APPENDIX 3.5-E

Geologic Logs, Well Construction Diagrams, and Well Development Forms for Wetlands Investigation, 1987
# Log of Test Boring No.: PZ-1A, 1B

**Client:** Kennecott  
**Project:** Wetlands  
**Project Number:** 87K10-13  
**Location:** River backwater  
**Coordinates:** 60601.44 N 38737.67 E  
**Surface Elevation:** 1103.5  
**Boring Depth:** 6.0  
**Date:** 10/30/87

<table>
<thead>
<tr>
<th>MSL ELEV.</th>
<th>DEPTH FROM SURF. INTERVAL</th>
<th>SAMPL. DEPTH INTERVAL</th>
<th>TYPE</th>
<th>#</th>
<th>REC. (ft)</th>
<th>DESCRIPTION OF MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1103.5</td>
<td>0.0-1.5</td>
<td>0.0-1.5</td>
<td>ss</td>
<td>1</td>
<td>5.0</td>
<td>5-in gray organic silt (k)'s over 1-in gray silti SAND, fn, vy soft, saturated (vy fine sand)</td>
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<tr>
<td>1102.5</td>
<td>--1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Same to about 2 ft; at 2 ft red brn silty SAND, fn, w/ved &amp; cse sand, fn &amp; cse gvl, saturated</td>
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<tr>
<td>1101.5</td>
<td>--2</td>
<td>1.5-3.0</td>
<td>as</td>
<td>2</td>
<td>7.0</td>
<td>9.0</td>
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<tr>
<td>1100.5</td>
<td>--3</td>
<td>3.0-4.5</td>
<td>ss</td>
<td>3</td>
<td>29.1</td>
<td>Gray &amp; red brn wellgraded SAND w/silt, fn sand w/ fn gvl, saturated, dense, w/str yel brn (10N 4/4) mottles. Very irreg., indistinct bedding</td>
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<td>1099.5</td>
<td>--4</td>
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<td>SW-SM</td>
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<td>1098.5</td>
<td>--5</td>
<td>4.5-6.0</td>
<td>ss</td>
<td>4</td>
<td>36.0</td>
<td>Saw as above except massive</td>
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<td>1097.5</td>
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<td></td>
<td></td>
<td></td>
<td>6'-End of Boring in Sand &amp; Gravel</td>
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<td></td>
<td></td>
<td></td>
<td>PZ-1A Installed in boring</td>
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<td>1096.5</td>
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<td></td>
<td>PZ-1B Installed in unsampled boring about 5 ft east.</td>
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<td>PZ-18 at 40599.83 N 38739.21 E</td>
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<td>1093.5</td>
<td>--10</td>
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<td>1092.5</td>
<td>--11</td>
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</tbody>
</table>

## Drilling Data

**Start Date:** 10/30/87  
**Completion Date:** 10/30/87  
**Logged By:** BJS  
**Drilling Method:** 4 1/4" ID Hollow stem auger  
**Drilling Contractor:** Wisconsin Test Drilling, Inc.

**Water Level Information**

- **Depth at Completion:**  
- **Later Time/Depth:**  
- **Later Time/Depth:**  
- **Cave in Depth:**  
- **Drilling Losses:**

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3.5-E-1
MONITORING WELL CONSTRUCTION DIAGRAM

Driller: Wisconsin Test Drilling, Inc.
Drilling Method: Hollow Stem Augers 4.25" ID
Coordinates: 40,601.44N 38,737.67E

Well No.: PZ-1A
Date Installed: 10-30-87

1106.20' Elevation
2.79' Stick-up

Protector Pipe:
Size: --
Material: --
Lock No.: --

Surface Seal Material: None

Drill Hole Diameter: 7"

Riser:
Diameter: 2"
Material: PVC
Sch.: 40
Type of Joints: Flush threaded Stenciled? --

Type of Annular Space Backfill
Bentonite Powder

Type of Filter Material
#30 Sand

Type of Filter Material
None

Type of Seal

Type of Backfill

NOTE: Not to Scale

MONITORING WELL CONSTRUCTION DIAGRAM

Driller: Wisconsin Test Drilling, Inc.
Drilling Method: Hollow Stem Augers 4.25" ID
Coordinates: 40,599.83 38,739.21

Well No.: PZ-1B
Date Installed: 10-30-87

1106.20' Elevation
2.79' Stick-up

Protector Pipe:
Size: --
Material: --
Lock No.: --

Surface Seal Material: None

Drill Hole Diameter: 7"

Riser:
Diameter: 2"
Material: PVC
Sch.: 40
Type of Joints: Flush threaded Stenciled? --

Type of Annular Space Backfill
Bentonite Powder

Type of Filter Material
#30 Sand

Type of Filter Material
None

Type of Seal

Type of Backfill

NOTE: Not to Scale
## Monitoring Well Construction Diagram

**Client:** Kennebecott  
**Scope I.D.:** 87K10  
**Project:** Wetlands  
**Page:** 1  
**Prepared by:** BJS  
**Date:** 9-24-87  
**Checked by:** BJS  
**Date:** 12-14-88

### Well Construction Details

- **Driller:** Wisconsin Test Drilling, Inc.  
- **Well No.:** PZ-1006  
- **Drilling Method:** Hollow Stem Augers 4.25" ID  
- **Coordinates:** 41,427.59R 41,318.308  
- **Date Installed:** 9-24-87

### Laboratory Tests

- **Surface Elevation:** 1147.5  
- **Boring Depth:** 54.0  
- **Date:** 09/23/87

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<tr>
<th>WELL</th>
<th>DEPT H</th>
<th>DEPTH (FT)</th>
<th>SAMPL DEPTH</th>
<th>INTERVAL</th>
<th>TYPE</th>
<th>%</th>
<th>REC</th>
<th>DESCRIPTION OF MATERIAL</th>
<th>CLASS</th>
<th>LABORATORY TESTS</th>
<th>DRILLING AND SAMPLE NOTES</th>
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<tr>
<td>1147.5</td>
<td>-0.0</td>
<td>2.0-3.5</td>
<td>ss</td>
<td>1</td>
<td>36</td>
<td>1.5</td>
<td>Dr yl berm (10YR 4/6) silt sandy silt, fns.</td>
<td>SP</td>
<td>DM,ML</td>
<td>-</td>
<td></td>
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<tr>
<td>1142.5</td>
<td>-5.0</td>
<td>5.0-6.5</td>
<td>ss</td>
<td>2</td>
<td>70</td>
<td>1.0</td>
<td>As above to 5.5' w. two interbedded at 5.5' poorly graded gravel, loose, dry, w/f sand.</td>
<td>SP</td>
<td>SN</td>
<td>-</td>
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<td>1137.5</td>
<td>-10.0</td>
<td>10.0-11.5</td>
<td>ss</td>
<td>3</td>
<td>51</td>
<td>1.1</td>
<td>Red berm (7.5YR 1/4) silt sandy silt, fns and clay, fns, moss, diatomite</td>
<td>SP</td>
<td>SN</td>
<td>-</td>
<td></td>
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<td>1132.5</td>
<td>-15.0</td>
<td>15.0-16.5</td>
<td>ss</td>
<td>4</td>
<td>68</td>
<td>0.5</td>
<td>same, mossy</td>
<td>SN</td>
<td>SN</td>
<td>-</td>
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<td>1127.5</td>
<td>-20.0</td>
<td>20.0-21.5</td>
<td>ss</td>
<td>5</td>
<td>12</td>
<td>0.8</td>
<td>same, except massive, saturated</td>
<td>SN</td>
<td>SN</td>
<td>-</td>
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<td>1122.5</td>
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<td>25.0-26.5</td>
<td>ss</td>
<td>6</td>
<td>16</td>
<td>0.8</td>
<td>same, saturated, vy soft</td>
<td>SN</td>
<td>SN</td>
<td>-</td>
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<td>1117.5</td>
<td>-30.0</td>
<td>30.0-31.5</td>
<td>ss</td>
<td>7</td>
<td>40</td>
<td>1.0</td>
<td>same, soft to firm, weath. cobble in shoe, crumbly, soft</td>
<td>SP</td>
<td>SN</td>
<td>-</td>
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<tr>
<td>1112.5</td>
<td>-35.0</td>
<td>35.0-36.5</td>
<td>ss</td>
<td>8</td>
<td>99</td>
<td>1.0</td>
<td>Yl berm (7.5YR 4/6) to yl red (5YR 4/6) silt sandy silt, fns and diatomite</td>
<td>SP</td>
<td>SN</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>1107.5</td>
<td>-40.0</td>
<td>40.0-41.5</td>
<td>ss</td>
<td>9</td>
<td>41</td>
<td>1.0</td>
<td>Same as above, mossy, cohesive, firm</td>
<td>SP</td>
<td>SN</td>
<td>-</td>
<td></td>
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<tr>
<td>1102.5</td>
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<td>45.0-46.5</td>
<td>ss</td>
<td>10</td>
<td>51</td>
<td>1.0</td>
<td>Str yl berm (7.5YR 4/6) to yl red (5YR 4/6) silt sandy silt, fns and diatomite</td>
<td>SP</td>
<td>SN</td>
<td>-</td>
<td></td>
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<td>1097.5</td>
<td>-50.0</td>
<td>50.0-51.5</td>
<td>ss</td>
<td>11</td>
<td>95</td>
<td>1.3</td>
<td>At 50', 1.5' blowup. Sample mix of cave</td>
<td>SP</td>
<td>SN</td>
<td>-</td>
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<tr>
<td>1092.5</td>
<td>-55.0</td>
<td>55.0-56.5</td>
<td>ss</td>
<td>12</td>
<td>95</td>
<td>1.2</td>
<td>Red, gray, variegated sand, soft</td>
<td>SP</td>
<td>SN</td>
<td>-</td>
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**Ground Elevation:** 1147.50'  
**Stick-up:** 2'  
**Type of Annular Space Backfill:** Bentonite Pellets  
**Type of Seal Pellets:** Bentonite Pellets  
**Type of Filter Material:** #30 Sand  
**Type of Filter Material:** None  
**Type of Seal:** None  
**Type of Backfill:** None  

**Screen:**  
- **Diameter:** 2"  
- **Material:** PVC  
- **Slot Size:** 0.010"  
- **Length:** 5'

**Centralizer:**  
- **Used:** No  
- **Not Used:** Yes

**Depth to Water From Top of Riser at Completion:**  
- **Dry:** Not to Scale

**Client:** Kennebecott  
**Scope I.D.:** 87K10  
**Project:** Wetlands  
**Page:** 1  
**Prepared by:** BJS  
**Date:** 9-24-87  
**Checked by:** BJS  
**Date:** 12-14-88

### Well Depth Information

- **Start Date:** 09/23/87  
- **Completion Date:** 09/23/87  
- **Logged by:** BJS  
- **Drilling Method:** Hollow stem augers 4.25" ID  
- **Drilling Contractor:** Wisconsin Test Drilling, Inc.

### Water Level Information

- **Start Date:** 09/23/87  
- **Completion Date:** 09/23/87  
- **Logged by:** BJS  
- **Drilling Method:** Hollow stem augers 4.25" ID  
- **Drilling Contractor:** Wisconsin Test Drilling, Inc.
MONITORING WELL DEVELOPMENT

WELL NUMBER: PZ-1006
WELL DIAMETER: 2"
TOTAL DEPTH OF WELL: 10.0'
DEPTH TO WATER: TIME OF MEASUREMENT
BEFORE: Dry
AFTER: 

DESCRIPTION OF DEVELOPMENT METHOD

VOLUME OF WATER REMOVED FROM WELL: None
CLARITY OF WATER IN WELL BEFORE DEVELOPMENT: 
CLARITY OF WATER IN WELL AFTER DEVELOPMENT: 
PRESENCE OF SEDIMENT AT THE BOTTOM OF THE WELL: 
VOLUME OF WATER ADDED TO WELL: None
SOURCE OF WATER ADDED TO WELL: 
TIME SPENT FOR DEVELOPMENT: 

STABILIZATION READINGS

<table>
<thead>
<tr>
<th>GAL. REMOVED</th>
<th>TIME</th>
<th>TEMPERATURE</th>
<th>SPEC. COND.</th>
<th>pH</th>
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MONITORING WELL CONSTRUCTION DIAGRAM

Driller: Wisconsin Test Drilling, Inc.
Drilling Method: Hollow Stem Augers
Well No.: PZ-1006G
Coordinates: 41°43.29’N  41°31.21’E
Date Installed: 9-24-87

Ground Surf. to Tip of Well Screen

Type of Annular Space Backfill
Bentonite Grout

Type of Seal
Bentonite Pellets

Type of Filter Material
#30 Sand & Caved Sand

Type of Filter Material

Type of Seal

Type of Backfill

Screen:
Diameter: 2"
Material: PVC
Slot Size: 0.010"
Length: 5'
Type of Cap: PVC
Centralizer: Used

Drill Hole Diameter: 7"

Surface Seal Material: Cement

FOTH AND VAN DYKE

3.5-K-6
MONITORING WELL DEVELOPMENT

<table>
<thead>
<tr>
<th>WELL NUMBER</th>
<th>FZ-10066</th>
</tr>
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<tbody>
<tr>
<td>WELL DIAMETER</td>
<td>2&quot;</td>
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<tr>
<td>TOTAL DEPTH OF WELL</td>
<td>33.1'</td>
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<td>DEPTH TO WATER TIME OF MEASUREMENT</td>
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</tr>
<tr>
<td>BEFORE 12.8'</td>
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<tr>
<td>AFTER 33' (Dry)</td>
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</table>

DESCRIPTION OF DEVELOPMENT METHOD

Well was alternately surged and bailed using a PVC hand pump.

VOLUME OF WATER REMOVED FROM WELL: 10 gallons
CLARITY OF WATER IN WELL BEFORE DEVELOPMENT: brown, sandy, silty
CLARITY OF WATER IN WELL AFTER DEVELOPMENT: light brown
PRESENCE OF SEDIMENT AT THE BOTTOM OF THE WELL: None
VOLUME OF WATER ADDED TO WELL: None
SOURCE OF WATER ADDED TO WELL: None
TIME SPENT FOR DEVELOPMENT: 15 Minutes

MONITORING WELL CONSTRUCTION DIAGRAM

- **Clients:** Kennecott
- **Project:** Baseline Groundwater Monitoring
- **Scope ID:** 87K10
- **Prepared by:** BJS
- **Date:** 9-30-87
- **Checked by:** BJS
  - **Date:** 12-14-88

Driller: Wisconsin Test Drilling, Inc.
Drilling Method: Hollow Stem Augers 4.25" ID
Coordinates: 41,420.45N 41,317.34E

- **Surface Seal Material:** Cement
- **Drill Hole Diameter:** 7"
- **Riser Diameter:** 2"
- **Centralizer Used?** No
- **Type of Filter Material #30 Sand:** Length: 5'
- **Type of Cap:** PVC
- **Depth to Water From Top of Riser at Completion:** 14'

STABILIZATION READINGS

<table>
<thead>
<tr>
<th>GAL. REMOVED</th>
<th>TIME</th>
<th>TEMPERATURE</th>
<th>SPEC. COND.</th>
<th>pH</th>
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FOTH AND VAN DYKE

3.5E-8

3.5E-9
MONITORING WELL DEVELOPMENT

WELL NUMBER PZ-1006S
WELL DIAMETER 2"
TOTAL DEPTH OF WELL 52.0'
DEPTH TO WATER TIME OF MEASUREMENT
BEFORE 14.2'
AFTER 13.5'

DESCRIPTION OF DEVELOPMENT METHOD

Well was alternately surged and bailed using a PVC hand pump.

VOLUME OF WATER REMOVED FROM WELL

50 gallons

CLARITY OF WATER IN WELL BEFORE DEVELOPMENT brown, sandy

CLARITY OF WATER IN WELL AFTER DEVELOPMENT light brown

PRESENCE OF SEDIMENT AT THE BOTTOM OF THE WELL

VOLUME OF WATER ADDED TO WELL
None

SOURCE OF WATER ADDED TO WELL

TIME SPENT FOR DEVELOPMENT 0.5 hours

STABILIZATION READINGS

<table>
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<tr>
<th>GAL. REMOVED</th>
<th>TIME</th>
<th>TEMPERATURE</th>
<th>SPEC. COND.</th>
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FOOTH AND VAN DYKE

3.5-E-11