sandy soil. Infiltration of a portion (roof drains) storm runoff will tend to duplicate existing conditions related to ground water recharge. We understand that a portion of the stormwater runoff at the site may be released directly to the Puyallup River. Provided proper design and construction practices are followed, we expect that direct discharge of the site's stormwater will provide for a better storm peak management system than detention relative to the upstream flows in the river. In effect, the site's storm water will be at the Tide Flats before much of the upstream water reaches the site's release point.

## GROUND WATER IMPACTS

It is our opinion that there will be no adverse impacts on ground water as a result of the proposed development plans if existing conditions are closely matched. The potential ground water impacts are related to the relationship between precipitation, surface water/shallow subsurface runoff, evapotranspiration and ground water recharge.

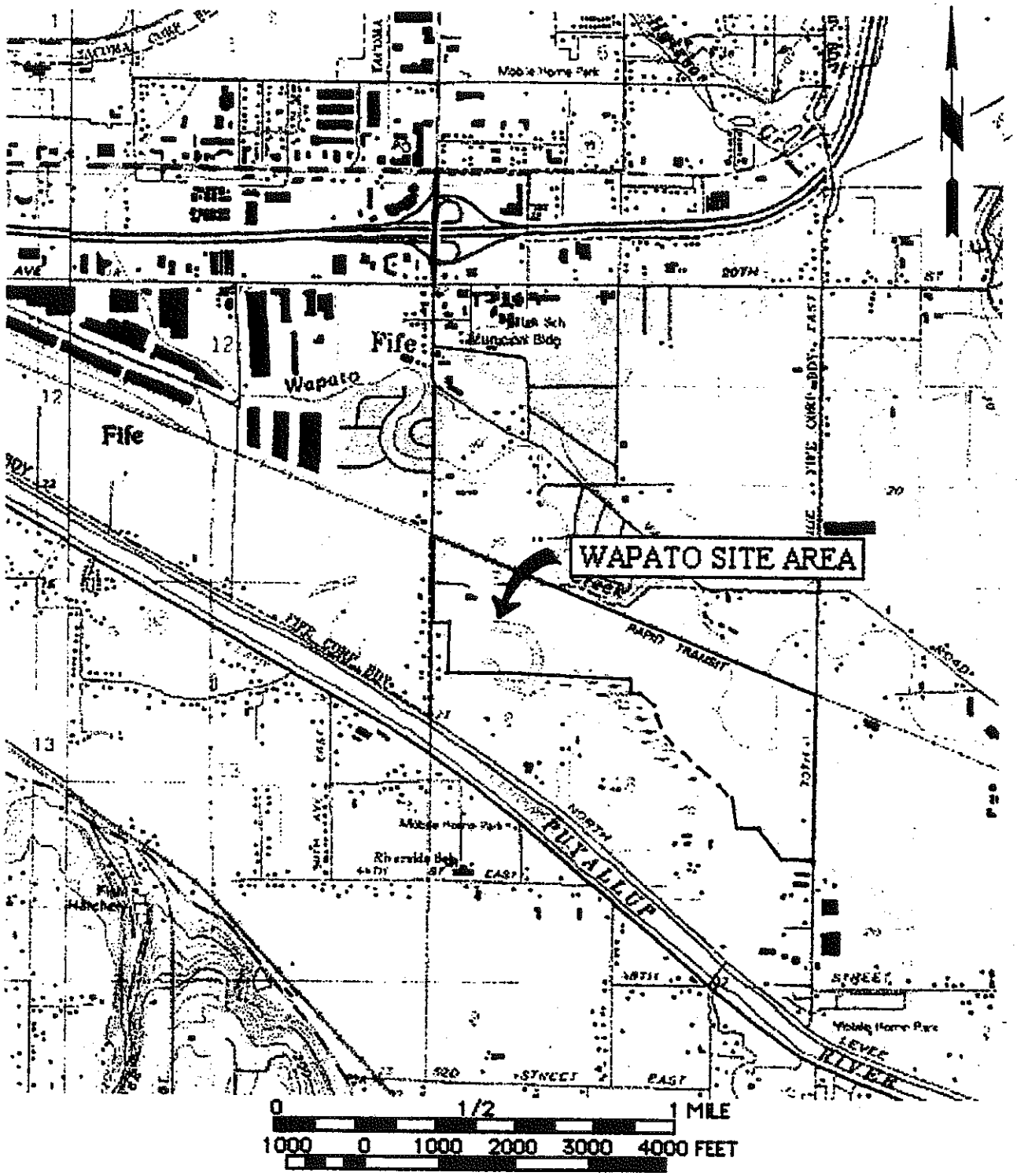
As the site is developed, a portion of the natural vegetative cover will be replaced with yard areas and impervious surfaces. The replacement of the natural cover with landscaping, and impervious surfaces will result in a decrease in evapotranspiration, with a consequent increase in runoff and/or ground water recharge. The design of the stormwater system will ultimately determine any changes in runoff and/or ground water recharge. Water from roof drains and landscape/lawn irrigation systems will likely offset any decrease in natural ground water recharge. Based on our water budget analyses, development concepts using infiltration of a portion of the stormwater best match the existing conditions. The net result of the proposed site development will essentially be a minor increase in total ground water recharge of the upper aquifer and/or runoff in the project area.

We do not expect any adverse affects on the recharge condition of the deep aquifers. As stated above, recharge to the deeper aquifers occurs by infiltration of rainfall through the overlying aquifers and aquitards and over a large area. Because the recharge of the shallow aquifers will not be significantly affected, the recharge of the deep aquifers should not be affected. It should also be noted that the recharge area for the aquifers, in particular the deeper aquifers, essentially occurs over the up-basin area. This site comprises less than 0.1 percent of that total area. The aquifer systems are protected from possible contamination by the natural filtering effect of the overlying silty sand and sandy silt.

## LIMITATIONS

We have prepared this report for use by CMC Heartland Partners for use in the preliminary design of a portion of this project. The data and report should be provided to prospective contractors for their bidding or estimating purposes only. Our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions. Variations in subsurface conditions are possible between the explorations and may also occur with time.

When the design is finalized, we recommend that the design and specifications be reviewed by our firm to see that our recommendations have been interpreted and implemented as intended. The scope of our services does not include services related to environmental remediation and construction safety precautions. Our recommendations are not intended to direct the contractor's methods, techniques, sequences or procedures, except as specifically described in our report for consideration in design.

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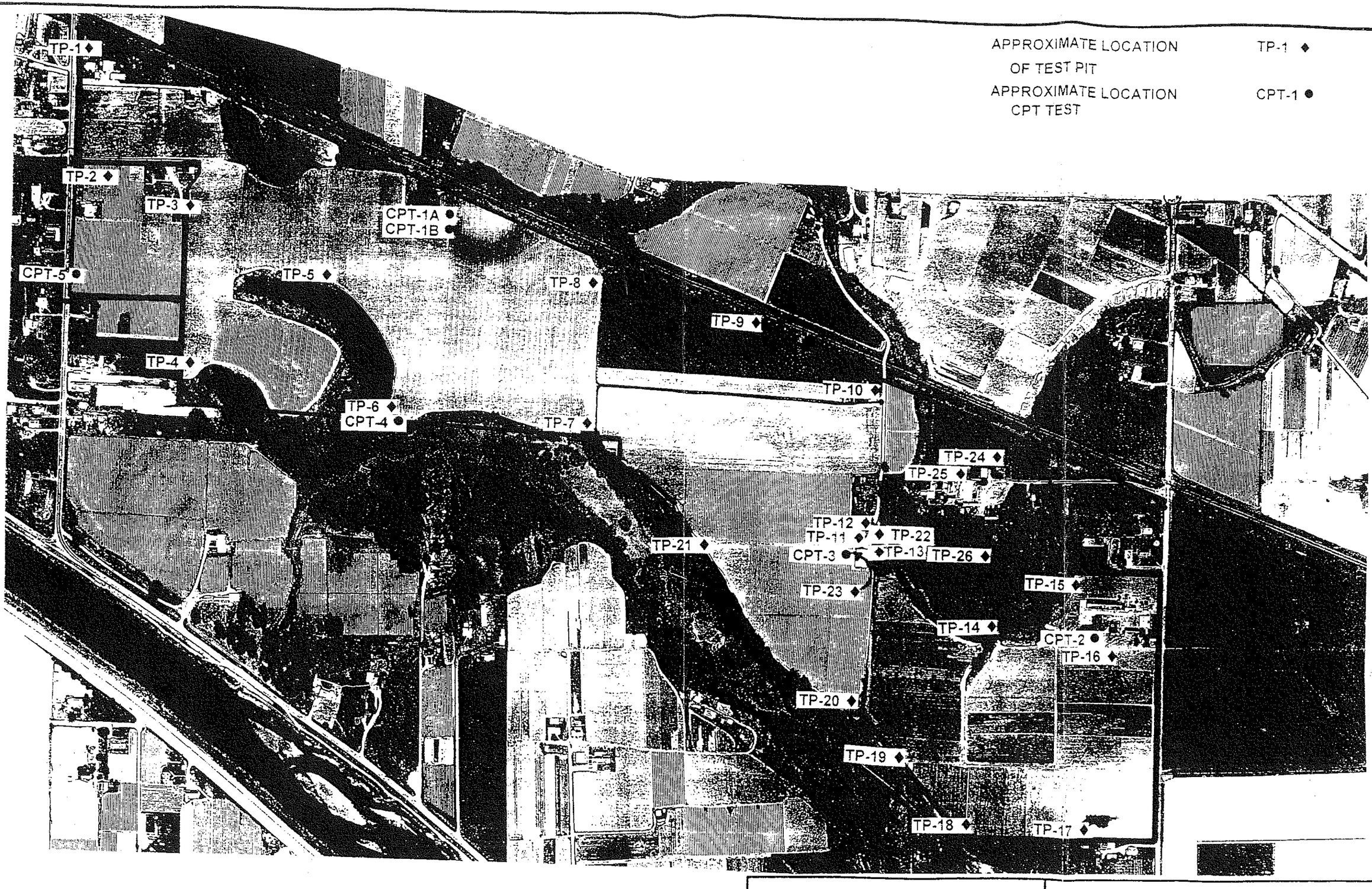
VICINITY MAP

Figure 1




APPROXIMATE LOCATION OF TEST PIT — TP-1

APPROXIMATE LOCATION CPT TEST — CPT-1

APPROXIMATE SCALE 1"=100'

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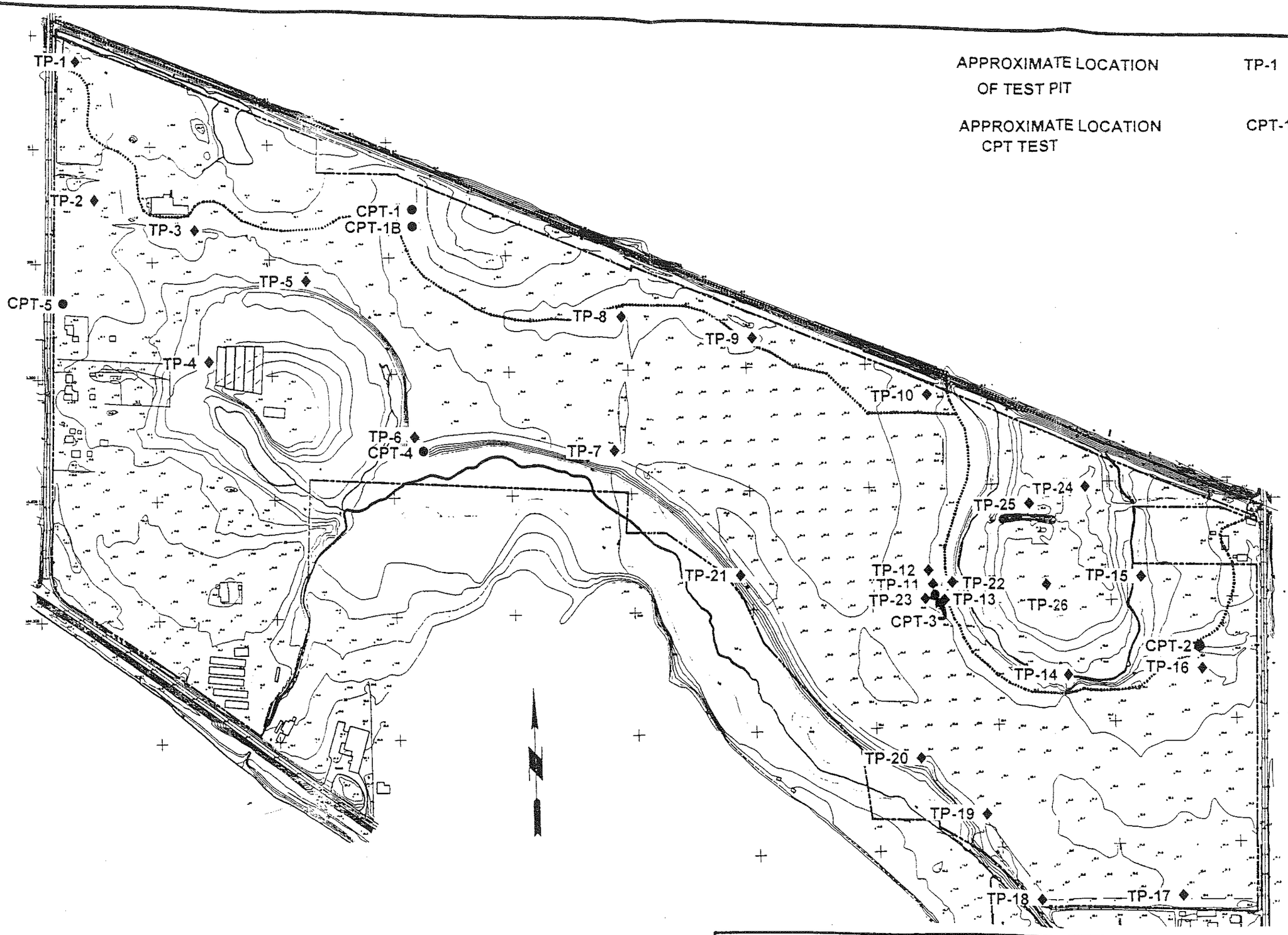
SITE PLAN

FIGURE 2




APPROXIMATE SCALE 1"=100'

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SITE PLAN

FIGURE 3

# APPENDIX "A"

## SOIL CLASSIFICATION SYSTEM

| MAJOR DIVISIONS | | | GROUP SYMBOL | GROUP NAME |
|---|---|---|---|---|
| COARSE GRAINED SOILS<br><br>More Than 50% Retained on No. 200 Sieve | GRAVEL<br><br>More Than 50% of Coarse Fraction Retained on No. 4 Sieve | CLEAN GRAVEL | GW | WELL-GRADED GRAVEL, FINE TO COARSE GRAVEL |
| | | | GP | POORLY-GRADED GRAVEL |
| | | GRAVEL WITH FINES | GM | SILTY GRAVEL |
| | | | GC | CLAYEY GRAVEL |
| | SAND<br><br>More Than 50% of Coarse Fraction Passes No. 4 Sieve | CLEAN SAND | SW | WELL-GRADED SAND, FINE TO COARSE SAND |
| | | | SP | POORLY-GRADED SAND |
| | | SAND WITH FINES | SM | SILTY SAND |
| | | | SC | CLAYEY SAND |
| FINE GRAINED SOILS<br><br>More Than 50% Passes No. 200 Sieve | SILT AND CLAY<br><br>Liquid Limit Less Than 50 | INORGANIC | ML | SILT |
| | | | CL | CLAY |
| | | ORGANIC | OL | ORGANIC SILT, ORGANIC CLAY |
| | SILT AND CLAY<br><br>Liquid Limit 50 or More | INORGANIC | MH | SILT OF HIGH PLASTICITY, ELASTIC SILT |
| | | | CH | CLAY OF HIGH PLASTICITY, FAT CLAY |
| | | ORGANIC | OH | ORGANIC CLAY, ORGANIC SILT |
| HIGHLY ORGANIC SOILS | | | PT | PEAT |

NOTES:

1. Field classification is based on visual examination of soil in general accordance with ASTM D2488-90.
2. Soil classification using laboratory tests is based on ASTM D2487-90.
3. Descriptions of soil density or consistency are based on interpretation of blow count data, visual appearance of soils, and/or test data.

SOIL MOISTURE MODIFIERS:

Dry - Absence of moisture, dusty, dry to the touch

Moist - Damp, but no visible water

Wet - Visible free water or saturated, usually soil is obtained from below water table

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**SOIL CLASSIFICATION SYSTEM**

**FIGURE 1A**

**Test Pi t –5:** South of field, by N apex of ox-bow

| Depth (feet) | Soil Type | Description |
|---|---|---|
| 0.0 - 1.5 | SM | Brn silty fine SAND w/ min organics-roots (loose, moist) |
| 1.5 - 7.0 | ML | Brn fi sdy SILT (med stiff to stiff, moist, to wet) |
| 7.0 - 8.5 | SM/ML | Red/brn mottled si fi SAND/fi sdy SILT (stiff, wet) |
| 8.5 - 14.0 | SM | Gry si fi SAND (med dense, wet) |
| 14.0-16.0 | SM | Gry si fi SAND w/ organic debris (wood/logs) (med dense, wet) |

No groundwater seepage observed but wet.
Minor to mod caving observed above sand

**Test Pi t –6:** Just north of ox-bow & South of field by irrigation line

| Depth (feet) | Soil Type | Description |
|---|---|---|
| 0:0 - 1.0 | SM | Brn silty fine SAND w/ min organics-roots (loose, moist) |
| 1.0 - 6.5 | SM/ML | Brn si fi SAND/fi sdy SILT w/ Fe staining (stiff, moist to wet) |
| 6.5 - 8.5 | ML | Org/brn mottled fi sdy SILT (med stiff, wet) |
| 8.5 -14.0 | SP | Gry fi-med SAND (med dense, wet) |
| 14.0-15.5 | SM | Gry/brn si fi SAND (dense, wet) |

Heavy groundwater seepage observed @ 13.0 to 15.0
Mod to Severe caving observed in sand, flowing/heaving sand

**Test Pi t –7:** Just north of ox-bow by irrigation ditch

| Depth (feet) | Soil Type | Description |
|---|---|---|
| 0.0 - 1.0 | SM | Brn silty SAND w/ organics-roots (loose, moist) |
| 1.0 - 6.5 | SM/ML | Org/brn si fi SAND/fi sdy SILT (med stiff to stiff, moist, to wet) |
| 6.5 - 8.0 | SP | Gry/brn fi-med SAND (med dense, wet) |
| 8.0 - 9.0 | ML | Gry/brn fi sdy SILT (stiff, wet) |
| 9.0 -15.0 | SP | Gry fi-med SAND w/ thin lenses of silt (med dense, wet) |

Moderate groundwater seepage observed @ 6.5 to 12.0
Mod caving observed in sand, flowing/heaving sand

**Test Pi t –8:** North ctr of site by irrigation ditch,& south RR line & dirt road

| Depth (feet) | Soil Type | Description |
|---|---|---|
| 0.0 - 2.0 | SM | Dk brn silty fine SAND w/ min organics-roots (loose, moist) |
| 2.0 - 4.0 | ML | Brn fi sdy SILT (stiff, moist) |
| 4.0 - 14.0 | SP | Gry fi-med SAND (med dense, moist to damp) |

Moderate groundwater seepage observed @ 10.0
Severe caving observed in sand, flowing/heaving sand

**Test Pi t –13**: SE of TP-11 by edge of trees & concrete rubble

| Depth (feet) | Soil Type | Description |
|---|---|---|
| 0.0 - 0.5 | | Topsoil |
| 0.5 - 3.5 | ML | Brn sdy SILT (med stiff, moist to wet) |
| 3.5 -10.5 | SP | Gry/brn mottled fi-med SANDw/ min si (med dense, wet) |
| 10.0-13.5 | ML | Brn SILT w/ fi sd (stiff, moist to damp) |

Moderate groundwater seepage observed @ 9.5 ft.
Mod caving observed

**Test Pi t –14:** by Creek, north side of road

| Depth (feet) | Soil Type | Description |
|---|---|---|
| 0.0 - 0.5 | | Topsoil |
| 0.5 - 3.5 | ML | Brn sdy SILT (med stiff, moist to wet) |
| 3.5 - 6.5 | SM | Org/brn mottled si fi SANDw/ min org (roots) (loose to med dense,moist) |
| 6.5 -12.0 | ML | Green/gry SILT w/ min clay (stiff, wet) |
| 12.0-16.0 | SP | Gry fi-med SAND (med dense, wet) |

Heavy groundwater seepage observed @ 12 ft.
Severe caving observed

**Test Pit – 15:** Thirty ft east of Ck, corner of field

| Depth (feet) | Soil Type | Description |
|---|---|---|
| 0.0 - 2.5 | | Topsoil |
| 2.5 - 7.0 | SP | Dk gry fi-co SAND w/ min fi gravel (loose to med dense, moist to wet) |

Static groundwater seepage observed @ 3.5 ft.
Severe caving observed

**Test Pi t –16**: East center of site old house foundation & trees

| Depth (feet) | Soil Type | Description |
|---|---|---|
| 0.0 - 0.5 | | Topsoil/Fill? |
| 0.5 - 1.5 | ML | Dk brn sdy SILT w/ Org (roots) (med stiff, moist) |
| 1.5 - 4.5 | ML | Brn/org sdy SILT (stiff, moist) |
| 4.5 - 8.5 | ML | Org/brn SILT w/ min sd (stiff, (damp to wet) |
| 8.5 -13.5 | SP/SM | Gry/brn mottled fi-med SAND/si (med dense to dense, damp to wet) |
| 13.5-15.0 | SP | Gry SAND (med denese to dense,wet) |

Static groundwater seepage observed @ 13.5 ft.
Mod caving observed

**Test Pi t –21:** South property line, vegetation line

| Depth (feet) | Soil Type | Description |
|---|---|---|
| 0.0 - 1.0 | SM | Brn silty fine SAND w/ min organics-roots (loose, moist) |
| 1.0 - 10.0 | SM | Brn si SAND w/ occ org (roots) (med dense, moist) |
| 12.5-16.5. | ML | Brn sdy SILT (med stiff, damp) |
| 16.5-17.0 | ML | Brn SILT w/ fi sd & trace clay (v. stiff, damp to wet) |

No groundwater seepage observed
Minor caving observed

**Test Pi t –22:** South property line, between irrigation lines

| Depth (feet) | Soil Type | Description |
|---|---|---|
| 0.0 - 1.0 | | Topspo; |
| 1.0 - 4.0 | SP | Brn SAND w/ silt & min organics (roots) (loose, moist) |
| 4.0 - 6.0 | SM | Brn/org si fi SAND w/ occ org (roots) (med dense, moist) |
| 6.0 - 8.0 | SP | Brn SAND (med dense, damp) |
| 8.0 - 9.0 | ML | Brn SILT w/ min fi sd (stiff, moist to damp) |
| 9.0 -13.0 | SP | Gry SAND (med dense, wet) |
| 13.0-14.0 | ML | Brn SILT w/ trace clay (stiff, wet) |
| 14.0-16.0 | SP | Gry SAND aa (med dense, wet) |

Heavy groundwater seepage observed @ 12 to 13 ft.
Severe caving observed in sand

**Test Pi t –23:** Downgradient of TP-11

| Depth (feet) | Soil Type | Description |
|---|---|---|
| 0.0 - 1.0 | SM | Brn silty fine SAND w/ abd organics (roots) (loose, moist) |
| 1.0 - 4.5 | SP | Brn SAND w/ silt & occ org (roots) (med dense, moist) |
| 4.5 - 7.5 | ML | Brn fi sdy SILT (med stiff to stiff, damp) |
| 7.5 - 12.0 | SP/SM | Gry interbedded SAND/si SAND (med dense, wet) |

No groundwater seepage observed, but wet at 7.5 ft.
Moderate caving observed

**Test Pi t –24:** Northeast part of site, north of Creek

| Depth (feet) | Soil Type | Description |
|---|---|---|
| 0.0 - 1.0 | ML | Brn sdy SILT w/ min organics (roots) (loose, moist) |
| 1.0 - 3.0 | SP | Brn fi SAND w/ occ org (roots) (loose to med dense, moist) |
| 3.0 - 8.5 | SM/ML | Brn si fi SAND/fi sdy SILT (med dense, damp) |
| 8.5 - 11.0 | SP | Brn SAND w/ si sd lenses (med dense,moist) |
| 11.5-14.0 | SP | Gry SAND w/ min si (med dense, wet) |

Heavy groundwater seepage observed @ 11 to 14 ft., static @ 9.0 ft. after 20 min.
Severe caving observed in sand

# APPENDIX "B"

# *Northwest Cone Exploration News*

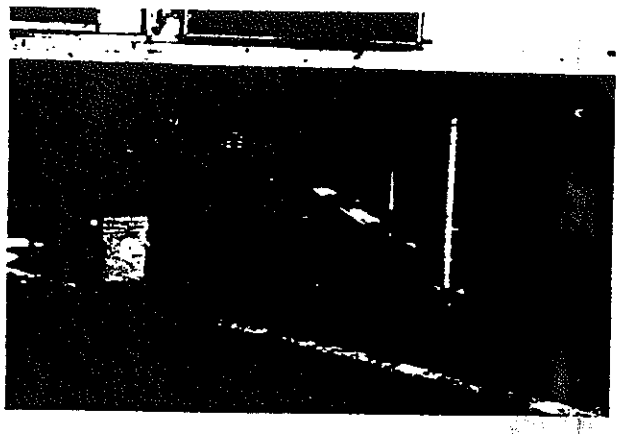
(A Thinly Veiled Attempt at Marketing) December, 1996

*by: Keith Brown, P.E., President & Chief Conehead*

## The Truck

For those of you who haven't used Northwest Cone Exploration, most of the testing is done from our CPT truck. The truck weighs 15 tons empty and 18 tons with all the water tanks filled. The truck has a SIMCO 2400 drill head and 3" O.D. solid stem auger for predrilling through pavements, surface gravel and coarse fill, a pressurized water system, dedicated decon water holding tanks, washdown tray and layout space for the consultant's equipment. It is also equipped with a grout mixer and pump, generator and a pressure washer. The truck keeps the instruments and staff out of the weather while working. The truck isn't a go anywhere truck but it has been to many soft sites with the aid of plywood or a dozer. When a dozer is needed, the local rental yard can usually deliver on short notice and NCE operates it. It generally adds only about $300 a day to the cost of the project and can really make a big difference on soft sites.

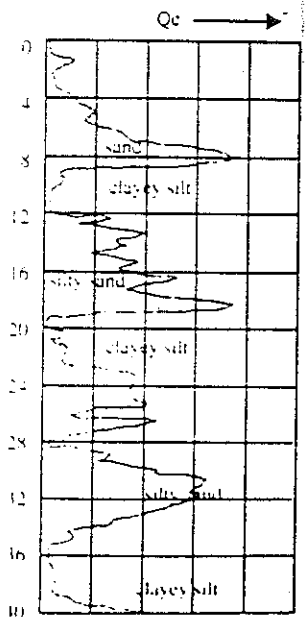
### Shear Wave Setup Under CPT Truck



Shown is the steel reaction beam placed under the CPT truck's front jacks. The sledge hammer acts as an electric switch to start the data recording. Note the 7 foot offset between the beam and the test hole (shown by pavement predrilling auger). Using Shear Waves to measure the seismic velocity of soils has become more commonplace now that the seismic cone is available. The shear velocity of the soil is especially helpful for liquefaction assessment and dynamic response properties. NCE provides downhole seismic cone measurements with the use of a geophone mounted in the cone. A steel beam is placed directly under the front leveling jacks and an "electric sledge hammer" is used to induce the shear wave. The arrival time is recorded on the digital oscilloscope in the data acquisition computer. Measurements are normally taken at 1 meter intervals, but can be taken at any depth increment. Velocities can be determined by plotting arrival times on a graph, or comparing differences in arrival times between consecutive measurements.

### The Value of CPT

- Substituting CPT holes for drill holes will save money.
- Using both drilling and CPT on site will provide better information.
- CPT measures the soil properties directly and infers the soil type, whereas the drill sample shows the soil type and the consultant infers the engineering properties.
- By measuring the hydrostatic head with the cone, it is unnecessary to install a piezometer to measure the water level.
- The CPT more accurately determines "N" value than the SPT. It also more accurately determines liquefaction potential.
- The CPT provides a continuous record of the soil instead of every five feet.
- The CPT is a very repeatable test, unlike drilling and logging which is influenced greatly by the skill of the individuals and system of logging.
- The CPT provides the data on a floppy disk which you can load directly into spreadsheets and other analysis software.
- Northwest Cone provides a report-ready laser quality log of the CPT.
- Friction ring grouting is part of the footage cost, not extra.
- The Truck box also defeats the worst of the west slope winter monsoons!

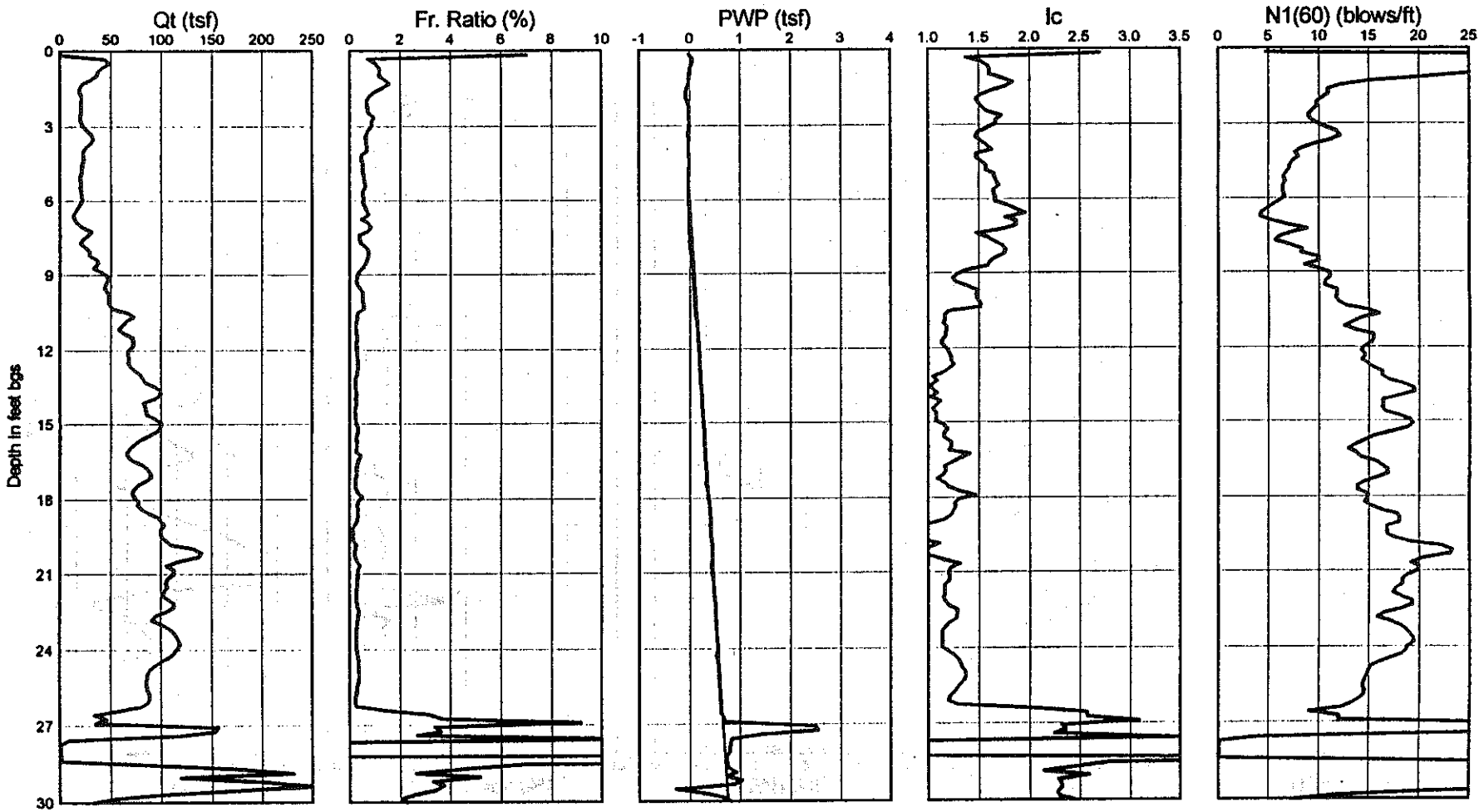


# Cone Penetration Test - CPT-01B

Test Date : May 18, 1998
Location : Wapato Site, Fife, Washington

Operator : Northwest Cone Exploration

Ground Surf. Elev. : 0.00
Water Table Depth : 6.00




Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 115.2 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Clayey silt to silty clay
2.82 <Ic < 3.22 - Clays

After Jefferies and Davies (1993)

PROJECT NO. CMC.01 DATE: May 20, 1998 DRAWN BY: Keith Brown

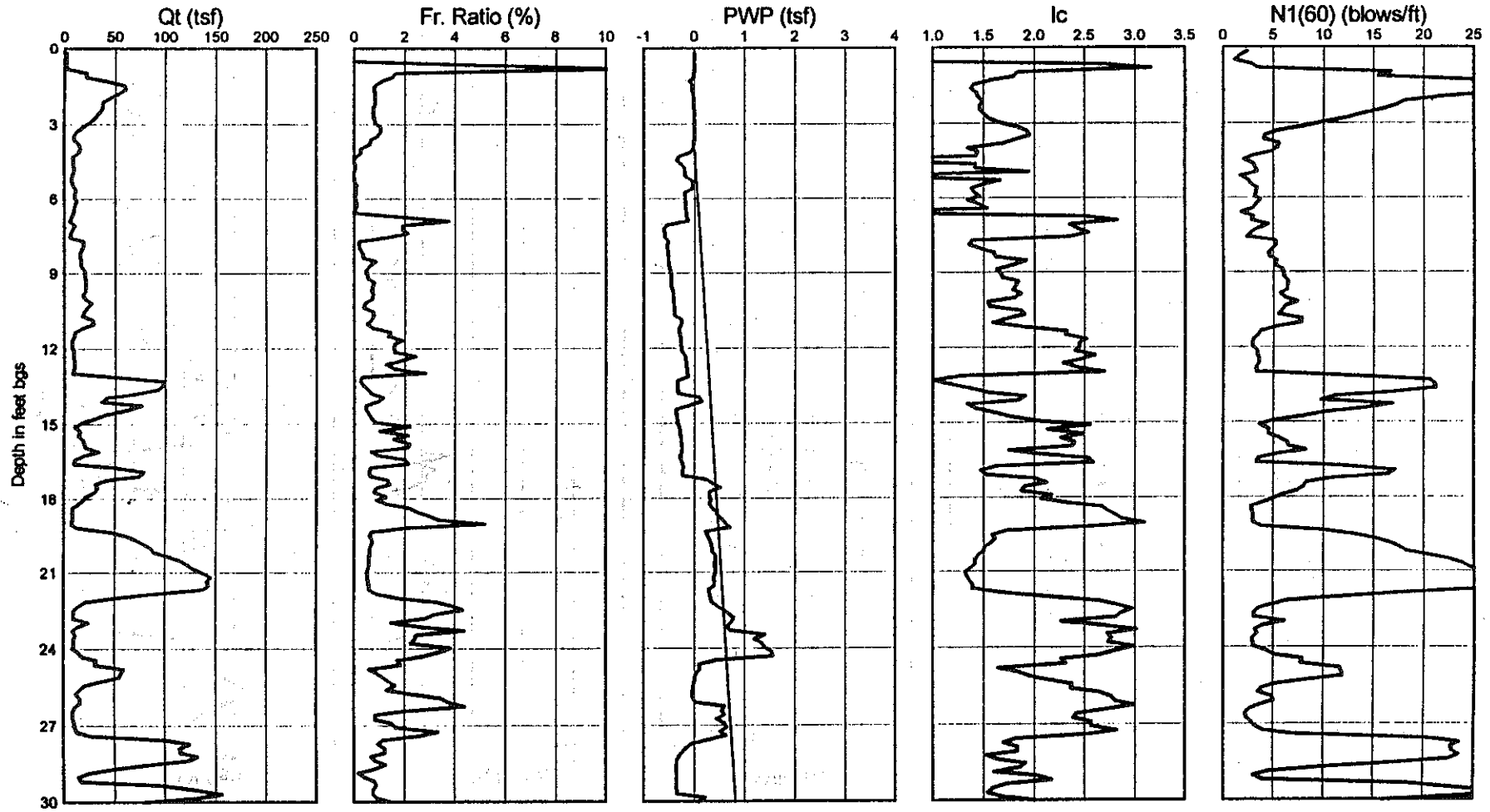
GeoResources

# Cone Penetration Test - CPT-02

Test Date : May 18, 1998
Location : Wapato Site, Fife, Washington

Operator : Northwest Cone Exploration

Ground Surf. Elev. : 0.00
Water Table Depth : 4.00




Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 115.2 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Clayey silt to silty clay
2.82 <Ic < 3.22 - Clays

After Jefferies and Davies (1993)

PROJECT NO. CMC.01 DATE: May 20, 1998 DRAWN BY: Keith Brown

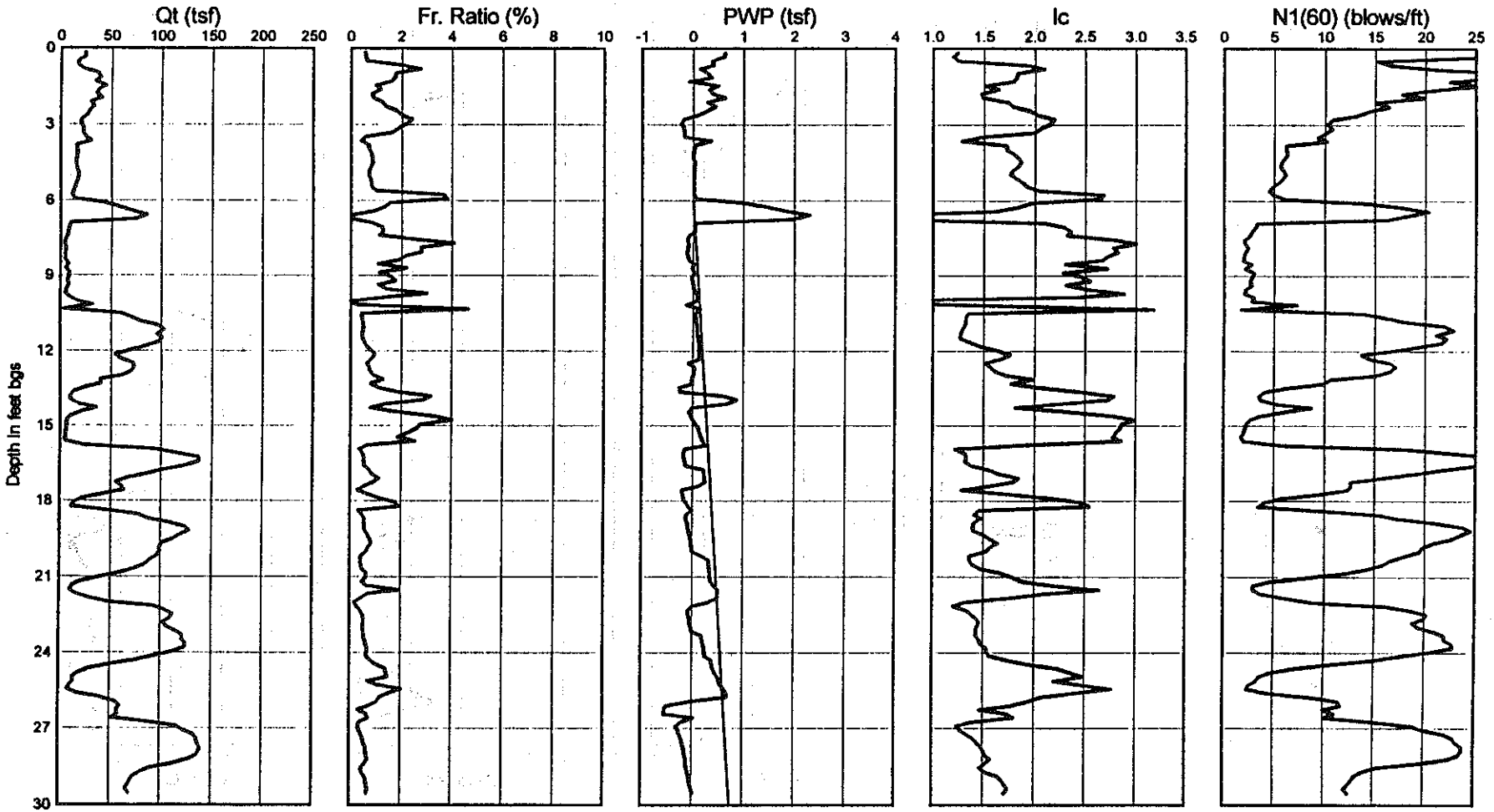
GeoResources

# Cone Penetration Test - CPT-03

Test Date : May 19, 1998
Location : Wapato Site, Fife, Washington

Operator : Northwest Cone Exploration

Ground Surf. Elev. : 0.00
Water Table Depth : 6.00




Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 115.2 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Clayey silt to silty clay
2.82 <Ic < 3.22 - Clays

After Jefferies and Davies (1993)

PROJECT NO. CMC.01 DATE: May 20, 1998 DRAWN BY: Keith Brown

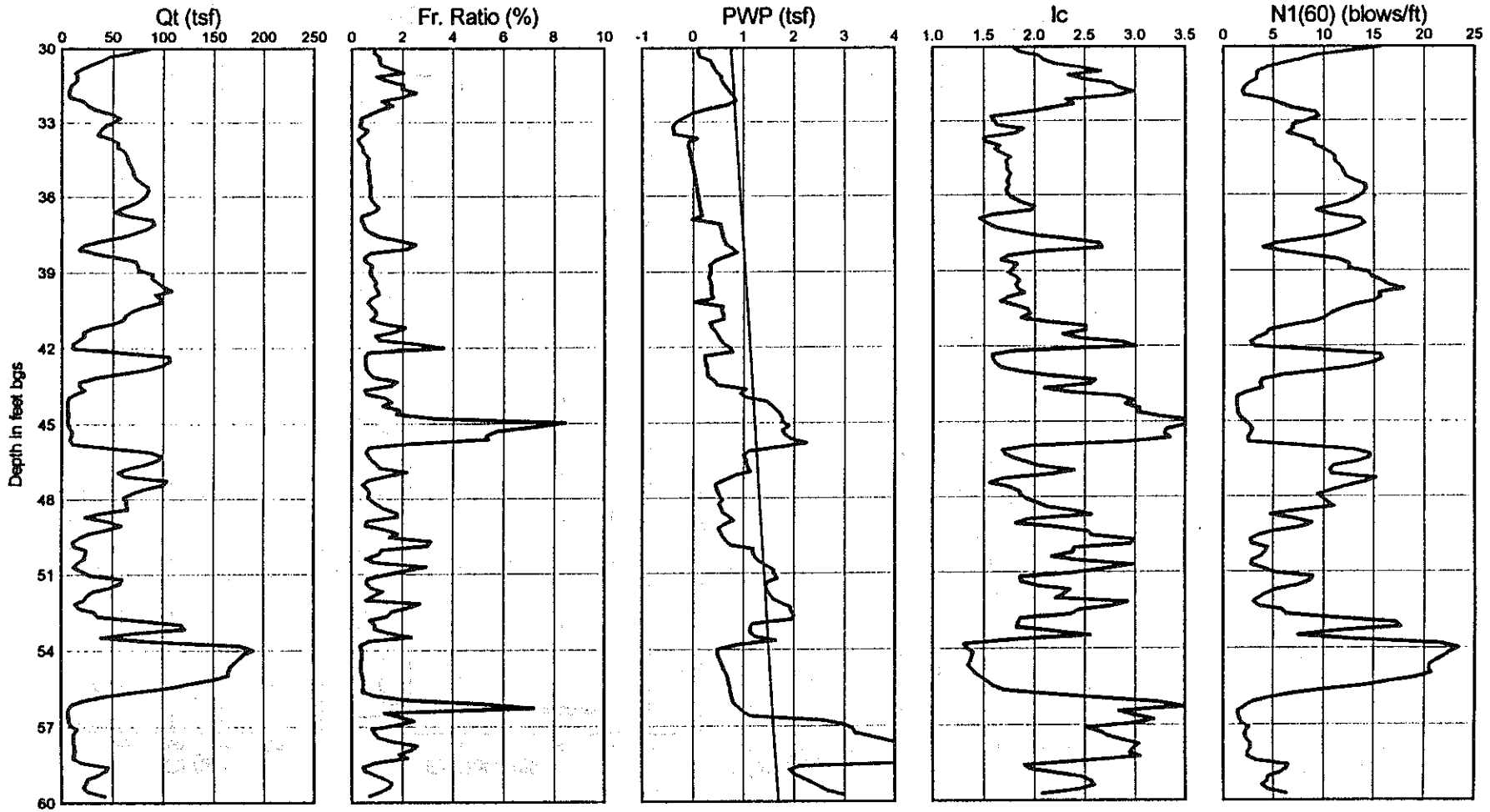
GeoResources

# Cone Penetration Test - CPT-04

Test Date : May 19, 1998
Location : Wapato Site, Fife, Washington

Operator : Northwest Cone Exploration

Ground Surf. Elev. : 0.00
Water Table Depth : 6.00




Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 115.2 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Clayey silt to silty clay
2.82 <Ic < 3.22 - Clays

After Jefferies and Davies (1993)

PROJECT NO CMC 01 DATE: May 20, 1998 DRAWN BY: Keith Brown

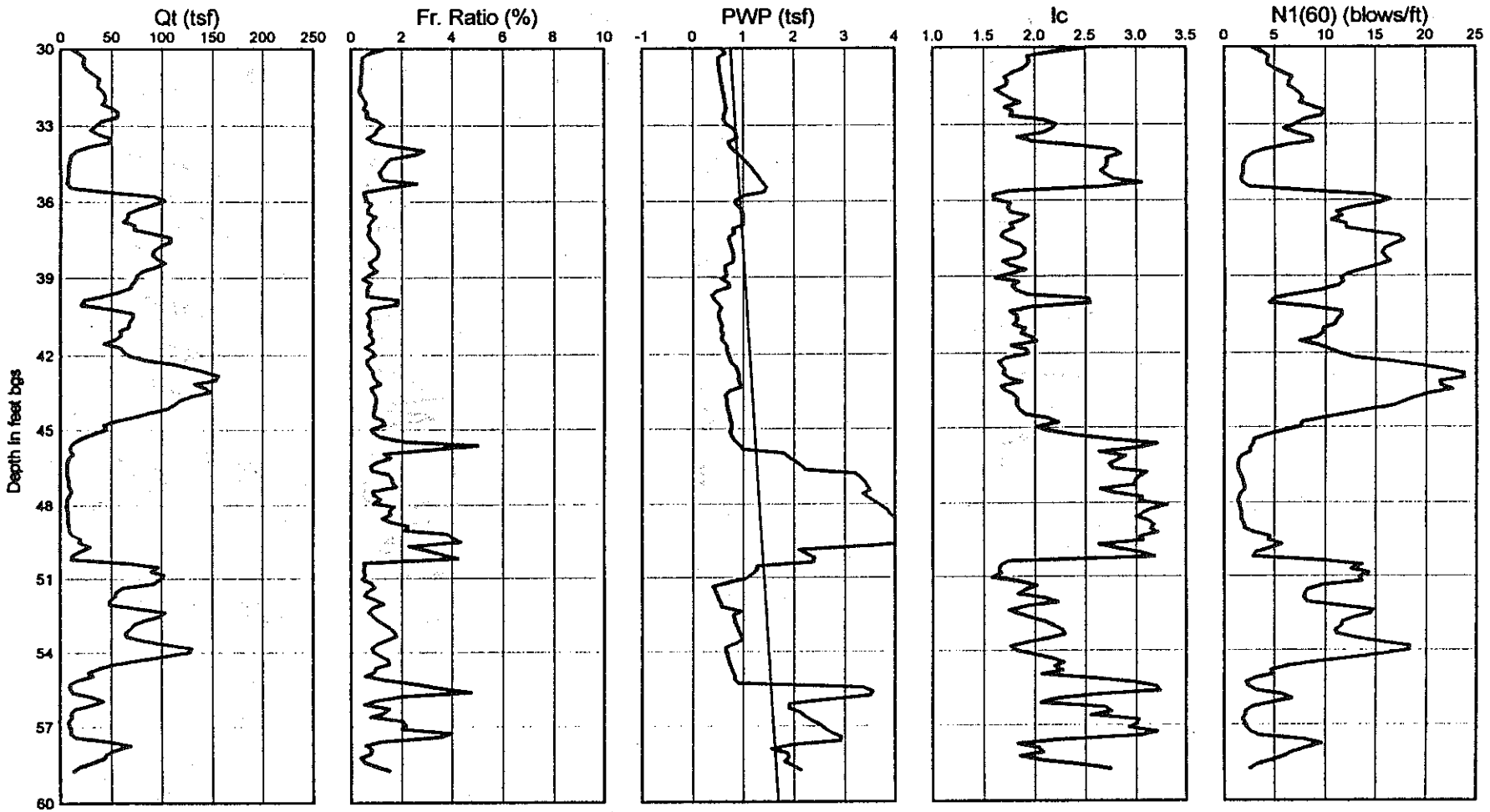
GeoResources

# Cone Penetration Test - CPT-05

Test Date : May 19, 1998
Location : Wapato Site, Fife, Washington

Operator : Northwest Cone Exploration

Ground Surf. Elev. : 0.00
Water Table Depth : 6.00




Qt normalized for
unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 115.2 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Clayey silt to silty clay
2.82 <Ic < 3.22 - Clays

After Jefferies and Davies (1993)

PROJECT NO. CMC.01 DATE: May 20, 1998 DRAWN BY: Keith Brown

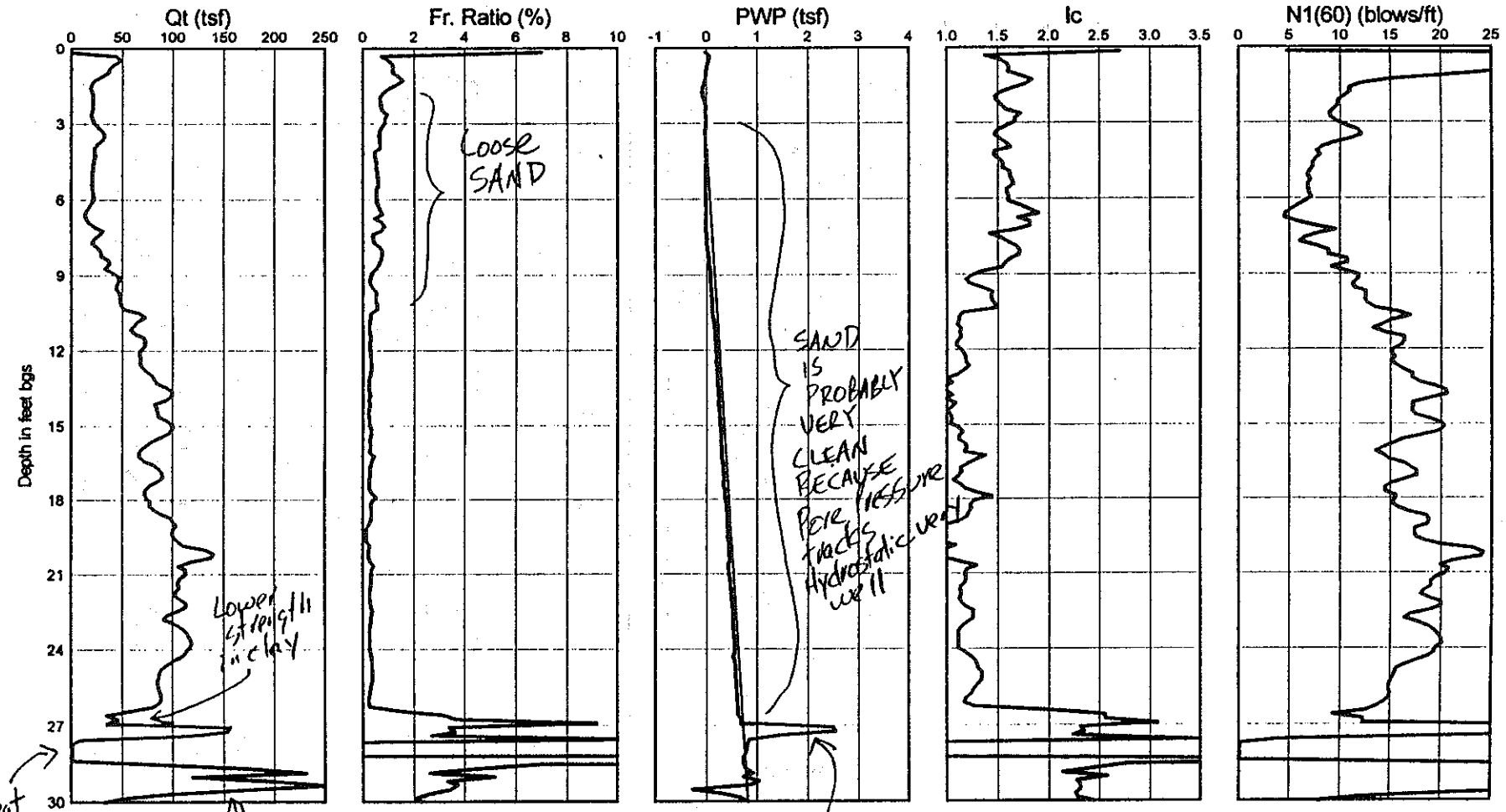
GeoResources

# Cone Penetration Test - CPT-01B

Test Date : May 18, 1998
Location : Wapato Site, Fife, Washington

Operator : Northwest Cone Exploration

Ground Surf. Elev. : 0.00
Water Table Depth : 4.00




Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 115.2 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Clayey silt to silty clay
2.82 <Ic < 3.22 - Clays

After Jefferies and Davies (1993)

PROJECT NO. CMC 01 DATE: May 20, 1998 DRAWN BY: Keith Brown

GeoResources

# APPENDIX "C"

# WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. 012494
Water Right Permit No.

(1) OWNER: Name DILL GEORGE Address 7710 VALLEY AVE E PUYALLUP, WA 98371-

(2) LOCATION OF WELL: County PIERCE - SE 1/4 NW 1/4 Sec 17 T 20 N., R 4E WM
(2a) STREET ADDRESS OF WELL (or nearest address) 7710 VALLEY AVE E

(3) PROPOSED USE: INDUSTRIAL

(4) TYPE OF WORK: Owner's Number of well (If more than one)
NEW WELL Method: AIR ROTARY

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 200 ft. Depth of completed well 92 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Dia. from 0 ft. to 92 ft.
WELDED " Dia. from ft. to ft.
" Dia. from ft. to ft.

Perforations: NO
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: YES
Manufacturer's Name JOHNSON WELL
Type Model No.
Diam. 6 slot size 25 from 92 ft. to 97 ft.
Diam. slot size from ft. to ft.

Gravel packed: NO Size of gravel
Gravel placed from ft. to ft.

Surface seal: YES To what depth? 18 ft.
Material used in seal BENTONITE CLAY
Did any strata contain unusable water? NO
Type of water? Depth of strata ft.
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level 10 ft. below top of well Date 04/12/89
Artesian Pressure lbs. per square inch Date / /
Artesian water controlled by

(9) WELL TESTS: Drawdown is amount water level is lowered below static level.
Was a pump test made? YES If yes, by whom? JIM
Yield: 37.5 gal./min with 37.5 ft. drawdown after 4/1 hrs.

Recovery data

| Time | Water Level | Time | Water Level | Time | Water Level |
|---|---|---|---|---|---|
| | | | | | |

Date of test 05/02/89
Bailer test gal/min. ft. drawdown after hrs.
Air test gal/min. w/ stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? YES

(10) WELL LOG

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change in formation.

| MATERIAL | FROM | TO |
|---|---|---|
| SAND | 0 | 3 |
| SILTY SAND AND SEEPAGE | 3 | 20 |
| HEAVING SAND | 20 | 45 |
| SILTY CLAY SAND | 45 | 87 |
| SAND & GRAVEL WOOD WATER | 87 | 97 |
| SILTY STICKY CLAY | 97 | 155 |
| SILTY HEAVING SAND | 155 | 160 |
| STICKY SILTY CLAY | 160 | 168 |
| FINE SILTY HEAVING SAND | 168 | 195 |
| CLAY | 195 | 200 |

Work started 04/10/89 Completed 04/12/89

WELL CONSTRUCTOR CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME RICHARDSON WELL DRILLING
(Person, firm, or corporation) (Type or print)

ADDRESS P O BOX 44427

[SIGNED] _____ License No. 1424

Contractor's
Registration No. RICHAW*321OB Date 05/12/89

RECEIVED
MAY 11 AM 9:16
DEPT. OF ECOLOGY

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cond Copy — Owner's Copy
ird Copy — Driller's Copy

# WATER WELL REPOP

**STATE OF WASHINGTON**

Application No. .....

Permit No. .....

(1) OWNER: Name HARRY DILLON Address .....

(2) LOCATION OF WELL: County PIERCE NE ¼ SW ¼ Sec. 18 T. 20 N., R. 4E W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) ....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 237 ft. Depth of completed well 237 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from 0 ft. to 237 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☒ No ☐
Manufacturer's Name
Type Johnson Model No. 8 Slot
Diam. 6 Slot size 8 from 230 ft. to 235 ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name Valley
Type: Sub H.P. 3/4

(8) WATER LEVELS: Land-surface elevation above mean sea level.... ft.
Static level flows ft. below top of well Date 12/17/77
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

| Time | Water Level | Time | Water Level | Time | Water Level |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

Date of test
Bailer test 22 gal./min. with 20 ft. drawdown after 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

| MATERIAL | FROM | TO |
|---|---|---|
| Sandy Top Soil | 0 | 16 |
| Brown Sand | 16 | 88 |
| Gray Sand & Water | 88 | 107 |
| Black fine Sand | 107 | 158 |
| Black Sand & Water | 158 | 175 |
| Black Sand | 175 | 200 |
| Black Sand & Water | 200 | 237 |

Work started 12/1 19 77 Completed 12/17 19 77

**WELL DRILLER'S STATEMENT:**

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Tacoma Pump & Drilling Inc
(Person, firm, or corporation) (Type or Print)

Address 30316 Mt. Hiway, Graham

[Signed] Kenneth Hagan
(Well Driller)

License No. 194 Date 12/29 19 77

(USE ADDITIONAL SHEETS IF NECESSARY)

e Original and First Copy with
partment of Ecology
ond Copy — Owner's Copy
rd Copy — Driller's Copy

# WATER WELL REPORT

STATE OF WASHINGTON

Application No. 52-26314

Permit No. ....

(1) OWNER: Name Ron Duris Address 2912 Kelley Rd. E. Puyallup, Wa. 98371

(2) LOCATION OF WELL: County Pierce SW ¼ SE ¼ Sec. 18 T. 20 N., R. 4E W.M.

ring and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one).... 1
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 120 ft. Depth of completed well 120 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from 0 ft. to 115 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson Well
Type Stainless steel Model No.
Diam. 6 Slot size 15 from 115 ft. to 120 ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level.... ft.
Static level 5 ft. below top of well Date 4-28-83
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

| Time | Water Level | Time | Water Level | Time | Water Level |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

Date of test
Bailer test 22 gal./min. with 30 ft. drawdown after 1 hrs.
Artesian flow g.p.m. Date 4-28-83
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

| MATERIAL | FROM | TO |
|---|---|---|
| Top soil | 0 | 5 |
| Sandy clay | 5 | 23 |
| Clean coarse sand & fine gravel | 23 | 26 |
| Clay, sand, wood (muck) | 26 | 103 |
| Little cleaner, less wood | 103 | 108 |
| Clay | 108 | 116 |
| Dirty sand, shells | 116 | 120 |

RECEIVED
MAY 18 1983
DEPARTMENT OF ECOLOGY
SOUTHWEST REGIONAL OFFICE

Work started 4-19 19 83 Completed 4-28 19 83

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Richardson Well Drilling Co.
(Person, firm, or corporation) (Type or print)

Address P.O. Box 44427 Tacoma, Wa. 98444

[Signed] (Well Driller)

License No. 223-02-6500 Date 5-17 19 83

(USE ADDITIONAL SHEETS IF NECESSARY)

Original and First Copy with
tment of Ecology
d Copy — Owner's Copy
Copy — Driller's Copy

# WATER WELL REPORT

STATE OF WASHINGTON

Mor. Kreuzer

Application No. .....

Permit No. .....

**OWNER:** Name WAYNE Howard Address PO Box 276 Puyallup, Wash.

**LOCATION OF WELL:** County Pierce ¼ ¼ Sec 18 T 20 N., R 4 W.M.

ng and distance from section or subdivision corner

**PROPOSED USE:** Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

**TYPE OF WORK:** Owner's number of well (if more than one) ....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

**DIMENSIONS:** Diameter of well 6 inches.
Drilled 144 ft. Depth of completed well 144 ft.

**CONSTRUCTION DETAILS:**

Casing installed: 6 " Diam. from 0 ft. to 125 ft.
Threaded ☐ ____ " Diam. from ____ ft. to ____ ft.
Welded ☒ ____ " Diam. from ____ ft. to ____ ft.

**Perforations:** Yes ☐ No ☒
Type of perforator used
SIZE of perforations ____ in. by ____ in.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.

**Screens:** Yes ☒ No ☐
Manufacturer's Name Hydrophilic Industries
Type PVC Slotted Model No.
Diam. 5" Slot size .013 from 124 ft. to 144 ft.
Diam. ____ Slot size ____ from ____ ft. to ____ ft.

**Gravel packed:** Yes ☐ No ☒ Size of gravel:
Gravel placed from ____ ft. to ____ ft.

**Surface seal:** Yes ☐ No ☒ To what depth? ____ ft.
Material used in seal
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

**PUMP:** Manufacturer's Name
Type: H.P.

**WATER LEVELS:** Land-surface elevation above mean sea level.... 35' ft.
tic level Flowing ft. below top of well Date June 1, 73
ian pressure ____ lbs. per square inch Date
Artesian water is controlled by Cap + Valve (Cap, valve, etc.)

**WELL TESTS:** Drawdown is amount water level is lowered below static level
a pump test made? Yes ☐ No ☒ If yes, by whom?
ld: gal./min. with ft. drawdown after hrs.
" " "
" " "

very data (time taken as zero when pump turned off) (water level measured from well top to water level)

| Time | Water Level | Time | Water Level | Time | Water Level |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

Date of test
r test gal./min. with ft. drawdown after hrs.
ian flow 20 g.p.m. Date June 1, 1973
mperature of water Was a chemical analysis made? Yes ☐ No ☒

**(10) WELL LOG:**

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

| MATERIAL | FROM | TO |
|---|---|---|
| Brown Silt | 0 | 5 |
| Soft Moist Silt + Silty Sand | 5 | 119 |
| Clean Black + Red Sand | 119 | 137.5 |
| Brown Clay | 137.5 | 141 |
| Silty Fine Sand (Artesian Flow) | 141 | 144 |

Work started 5-30, 1973 Completed 6-1, 1973

**WELL DRILLER'S STATEMENT:**

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Western Water Supply, Inc.
(Person, firm, or corporation) (Type or print)

Address 5815 No. Meridian, Puyallup, Wa

[Signed] Victor Kring by D Dow
(Well Driller) Manager.

License No. Applied For Date June 4, 1973

(USE ADDITIONAL SHEETS IF NECESSARY)

F. No. 7356—OS—(Rev. 4-71).

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION
AND DEVELOPMENT

WELL LOG

No. Appli. 491
Cert. 56-A

Date Jan. 3, 1947

Record by Ralph R. Wharton

Source Driller record

*Location:* State of WASHINGTON

County Pierce

Area

Map

NE ¼ SE ¼ sec. 18 T 20 N., R. 4 E. W.

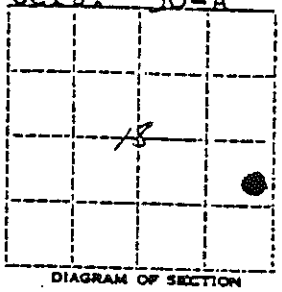


DIAGRAM OF SECTION

*Drilling Co.* Ralph R. Wharton

Address Rt. 1, Box 11, Puyallup, Wn.

Method of Drilling Date 19

Owner Carl W. Kriese

Address Rt. 2, Box 577, Tacoma, Wn.

*Land surface, datum* ft. above / below

| CORRELATION | MATERIAL | THICKNESS (feet) | DEPTH (feet) |
|---|---|---|---|
| | (Transcribe driller's terminology literally but paraphrase as necessary, in parentheses. If material water-bearing, so state and record static level if reported. Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc.) | | |
| | Sand | 175 | 175 |
| | Coarse sand | 25 | 200 |
| | | | |
| | Pump Test: | | |
| | Dim: 200' x 6" | | |
| | SWL: Flowing 20 GPM pressure 20# | | |
| | Dd: 14 | | |
| | Yield: 75 g.p.m. | | |
| | Casing: 6" from 0 to 200' | | |
| | Perforations: 175' to 185' | | |

Turn up Artesian

Sheet of sheets

Original and First Copy with
rtment of Ecology
d Copy — Owner's Copy
d Copy — Driller's Copy

# WATER WELL REPORT
## STATE OF WASHINGTON

Application No. _____
Permit No. .... _____

**OWNER:** Name Peterson, Joe Address Puyallup Indian Reservation

**LOCATION OF WELL:** County Pierce — SE¼ NW¼ Sec. 18 T. 20 N., R. 4 W.M.

ing and distance from section or subdivision corner

**PROPOSED USE:** Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

**TYPE OF WORK:** Owner's number of well (if more than one).... _____
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

**DIMENSIONS:** Diameter of well 6 inches.
Drilled 99 ft. Depth of completed well 96' 6" dtr.

**CONSTRUCTION DETAILS:**
Casing installed: 6 " Diam. from +1 ft. to 88'2" dtr.
Threaded ☐ _____ " Diam. from _____ ft. to _____ ft.
Welded ☒ _____ " Diam. from _____ ft. to _____ ft.

**Perforations:** Yes ☐ No ☒
Type of perforator used _____
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

**Screens:** Yes ☒ No ☐
Manufacturer's Name Johnson
Type Stainless Steel Model No. _____
Diam. 6 "Slot size 15 from 88'2" ft. to 96'6" dtr.
Diam. _____ Slot size _____ from _____ ft. to _____ ft.

**Gravel packed:** Yes ☐ No ☒ Size of gravel: _____
Gravel placed from _____ ft. to _____ ft.

**Surface seal:** Yes ☒ No ☐ To what depth? 25 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

**PUMP:** Manufacturer's Name /
Type: _____ H.P. _____

**WATER LEVELS:** Land-surface elevation above mean sea level.... _____ ft.
Static level 7 ft. below top of well Date 3-19-84
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

**WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? CDC
Yield: 10 gal./min. with 63 ft. drawdown after 2½ hrs.
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

| Time | Water Level | Time | Water Level | Time | Water Level |
|---|---|---|---|---|---|
| 11:35 | 69' 10" | 11:45 | 34' 4" | 12:05 | 12' 8" |
| 11:37 | 61' 8½" | 11:55 | 18' 7" | 12:10 | 9' 0" |
| 11:40 | 48' 2" | 12:00 | 16' 3" | 12:15 | 7' |

Date of test 3-19-84
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? Yes ☒ No ☐

**(10) WELL LOG:**

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

| MATERIAL | FROM | TO |
|---|---|---|
| Sandy loam (dark brown) | 0 | 6 |
| Silty sand (brown) | 6 | 24 |
| Clay and silt dark (grey) | 24 | 27 |
| Clay, silt & sand w/organic matter (seepage) | 47 | 64 |
| Grey clay | 64 | 80 |
| Sand strips intermixed with silt | 80 | |
| NOT clean or any sand Formation deep enough to screen | | |

RECEIVED
OCT 25 1984
DEPARTMENT OF ECOLOGY
S.W. REGIONAL OFFICE

Work started 3-12 19 84 Completed 3-19 19 84

**WELL DRILLER'S STATEMENT:**

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Carpenter Drilling Co
(Person, firm, or corporation) (Type or print)

Address 2032 S Bay Rd. Olympia

[Signed] Tommy Carpenter
(Well Driller)

License No. 967 Date 4-3 19 84

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY-050-1-20

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION
AND DEVELOPMENT

No. Appl. 397
Cert. 47-A

WELL LOG

Date Dec. 19, 1946
Record by Ralph R. Charlton
Source Driller record

*Location:* State of WASHINGTON
County Pierce
Area
Map
SE¼ SW¼ sec 18 T. 20 N., R 4 E. ~~XX~~

DIAGRAM OF SECTION

*Drilling Co.* Ralph R. Charlton
Address Rt. 4, Box 465; Puyallup
Method of Drilling Date 3-15 1946
Owner George Richen
Address Rt. 4, Box 375; Puyallup
*Land surface, datum* ft. above / below

| CORRELATION | MATERIAL | THICKNESS (feet) | DEPTH (feet) |
|---|---|---|---|
| | (Transcribe driller's terminology literally but paraphrase as necessary, in parentheses. If material water-bearing, so state and record static level if reported. Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc.) | | |
| | Sand | 366 | 366 |
| | Pump test: | | |
| | Dim: 366' x 6" | | |
| | SWL: flowing | | |
| | D.D. 22' | | |
| | Yield 60 g.p.m. | | |
| | (artesian) | | |

Sheet ____ of ____ Sheets

Turn up

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION AND DEVELOPMENT

WELL LOG

Date December 31, 1947 — No. Appl. 721 Cert. 741-A

Record by Ralph R. Charlton

Source Driller's Record

*Location:* State of WASHINGTON

County Pierce

Area

Map

SE ¼ NE ¼ sec. 18 T. 20 N., R. 4 E. W.

DIAGRAM OF SECTION

*Drilling Co.* Ralph R. Charlton

Address Route 4 Box 465; Puyallup

Method of Drilling Date Dec. 31 1947

Owner Valley Packing Co.

Address Rt. 12 Box 214; Tacoma

*Land surface, datum* ft. above / below

| CORRELATION | MATERIAL | THICKNESS (feet) | DEPTH (feet) |
|---|---|---|---|
| | Sand & clay | 315 | 315 |
| | Pump Test: | | |
| | Dim: 315' x 6" Drilled | | |
| | SWL: —Flowing 30gpm | | |
| | DD: — 12' | | |
| | Yield: 240 g.p.m. | | |
| | Casing: 6" dia. from 0 to 315' | | |
| | Shutin Pressure 20#65 | | |
| | Perforations: | | |
| | 1/8 x 1½ perf. from 260 to 315' | | |

(Transcribe driller's terminology literally but paraphrase as necessary, in parentheses. If material water-bearing, so state and record static level if reported. Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc.)

Turn up

Sheet of sheets

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION
AND DEVELOPMENT

WELL LOG

No. Appl'n. 2667
Cert. 1369-A

Date September 5, 1952

Record by Geo. Dean

Source Driller's Record

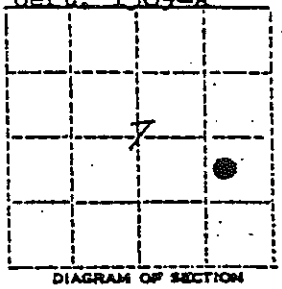


DIAGRAM OF SECTION

*Location:* State of WASHINGTON

County Pierce

Area

Map

NE¼ SE¼ sec. 7 T. 20 N., R. 4 E. W.

*Drilling Co.* Geo. Dean

Address Rt. 12 Box 190; Tacoma

Method of Drilling Date Oct. 27 19 52

Owner Ben Holdener

Address Rt. 2 Box 167; Tacoma

*Land surface, datum* ft. above / below

| CORRELATION | MATERIAL | THICKNESS (feet) | DEPTH (feet) |
|---|---|---|---|
| | No information | | |
| | Pump Test: | | |
| | Dim: 46' x 2" Driven | | |
| | SWL: 6' | | |
| | DD: 6' | | |
| | Yield: 170 g.p.m. | | |
| | Casing: No information | | |
| | Perforations: | | |
| | No information | | |

(Transcribe driller's terminology literally but paraphrase as necessary, in parentheses. If material water-bearing, so state and record static level if reported. Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc.)

Turn up

Sheet of sheets

# WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W066849
Unique Well I.D. # ACM181
Water Right Permit No.

(1) OWNER: Name C & S DEVELOPMENT Address 2609 358TH COURT ROY, WA 98580-

(2) LOCATION OF WELL: County PIERCE - SE 1/4 NW 1/4 Sec 13 T 20 N., R 3E WM
(2a) STREET ADDRESS OF WELL (or nearest address) 47XX GAY ROAD,

(3) PROPOSED USE: DOMESTIC

(4) TYPE OF WORK: Owner's Number of well (If more than one)
NEW WELL Method: ROTARY

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 99 ft. Depth of completed well 95.5 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Dia. from +1 ft. to 92.3 ft.
WELDED " Dia. from ft. to ft.
" Dia. from ft. to ft.

Perforations: NO
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: YES
Manufacturer's Name JOHNSON
Type STAINLESS STEEL Model No.
Diam. 5 slot size .010 from 87.5 ft. to 95.7 ft.
Diam. slot size from ft. to ft.

Gravel packed: NO Size of gravel
Gravel placed from ft. to ft.

Surface seal: YES To what depth? 18 ft.
Material used in seal BENTONITE CLAY
Did any strata contain unusable water? NO
Type of water? Depth of strata ft.
Method of sealing strata off N/A

(7) PUMP: Manufacturer's Name
Type N/A H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level 2 ft. below top of well Date 11/12/96
Artesian Pressure lbs. per square inch Date
Artesian water controlled by N/A

(10) WELL LOG

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change in formation.

| MATERIAL | FROM | TO |
|---|---|---|
| BROWN TOPSOIL | 0 | 2 |
| GRAY SAND | 2 | 11 |
| GRAY BROWN SILT | 11 | 65 |
| SOME SAND | 11 | 65 |
| GRAY SILTY CLAY W/WOOD CHIPS | 65 | 75 |
| GRAY RED SAND | 75 | 100 |
| SOME WHITE SHELLS | 75 | 100 |
| & WATER | 75 | 100 |

Work started 11/11/96 Completed 11/12/96

(9) WELL TESTS: Drawdown is amount water level is lowered below static level.
Was a pump test made? NO If yes, by whom?
Yield: gal./min with ft. drawdown after hrs.

Recovery data

| Time | Water Level | Time | Water Level | Time | Water Level |
|---|---|---|---|---|---|
| | | | | | |

Date of test / /
Bailer test gal/min. ft. drawdown after hrs.
Air test 10 gal/min. w/ stem set at 95.7 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? NO

WELL CONSTRUCTOR CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME OELKE DRILLING, INC.
(Person, firm, or corporation) (Type or print)

ADDRESS 4312-166 AVE E. SUMNER,WA

[SIGNED] _____ License No. 837 K. MCKENNA

Contractor's
Registration No. OELKEDI 136QC Date 11/14/96

File: Orig. & First Copy - Dept of Ecology
Second Copy - Owner; Third Copy - Driller

# WATER WELL REPORT
State of Washington

Start Card No. W093407
Unique Well ID 1
Water Right Permit No.



(1) OWNER: Name JINS FARM Address 4508 GAY RD E TACOMA WA 98443

(2) LOCATION OF WELL: County PIERCE SW 1/4 NE 1/4 Sec 13 T 20 N R 3 E

(2a) STREET ADDRESS OF WELL (or nearest address) 4720 E GAY RD TACOMA WA

(3) PROPOSED USE: DOMESTIC

(4) Type of work: NEW WELL
Method: ROTARY

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 100 feet. Depth of completed well 100 ft.

(6) CONSTRUCTION DETAILS:
Casing instld: 6 " Diam. from 0 ft. to 70 ft.
Welded X " Diam. from ft. to ft.
Liner _ " Diam. from ft. to ft.
Threaded _

Perforations: Yes _ No X
Type of perforator used
Size of perforations in. by in.
perforations from ft. to in.
perforations from ft. to in.
perforations from ft. to in.

Screens: Yes X No _
Manufacturer's Name
Type Model No
Diam 6 Slot size .016 from 68 ft. to 78.67 ft.
Diam Slot size from ft. to ft.

Gravel packed: Yes _ No X Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes X No _ To what depth? 18 ft.
Material used in seal BENTONITE
Did any strata contain unusable water? Yes _ No X
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type H.P. 0

(8) WATER LEVELS: Surface elev above mean sea level ft.
Static level 4 ft. below top of well Date 06/12/97
Artesian pressure lbs. per sq. in. Date
Artesian pressure is controlled by

(9) WELL TESTS: Pump test made? ___ By whom?
Yield 0 gal./min. with ft. drawdown after hrs
Yield 0 gal./min. with ft. drawdown after hrs
Yield 0 gal./min. with ft. drawdown after hrs
Recovery data:

| Time | Wtr. Lvl. | Time | Wtr. Lvl. | Time | Wtr. Lvl. |
|---|---|---|---|---|---|

Date of test
Bailer test 0 gal/min with ft. drawdown after hr
Airtest 100 gal/min with stem set at 60 ft. for 2 hrs
Artesian flow 0 gal/min Date
Temperature of water Was chemical analysis made? NO

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION

| Material | From | To |
|---|---|---|
| CLAY, SOIL | 0 | 10 |
| SILTY SANDY CLAY | 10 | 30 |
| SILTY SAND | 30 | 45 |
| SAND, SILT | 45 | 50 |
| SOFT GRAY SILTY CLAY | 50 | 70 |
| SAND, WOOD, WATER | 70 | 80 |
| SAND, WOOD | 80 | 85 |
| CLAY | 85 | 90 |
| SILTY SAND, WOOD, SEASHELLS | 90 | 100 |

RECEIVED
97 AUG -1 PM 1:45

Work Started 06/11/97 Completed 06/12/97

WELL CONSTRUCTOR CERTIFICATION:
I constructed and/or accept responsibility for construction this well, and its compliance with all Washington well construction standards. Materials used and the information report above are true to my best knowledge and belief.
Name RICHARDSON WELL DRILLING
Address P.O. Box 44427 Tacoma WA 98444

(Signed) Ronald E. Jones Lic. No 1547
(Well Driller)

Contractor's Registration No. RICHAW*3210B Date 07/03/

Based on form ECL 050-1-20 (2/93)**f-1329- by Speed Systems Co

Original and First Copy with Department of Ecology
2nd Copy — Owner's Copy
3rd Copy — Driller's Copy

# WATER WELL REPORT
## STATE OF WASHINGTON

Application No. _____
Permit No. _____

**OWNER:** Name WARIN MACOMBER Address 3803 - 50th AVE. E, TACOMA 98443

**LOCATION OF WELL:** County PIERCE SE ¼ NE ¼ Sec. 13 T. 20 N., R. 3 W.M.

ng and distance from section or subdivision corner

**PROPOSED USE:** Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

**TYPE OF WORK:** Owner's number of well (if more than one)....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

**DIMENSIONS:** Diameter of well 6 inches.
Drilled 78 ft. Depth of completed well 78 ft.

**CONSTRUCTION DETAILS:**
Casing installed: 6 " Diam. from 0 ft. to 73 ft.
Threaded ☐ _____ " Diam. from _____ ft. to _____ ft.
Welded ☒ _____ " Diam. from _____ ft. to _____ ft.

**Perforations:** Yes ☐ No ☒
Type of perforator used
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

**Screens:** Yes ☐ No ☒
Manufacturer's Name COOK
Type Stainless Steel Model No
Diam. 6 Slot size .010 from 73 ft. to 78 ft.
Diam. _____ Slot size _____ from _____ ft. to _____ ft.

**Gravel packed:** Yes ☐ No ☑ Size of gravel: _____
Gravel placed from _____ ft. to _____ ft.

**Surface seal:** Yes ☑ No ☐ To what depth? 18 ft.
Material used in seal puddling clay
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? _____ Depth of strata
Method of sealing strata off

**PUMP:** Manufacturer's Name
Type: _____ H.P.

**(8) WATER LEVELS:** Land-surface elevation above mean sea level.... ft.
Static level 3 ft. below top of well Date 10/2/80
Artesian pressure _____ lbs. per square inch Date
Artesian water is controlled by _____ (Cap, valve, etc.)

**WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? DRILLER WITH AIR
Yield: 75 gal./min. with _____ ft. drawdown after _____ hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

| Time | Water Level | Time | Water Level | Time | Water Level |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water 51 Was a chemical analysis made? Yes ☒ No ☐
IRON - .5

**(10) WELL LOG:**

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

| MATERIAL | FROM | TO |
|---|---|---|
| FINE BRN. SAND | 0 | 13 |
| FINE DK. GRAY SILTY SAND | 13 | 37 |
| COARSE SAND, FINE GRAY SAND AND WOOD PIECES | 37 | 40 |
| FINE DK. GRAY SILTY HEAVING SAND, CHUNK OF WOOD | 40 | 71 |
| UNIFORM MED. SAND | 71 | 78 |

RECEIVED
JAN 30 1981
DEPARTMENT OF ECOLOGY
SOUTHWEST REGIONAL OFFICE

Work started 9/30 19 80 Completed 10/2 19 80

**WELL DRILLER'S STATEMENT:**

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME John Muir OELKE DRILLING CO
(Person, firm, or corporation) (Type or print)

Address 701 - 41st Ave. N.E., Puyallup 98371

[Signed] John Muir (Well Driller)

License No. 0829 Date 1-15 19 81

(USE ADDITIONAL SHEETS IF NECESSARY)

Original and First Copy with
rtment of Ecology
nd Copy — Owner's Copy
i Copy — Driller's Copy

# WATER WELL REPORT
STATE OF WASHINGTON

Application No. 52-20930
Permit No. 52-20930P

) **OWNER:** Name FRED A MASELLA Address 4214 River Rd

**LOCATION OF WELL:** County Pierce Govt Lot 4 S. ¼ ¼ Sec. 13 T. 20 N., R. 3E W.M.

ring and distance from section or subdivision corner 600 ft. So & 1420 ft E from NW Corner of Sec 13

**PROPOSED USE:** Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

) **TYPE OF WORK:** Owner's number of well (if more than one) .... #2
New well ☐ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☒
Reconditioned ☐ Rotary ☐ Jetted ☐

**DIMENSIONS:** (2 wells) Diameter of well 2 inches.
Drilled ..... ft. Depth of completed well 75 + 85 ft.

) **CONSTRUCTION DETAILS:**

**Casing installed:** ..... " Diam. from ..... ft. to ..... ft.
Threaded ☒ 2 " Diam. from 0 ft. to 75 + 85 ft.
Welded ☐ ..... " Diam. from ..... ft. to ..... ft.

**Perforations:** Yes ☐ No ☒
Type of perforator used .....
SIZE of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

**Screens:** Yes ☒ No ☐
Manufacturer's Name unknown
Type Brass Model No. unknown
Diam. 2 in. Slot size ..... from 0 ft. to 3 ft. ft.
Diam. 2 in. Slot size ..... from 0 ft. to 3 ft. ft.

**Gravel packed:** Yes ☐ No ☒ Size of gravel: .....
Gravel placed from ..... ft. to ..... ft.

**Surface seal:** Yes ☐ No ☐ To what depth? ..... ft.
Material used in seal .....
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? ..... Depth of strata .....
Method of sealing strata off .....

7) **PUMP:** Manufacturer's Name Ingersoll
Type: Centrifugal H.P. 5

) **WATER LEVELS:** Land-surface elevation above mean sea level .... ..... ft.
atic level 8 ft. ft. below top of well Date .....
esian pressure ..... lbs. per square inch Date .....
Artesian water is controlled by ..... (Cap, valve, etc.)

9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
s a pump test made? Yes ☐ No ☒ If yes, by whom? .....
ld: 50 gal./min. with ..... ft. drawdown after ..... hrs.
" " " "
" " " "

overy data (time taken as zero when pump turned off) (water level measured from well top to water level)

| Time | Water Level | Time | Water Level | Time | Water Level |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

Date of test .....
ler test ..... gal./min. with ..... ft. drawdown after ..... hrs.
esian flow ..... g.p.m. Date .....
Temperature of water ..... Was a chemical analysis made? Yes ☐ No ☐

**(10) WELL LOG:**

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

| MATERIAL | FROM | TO |
|---|---|---|
| Silt - River Bed | 0 | 75 |

Work started March 19 1970 Completed April 19 70

**WELL DRILLER'S STATEMENT:**

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Fred Masella
(Person, firm, or corporation) (Type or print)

Address 4214 River Rd.

[Signed] Fred T. Masella
(Well Driller)

License No. ..... Date 6-25 19 74

OK with me 6-12-74

(USE ADDITIONAL SHEETS IF NECESSARY)

3. F. No. 7356—OS—(Rev. 4-71).

Start card 007483

le Original and First Copy with
epartment of Ecology
econd Copy — Owner's Copy
hird Copy — Driller's Copy

# WATER WELL REPORT

**STATE OF WASHINGTON**

Application No. .....

Permit No. .....

(1) **OWNER:** Name Leonard Piccolos Address 4139 Gay Road, Tacoma

(2) **LOCATION OF WELL:** County Pierce — NW ¼ NW ¼ Sec. 19 T. 20 N., R. 3E W.M.

aring and distance from section or subdivision corner

(3) **PROPOSED USE:** Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(4) **TYPE OF WORK:** Owner's number of well (if more than one) ....
New well ☒ Method: Dug ☐ Bored ☒
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 5" inches.
Drilled 105 ft. Depth of completed well 105 ft.

(6) **CONSTRUCTION DETAILS:**

**Casing installed:** 12" Diam. from 0 ft. to 19 ft.
Threaded ☐ 5" Diam. from 0 ft. to 100 ft.
Welded ☒ ____" Diam. from ____ ft. to ____ ft.

**Perforations:** Yes ☐ No ☐
Type of perforator used
SIZE of perforations ____ in. by ____ in.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.

**Screens:** Yes ☒ No ☐
Manufacturer's Name Johnson
Type S.S. wire wrap Model No.
Diam. ____ Slot size 0.010 from 100 ft. to 105 ft.
Diam. ____ Slot size ____ from ____ ft. to ____ ft.

**Gravel packed:** Yes ☐ No ☒ Size of gravel:
Gravel placed from ____ ft. to ____ ft.

**Surface seal:** Yes ☒ No ☐ To what depth? 85 ft.
12" cement grouted in
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) **PUMP:** Manufacturer's Name Customer's own
Type: H.P.

(8) **WATER LEVELS:** Land-surface elevation above mean sea level .... 25 ft.
atic level -3' ft. below top of well Date 11-24-87
rtesian pressure ____ lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
as a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

| Time | Water Level | Time | Water Level | Time | Water Level |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

Date of test
ailer test 20 gal./min. with 20 ft. drawdown after 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) **WELL LOG:**

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

| MATERIAL | FROM | TO |
|---|---|---|
| brown silty sand | 0 | 60 |
| clean dry sand | 60 | 80 |
| gray clayey silt | 80 | 90 |
| clean med. sand, sat., w. clam shells | 90 | 105 |

Work started 11-12 19 87 Completed 11-25 19 87

**WELL DRILLER'S STATEMENT:**

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Dutch R. Kring KRING DRILLING
(Person, firm, or corporation) (Type or print)

Address P.O. Box 247

[Signed] Dutch R. Kring
(Well Driller)

License No. 0252 Date 12-3 19 87

(USE ADDITIONAL SHEETS IF NECESSARY)

Original and First Copy with
tment of Ecology
d Copy — Owner's Copy
d Copy — Driller's Copy

# WATER WELL REPORT

**STATE OF WASHINGTON**

Application No. .....

Permit No. .....

**OWNER:** Name Solar Mfg. Address 102 So. 26th Tacoma, Wa. 98402

**LOCATION OF WELL:** County Pierce — NE ¼ NE ¼ Sec. 13 T. 20 N., R. 3E W.M.

ng and distance from section or subdivision corner None

**PROPOSED USE:** Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

**TYPE OF WORK:** Owner's number of well (if more than one).... 1
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

**DIMENSIONS:** Diameter of well 6 inches.
Drilled 151 ft. Depth of completed well 145 ft.

**CONSTRUCTION DETAILS:**

**Casing installed:** 6 " Diam. from 0 ft. to 140 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☒ " Diam. from ft. to ft.

**Perforations:** Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

**Screens:** Yes ☒ No ☐
Manufacturer's Name Johnson Well
Type Stainless steel Model No
Diam. 6 Slot size .010 from 140 ft. to 145 ft.
Diam. Slot size from ft. to ft.

**Gravel packed:** Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

**Surface seal:** Yes ☒ No ☐ To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

**PUMP:** Manufacturer's Name Pioneer
Type: A1812E H.P 1

**WATER LEVELS:** Land-surface elevation above mean sea level.... ft.
level 2+ ft. below top of well Date 5-1-87
an pressure lbs. per square inch Date
Artesian water is controlled by Well Seal (Cap, valve, etc.)

**WELL TESTS:** Drawdown is amount water level is lowered below static level
s a pump test made? Yes ☐ No ☒ If yes, by whom? ~~DRILLER~~
d: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

overy data (time taken as zero when pump turned off) (water level measured from well top to water level)

| e | Water Level | Time | Water Level | Time | Water Level |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

te of test
test 36 gal./min. with 18 ft. drawdown after 1 hrs.
esian flow g.p.m. Date 5-1-87
erature of water Was a chemical analysis made? Yes ☐ No ☒

## (10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

| MATERIAL | FROM | TO |
|---|---|---|
| Brown sandy loam soft | 0 | 2 |
| Brown sandy clay soft | 2 | 16 |
| Grey sand & clay soft (wood) | 16 | 33 |
| Black silty sand soft (organics) | 33 | 52 |
| Brown sandy ~~clay~~ clay soft | 52 | 66 |
| Silty black sand (med) water | 66 | 85 |
| Black sand soft shells water | 85 | 92 |
| Black sand silty Med. | 92 | 121 |
| Black sand water & shells | 121 | 126 |
| Grey sandy clay soft | 126 | 140 |
| Grey & black sand clean water | 140 | 145 |
| Brown sandy clay soft | 145 | 151 |

Work started 5-1 19 87 Completed 5-1 19 87

## WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Richardson Well Drilling Co.
(Person, firm, or corporation) (Type or print)

Address P.O. Box 44427 Tacoma, Wa. 98444

[Signed] .....
(Well Driller)

License No. 0419 Date 7-28 19 87

(USE ADDITIONAL SHEETS IF NECESSARY)

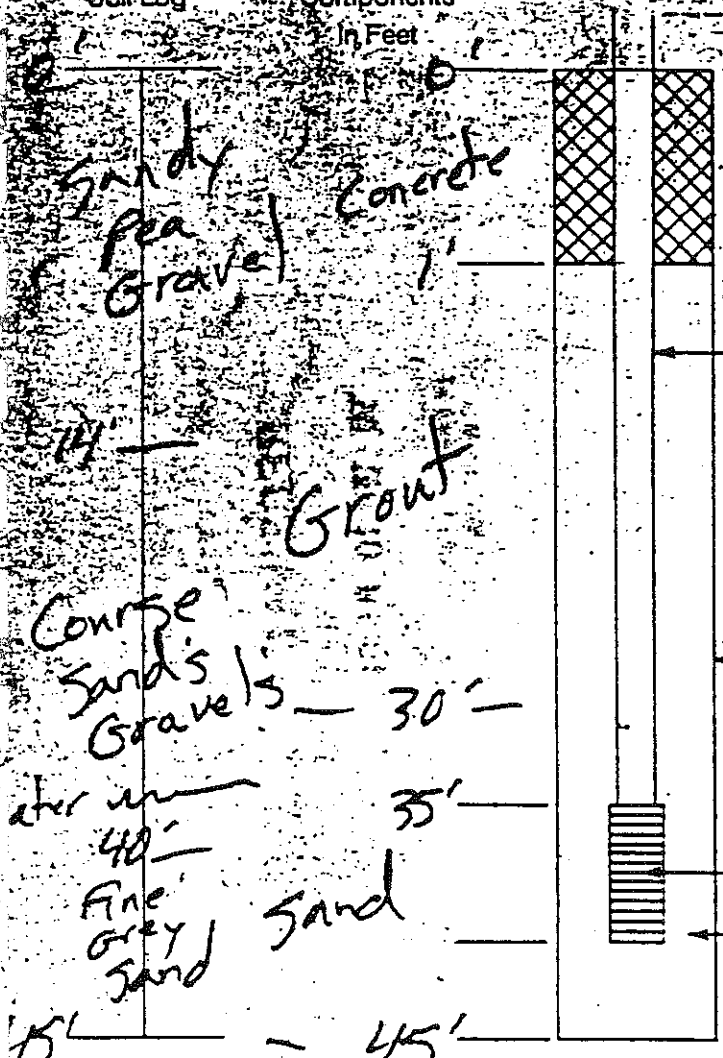
# Geoboring & Developme..., Inc.

## Resource Protection Well Report

Project Name: Unocal cc Tacoma
Well Identification #: MW-2
Drilling Method: HSA 4"
Driller: Terry Burns
License #: 1733
Job #: 348

Date: 12/5/90
County: Pierce, NW 1/4 SW 1/4
Section: 13 T. 20N R. 3E
Start Card: 038952
Consulting Firm: RZA

Stick up: Flush on Monument Casing




Type of Surface Seal: Concrete
Amount:

ID of Riser Pipe: 2"
Type of Riser Pipe: PVC
Amount:
Type of Connection: Thread

Type of Backfill around Riser: Cement Bentonite Grout
Amount:

Diameter of Borehole: 8¼"

Screen Size or Type: .02 PVC

Type of Filter Material: 10-20 Clo Sand
Amount:

Remarks:

Signature:

GWA-11264
GWP-10392

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION
DIVISION OF WATER RESOURCES

WELL LOG

3 wells

Record by Driller
Source Driller's Record

*Location:* State of WASHINGTON
County Pierce
Area
Map
SW ¼ NE ¼ sec. 13 T 20 N., R 3 (E) W.

Diagram of Section

*Drilling Co.* Valley Pump Service
Address 1408 - 18th N.W. Puyallup
Method of Drilling Driven Date Aug., 1970
Owner Lester Webb
Address 4618 Gay Rd. East, Tacoma
Land surface, datum ft above below 2" X 86'
SWL: 3' Date 8/15, 1970 Dims.: 2" X 85'

| Correlation | Material | From (feet) | To (feet) |
|---|---|---|---|
| | (Transcribe driller's terminology literally but paraphrase as necessary, in parentheses. If material water-bearing, so state and record static level if reported. Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc.) | | |
| | Top Soil, Sandy | 0 | 4 |
| | Silt & Sand, Fine | 4 | 80 |
| | Sand, Coarse, Water Bearing | 80 | 85 |
| | Casing: #1 - 2" from 0 to 85' | | |
| | #2 - 2" from 0 to 86' | | |
| | Screens: Clayton-Marks, Drive Points | | |
| | #1 - Diam. 2, Size 50 from 81' to 85' | | |
| | #2 - Diam. 2, Size 50 from 82' to 86' | | |
| | Pump: Berkely, Jet, 1/2-HP | | |

Turn up

Sheet ____ of ____ sheets

Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

# WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 28110

Water Right Permit No. _____

OWNER: Name Painier Corporate Park Address 2503 Frank Albert Rd Fife WA.

LOCATION OF WELL: County Pierce NW¼ SE¼ Sec 12 T 20 N., R 3E W.M.

STREET ADDRESS OF WELL (or nearest address) 2503 Frank Albert Rd.

PROPOSED USE: ☐ Domestic ☐ Industrial ☐ Municipal ☐ ☐ Irrigation ☒ Dewater ☐ Test Well ☐ Other ☐

TYPE OF WORK: Owner's number of well (if more than one) 1 thru 32

Abandoned ☐ New well ☒ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☐ Driven ☐ Reconditioned ☐ Rotary ☐ Jetted ☐

DIMENSIONS: Diameter of well 36" inches. Drilled 30 feet. Depth of completed well 30 ft.

CONSTRUCTION DETAILS:

Casing installed: 10" Diam. from 0 ft. to 30 ft.
Welded ☐ Liner installed ☐ Threaded ☐ _____" Diam. from _____ ft. to _____ ft.

Perforations: Yes ☒ No ☐
Type of perforator used Slotted
SIZE of perforations 50,000th in. by _____ in.
50,000ths perforations from 12 ft. to 30 ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

Screens: Yes ☐ No ☒
Manufacturer's Name _____
Type _____ Model No. _____
Diam. _____ Slot size _____ from _____ ft. to _____ ft.
Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes ☒ No ☐ Size of gravel 3/8 minus
Gravel placed from 0 ft. to 30 ft.

Surface seal: Yes ☒ No ☐ To what depth? _____ ft.
Material used in seal Concrete
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

PUMP: Manufacturer's Name _____
Type: _____ H.P. _____

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level _____ ft. below top of well Date 30
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? _____
Yield: 25 gal./min. with 5 ft. drawdown after 48 hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

| Time | Water Level | Time | Water Level | Time | Water Level |
|---|---|---|---|---|---|
| | | | | | |
| | n/A | | | | |

Date of test _____

Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest _____ gal./min. with stem set at _____ ft. for _____ hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? Yes ☐ No ☐

## (10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

| MATERIAL | FROM | TO |
|---|---|---|
| | 0 | 3 |
| TOPSOIL | | |
| | 3 | 18 |
| sand silt & clay mixture | | |
| | 18 | 30 |
| sand & clay | | |

Installed 32 Dewatering wells for an approx. pumping period of 5 months during construction of Corp Business Park

See Attached map for well locations

TEMPORARY SYSTEM

Work started 4-18- 19 90 Completed _____ 19 _____

## WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME SLEADS Constr Inc (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 2703 E. 96th TACOMA, WA 98445

(Signed) Carl Sleed (WELL DRILLER) License No. 1762

Contractor's Registration No. SLEADC*325K8 Date 5-9- 19 90

(USE ADDITIONAL SHEETS IF NECESSARY)

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION
AND DEVELOPMENT Appli.#7431

WELL LOG No. Permit #7134

Date December 26, 1965

Record by Driller

Source Driller's Record

*Location:* State of WASHINGTON

County Pierce

Area

Map

NE¼ SE¼ sec. 12 T. 20 N., R. 3 E.

Diagram of Section

*Drilling Co.* E.L.Kelley, Water Supt., Town of Fife

Address 3110 Sieade Rd. East, Puyallup, Wash.

Method of Drilling Cable Date December, 1964

Owner Town of Fife

Address 2619 David Court Place East, Tacoma

Land surface, datum ft. above / below

| Correlation | Material | Thickness (feet) From | Depth (feet) To |
|---|---|---|---|
| | Municipal supply | | |
| | Dims: 6" x 90' | | |
| | Silty top dirt | 0 | 3 |
| | Silty clay, sand | 3 | 75 |
| | Sand | 75 | 90 |
| | Casing: 6" from 0-90' | | |
| | Screen installed from 80-90' | | |
| | SWL: 2' on 2-23-65 | | |
| | Yield: 150 gpm with 21' DD after 8 hrs. | | |
| | Recovery—Time Water Level | | |
| | 0 21' | | |
| | 4 min. 2' | | |
| | Pump: 10 h.p. turbine | | |
| | Jacuzzi | | |

(Transcribe driller's terminology literally but paraphrase as necessary, in parentheses. If material water-bearing, so state and record static level if reported. Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc.)

Turn up

Sheet of sheets

Original and First Copy with
artment of Ecology
cond Copy—Owner's Copy
d Copy—Driller's Copy

# WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 028078

Water Right Permit No. _____

OWNER: Name Rainier Camp Park Address 2003 Frank Albert Rd Fife WA 98421

LOCATION OF WELL: County Pierce NW¼ SE¼ Sec 12 T. 20N. N., R. 3E W.M.

STREET ADDDRESS OF WELL (or nearest address) Same As Above

PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ ☐ Irrigation ☐ Test Well ☐ Other ☐ ☐ DeWater

TYPE OF WORK: Owner's number of well (if more than one) _____

Abandoned ☒ New well ☐ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☐ Driven ☐ Reconditioned ☐ Rotary ☐ Jetted ☐

DIMENSIONS: Diameter of well _____ inches.

Drilled _____ feet. Depth of completed well _____ ft.

CONSTRUCTION DETAILS:

Casing installed: _____ " Diam. from _____ ft. to _____ ft.

Welded ☐ Liner installed ☐ Threaded ☐ _____ " Diam. from _____ ft. to _____ ft.

_____ " Diam. from _____ ft. to _____ ft.

Perforations: Yes ☐ No ☐

Type of perforator used _____

SIZE of perforations _____ in. by _____ in.

_____ perforations from _____ ft. to _____ ft.

_____ perforations from _____ ft. to _____ ft.

_____ perforations from _____ ft. to _____ ft.

Screens: Yes ☐ No ☐

Manufacturer's Name _____

Type _____ Model No. _____

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes ☐ No ☐ Size of gravel _____

Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes ☐ No ☐ To what depth? _____ ft.

Material used in seal _____

Did any strata contain unusable water? Yes ☐ No ☐

Type of water? _____ Depth of strata _____

Method of sealing strata off _____

PUMP: Manufacturer's Name _____

Type: _____ H.P. _____

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.

Static level _____ ft. below top of well Date _____

Artesian pressure _____ lbs. per square inch Date _____

Artesian water is controlled by _____ (Cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? Yes ☐ No ☐ If yes, by whom? _____

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

" " " "

" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

| Time | Water Level | Time | Water Level | Time | Water Level |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

Date of test _____

Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.

Airtest _____ gal./min. with stem set at _____ ft. for _____ hrs.

Artesian flow _____ g.p.m. Date _____

Temperature of water _____ Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

| MATERIAL | FROM | TO |
|---|---|---|
| Approx 100' Deep Artesian well w/ 2" Pipe to the surface | | |
| Pressure grouted to State requirements by Welco | | |
| Unknown by property owner how long well was on site but the property was previously farm in Fife Valley | | |
| Artesian well Abandonment | | |

RECEIVED
MAY 10 1990
DEPT. OF ECOLOGY

Work started 5-5 19 90 completed 5-5 19 90

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME SLEAD's Construction Inc (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 2703 E. 96th Tacoma, WA 98445

(Signed) Dave Ringedahl (WELL DRILLER) License No. 1760

Contractor's Registration No. SLEADSC 325KO Date 5-5 19 90

(USE ADDITIONAL SHEETS IF NECESSARY)

Original and First Copy with Department of Ecology
2nd Copy—Owner's Copy
3rd Copy—Driller's Copy

# WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 28110

Water Right Permit No. _____

OWNER: Name Rainier Corporate Park Address 2503 Frank Albert Rd Fife WA

LOCATION OF WELL: County Pierce NW. SE Sec 12 T. 20 N. R 3E W.M.

STREET ADDRESS OF WELL (or nearest address) 2503 Frank Albert Rd. Fife WA. 98

PROPOSED USE: ☐ Domestic ☐ Industrial ☐ Municipal ☐ ☐ Irrigation ☐ Test Well ☐ Other ☐ ☐ DeWater

TYPE OF WORK: Owner's number of well (if more than one) _____

Abandoned ☐ New well ☐ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☐ Driven ☐ Reconditioned ☐ Rotary ☐ Jetted ☐

DIMENSIONS: Diameter of well _____ inches.

Drilled _____ feet. Depth of completed well _____ ft.

CONSTRUCTION DETAILS:

Casing installed: _____ " Diam. from _____ ft. to _____ ft.

Welded ☐ Liner installed ☐ Threaded ☐ _____ " Diam. from _____ ft. to _____ ft.

_____ " Diam. from _____ ft. to _____ ft.

Perforations: Yes ☐ No ☐

Type of perforator used _____

SIZE of perforations _____ in. by _____ in.

_____ perforations from _____ ft. to _____ ft.

_____ perforations from _____ ft. to _____ ft.

_____ perforations from _____ ft. to _____ ft.

Screens: Yes ☐ No ☐

Manufacturer's Name _____

Type _____ Model No. _____

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes ☐ No ☐ Size of gravel _____

Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes ☐ No ☐ To what depth? _____ ft.

Material used in seal _____

Did any strata contain unusable water? Yes ☐ No ☐

Type of water? _____ Depth of strata _____

Method of sealing strata off _____

PUMP: Manufacturer's Name _____

Type: _____ H.P. _____

(3) WATER LEVELS: Land-surface elevation above mean sea level _____ ft.

Static level _____ ft. below top of well Date _____

Artesian pressure _____ lbs. per square inch Date _____

Artesian water is controlled by _____ (Cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? Yes ☐ No ☐ If yes, by whom? _____

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

" " " "

" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

| Time | Water Level | Time | Water Level | Time | Water Level |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

Date of test _____

Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.

Airtest _____ gal./min. with stem set at _____ ft. for _____ hrs.

Artesian flow _____ g.p.m. Date _____

Temperature of water _____ Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

| MATERIAL | FROM | TO |
|---|---|---|
| Sealed in Accordance with State Specifications | 0 | 30 |
| RECEIVED | | |
| SEE SITE MAP ATTACHED FOR Well Numbers & DATES SEALED | | |

Work started 3-12-90 Completed 7-25-90

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME SLEAD'S Construction Inc (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 2703 E 96th Tacoma, WA 98444

(Signed) Curtis Slead (WELL DRILLER) License No. 1762

Contractor's Registration No. SLEADSB25KD Date 8-20-90

(USE ADDITIONAL SHEETS IF NECESSARY)