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*Geotechnical Data Report*

# Columbia River Ship Channel Deepening Project

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Prepared by  
**CH2MHILL**

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# **Introduction**

## **Authorization**

This report presents the findings of the geotechnical exploration program performed for the proposed Columbia River ship channel deepening project. This work is authorized by Task Order No. DACW 57-97-D-0004-0022, dated July 14, 2000.

## **Purpose and Scope**

This geotechnical data report presents the findings of a geotechnical exploration for the proposed channel deepening. The scope of the project conformed to the statement of work provided by the U.S. Army Corps of Engineers, dated July 14, 2000. The specific tasks involved the following:

- Conducting geotechnical field explorations at various locations within the existing channel limits. This included 40 test pits, 184 jet probe holes, and 14 rock core borings.
- Evaluating of subsurface conditions at various locations in terms of excavation requirements.
- Preparing this report.

## **Background**

### **Site Location**

Our investigation included selected locations of the Columbia River ship channel between River Mile (RM) 42 and RM 104. Sampling locations were provided by the U.S. Army Corps of Engineers.

### **Project Description**

The proposed Columbia River ship channel improvement consists of deepening the navigation channel 3 feet from its currently authorized channel depth of elevation -40 feet Columbia River Datum (CRD). With an additional 2 feet of advance maintenance, the actual planned excavation depth for the new channel is elevation -48 feet. In bedrock areas excavation would extend to elevation -48 feet.

### **Limitations**

This report has been prepared for the exclusive use of the U.S. Army Corps of Engineers for specific application to the Columbia River channel deepening project between RM 42 and RM 104. This report has been prepared in accordance with generally accepted geotechnical engineering practice. No other warranty, expressed or implied, is made.

The test pit, jet probe, and boring logs indicate subsurface conditions only at specific locations and times, and only to the depths penetrated. Subsurface conditions at other locations may differ from conditions at these locations. In addition, the passage of time may result in a change in the conditions at these locations. If, during excavation, subsurface conditions are found to vary from those described in this report, the geotechnical data report may need to

be reevaluated. CH2M HILL is not responsible for any claims, damages, or liabilities associated with interpretation of subsurface data or reuse of the subsurface data or engineering analyses without the express written authorization of CH2M HILL.

## Field Exploration Program

The field exploration program was conducted on August 7 through 30, 2000. The exploration consisted of advancing 40 test pits, 184 probe holes, and 14 rock core borings. An overview of the areas investigated is shown in Figures 1 through 4. The specific locations of each test pit, probe hole, and rock core boring are shown on figures presented in Appendix A. The purpose of the field exploration was to determine the presence or absence of bedrock that will extend above the excavation grade line for the planned new ship channel depth. All test pit, jet probe, and core borings were within a 5-foot radius of the proposed location, with the exception of four drill holes that were within 8 feet of the proposed location.

### Personnel

Hickey Marine Enterprises performed the test pit and probe hole work. Geotech Explorations Inc., as the subcontractor to Hickey Marine, performed the rock core drilling operations. Minister-Glaeser established the horizontal control for the project and set up 15 staff gauges on the river so that river elevations could be determined at the time of each exploration.

CH2M HILL personnel were present during field explorations for the purpose of coordinating and observing the operations, verifying correct locations for the explorations, and logging the test pits, probe holes, and rock core borings. Subsurface materials recovered or encountered were recorded in the field.

### Test Pit Operations

A 103- by 60-foot derrick barge (Hickey Marine's "Sea Vulture") with two 30-inch-diameter spuds and a 38- by 17-foot tugboat with 800 horsepower (the "Nova") were used for test pit operations. Test pit operations were conducted by using a barge-mounted crane (a 4600 Manitowoc) with an 8-cubic-yard rock bucket to dig the pits. The steel cable attached to the rock bucket was marked in 1-foot increments so that depths could be determined. Test pit sites were located using a differential global positioning system (GPS) with the antenna placed on the tip of the crane's boom. A computer and monitor placed in the crane operator's cabin showed the position of the top of the boom. Once the barge was securely spudded, the crane was brought into position and test pit coordinates were recorded and verified. A tide reading was taken before and after each test pit was excavated. Materials from each scoop were placed on a separate barge (Harvey, 120- by 40-foot) for the field personnel to observe and identify. After each scoop, the rock bucket was carefully lowered back into the existing hole with help of the GPS. The depth of the open bucket was recorded before every scoop. Digging in the same hole continued until an elevation of -50 feet CRD was reached. Materials were disposed of in the same general area after the hole was completed.

All 40 test pits were dug in the same general area near RM 66, close to the Lewis and Clark bridge that connects Longview, Washington, to Oregon. Test pit logs are shown in Appendix B. Table 1 shows a summary of the locations and depths of the test pits.

### **Jet Probe Operations**

The jet probing operations were conducted as recommended by the U.S. Army Corps of Engineers. A procedure similar to that used for channel deepening explorations in Coos Bay, Oregon, was implemented for this work (COE, 1995). A 103- by 60-foot derrick barge (Hickey Marine's "Sea Vulture") with two 30-inch-diameter spuds and a 38- by 17-foot tugboat with 800 horsepower (the "Nova") were used for jet probe operations. An 84-foot-long jet pile driver was used for probing operations. The pipe size was 6 inches outside diameter with a wall thickness of 0.5 inch. The nozzle was approximately 1 foot long, which includes a 6-inch taper. The bottom jet opening was 1.5 inches wide, and three side jets located approximately 1.5 to 2 feet from the bottom jet had 1.5-inch-diameter openings. A three-stage diesel jet pump supplied water pressures ranging from 75 to 175 pounds per square inch (psi). Table 2 shows the location and depths of the jet probe holes.

A differential global positioning system was used to locate on the exploration sites, with the antenna placed on the tip of the crane's boom. A computer and monitor placed in the crane operator's cabin showed the position of the tip of the boom. Positioning was achieved to within 5 feet of the designed probe location. After the barge was securely spudded, the coordinates were verified. The tide was recorded while the probe was lowered to the river bottom so that the equivalent CRD of the top of the overburden material could be recorded.

It was common for the probe to sink a few inches into the sediments, but the slower penetration rate indicated when the probe was in sediment so that the river bottom elevation could be recorded. The probe tip was then raised approximately 1 foot above the bottom to ensure that the nozzle was not plugged and the water pump was turned on. The water pressure used for initial probing was 75 psi. The probe was lowered until refusal was obtained. The probe was then lifted approximately 1 to 2 feet and lowered two more times; the final depth was then recorded. This depth was assumed to be the top of weathered or partially decomposed rock. The probe was then raised about 1 foot and the water pressure was increased to the full pump capacity of 175 psi. The same procedures were repeated. The rate of penetration was observed as probing progressed to see whether refusal happened suddenly, which would indicate hard rock, or gradually, which could indicate gravel, weathered rock, or cemented sand. The bottom depth was recorded at refusal or upon reaching the termination elevation. The probe was retrieved to the surface to ensure that the nozzle was not blocked. Probes not encountering refusal were terminated around elevation -50 feet CRD.

A total of 184 jet probes were conducted between RM 42 and RM 104 of the Columbia River to identify areas where bedrock is present. Jet probe logs are shown in Appendix B. Table 2 shows a summary of the locations and depths of the jet probing.

### **Drilling Procedures**

A 103- by 50-foot derrick barge (Hickey Marine's "Sea Lion") with two 30-inch-diameter spuds and a 40.6-by 13-foot tugboat (the "Viking") were used for drilling operations. The drill rig was placed on a separate flat-top barge, 173 by 39 feet, tied to the "Sea Lion."

A CME 75 truck-mounted drill rig was used for drilling operations. A 5-inch casing was used with an HQ-size core barrel with a split inner tube.

The crane (3900 Manitowoc) was used to load the drill rig onto the barge. Drilling was accomplished through an existing 2.5-foot-diameter opening through the barge deck. Drill rig sites were located using differential GPS. A computer and monitor placed in the crane operator's cabin showed the position of the drill rate. Once the barge was securely spudded, the drill hole coordinates were recorded. The 5-inch casing was lowered to the channel bottom and seated by being struck with a 140-pound hammer. The tide elevation was recorded, and the bottom elevation of the drill casing and the elevation of the river bottom were calculated by establishing the length of drill casing reaching from the water surface to the bottom. All core drilling was done within the casing. Varying lengths of casing and/or drill rods were added or deleted from the setup depending on tide fluctuations. Water and a face discharge, impregnated, tapered drill bit was used for the core drilling procedures.

A total of 14 borings were drilled between RM 41 and RM 88 to identify the nature of the bedrock material, if bedrock was present. Boreholes were sited in areas of rock removal from previous channel deepenings. An effort was made to determine if the rock encountered was loose and jumbled or more in place to assess what methods of removal would be necessary for the upcoming deepening. Ten feet of rock core drilling was required at each site. Therefore, some of the core borings extended beyond elevation -50 feet. All the core was logged, placed in core boxes, and photographed. Boring logs and core photos are shown in Appendix B and Appendix C, respectively. Table 3 shows the locations and depth of the core borings.

## Findings

We refer to basalt fragments in this report if the basalt encountered during our core drilling operations was highly fractured, possibly as a result of previous blasting activities in the area. These basalt fragments may have been transported by the river and may not be at their original location. In many areas the basalt fragments were underlain by loose sands or soft sandstone indicating the basalt fragments have been transported to the area and lie above the original river bottom. Solid in-place basalt bedrock is referred to as basalt.

During jet probing, refusal at 175 psi was referred to as rock, indicating a very hard contact of the jet probe with the material encountered. It could not be determined whether this rock was solid bedrock, a boulder, or rock fragments. Jet probing was conducted before the core drilling. Therefore, a description of the materials encountered during drilling had not been available.

Test pit, jet probe, and core boring logs are attached in Appendix B. Summary tables of the test pit, jet probe, and core drilling exploration locations and depths are shown in Tables 1 through 3. Contour maps showing top of rock, or refusal, for all localized areas containing 10 or more probe and drill holes are provided in Appendix D.

Excavation of most of the materials encountered during our exploration can be completed with a clam shell bucket with rock teeth. Basalt bedrock was encountered in a few areas only, therefore blasting activities can possibly be limited to those areas. The actual channel depth was deeper than expected at many locations, so the quantities of material to be

excavated will be significantly smaller than initially expected assuming a river bottom elevation of -40 feet CRD. Dredging is another option for removal of materials. However, removal of basalt fragments scattered throughout the channel can most likely not be accomplished by dredging.

### **Area 42/1**

Two borings (DH-41-1 and DH-41-2) and 10 jet probes (JP-41-1 through JP-41-10) were conducted in this area. The river bottom was encountered between elevation -46.6 feet and elevation -51.5 feet. Basalt fragments with an average thickness of 2 feet were encountered in the core borings at approximately elevation -47.5 feet. Coring below the basalt fragments yielded very poor recovery, with only several gravel-sized pieces of sandstone or cemented sand. Given the very poor recovery, it was not determined whether the material encountered is a sand, cemented sand, or possibly a weak sandstone. Refusal was encountered during our jet probe explorations at elevations as shallow as -47.6 feet. Not every jet probe encountered refusal above elevation -50 feet. We believe that no hard, in-place bedrock is present above elevation -50 feet.

### **Area 42/2**

Two borings (DH-42-1 and DH-42-2) and 32 jet probes (JP-42-1 through JP-42-32) were conducted in this area. The river bottom was encountered between elevation -45.8 feet and elevation -54.0 feet. The core borings encountered basalt fragments between elevation -46.6 feet and elevation -50 feet, followed by what is possibly a sand, cemented sand, or very soft sandstone. Some of the jet probing indicated refusal starting at elevation -47.2 ft. We believe that no hard, in-place bedrock is present above elevation -50 feet.

### **Area 42/3**

Three borings (DH-42-3, DH-42-4, and DH-42-5) and 32 jet probes (JP-42-33 through JP-42-64) were advanced in this area. The river bottom was encountered between elevation -46.2 feet and elevation -53.9 feet. The boreholes encountered basalt fragments in a matrix consisting of a soft or loose material. Basalt bedrock was encountered in DH-42-3 at elevation -62.2 feet. Jet probe refusal was not encountered above elevation -47.5 feet. We believe that no hard, in-place bedrock is present above elevation -50 feet.

### **Area 44**

One jet probe (JP-44-1) was advanced in this area. The river bottom was encountered at elevation -45.1 feet. Probing indicated soft materials easily penetrated by the jet probe to elevation -50 feet using a water pressure of 75 psi. No hard bedrock was encountered.

### **Area 46**

One jet probe (JP-46-1) was advanced in this area. The river bottom was encountered at elevation -43.4 feet. Probing indicated soft materials easily penetrated by the jet probe to elevation -50 feet using a water pressure of 75 psi. No hard bedrock was encountered.

### **Area 47**

One jet probe (JP-47-1) was advanced in this area. The river bottom was encountered at elevation -44.5 feet. Probing indicated soft materials easily penetrated by the jet probe to elevation -50 feet using a water pressure of 75 psi. No hard bedrock was encountered.

### **Area 56/1**

One core boring (DH-55-1) and 15 jet probes (JP-55-1 through JP-55-15) were advanced in this area. The river bottom was encountered between elevation -47 feet and elevation -56.2 feet. Basalt fragments in a silty sand matrix were encountered in the core boring at elevation -52.5 feet. In general, the coring encountered highly fractured basalt with areas of sudden drops resulting in poor recovery, possibly indicating boulders or basalt flows with interbedded soft layers or sand. In-place basalt bedrock was encountered at elevation -64 feet. Jet probe refusal was observed as shallow as elevation -48 feet.

### **Area 56/2**

One jet probe (JP-56-1) was advanced in this area. The river bottom was encountered at elevation -42.4 feet. Probing indicated soft materials easily penetrated by the jet probe to elevation -50 feet using a water pressure of 75 psi. No hard bedrock encountered.

### **Area 61**

One jet probe (JP-61-1) was advanced in this area. The river bottom was encountered at elevation -49.4 feet. Probing indicated soft materials easily penetrated by the jet probe to elevation -50 feet using a water pressure of 75 psi. No hard bedrock was encountered.

### **Area 63**

Four jet probes (JP-62-1, and JP-63-1 through JP-63-3) were advanced in this area. The river bottom was encountered between elevation -44.0 feet and elevation -50.4 feet. Probing indicated soft materials easily penetrated by the jet probe to elevation -50 feet using a water pressure of 75 psi. No hard bedrock was encountered.

### **Area 66**

Forty test pits (TP-66-1 through TP-66-40) were excavated in this area. None of the test pits encountered bedrock. Materials predominately consisted of sand and silt overlying gravel. Occasional basalt boulders up to 4 feet in diameter and scattered logs at the river bottom were encountered. The river bottom was encountered between elevation -41.3 feet and elevation -49.0 feet. Hard digging was encountered at several locations, but refusal was never achieved. Excavation of the majority of the test pits was easy. Boulders were scattered throughout the area explored, except for the northeast side where mainly Mt. St. Helens material was encountered. The test pits at the east half of the north side were very easy to excavate. In general, a 1- to 5-feet thick layer of Mt. St. Helens material was encountered on top of pre-Mt. St. Helens material.

## **Area 71**

One jet probe (JP-70-1) was advanced in this area. The river bottom was encountered at elevation -40.6 feet. The probing indicated sandy materials slowly penetrated by the jet probe to elevation -50 feet using water pressures of 75 and 175 psi. No hard bedrock was encountered.

## **Area 75**

One jet probe (JP-74-1) was advanced in this area. The river bottom was encountered at elevation -40.6 feet. The probing indicated sandy materials slowly penetrated by the jet probe to elevation -50 feet using water pressures of 75 and 175 psi. No hard bedrock was encountered.

## **Area 79**

Three jet probes (JP-79-1, JP-79-2, and JP-79-3) were advanced in this area. The river bottom was encountered between elevation -43.4 feet and elevation -46.5 feet. The probing indicated soft materials easily penetrated by the jet probe to elevation -50 feet using a water pressure of 75 psi. No hard bedrock was encountered.

## **Area 83**

Three jet probes (JP-82-1, JP-82-2, and JP-82-3) were advanced in this area. The river bottom was encountered between elevation -42.1 feet and elevation -42.4 feet. The probing indicated soft materials easily penetrated by the jet probe to elevation -50 feet using a water pressure of 75 psi. No hard bedrock was encountered.

## **Area 88/1**

Four core borings (DH-87-1 through DH-87-4) and 46 jet probes (JP-87-1 through JP-87-46) were advanced in this area. The river bottom was encountered between elevation -39.2 feet and elevation -53 feet. Basalt fragments were encountered in the borings as shallow as elevation -43 feet (DH-87-2). Typically the basalt is highly fractured to a depth of approximately elevation -48 feet. The rock quality encountered in our borings was very poor (the rock quality designation, or RQD, was less than 18.3 percent) above elevation -50 feet and improved to poor (the RQD was 46 percent) in DH-87-1 between elevation -53.3 feet and elevation -56.2 feet. During our jet probing we encountered refusal, at all but four sites, possibly indicating basalt as shallow as elevation -43.6 feet.

## **Area 88/2**

Two borings (DH-88-1 and DH-88-2) and 15 jet probes (JP-88-1 through JP-88-15) were advanced in this area. The river bottom was encountered between elevation -41.7 feet and elevation -47.5 feet. Basalt was encountered in our borings at elevation as shallow as -45.2 feet (DH-88-2). The jet probes encountered refusal, at all locations, possibly indicating basalt as shallow as elevation -44.5 feet. DH-88-1 and DH-88-2 yielded very poor rock quality (the RQD was 0 percent) to elevation -50.3 feet and elevation -48.6 feet, respectively.

## **Area 90**

Two jet probes (JP-90-1 and JP-90-2) were advanced in this area. The river bottom was encountered at elevation -40.6 feet and elevation -44.1 feet. The probing indicated soft materials easily penetrated by the jet probe to elevation -50 feet using a water pressure of 75 psi. No hard bedrock was encountered.

## **Area 93**

One jet probe (JP-93-1) was advanced in this area. The river bottom was encountered at elevation -48.5 feet. The probing indicated soft materials easily penetrated by the jet probe to elevation -50 feet using a water pressure of 75 psi. No hard bedrock was encountered.

## **Area 95**

One jet probe (JP-95-1) was advanced in this area. The river bottom was encountered at elevation -47.0 feet. The probing indicated soft materials easily penetrated by the jet probe to elevation -50 feet using a water pressure of 75 psi. No hard bedrock was encountered.

## **Area 100**

Ten jet probes (JP-100-1 through JP-100-10) were advanced in this area. The river bottom was encountered from elevation -43.3 feet to below elevation -50.6 feet. The probing indicated soft materials easily penetrated by the jet probe to elevation -50 feet using a water pressure of 75 psi. No hard bedrock was encountered.

## **Area 104**

Two jet probes (JP-104-1 and JP-104-2) were advanced in this area. The river bottom was encountered between elevation -44.5 feet and elevation -45.7 feet. Refusal of the probes was encountered at elevation -48.1 feet and elevation -48.4 feet. The material encountered was believed to be gravel rather than hard bedrock, given the slow penetration of the material and one gravel piece stuck at the bottom of the jet probe.

## **Geologic Setting**

Geologic units beneath the Columbia River that are significant to this project (Walker and MacLeod, 1991; Walsh et al., 1987) include the following:

- Recent Columbia River alluvium. This consists of loose or soft sediment ranging in size from clay to boulders.
- Miocene-age Columbia River Basalt. Flow rock could be encountered from one or all of the following units: Pomona Member of the Saddle Mountain Basalt Formation, Frenchman Springs Member of the Wanapum Basalt Formation, and Grande Ronde Basalt Formation (Wells et al., 1989). These units originated in eastern Oregon or Washington and flowed westward to through a broad lowland in the approximate location of the Columbia River Gorge (Beeson et al., 1989).
- Miocene-age marine sedimentary rocks. These could include fine-grained, friable sandstone; massive to thin-bedded siltstone; and tuffaceous siltstone to sandstone.

## Assessment of Exploration Methods

This section describes the effectiveness of each work method used to gain knowledge about the materials present in the areas of concern.

### Test Pits

We were able to excavate all 40 test pit holes to the required depth of elevation -50 feet using a clamshell bucket with teeth. Potential problems with this method include the excavated hole caving in, so that the contact between different layers can only be estimated. However, the materials encountered in this excavation were easy to characterize, and this method worked very well for the area under investigation.

Excavating test pits using a clamshell bucket with rock teeth could also have been helpful in determining general excavatability in areas with basalt fragments.

### Jet Probes

Materials encountered during jet probing were classified based on the rate of penetration and the reaction of the jet probe when lowered through the material. When penetrating sandy materials, the probe advanced at a steady pace. When advancing through gravel, the probe was observed to penetrate very slowly, sometimes resulting in refusal. When penetrating hard material and refusal was encountered at a low pressure (75 psi), the pressure was increased to 175 psi. If the probe was on top of basalt bedrock, it did not advance any further. If basalt fragments were encountered, the probe sometimes penetrated a little further because it bounced off a rock piece.

Without any visual information, the jet probes can be misleading in classifying the materials encountered during refusal. What was labeled as bedrock during probing was discovered during core drilling to be basalt fragments overlying a sand material. Therefore, caution should be used when evaluating the materials encountered during jet probing, especially at refusal.

### Core Drilling

Core drilling was very effective in finding competent bedrock and enabling its characterization. Core drilling did not yield very good visual information about soft bedrock materials. It is possible that a cemented sand or sandstone was encountered. These materials could be difficult to excavate.

For this project the combination of jet probes and core drilling was adequate to define the existence of hard bedrock. The jet probes yielded valuable information on river bottom elevations and indicated whether there was soft or hard contact between the jet probe and the material encountered. The drilling verified the difference between hard basalt bedrock and basalt fragments. Without the core drilling operations, the jet probe information could have been misleading.

Core drilling procedures only gave a good indication of the nature of the basalt fragments if good recovery was achieved with in-place material or if jumbled material was rounded. It was hard to distinguish between blast fractures and natural joints, and only the highly

fractured nature of the blasted material aided in classification. Core drilling does not give a good indication of excavatability of the material encountered if gravel or basalt fragments are encountered.

## **Assessment of Excavability and Characteristics of Rock Material**

### **Areas Where Bedrock or Basalt Fragments Were Encountered above Elevation -45 Feet**

At the following areas bedrock and/or hard materials were encountered at elevations shallower than elevation -45 feet. Each area is discussed separately, to address the excavatability of the rock material encountered. Rock excavation techniques such as blasting are required in areas where solid basalt bedrock was encountered. In areas where basalt fragments or in-place basalt broken up by previous blasting was encountered, excavation with a clam shell bucket with rock teeth might be sufficient due to the relatively thin layer needing removal. Should basalt fragments be too large in size, blasting might be required to break up those large pieces so that removal with a clam shell bucket with rock teeth can be completed later.

#### **Area 88/1**

Highly fractured basalt bedrock or basalt fragments were encountered during our jet probing above elevation -45 feet. Therefore, rock excavation techniques will be required in this area.

#### **Area 88/2**

Highly fractured basalt bedrock or basalt fragments were encountered during our jet probing above elevation -45 feet. Therefore, rock excavation techniques will be required in this area.

### **Areas Where Bedrock or Basalt Fragments Were Encountered between Elevation -45 Feet and Elevation -48 Feet**

At the following areas, bedrock and/or hard materials were encountered between elevation -45 feet and elevation -48 feet. Each area is discussed separately, to identify the excavatability of the rock material encountered. Basalt fragments can be removed with a clam shell bucket with rock teeth. If boulder-size material is within the basalt fragments, and cannot be removed by a clam shell, blasting of these boulders might be required for removal.

#### **Area 42/1**

Basalt fragments were not encountered above elevation -45 feet but do occur between elevation -45 feet and elevation -48 feet. Therefore, rock excavation techniques will be required if the channel is deepened to elevation -48 feet.

### **Area 42/2**

Basalt fragments were not encountered above elevation -45 feet but do occur between elevation -45 feet and elevation -48 feet. Therefore, rock excavation techniques will be required if the channel is deepened to elevation -48 feet.

### **Area 42/3**

Basalt fragments were not encountered above elevation -45 feet but do occur between elevation -45 feet and elevation -48 feet. Therefore, excavation techniques that can accommodate boulder-sized material will be required if the channel is deepened to elevation -48 feet.

### **Area 56/1**

Basalt fragments were not encountered above elevation -45 feet, but they do occur between elevation -45 feet and elevation -48 feet. Therefore, excavation techniques that can accommodate boulder-sized material will be required if the channel is deepened to elevation -48 feet.

### **Area 104**

Gravel was encountered in probe holes between elevation -45 feet and elevation -48 feet. Therefore, excavation techniques that can accommodate boulder-sized rock will be required if the channel is deepened to elevation -48 feet.

## **Areas Where Bedrock or Basalt Fragments Were Not Encountered above Elevation -48 Feet**

Most of our exploration resulted in river bottom elevations deeper than elevation -43 or even elevation -45 feet. This section addresses areas where basalt bedrock or hard material was encountered below elevation -48 feet, which is the deepest elevation of interest for this project. Based on our exploration results, excavation in the following areas can be accomplished using conventional dredging techniques for sandy materials:

- Area 44
- Area 46
- Area 47
- Area 56/2
- Area 61
- Area 63
- Area 66
- Area 71
- Area 75
- Area 79
- Area 83
- Area 90
- Area 93
- Area 95
- Area 100

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**TABLE 1**

Summary of Test Pit Explorations

Test Pit	Date Completed	Location		Starting El. (ft)	Final El. (ft)	Bedrock Encountered
		Northing	Easting			
TP-66-1	08/11/2000	1,371,477.11	901,680.78	-46.9	-50.5	No
TP-66-2	08/11/2000	1,371,787.88	901,370.69	-43.3	-50.3	No
TP-66-3	08/11/2000	1,371,916.28	901,990.39	-45.3	-50	No
TP-66-4	08/11/2000	1,372,015.29	901,701.28	-42.4	-50.1	No
TP-66-5	08/11/2000	1,372,233.24	901,241.32	-43	-50	No
TP-66-6	08/10/2000	1,372,382.60	901,256.31	-45.4	-50.1	No
TP-66-7	08/10/2000	1,372,724.98	900,933.40	-45.7	-50.2	No
TP-66-8	08/10/2000	1,373,186.43	900,616.67	-45.7	-50.2	No
TP-66-9	08/10/2000	1,373,606.23	900,311.11	-45.6	-50.1	No
TP-66-10	08/10/2000	1,373,629.15	899,648.05	-42.4	-50.3	No
TP-66-11	08/10/2000	1,373,976.44	899,820.60	-47	-50.1	No
TP-66-12	08/09/2000	1,374,054.54	899,405.28	-43.8	-50.3	No
TP-66-13	08/09/2000	1,374,332.57	899,237.91	-46	-50.3	No
TP-66-14	08/09/2000	1,374,362.85	899,428.60	-45.9	-50.1	No
TP-66-15	08/10/2000	1,374,374.22	899,658.70	-46.9	-50.3	No
TP-66-16	08/10/2000	1,374,401.97	899,744.62	-46.4	-50.1	No
TP-66-17	08/10/2000	1,374,747.85	899,637.85	-45.2	-50.3	No
TP-66-18	08/09/2000	1,374,993.93	898,857.34	-47.5	-50.1	No
TP-66-19	08/09/2000	1,375,212.96	899,124.08	-46.6	-50	No
TP-66-20	08/09/2000	1,375,309.02	899,300.28	-45.8	-50.7	No
TP-66-21	08/09/2000	1,375,425.31	898,813.41	-46	-50.1	No
TP-66-22	08/09/2000	1,375,638.95	899,101.01	-45.3	-50.2	No
TP-66-23	08/08/2000	1,375,651.02	898,456.32	-41.3	-50.3	No
TP-66-24	08/09/2000	1,375,777.81	898,746.36	-47.9	-50	No
TP-66-25	08/08/2000	1,375,875.82	898,371.98	-45.2	-50.1	No
TP-66-26	08/08/2000	1,376,069.22	898,223.47	-48	-50	No
TP-66-27	08/08/2000	1,376,445.46	898,572.76	-45	-50	No
TP-66-28	08/08/2000	1,376,488.17	898,496.61	-46.8	-50.2	No
TP-66-29	08/08/2000	1,376,515.30	897,955.79	-44.9	-50.2	No
TP-66-30	08/08/2000	1,376,643.14	898,233.05	-47	-50	No
TP-66-31	08/07/2000	1,376,725.50	897,834.47	-48.5	-50.6	No
TP-66-32	08/08/2000	1,376,736.65	898,385.83	-45.5	-50.1	No
TP-66-33	08/08/2000	1,376,922.30	898,303.49	-47.7	-50.6	No
TP-66-34	08/07/2000	1,377,092.20	898,005.50	-44.8	-50.5	No
TP-66-35	08/07/2000	1,377,217.65	898,098.76	-46	-50.6	No
TP-66-36	08/07/2000	1,377,221.43	897,837.70	-49	-50.1	No
TP-66-37	08/07/2000	1,377,363.12	898,016.13	-49	-50.7	No
TP-66-38	08/07/2000	1,377,654.33	897,643.40	-46.3	-50.8	No
TP-66-39	08/07/2000	1,377,855.01	897,711.80	-49	-50.8	No
TP-66-40	08/07/2000	1,378,106.26	897,579.30	-48.5	-50	No

**Note:**

All elevations refer to Columbia River Datum (CRD).

**TABLE 2**  
Jet Probing: Columbia River Channel Deepening Project

Probe Number	Date	Time		Northing	Easting	River El. CRD/ Time	River Bottom El. (CRD)	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Encountered by Probe	Top of Rock El.	Miscellaneous Notes
		Start	End										
41-01	08/24/2000	1151	1151	1264670.06	921977.16	4.5/1144	-51.5+	--	--	--	--	--	Below grade, stopped probe above bottom
41-02	08/24/2000	1148	1149	1264666.18	921997.77	4.5/1144	-48.4	-49.9	Y	75	Rock	-48.4	Hard contact.
	08/24/2000	1149	1150	1264666.18	921997.77	4.5/1144	-49.9	-50.2	Y	175	Rock		Difficult to advance.
41-03	08/24/2000	1134	1135	1265641.64	921000.88	4.6/1125	-46.9	-47.9	Y	75	Basalt fragments (?)	-47.4	Hard contact, loose rocks over hard.
	08/24/2000	1135	1136	1265641.64	921000.88	4.6/1125	-47.9	-48.4	Y	175	Rock		
41-04	08/24/2000	1145	1146	1265658.50	921014.71	4.5/1144	-46.6	-47.0	Y	75	Rock	-46.6	Hard contact, difficult to advance.
	08/24/2000	1146	1147	1265658.50	921014.71	4.5/1144	-47.0	-47.6	Y	175	Rock		Difficult to advance
41-05	08/24/2000	1137	1138	1265657.51	921035.57	4.6/1125	-47.8	-48.2	Y	75	Basalt fragments (?)	-47.8	Hard contact, difficult to advance.
	08/24/2000	1138	1139	1265657.51	921035.57	4.6/1125	-48.2	-48.2	Y	175	Rock		No gain
41-06	08/24/2000	1131		1265629.92	921034.47	4.6/1125	-48.4	-50.3	N	75	Sand over rock	-49.8	Easy at first, harder last 0.5 foot
41-07	08/24/2000	1129	1130	1265621.88	921052.21	4.6/1125	-49.2	-50.5	N	75	Basalt fragments (?)	-49.2	Work probe, moderate difficulty
41-08	08/24/2000	1125	1127	1265598.99	921039.77	4.6/1125	-46.9	-47.8	Y	75	Basalt fragments (?)	-46.9	Hard contact, difficult to advance
	08/24/2000	1127	1128	1265598.99	921039.77	4.6/1125	-47.8	-48.3	Y	175	Rock		Difficult to advance
41-09	08/24/2000	1121	1122	1265584.37	921057.21	4.6/1110	-47.9	-49.5	Y	75	Basalt fragments (?)	-47.9	Hard contact, difficult to advance
	08/24/2000	1122	1124	1265584.37	921057.21	4.6/1110	-49.5	-49.5	Y	175	Rock		No gain
41-10	08/24/2000	1112	1114	1265559.83	921073.19	4.6/1110	-48.4	-48.9	Y	75	Basalt fragments (?)	-48.4	Hard contact, difficult to advance
	08/24/2000	1114	1115	1265559.83	921073.19	4.6/1110	-48.9	-49.2	Y	175	Rock		Bouncing onto rock
42-01	08/24/2000	0948	0948	1265067.13	921741.26	3.7/0944	-52.8	--	--	--	Sand on bottom	--	Soft contact below grade
42-02	08/24/2000	0944	0944	1265094.64	921787.09	3.7/0944	-48.3	-50.3	N	75	Sand	--	Easy advance to 1 ft/sec
42-03	08/24/2000	0932	0932	1265014.13	921757.35	3.6/0928	-50.4	--	--	--	Sand	--	Soft contact below grade
42-04	08/24/2000	0940	0942	1265060.35	921813.87	3.7/0936	-48.7	-50.1	N	75	Rock	-48.7	"Bouncey" advance, moderate difficulty
42-05	08/24/2000	1037	1038	1265100.86	921844.14	4.3/1030	-48.2	-49.6	Y	75	Rock	-48.2	Hard contact, difficult to advance
	08/24/2000	1038	1040	1265100.86	921844.14	4.3/1030	-49.6	-49.7	Y	175	Rock		Difficult to advance
42-06	08/24/2000	0847	0848	1265947.99	920758.52	2.7/0840	-48.6	-49.3	Y	75	Basalt fragments (?)	-49.3	Hard contact
	08/24/2000	0848	0851	1265947.99	920758.52	2.7/0840	-49.3	-50.2	N	175	Rock		Work probe to grade with difficulty
42-07	08/24/2000	0929	0929	1265976.68	920784.19	3.6/0928	-48.4	-50.9	N	75	Sand	--	Easy advance at 1 ft/sec
42-08	08/24/2000	0937	0938	1265023.91	921842.66	3.7/0936	-47.5	-49.8	Y	75	Sand	-49.8	Soft, easy to 49.8
	08/24/2000	0938	0939	1265023.91	921842.66	3.7/0936	-49.8	-50.2	N	175	Basalt fragments (?)		Work probe to planned grade in rock
42-09	08/24/2000	1029	1030	1265073.03	921895.69	4.3/1030	-46.6	-46.8	Y	75	Basalt fragments (?)	-46.6	Hard contact, difficult to advance
	08/24/2000	1030	1030	1265073.03	921895.69	4.3/1030	-46.8	-47.2	Y	175	Rock		Difficult to advance
42-10	08/24/2000	0923	0925	1265976.15	920819.28	3.5/0921	-47.4	-47.7	Y	75	Basalt fragments (?)	-47.4	Hard, slow, difficult progress
	08/24/2000	0925	0926	1265976.15	920819.28	3.5/0921	-47.7	-47.9	Y	175	Rock		Difficult to advance; check jets = okay
42-11	08/24/2000	0829	0829	1265884.45	920750.18	2.6/0829	-53.4	--	--	--	--	--	Well below grade
42-12	08/24/2000	0831	0832	1265902.24	920794.24	2.6/0829	-46.4	-48.2	Y	75	Sand	-48.2	Semi-soft, easy penetration at first
	08/24/2000	0832	0833	1265902.24	920794.24	2.6/0829	-48.2	-48.4	Y	175	Basalt fragments (?)		Stopped penetration like hard rock
42-13	08/24/2000	0845	0845	1265941.48	920846.36	2.7/0840	-48.6	-51.3	N	75	Sand	--	Soft contact, easy penetration
42-14	08/24/2000	0915	0916	1265979.44	920876.80	3.4/0912	-47.4	-47.8	Y	75	Basalt fragments (?)	-47.4	Hard contact, difficult to advance.

See NOTES at end of table

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**TABLE 2**  
Jet Probing: Columbia River Channel Deepening Project

Probe Number	Date	Time		Northing	Easting	River El. CRD/ Time	River Bottom El. (CRD)	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Encountered by Probe	Top of Rock El.	Miscellaneous Notes
	08/24/2000	0916	0917	1265979.44	920876.80	3.4/0912	-47.8	-47.8	Y	75	Rock		No progress, hard
42-15	08/24/2000	1025	1026	1265027.83	921936.95	4.2/1020	-48.8	-49.0	Y	75	Rock	-48.8	Firm bottom difficult to advance
	08/24/2000	1026	1027	1265027.83	921936.95	4.2/1020	-49.0	-49.0	Y	175	Rock		No gain
42-16	08/24/2000	0836	0837	1265903.35	920831.59	2.6/0835	-48.9	-49.9	Y	75	Sand	--	Semi-soft, easy at first then hard
	08/24/2000	0837	0838	1265903.35	920831.59	2.6/0835	-49.9	-50.7	N	175	Sand		Acted like moved rock out of way and then easy penetration
42-17	08/24/2000	0822	0822	1265860.18	920822.24	2.5/0821	-48.7	-51.0	N	75	Sand	--	Semi-soft, easy penetration 1 ft/sec
42-18	08/24/2000	0909	0911	1265941.42	920908.50	3.4/0912	-45.8	-48.8	Y	75	Sand	-48.8	Easy to 48.8 then hard
	08/24/2000	0911	0912	1265941.42	920908.50	3.4/0912	-48.8	-49.6	Y	175	Rock		Difficult to advance
42-19	08/24/2000	1023	1023	1265980.82	920959.23	4.2/1020	-50.8	--	--	--	Sandy bottom	--	Soft bottom below grade
42-20	08/24/2000	0811	0811	1265823.80	920801.16	2.0/0757	-51.8	--	--	--	Rock	-51.8	Hard contact below grade
42-21	08/24/2000	0819	0819	1265862.63	920857.57	2.3/0815	-48.5	-50.7	N	75	Sand	--	Semi-soft contact, easy penetration 1 ft/sec
42-22	08/24/2000	0840	0841	1265885.90	920891.33	2.7/0840	-47.5	-49.1	Y	75	Sand	-49.1	Soft contact, easy to 49.1 then hard
	08/24/2000	0841	0842	1265885.90	920891.33	2.7/0840	-49	-49.3	Y	175	Rock		Hard, difficult probing advance
42-23	08/24/2000	0902	0904	1265945.69	923949.10	3.2/0902	-48.8	-49.6	Y	75	Sand	-49.6	Easy at first then progress stopped
	08/24/2000	0904	0905	1265945.69	923949.10	3.2/0902	-49.6	-49.8	Y	175	Rock		Hard, difficult to advance
42-24	08/24/2000	0801	0801	1265741.94	920763.20	2.0/0757	-48.0	-51.0	N	75	Sand	--	Hard contact, easy penetration at 1 ft/sec
42-25	08/24/2000	0754	0754	1265781.74	920835.56	2.0/0757	-54.0	--	--	--	Rock	-54.0	Hard rock below grade of -50.0; no probing
42-26	08/24/2000	0814	0814	1265833.52	920884.55	2.0/0757	-51.0	--	--	--	Rock	-51.0	Hard contact below grade
42-27	08/24/2000	0816	0816	1265856.43	920915.95	2.3/0815	-52.0	--	--	--	Sand	--	Soft contact below grade
42-28	08/24/2000	0857	0857	1265902.03	920939.91	3.0/0857	-51.0	--	--	--	--	--	Hard contact but not like rock below grade
42-29	08/24/2000	0806	0808	1265720.71	920784.23	2.0/0757	-48.1	-48.1	Y	75	--	-48.1	Hard contact, no progress probing (hard)
	08/24/2000	0808	0810	1265720.71	920784.23	2.0/0757	-48.1	-48.9	Y	175	Basalt fragments (?)		Difficult to advance probe
42-30	08/24/2000	1059	1059	1266261.83	921028.59	4.5/1055	-45.5	-52.5	N	75	Sand	--	Soft contact, easy penetration at 1 ft/sec
42-31	08/24/2000	1057	1057	1266264.20	921048.27	4.5/1055	-45.5	-52.5	N	75	Sand	--	Soft contact, easy penetration at 1 ft/sec
42-32	08/24/2000	1050	1050	1266093.27	921227.27	4.4/1049	-45.6	-52.6	N	75	Sand	--	Firm contact, easy penetration at 1 ft/sec
42-33	08/23/2000	1440	1440	1266334.90	920361.95	1.6/1420	-53.4	--	N	--	Sand	--	Over grade depth of -50 feet, no test
42-34	08/23/2000	1412	1412	1266297.54	920365.65	1.7/1402	-49.5	-52.3	N	75	Sand	--	Good penetration at 0.5 ft/sec
42-35	08/23/2000	1437	1437	1266337.40	920399.31	1.6/1420	-47.6	-53.4	N	75	Sand	--	Steady penetration at 0.5 ft/sec
42-36	08/23/2000	1405	1405	1266253.66	920356.63	1.7/1402	-51.3	--	--	--	Silty sand	--	Semi-soft contact
42-37	08/23/2000	1408	1410	1266264.71	920394.30	1.7/1402	-47.3	-50.4	N	75	Sand	--	Hard (not like rock) penetrates like sand
42-38	08/23/2000	1420	1422	1266301.48	920427.14	1.6/1420	-48.3	-50.4	N	75	Sand	--	Semi-soft contact, steady slow penetration; check jets = okay.
42-39	08/23/2000	1429	1432	1266333.55	920446.06	1.6/1420	-47.4	-47.8	Y	75	Cemented breccia??	-47.4	Hard, but does not "feel" like rock
	08/23/2000	1432	1435	1266333.55	920446.06	1.6/1420	-47.8	-49.9	Y	175	Cemented breccia??		
42-40	08/23/2000	1403	1403	1266220.55	920384.65	1.7/1402	-51.3	--	--	--	Silty sand	--	Semi-soft contact

See NOTES at end of table

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Probe Number	Date	Time		Northing	Easting	River El. CRD/ Time	River Bottom El. (CRD)	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Encountered by Probe	Top of Rock El.	Miscellaneous Notes
		Start	End										
42-41	08/23/2000	1425	1426	1266305.03	920474.97	1.6/1420	-48.2	-50.2	N	75	Sandy?	--	Semi-soft contact; "jerky" penetration; note irregular bottom values as much as 5 feet
42-42	08/23/2000	1505	1506	1266318.44	920513.21	1.5/1445	-47.6	-49.3	Y	75	Cemented sand?	-50.3	Semi-soft, probe settles in, does not "clank"
	08/23/2000	1506	1509	1266318.44	920513.21	1.5/1445	-49.3	-50.0	Y	175			Work it down slow to grade, does not "clank" like rock
42-43	08/23/2000	1400	1400	1266186.24	920388.29	1.7/1402	-53.3	--	--	--	Silty sand	--	Semi-soft contact
42-44	08/23/2000	1345	1347	1266225.00	920426.44	1.9/1338	-47.1	-49.9	Y	75	Basalt fragments (?)	-47.1	Hard contact
42-45	08/23/2000	1347	1350	1266225.00	920426.44	1.9/1338	-49.9	-50.1	Y	175	Rock		
42-45	08/23/2000	1323	1324	1266189.38	920416.28	2.1/1316	-49.4	-50.2	Y	75	Basalt fragments (?)	-49.4	Hard contact
42-46	08/23/2000	1338	1340	1266236.19	920469.44	1.9/1338	-47.1	-47.1	Y	75	Basalt fragments (?)	-47.1	Hard contact
42-46	08/23/2000	1340	1342	1266236.19	920469.44	1.9/1338	-47.1	-48.1	Y	175	Rock		Skid off rock to make depth
42-47	08/23/2000	1459	1501	1266309.43	920561.53	1.5/1445	-47.6	-48.7	Y	75	Sand over rock	-48.7	Semi-soft contact
42-47	08/23/2000	1501	1503	1266309.43	920561.53	1.5/1445	-48.7	-48.7	Y	175	Rock		
42-48	08/23/2000	1321	1321	1266193.12	920454.16	2.1/1316	-51.7	--	--	--	--	-51.7	Hard contact below grade
42-49	08/23/2000	1318	1318	1266161.57	920438.63	2.1/1316	-53.9	--	--	--	--	-53.9	Hard contact below grade
42-50	08/23/2000	1330	1330	1266202.98	920494.19	2.1/1316	-51.6	--	--	--	--	-51.6	Hard contact below grade
42-51	08/23/2000	1454	1454	1266259.80	920566.08	1.5/1445	-51.1	--	N	--	Sand	--	Semi-soft contact below grade
42-52	08/23/2000	1314	1314	1266167.25	920474.49	2.1/1316	-52.9	--	--	--	--	-52.7	Hard contact below grade
42-53	08/23/2000	1445	1445	1266217.56	920542.85	1.5/1445	-51.3	--	N	--	Rock	-51.3	Hard bottom below grade
42-54	08/23/2000	1335	1335	1266182.87	920520.35	2.1/1316	-53.9	--	--	--	--	-53.9	Hard contact below grade
42-55	08/23/2000	1304	1304	1266045.12	920335.28	2.3/1253	-50.3	--	--	--	--	-50.3	Hard contact at below grade, okay -50.0 elevation
42-56	08/23/2000	1259	1300	1266023.84	920346.53	2.3/1253	-47.7	-48.4	Y	75	Basalt fragments (?)	-47.7	Hard contact
	08/23/2000	1300	1302	1266023.84	920346.53	2.3/1253	-48.4	-48.5	Y	175	Rock		Hard to make progress
42-57	08/23/2000	1255	1256	1266034.22	920369.99	2.3/1253	-49.3	-49.7	Y	75	Rock	-49.3	Hard contact
	08/23/2000	1256	1258	1266034.22	920369.99	2.3/1253	-49.7	-50.5	Y	175	Rock		Work to grade slow.
42-58	08/23/2000	1252	1253	1266015.55	920384.28	2.3/1253	-48.7	-49.3	Y	75	Rock	-48.7	Hard contact
	08/23/2000	1253	1254	1266015.55	920384.28	2.3/1253	-49.3	-50.4	Y	175	Rock		
42-59	08/23/2000	1244	1246	1266983.61	919382.02	2.8/1220	-48.0	-49.7	Y	75	Rock	-48	Hard contact
	08/23/2000	1246	1248	1266983.61	919382.02	2.3/1253	-49.7	-50.2	Y	175	Rock		Work probe up and down to get depth
42-60	08/23/2000	1239	1240	1266999.07	919401.16	2.8/1220	-48.7	-49.3	Y	75	Basalt fragments (?)	-48.7	Hard contact
	08/23/2000	1240	1242	1266999.07	919401.16	2.8/1220	-49.3	-50.2	Y	175	Rock		
42-61	08/23/2000	1231	1232	1266965.29	919399.19	2.8/1220	-46.9	-47.3	Y	75	Rock	-46.9	Hard contact
	08/23/2000	1232	1234	1266965.29	919399.19	2.8/1220	-47.3	-47.5	Y	175	Rock		Very hard to penetrate
42-62	08/23/2000	1235	1236	1266983.46	919415.78	2.8/1220	-48.3	-49.2	Y	75	Basalt fragments (?)	-48.3	Hard contact
	08/23/2000	1236	1238	1266983.46	919415.78	2.8/1220	-49.2	-50.0	Y	175	Rock		Worked down to grade
42-63	08/23/2000	1225	1226	1266961.97	919420.13	2.8/1220	-47.3	-47.7	Y	75	Rock	-47.3	Hard contact

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**TABLE 2**  
Jet Probing: Columbia River Channel Deepening Project

Probe Number	Date	Time		Northing	Easting	River El. CRD/ Time	River Bottom El. (CRD)	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Encountered by Probe	Top of Rock El.	Miscellaneous Notes
	08/23/2000	1226	1228	1266961.97	919420.13	2.8/1220	-47.7	-50.2	Y	175	Basalt fragments (?)		Gain 0.5 foot with pump pressure increased; worked to get to El.-50.2 ft.
42-64	08/23/2000	1221	1222	1266938.76	919426.07	2.8/1220	-48.0	-48.4	Y	75	Basalt fragments (?)	-48	Hard contact
	08/23/2000	1222	1224	1266938.76	919426.07	2.8/1220	-48.4	-48.7	Y	175	Basalt fragments (?)		Hard
42-65	08/23/2000	1449	1449	1266246.19	920566.36	1.5/1445	-50.2	-51.5	N	No pump	Sand	--	Semi-soft contact below grade; pick up and down to El.-51.5 ft.
44-01	08/23/2000	1138	1138	1278804.01	915898.80	3.9/1137	-45.1	-51.1	N	75	Sand	--	Soft contact soft easy probe at 0.5 to 1 foot/second
46-01	08/23/2000	1109	1110	1284076.30	915840.34	4.1/1109	-43.4	-51.4	N	75	Sand	--	Soft contact probe okay at 0.5 feet/second
47-01	08/23/2000	1044	1044	1292714.36	915139.05	4.5/1044	-44.5	-51.0	N	75	Sand	--	Soft contact eased in 1 foot/second penetration
55-01	08/23/2000	0855	0855	1333268.43	930342.50	4.3/0839	-49.5	-51.5	N	75	Fractured rock		Bumped rock out of way, went to -51.5
55-02	08/23/2000	0839	0839	1333291.21	930344.28	4.3/0839	-50.4	--	--	--	Rock	-50.4	Hard contact, over -50 elevation no need to pump
55-03	08/23/2000	0850	0851	1333265.93	930366.01	4.3/0839	-48.2	-48.7	Y	75	Basalt fragments (?)	-48.2	Hard contact, probe jumps around
	08/23/2000	0851	0853	1333265.93	930366.01	4.3/0839	-48.7	-49.2	Y	175	Basalt fragments (?)		
55-04	08/23/2000	0830	0831	1333286.61	930364.10	3.8/0807	-47.8	-50.2	Y	75	Basalt fragments (?)	-47.8	Probe "works" its way in after hard contact
	08/23/2000	0831	0832	1333286.61	930364.10	3.8/0807	-50.2	-49.4	Y	175	Rock		Pick up and cannot get back to same point
55-05	08/23/2000	0849	0849	1333246.31	930384.51	4.3/0839	-53.7	--	--	--	Rock	-53.7	Hard contact over El.-50 ft.
55-06	08/23/2000	0826	0827	1333285.42	930382.06	3.8/0807	-48.1	-49.0	Y	75	Rock	-48.1	Hard contact, rocks feel like they roll around
	08/23/2000	0827	0829	1333285.42	930382.06	3.8/0807	-49.0	-49.0	Y	175	Rock		Probe "skids" around
55-07	08/23/2000	0847	0847	1333258.97	930397.53	4.3/0839	-50.9	--	--	--	Rock	-50.9	Hard contact over El.-50 ft.
55-08	08/23/2000	0821	0822	1333282.17	930409.58	3.8/0807	-47.0	-47.0	Y	75	Rock	-47	Hard contact; difficult penetration (Basalt fragments (?))
	08/23/2000	0822	0823	1333282.17	930409.58	3.8/0807	-47.0	-48.0	Y	175	Rock		
55-09	08/23/2000	0820	0820	1333256.07	930420.57	3.8/0807	-55.7	--	--	--	Rock	--	Hard contact
55-10	08/23/2000	0816	0818	1333255.90	930440.25	3.8/0807	-56.2	--	--	--	Sand	--	Soft contact
55-11	08/23/2000	0816	0816	1333279.54	930438.56	3.8/0807	-50.7	--	--	--	Rock	--	
55-12	08/23/2000	0814	0814	1333244.85	930455.73	3.8/0807	-55.7	--	--	--	Rock	--	
55-13	08/23/2000	0811	0811	1333272.77	930471.63	3.8/0807	-54.2	--	--	--	Rock	--	Hard on contact
55-14	08/23/2000	0810	0810	1333249.26	930474.57	3.8/0807	-56.2	--	--	--	Sand over rock	--	
55-15	08/23/2000	0807	0807	1333266.28	930500.96	3.8/0807	-56.2	--	--	--	Sand over rock	--	Tagged bottom at over -50 elevation, no need to pump, soft then hard
56-01	08/22/2000	1412	1413	1336965.00	928321.39	2.1/1411	-42.4	-51.9	N	75	Sand	--	Soft, steady penetration at ~0.5 feet/second
61-01	08/22/2000	1255	1255	1356223.25	915108.06	1.8/1255	-49.4	-52.2	N	75	Sand	--	Soft, easy penetration at ~0.5 feet/second
62-01	08/22/2000	1225	1225	1364446.55	908273.64	2.0/1221	-45.0	-50.5	N	75	Sand	--	Soft, easy penetration at 0.5 foot/second
63-01	08/22/2000	1205	1205	1365162.66	908676.58	2.3/1205	-44.0	-51.7	N	75	Sand	--	Soft, easy penetration at 0.5 foot/second
63-02	08/22/2000	1149	1149	1366754.13	906980.97	2.6/1132	-47.4	-51.4	N	75	Sand	--	Soft, easy, fast penetration at 1 foot/second

See NOTES at end of table

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Probe Number	Date	Time Start	Time End	Northing	Easting	River El. CRD/ Time	River Bottom El. (CRD)	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Encountered by Probe	Top of Rock El.	Miscellaneous Notes
63-03	08/22/2000	1132	1132	1367522.58	906252.90	2.6/1132	-50.4	-51.4	N	75	Sand	--	Soft, easy penetration
70-01	08/22/2000	0942	0944	1394461.09	883580.78	3.6/0942	-40.6	-42.9	N	75	Sand	--	Soft stop on initial contact, slow penetration in soft material to stop
	08/22/2000	0944	0950				-42.9	-48.4	N	175	Sand	--	Better penetration; pulled up and could not get back (cave in), tried several times. Check jets = 2 side jets plugged with coarse sand; clean and retry at 175 penetration 11 in 22 seconds; okay
	08/22/2000	0952	0952				-40.6	-51.4	N	175	Coarse sand	--	
74-01	08/21/2000	1427	1427	1401777.77	863795.88	1.5/1424	-49.5	-53.5	N	75	Sand	--	Soft stop on initial contact with pump off; pump on = 1 second/1 foot easy penetration rate
79-01	08/21/2000	1317	1317	1411613.81	844826.22	1.9/1314	-46.3	-51.6	N	75	Sand	--	Soft stop on initial contact with pump off; pump on = 1 second/1 foot easy penetration
79-02	08/21/2000	1257	1257	1413257.94	843104.11	2.0/1256	-46.5	-52.0	N	75	Sand	--	Soft stop on initial contact with pump off; pump on = 6'/10 seconds, smooth even penetration
79-03	08/21/2000	1151	1151	1413839.98	840861.41	2.4/1149	-43.4	-52.1	N	75	Sand	--	Soft stop on initial contact (pump off); pump on lift up then cover 10' in 10 seconds; okay
82-01	08/21/2000	1103	1103	1412988.12	826242.91	2.6/1054	-42.4	-52.4	N	75	Sand	--	Soft stop on contact, no pump; pick up with pump on, blow out hole fast penetration
82-02	08/21/2000	1054	1054	1412555.93	826257.89	2.6/1054	-42.4	-51.0	N	75	Sand	--	Slow stop on contact, no pump; pump on pick up = smooth fast penetration
82-03	08/21/2000	1044	1044	1412874.58	825417.52	2.6/1043	-42.1	-50.9	N	75	Sand	--	Soft, even fast penetration; hard at first contact - sand
87-01	08/21/2000	0901	0901	1417077.99	801063.07	3.5/0900	-50.0	-52.5+	N	75	Sand/silt	>-52.5	First touch soft, easy fast penetration to over - 52 elevation
87-02	08/21/2000	0852	--	1417006.03	801081.05	3.5/0849	-50.5	-52.0	N	--	Sand/silt	>-52.0	First touch bottom at -50.5 elevation, probe sink to 52 with pump off
87-03	08/21/2000	0845	0847	1417987.10	800027.60	3.5/0849	-45.5	-46.2	Y	75	Basalt fragments (?)	-46.2	Hard from start
	08/21/2000	0847	0848				-46.2	-46.5	Y	175	Rock		
87-04	08/21/2000	--	--	1417971.25	800104.96		-52.8+	--	N		Unknown	--	Bottom over -50.0 feet at this location
87-05	08/18/2000	1441	1443	1417926.10	800053.50	3.1/1438	-44.4	-45.4	Y	75	Rock	-45.4	Hard contact.
	08/18/2000	1443	1445				-45.4	-46.1	Y	175	Rock		Hard contact.
87-06	08/21/2000	0830	0831	1417901.15	800123.81	3.2/0825	-49.6	-52.8+	N	75	Sand, silt	>52.8	Soft <10 seconds to complete
87-07	08/18/2000	1433	1435	1416884.40	800984.77	3.1/1438	-43.2	-43.6	Y	75	Rock	-43.6	Hard contact.
	08/18/2000	1435	1437				-43.6	-43.9	Y	175	Rock		Hard contact.
87-08	08/18/2000	1425	1427	1417801.72	800126.55	3.2/1424	-48.1	-48.8	Y	75	Gravel over rock	-48.8	Probe holds, then surges ahead
	08/18/2000	1427	1429				-48.8	-49.1	Y	175	Rock		Hard contact.
87-09	08/18/2000	1402	1403	1417753.98	800023.67	3.3/1402	-43.7	-43.7	Y	75	Rock	-43.7	Hard, rock rolled
	08/18/2000	1403	1404				-43.7	-43.9	Y	175	Rock		
87-10	08/18/2000	1315	1317	1417727.44	800094.09	3.4/1315	-43.0	-43.9	Y	75	Small gravel?	--	Hard contact.

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	08/18/2000	1317	1318				-43.9	-50.6	Y	175	Gravel?	-50.6	Took off with increase in pump pressure
87-11	08/18/2000	1353	1354	1417669.90	800145.95	3.3/1350	-47.2	-47.4	Y	75	Rock	-47.4	Hard contact.
	08/18/2000	1354					-47.4	-47.7	Y	175	Rock		
87-12	08/18/2000	1335	1336	1417643.30	800210.58	3.3/1335	-45.8	-46.7	Y	75	Gravel?	-46.7	Hesitated, then quickly advanced 1 foot
	08/18/2000	1336	1337				-46.7	-46.7	Y	175	Rock		
87-13	08/18/2000	0922	0923	1417612.43	800264.55	4.8/0922	-39.2	-44.1	Y	75	Sand over rock	-44.1	Soft, easy then hard
	08/18/2000	0923					-44.1	-44.2	Y	175			
87-14	08/18/2000	1310	1312	1416714.82	800970.09	3.4/1310	-44.1	-44.1	Y	75	Rock	-44.1	Hard contact.
	08/18/2000	1312	1313				-44.1	-44.6	Y	175	Rock		
87-15	08/18/2000	1304	1306	1417665.59	800053.77	3.4/1304	-48.0	-48.4	Y	75	Rock, cobbles?	-48.4	Hard contact.
	08/18/2000	1306	1308				-48.4	-48.4	Y	175	Cobbles?		Seem to lose ground when moving probe
87-16	08/18/2000	1343	1344	1417633.62	800119.06	3.3/1340	-45.3	-46.0	Y	75	Gravel?		
	08/18/2000	1344	1345				-46.0	-47.2	Y	175	Gravel	-47.2	Hesitated, then dropped with pressure increase
87-17	08/18/2000	0927	0928	1417616.46	800161.87	4.8/0928	-43.7	-43.9	Y	75	Rock	-43.9	Hard contact.
	08/18/2000	0929					-43.9	-44.0	Y	175	Rock		Hard contact.
87-18	08/18/2000	0917	0919	1417598.85	800207.42	4.8/0917	-44.3	-44.4	Y	75	Rock	-44.4	Hard contact.
	08/18/2000	0919	0920				-44.4	-44.5	Y	175	Rock		
87-19	08/18/2000	0911	0912	1417581.81	800246.75	4.9/0911	-39.8	-44.4	Y	75	Sand over rock	-44.4	Soft, easy then hard
	08/18/2000	0912	0913				-44.4	-44.6	Y	175			
87-20	08/18/2000	0903	0905	1417573.60	800289.77	4.9/0903	-39.7	-44.4	Y	75	Silt/sand over rock	-44.4	Soft to 49.3 then hard
	08/18/2000	0905	0908				-44.4	-44.4	Y	175	Rock		Hard, no problem return to mark if pulled up
87-21	08/18/2000	1253	1254	1416664.48	800886.02	3.5/1252	-44.3	-45.0	Y	75	Rock	-45	Hard contact.
	08/18/2000	1254	1255				-45.0	-45.6	Y	175	Rock		
87-22	08/18/2000	1327	1328	1417577.31	800091.78	3.4/1324	-43.4	-43.6	Y	75	Cobbles?	-43.6	
	08/18/2000	1328	1330				-43.6	-43.8	Y	175	Cobbles on big rocks		Pick up and go back to same spot, can't get same depth
87-23	08/21/2000	0754	0756	1417555.25	800157.22	2.9/0754	-45.1	-45.7	Y	75	Basalt fragments (?)	-45.7	Hard, slow penetration
	08/21/2000	0756	0758				-45.7	-45.9	Y	175	Rock		
87-24	08/18/2000	0801	0802	1417536.97	800217.95	5.1/0800	-46.0	-46.0	Y	75	Rock	-46	Hard contact.
	08/18/2000	0803	0804				-46.0	-46.2	Y	175	Rock		
87-25	08/18/2000	0754	0755	1417520.40	800265.01	5.2/0752	-39.8	-45.0	Y	175	Silt/sand over rock	-45	Easy to Rock 10 sec/ft
	08/18/2000	0755	0756				-45.0	-45.0	Y	175	Rock		
87-26	08/18/2000	1008	1010	1417536.38	800108.07	4.7/1002	-44.2	-44.3	Y	75	Rock	-44.3	Hard contact.
	08/18/2000	1010	1011				-44.3	-44.3	Y	175	Rock		Hard contact.
87-27	08/18/2000	0808	0809	1417497.78	800210.96	5.1/0807	-44.7	-44.7	Y	75	Rock	-44.7	Hard, no progress
	08/18/2000	0809	0810				-44.7	-44.7	Y	175	Rock		
87-28	08/18/2000	0812	0813	1417479.58	800255.41	5.1/0812	-41.9	-44.8	Y	75	Silt/sand over rock	-44.8	Soft, easy at first
	08/18/2000	0814	0815				-44.8	-44.9	Y	175	Rock		
87-29	08/18/2000	1150	1152	1416589.02	800916.27	4.0/1145	-44.0	-45.0	Y	75	Sand over rock	-45	First 1.0 feet <10 seconds

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		Start	End										
	08/18/2000	1152	1153				-45.0	-45.1	Y	75	Rock		
87-30	08/18/2000	1155	1156	1416558.11	800981.91	3.8/1159	-44.0	-44.7	Y	75	Sand over rock	-44.7	2 seconds to rock
	08/18/2000	1156	1157				-44.7	-45.0	Y	175	Rock		
87-31	08/18/2000	1126	1129	1417529.01	800033.03	4.1/1125	-44.9	-45.0	Y	75	Rock	-45	Hard contact.
	08/18/2000	1129	1130				-45.0	-45.0	Y	175	Rock		
87-32	08/18/2000	0837	0838	1417481.74	800125.21	5.0/0837	-44.1	-44.5	Y	75	Cobbles	-44.5	Lose ground when pick up probe as before
	08/18/2000	0838	0839				-44.5	-44.5	Y	175	Cobbles		
87-33	08/18/2000	0829	0831	1417462.36	800170.36	5.0/0829	-45.0	-45.2	Y	75	Rock, cobbles?	-45.2	Hard bottom, lose progress if pick up
	08/18/2000	0831	0832				-45.2	-45.3	Y	175	Rock, cobbles?		Probe and return to same point
87-34	08/18/2000	0818	0819	1417435.00	800216.50	5.1/0817	-45.3	-45.7	Y	75	Gravel over rock	-45.7	When pick up and go back acted like material sloughed in
	08/18/2000	0819	0820				-45.7	-45.7	Y	175	Rock		
87-35	08/18/2000	0848	0849	1417423.48	800172.90	4.9/0848	-45.1	-45.1	Y	75	Cobbles	-45.1	Jet skids around.
	08/18/2000	0849	0851				-45.1	-45.2	Y	175	Cobbles		
87-36	08/18/2000	1120	1121	1416510.86	800959.06	4.1/1120	-44.9	-45.4	Y	75	Sand over rock	-45.4	Easy at first, then hard
	08/18/2000	1121	1122				-45.4	-45.9	Y	175	Rock		Hard contact.
87-37	08/18/2000	1107	1108	1416500.49	800821.44	4.2/1107	-43.8	-44.1	Y	75	Rock	-44.1	Hard contact.
	08/18/2000	1108	1110				-44.1	-44.6	Y	175	Rock		
87-38	08/18/2000	1114	1116	1416478.09	800877.05	4.2/1114	-43.8	-44.3	Y	75	Rock	-44.3	Soft 0.5 feet over hard
	08/18/2000	1116	1117				-44.3	-44.4	Y	175	Rock		
87-39	08/18/2000	1028	1030	1416448.40	800943.08	4.6/1028	-43.9	-44.5	Y	75	Rock	-44.5	Hard, little progress. Note: river current increasing.
	08/18/2000	1030	1031				-44.5	-44.6	Y	175	Rock		
87-40	08/18/2000	1033	1034	1417418.44	800000.10	4.5/1035	-43.6	-45.5	Y	75	Sand over rock	-45.5	Soft, easy jetting to top of hard
	08/18/2000	1034	1035				-45.5	-45.7	Y	175	Rock		
87-41	08/18/2000	1141	1142	1416447.84	800796.71	4.0/1140	-43.1	-44.0	Y	75	Sand over rock	-44	Easy at first to top of rock
	08/18/2000	1142	1143				-44.0	-44.0	Y	175	Rock		
87-42	08/18/2000	1100	1101	1416417.93	800858.61	4.4/1048	-43.1	-43.6	Y	75	Sand over rock	-43.6	Easy for 5 feet then hard
	08/18/2000	1101	1102				-43.6	-43.7	Y	175	Rock		
87-43	08/17/2000	1430	1432	1416386.04	800920.40	3.0/1430	-43.8	-43.8	Y	75	Rock	-43.8	Very hard, no sediments
	08/17/2000	1432	1434	1416386.04	800920.40	3.0/1430	-43.8	-43.8	Y	175	Rock	-43.8	
87-44	08/17/2000	1442	1443	1416353.47	800979.20	3.0/1430	-46.8	-47.2	Y	75	Sand/silt over rock	-47.2	
	08/17/2000	1443	1444	1416353.47	800979.20	3.0/1430	-47.2	-47.2	Y	175	Rock	-47.2	
87-45	08/18/2000	0748	0749	1417467.53	800368.11	5.2/0747	-41.6	-46.6	Y	75	Silt/sand over rock	-46.6	
	08/18/2000	0749	0750				-46.6	-46.6	Y	175	Rock		
87-46	08/18/2000	0737	0738	1417333.97	800300.76	5.2/0735	-43.7	-44.6	Y	75	Silt/sand over rock	-44.6	
	08/18/2000	0738	0740				-44.6	-44.7	Y	175	Rock		
88-01	08/17/2000	1359	1401	1416904.30	799564.70	3.1/1359	-41.9	-48.9	Y	75	Sand/silt	-48.9	Moderate rate at first, then hard
	08/17/2000	1401	1402	1416904.30	799564.70	3.1/1359	-48.9	-49.2	Y	175	Sand/silt	-48.9	

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88-02	08/17/2000	1415	1416	1416840.39	799536.50	3.1/1359	-42.9	-47.0	Y	75	Sand/silt	-47.0	60 seconds/4.1 feet
	08/17/2000	1416	1416	1416840.39	799536.50	3.1/1359	-47.0	-47.1	Y	175	Sand/silt	-47.0	
88-03	08/17/2000	1406	1408	1416811.36	799606.20	3.1/1359	-41.7	-46.1	Y	75	Sand/silt	-46.1	Moderate rate at first, then hard
	08/17/2000	1408	1409	1416811.36	799606.20	3.1/1359	-46.1	-46.2	Y	175	Sand/silt	-46.1	Check jets = okay
88-04	08/17/2000	1325	1326	1416763.26	799503.61	3.3/1325	-45.9	-45.9	Y	75	Rock	-45.9	
	08/17/2000	1326	1328	1416763.26	799503.61	3.3/1325	-45.9	-45.9	Y	175	Rock	-45.9	Work probe, hard bottom
88-05	08/17/2000	1331	1332	1416751.54	799556.47	3.3/1325	-45.7	-45.9	Y	75	Rock	-45.9	
	08/17/2000	1332	1334	1416751.54	799556.47	3.3/1325	-45.9	-45.9	Y	175	Rock	-45.9	
88-06	08/17/2000	1337	1338	1416711.90	799600.92	3.3/1325	-44.2	-45.7	Y	75	Sand/silt over rock	-45.7	
	08/17/2000	1338	1339	1416711.90	799600.92	3.3/1325	-45.7	-46.0	Y	175	Rock	-45.7	Check jets = okay
88-07	08/17/2000	1344	1345	1416702.75	799516.74	3.3/1325	-44.7	-46.7	Y	75	Sand/silt over rock	-46.7	
	08/17/2000	1345	1346	1416702.75	799516.74	3.3/1325	-46.7	-47.0	Y	175	Rock	-46.7	
88-08	08/17/2000	1253	1255	1416625.93	799603.98	3.5/1252	-47.5	-47.5	Y	75	Rock	-47.5	
	08/17/2000	1255	1255	1416625.93	799603.98	3.5/1252	-47.5	-48.0	Y	175	Rock	-47.5	
88-09	08/17/2000	1118	1120	1416636.96	799510.25	4.0/1107	-44.4	-44.5	Y	75	Rock	-44.5	
	08/17/2000	1120	1122	1416636.96	799510.25	4.0/1107	-44.5	-44.5	Y	175	Rock	-44.5	
88-10	08/17/2000	1201	1202	1416608.96	799560.09	3.8/1205	-46.6	-46.7	Y	75	Rock	-46.7	
	08/17/2000	1202	1203	1416608.96	799560.09	3.8/1205	-46.7	-47.4	Y	175	Rock	-46.7	Moved probe around to check consistency
	08/17/2000	1203	1205	1416603.98	799560.86	3.8/1205	-46.7	-47.4	Y	175	Rock	-46.7	
88-11	08/17/2000	1156	1157	1416615.50	799440.96	4.0/1132	-44.8	-44.8	Y	75	Rock	-44.8	
	08/17/2000	1157	1159	1416615.50	799440.96	4.0/1132	-44.8	-44.8	Y	175	Rock	-44.8	Check jets = good
88-12	08/17/2000	1128	1128:30	1416585.74	799508.37	4.0/1107	-44.8	-45.0	Y	75	Rock	-45.0	
	08/17/2000	1128	1129	1416585.74	799508.37	4.0/1107	-45.0	-45.0		175	Rock	-45.0	Weren't making good progress; moved probe to new location
	08/17/2000	1129	1130	1416591.01	799509.16	4.0/1132	-45.0	-45.1	Y	175	Rock	-45.1	
88-13	08/17/2000	1134	1135	1416558.41	799572.24	4.0/1132	-46.0	-46.0	Y	75	Rock	-46.0	
	08/17/2000	1135	1137	1416558.41	799572.24	4.0/1132	-46.0	-46.1	Y	175	Rock	-46.0	Check jets = good
88-14	08/17/2000	1110	1111	1416563.08	799478.67	4.0/1107	-45.0	-46.0	Y	75	Rock?	-46.0	
	08/17/2000	1111	1112	1416563.08	799478.67	4.0/1107	-46.0	-46.0	Y	175	Rock?	-46.0	Move over
	08/17/2000	1113	1115	1416556.60	799482.01	4.0/1107	-46.3	-47.3	Y	175	Rock?	-47.3	Check jets = OK
88-15	08/17/2000	1150	1152	1416572.97	799438.66	4.0/1132	-45.0	-45.2	Y	75	Rock	-45.2	Operator feels hard surface under soft mud
	08/17/2000	1152	1153	1416572.97	799438.66	4.0/1132	-45.2	-45.3	Y	175	Rock	-45.2	
90-01	08/17/2000	1023	1024	1415509.90	788302.00	4.4/1025	-40.6	-50.6	N	75	Sand	--	30 second to 55 ft.
90-02	08/17/2000	1003	1003	1416905.16	787276.07	4.5/0958	-44.1	-51.5	N	75	Sand	--	<30 seconds
93-01	08/17/2000	0924	0924	1422797.30	775127.73	4.7/0920	-48.5	-51.3	N	75	Sand	--	<1 minute to 56' like each second
95-01	08/17/2000	0842	0845	1423203.08	763587.30	5.5/0840	-47.0	-50.5	N	75	Sand	--	<1 minute to 56'
100-01	08/16/2000	1506	1506	1420663.63	737057.91	3.3/1506	-50.6	-50.6	N	-	-	--	Top of overburden below final depth
100-02	08/16/2000	1423	1424	1420275.14	737098.78	3.5/1423	-46.8	-50.0	N	75	Sand	--	Fast to 53.5
100-03	08/16/2000	1451	1452	1420374.91	737370.71	3.4/1447	-48.4	-50.6	N	75	Sand	--	Fast to 54.0

See NOTES at end of table

PDX/003675115.XLS

**TABLE 2**  
Jet Probing: Columbia River Channel Deepening Project

Probe Number	Date	Time		Northing	Easting	River El. CRD/ Time	River Bottom El. (CRD)	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Encountered by Probe	Top of Rock El.	Miscellaneous Notes
		Start	End										
100-04	08/16/2000	1403	1405	1420351.24	736259.64	3.6/1403	-44.9	-50.4	N	75	Sand	--	Moderate to fast pace with 175 psi, maybe some obstructions
100-05	08/16/2000	1351	1355	1420126.99	736322.99	3.7/1351 3.7/1355	-43.3	-51.1	N	75-175	Sand	--	Fast to 53.7, increase pressure, stopped at 53.7, then very fast to 54.8
100-06	08/16/2000	1330	1332	1420902.43	735353.85	3.8/1332	-49.5	-50.3	N	75	Sand	--	Fast to 54.1 or (El.-50.3 CRD)
100-07	08/16/2000	1324	1325	1420739.32	735402.17	3.9/1323	-46.0	-54.0	N	75	Sand	--	Easy to 54 CRD; tried to go further
100-08	08/16/2000	1315	1317	1420677.32	735380.48	4.0/1315	-45.3	-50.1	N	75	Sand	--	Very fast to 54.1, <1 minute
100-09	08/16/2000	1306	1309	1420576.21	735442.98	4.0/1306 4.0/1309	-47.1	-50.2	N	75	Sand	--	Fast to 54.0, easy
100-10	08/16/2000	1248	1253	1420399.98	735500.82	3.8/1248 3.8/1252	-46.5	-50.2	N	75-175	Sand, gravel, loose	--	Slow to 53.0 ft, increase pressure to 54 ft
104-01	08/16/2000	0944	0956	1435832.96	725248.39	4.4/0925 4.1/0950	-45.7	-48.1	Y	175-180	Gravel?	-48.1	Slow advance; Troutdale Gravel
104-02	08/16/2000	1030	1040	1435716.70	725345.37	3.9/1025 3.8/1050	-44.5	-48.6	Y	75-175	Gravel and sand	-48.4	Fast to 51.5', slow to 52.2'; dacite gravel piece stuck at bottom of jet probe, when checked.

**Notes:**

- Materials encountered during jet probing were classified based on the rate of penetration and reaction of jet probe when lowered through the material.
- All elevations refer to Columbia River Datum (CRD).

**TABLE 3**  
Summary of Drilling Explorations

Drill Hole	Date	Locations		Top of Hole	Overburden	Top of Rock	Bottom of Hole	Remarks
		Northing	Easting	El. (CRD)	Thickness (ft)	El. (CRD)	El. (CRD)	
DH-41-1	08/30/2000	1265018.75	921639.82	-47.1	>18	N/A	-65.1	Basalt fragments on top of silt/sand.
DH-41-2	08/30/2000	1265031.41	921612.43	-47.5	>16	N/A	-63.5	Possibly very soft Sandstone at El. -49.5 ft (CRD)
DH-42-1	08/29/2000	<b>1265798.12</b>	<b>921016.16</b>	-47.9	>15.4	N/A	-63.3	Possibly very soft Sandstone at El. -60.5 ft (CRD)
DH-42-2	08/29/2000	<b>1265802.92</b>	<b>920934.03</b>	-46.6	>16.5	N/A	-63.1	Basalt fragments in sandy silt matrix. Basalt bedrock at El.-62.0 ft.
DH-42-3	08/25/2000	<b>1266454.61</b>	<b>920265.40</b>	-46.2	16	-62.0	-65.2	Basalt fragments in sandy silt matrix. Basalt bedrock at El.-62.0 ft.
DH-42-4	08/25/2000	1266512.11	920273.38	-46.8	>17.1	N/A	-63.9	Sand with occasional basalt fragments. Not in place.
DH-42-5	08/28/2000	1266366.21	920004.75	-51	>14.5	N/A	-65.5	Basalt fragments. Not in place.
DH-55-1	08/24/2000	1333423.53	930267.91	-51.5	5	-56.5	-69.4	Basalt fragments and sand. Basalt bedrock at El.-56.5 ft.
DH-87-1	08/21/2000	<b>1417053.23</b>	<b>800830.54</b>	-46	3.2	-49.2	-56.2	Bedrock is broken up at top 3.2 ft, possibly effects of previous blasting.
DH-87-2	08/23/2000	<b>1416937.22</b>	<b>800793.07</b>	-42	1	-43	-51.3	Bedrock is broken up at top 5 ft, possibly effects of previous blasting.
DH-87-3	08/22/2000	<b>1416982.28</b>	<b>800629.47</b>	-44.2	0	-44.2	-54.5	Basalt bedrock possibly affected by previous blasting activities.
DH-87-4	08/22/2000	<b>1417157.49</b>	<b>800515.68</b>	-44.3	0	-44.3	-54.3	Basalt bedrock possibly affected by previous blasting activities.
DH-88-1	08/21/2000	<b>1416474.16</b>	<b>799704.44</b>	-43.2	3	-46.2	-56.2	3 ft of sand on top of basalt bedrock.
DH-88-2	08/18/2000	<b>1416475.90</b>	<b>799637.96</b>	-43.2	2	-45.2	-55.7	1.5 ft of sand on top of basalt bedrock.

\*Bold numbers are not within 5-foot radius of the proposed locations. Actual locations were within 8 feet of proposed.

\*All elevations refer to Columbia River Datum (CRD)

**APPENDIX A**

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**Exploration Location Maps**

1264800

1265000

1265200

1265400

Columbia River Channel Deepening  
PED Explorations



Area 42.5  
Sheet 1 of 3

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**Vicinity Map**

N

42

JP-41-1 JP-41-2 JP-41-4  
JP-41-3 ▲ JP-41-5 JP-41-6  
DH-41-1 ▲ DH-41-2 ▲ JP-41-7  
JP-41-8 ▲ JP-41-9  
JP-41-10

50 0 50 100 150 Feet

Projection: State Plane, Oregon North  
Zone, NAD 27.  
Produced by GIS, Survey and Mapping  
Section, CENWP-EC-HM

**Legend**

- 42 Rivermiles
- Drill Hole
- ▲ Jet Probe
- ◊ Test Pit

1265800

1266000

1266200

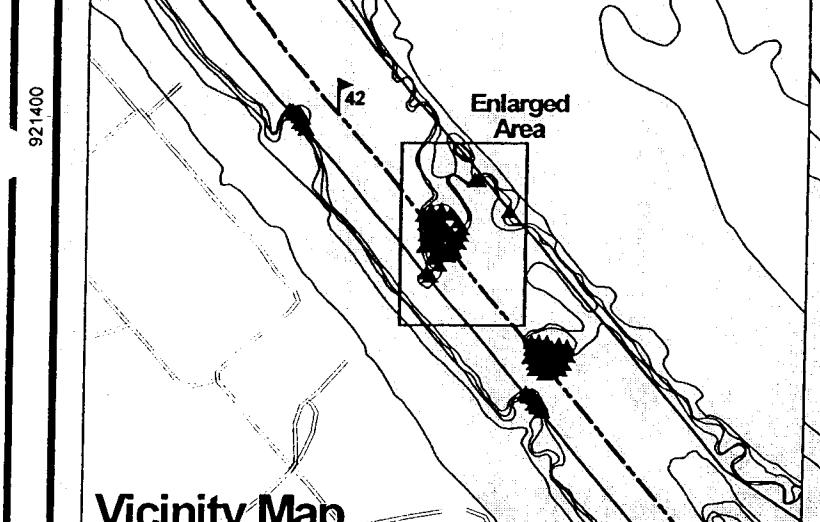
Columbia River Channel Deepening  
PED Explorations



Area 42.5  
Sheet 2 of 3

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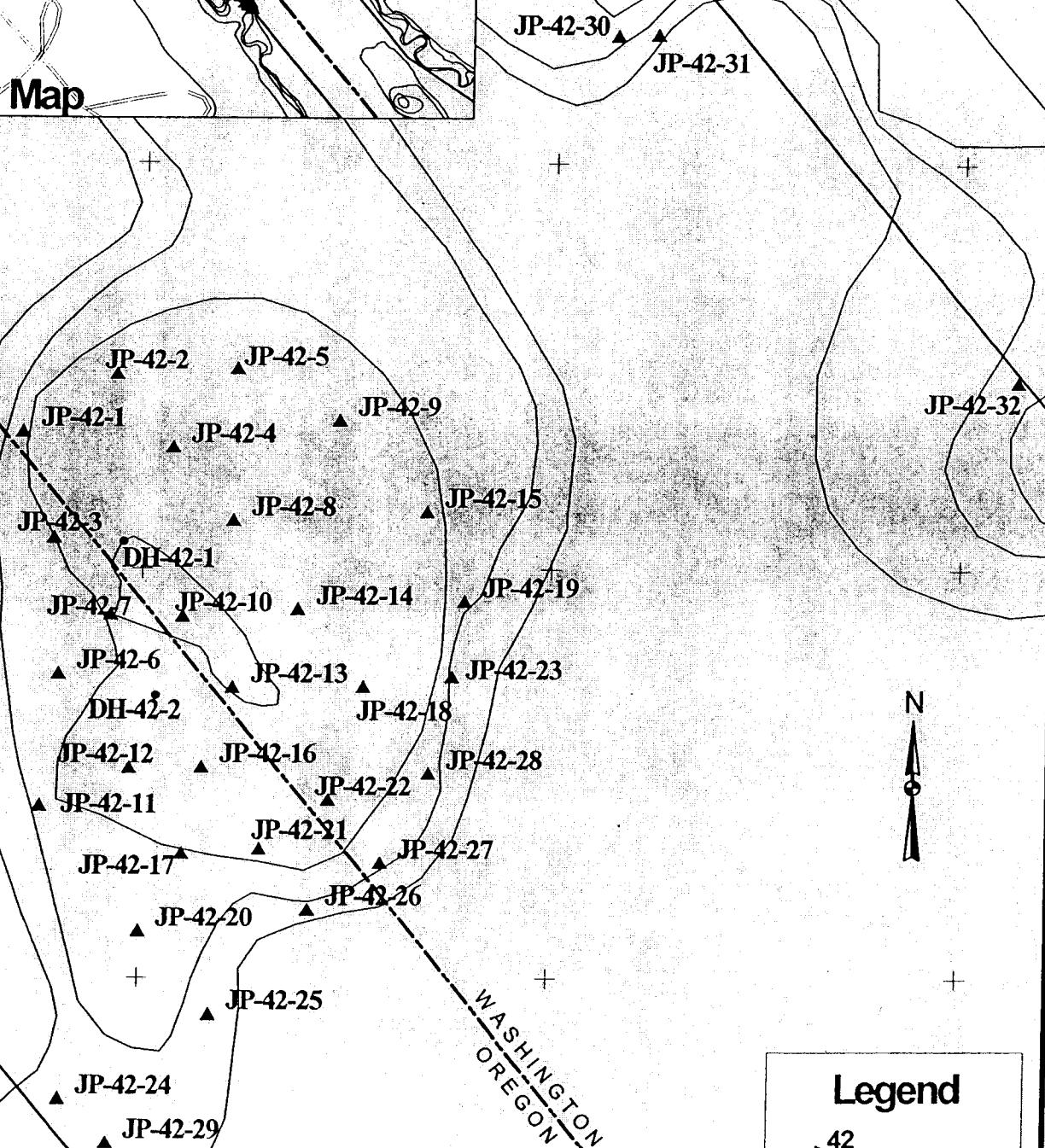
Vicinity Map



921200

921100

920800



100 0 100 Feet

Projection: State Plane, Oregon North  
Zone, NAD 27  
Produced by GIS, Survey and Mapping  
Section, CENWP-EC-HM

**Legend**

42	Rivermiles
•	Drill Hole
▲	Jet Probe
◊	Test Pit

1266400

1266600

12668

# Columbia River Channel Deepening

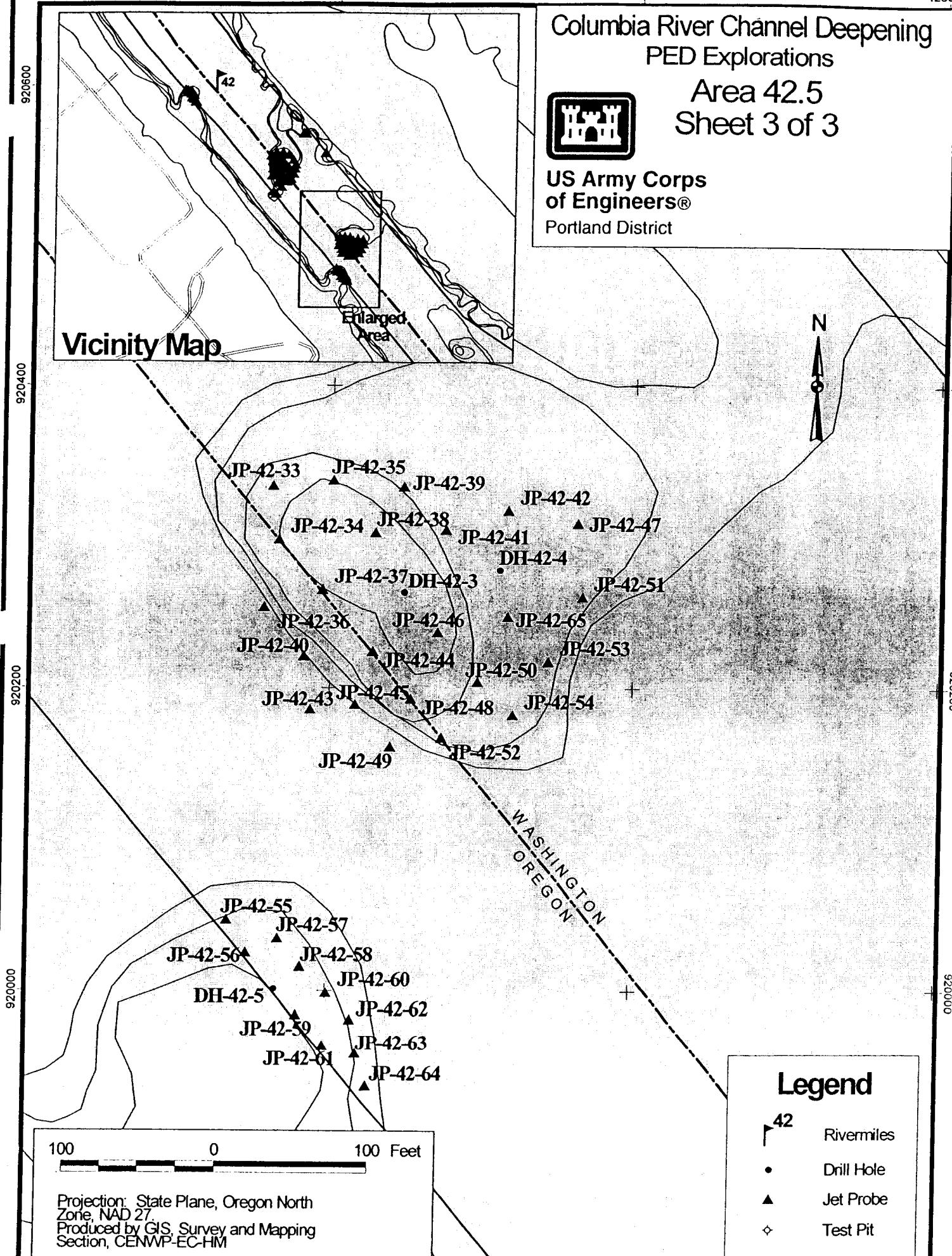
PED Explorations

Area 42.5  
Sheet 3 of 3



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## Vicinity Map



1276000

1278000

1280000

Columbia River Channel Deepening  
PED Explorations  
Area 44.5



US Army Corps  
of Engineers®  
Portland District

920000

918000

916000

914000

912000

500 0 500 1000 1500 Feet

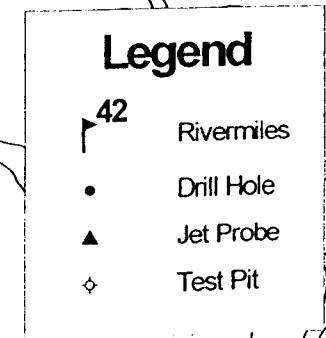
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Produced by GIS Survey and Mapping  
Section, CENWP-EC-HM

N



JR 44.5

45



910000

908000

906000

904000

902000

901

1282000

1284000

1286000

1288000

920000

918000

916000

914000

912000

910000

Columbia River Channel Deepening  
PED Explorations  
Area 46



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500 0 500 1000 1500 Feet

Projection: State Plane, Oregon North  
Zone NAD 27  
Produced by GIS, Survey and Mapping  
Section, CENWMP-ECHM

46-TP-46-1

N

Legend

42

Rivermiles

•

Drill Hole

▲

Jet Probe

◊

Test Pit

000716

1290000

1292000

1294000

1296000

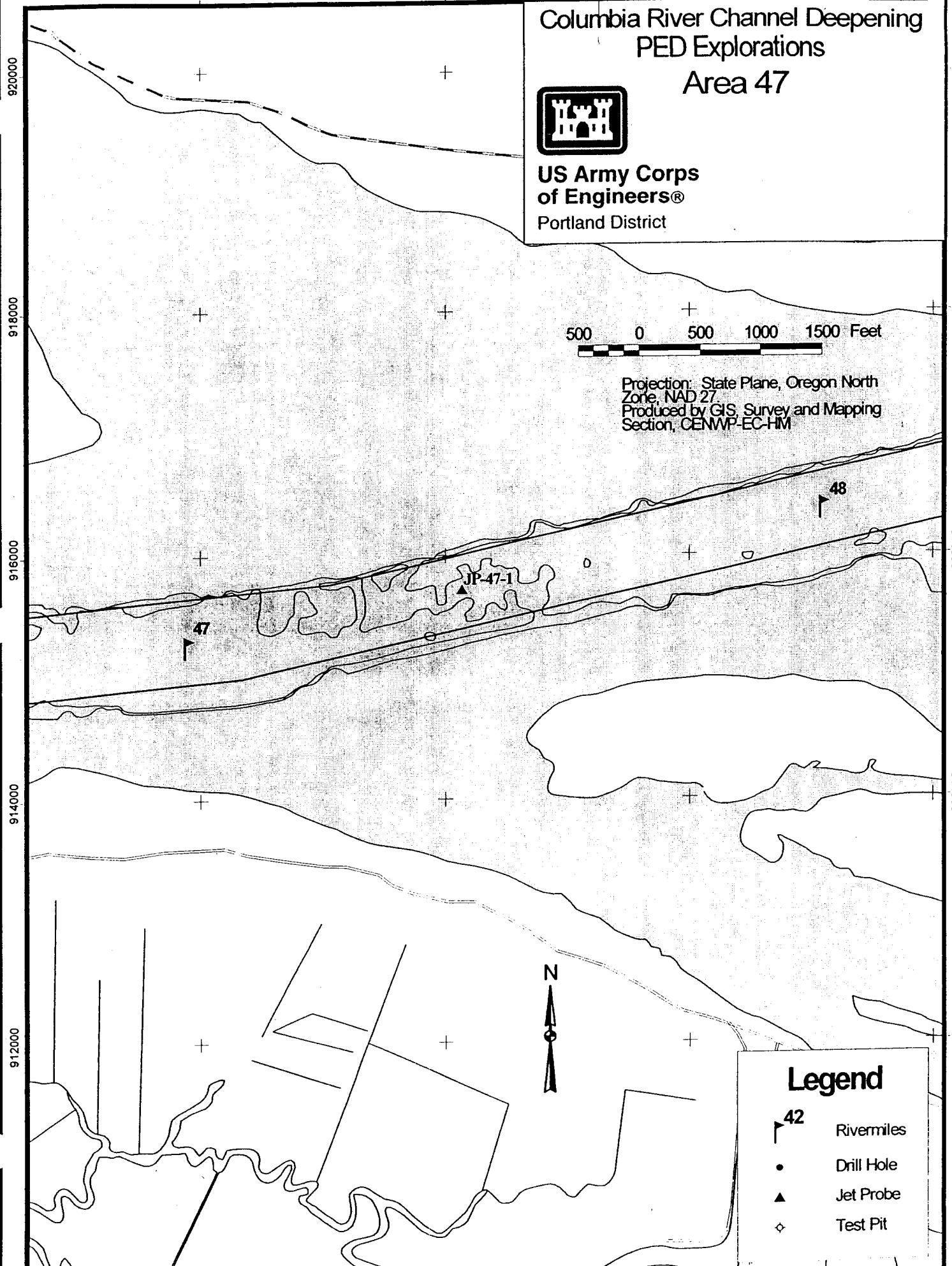
Columbia River Channel Deepening  
PED Explorations  
Area 47



US Army Corps  
of Engineers®  
Portland District

500 0 500 1000 1500 Feet

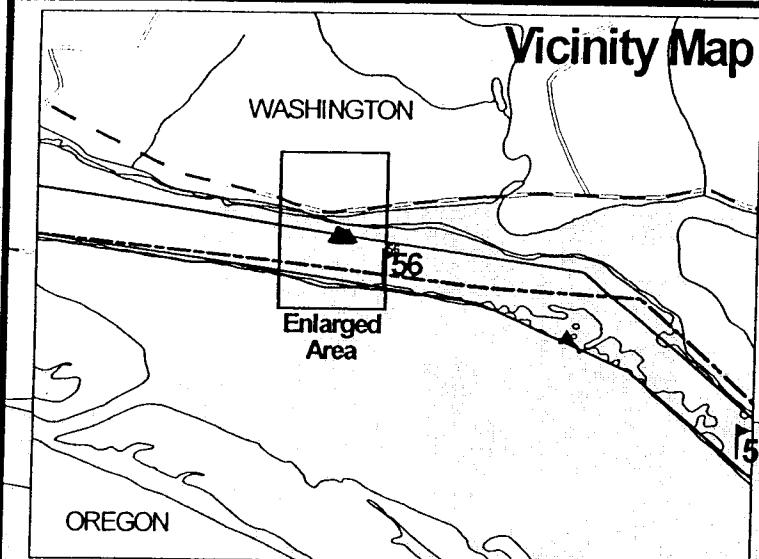
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Produced by GIS Survey and Mapping  
Section, CENWP-EC-HM



1333200

1333400

1333600



# Columbia River Channel Deepening PED Explorations



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**Area 56  
Sheet 1 of 2**

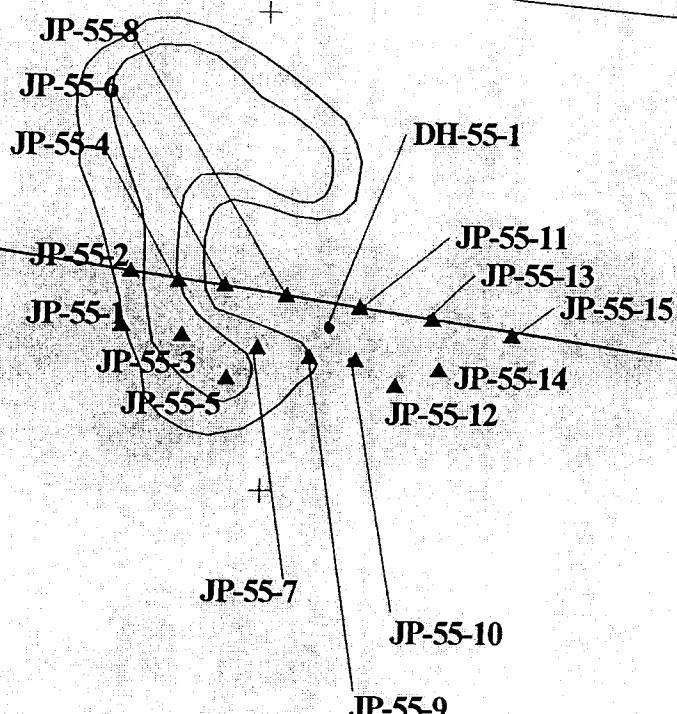
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930400

930200

930000

00000000



100 0 100 Feet

Projection: State Plane, Oregon North  
Zone, NAD 27.  
Produced by GIS, Survey and Mapping  
Section, CENWMP-EC-HM

## Legend

- 42 Rivermiles
- Drill Hole
- ▲ Jet Probe
- ◊ Test Pit

1336000

1336200

1336400

1336600

929400

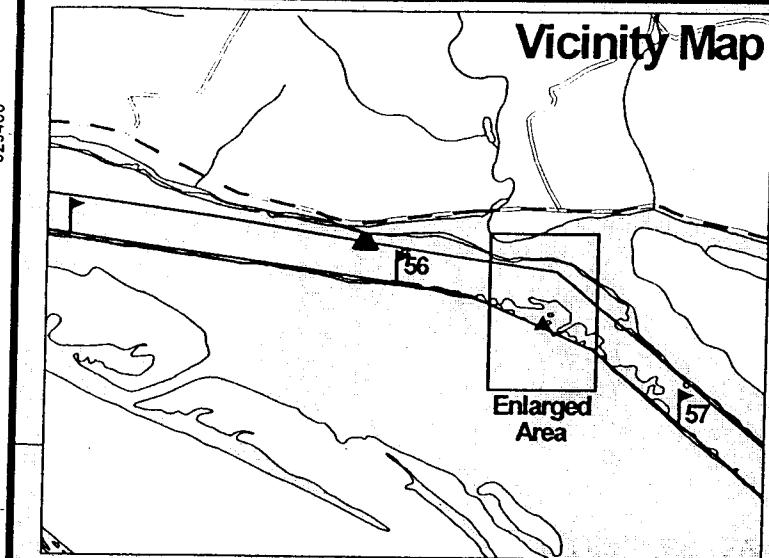
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929000

928800

928600

50 0 50 100 150 Feet



# Columbia River Channel Deepening PED Explorations



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**Area 56  
Sheet 2 of 2**

N

928700

928600

928500

<b>Legend</b>	
42	Rivermiles
•	Drill Hole
▲	Jet Probe
◊	Test Pit

Projection: State Plane, Oregon North  
Zone, NAD 27.  
Produced by GIS, Survey and Mapping  
Section, CENWP-EC-HM

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1356000

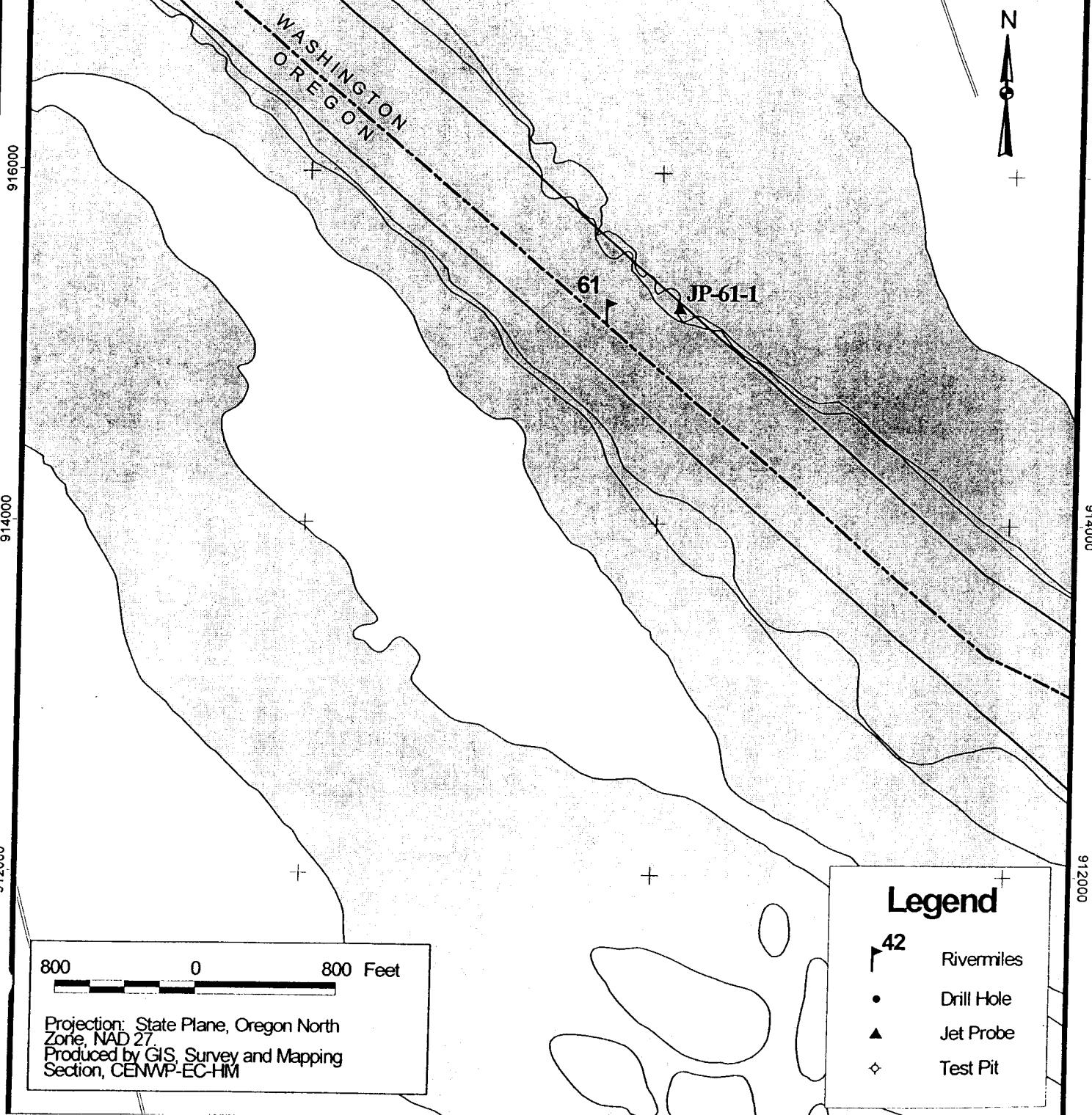
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Columbia River Channel Deepening  
PED Explorations  
Area 61



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N



1364000

1366000

1368000

Columbia River Channel Deepening  
PED Explorations  
Area 63.5



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91200

910000

908000

906000

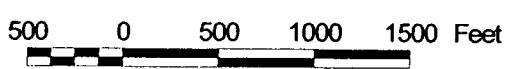
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Riverside

000900

000800

63  
JP-62-1  
JP-63-1  
JP-63-2  
JP-63-3  
PO-64



Projection: State Plane, Oregon North  
Zone, NAD 27.  
Produced by GIS, Survey and Mapping  
Section, CENWP-EC-HM

**Legend**

- 42 Riversides
- Drill Hole
- ▲ Jet Probe
- ◊ Test Pit

1372000

1374000

1376000

1378000

Columbia River Channel Deepening  
PED Explorations  
Area 66



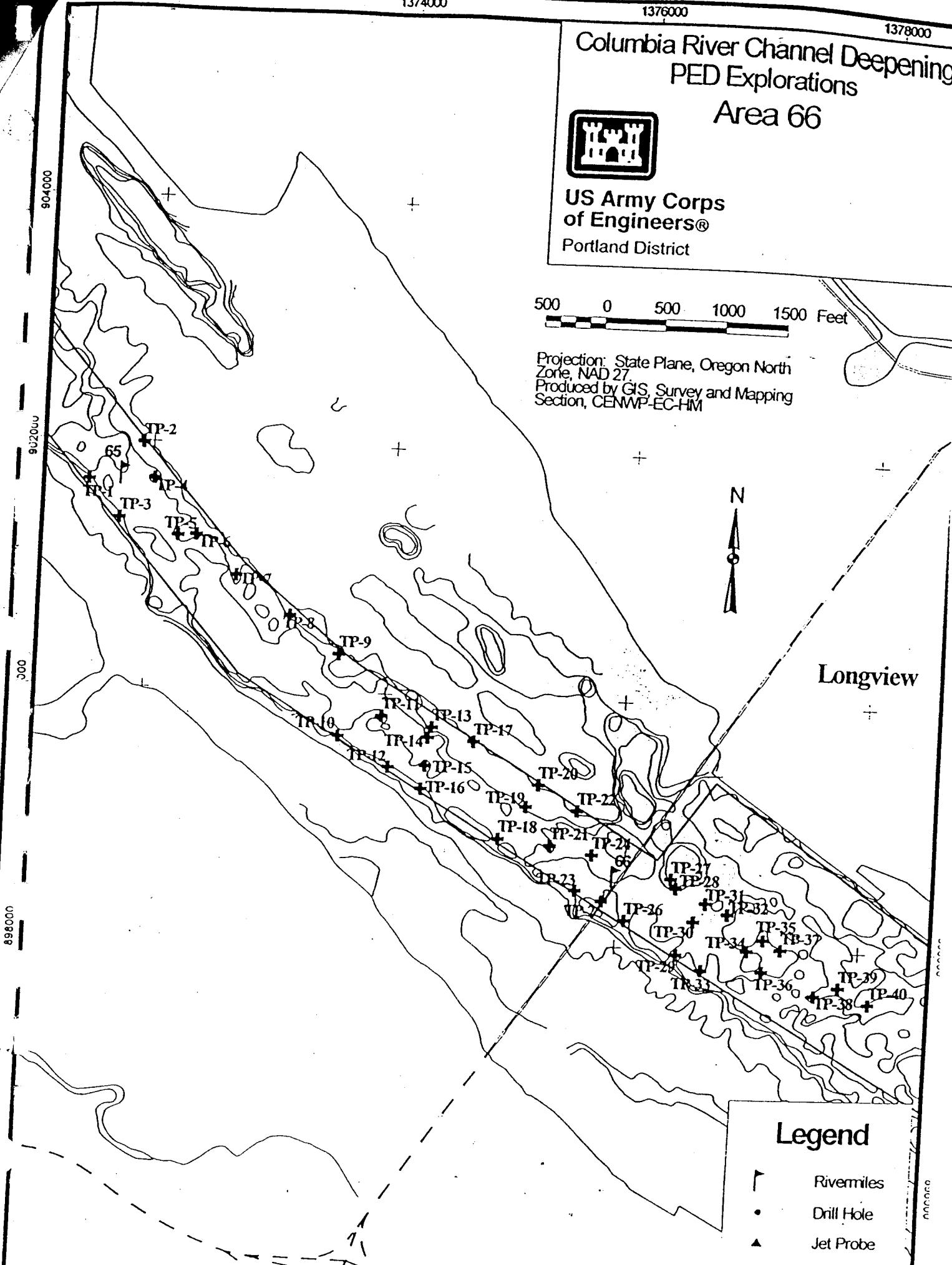
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Portland District

500 0 500 1000 1500 Feet

Projection: State Plane, Oregon North  
Zone, NAD 27  
Produced by GIS, Survey and Mapping  
Section, CENWP-EC-HM



Longview



1392000

1394000

1396000

WASHINGTON  
OREGON

F70

886000

884000

882000

30

Columbia River Channel Deepening  
PED Explorations  
Area 71



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800 0 800 Feet

Projection: State Plane, Oregon North  
Zone, NAD 27.  
Produced by GIS, Survey and Mapping  
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JB-70-I

71

- Legend**
- 42 Rivermiles
  - Drill Hole
  - ▲ Jet Probe
  - ◊ Test Pit

000288  
000088

1398000

1400000

1402000

1404000

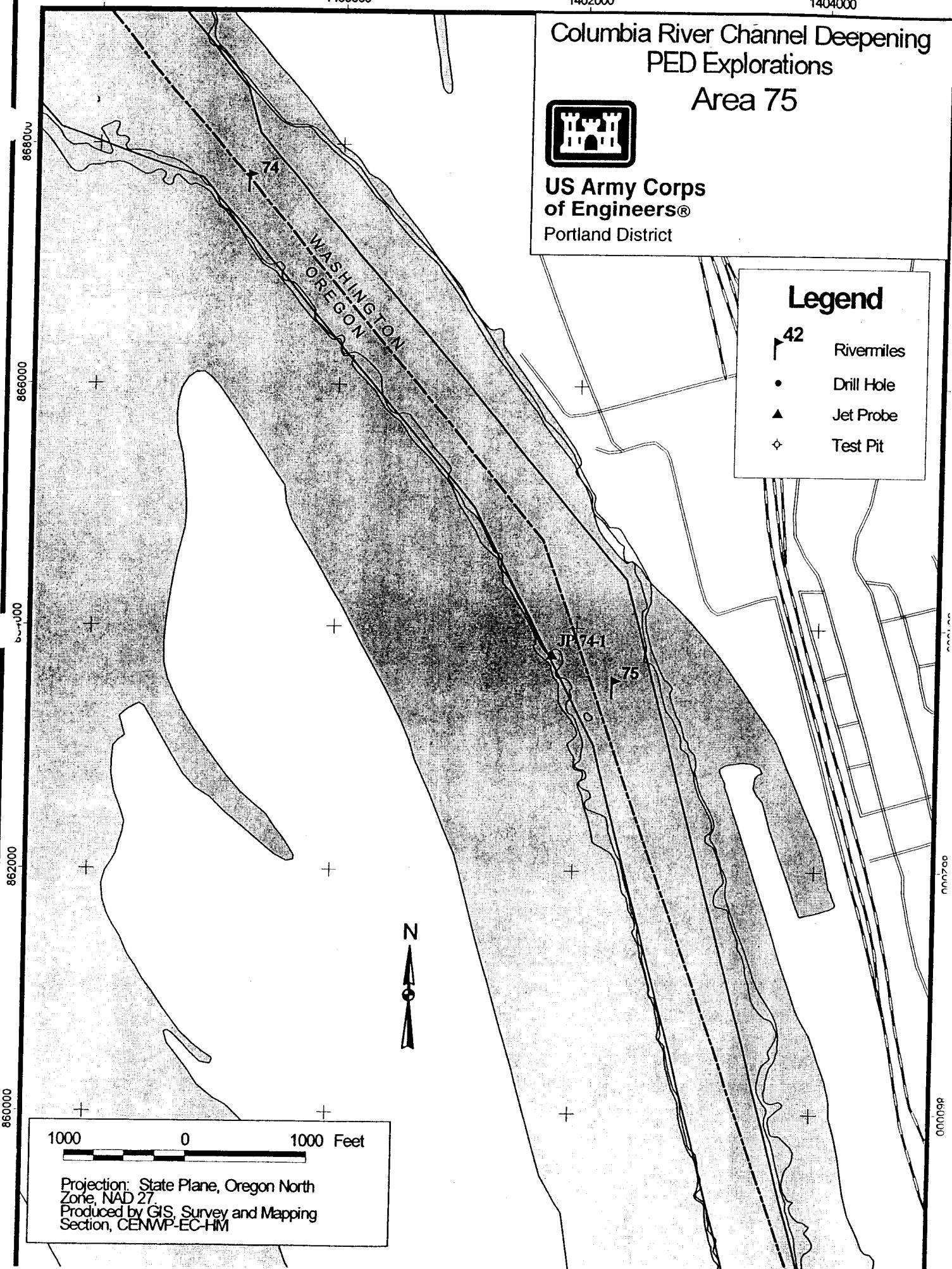
Columbia River Channel Deepening  
PED Explorations  
Area 75



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Portland District

**Legend**

- 42 Rivermiles  
• Drill Hole  
▲ Jet Probe  
◊ Test Pit



1410000 1412000 1414000 1416000  
848000 846000 844000 842000 840000 838000  
WASHINGTON OREGON

Columbia River Channel Deepening  
PED Explorations  
Area 79.5



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Portland District

1000 0 1000 Feet

Projection: State Plane, Oregon North  
Zone, NAD 27.  
Produced by GIS, Survey and Mapping  
Section, CENWP-EC-HM

79

JP-79-1

JP-79-2

JP-79-3

80



Legend

- 42 Rivermiles
- Drill Hole
- ▲ Jet Probe
- ◊ Test Pit

838000

1410000

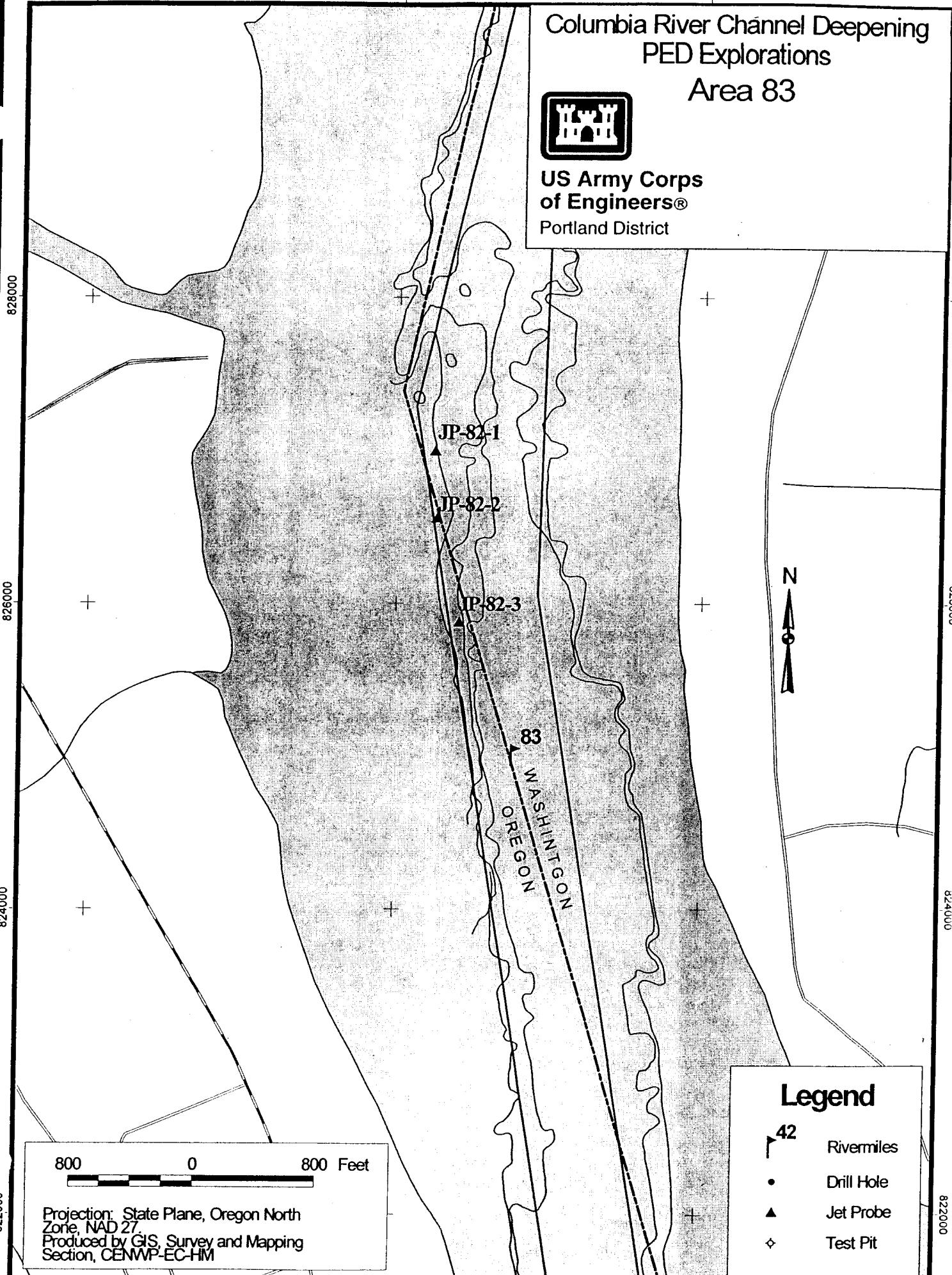
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Columbia River Channel Deepening  
PED Explorations  
Area 83



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Portland District



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1417000

1417200

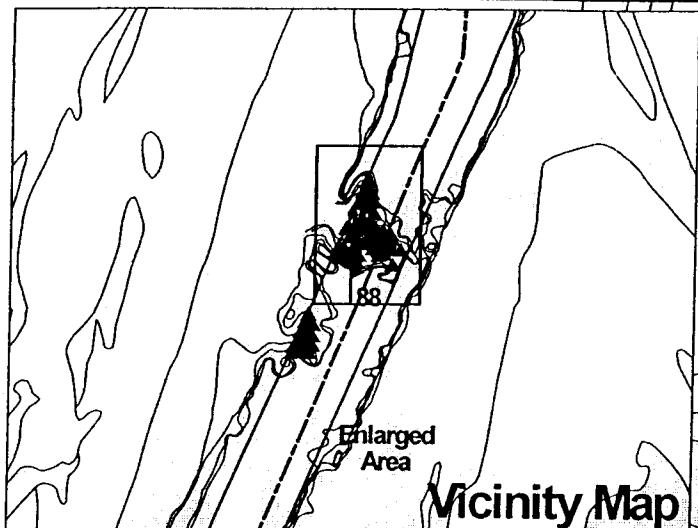
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Columbia River Channel Deepening  
PED Explorations



Area 88  
Sheet 1 of 2

US Army Corps  
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Portland District



**Vicinity Map**

100 0 100 Feet

Projection: State Plane, Oregon North  
Zone NAD 27  
Produced by GIS, Survey and Mapping  
Section, CENWMP-EC-HM

801200

801000

800800

800600

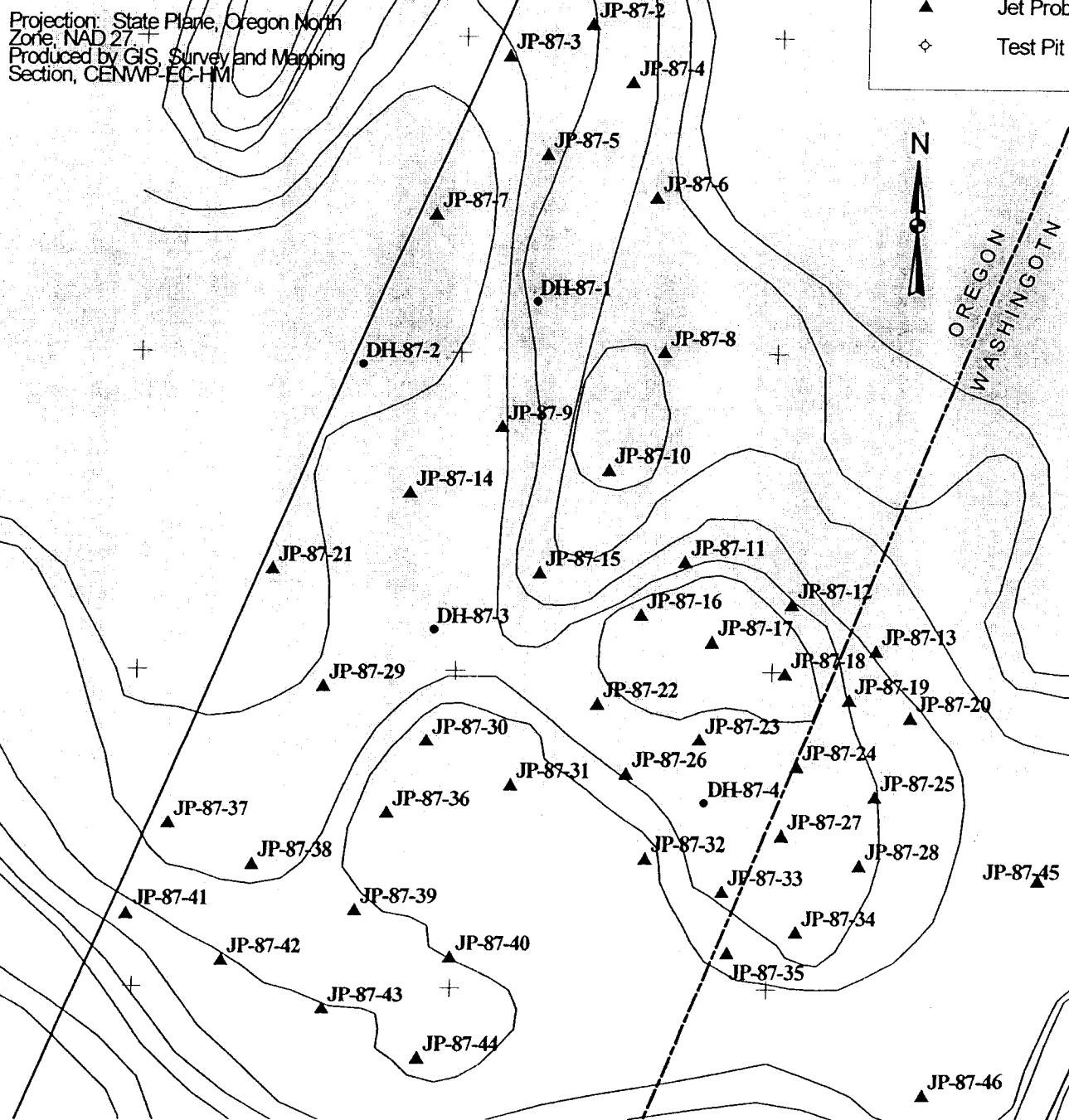
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**Legend**

- 42 Rivermiles
- Drill Hole
- ▲ Jet Probe
- ◇ Test Pit

N

OREGON  
WASHINGTON



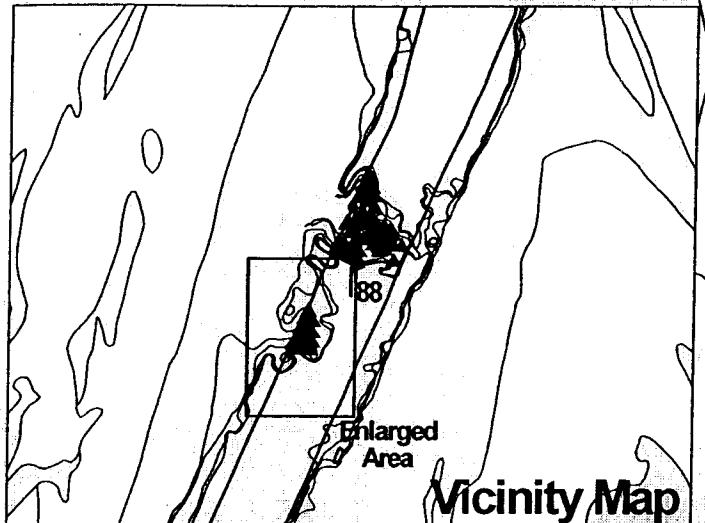
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1416400

1416600

1416800

800200



50 0 50 100 150 Feet

Projection: State Plane, Oregon North  
Zone, NAD 27  
Produced by GIS, Survey and Mapping  
Section, CENWP-EC-HM

## Columbia River Channel Deepening PED Explorations



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Portland District

Area 88  
Sheet 2 of 2

### Legend

- 42 Rivermiles
- Drill Hole
- ▲ Jet Probe
- ◊ Test Pit

N

- JP-88-1  
JP-88-2  
JP-88-3  
JP-88-4  
JP-88-5  
JP-88-6  
JP-88-7  
JP-88-9  
JP-88-10  
JP-88-11  
JP-88-12  
JP-88-13  
JP-88-14  
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DH-88-2

799800

799600

799400

99200

799200

799400

799600

42

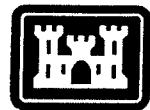
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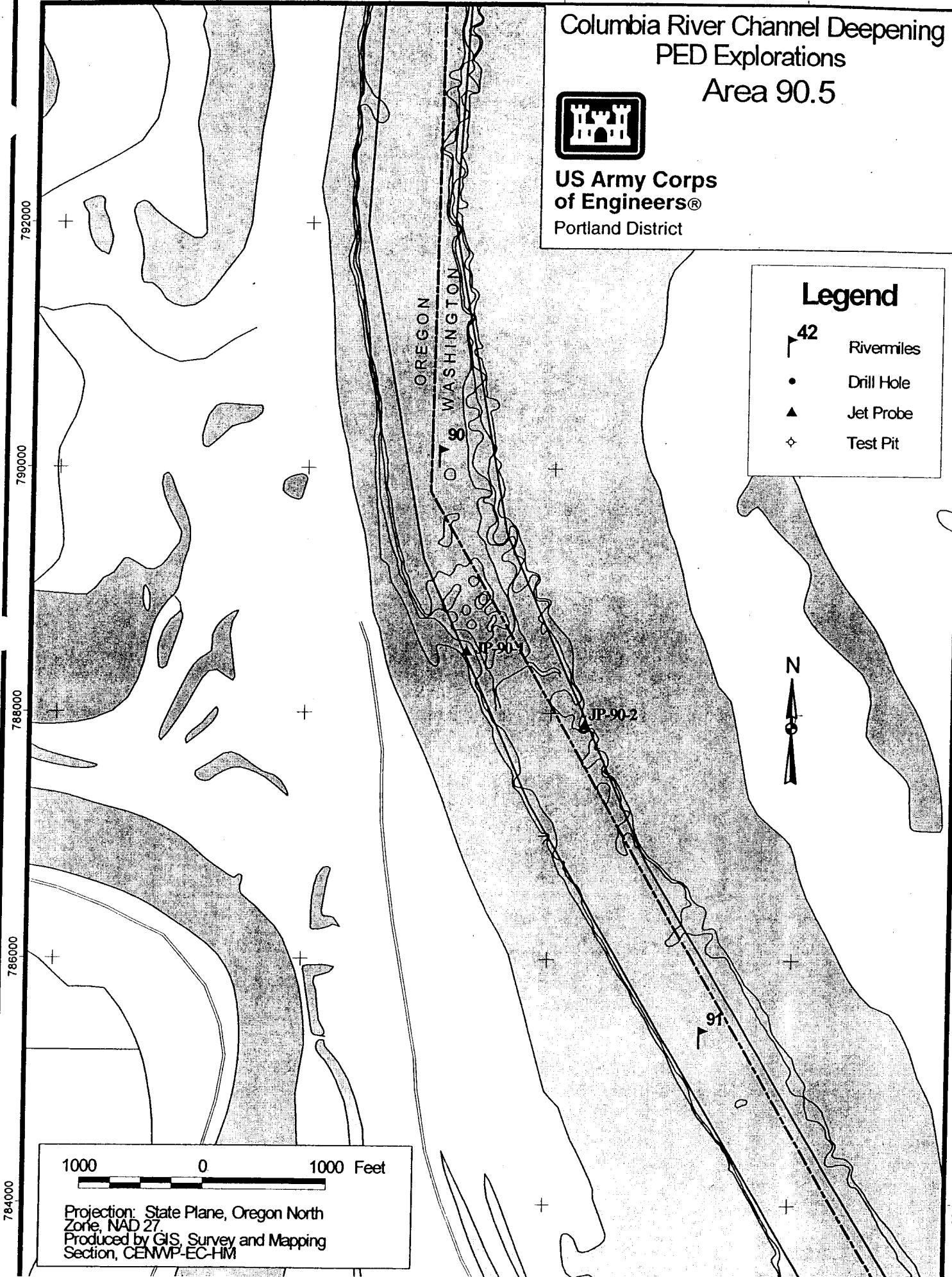
Columbia River Channel Deepening  
PED Explorations  
Area 90.5



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Portland District

**Legend**

- 42 Rivermiles  
• Drill Hole  
▲ Jet Probe  
◊ Test Pit



1420000

1422000

1424000

780000

780000

778000

WASHINGTON  
OREGON

776000

774000

800

0

800 Feet



# Columbia River Channel Deepening PED Explorations Area 93



**US Army Corps  
of Engineers®**  
Portland District

93

JP-93-1

## Legend

42

Rivermiles

• Drill Hole

▲ Jet Probe

◆ Test Pit

Projection: State Plane, Oregon North  
Zone, NAD 27.  
Produced by GIS, Survey and Mapping  
Section, CENWP-EC-HM

1420000

1422000

1424000

Columbia River Channel Deepening  
PED Explorations  
Area 95.5



US Army Corps  
of Engineers®  
Portland District

95

WASHINGTON  
OREGON

N

JP-95-I

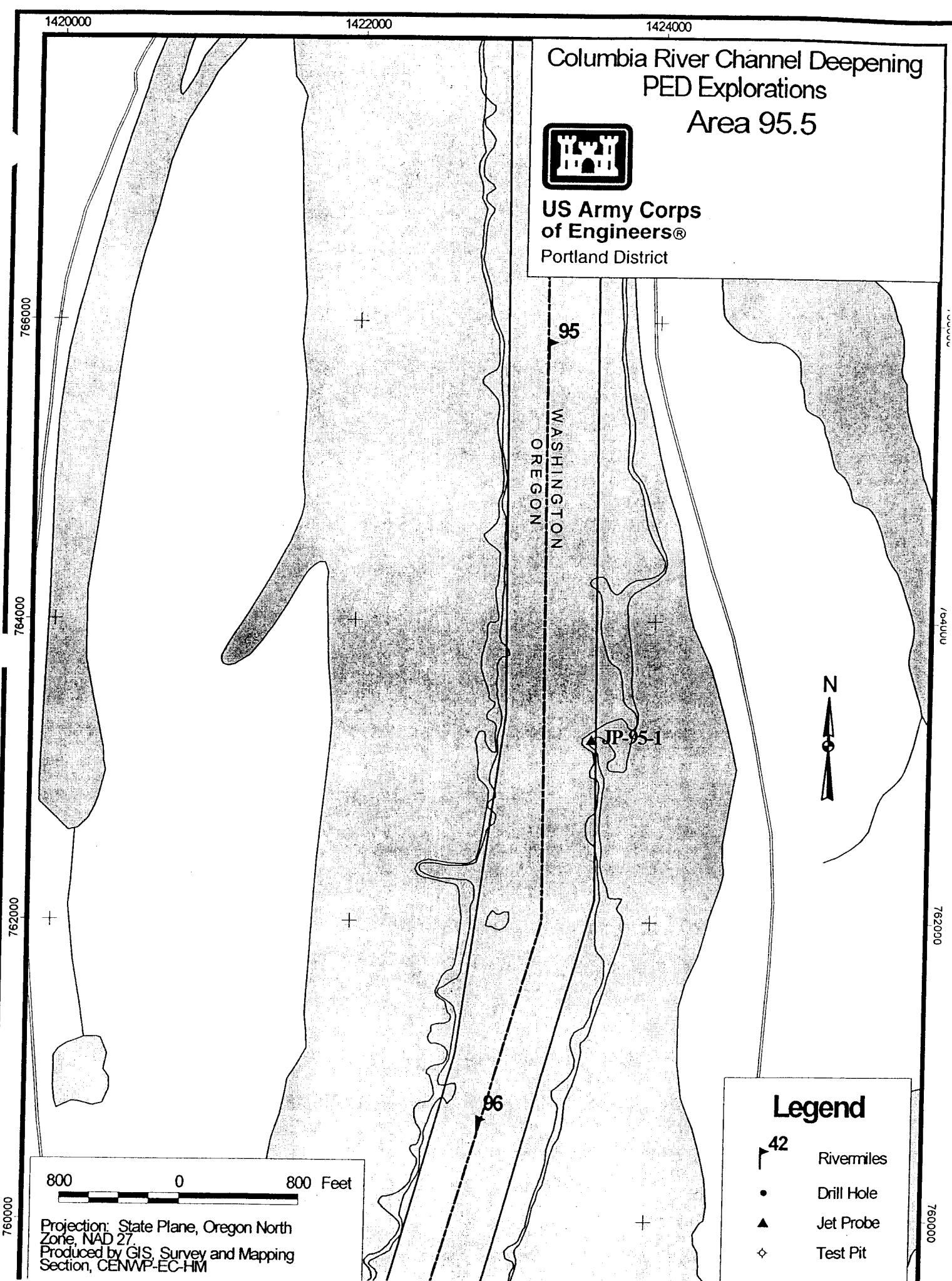
86

800 0 800 Feet

Projection: State Plane, Oregon North  
Zone, NAD 27  
Produced by GIS Survey and Mapping  
Section, CENWP-EC-HM

**Legend**

42	Rivermiles
•	Drill Hole
▲	Jet Probe
◊	Test Pit



1420000

1422000

1424000

1426000

Columbia River Channel Deepening  
PED Explorations  
Area 95.5



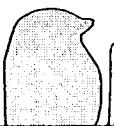
US Army Corps  
of Engineers®  
Portland District

95

NP 95-1

96

N



**Legend**

42

Rivermiles

•

Drill Hole

▲

Jet Probe

◊

Test Pit

500 0 500 1000 1500 Feet

Projection: State Plane, Oregon North  
Zone, NAD 27.  
Produced by GIS, Survey and Mapping  
Section, CENWP-EC-HM

1420000

1422000

# Columbia River Channel Deepening PED Explorations

## Area 100



**US Army Corps  
of Engineers®**

Portland District

### Legend

42

Rivermiles

•

Drill Hole

▲

Jet Probe

◊

Test Pit



250 0 250 500 750 Feet

Projection: State Plane, Oregon North  
Zone, NAD 27.  
Produced by GIS, Survey and Mapping  
Section, CENWP-EC-HM

734000

735000

1434000

1436000

1438000

Columbia River Channel Deepening  
PED Explorations  
Area 104



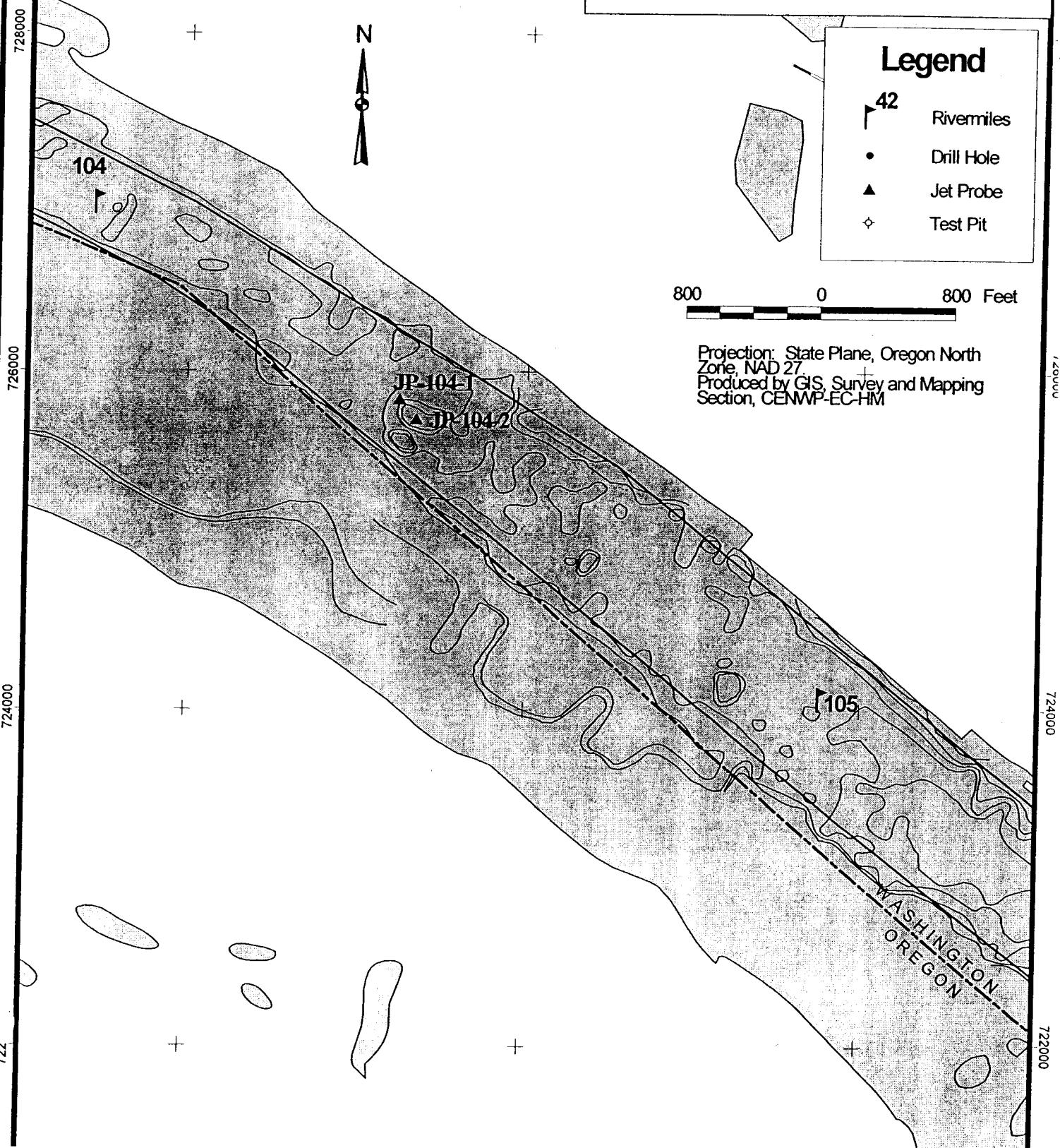
US Army Corps  
of Engineers®  
Portland District

**Legend**

- 42 Rivermiles
- Drill Hole
- ▲ Jet Probe
- ◊ Test Pit

800 0 800 Feet

Projection: State Plane, Oregon North  
Zone, NAD 27.  
Produced by GIS, Survey and Mapping  
Section, CENWP-EC-HM



**APPENDIX B**  
**Exploration Logs**

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# **Test Pit Logs**

## SOIL DESCRIPTIONS

**Sample log:** Soil strength, modifier NAME; trace/some/matrix, color and color variations, moisture, plasticity or grain description, structure, cementation, torvane/PP, other.

**Field Summary Log:** Interpreted contacts, changes in drilling, drillers comments, unit descriptions such as interbedded, gradational changes, boulders, (unit name/origin).

Field Identification	Cohesive soils			Granular Soils	
	SPT	Su TsF	Term	SPT	Term
Easily penetrated several inches by fist.	0 - 1	<0.125	Very Soft	0 - 4	Very Loose
Easily penetrated several inches by thumb.	2 - 4	0.125 - 0.25	Soft	5 - 10	Loose
Can be penetrated several inches by thumb with moderate effort.	5 - 8	0.25 - 0.50	Medium Stiff (Firm)	11 - 30	Medium Dense
Readily indented by thumb but penetrated only with great effort.	9 - 15	0.50 - 1.0	Stiff	31 - 50	Dense
Readily indented by thumbnail.	16 - 30	1.0 - 2.0	Very Stiff	> 50	Very Dense
Indented with difficulty by thumbnail.	31 - 60	> 2.0	Hard		

modifiers: 30-50%, silty, sandy, clayey, gravelly, organic, or other significant modifier (angular, cemented)

NAME: SILT, SAND, CLAY, GRAVEL, COBBLES

with: some 15 - 30%, trace 5 - 15%

color: primary color - mottled, stained, etc.

Term	Soil Moisture Field Description	
Dry	Absence of moisture. Dusty. Dry to the touch.	
Damp	Soil has moisture. Cohesive soils are below plastic limit (BPL) and usually moldable.	
Moist	Grains appear darkened, but no visible water. Silt/clay will clump. Sand will bulk. Soils are often at or near plastic limit.	
Wet	Visible water on larger grain surfaces. Sand and cohesionless silt exhibit dilatancy. Cohesive silt/clay can be readily remolded. Soil leaves wetness on the hand when squeezed. "Wet" indicates that the soil is wetter than the optimum moisture content and above plastic limit (APL).	

Term	PI	Plasticity Field Test
Nonplastic	0 - 3	Cannot be rolled into a thread.
Low plasticity	3 - 15	Can be rolled into thread with some difficulty.
Medium Plasticity	15 - 30	Easily rolled into thread.
High Plasticity	> 30	Easily rolled and rerolled into thread.

**Grain lithology / Grain Shape:** angular, subangular, subrounded, rounded

**Gradation:** well graded, poorly graded, uniformly graded, gap graded

**Hardness and weathering of gravel and cobbles**

Term	Soil Structure Criteria
Stratified	Alternating layers at least 1 inch thick - describe variation
Laminated	Alternating layers at less than 1 inch thick - describe variation
Fissured	Contains shears and partings along planes of weakness
Slikensides	Partings appear glossy or striated
Blocky	Breaks into lumps - crumbly
Lensed	Contains pockets of different soils - describe variation

Term	Soil Cementation Criteria
Weak	Breaks under light finger pressure
Moderate	Breaks under hard finger pressure
Strong	Will not break with finger pressure

**(Unit Name-Origin):** Origin of the deposit ( residual, colluvial, alluvial, fill, etc.) and or name of commonly known mapped units (Willamette Silt).

Picture 1/2 of barge 'KOU#1  
3 of pile'



RIVER EL: +2.2

CRD 8:06 am

+2.0

CRD 8:30 am

PROJECT NUMBER 31.  
159184-TP

TEST PIT NUMBER TP-1

SHEET 1 OF 1

### TEST PIT WALL LOG

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	PROJECT C.P. Channel Deepening	LOCATION Longview Area 66	MAP OF... WALL OF PIT
		ELEVATION	CONTRACTOR Hickey Marine	DATE EXCAVATED 8/11/00
		WATER LEVEL AND DATE	EXCAVATION METHOD Clam Shell	LOGGER H. Guetter
		APPROXIMATE DIMENSIONS: LENGTH _____	WIDTH _____	DEPTH _____ REMARKS _____
C D P R	1st - 2nd - 3rd - 4th - 5th - 6th - 7th - 8th - 9th - 10th - 11th - 12th - 13' =	SAND; some gravel at bottom (SM) -11- (SM) -11- (SM) -11- maybe GRAVEL in SILTY SAND matrix (GW-GM) GRAVEL, sand, scattered cobbles (GW-GM) -11- -11- -11- -11- little gravel recovery GRAVEL, some sand double bit - GRAVEL (GN-Gn)		COMMENTS Start: 8:06 am 1st - 49.1' River bottom depth. 2nd - 49.5' 3rd - 50.5' 4th - 50.7' 5th - 50.7' 6th - 50.7' 7th - 50.8' 8th - 51.3' 9th - 51.5' 10th - 51.6' 11th - 51.5' 12th - 51.6' 13' - 51.8' FINAL: 52.4' (bottom of hole) (at EL. -50.4 ft)
49 - 50 - 51 - 52 -	46.9 47.9 48.9 49.9	EL. - 46.9 SAND, some with scattered wood debris (small) (SM) EL. - 48.5 GRAVEL in a SILTY SAND matrix, scattered cobbles, & wood debris (small) EL. - 50.4 (GW-GM) (clacite + basalt) multilithology	PRE. 1980	Hard digging below EL. - 48.5 ft End: 8:50 am
		LENGTH (FT)		Figure 2 TEST PIT WALL LOG FORM D1599



RIVER EL: +1.7' CRD      11 am  
+1.9' CRD      11:25 am

PROJECT NUMBER	TEST PIT NUMBER
159184.B1.TP	TP-3
SHEET 1 OF 5	
TEST PIT WALL LOG	

DEPTH BELOW SURFACE (FT)	SAMPLE #	SAMPLE NUMBER AND TYPE	PROJECT	LOCATION	MAP OF	WALL OF PIT
			CP. channel Deepening	Area 66		
ELEVATION				Flushing Marine	DATE EXCAVATED	8/11/00
WATER LEVEL AND DATE				Shell Clam	LOGGER	H. Guetter
APPROXIMATE DIMENSIONS:			LENGTH	WIDTH	DEPTH	REMARKS

<b>C R D</b> 1st - SAND; 1 log ~8" long, 3" dia. 2nd - SAND; some gravel at bottom, rest of log 10' (see above) 3rd - -11- no log 4th - -11- gravel probably at bottom 5th - scattered cobbles, more gravel sand on top 6th - Gravel, some silt + sand, scattered cobbles 7th - -11- 8th - Gravel, scattered cobbles, rounded 9th - one angular boulder ~13" long 6" wide, rest gravel 10th - SAND, some gravel 11th - Gravel, scattered cobbles, sand 12th - -11-	<b>COMMENTS</b> Start: 11:00 am 1st - 47' (River bottom) 2nd - 48.5' 3rd - 48.8' 4th - 48.8' 5th - 50.1' 6th - 49.9' 7th - 49.9' 8th - 50.5' 9th - 50.2' 10th - 50.4' 11th - 51.5' 12th - 50' 13th - 51.9' FINAL	
<b>-EL. -45.3</b>		
47 - 45.3	MT. ST. MELTON POST 1980	
48 -	SAND; some silt; scattered gravel and wood debris 1 large log, broken; 2 pieces, grey wet medium grained sand, rounded gravel, multi lithology (SN)	
-47.3	EL. -47.7 (SM)	
50 - 48.3	PRE. MT. ST. MELTON	
-49.3	GRAVEL in a silty SAND matrix; scattered wood + debris, grey; wet, rounded, well graded gravel with multi lithology (diorite, basalt and more). Biggest boulders (only 1) ~13". cobble up to 12". (GW-GM)	
52	BOTTOM OF TP-3 @ EL. -50 ft.	
	LENGTH (FT)	

FIRST EASY THEN  
**HARDER DIGGING**  
 (DEBUT EL. -47.7 ft)  
 Bottom of TP-3 @  
 EL. -50 ft

END: 11:25 am

Figure 2

TEST PIT WALL LOG  
FORM D1599

# Picture # 4 Pile Roll#)

RIVER EL: +1.8 CRD +1.8 CRD		9:23am 9:41 am	PROJECT NUMBER 159184, Bl.TP	TEST PIT NUMBER TP-2	SHEET 1 OF 1	
TEST PIT WALL LOG						
DEPTH BELOW SURFACE (FT)	SAMPLE		LOCATION Area 66	MAP OF WALL OF PIT		
	#	NUMBER AND TYPE		ELEVATION	CONTRACTOR Hickey Marine	DATE EXCAVATED 8/11/00
		WATER LEVEL AND DATE	EXCAVATION METHOD Clam Shell	LOGGER H. Groutte		
		APPROXIMATE DIMENSIONS:	LENGTH	WIDTH	DEPTH	REMARKS

**C**  
**R**  
**D**

1st - SAND, scattered gravel; scattered wood debris (small),  
 2nd - -||-  
 3rd - -||-  
 4th - . -||-.  
 5th - -||- 2 log ~ 3-4' long, 3" Ø  
 6th - SAND; scattered gravel + wood (small)  
 7th - -||-  
 8th - . SAND; gravel with silt + sand @ bottom, diff. grey  
 9th - -||- up to 10"  
 10th - -||- scattered cobbles, very round ○  
 11th - -||- scattered wood debris, no cobbles, log 1"-3" Ø  
 12th - . SAND, scattered gravel  
 13th -  
 14th -  
 15th -  
 16th -  
 17th -  
 18th -  
 19th -  
 20th -  
 21st -  
 22nd -  
 23rd -  
 24th -  
 25th -  
 26th -  
 27th -  
 28th -  
 29th -  
 30th -  
 31st -  
 32nd -  
 33rd -  
 34th -  
 35th -  
 36th -  
 37th -  
 38th -  
 39th -  
 40th -  
 41st -  
 42nd -  
 43rd -  
 44th -  
 45th -  
 46th -  
 47th -  
 48th -  
 49th -  
 50th -  
 51st -  
 52nd -

EL.-43.3 ft.  
 SAND; some silt, scattered gravel and wood debris, grey, wet, medium grained, poorly graded sand, rounded gravel (dacite) / well graded gravel. (SM)  
 Areas of concentrated gravel in silt & sand either in lenses or layers (thin). Almost all gravel is dacite.  
 MT. St. Helens deposits

POST 1980

COMMENTS  
 Start: 9:22  
 1st @ 45.1 RIVER BOTTOM  
 2nd @ 45.3'  
 3rd @ 47.5'  
 4th @ 48.5'  
 5th @ 48.5'  
 6th @ 48.8'  
 7th @ 49.0'  
 8th @ 50'  
 9th @ 50.3'  
 10th @ 50.6'  
 11th @ 51'  
 12 @ 51.7'  
 13 @ 52.1')  
 FINAL  
 [EASY DIGGING]  
 END 9:41 a  
 Bottom of hole at EL.-50.3 ft.

Figure 2  
 TEST PIT WALL LOG  
 FORM D1599



RIVER EL: +2.7 CRD  
+3.2 CRD  
+3.4 CRD

12:09 pm  
12:35 pm  
12:44 pm

Pick 2 ft 5' Park!  
#6 pile of gravel

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	PROJECT	LOCATION	MAP OF	WALL OF PIT
		C.P. Channel Deepening	Area 66	TP-5	SHEET 1 OF 1
	ELEVATION	CONTRACTOR	Hickey Marine	DATE EXCAVATED	8/11/00
	WATER LEVEL AND DATE	EXCAVATION METHOD	Clam Shell	LOGGER	H. Gruenthal
	APPROXIMATE DIMENSIONS:	LENGTH	WIDTH	DEPTH	REMARKS
C R D	1st - SAND; scattered gravel				
	2nd - -1" - scattered wood debris ~ 9". 3" Ø				
	3rd - -1" - some brownish gravel & bottom w/ silt				
	4th - more gravel w/ silt; some sand				
	5th - 1 boulder, some sand, not mud recovered 1.5' Ø				
	6th - SAND; some gravel, scattered cobbles 2 boulders				
	7th - -1" - no boulders				
	8th - SAND; some gravel at bottom				
	9th - -1" - SAND; trace gravel				
	10th - -1" - pieces of gravel in silt matrix				
45 42.3	el-43.0 <sup>b</sup> SAND; some silt; scattered gravel and wood debris, grey, wet, medium grained, gravel is fine < 1" rounded multilithology gravel (SM) bivalve	11th - Sand top, gravel by 12th - Gravel + 1 cobble 13th - -1" 14th - -1" 15th - -1" 16th - -1" 17th - gravel some cobbles 18th - 1 boulder 19th - scattered cobble 20th - sand (top) gravel (bottom) cobble + 2 boulders angular boulders partly rounded 21st - -1" 22nd - gravel, cobble			
47 44.3	el-46.2 <sup>b</sup> GRAVEL in a silt matrix, some sand, scattered cobbles + wood debris, occasional boulder, grey, some brown, wet, gravel is rounded, well graded multilithology, cobbles are rounded, angular (broken up) and subangular, boulders mostly subangular, mat boulder 1.5' Ø bivalve + oyster up to 12". (GM)	11th = 50.2' 12th = 50.3' 13th = 50.4' 14th = 51.1' 15th = 51.2' 16th = 51.5' 17th = 50.7' 18th = 52' 19th = 52.9' 20th = 52.9' 21st = 52.9'			
49 46.3		HARD DIGGING below EL-47 ft			
50 48.3		Figure 2 22nd - 53 TEST PIT WALL LOG FORM D1599			
53 50.3	el-50.0 <sup>b</sup>	23rd - 53.4 FINAL			
		LENGTH (FT)	END AT	12:45 pm	
① BOTTOM OF TP-5 @ EL - 50 ft					

RIVER DEPTH: +1.7' CRD 10.08a  
+1.6' CRD 10:30am

PROJECT NUMBER 159184.B1.TP TEST PIT NUMBER TP-4 SHEET 1 OF 1

## TEST PIT WALL LOG

DEPTH BELOW SURFACE (FT)	SAMPLE	PROJECT	LOCATION	MAP OF	WALL OF PIT
	NUMBER AND TYPE	ELEVATION	CONTRACTOR	DATE EXCAVATED	LOGGER
	C	1st - SAND; scattered gravel & wood debris			COMMENTS
	R	2nd - -11-		Start: 10:08a	RIVER BOTTOM
①		3rd - -11-		1st - 44.1	
		4th - -11-		2nd - 46	
		5th - -11-		3rd - 47	
		6th - SAND, some more gravel at bottom or - lens		4th - 48.1	
		7th - -11-		5th - 48.2	
		8th - -11-		6th - 49	
		9th - -11-		7th - 49.1	
		10th - -11-	brownish color with gravel	8th - 49.8	
		11th - -11-		9th - 50	
		12th - -11-	cobble, rounded, basalt	10th - 50.2	
		13th - -11-		11th - 50.6	
44	42.3	EL - 42.4 ft		12th - 50.6	
45	43.3	SAND; some silt, scattered to trace gravel,		13th - 51.0	
46	43.3	occasional cobble (up to 10"), scattered wood		FINAL: 51.7	
47	45.3	debris (small), grey, some brownish silt, wet		BOTTOM OF TP-4	
48	45.3	iron stained in areas, medium sand, rounded		at EL - 50.1 ft	
49	47.3	gravel, mostly dacite some basalt, a.o., well		EASY DIGGING	
50	49.3	graded gravel, mostly < 2" some up to 3"			
51	49.3	PRE-AND POST ST. HELENS DACITE. (SM)			
52	50	EL - 50.1 ft (end of TP-4)			
		LENGTH (FT)			

END 10:30 am  
Figure 2

TEST PIT WALL LOG  
FORM D1599



RIVER EL: +4.1  
+4.1  
+4.0

CRD 2:43p-  
CRD 3:05pm  
CRD 3:09pm

PROJECT NUMBER  
159184.31.TP

TEST PIT NUMBER  
TP-6

SHEET ( OF )

### TEST PIT WALL LOG

DEPTH BELOW SURFACE (FT)	SAMPLE		PROJECT C.R. channel Deepening	LOCATION AREA 66	MAP OF WALL OF PIT		
	NUMBER AND TYPE	H				ELEVATION	CONTRACTOR HICKLEY MARINE
					LOGGER H. Gruettel		
			APPROXIMATE DIMENSIONS:	LENGTH	WIDTH	DEPTH	REMARKS
C			1st - SAND; small log ~2"; 3' long				
P			2nd - SAND, gravel with scattered cobble & boulders at bottom				
R			3rd - SAND; scattered boulders basalt, broken up - broken wood debris				
D			4th - GRAVEL, SAND, SILT				
			5th - SAND; GRAVEL with sand + silt at bottom				
			6th - -" scattered cobbles				
			7th - -"				
			8th - -" wood fragments 2"				
			9th - -"				
			10th - gravel + sand + silt recovery				
			11th - -" max 4"				
			12th - boulders, subrounded, basalt, -" -"				
			13th - -" same as above -"				
			14th - -" -" no boulders				
			15th - -"				
			16th - -"				
			17th - -"				
			18th - silt, gravel, sand, cobbles				
49	45	EL. - 45.4 ft					
50	46	EL. - 46.9 ft	SAND, trace gravel + cobbles, grey, wet, medium Some silt, scattered wood debris. (SW-SM) Basalt + dacite	grey, wet, medium greened			
52	48	EL. - 48.0 ft	GRAVEL in a silty SAND matrix; scattered cobbles, boulders & wood debris, grey, wet, rounded gravel and cobbles; multilithology. (basalt, dacite)				
54	50	EL. - 50.1 ft	boulders are basalt, some look like they got broken up by clam shell bucket max 4' boulders well graded gravel, fine to med. sand (GM)				
			LENGTH (FT)	PRE 1980			

**HARD DIGGING  
BELOW EL- 47.0 ft**

END 3:08 PM  
Figure 2



RIVER EL: +4.4' CRD (2:10pm)  
EL: 4.3' (2:22pm)

Picture 25 Disposable #1  
Clam Shell

PROJECT NUMBER	TEST PIT NUMBER
159184.BI.TP	TP-7
SHEET 1 OF 1	
TEST PIT WALL LOG	

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	PROJECT	LOCATION	MAP OF	WALL OF PIT
		C.R. Channel Deepening	Area 66		
	ELEVATION		CONTRACTOR	Hickey Marine	DATE EXCAVATED
	WATER LEVEL AND DATE		EXCAVATION METHOD	Clam Shell	LOGGER
	APPROXIMATE DIMENSIONS:	LENGTH	WIDTH	DEPTH	REMARKS
C R ①	1st - SAND, trace gravel at bottom 2nd - " " 3rd - GRAVEL, some sand + silt, rounded 4th - " " 5th - (cobble) - " , basalt				START: 2:11 pm 1st - 50.1' RIVER BOTTOM 2nd - 51.5' 3rd - 52' 4th - 53' 5th - 54' FINAL 54.5' Bottom of TP-7 @ 50.3
	(2) GRAVEL, with sand and silt scattered cobbles, & wood debris (small), occasional boulder, rounded gravel, multi-lithology, basalt + dacite, cobbles are rounded, boulder is basalt + subrounded. (GW-GM)				Easy to moderate digging
45.7	EL - 45.7.4				END 2:22pm
46.7	POST 1980	SAND, some silt, scattered wood debris + gravel, grey, wet, medium grained, rounded small gravel dacite (SM)			Backfill hole
47.6	EL - 47.6.4				
48.7	PRE 1980	(2)			
49.3	EL - 50.3.4	(GW-GM)			
50.7					
		LENGTH (FT)			

Figure 2  
TEST PIT WALL LOG  
FORM D1599

Pict # 24 Depth Log



RIVER EL: +4.2' CRD  
 +4.3' CRD  
 +4.3' "

1:16 pm  
 1:36 pm  
 1:39 p-

PROJECT NUMBER

159184.B1.TP

TEST PIT NUMBER

TP-8

SHEET 1 OF 1

## TEST PIT WALL LOG

DEPTH BELOW SURFACE (FT)	SAMPLE		PROJECT C.R. Channel Deepening	LOCATION Area 66	MAP OF WALL OF PIT
	NUMBER	AND TYPE			
			ELEVATION	CONTRACTOR Tickey Marine	DATE EXCAVATED 8/10/00
			WATER LEVEL AND DATE	EXCAVATION METHOD Clam Shell	LOGGER H. GUETTEL
			APPROXIMATE DIMENSIONS:	LENGTH    WIDTH    DEPTH	REMARKS
	C		1st - SAND, scattered gravel, cobbles & wood debris		COMMENTS
	R		2nd - SAND		START: 1:15 pm
	J		3rd - GRAVEL, SAND, SCATTERED WOOD DEBRIS		1st - 49.9' RIVER BOTTOM
			4th - GRAVEL, sand, scattered cobble + boulders (15")		2nd - 50.1'
			5th - 1 boulder, scattered cobbles, sand		3rd - 51.2'
			6th - No boulders		4th - 51.3'
			7th - GRAVEL, scattered cobbles, sand		5th - 51.3'
			8th - " "		6th - 51.2'
			9th - " "		7th - 52'
			10th - " "		8th - 52.1'
			11th - " "		9th - 52.5'
			12th - " "		10th - 52.5'
			13th - " "		11th - 53.1'
					12th - 54'
					13th - 54.1'
					FINAL: 54.5'
					END 1:39 pm
49					
50	45.7	POST PREO EL. - 49.7 ft	SAND, scattered gravel & wood debris, some silt grey, wet, medium sand, poorly graded, multilithology, rounded (SM)		HARD DIGGING BELOW EL. - 47.5 ft
51					
52	49.7	PRE 1980	GRAVEL in a sandy silt matrix, scattered cobbles, boulders and wood debris, grey, iron stained, wet, rounded gravel, well graded cobbles + boulders are mostly bimodal, some subrounded, mostly basalt.		Bottom of TP-8 at EL. - 50.2 ft, Figure 2
53					
54	49.7		Multilithology gravel (basalt, dacite, ...) (GM)		TEST PIT WALL LOG FORM D1599
			EL - 50.2 FT		
			LENGTH (FT)		

RIVER EL: + 3.5' CRD (12:10 pm)  
+ 3.8 CRD (12:30 pm)  
12 35pm

PROJECT NUMBER  
159184.B1. TP

TEST PIT NUMBER  
TP-9

SHEET 1 OF 1

### TEST PIT WALL LOG

DEPTH BELOW SURFACE (FT)	SAMPLE		PROJECT C.R. Channel Deepening	LOCATION Area 66	MAP OF WALL OF PIT
	NUMBER	AND TYPE			
		ELEVATION	CONTRACTOR Hickory Marine		DATE EXCAVATED 8/10/00
		WATER LEVEL AND DATE	EXCAVATION METHOD Clam Shell		LOGGER H. GUETTEL
		APPROXIMATE DIMENSIONS:	LENGTH	WIDTH	DEPTH
					REMARKS
	C	1st - SAND			WOOD
	R	2nd - SAND, SILT, GRAVEL, COBBLES			
	D	3rd - -  - (11"-14" Ø)			
		4th - 4 cobble to boulder size pieces, gravel, sand			
		5th - 1 boulder, scattered cobbles, sand+gravel			
		6th - 3' Ø boulder -  - subangular			
		7th - SAND, COBBLES, WOOD up to 2' long 4" thick			
		8th - SAND, GRAVEL, COBBLES, ROUNDED			
		9th - -  -			
		10th - -  -			
		11th - GRAVEL, SAND, SCATTERED COBBLES			
		12th - -  -, scattered boulders			
		13th - -  - no boulders.			
46					
47					
48					
49	-45.6	EL. - 45.6 ft			
50	-47.4	SAND, some silt, scattered gravel, wet, medium grain size, poorly graded, (SM)			
51	-47.6	GRAVEL in a silty SAND matrix, scattered cobbles, occasional boulders and wood debris, grey, iron-stained, wet, rounded to subrounded gravel, cobbles & boulders, gravel is well graded, boulders up to 3' Ø, boulders are basalt. (GM)			
52	-48.0				
53	-49.6	EL. - 50.1			
			PIT 1980		
		LENGTH (FT)			

COMMENTS  
 START: 12:10 am  
 1st - 49.1 ft RIVER  
 2nd - 50'  
 3rd - 50.4'  
 4th - 50.8'  
 5th - 51.2'  
 6th - 52.1'  
 7th - 52.5'  
 8th - 52.5'  
 9th - 52.6'  
 10th - 52.7'  
 11th - 53.5'  
 12th - 53.8'  
 13th - 53.8'  
 FINAL: 53.9'

BOTTOM OF TP-9  
(EL = 50.1 FT.)

End 12:35 pm

HARD DIGGING  
BELLOW EL. - 48.0'  
Figure 2

TEST PIT WALL LOG  
FORM D1599



RIVER EL: +2.6' (11:14 am) CRD  
+28' (11:36 am)

PROJECT NUMBER	TEST PIT NUMBER
159184.B1.TP	TP-10
SHEET 1 OF 1	
TEST PIT WALL LOG	

DEPTH BELOW SURFACE (FT) <small>INTERVAL</small>	SAMPLE NUMBER AND TYPE	PROJECT C.R. CHANNEL DEEPENING	LOCATION AREA 66	MAP OF WALL OF PIT
		ELEVATION	CONTRACTOR Hickey Marine	DATE EXCAVATED 8/10/00
WATER LEVEL AND DATE			EXCAVATION METHOD CLAM SHELL	LOGGER H. Gueotel
APPROXIMATE DIMENSIONS: LENGTH		WIDTH	DEPTH	REMARKS
C	1ST - SAND 2nd - SAND 3rd - SAND, gravel at bottom 4th - -  - 5th - -  - 6th - -  - 7th - -  - 8th - -  - 9th - -  - 10th - -  - 11th - -  - 12th - -  -	gravel embedded in silt (lenses) scattered wood debris		
D				COMMENTS start, 11:12 am 1st - 45' RIVER BOTTOM 2nd - 46' 3rd - 48' 4th - 49' 5th - 49.1' 6th - 49.5' 7th - 51.1' 8th - 51.5' 9th = 52.2' 10th = 52.5' 11th = 52.1' 12th = 52.1'
42.4	EL. 42.4 ft			FINAL = 53.2'
43.4	POST 1980	SAND; scattered gravel (fine) and wood debris (small), some silt, grey, wet, medium sand, poorly graded, gravel is rounded multi-lithology. < 1/2" (SP-SM)		BOTTOM OF TP-10 @ EL. 50.5 ft Moderate to easy digging throughout
45.4	EL. 46.5 ft			
47.4	PRE 1980	GRAVEL in a sandy SILT matrix, scattered wood debris (small), grey, wet, rounded gravel, fine to medium size (< 2.5") fine sand. Gravel has multi-lithology, mostly dolite. (GM)		
49.4	EL. 50.5 ft			
		NOTE: GRAVEL LAYER IS A GUESS. IT COULD BE LENSES IN LENGTH (FT) SAND, BUT IT WAS ALWAYS AT BOTTOM OF CLAM SHELL.		END : 11:35 am Figure 2 TEST PIT WALL LOG FORM D1599

# Picture 23 Disposable #1



RIVER EL: + 1.8 CRD  
+ 1.9 CRD

10:10

10:26

PROJECT NUMBER  
159184.B1TP

TEST PIT NUMBER  
TP- 11

SHEET 1 OF 1

## TEST PIT WALL LOG

DEPTH BELOW SURFACE (FT)	SAMPLE		PROJECT C.R. Channel Deepening	LOCATION Area 66	MAP OF WALL OF PIT
	#	NUMBER AND TYPE			
		WATER LEVEL AND DATE	EXCAVATION METHOD Clam Shell	LOGGER H. Guebel	
		APPROXIMATE DIMENSIONS: LENGTH	WIDTH	DEPTH	REMARKS
C R D	1st	GRAVEL, some sand, silt, scattered cobble+wood			COMMENTS
	2nd	GRAVEL, sand, rounded, sub brownish-grey debris			Start: 10:10
	3rd	GRAVEL, sand, silt, scattered cobbles			1st - 48.8' RIVER BOTTOM
	4th	- 11 -			2nd - 49.2'
	5th	- 11 -			3rd - 50.4'
	6th	- 11 -	iron staining	total 3 boulders	4th - 50.9'
	7th	- 11 -		2 @ at EL-49 and below	5th - 51.0'
					6th - 51.7'
				7th - 51.8'	
				FINAL 52'	
				End : 10:26 am	
				BOTTOM OF TP-11 @ EL-50.1 FT	
48	EL. - 47.0 ft				
48.1	POST 1980	CLAY		HARD DIGGING	
48.1	EL. - 48'	0 0 0		from top	
49	PRE 1980	0 0 0			
49	EL. - 50.1 ft	0 0 0			
50			GRAVEL, some sand + silt, (GM)		
50			scattered cobbles & boulders (2-3')		
52					
			LENGTH (FT)		

Figure 2

TEST PIT WALL LOG  
FORM D1599



RIVER EL: + 4.0 CRD  
+ 3.9 CRD  
+ 3.8-3.9 CRD  
(high waves)

1:45pm  
2:05pm  
2:15pm

PROJECT NUMBER  
159184, Bl. TP

TEST PIT NUMBER  
TP-12

SHEET 1 OF 1

### TEST PIT WALL LOG

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	PROJECT	LOCATION	MAP OF	WALL OF PIT
		ELEVATION	CONTRACTOR	DATE EXCAVATED	LOGGER
		WATER LEVEL AND DATE	EXCAVATION METHOD		
		APPROXIMATE DIMENSIONS:	LENGTH	WIDTH	DEPTH
					REMARKS
					COMMENTS
	C	1st. 2nd. 3rd. 4th. 5th. 6th. 7th. 8th. 9th. 10th. 11th. 12th. 13th. 14th. 15th. 16th.	SAND Sand, some gravel at the bottom of bucket Sand " one boulder, approx 2' Ø Sand; some gravel SAND... scattered gravel, 1 cobble SAND: some silt, scattered gravel " " wood fragment Sand; gravel at bottom " " " " sand some gravel up to 3" at bottom, SILT 2 boulders, rounded, 2' Ø 1 boulder, 2' SAND; trace gravel, 1 small boulder ~ 1.2" Ø SAND; scattered cobbles, trace gravel		Start : 1:45 pm 1st @ 47.8' RIVER BOTTOM 2nd @ 48.9' 3rd @ 49.8' 4th @ 50.9' 5th @ 51.0' 6th @ 51.0' 7th @ 52.0' 8th @ 52.0' 9th @ 52.1' 10th @ 52.5' 11th @ 52.5' 12th @ 53.1' 13th @ 53.5' 14th @ 53.5' 15th @ 53.6' 16th @ 53.8' 17th @ 53.8'
47					DEPTHS INDICATE TOP OF GROUND SURFACE BEFORE SCOOP WAS TAKEN
48	EL-43.8	PPE 1980			
44		EL-48.1			
50	-46				
52	-48				
54	-50	EL-50.2			
55					
			LENGTH (FT)		

17th: SAND GRAVEL, scattered cobbles

HARD DIGGING  
BELOW EL-48 ft  
END 2:15pm  
Figure 2

TEST PIT WALL LOG  
FORM D1599  
BOTTOM OF TP-12  
@ EL-50.2 ft

REV 7/86 FORM D1599

Picture 22 Disposable#1

CRHILL

RIVER EL: +1.5 CRD 9:24 am  
+1.6 CRD 9:42 am

PROJECT NUMBER	TEST PIT NUMBER
159184.B1.TP	TP-13
SHEET 1 OF 1	
TEST PIT WALL LOG	

DEPTH BELOW SURFACE (FT)	SAMPLE	PROJECT	LOCATION	MAP OF	WALL OF PIT
	NUMBER AND TYPE	ELEVATION	CONTRACTOR	EXCAVATION METHOD	DATE EXCAVATED
	C	CR. channel Deepening	Area 66		
	R		Turkey Marine		8/10/00
	D		Clam Shell		H. Guebel
		APPROXIMATE DIMENSIONS: LENGTH _____	WIDTH _____	DEPTH _____	REMARKS _____
46	C	1st: - sand, silt, trace gravel, scattered boulders, 2" d grey-brown color	Subrounded 2 pieces	Angular cobble	COMMENTS Start: 9:22 a 1st. 47.9' RIVER 2nd. 48.3' BOTTOM
	R	2nd: - SAND. - II -			
	D	3rd: - 1 log = 3.5' long, 5" d, sand, trace gravel			3rd. 48.6'
		4th: SAND, trace gravel, silt, scattered cobbles			4th. 49.0'
		5th: - II -			5th. 49.7'
		6th: sand, trace gravel, scattered cobbles			6th. 50'
		7th: Sand, trace gravel with cobbles			7th. 50'
		8th: more gr SAND, some gravel, scattered cobbles			8th. 50.3'
		9th: - II - 2 boulders, basalt, sub-angular			9th. 50.5'
		10th: sand, gravel, cobbles, boulders			10th. 50.8'
		- II - 1 boulder 3.5' d Dacite reddish, subrounded			11th. 50.9'
		12th: GRAVEL, scattered cobbles	wood debris		12th. 51.3'
		13th: - II -			13th. 51.5'
		14th: GRAVEL & SAND; scattered cobbles, rounded			14th. 51.6'
		EL. - 46.4 FT			FINAL. 51.7'
48	PRE 1980	SAND, some silt, trace gravel, scattered cobbles, boulders & wood debris, grey, wet, medium sand, rounded gravel, subrounded + subangular, gravel + boulders, gravel is mostly dacite, some basalt, basalt c+b (SM)			Hard digging below EL -
47.4		EL. - 48.7 FT			
50		GRAVEL in a silty SAND matrix, scattered cobbles & boulders & wood debris, grey, wet, rounded gravel, some subrounded, 1 3/4' d dacite boulders (subrounded), mixed lithology cobbles, mostly dacite. (GM)			End 9:42 am
49.4		EL. - 50.1 FT			Bottom of TP-13 @ EL-50.1
52					Figure 2
					TEST PIT WALL LOG FORM D1599

LENGTH (FT)



RIVER EL: +1.6 C.R.D  
1.5 C.R.D

9:00 am  
9:10 am

PROJECT NUMBER  
159184.B1.TP

TEST PIT NUMBER  
TP-14

SHEET 1 OF 1

### TEST PIT WALL LOG

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	PROJECT	LOCATION	MAP OF WALL OF PIT
		C.R. Channel Deepening	Area 66	
ELEVATION		CONTRACTOR	Hickey Marine	DATE EXCAVATED
WATER LEVEL AND DATE		EXCAVATION METHOD	Clam Shell	LOGGER H. Gueotel
APPROXIMATE DIMENSIONS:	LENGTH	WIDTH	DEPTH	REMARKS
(C) R D				COMMENTS
1st	- SAND	trace to some gravel; scattered cobbles		Start : 9:00 am
2nd	- "			1st - 48.5' RIVER BOTTOM
3rd	- Sand, some gravel, scattered cobbles, angular			2nd - 49.0' ) TOP OF GROUND
4th	- gravel, some sand, silt.			3rd - 50.7' ) SURFACE BEFORE SCOP WAS TAKEN
5th	- " scattered cobbles iron stained, rounded, dacite + basalt scattered wood boulders (13'-15')			4th - 51.3' 5th - 51.8' FINAL: 51.8' End 9:10 am
47	SAND, trace to some gravel and silt, scattered cobbles, boulders and wood debris, grey, wet, medium sand, rounded gravel, iron-stained, multilithology, mostly dacite, few basalt pieces, basalt boulders and cobbles, some dacite c+b, basalt cobbles+ boulders are subangular and partly weathered. (SM)			Moderate Digging Throughout
48 - 46.5	EL. - 46.9			
49 - 47.5	POST- AND PRE- 1980.	(SM)		
50 - 48.5				
51 - 49.5	EL. - 50.3 FT			
52 - 50.5				
53 -				
			NO big wood pieces	
		LENGTH (FT)		

Figure 2

TEST PIT WALL LOG  
FORM D1599

Picture #21 of pile exposure

RIVER EL: +4.1' CRD      12:48 am  
 +4.1' CRD

PROJECT NUMBER 159184.B1.TP TEST PIT NUMBER TP-15  
 SHEET 1 OF 7

Manitowoc  
Crane 4600 TEST PIT WALL LOG

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	PROJECT	LOCATION	MAP OF	WALL OF PIT
		C.R. channel Deepening	Area 66	DATE EXCAVATED	8/9/00
ELEVATION		CONTRACTOR	Hickey Marine	LOGGER	H. Gruetzel
WATER LEVEL AND DATE		EXCAVATION METHOD	Clam Shell		
APPROXIMATE DIMENSIONS:	LENGTH	WIDTH	DEPTH	REMARKS	
D	C	1st: GRAVEL & SAND and some boulders and cobbles		Start: 12:48 am	COMMENTS
D	D	2nd: GRAVEL & SAND, scattered boulders and cobbles		1st @ 50' RIVER BOTTOM	
D	D	3rd: GRAVEL and scattered cobbles in sand matrix		2nd @ 50.5'	
D	D	4th: GRAVEL, scattered cobbles in sand matrix		3rd @ 51'	
D	D	5th: same as above		4th @ 51.3'	
D	D	6th: same as above with 2 boulders ~2' Ø		5th @ 51.5'	
D	D	7th: - GRAVEL one cemented boulder size piece, brittle, easy to break, weakly cemented		6th @ 52'	
D	D	8th: - 1 boulder -II-		7th @ 52.5'	
D	D	9th: - GRAVEL		8th @ 52.8'	
D	D	10th: - GRAVEL, some cobbles		9th @ 53.0'	
D	D	11th: - II - some iron staining		10th @ 53.2'	
D	D			11th @ 53.5'	
D	D			12th @ 54.2'	
D	D			END 1:10 pm	
EL. - 45.9 FT	PRE 1980	GRAVEL in a silty SAND matrix, (GM) scattered to trace cobbles, scattered boulders and wood charcs grey, some iron staining, wet, rounded gravel in all sizes, medium to fine sand, dacite and basalt gravel+cobbles, basalt boulders, subangular (GM)		Moderate digging throughout BOTTOM OF TP-15 @ EL- 50.1 FT	
50 - 45.9					
51					
52 - 47.9					
53					
54 - 49.9	EL- 50.1 FT				
55					
		LENGTH (FT)			

Figure 2

TEST PIT WALL LOG  
FORM D1599

PI. 'ME' 12  
PILE



RIVER EL: +4.0'  
+4.0'

CRD 12:12 am  
CRD 12:30 am

PROJECT NUMBER	TEST PIT NUMBER
159184.B1.TP	TP-16
SHEET 1 OF 1	
TEST PIT WALL LOG	

DEPTH BELOW SURFACE (FT)	SAMPLE #	SAMPLE NUMBER AND TYPE	PROJECT	LOCATION	MAP OF	WALL OF PIT		
		ELEVATION	CONTRACTOR	EXCAVATION METHOD	DATE EXCAVATED	LOGGER		
	C		C.R. channel Deepening	Area 66				
	R			Hickey Marine				
	D			Calm Shell				
			APPROXIMATE DIMENSIONS:	LENGTH	WIDTH	DEPTH	REMARKS	COMMENTS
			1st -	SAND and cobbles+boulders, not much recovery, open cl-				
			2nd -	1 log, 2' long, 3"Ø; SAND, some gravel	recovery			Start: 12:12 am
			3rd -	GRAVEL in SAND; scattered cobbles	fall out,			1st - 50' RIVER BOTTOM
			4th -	Log, 3' long; 4"Ø, SAND; cobbles (scattered)	due to			2nd - 50.5'
			5th -	SAND, GRAVEL, scattered cobbles	open bucket			3rd - 51'
			6th -	GRAVEL, SAND, scattered cobbles	boulder			4th - 51'
			7th -	IRON-stained gravel, sand+silt, few cobbles	stuck pot			5th - 51.3'
			8th -	Log, SAND; some gravel (log ~ 3"Ø; 2' long)	wet walls			6th - 51.7'
			9th -	boulders, scattered cobbles, gravel+sand				7th - 52'
				Weathered basalt cobbles, easy to break (crumbles)				8th - 53'
								9th - 53.2'
								10th - 54.3' (FINAL)
								END 12:30 am
								Moderate to hard digging below
								EL. - 47.0 FT
50	46	TEST 1980	EL. - 46.0 FT	SAND, some gravel, trace silt, SW-SM	/ dacite gravel,			
51	47	-47.3	medium grained sand rounded gravel	scattered wood debris+cobbles	basalt+dacite			
52	48			and boulders, grey+we.	cobbles, basalt boulders			
53	49	PRE 1980	(EL-47.3')	GRAVEL in silty SAND matrix, GM	Basalt cobbles			
54	50			scattered cobbles & boulders	+ boulders are			BOTTOM OF TP-16
				scattered wood debris, grey, wet	weathered			at EL-50.3'
				rounded gravel, iron stained	and angular,			Figure 2
				mostly dacite, some basalt	crumble under			
					finger pressure			
55			EL. - 50.3'					
				LENGTH (FT)				

TEST PIT WALL LOG  
FORM D1599

RIVER EL: + 1.9' CRD 7:55am  
+ 1.8' CRD 8:06am

PROJECT NUMBER	TEST PIT NUMBER
159184, 31.TP	TP-17
SHEET 1 OF 1	
TEST PIT WALL LOG	

DEPTH BELOW SURFACE (FT)	SAMPLE		PROJECT C.R. CHANNEL DEEPENING	LOCATION AREA 66	MAP OF WALL OF PIT
	NUMBER	AND TYPE			
		WATER LEVEL AND DATE		EXCAVATION METHOD Clam Shell	LOGGER H. Guettel
APPROXIMATE DIMENSIONS:	LENGTH	WIDTH	DEPTH	REMARKS	
C D	1st - SAND, 1 Log ~ 12" dia; 6 ft Ø 2nd - SAND, some gravel, 3 cobbles (angular basalt) 3rd - SAND, some gravel, scattered cobbles 4th - 5th - SAND & GRAVEL 6th - SAND, GRAVEL, scattered cobbles 7th - 1 boulder ~ 12" Ø; basalt, lost the rest SILT 8th - GRAVEL, rounded, some sand, scattered cobbles 9th - GRAVEL, sand, scattered cobbles & boulders (12"-16" Ø)  (EL. -45.2 to -50.4') SAND, some gravel and silt, scattered cobbles, boulders and wood debris, grey wet medium sand, poorly graded, rounded gravel, multi-lithology (dacite, basalt) EL. -45.2				COMMENTS start @ 7:50 am 1st @ 47.1' RIVER 2nd @ 48.2' BOTTOM 3rd @ 49.1' 4th @ 49.8' 5th @ 50.3' 6th @ 51.2' 7th @ 51.5' 8th @ 50.5' 9th @ 51.7'  FINAL @ 52.2' End 8:06 am
47 - 45.2					Moderate Digging
48 - 46.2					
49 - 47.2					
50 - 48.2					
51 - 49.2					
52 - 50.2					
53 - 51.1					
		LENGTH (FT)			

Figure 2

TEST PIT WALL LOG  
FORM D1599

RIVER EL: + 3.8 CRD (11:29 am)  
+ 3.9 CRD (11:45 am)

PICURE NO 19 U.S.P. #1  
Clam bucket



PROJECT NUMBER	TEST PIT NUMBER
159184.B1.TP	TP-1B
SHEET 1 OF 1	
TEST PIT WALL LOG	

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	PROJECT	LOCATION	MAP OF WALL OF PIT		
		ELEVATION	CONTRACTOR	DATE EXCAVATED		
		C.P. Channel Deepening	Area 66			
			Turkey Marine	8/9/00		
			Excavation Method Clam Shell	Logger H. Gueotel		
		APPROXIMATE DIMENSIONS:	LENGTH	WIDTH	DEPTH	REMARKS
48	C R D	1 <sup>st</sup> - GRAVEL and sand, both was $\frac{1}{2}$ to $\frac{1}{2}$ in bucket, 3 boulders $\approx$ 12"; scattered wood debris 2 <sup>nd</sup> - same as above, but no cobbles or boulders 3 <sup>rd</sup> - -11- 4 <sup>th</sup> - -11- 5 <sup>th</sup> - all GRAVEL, 1-2 cobbles, silt+sand 6 <sup>th</sup> - -11- 7 <sup>th</sup> - GRAVEL, scattered cobbles; 1 boulder 8 <sup>th</sup> - -11-				COMMENTS
48		51.3 - 53': SAND and GRAVEL, trace silt, scattered boulders, cobbles and wood debris, grey, wet sand is medium, gravel is rounded iron stained all sizes, mostly dacite/schist basalt, basalt boulders, subangular (SP-SM)				START! 1 <sup>st</sup> @ 51.3' RIVER 2 <sup>nd</sup> @ 51.5' BOTTOM 3 <sup>rd</sup> @ 52.7' DEPTHS 4 <sup>th</sup> @ 52.8' INDICATE 5 <sup>th</sup> @ 53.0' GROUND 6 <sup>th</sup> @ 53.2' SURFACE 7 <sup>th</sup> @ 53.2' BEFORE 8 <sup>th</sup> @ 53.5' SCOOP FINAL @ 54' WAS TAKEN
46.1		53 - 54': GRAVEL in a silty SAND matrix; grey, wet, rounded gravel in all sizes, fine to medium grained sand, gravel is iron stained some angular cobbles (basalt), subangular (GM) boulders (basalt) max $\approx$ 13"				END 11:45 am. Harder digging of last 2 ft
48.1		EL. - 47.5 ft SAND & GRAVEL, trace silt, scattered cobbles & boulders, wood debris (SP-SM)				FINAL DEPTH @ EL. - 50.1 FT
50		EL. - 49.1 ft SEDIMENT predominately post 1980.				
54	50.1	EL. - 50.1 ft GRAVEL in a silty sand matrix (GM) Pre 1980.				
			LENGTH (FT)			

Figure 2

TEST PIT WALL LOG  
FORM D1599

Pic. of boulders Disposable #1 NR. 1775



RIVER EL: +3.4' CRD 11:02  
+3.5' CRD 11:12

PROJECT NUMBER	TEST PIT NUMBER
159184.B1.TP	TP-19
SHEET 1 OF 1	
TEST PIT WALL LOG	

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	PROJECT	LOCATION	MAP OF	WALL OF PIT
		C.R. channel Deepening	Area 66		
ELEVATION		CONTRACTOR	Hickey Marine	DATE EXCAVATED	8/19/00
WATER LEVEL AND DATE		EXCAVATION METHOD	Clam Shell	LOGGER	H. Grueter
APPROXIMATE DIMENSIONS:	LENGTH	WIDTH	DEPTH	REMARKS	
C	1st - SAND, trace to some silt, trace gravel, scattered wood				Comments
R	2nd - same as above, 1 boulder - basalt ~12"				Start 11:03 am
D	3rd - " 1 boulder, 2-3 cobbles				1st @ 50' RIVER BOTTOM
	4th - boulders +4" in size, mostly gravel in sand/silt matrix				2nd @ 51'
	scattered cobbles & boulders				3rd @ 51.7' DEPTHS
	5th - gravel, scattered boulders + cobbles				4th @ 53' BEFORE SCOOP
	50'-52' SAND, trace to some silt, trace gravel, scattered wood debris, grey, wet, medium grained sand, poorly graded, gravel is rounded all sizes, mostly dacite, no big wood pieces. (SP-SM)				5th @ 53' WAS
46					6th @ 53.5' TAKEN
48					END @ 11:12
50	52'-53.5' GRAVEL in a silty SAND matrix, scattered cobbles and boulders and wood fragments, grey, wet, gravel is rounded, boulders are subrounded and angular, mostly basalt, dacite and basalt gravel+cobbles (GM)				Easy digging.
46.5	EL. - 46.6 ft	SAND, trace gravel + silt (SP-SM)		POST MT. ST HELENS	BOTTOM OF TP-19
48.5	EL. - 48.5 ft				@ EL. - 50.0 ft
52	EL. - 50.0 ft	GRAVEL (GM)		PRE 1980	
54					
		LENGTH (FT)			

Figure 2

TEST PIT WALL LOG  
FORM D 1599



RIVER EL: + 2.8 CRD  
+ 3.0 CRD

(10:28a)  
10:40

PROJECT NUMBER  
159184.R1.TP

TEST PIT NUMBER  
TP- 20

SHEET OF /

## **TEST PIT WALL LOG**

DEPTH BELOW SURFACE (FT.)	SAMPLE		PROJECT <u>C.R. Channel Deepening</u>	LOCATION <u>Area 66</u>	MAP OF <u>WALL OF PIT</u>
	NUMBER AND TYPE	ELEVATION	CONTRACTOR <u>Turkey Marine</u>	EXCAVATION METHOD <u>Jam Shell</u>	DATE EXCAVATED <u>8/9/00</u>
		WATER LEVEL AND DATE			LOGGER <u>H. Guebel</u>
		APPROXIMATE DIMENSIONS:	LENGTH	WIDTH	DEPTH
					REMARKS
C		1st - SAND, scattered gravel and wood debris, some silt			COMMENTS
R		2nd - " "			wait for ship from
D		3rd - " at bottom more greyish gravel			10:05 am to 10:28 am
		4th - same as above			Start @ 10:30 am
		5th - " "			1st @ 48.6'
		6th - same as above			RIVER BOTTOM
		SAND, scattered to trace gravel, scattered wood debris, trace and cobbles to some silt; grey, wet, medium to coarse sand, poorly graded, rounded gravel, up to 3" in size, multilithology, mostly dacite, cobbles are dacite, rounded up to 7", wood has max length of 10" and Ø 4". (SM)			2nd @ 49.5'
47					3rd @ 50'
48	45	EL-45.8 ft			4th @ 51'
49	46				5th @ 52'
50	47				6th @ 52.7'
51	48				Final @ 53.7')
52	49				DEPTHS BEFORE SCOOP WAS TAKEN
53	50	EL-50.7 ft			end @ 10:40 am
					Easy digging
					Post 1980
					Bottom of TP-20
					@ EL-(50.7 ft)

**Figure 2**

**TEST PIT WALL LOG  
FORM D1599**

2 pictures DISPOSABLE #1  
off gravel PIC. 13+14

RIVER EL: 2.0' CRD 7:55  
1.9' CRD 8:15

PROJECT NUMBER	TEST PIT NUMBER
159184.B1.TP	TP-21
SHEET 1 OF 1	
TEST PIT WALL LOG	

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	PROJECT	LOCATION	MAP OF	WALL OF PIT
		CR CHANNEL DEEPENING	LONGVIEU AREA 66	8/9/00	
		ELEVATION	CONTRACTOR	TICKET MARINE	DATE EXCAVATED
		WATER LEVEL AND DATE	EXCAVATION METHOD	CLAM SHELL	LOGGER H. GUILTEL
		APPROXIMATE DIMENSIONS: LENGTH	WIDTH	DEPTH	REMARKS
					COMMENTS
(C) R D		1st - SAND, some gravel, scattered cobble + boulders 2nd - same as above, rounded gravel angular 3rd - GRAVEL, trace sand + silt, scattered cobble + boulders 4th - -II- rounded gravel 5th - -II- 6th - same as above, looks like silt matrix 7th - boulders, log. 4"Ø, 1.5 long, gravel 8th - GRAVEL, silt, sand 9th - GRAVEL in silt matrix, rounded 10th - angular cobbles + boulders with silt + sand 11th - GRAVEL in silt matrix, scattered cobbles + boulders (angular) 12th - same as above - (UP to 15")		- gravel is iron stained - Basalt + boulders up to 25"Ø	Start: 7:55 AM 1st @ 48' RIVER BOTTOM 2nd @ 48.5' 3rd @ 48.5' 4th @ 48.7' 5th @ 49.0' 6th @ 49' 7th @ 49.4' 8th @ 50.1' 9th @ 50.3' 10th @ 50.5' 11th @ 5/ 12th @ 5.5' FINAL 52) END 8:15 a
46	EL-46' PRE 1980	TOP LAYER - 46-46.5': SAND, trace to some gravel & silt, scattered cobbles and boulders, and wood debris, grey, wet medium grained sand, poorly graded, rounded gravel in all sizes, mainly dacite gravel (SP-SM)			
46	EL-46' POST 1980	SAND, trace to some gravel, scattered cobbles + boulders (SP-SM)			
47	PRE 1980	GRAVEL in a silty SAND/sandy SILT matrix, scattered cobbles, boulders and wood debris, grey, wet, fine to medium grained sand, rounded gravel, iron stained, all sizes, boulders are angular (GM)			HARD DIGGING. BELOW EL-46.5 FT
48					BOTTOM OF TP-21 @ EL-50.1 ft
49					
50					
51					
52					
53		Max wood size = 1.5' long, 4"Ø - 2-5% above boulders (of material) up to 15"Ø			
		LENGTH (FT)			

Figure 2

TEST PIT WALL LOG  
FORM D1599

PICKETT'S LANDING SAMPLE (PILE)

RIVER EL: +2.4 CRD 9:36  
2.4 CRD 9:50

PROJECT NUMBER	TEST PIT NUMBER
159184.B1.TP	TP-22
SHEET 1 OF 1	
TEST PIT WALL LOG	

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	PROJECT C.R. Channel Deepening	LOCATION Area 66	MAP OF WALL OF PIT
		ELEVATION	CONTRACTOR Hickory Marine	DATE EXCAVATED 8/9/00
		WATER LEVEL AND DATE	EXCAVATION METHOD Clam Shell	LOGGER
		APPROXIMATE DIMENSIONS:	LENGTH    WIDTH    DEPTH	REMARKS
C		1st - SAND; scattered gravel + wood debris		COMMENTS
D		2nd - SAND; scattered gravel		START: 9:36
		3rd - " "		1st @ 47.7 River
		4th - SAND; some gravel		2nd @ 49.0 Bottom
		5th - SAND; some gravel, lighter, probably at bottom		3rd @ 50.0 DEPTHS
		SAND; scattered gravel and wood debris, some silt; grey wet, medium sand, poorly graded, rounded gravel up to 2", gravel is multi- lithology, mostly dacite. (SM)		4th @ 50.5 BEFORE
				5th @ 51.5 EACH SCOP
				FINAL @ 52.6
				EASY DIGGING
47		EL.-45.3 FT		END 9:55
48				Bottom of TP-22
49				@ EL - 50.2 FT.
50		EL.-47.9'	SAND, scattered gravel and wood debris (SM) / mostly post 1980 material.	
51		EL - 50.2 FT	increasing gravel content, different grey color (SM)	
53		50.6		
			LENGTH (FT)	

Figure 2

TEST PIT WALL LOG  
FORM D1599



1 PL Disposal #1  
tug boat #3 pile of materials

RIVER EL: +3.5 CRD 1:31pm  
+3.4 CRD 1:52pm  
+3.2 CRD 2:10

PROJECT NUMBER 159184.B1.TP TEST PIT NUMBER TP-23  
SHEET 1 OF 2

### TEST PIT WALL LOG

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	PROJECT	LOCATION	MAP OF WALL OF PIT
		CE Channel Deepening	MP:66 (Longview)	
		ELEVATION	CONTRACTOR HICKORY MARINE	DATE EXCAVATED 8/8/00
		WATER LEVEL AND DATE	EXCAVATION METHOD CLAM SHELL	LOGGER H. GUETTEL
		APPROXIMATE DIMENSIONS: LENGTH	WIDTH	DEPTH REMARKS
	(CRD)	1st = SAND; scattered gravel? and wood debris 2nd = SAND 3rd = same as above 4th = SAND; scattered fine gravel 5th = same as above 6th = " " 7th = Some grey gravel + silt at bottom of bucket 8th = SAND; trace grey gravel + silt 9th = " " 10th = " - 1 boulder (16"Ø) 11th = " " 12th = " " 13th = SAND; trace gravel + silt, grey 14th = SAND; increasing gravel 15th = " " 16th = " " 17th = " " 18th = SAND; some gravel (cobble) 19th = EL - 4.3 FT some silt around gravel		COMMENTS START 1:31 pm RIVER BOTTOM 1st @ 44.8' 2nd @ 46.0' 3rd @ 47' 4th @ 48.5' 5th @ 49.0' 6th @ 49.4' 7th @ 51' 8th @ 50.5' 9th @ 50' 10th @ 50.8' 11th @ 52' 12th @ 52.5' 13th @ 52.0' 14th @ 52' 15th @ 52.3' 16th @ 52.7' 17th @ 52.7' 18th @ 53.2' 19th @ 53.2' 20th @ 53.5' FINAL
45			1-2 boulders (12"-16") Gravel most likely at bottom and hole keeps on caving in.	
44	-40.5			
46	-42.5	46	SAND (SM)	
48	-44.5	48		① Post 1980
50	-46.5	50	EL - 47.5 FT	
52	-48.5	52	MORE GRAVEL, some Silt embedment scattered cobbles (GM)	② PRE 1980
54	-50.5	54	EL - 50.3 FT	
			LENGTH (FT)	see backside for ①+②

(1)+(2) see backside

Relatively easy digging  
hole kept on caving in

Classif: Dr. I TK-23 1 1 1 1 1 Silt wet 3 of 7

① (-91.3 FT TO -47.5 FT)  
SAND; trace silt, scattered gravel and wood debris (fine),  
grey, wet, medium <sup>grained</sup> sand, rounded fine gravel 0.2"-2",  
gravel is mostly dacite, some basalt (sm)

② (-47.5 to -50.3 FT)  
GRAVEL IN A SILTY SAND MATRIX, <sup>+ scattered cobbles</sup> grey, wet, gravel is  
fine to coarse (0.2"-3"), rounded & subrounded.  
sand is fine to medium grained, gravel is mostly  
basalt, some dacite, cobbles up to 9" wide (GM)

P.L. "15 D15-TPSAKLE #1 River 1P report



RIVER EL: 1.9' (CR)  
2.0' (CR)

9:13

PROJECT NUMBER	TEST PIT NUMBER
159184.B1.TP	TP-24
SHEET 1 OF 1	
TEST PIT WALL LOG	

DEPTH BELOW SURFACE (FT)	SAMPLE		PROJECT CR. CHANNEL DEEENING	LOCATION AREA 66	MAP OF WALL OF PIT
	#	NUMBER AND TYPE			
		WATER LEVEL AND DATE	EXCAVATION METHOD CLAM SHELL	LOGGER H. GUILTEL	
		APPROXIMATE DIMENSIONS: LENGTH	WIDTH	DEPTH	REMARKS
	C R D	1st - GRAVEL, SILT, SAND, scattered cobbles + boulders, brownish grey, scattered wood, rounded gravel, angular boulders 2nd - 1 boulder <sup>"</sup> + gravel, no mud recovery 3rd - GRAVEL; SAND; SILT (COBBLES, BOULDERS scattered) (7" to 17") 4th. - GRAVEL, some silt, scattered cobbles + boulders (up to 15")			COMMENTS START: 9:03 am , 1st - 49.8' RIVER 2nd - 50.5' BOTTOM 3rd - 50.3' TOP OF 4th - 51.1' SCOOP FINAL 52.0 FT END 9:13 am  <u>EASY DIGGING</u> Bottom of TP-24 @ EL - 50.0 FT
48		GRAVEL in a sandy SILT matrix; scattered cobbles and boulders, no wood encountered, grey, wet, fine sand, gravel is rounded, multilithology, mostly dacite, most cobbles and boulders are basalt and angular, some angular basalt gravel encountered (weathered boulders?), gravel is iron stained (GM) Boulders are scattered throughout test pit (up to 17" in diameter)			
-47		EL. - 47.9 FT			
50		Post 1980	• • •	GRAVEL IN. sandy SILT matrix	
-49		EL. - 50.0 FT	• • •		
52			(GM)		
			LENGTH (FT)		

Figure 2

TEST PIT WALL LOG  
FORM D1599

Picture 10+11 Disposable #1

O rock piece



River level: +3.8 CRD 12:41  
+3.7 CRD 12:50

PROJECT NUMBER	TEST PIT NUMBER
159184.B1.TP	TP-25
SHEET 1 OF 1	

TEST PIT WALL LOG

DEPTH BELOW SURFACE (FT)	SAMPLE		PROJECT	LOCATION	MAP OF WALL OF PIT
	NUMBER AND TYPE	IMPERIAL			
			CR channel Deepening	Under Bridge MP 66	
ELEVATION			CONTRACTOR	Hickey Marine	DATE EXCAVATED 8/8/00
WATER LEVEL AND DATE			EXCAVATION METHOD	Clam Shell	LOGGER H. Guttell
APPROXIMATE DIMENSIONS:	LENGTH	WIDTH	DEPTH	REMARKS	COMMENTS
45	1st - SAND, trace to scattered gravel 2nd - SAND, scattered gravel. 3rd - gravelly SAND, probably GRAVEL AT BOTTOM 4th - GRAVEL, scattered cobble 5th - - " - some sand 6th - GRAVEL, some sand. 7th - GRAVEL + SAND 8th - GRAVEL + SAND & 1 BOULDER 9th - SAND, some gravel 10th - Gravel in Sand matrix 11th - Sand, gravel, scattered cobbles				Start @ 12:41 PM
48					
49	EL. - 45.2 FT		SAND, trace silt, trace to scattered gravel, scattered wood, grey, wet (SP-SM)	POST 1980	1st @ 49' } RIVER 2nd @ 50' } Bottom 3rd @ 50.8' } DEPTHS 4th @ 51' } INDICATE 5th @ 51' } GROUND 6th @ 51.7' } SURFACE 7th @ 52' } BEFORE 8th @ 52' } EACH 9th @ 52.2' } SCOOP 10' @ 52.8' } WAS 11' @ 53' } TAKEN 12' @ 53.2' } FINAL 53.8'
50	EL - 47.0 FT		SAND, some gravel and silt, scattered wood, grey, wet, medium sand, rounded gravel, multilayered, scattered cobbles (basalt up to 1")	PRE 1980	harder digging below EL - 48 FT but not close to refusal. Round rock.
49.2					
50.2	EL. - 50.1 FT		(SM)		
55					

Bottom of TP-25 @  
Figure 2  
EL - 50.1 FT  
TEST PIT WALL LOG  
FORM D1599

Picture  
Disposable #1



RIVER EL: + 4.0' CRD 12pm

PROJECT NUMBER	TEST PIT NUMBER
159184.B1.TP	TP-26
SHEET 1 OF 1	
TEST PIT WALL LOG	

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	PROJECT	LOCATION	MAP OF WALL OF PIT
		CR Channel Deepening	MP 66	
ELEVATION		CONTRACTOR	Tickey Marine	DATE EXCAVATED 8/18/00
WATER LEVEL AND DATE		EXCAVATION METHOD	Clam Shovel BCy+z	LOGGER H. Guettel
APPROXIMATE DIMENSIONS:	LENGTH	WIDTH	DEPTH	REMARKS
CRD		1st - full size log ~ 10"Ø, 20' long, put back into river next to barge. - SAND, trace gravel. 2nd - GRAVEL, iron stained <u>52.5'-54'</u> . GRAVEL in a silty sand MATRIX; scattered GM) wood debris, grey, wet, gravel is rounded, iron stained ranges up to 3", scattered cobbles < 1%, coarse sand, dacite + basalt gravel <u>52-52.5'</u> SAND; trace gravel, scattered wood debris, trace silt, grey, wet, medium sand, rounded gravel, dacite + basalt gravel. (SP-SM)		COMMENTS Start: 12:03pm 1st at 52' RIVER BOTTOM 2nd @ 52.5' TOP of scoop 3 FINAL 54'
49	45			EASY DIGGING THROUGHOUT
50				
51				
52	48	EL.-48 FT		
53	49	EL.-52.5	SAND (SP-SM)	Pre and post 1980.
54	50	EL.-50 FT	GRAVEL (GM)	
55				
		LENGTH (FT)		

Figure 2

TEST PIT WALL LOG  
FORM D1599



RIVER EL: +4.0

CRD 11:21

11:32

PROJECT NUMBER

159184.B1, TP

TEST PIT NUMBER

TP-27

SHEET 1 OF 1

## TEST PIT WALL LOG

DEPTH BELOW SURFACE (FT)	SAMPLE		PROJECT	LOCATION	MAP OF WALL OF PIT
	NUMBER	AND TYPE			
			CR channel Deepening	Hickey Marine Chem Shell	8/8/00
					Heike Guelel
			WATER LEVEL AND DATE	EXCAVATION METHOD	
			APPROXIMATE DIMENSIONS:	LENGTH ± 15'	WIDTH 7'
				DEPTH	REMARKS
CRD			1st - Sand, scattered gravel + wood debris 2nd - —  — 3rd - same gravel has different grey color 4th - —  — 5th - SAND, trace gravel 6th . . .  (EL-45 TO EL-50 FT) SAND, scattered to trace gravel, trace silt, scattered wood fragments. grey, wet, sand is medium grained to 52' and grades to coarse below 52', poorly graded, gravel is rounded, fine to medium in size (hosley dacite (SP-SM))		COMMENTS START 11:21 am 1st @ 49 = RIVER BOTTOM 2nd @ 51 ) TOP OF GROUND 3rd @ 51.5 ) BEFORE EACH SCOOP. 4th @ 52.5 ) 5th @ 53' 6th @ 54' FINAL
49	45		EL-45 FT	(SP-SM)	EASY DIGGING
50	46			medium sand	
51	47				POST 1980 MATERIAL
52	48				
53	49				
54	50		EL-50 FT	COARSE SAND	Bottom of TP-27 @ -50 FT
55					
				LENGTH (FT)	

Figure 2

TEST PIT WALL LOG  
FORM D1599



RIVER EL: + 4.0

10:52 a

PROJECT NUMBER	TEST PIT NUMBER
159184.B1.TP	TP-28
SHEET 1 OF 1	
TEST PIT WALL LOG	

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	PROJECT	CHANNEL DEEPENING	LOCATION	BRIDGE MP 66	MAP OF	WALL OF PIT
		ELEVATION	CONTRACTOR	HICKORY MARINE	DATE EXCAVATED	8/18/00	
		WATER LEVEL AND DATE	EXCAVATION METHOD	CLAM SHELL	LOGGER	Heike Guicher	
		APPROXIMATE DIMENSIONS:	LENGTH	WIDTH	DEPTH	REMARKS	
47		1st - sand, wood debris, 1 log 2nd - WOOD DEBRIS - BIG LOGS 3' long; 7" Ø 3rd - BIG LOG - 3' long; 8" Ø				START @ 10:50 am	COMMENTS
48		SAND; trace silt, scattered gravel and wood, grey, wet, sand is mostly medium grained, some coarse lenses, gravel is fine to medium <5 <sup>1</sup> , rounded dolerite, few scattered basalt pieces, (SP-SM)				1st @ 50.8 RIVER BOTTOM	
49						2nd @ 52'	TOP OF
50						3rd @ 53'	SCOOP
51	47	EL-46.3 FT				4th @ 54.2 FINAL	
52	48	POST 1980 MATERIAL					
53	49						
54	50	EL-50.2 FT (SP-SM)					
55							

easy digging

LENGTH (FT)

Figure 2

TEST PIT WALL LOG  
FORM D1599

Pictures 1+2 disposable #1



RIVEREL: + 2.2 CRD start + end

4 2 3 5

PROJECT NUMBER 159 184.B1.TP	TEST PIT NUMBER TP-29	SHEET 1 OF 1
TEST PIT WALL LOG		

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	PROJECT	LOCATION	MAP OF	WALL OF PIT	
		CONTRACTOR	EXCAVATION METHOD	DATE EXCAVATED	LOGGER	
		CR channel Deepening	Tickey Morine	8/8/00	Hieke Gruetl	
		APPROXIMATE DIMENSIONS:	LENGTH	WIDTH	DEPTH	REMARKS
45	CED	1st - SAND 2nd - SAND; scattered gravel 3rd - Sand, gravel, different grey color 4th - Sand, 1 lag (1-2" Ø) 3" long) trace gravel 5th - Sand, trace gravel 6th - Sand, some trace gravel. 7th - Sand, some gravel (- gravel interbedded in silt) 8th - sand, trace gravel (- occurs in lenses)				START : 7:52 AM
-44.8		EL. -44.9 FT				1st. 47.1 ft River bottom
48		EL. -45.5'	(SM) SAND, scattered fine gravel has some silt			2nd. 47.8 ft top
49			SAND, scattered gravel & wood debris, grey wet, medium sand, poorly graded, fine to medium gravel (1/2"-2 1/2") ; rounded gravel.			3rd. 49.8 ft of
50			1-2 cobbles ~ 6-7" Ø (SM)			4th. 50.8' each
51		EL. -49.2 FT	some silt			5th. 50.3' caved in
52		EL. -50.2 FT	SAND) trace to some gravel, grey wet, medium sand (SP-SM)	gravel size: 1/2"-4"		6th. 52.0' scoop
55			- GRAVEL: - mainly basalt, some dacite - Dacite at top 2 ft. of test pit (above EL - 46.8 FT)			Bottom of TP-29 @ EL - 50.2 FT

Figure 2

TEST PIT WALL LOG  
FORM D1599

out we'd of ship | | | | | | | |  
2 pictures of boulders 5+6

12

RIVER EL: + 2.8 CED

start  
+  
end

PROJECT NUMBER 159184.B1.TP	TEST PIT NUMBER TP-30	SHEET 1 OF 1
--------------------------------	--------------------------	--------------

**TEST PIT WALL LOG**

Clam Shell Unloading  
Picture 8 Disposable #1



RIVER EL. +3.9' CRD (10:15)  
+3.9 CRD (10:25)

PROJECT NUMBER 159184.B1.TP TEST PIT NUMBER TP-31  
SHEET 1 OF 1

TEST PIT WALL LOG

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	PROJECT	CR CHANNEL DEEPENING	LOCATION	MP 68 BRIDGE	MAP OF 1 WALL OF PIT
		ELEVATION	CONTRACTOR	HICKORY MARINE	DATE EXCAVATED 8/8/00	
		WATER LEVEL AND DATE		EXCAVATION METHOD CLAM SHELL		LOGGER Heike Guehler
		APPROXIMATE DIMENSIONS:	LENGTH	WIDTH	DEPTH	REMARKS
CRD		1st - SAND, scattered gravel 2nd - SAND - II - 3rd - II - 4th - Sand, scattered to trace gravel, wood debris 5th - II - 6th - II -				COMMENTS START: 10:15 am ft @ 49.4 = RIVER BOTTOM
47		SAND; scattered gravel, trace silt, scattered wood debris, grey, wet, medium to coarse sand, fine to medium gravel, rounded, sand is poorly graded, gravel is mostly dacite, scattered basalt, (SP-SM)				2nd @ 51 ) 3rd @ 51.5 ) TOP 4th @ 52.7 ) OF EACH 5th @ 53.1 ) SCOOP. 6th @ 53.5 ) FINAL @ 54 )
48						
49						
50	46.1	POST 1980	SAND, scattered gravel, trace silt, scattered wood debris, (SP-SM), grey, wet, medium to coarse sand, rounded, poorly graded, mostly dacite, scattered basalt			
51	47.1	EL 47.5				EASY DIGGING
52	48.1	PRE 1980				
53	49.1					
54	50.1	EL 51.0 FT				
55						
		- logs 5" Ø 1-2' long in upper 2 ft of hole.				
			LENGTH (FT)			

Figure 2

TEST PIT WALL LOG  
FORM D1599

The logo consists of the letters "CKB HILL" in a bold, sans-serif font, enclosed within a dark rectangular border.

RIVER EL: +3.2 CRD (9:40)  
+3.3 CRD 9:47

PROJECT NUMBER	TEST PIT NUMBER
159 184. B1. TP	TP-32
SHEET 1 OF 1	

**TEST PIT WALL LOG**

DEPTH BELOW SURFACE (FT)	SAMPLE		PROJECT CR CHANNEL DEEPENING	LOCATION MP 66 bridge	MAP OF WALL OF PIT
	NUMBER	AND TYPE			
		WATER LEVEL AND DATE	EXCAVATION METHOD clam shell	LOGGER Heine Grueter	
		APPROXIMATE DIMENSIONS: LENGTH _____	WIDTH _____	DEPTH _____	REMARKS _____
48	CPD	1st. SAND, scattered gravel 2nd. SAND, gravel 3rd. SAND, scattered gravel. 4th. SAND, "			COMMENTS Start @ 9:40am 1st @ 50.9 ft 2nd @ 51.5' TOP 3rd @ 53.0' OF 4th @ 53.2' SCOO
49		SAND; trace to some silt, scattered to fine gravel, scattered wood debris, grey, wet, medium to coarse sand; fine to medium gravel 0.1 - 4", 2 cobbles ~b", gravel is all dacite, rounded sand sub-rounded, poorly graded sand.			FINAL : 53.9 FT
50		(HOLE IS UNIFORM) (SM)			/ EASY digging /
51	47.8	EL - 47.7		POST 1980	Bottom of TP-32 @ EL. - 50.6 FT
52	48.8				
53	49.8				
54	50.8	EL - 50.6 FT (SM)			
		NO BOULDERS			
		LENGTH (FT)			

**Figure 2**

**TEST PIT WALL LOG  
FORM D1599**



RIVER EL: 2.5 FT

CRD 14:15

PROJECT NUMBER

159184.B1.TP

TEST PIT NUMBER

TP-33

SHEET 1 OF 1

2.4

CRD 14:29

## TEST PIT WALL LOG

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	PROJECT	LOCATION	MAP OF	WALL OF PIT	
		CR DEEPENING	LONGVIEW			
		ELEVATION	CONTRACTOR	HICKORY MARINE		
		WATER LEVEL AND DATE	EXCAVATION METHOD	CLAM SHELL		
		APPROXIMATE DIMENSIONS:	LENGTH	WIDTH	DEPTH	REMARKS
42	C RC D	1 <sup>st</sup> boulders + cobbles 2 <sup>nd</sup> → cobble+ gravel		clam shell does not close properly due to gravel		START: 14:15 1 <sup>st</sup> @ 51' RIVER BOTTOM 2 <sup>nd</sup> @ 51' 3 <sup>rd</sup> @ 52' 4 <sup>th</sup> @ 52 1/2' 5 <sup>th</sup> @ 53' FINAL @ 53'
45		GRAVEL in a silt matrix, some trace sand, scattered cobbles, fragments, grey, wet, rounded gravel, subrounded boulders, fine sand.				EASY digging. Hole caved in easily.
48.5		BOULDERS UP TO 3 FT Ø → 4 large boulders, & basalt, some dacite gravel and cobbles. Gravel ranges between 0.5" and 4" in size (GM)				NO big logs
49.5		EL - 48.5 FT				
50.5		EL - 50.6 FT	scattered boulders (GM)	PRE 1980		Bottom of TP-33, at EL. 50.6'
51	48.5					
52	49.5					
53	50.5					
			LENGTH (FT)			

Figure 2

TEST PIT WALL LOG  
FORM D1599

6 4 2 3 1



RIVER ELI: 2.6 CRD 125 pm  
 2.5 CRD 1:47 pm  
 2.5 CRD 2pm

PROJECT NUMBER	TEST PIT NUMBER
159184.B1.TP	TP-34
SHEET 1 OF 1	
TEST PIT WALL LOG	

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	PROJECT	LOCATION	MAP OF
		CR CHANNEL DEEPENING	LONGVIEW	WALL OF PIT
		ELEVATION	CONTRACTOR	8/7/00
		WATER LEVEL AND DATE	EXCAVATION METHOD	LOGGER
		APPROXIMATE DIMENSIONS:	LENGTH 15 WIDTH 7 DEPTH	REMARKS
CRD		1st big log 4-5' long ~0.7' thick 2nd piece of metal roof (RMA) → plexiglas  5th. wood debris, gravel layer, rounded Basalt + dacite up to 3' 6th wood 1' wide, 3' long, some basalt gravel - wood debris on top of each bucket		COMMENTS START 1:25pm 1st @ 47.2' River Bottom 2nd @ 49.0' TOP OF EACH SCOOP 3rd @ 50' 4th @ 51.2' 5th @ 51.5' 6th @ 52' FINAL @ 53'
47 -49.5		EL. -49.6 POST 1980 EL. -46.5'	SAND; some silt, scattered gravel + wood, grey, wet, mostly medium sand some grades to coarse fine to medium gravel, rounded (SM)	EASY DIGGING
-46.5		PRE 1980		Bottom of TP-34 @ EL. -50.5 FT
50				
-48.5				
52				
53 -50.5		EL. -50.5 FT		
			LENGTH (FT)	

Figure 2

TEST PIT WALL LOG  
FORM D1599

RIVER EL: +3 (CRD)

END: 13:00 +29 CRD

PROJECT NUMBER	TEST PIT NUMBER
159184.B1.TP	TP-35
SHEET 1 OF 1	
TEST PIT WALL LOG	

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	PROJECT	LOCATION	MAP OF	WALL OF PIT	
		CR CHANNEL DEEPENING	TURKEY Marine	DATE EXCAVATED	8/7/00	
		ELEVATION	CONTRACTOR	LOGGER	Heike Suerstel	
		WATER LEVEL AND DATE	EXCAVATION METHOD			
		APPROXIMATE DIMENSIONS:	LENGTH	WIDTH	DEPTH	REMARKS
CRD		<p>① SAND, some silt, scattered gravel and wood, grey, wet, coarse sand, fine gravel &lt;1", pumice</p> <p>51-52 same as above + rubber tire</p> <p>52-53½: sand grades to medium, some light bluish-grey color variation, some basalt gravel in 4th bucket gravel up to 3", rounded</p>				COMMENTS
45						START 12:50 pm 1st @ 49' RIVER BOTTOM 2nd @ 51' 3rd @ 52' rubber tire in 3rd bucket 4th @ 52.5' FINAL: 53.5'
49						EASY DIGGING
50						TP-35 ends at EL-50.5 ft
51						
52						
53						
54						
55						
						LENGTH (FT)

Figure 2

TEST PIT WALL LOG  
FORM D1599



River EL: +3.1 (CBR)

PROJECT NUMBER 159184.B1.TP TEST PIT NUMBER TP-36 SHEET 1 OF 1

TEST PIT WALL LOG

DEPTH BELOW SURFACE (FT)	SAMPLE		PROJECT CR CHANNEL DEEPENING	LOCATION Area 66	MAP OF _____ WALL OF PIT	
	NUMBER AND TYPE	DESCRIPTION				ELEVATION
					LOGGER Heiko Grueter	
			APPROXIMATE DIMENSIONS: LENGTH _____	WIDTH _____	DEPTH _____	REMARKS _____
45	C D D C		① SAND, some silt, trace to scattered gravel and wood, scattered boulders & cobbles, grey, (2 large boulders 3-4 ft Ø; basalt) (1 dacite cobble) (SM)  wet, fine to medium sand, rounded gravel.			COMMENTS Start: 12 pm 1st bucket @ 52.1' River bottom 2nd @ 52 1/2' Top of scoop FINAL: 53.2' scoop
50			- boulders in each bucket - wood, logs mostly in 2nd bucket. - Wood debris in 1st bucket			<u>EASY PIGGING</u>
52			EL. -48.0 FT			Bottom of TP-36 @ EL - 50.1 FT
54			(SM.)	② SAND, some silt, PRE 1980 trace to scattered boulders & cobbles		
55			EL. -50 FT	2 basalt boulders 3-4' in diameter		
			LENGTH (FT)			

Figure 2

TEST PIT WALL LOG  
FORM D1599

RIVER EL: +3 (RB)

PROJECT NUMBER	TEST PIT NUMBER
159184.B1.TP	TP-37
SHEET 1 OF 1	
TEST PIT WALL LOG	

DEPTH BELOW SURFACE (FT)	SAMPLE		PROJECT	LOCATION	MAP OF _____ WALL OF PIT
	NUMBER	AND TYPE			
0' (RD)			CR CHANNEL DEEPENING	Area 66	8/7/00
50			WATER LEVEL AND DATE	Trickey Marine	LOGGER HG
52 - 49			APPROXIMATE DIMENSIONS: LENGTH	EXCAVATION METHOD	
53 - 50			WIDTH	Clam Shell	
54 - 51			DEPTH	REMARKS	
55					
					COMMENTS
			① SAND, trace silt, scattered gravel, few scattered wood pieces, grey, wet, medium to coarse sand, fine to medium gravel, poorly graded (SP-SM) - Gravel 0.2-5". - Pumice & dacite gravel. - no boulders or logs.		START 12:26pm 1st @ 52' River bottom 2nd @ 52.8" TOP FINAL: 53.7" scoop rocky @ bottom.
			EL: -49 FT	POST 1980	<u>EASY DIGGING.</u>
			EL: -50.7 FT	SAND (SP-SM) trace silt, scattered gravel	Bottom of TP-37 at EL - 50.7 ft
				LENGTH (FT)	

Figure 2

TEST PIT WALL LOG  
FORM D1599



RIVER EL. + 3.7 (CRD)

PROJECT NUMBER

159.184.BI.TP

TEST PIT NUMBER

TP-38

SHEET 1 OF 1

## TEST PIT WALL LOG

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	PROJECT CR CHANNEL DEEPENING	LOCATION RIVER	MAP OF WALL OF PIT
ELEVATION		CONTRACTOR HICKEY MARINE		
WATER LEVEL AND DATE		EXCAVATION METHOD CLAM SHELL		DATE EXCAVATED 8/7/00
APPROXIMATE DIMENSIONS: LENGTH	WIDTH	DEPTH	REMARKS	LOGGER Heike Gruetzel
30 CRD		SAND; trace silt, scattered gravel and wood, grey, wet; coarse sand, medium to small gravel		COMMENTS START AT: 11:13 am River bottom
45		- fine sandy SILT lenses with interbedded fine gravel, rounded gravel		1st Bucket @ 50'
46		- gravel consists of mainly pumice; dacite		2nd " @ 50.5'
47		3rd Basalt gravel - rounded, quartile then basalt starting at EL-48 ft		3rd " @ 52'
48		Wood up to 2" Ø; 2' long		4th " @ 53 1/2'
49		- 1 shell (mussel)		FINAL scoop
50 -46.3	EL-46.3	Wood debris, coarse sand, scattered dacite gravel		EASY DIGGING
51 -47.3		some gravel, dacite, 0.3 - 2 1/2" (SP-SM)	POST 1980	
52 -48.3		some basalt gravel, mostly dacite	PRE. 1980	
53 -49.3		gravel, basalt rounded, dacite,		
54 -50.3	EL-50.7	0.5 - 3"		
55				
56				
		LENGTH (FT)		

Figure 2

TEST PIT WALL LOG  
FORM D1599



Rives El: +4 CRD

START: 10:50 am

PROJECT NUMBER 159184.B1.TP	TEST PIT NUMBER TP-39	SHEET 1 OF 1
TEST PIT WALL LOG		

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	PROJECT	LOCATION	MAP OF WALL OF PIT
		CR Channel Deepening	TP-39	
ELEVATION		CONTRACTOR	Turkey Marine	DATE EXCAVATED
WATER LEVEL AND DATE		EXCAVATION METHOD	Clam Shell	LOGGER
APPROXIMATE DIMENSIONS:	LENGTH	WIDTH	DEPTH	REMARKS
CRD		SAND, some fine gravel, trace silt, trace to scattered gravel, <del>some</del> <sup>scattered</sup> wood (tree stumps), grey, wet, coarse sand, medium to fine gravel, rounded gravel		
50				
51				
52				
53				
49		EL. -49.0 FT POST A80 COARSE SAND		
54		EL. -50.8 FT		
55		sandy SILT, fine sand interbedded gravel in 2nd scoop		
		Comments 1st bucket @ 53' River bottom 2nd " @ 53.9' top of scoop FINAL DEPTH = 54.8'		
		Easy digging		
		Bottom of TP-39 at EL. -50.8 ft		
		Lithology: Pumice Gravel - tree stump ~ 3½' - some logs 3-4" Ø - Dacite - Gravel colors red, greenish grey, white (pumice) - Gravel size: 0.2"- 6"		
		LENGTH (FT)		

Figure 2

TEST PIT WALL LOG  
FORM D1599



RIVER EL. +4 (CRD)

START AT 10:10 am - 10:20 am

PROJECT NUMBER 159 184. Bl. TP	TEST PIT NUMBER TP-40
SHEET 1 OF 1	

## TEST PIT WALL LOG

DEPTH BELOW SURFACE (FT)	SAMPLE #	PROJECT COLUMBIA RIVER CHANNEL		LOCATION TP-40	MAP OF WALL OF PIT
		NUMBER AND TYPE	ELEVATION		
WATER LEVEL AND DATE				EXCAVATION METHOD CLAM SHELL	LOGGER Heike Guettel
APPROXIMATE DIMENSIONS:		LENGTH	WIDTH	DEPTH	REMARKS
C	R	D			COMMENTS
			MATERIAL: - TOOK 2 BUCKETS - SAND, some silt, scattered to trace gravel, scattered wood, grey; wet; sand is coarse grained; gravel is fine to medium, rounded gravel (SM) Lithology: Dacite pieces up to 2" Pumice (Mt. St. Helens) ~ -2' Wood up to 6" in Ø and 2½" long	Weather: cloudy ~60°F Water: calm EASY DIGGING	
53.5	-49.5		EL-49.5 FT	some silt	Bottom of TP-40(a)
54.5	-50.5		EL-SOFT (SM)	coarse sand, pumice dacite gravel	EL: -50.0 FT
55.5				EXISTING	
			POST Mt. St. Helens		
			LENGTH (FT)		

Figure 2

TEST PIT WALL LOG  
FORM D1599

# **Jet Probe Logs**

Date: 8/16/00

Logger: Heike Guettel

Probe Number JP-	Time Start End		Northing	Easting	River El. CRD/ Time	Top of Over-burden (CRD)	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures (psi)	Assumed Material Penetrated by Probe	Top of Rock El. CRD	Misc. Notes
104-1	9:44	9:56	832.96	248.39	4.4 / 9:25 4.1 / 9:50	50.1 (45.7)	52.7 (48.7)	Y	75-180	GRAVEL?	48.1'	SLOW advance
104-2	10:30	10:40	716.7	345.37	3.9 / 10:25 3.8 / 10:50	48.5 (44.5)	52.2 (48.6)	Y	75-175	GRAVEL, sand	48.4'	Foot to 51.5'; slow to 52.2' GRAVEL PIECE @ bottom (decite)
100-10	12:48	12:53	399.98	500.82	3.8 / 12:48 3.8 / 12:52	50.3 (48.5)	54.0 (50.2)	N	75-175	SAND, gravel loose	?	slow to 53.0 → increase pressure → 54
100-9	1:06	1:09	576.21	442.98	4.0 / 1:06 4.0 / 1:09	51.1 (47.1)	54.2 (50.2)	N	75-	SAND	—	foot to 54.1 → easy
100-8	1:15	1:17	677.32	380.48	4.0 / 1:15	49.3 (45.3)	54.1 (50.1)	N	75	SAND	—	very fast to 54.1' clean
100-7	1:24	1:25	739.32	402.17	3.9 / 1:23	50.0 (46.0)	+50' (54.0)	N	75	SAND	—	easy to 54 CRD. Tried to go further
100-6	1:30	1:32	902.43	355.85	3.8 / 1:32	49.5 (50.3)	54.1 (50.3)	N	75	SAND	—	fast to 54 Nor (50.3 CRD)
100-5	1:51	1:55	126.99	322.99	3.7 / 1:51 3.7 / 1:55	47.0 (43.3)	54.8 (51.1)	N	75-15	SAND	—	fast to 53.7' increase pressure stopped @ 53.7 then very fast to 54.8
100-4	2:03	2:05	351.24	259.64	3.6 / 2:03	48.5 (44.9)	54.0 (50.4)	N	75-	Sand	—	moderate to fast pace, w/ 14 may be some obstruction 175ps
100-2	2:23	2:24	275.14	098.78	3.5 / 2:23	50.3 (46.9)	53.5 (50.0)	N	75-	Sand	—	fast to 53.5
100-3	2:51	2:52	374.91	370.71	3.4 / 2:47	51.8 (48.4)	54.0 (50.6)	N	75-	Sand	—	fast to 54.0
100-1	3:06	3:06	663.63	057.91	3.3 / 3:06	58.9 (52.6)	53.9 (50.6)	N	—	—	—	Top of overburden below final depth
<hr/>												
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8/17/00												
95-1	8:42	8:45	203.3	581.40	5.5 / 8:40	52.5 (47.0)	56 (50.5)	N	75-	Sand, silt?	—	easy to 56.0'
93-1	9:25	2:25	797.84	128.10	4.7 / 9:20	53.2 (48.5)	56 (51.5)	N	75	Sand, silt?	—	easy ~ 20s for 3'
90-2	10:03	10:04	904.97	276.11	4.5 / 9:58	48.6 (44.9)	55.1 (51.4)	N	75-	Sand, silt	—	20sec easy
90-1	10:23	10:24	509.53	302.01	4.4 / 10:20	45 (40.6)	54.9 (50.5)	N	75	Sand, silt	—	40 sec - easy
88-14	11:10	11:15	562.91	428.81	4.0 / 11:06	49.5 (45)	50.0	Y	75-175	Rock	49.8'	hard more often 3-5' at 2 locations close by reported
88-9						48.4	48.45	Y		ROCK	L	

Probing Explorations Columbia River Channel Deepening Project

Date: 8/18/00 G. VEDERA

Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
JP 87-46	0737	0738	338.97	300.76	5.2/0735	48.9 (43.7)	49.8 (44.6)	Y	75	SILT/SAND OVER ROCK	44.6	
	0738	0740				49.8 (44.6)	49.9 (44.7)	Y	175	ROCK		
JP 87-45	0748	0749	467.53	368.11	5.2/0747	46.8 (41.6)	51.8 (46.6)	Y	75	SILT AND SAND OVER ROCK	46.6	
	0749	0750				51.8 (46.6)	51.8 (46.6)	Y	175	ROCK		
JP 87-25	0754	0755	520.40	265.01	5.2/0752	44.8 (39.6)	50.2 (45.8)	Y	75	SAND AND SILT OVER ROCK	45.0	EASY TO Rock 90/FT
	0755	0756				50.2 (45.0)	50.2 (45.0)	Y	175	ROCK		
JP 87-24	0801	0802	536.97	217.95	5.1/0800	51.1 (46.0)	51.1 (46.0)	Y	75	ROCK	46.0	HARD
	0803	0804				51.1 (46.0)	51.3 (46.2)	Y	175	ROCK		
JP 87-27	0809	0809	497.78	210.46	5.1/0807	49.8 (44.7)	49.8 (44.7)	Y	75	ROCK	44.7	HARD NO PROGRESS
	0809	0810				49.8 (44.7)	49.8 (44.7)	Y	175	ROCK		
JP 87-28	0812	0813	499.58	255.41	5.1/0812	47.0 (41.9)	49.9 (44.8)	Y	75	SAND/SILTY OVER ROCK	49.8	SOFT FEAST AT FIRST
	0814	0815				49.9 (41.8)	50.0 (44.9)	Y	175	ROCK		
JP 87-34	0818	0819	435.00	216.50	5.1/0817	50.4 (45.3)	50.0 (45.7)	Y	75	GRAVEL OVER ROCK	45.7	WHEN PU AND GO BACK ACTED LIKE MATEM CLOUGHING IN
	0819	0820				50.0 (45.7)	50.8 (45.7)	Y	175	ROCK		
JP 87-33	0829	0831	462.36	170.36	5.0/0829	50.0 (45.0)	50.2 (45.2)	Y	75	ROCK COBBLES ?	45.2	HARD BOTTOM LOSE PROGRESS IF PICK UP
	0831	0832				50.2 (45.2)	50.3 (45.3)	Y	175	ROCK COBBLES ?		PLUNGE AND RETURN TO SAME POINT
JP 87-32	0837	0838	481.74	125.21	5.0/0837	49.1 (44.1)	49.5 (44.5)	Y	75	COBBLES	44.5	LOSE Ground WHEN PU PULLS AS BE FORE
	0838	0839				49.5 (44.5)	49.5 (44.5)	Y	175	COBBLES		
JP 87-35	0848	0849	423.48	172.90	4.9/0848	50.0 (45.1)	50.0 (45.1)	Y	75	COBBLES	45.1	JET SKIS around 50ft
	0849	0851				50.0 (45.1)	50.1 (45.2)	Y	175	COBBLES		
JP 87-20	0903	0905	573.60	284.77	4.9/0903	44.6 (39.7)	44.3 (44.4)	Y	75	SILT/SAND ROCK	44.4	SOFT 7 44.3 THEN HARD
	0905	0910				49.3 (44.4)	49.3 (44.4)	Y	175	ROCK		Hard, NO PROBLEM PULL TO WHERE IF PULLED UP

## Probing Explorations Columbia River Channel Deepening Project

KA

Date: 8/18/00 G. VEDERA

Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
87-19	0911	0912	521.81	246.75	4.9/0911	44.7 (39.8)	49.3 (44.4)	Y	75	SAND OVER ROCK	44.4	SOFT, EASY THEN HARD
	0912	0913				49.3 (44.4)	49.5 (44.6)	Y	175			
87-18	0917	0919	523.83	207.42	4.8/0917	49.6 (44.3)	49.2 (44.4)	Y	75	ROCK	44.4	HARD
	0919	0920				49.2 (44.4)	49.3 (44.5)	Y	175	ROCK		
87-13	0922	0923	612.43	264.55	4.8/0922	44.0 (39.2)	48.9 (44.1)	Y	75	SAND OVER ROCK	44.1	SOFT, EASY THEN HARD
	0923					48.9 (44.1)	49.0 (44.2)	Y	175			
87-17	0927	0928	610.46	168.83	4.8/0928	48.5 (43.7)	48.7 (43.9)	Y	75	ROCK	43.9	HARD
	0929					48.7 (43.9)	48.8 (44.0)	Y	175	ROCK		HARD
87-26	1010	1010	536.38	108.07	4.7/1002	49.9 (44.2)	49.6 (44.3)	Y	75	ROCK	44.3	HARD
	1010	1011				49.0 (44.3)	49.0 (44.3)	Y	175	ROCK		HARD
87-39	1029	1030	448.40	943.00	4.6 /1028	49.5 (43.9)	49.1 (44.5)	Y	75	ROCK	44.5	CURRENT IT HAD, LITTLE PROGRESS
	1030	1031				49.1 (44.5)	49.2 (44.6)	Y	175	ROCK		
87-40	1033	1034	418.44	000.10	4.5 /1035	48.2 (43.6)	50.1 (45.5)	Y	75	SAND OVER ROCK	45.5	SOFT, EASY JETTING TO TOP OF HARD.
	1034	1035				50.1 (45.5)	50.3 (45.7)	Y	175	ROCK		
87-42	1100	1101	417.93	858.61	4.4 /1048	47.5 (43.1)	48.0 (43.6)	Y	75	SAND OVER ROCK	43.6	EAST - 5 FT THEN HARD
	1101	1102				48.0 (43.6)	48.1 (43.7)	Y	175	ROCK		
87-37	1107	1108	500.49	021.44	4.2 /1107	48.0 (43.8)	48.5 (44.1)	Y	75	ROCK	44.1	HARD
	1108	1110				48.3 (44.1)	48.8 (44.6)	Y	175	ROCK		
87-38	1114	1116	478.9	877.05	4.2 /1114	48.0 (43.8)	48.5 (44.3)	Y	75	ROCK	44.3	SOFT 0.5 FT OVER HARD
	1116	1117				48.5 (44.3)	48.6 (44.4)	Y	175	ROCK		
87-36	1120	1121	510.86	959.06	4.1 /1120	49.0 (44.9)	49.5 (45.4)	Y	75	SAND OVER ROCK	45.4	EASY AT FIRST, THEN HARD
	1121	1122				49.5 (44.5)	50.0	Y	175	ROCK		HARD

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Probing Explorations Columbia River Channel Deepening Project

Date: 8/18/00 G. VEDERA

Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
87-31	1126	1129	529.01	033.03	4.1 / 1125	49.4 (44.9)	49.1 (45.0)	Y	75	ROCK	45.0	HARD
	1129	1130				49.1 (45.0)	49.1 (45.0)	Y	175	ROCK		
87-41	1141	1142	447.84	796.71	4.0 / 1140	47.1 (43.1)	48.0 (44.0)	Y	75	SAND OVER ROCK	44.0	EASY AT FIRST TO TOP OR LOCAR
	1142	1143				48.0 (44.0)	48.0 (44.0)	Y	175	ROCK		
87-29	1150	1152	589.02	916.27	4.0 / 1145	48.0 (44.0)	49.0 (45.0)	Y	75	SAND OVER ROCK	45.0	FIRST 1.0 FT < 10 SEC
	1152	1153				49.0	49.1	Y	175	ROCK		
87-30	1155	1156	558.11	981.91	3.8 / 1159	48.0 (44.0)	48.0 (44.7)	Y	75	SAND OVER ROCK	44.7	2 SEC TO ROCK
	1156	1157				48.7 (44.7)	49.0 (45.0)	Y	175	ROCK		
87-21	1253	1254	664.48	806.02	3.5 / 1252	47.8 (44.3)	48.5 (45.00)	Y	75	ROCK	45.00	HARD
	1254	1255				48.5 (45.00)	49.1 (45.6)	Y	175	ROCK		
87-15	1304	1306	66559	053.77	3.4 / 1304	51.4 (48.0)	51.8 (48.4)	Y	75	ROCK COBBLES?	48.4	HARD
	1306	1308				51.8 (48.4)	51.8 (48.4)	Y	175	COBBLES?		SEEM TO LOSE GROUND WHEN MOVE PROBE
87-14	1310	1312	714.82	970.09	3A / 1310	47.5 (44.1)	47.5 (44.1)	Y	75	ROCK	44.1	HARD
	1312	1313				47.5 (44.1)	48.0 (44.6)	Y	175	ROCK		
87-10	1315	1317	727.44	094.09	3.4 / 1315	46.4 (43.0)	47.3 (43.3)	Y	75	SMALL GRAVEL?	—	HARD
	1317	1318				47.3 (43.3)	54.0 (50.6)	Y	175	GRAVEL?	50.6	TOOK OFF W/ INCREASE IN PUMP PRESSURE
87-22	1327	1328	577.31	091.78	3.4 / 1324	46.8 (43.4)	47.0 (43.6)	Y	75	COBBLES?	43.6	
	1328	1330				47.0 (43.6)	47.2 (43.8)	Y	175	COBBLES ON BIG ROCKS		PICK UP AND GO BACK TO SAME SPOT CAN'T GET SAME DEPTH
87-12	1335	1336	643.30	210.58	3.3 / 1335	49.1 (45.8)	50.0 (46.7)	Y	75	GRAVEL?	46.7	HESITATED THEN QUICKLY ADVANCED 1 FOOT
	1336	1337				50.0 (46.7)	50.0 (46.7)	Y	175	ROCK		
87-16	1343	1344	633.62	119.06	3.3 / 1340	48.6 (45.8)	49.3 (46.0)	Y	75	GRAVEL?	—	
	1344	1345				49.3 (46.0)	50.5 (47.2)	Y	175	GRAVEL?	47.2	HESITATED THEN DROPPED W/ PRESSURE INCREASE

## Finding Explorers Columbia River Channel Dredging Project

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Date: 8/18/00 G. VEDERA

Probing Explorations Columbia River Channel Deepening Project

52.15

1/3

Date: 8/17/00

G. VEDERA

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Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden (CRD)	Probe Penetration Elevation (CRD)	Probe Refusal	Water Jet Pressures psi	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
JP-951	0842	0845	203.08	587.30	5.4/0840	52.6 (47.0)	56.0 (50.5)	N	75	SAND	—	21 min T/56'
JP-931	0924	0924	797.30	127.78	4.7/0920	53.2 (48.5)	56.0 (51.3)	N	75	SAND	—	c/min T/56' live close
JP-90-2	1003	1003	903.16	2K.07	4.5/0958	48.6 (49.1)	56.0 (51.5)	N	75	SAND	—	~30sec
JP-90-1	1023	1024	504.90	308.00	4.4/1025	45.0 (40.6)	55.0 (50.6)	N	75	SAND	—	~30sec T/45
JP-88-14	1110	1111	563.00	478.67	4.0/1107	49.0 (45.0)	56.0 (46.0)	Y	75	ROCK?	46.0	
	1111	1112	"	"	"	50.0 (46.0)	56.0 (46.0)	Y	175	"	46.0	MOVE OPEN
	1113	1115	556.60	482.01	"	50.3 (46.3)	51.3 (47.3)	Y	175	"	47.3	CHECK JETS = OK
JP-88-9	1118	1120	636.96	510.26	"	46.4 (44.4)	48.5 (44.5)	Y	75	ROCK	44.5	
	1120	1122	"	"	"	46.5 (44.5)	48.5 (44.5)	Y	175	"	44.5	
JP-88-12	1128	1128;30	568.74	508.37	"	48.8 (44.8)	49.0 (45.0)	Y	75	ROCK	45.0	
	1128	1129	"	"	"	49.0 (45.0)	49.0 (45.0)		175	"	45.0	MOVE
	1129	1130	591.01	509.16	4.0/1132	49.0 (45.0)	49.1 (45.1)	Y	175	"	45.1	
JP-88-13	1134	1135	558.41	512.24	"	50.0 (46.0)	50.0 (46.0)	Y	75	ROCK	46.0	
	1135	1137	"	"	"	50.0 (46.0)	50.1 (46.1)	Y	175	"	46.0	CHECK JETS = Good

Date: 8/1/00

G. VENERA

Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
JP 88-15	1150	1152	572.97	438.66	4.9/132	49.0 (45.0)	49.2 (45.2)	Y	75	ROCK	45.2	SMOOTH FEELS ATRM SURFACE WATER SOFT WIND
	1152	1153	"	"	"	49.2 (45.2)	49.3 (45.3)	Y	175	ROCK	45.2	
JP 88-11	1156	1157	625.50	400.96	"	48.8 (44.4)	48.8 (44.8)	Y	75	ROCK	44.8	
	1157	1159	"	"	"	48.8 (44.4)	48.8 (44.8)	Y	175	ROCK	44.8	CHECK JETS - GOOD
JP 88-10	1201	1202	603.96	560.09	3.8/1205	50.4 (46.6)	50.5 (46.7)	Y	75	ROCK	46.7	
	1202	1203	"	"	"	50.5 (46.7)	51.2 (47.4)	Y	175	ROCK	46.7	MOVED PROBE AROUND
	1203	1205	603.98	560.86	"	50.5 (46.7)	51.2 (47.4)	Y	175	ROCK	46.7	TO CHECK CONSISTENCY
JP 88-8	1253	1255	625.93	603.98	3.5/1252	51.0 (47.5)	51.0 (47.5)	Y	75	ROCK	47.5	LUNCH BREAK 12:00-12:30
	1255	1255	"	"	"	51.0 (47.5)	51.5 (48.0)	Y	175	ROCK	47.5	
	1325	1326	763.26	503.61	3.3/1325	49.2 (45.9)	49.2 (45.9)	Y	75	ROCK	45.9	
JP 88-4	1326	1328	"	"	"	49.2 (45.9)	49.2 (45.9)	Y	175	ROCK	45.9	WORK PROBE, HAND DIG DOWN
	1331	1332	751.59	556.41	3.3/1325	49.0 (45.7)	49.2 (45.9)	Y	75	ROCK	45.9	
	1332	1334	"	"	"	49.2 (45.9)	49.2 (45.9)	Y	175	ROCK	45.9	
JP 88-6	1337	1339	711.90	600.92	3.3/1325	47.5 (44.2)	49.0 (45.7)		75	SMOOTH/PROBES ROCK	45.7	
	1338	1339	"	"	"	49.0 (45.7)	49.3 (46.0)		175	ROCK	45.7	CHECK JETS = OK

Probing Explorations Columbia River Channel Deepening Project

Date: 8/17/00 G. VEDEZA

Probe Number	Time		Northing	Easting	River El. CRD/ Time	Top of Over- burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
JP 88-7	1344	1345	702.75	516.74	3.3/1525	48.0 (44.7)	50.0 (46.7)	Y	75	SAND/SEDIMENT ROCK	46.7	
	1345	1346	"	"		50.0 (46.7)	50.3 (47.0)	Y	175	ROCK	46.7	
JP 88-1	1359	1401	904.30	564.70	3.1/1559	45.0 (41.7)	52.0 (48.9)	Y	75	SAND/SILT	48.9	MODERATE RATE AT FIRST THEN HARD
	1401	1402	"	"		52.0 (48.9)	52.3 (49.2)	Y	175	"	48.9	
JP 88-3	1406	1408	811.36	606.20	3.1/1559	44.8 (41.7)	49.2 (46.1)	Y	75	SAND/SILT	46.1	MODERATE RATE AT FIRST THEN HARD
	1408	1409	"	"		49.2 (46.1)	49.3 (46.2)	Y	175	"	46.1	CHECK JETS = OK
JP 88-2	1415	1416	840.31	536.50	3.1/1559	46.0 (42.9)	50.1 (47.0)	Y	75	SAND/SILT	47.0	60SEC / 4.1 FT.
	1416	1416	"	"		50.1 (47.0)	50.2 (47.1)	Y	175	"	47.0	
JP 87-43	1430	1432	986.00	920.40	3.0/1430	46.8 (43.8)	46.8 (43.8)	Y	75	ROCK	43.8	V. HARD, NO SEDIMENTS
	1432	1434	"	"		46.8 (43.8)	46.8 (43.8)	Y	175	ROCK	43.8	
JP 87-44	1442	1443	353.47	979.20	3.0/1430	49.8 (46.8)	50.2 (47.2)	Y	75	SAND/SILT OPEN ROCK	47.2	
	1443	1444	"	"		50.2 (47.2)	50.2 (47.2)	Y	175	ROCK	47.2	

21 TOTAL LOCATIONS F/DAY

Probing Explorations Columbia River Channel Deepening Project

Date: 8/21/00 G. VEDERA

Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
87-13	0754	0756	555.25	157.22	2.9/0754	48.0 (45.1)	48.6 (45.7)	Y	75	WEATHERED ROCK	45.7	HARD, SLOW PENETRATION
	0756	0758				48.6 (45.7)	48.8 (45.9)	Y	175	ROCK		
87-6	0830	0830	901.15	128.81	3.3/0830	52.0 (49.6)	50.0+ (52.0+)	N	75	SAND, SILT	>52.8	SOFT <0.10SEC TO CONTACT
87-4	—	—	976.25	104.96		50.0 (52.0+)	—	N	75	UNKNOWN	—	BOTTOM OVER -50.0 FT AT THIS LOCATION
87-3	0845	0847	987.10	027.60	3.5/0849	49.0 (45.5)	49.7 (46.2)	Y	75	WEATHERED ROCK	46.2	HARD FROM START
	0847	0848				49.7 (46.2)	50.0 (46.5)	Y	175	ROCK		
87-2	0852	—	006.03	081.05	3.5/0849	54.0 (50.5)	55.5 (52.0)	N	—	SAND/SILT	>52.0+	FIRST TOUCH BOTTOM 50.5 ELEV PLUGS SINK TO 52 W/ PUMP OFF
87-1	0901	0901	077.44	563.07	3.5/0900	53.5 (50.0)	50.0+ (52.5+)	N	75	SAND/SILT	>52.5	FIRST TOUCH SOFT - EASY FAST PENETRATION TO OVER 52 ELEV
82-3	1044	1044	874.58	417.52	2.6/1043	44.7 (42.1)	53.5 (50.9)	N	75	SAND	—	SOFT EVEN FAST PENETRATION HARD AT FIRST CONTACT - SAND
82-2	1054	1054	555.93	257.89	2.6/1054	45.0 (42.4)	53.6 (51.0)	N	75	SAND	—	SOFT STOP ON CONTACT NO PUMP, PLUNGE PU = SMOOTH FAST PENETRATION w/
82-1	1103	1103	988.12	242.91	2.6/1054	45.0 (42.4)	55 (52.4)	N	75	SAND	—	SOFT STOP ON CONTACT, NO PUMP PU w/ PUMP ON, BUT AT HOME FAST PEN.
79-3	1151	1151	839.98	801.41	2.4/1149	45.8 (43.4)	54.5 (52.1)	N	75	SAND	—	SOFT STOP ON INITIAL CONTACT (HUM) w/ PUMP ON LIFT UP WHEN COME 10' IN 10SEC OK
79-2	1257	1257	257.94	104.11	2.0/1256	48.5 (46.5)	54.0 (52.0)	N	75	SAND	—	SOFT STOP ON INITIAL CONTACT w/ PUMP OFF PUMP = 6'/10SEC SMOOTH EASY PENET.
79-1	1317	1317	613.81	826.22	1.9/1314	48.2 (46.3)	53.5 (51.6)	N	75	SAND	—	SOFT STOP ON INITIAL CONTACT w/ PUMP OFF PUMP = 1SEC/1FT EASY PENET.
74-1	1427	1427	777.77	795.88	1.5/1424	51.0 (49.5)	55 (53.5)	N	75	SAND	—	SOFT STOP ON INITIAL CONTACT w/ PUMP OFF PUMP = 1SEC/1FT PENET. RATE
	8/22/00	G. VEDERA				44.2						
70-1	0942	0944	461.09	3.0/0942		44.2 (40.6)	46.5 (42.9)	N	75	SAND	—	SOFT STOP ON INITIAL CONTACT SLOW PENETRATION IN SOFT MATERIAL
	0944	0950				46.5 (42.9)	52.0 (48.4)	N	175	SAND	—	HEAVY PENETRATION, PULLED UP AND COULDN'T GET BACK (CAME IN TRYED SEVERAL TIMES, CHECK JETS = 2.510 JETS PLUGGED)
↓	0952	0952	↓	↓	↓	44.2 (40.6)	53.0 (51.40)	N	175	COAL/S2 SAND	—	WITH COARSE SAND, CONCRETE @175 PENT, 11' IN 22 SEC. OK
63-3	1132	1132	522.58	252.90	2.0/1132	53.0 (50.4)	54.0 (51.4)	N	75	SAND	—	SOFT EASY PENETRATION

## Probing Explorations Columbia River Channel Deepening Project

Date: 8-22-00 G. VEDERA

Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
63-2	1149	1149	754.13	960.97	2.6 / 1132	50.00 (47.4)	54.0 (51.4)	N	75	SAND	—	SOFT, EASY, FAST PENETRATION @ 1 FT/SEC
63-1	1205	1205	162.66	676.98	2.3 / 1205	46.3 (44.0)	54.0 (51.7)	N	75	SAND	—	SOFT, EASY PENETRATION @ 0.5 FT/SEC
62-1	1225	1225	496.55	278.64	2.0 / 1221	47.0 (45.0)	52.5 (50.5)	N	75	SAND	—	SOFT, EASY PENETRATION @ 0.5 FT/SEC
61-1	1255	1255	223.25	108.06	1.8 / 1255	51.8 (49.4)	54.0 (52.2)	N	75	SAND	—	SOFT, EASY, PENETRATION @ NO. 0.5 FT/SEC
56-1	1412	1413	916500	32139	2.1 / 1411	44.5 (42.7)	54.0 (51.9)	N	75	SAND	—	SOFT, STEADY PENETRATION @ NO. 0.5 FT/SEC
8-23-00 G. VEDERA												
						TAKES 10 MIN & ADJACENT TO 56-1						
55-15	0807	0807	266.23	500.96	3.8 / 0807	60.0 (56.2)	—	N	—	SAND OVER ROCK	—	TAGGED BTM (OVER -50 ELEV NO NEED TO PUMP SOFT THRU AND)
55-14	0810	0810	249.26	474.57		60.0 (56.2)	—	++	—	SAND OVER ROCK	—	
55-13	0811	0811	272.77	471.63		58.0 (54.2)	—	++	—	ROCK	—	HARD ON CONTACT
55-12	0814	0814	244.85	455.73		59.5 (55.7)	—	++	—	ROCK	—	
55-11	0816	0816	271.54	438.86		54.5 (50.7)	—	++	—	ROCK	—	↓
55-10	0818	0818	255.90	440.25		60.0 (56.2)	—	++	—	SAND	—	SOFT CONTACT
55-9	0820	0820	256.07	420.57		59.5 (55.7)	—	++	—	ROCK		HARD CONTACT
55-8	0821	0822	282.17	409.58		50.8 (47.0)	50.8 (47.0)	Y	75	ROCK	47.0	HARD CONTACT, DIFFICULT PENETRATION (WEATHERED ROCK)
↓	0822	0823	↓	↓		50.8 (47.0)	51.8 (48.0)	Y	175	ROCK		
55-6	0826	0827	285.42	382.06		51.9 (46.9)	52.8 (49.0)	Y	75	ROCK	48.1	HARD CONTACT, ROCKS ROLL LIKE TIREY ROLL AROUND PROBE "SKIDS" AWAY AND
↓	0827	0828	↓	↓		52.8 (49.0)	52.8 (49.0)	Y	175	ROCK		
55-4	0830	0831	286.61	364.10		51.6 (47.8)	54.0 (51.8)	Y	75	WEATHERED ROCK	47.8	PROBE WORKS IT'S WATERTIGHT AFTER HARD CONTACT
↓	0831	0832	↓	↓		54.0 (50.8)	53.2 (49.4)	Y	175	ROCK		NO AMB CAN'T GET BACK TO SAME POINT
55-2	0839	0839	291.21	344.28	4.3 / 0839	54.7 (50.4)	—	—	—	ROCK	50.4	HARD CONTACT, OVER -50 ELEV NO NEED TO PUMP
55-7	0841	0841	259.91	397.53		56.0 (50.9)	—	—	—	ROCK	50.9	HARD CONTACT OVER -50 ELEV
55-5	0849	0849	246.31	384.51	↓	50.0 (53.7)	—	—	—	ROCK	53.7	HARD CONTACT OVER -50 ELEV

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Probing Explorations Columbia River Channel Deepening Project

Date: 8-23-00 G. VEDERA

Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
55-3	0850	0851	265.93	366.01	4.3/0839	52.5 (48.2)	53.0 (48.7)	Y	75	WEATHERED ROCK	48.2	HARD CONTACT. PROBE JUMPS AROUND
↓	0851	0853	↓	↓	↓	53.0 (48.7)	53.5 (49.2)	Y	175	WEATHERED ROCK		
55-1	0855	0855	268.43	392.50	↓	53.8 (49.5)	55.8 (51.5)	N	75	FRACTURED ROCK	49.5	BUMPED ROCK OUT OF WAY WENT TO ~51.5
47-1	1044	1044	714.36	139.05	4.5/1044	49.0 (44.5)	53.5 (51.00)	N	75	SAND	—	SOFT CONTACT. EASED IN 1 FT/SEC PENT.
46-1	1109	1110	076.30	040.34	4.1/1109	47.5 (43.4)	55.5 (51.4)	N	75	SAND	—	SOFT CONTACT. PROBE GR @ 0.5 FT/SEC
44-1	1138	1138	004.01	298.80	3.9/1137	49.0 (45.1)	55.0 (51.1)	N	75	SAND	—	SOFT CONTACT. SOFT EASY PROBE @ 0.5 TO 1 FT/SEC
42-64	1221	1222	958.76	426.07	2.8/1220	50.8 (48.0)	51.2 (48.4)	Y	75	WEATHERED ROCK	49.0	HARD CONTACT
↓	1222	1224	↓	↓	↓	51.2 (48.4)	51.5 (48.7)	Y	175	WEATHERED ROCK		HARD
42-63	1225	1226	961.91	428.15		50.1 (47.3)	50.5 (47.7)	Y	75	ROCK	47.3	HARD CONTACT
↓	1226	1228	↓	↓	↓	50.5 (47.7)	53.0 (50.2)	Y	175	WEATHERED ROCK		GAIN .5 FT w/ ZERO PRESS. INCH WORKED T/ GET T/-50.2 ELEV
42-61	1231	1232	965.29	399.19		49.7 (46.9)	50.1 (47.3)	Y	75	ROCK	46.9	HARD CONTACT
↓	1232	1234	↓	↓	↓	50.1 (47.3)	50.3 (47.5)	Y	175	ROCK		VERY HARD TO PENETRATE
42-62	1235	1236	983.46	415.78		51.1 (48.3)	52.0 (49.2)	Y	75	WEATHERED ROCK	48.3	HARD CONTACT
↓	1236	1238	↓	↓	↓	52.0 (49.2)	52.8 (50.0)	Y	175	ROCK		WORKED DOWN TO GRADE
42-60	1239	1240	999.02	408.16		51.5 (48.7)	52.1 (49.3)	Y	75	WEATHERED ROCK	48.7	HARD CONTACT
↓	1240	1242	↓	↓	↓	52.1 (49.3)	52.8 (50.2)	Y	175	ROCK		
42-59	1244	1246	983.61	382.02	↓	53.8 (48.0)	52.5 (49.1)	Y	75	ROCK	48.0	HARD CONTACT
↓	1246	1248	↓	↓	2.3/1253	52.5 (49.1)	52.9 (50.2)	Y	175	ROCK		WORK PROBE UP AND ON TO GET DEPTH
42-58	1252	1253	015.55	384.28	2.3/1253	51.0 (48.7)	51.6 (49.3)	Y	75	ROCK	48.7	HARD CONTACT
↓	1253	1254	↓	↓	↓	51.6 (49.3)	52.7 (50.4)	Y	175	ROCK		
42-57	1255	1256	034.12	369.99		51.6 (49.3)	52.0 (49.7)	Y	75	ROCK	49.3	HARD CONTACT
↓	1256	1258	↓	↓	↓	52.0 (49.7)	52.8 (50.5)	Y	175	ROCK		WORK T GRADE SLO

(A)

## Probing Explorations Columbia River Channel Deepening Project

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Date: 8-23-00

G. VERDECA

Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
42-56	1259	1300	023.84	346.53	2.3 / 1253	50.0 (47.7)	50.7 (48.4)	Y	75	WEATHERED ROCK	47.7	HARD CONTACT
↓	1300	1302	↓	↓	↓	50.7 (48.4)	50.8 (48.5)	Y	175	ROCK		HARD TO MAKE PROGRESS
42-55	1304	1304	045.10	335.58	↓	52.6 (50.3)	—	—	—	ROCK	50.3	HARD CONTACT @ BELOW GRADE OR -50.0 ELV.
42-52	1314	1314	167.25	474.49	2.1 / 1316	55.0 (52.9)	—	—	—	ROCK	52.7	HARD CONTACT BELOW GRADE
42-49	1318	1318	161.57	438.63	↓	58.0 (53.9)	—	—	—	ROCK	53.9	HARD CONTACT BELOW GRADE
42-48	1321	1321	193.12	454.16	↓	53.8 (51.7)	—	—	—	ROCK	51.7	HARD CONTACT BELOW GRADE
42-45	1323	1324	189.38	416.28	↓	51.5 (49.4)	52.3 (50.2)	Y	75	WEATHERED ROCK	49.4	HARD CONTACT.
42-50	1330	1330	202.98	494.19	↓	53.7 (51.6)	—	—	—		51.6	HARD CONTACT BELOW GRADE
42-54	1335	1335	182.87	520.35	↓	56.0 (53.9)	—	—	—		53.9	HARD CONTACT BELOW GRADE
42-46	1338	1340	236.19	469.44	1.9 / 1538	49.0 (47.1)	49.0 (47.1)	Y	75	WEATHERED ROCK	47.1	HARD CONTACT.
↓	1340	1342	↓	↓	↓	49.0 (47.1)	50.0 (48.1)	Y	175	ROCK		SKID OFF ROCK TO MAKE DEPTH
42-44	1345	1347	225.00	426.44	↓	49.0 (47.1)	51.8 (49.9)	Y	75	WEATHERED ROCK	47.1	HARD CONTACT
↓	1347	1350	↓	↓	↓	51.8 (49.9)	52.0 (50.1)	Y	175	ROCK		
42-43	1400	1400	186.24	588.29	1.7 / 1402	55.0 (53.3)	—	—	—	SILTY SAND	53.3	SEMI SOFT CONTACT
42-40	1403	1403	200.55	584.65	↓	53.0 (51.3)	—	—	—	↓	51.3	↓
42-36	1405	1405	253.60	356.63	↓	53.0 (51.3)	—	—	—	↓	51.3	↓
* 42-37	1410	1410	264.71	314.30	↓	49.0 (47.3)	52.1 (50.4)	N	75	SAND	47.3	HARD (NOT LIKE ROCK) PENTHICS LIKE SAND
42-34	1412	1412	297.54	365.65	↓	51.2 (49.50)	51.0 (52.3)	N	75	SAND	49.5	GOOD PENETRATION @ 3.5 FT / SEC
42-38	1420	1422	301.48	427.14	1.6 / 1420	49.9 (48.3)	52.0 (50.4)	N	75	SAND	48.3	SEMI SOFT CONTACT. STEADY SLOW PENETR. CK JERS = OK
* 42-41	1425	1426	305.03	474.97	↓	49.8 (48.2)	51.8 (50.2)	N	75	SAND?	48.2	SEMI SOFT CONTACT. "JERKY" PENETRATION.
A. 37												NOTE: INREGULAR BOTTOM
												VARIATIONS AS MUCH AS 5 FT

Jinglora & Co. Channel Deepening Project

Date: 8/23/00 G. VEDERA

Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
42-39	1429	1432	333.55	446.06	1.6 / 1420	49.8 (47.4)	49.8 (47.8)	Y	75	CEMENTED SILICA??	47.4	HARD, BUT DOESN'T FEEL LIKE ROCK
↓	1432	1435	↓	↓	↓	49.8 (47.8)	51.0 (49.9)	Y	175	SAND	47.6	STEAM PENETRATION @ 0.5 FT/SEC
42-35	1437	1437	337.40	399.31	↓	49.2 (47.6)	53.0 (53.4)	N	75	SAND	53.4	OVER GRADE DEPTH OF -SOFT NO TEST
42-33	1440	1440	334.46	361.95	↓	55.0 (53.4)	—	N	—	ROCK	51.3	HARD BOTTOM BELOW GRADE
42-53	1445	1445	27.56	592.85	1.5 / 1445	52.8 (51.3)	—	N	—	SAND	—	SEMI SOFT CONTACT BELOW GRADE. PUMP AND T/ 51.5 ELEV.
42-65	1449	1449	248.14	565.36	↓	51.7 (50.2)	53.0 (51.5)	N	NO PUMP	SAND	—	SEMI SOFT CONTACT BELOW GRADE.
42-51	1454	1454	259.80	566.08	↓	52.6 (51.1)	—	N	—	SAND	—	SEMI SOFT CONTACT.
42-47	1459	1501	309.43	561.53	↓	49.1 (47.6)	50.2 (48.7)	Y	75	SAND OVER ROCK	48.7	—
↓	1501	1503	↓	↓	↓	50.2 (48.7)	50.2 (48.7)	Y	175	ROCK	—	SEMI SOFT. PROBE SETTLES IN, DOESN'T "CLANK"
42-42	1505	1506	318.44	513.21	↓	49.1 (47.6)	50.8 (49.9)	Y	75	CEMENTED SAND?	50.8	WORK IT DOWN, FLOW TO GRADE. DOESN'T CLANK LIKE ROCK
↓	1506	1509	↓	↓	↓	50.8 (49.9)	51.5 (50.0)	Y	175	—	—	—
<b>Q-24-00 G. VEDERA</b>												
42-25	0754	0754	781.74	835.56	2.0 / 6757	50.0 (54.0)	—	—	—	ROCK	54.0	HARD ROCK BELOW GRADE OF -50.0!, NO PROBING
42-24	0801	0801	741.99	763.20	↓	50.0 (48.0)	53.0 (51.0)	N	75	SAND	—	HARD CONTACT. EASY PENETRATION @ 1 FT/SEC
42-29	0806	0808	720.71	784.23	↓	50.1 (48.1)	50.1 (48.1)	Y	75	—	48.1	HARD CONTACT. NO PROGRESS PROBING (HARD) DIFFICULT TO ADVANCE PROBE?
↓	0808	0810	↓	↓	↓	50.1 (48.1)	50.9 (48.9)	Y	175	WEATHERED ROCK	51.8	HARD CONTACT BELOW GRADE
42-20	0811	0811	823.80	801.16	↓	53.8 (51.8)	—	—	—	ROCK	51.0	HARD CONTACT BELOW GRADE
42-26	0814	0814	833.52	824.55	↓	53.0 (51.0)	—	—	—	SAND	—	SOFT CONTACT BELOW GRADE
42-27	0816	0816	856.43	915.95	2.3 / 6815	54.0 (52.0)	—	—	—	SAND	—	SEMI SOFT CONTACT. EASY PENETRATION 1 FT/SEC
42-21	0819	0819	862.63	957.57	↓	50.8 (49.5)	53.0 (50.7)	N	75	SAND	—	SEMI SOFT EASY PENETRATION 1 FT/SEC
42-17	0822	0822	860.18	912.24	2.7 / 6821	51.2 (48.7)	53.3 (51.00)	N	75	SAND	—	WELL BELOW GRADE
42-11	0829	0829	884.48	750.18	2.6 / 0829	56.0 (53.4)	—	—	—	—	—	—

Probing Explorations Columbia River Channel Deepening Project

Date: 8/24/00 G. VERA

Probe Number	Time Start End		Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
42-12	0831	0837	902.24	794.24	2.6/0829	49.0 (46.4)	50.8 (48.2)	Y	75	SAND	48.2	SEMI SOFT, EASY PENTR. AT FIRST
↓	0832	0833	↓	↓	↓	50.8 (48.2)	51.0 (48.4)	Y	175	WEATHERED ROCK	—	STOPPED PENETRATION LIKE HARD ROCK
42-16	0836	0837	903.35	031.59	2.6/0835	51.5 (48.9)	52.5 (49.1)	Y	75	SAND	—	SEMI SOFT, EASY AT FIRST THEN HARD
↓	0837	0838	↓	↓	↓	52.5 (49.9)	53.3 (50.7)	N	175	SAND	—	ACTED LIKE MOVED ROCK OUT OF WAY AND THEN EASY PENTR.
42-22	0840	0841	885.90	891.93	2.7/0840	50.2 (47.5)	51.8 (49.1)	Y	75	SAND	49.1	SOFT CONTACT EASY TO 49.1 THEN HARD
↓	0841	0842	↓	↓	↓	51.8 (49.)	52.0 (49.3)	Y	175	ROCK	—	HARD DIFFICULT PROGRESS ADVANCE
42-13	0845	0845	941.48	846.36	—	51.3 (48.6)	54.0 (51.3)	N	75	SAND	—	SOFT CONTACT EASY PENTR.
42-6	0847	0848	947.99	758.52	2.↓	51.3 (48.6)	52.0 (49.3)	Y	75	WEATHERED ROCK	49.3	HARD CONTACT
↓	0848	0851	↓	↓	↓	52.0 (49.3)	52.9 (50.2)	N	175	ROCK	—	WORK PROBE TO GRADE W/DIFFICULTY
42-28	0857	0857	902.03	939.91	3.0/0857	54.0 (51.0)	—	—	—	—	—	HARD CONTACT BUT NOT LIKE ROCK BELOW GRADE
42-23	0902	0904	945.69	949.10	3.2/0902	52.0 (48.8)	52.8 (49.6)	Y	75	SAND	49.6	EASY AT FIRST THEN PROGRESS STOPPED
↓	0904	0905	↓	↓	↓	52.8 (49.6)	53.0 (49.8)	Y	175	ROCK	—	HARD DIFFICULT TO ADVANCE
42-18	0909	0911	941.42	908.50	3.4/0912	49.2 (45.8)	52.2 (48.8)	Y	75	SAND	48.8	EASY TO 48.8 THEN HARD
↓	0911	0912	↓	↓	↓	52.2 (48.8)	53.0 (49.6)	Y	175	ROCK	—	DIFFICULT TO ADVANCE
42-14	0915	0916	979.44	876.80	—	50.8 (47.4)	51.2 (47.8)	Y	75	WEATHERED ROCK	47.4	HARD CONTACT, DIFFICULT TO
↓	0916	0917	↓	↓	↓	51.2 (47.8)	51.2 (47.8)	Y	175	ROCK	—	NO PROGRESS, HARD
42-10	0923	0925	976.15	819.28	3.5/0921	50.9 (47.4)	51.2 (47.7)	Y	75	WEATHERED ROCK	47.4	HALO, SLOW DIFFICULT PROGRESS
↓	0925	0926	↓	↓	↓	51.2 (47.7)	51.4 (47.9)	Y	175	ROCK	—	DIFFICULT TO ADVANCE JK JETS = OK
42-7	0929	0929	976.68	784.19	3.6/0929	52.0 (48.6)	54.6 (50.9)	N	75	SAND	—	EASY ADVANCE (0 FT/SEC)
42-3	0932	0932	014.13	757.35	3.↓	54.0 (50.4)	—	—	—	SAND	—	SOFT CONTACT BELOW GRADE
42-8	0937	0938	025.91	842.60	3.7/0936	51.2 (47.5)	53.5 (49.8)	Y	75	SAND	49.8	SOFT EASY TO 49.8
↓	0938	0939	↓	↓	↓	53.5 (49.8)	53.9 (50.2)	N	175	WEATHERED ROCK	—	WORK PROBE TO PLANE GRADE IN ROCK

Probing Explorations Columbia River Channel Deepening Project

7/8

Date: 8/24/00 G. VEDERA

Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
42-4	0940	0942	060.35	813.87	3.7/0936	52.4 (48.7)	53.8 (49.1)	N	75	ROCK	48.7	BOUNCEY ADVANCE. MODERATE DIFFICULTY
42-2	0944	0944	079.64	787.09	3.7/0944	52.0 (48.3)	54.0 (49.3)	N	75	SAND	—	EASY ADVANCE @ 1FT/SEC.
42-1	0948	0948	067.13	741.26	3.7↓	56.5 (52.8)	—	—	—	SAND ON ATM	—	SOFT CONTACT BELOW GRADE
42-19	1023	1023	980.82	759.23	4.2/1020	55.0 (50.8)	—	—	—	SAND ON ATM	—	SOFT BOTTOM BELOW GRADE
42-15	1025	1026	027.85	936.95	↓	53.0 (48.8)	53.2 (49.8)	Y	75	ROCK	48.8	FIRM BOTTOM. DIFFICULT TO ADVANCE
↓	1026	1027	↓	↓	↓	53.2 (49.0)	53.2 (49.0)	Y	175	ROCK	—	NO GAIN
42-9	1029	1030	673.03	895.69	4.3/1030	50.9 (46.6)	51.1 (46.8)	Y	75	WEATHERED ROCK	46.6	HARD CONTACT. DIFFICULT TO ADVANCE
↓	1030	1031	↓	↓	↓	51.1 (46.8)	51.5 (47.2)	Y	175	ROCK	—	DIFFICULT TO ADVANCE
42-5	1037	1038	100.86	844.14	↓	52.5 (48.2)	53.9 (49.6)	Y	75	ROCK	48.2	HARD CONTACT. DIFFICULT TO ADVANCE
↓	1038	1040	↓	↓	4.3/1040	53.9 (49.6)	54.0 (49.1)	Y	175	ROCK	—	DIFFICULT TO ADVANCE
42-32	1050	1050	093.27	227.27	4.4/1049	50.0 (45.2)	51.0 (52.6)	N	75	SAND	—	FIRM CONTACT EASY PENTR. @ 1FT/SEC
42-31	1057	1057	264.20	048.27	4.5/1055	50.0 (45.5)	51.0 (52.5)	N	75	SAND	—	SOFT CONTACT. EASY PENTR @ 1FT/SEC
42-30	1057	1059	261.83	028.59	↓	50.0 (45.5)	57.0 (52.5)	N	75	SAND	—	SOFT CONTACT. EASY PENTR. @ 1FT/SEC
41-10	1112	1114	559.83	073.19	4.6/1110	53.0 (48.4)	53.5 (48.4)	Y	75	WEATHERED ROCK	48.4	HARD CONTACT. DIFFICULT TO ADVANCE
↓	1114	1115	↓	↓	↓	53.5 (48.9)	53.8 (49.2)	Y	175	ROCK	—	BOUNCING OUT OF ROCK
41-9	1121	1122	584.37	057.21	↓	52.5 (47.9)	54.1 (49.5)	Y	75	WEATHERED ROCK	47.9	HARD CONTACT. DIFFICULT TO ADVANCE
↓	1122	1124	↓	↓	↓	54.1 (49.5)	54.1 (49.5)	Y	175	ROCK	—	NO GAIN
41-8	1125	1127	598.91	039.77	4.6/1125	51.5 (46.9)	52.4 (49.8)	Y	75	WEATHERED ROCK	46.9	HARD CONTACT. DIFFICULT TO ADVANCE
↓	1127	1128	↓	↓	↓	52.4 (47.8)	52.9 (48.3)	Y	175	ROCK	—	DIFFICULT TO ADVANCE
41-7	1129	1130	621.98	052.21	↓	53.8 (49.2)	55.1 (50.5)	N	75	WEATHERED ROCK	49.2	WORK PROBE MODERATE DIFFICULT
41-6	1131		629.92	034.41	↓	53.0 (48.4)	54.9 (50.3)	N	75	SAND OVER ROCK	49.8	EAST AT FIRST. HAMMER LAST 0.5 FT.

Probing Explorations Columbia River Channel Deepening Project

Date: 8/24/00 G. VEDRA

# **Core Boring Logs**

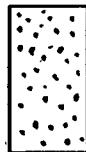
Legend for Core Drilling Logs



Basalt



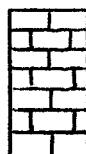
Basalt Fragments



Sand



Silt



Sandstone



Basalt Fragments in Silt/Sand Matrix



**CH2MHILL**

**PROJECT NUMBER: 159184.B1.CD**

**BORING NUMBER: DH-41-1**

Sheet: 1 of 1

# **ROCK CORE LOG**

## **PROJECT: Columbia River Channel Deepening**

**LOCATION:** River Mile 42

**BARGE ELEVATION: 0.9 to 2.7 ft (CRD).**

**DRILLING CONTRACTOR:** Geotech Explorations, Tualatin, OR

**DRILLING METHOD AND EQUIPMENT:** HQ-triple core barrel - CME 75

**ORIENTATION:** Vertical

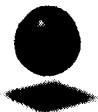
#### **WATER LEVEL:** Fluctuating

**START: 8/30/00**

**FINISH: 8/30/00**

LOGGER: H. Guettel

NEGATIVE ELEVATION CRD (FT)	CORE NUMBER	CORE RECOVERY	DISCONTINUITIES			GRAPHIC LOG	LITHOLOGY	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING, ROD DROPS, TEST RESULTS, ETC.
			RQD (%)	FRACTURES PER FOOT	DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS			
46							WATER. -47.1	
47					No bedrock encountered.		BASALT FRAGMENTS IN A SILTY SAND MATRIX, dark grey, fresh, difficult to scratch with a pocket knife, fine grained, gravel size, subangular.	Driller indicated casing is seated at El.-47.1 (CRD)
48							Some gravel sized intact pieces of cemented sand, up to 2.5", brown fine grained, moderately to highly weathered, dent quality, some black, light grey and reddish mottling.	Driller drove casing 4 ft into solid material, first hard then easy.  Basalt fragments possibly originating from previous blasting activities in the area. Not in place.  12:45-13:15
49								
50								
51								
52	1-HQ	18 %	0%	N/A				
53								
54								
55								
56								
57								
58							No recovery.	Drilling was very easy. Driller tried to go slower to get better recovery, but drilling was very fast.  Driller indicated possibly drilling through sand.
59								
60								
61	2-HQ	0 %	0%	N/A				
62								
63								
64								
65					End of Boring at El.-65.1 ft CRD.			



**CH2MHILL**

PROJECT NUMBER: 159184.B1.CD

BORING NUMBER: DH-41-2

Sheet: 1 of 1

## ROCK CORE LOG

PROJECT: Columbia River Channel Deepening

BARGE ELEVATION: 0.5 to 1 ft CRD

DRILLING CONTRACTOR: Geotech Explorations, Tualatin, OR

DRILLING METHOD AND EQUIPMENT: HQ-triple core barrel - CME-75

ORIENTATION: Vertical

WATER LEVEL: Fluctuating

START: 8/30/00

FINISH: 8/30/00

LOGGER: H. Guettel

NEGATIVE ELEVATION CRD (FT)	CORE NUMBER	CORE RECOVERY	DISCONTINUITIES		GRAPHIC LOG	LITHOLOGY	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING, ROD DROPS, TEST RESULTS, ETC.
			RQD (%)	FRACTURES PER FOOT			
47						Water. -47.5	Driller indicated casing is seated at El.-47.5 (CRD)
48						BASALT FRAGMENTS, dark grey, fresh, difficult to scratch with a pocket knife, fine grained, gravel to cobble size, subangular, some iron staining, few vesicles.	Driller drove casing 4 ft into solid material, first hard then easy.
49						SILTY SAND, some gravel size intact pieces of cemented sand, brown, fine grained, highly weathered.	Basalt fragments possibly originating from previous blasting activities in the area. Not in place.
50							
51							
52							
53	1-HQ	21.6%	0%	N/A			Easy drilling.
54							
55							
56							
57							
58							
59							5 minute run.
60							
61	2-HQ	23.3%	0%	N/A		SILTY SAND, some gravel size intact pieces of cemented sand, brown, fine grained, highly weathered.	Driller indicated that drilling was easy. It felt like drilling through sand.
62							
63							
64						End boring at El.-63.5 ft (CRD).	
65							
66							



PROJECT NUMBER: 159184.B1.CD

BORING NUMBER: DH-42-1  
Sheet: 1 of 1

## ROCK CORE LOG

PROJECT: Columbia River Channel Deepening

LOCATION: River Mile 42

BARGE ELEVATION: 1.6 to 3.7 ft CRD

DRILLING CONTRACTOR: Geotech Explorations, Tualatin, OR

DRILLING METHOD AND EQUIPMENT: HQ-triple core barrel - CME-75

ORIENTATION: Vertical

WATER LEVEL: Fluctuating

START: 8/29/00

FINISH: 8/29/00

LOGGER: H. Guettel

NEGATIVE ELEVATION CRD (FT)	CORE NUMBER	CORE RECOVERY	DISCONTINUITIES		GRAPHIC LOG	LITHOLOGY	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING, ROD DROPS, TEST RESULTS, ETC.
			RQD (%)	FRACTURES PER FOOT			
47						Water. -47.9	Driller indicated casing is seated at El.-47.9 (CRD)
48						No recovery, possibly sand or silt.	Driller drove casing 1.8 ft into solid material, 1 foot soft then hard.
49							
50							
51							
52							
53	1-HQ	0 %	0%	N/A			Driller indicated easy drilling, possibly through sand. 1 to 2 feet of gravel fragments between El.-47.9 and El.49.9.
54							
55							
56							
57							
58							
59							
60							
61	2-HQ	52.5%	0%	N/A		-60 SANDSTONE, brownish grey, fine grained, moderately weathered, soft to moderately hard, dent quality, thick to massive bedding.	Easy drilling.  5 minute run.  Driller indicated top of run very soft.
62							
63							
64							
65							
66							
		End boring at El.-63.3 ft (CRD).					



**CH2MHILL**

**PROJECT NUMBER:** 159184.B1.CD

**BORING NUMBER: DH-42-2**

Sheet: 1 of 1

## **ROCK CORE LOG**

## **PROJECT: Columbia River Channel Deepening**

**LOCATION:** River Mile 42

**BARGE ELEVATION: -1.1 ft CRD.**

**DRILLING CONTRACTOR:** Geotech Explorations, Tualatin, OR

#### **DRILLING METHOD AND EQUIPMENT: HQ-triple core barrel - CME-75**

**ORIENTATION:** Vertical

#### **WATER LEVEL · Fluctuating**

START: 8/29/00

FINISH: 8/29/00

LOGGER: H. Guettel



**CH2MHILL**

PROJECT NUMBER: 159184.B1.CD

BORING NUMBER: DH-42-3

Sheet: 1 of 1

## ROCK CORE LOG

PROJECT: Columbia River Channel Deepening

LOCATION: River Mile 42

BARGE ELEVATION: 4.8 ft CRD

DRILLING CONTRACTOR: Geotech Explorations, Tualatin, OR

DRILLING METHOD AND EQUIPMENT: HQ-triple core barrel - CME-75

ORIENTATION: Vertical

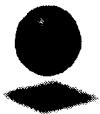
WATER LEVEL: Fluctuating

START: 8/25/00

FINISH: 8/25/00

LOGGER: H. Guettel

NEGATIVE ELEVATION CRD (FT)	CORE NUMBER	CORE RECOVERY	DISCONTINUITIES			GRAPHIC LOG	LITHOLOGY	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING, ROD DROPS, TEST RESULTS, ETC.
			RQD (%)	FRACTURES PER FOOT	DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS			
46							Water. -46.2	
47					No bedrock encountered. Broken up basalt fragments.		BASALT FRAGMENTS in sandy silt matrix, dark grey, iron stained, basalt, slightly weathered, subangular, one piece with large vesicles (0.5"), one piece of pumice on top.	Driller indicated casing is seated at El. -46.2 ft (CRD)
48								Driller drove casing 4.5 ft into solid material.
49								
50								
51	1-HQ	35 %	0%	N/A				According to driller we went through gravel on top followed by sand and back into rock approx. 3 feet thereafter.
52								
53								
54								
55								
56								
57								
58								
59								
60								
61								
62								
63	2-HQ	41%	0%	N/A			-62	
64								
65	3-HQ	7 %	0%	7	-62.0 to -63.7, 3 joints, 45 to 60 deg, rough, planar, secondary mineralization.		BASALT, dark grey, fine grained, secondary mineralization, fresh, difficult to scratch, no vesicles, some healed joints, some fine hairline cracks.	
66				10+	-62.7 to -63.7 ft, 2 joints, 40 deg. randomly jointed, i vertical joint.			
				8+	-63.7 to -65.2 ft, joints are between 15 and 50 deg., others randomly oriented, some vertical joints, secondary mineralization, planar, rough.			
					End boring at El.-65.2 ft (CRD).			



**CH2MHILL**

**PROJECT NUMBER: 159184.B1.CD**

**BORING NUMBER: DH-42-4**

Sheet: 1 of 1

## **ROCK CORE LOG**

## **PROJECT: Columbia River Channel Deepening**

**LOCATION:** River Mile 42

**BARGE ELEVATION: 1 to 3.1 ft CRD**

**DRILLING CONTRACTOR:** Geotech Explorations, Tualatin, OR

**DRILLING METHOD AND EQUIPMENT:** HQ-core - CME 75 truck mounted

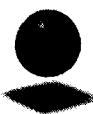
**ORIENTATION:** Vertical

#### **WATER LEVEL:** Fluctuating

START: 8/25/00

**FINISH: 8/25/00**

LOGGER: H. Guettel



**CH2MHILL**

**PROJECT NUMBER: 159184.B1.CD**

**BORING NUMBER: DH-42-5**  
**Sheet: 1 of 1**

## **ROCK CORE LOG**

**PROJECT:** Columbia River Channel Deepening

**LOCATION:** River Mile 42

**BARGE ELEVATION: -1.5 ft CRD**

**DRILLING CONTRACTOR:** Geotech Explorations, Tualatin, OR

**DRILLING METHOD AND EQUIPMENT:** HQ-triple core barrel - CMF-75

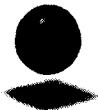
**ORIENTATION:** Vertical

**WATER LEVEL:** Fluctuating

START: 8/28/00

FINISH: 8/28/00

LOGGER: H. Guettel



CH2MHILL

PROJECT NUMBER: 159184.B1.CD

BORING NUMBER: DH-55-1

Sheet: 1 of 1

## ROCK CORE LOG

PROJECT: Columbia River Channel Deepening

LOCATION: River Mile 55

BARGE ELEVATION: 3.7 to 4.0 ft CRD

DRILLING CONTRACTOR: Geotech Explorations, Tualatin, OR

DRILLING METHOD AND EQUIPMENT: HQ-triple core barrel - CME-75

ORIENTATION: Vertical

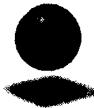
WATER LEVEL: Fluctuating

START: 8/24/00

FINISH: 8/24/00

LOGGER: H. Guettel

NEGATIVE ELEVATION CRD (FT)	CORE NUMBER	CORE RECOVERY	DISCONTINUITIES			GRAPHIC LOG	LITHOLOGY	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING, ROD DROPS, TEST RESULTS, ETC.
			RQD (%)	FRACTURES PER FOOT	DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS			
51							Water. -51.5	Driller indicated casing is seated at El.-51.5 ft (CRD) Driller drove casing 1.5 feet into the ground. (9:50-10:05) Hard bumpy drilling.
52							BASALT FRAGMENTS, dark grey, iron stained, secondary mineralization, fine grained, fresh, no vesicles, subangular, 0.5 to 3.5", possibly broken up in place by previous blasting activities.	
53							-56.5	
54	1-HQ	40%	0%	2 5 2	Broken up basalt fragments.		BASALT, dark grey, fine grained, hard, vesicular.	Driller indicated he drilled through sand at beginning and end of run 1-HQ. (10:15-10:30) Core looks like it was in place, not loose material.
55								
56								
57								
58								
59	2-HQ	66%	14%	4 5 >10 >10 >6	-56.5 to -61.5, randomly oriented joints, planar, rough, iron stained, some secondary mineralization (greenish), no infilling visible, some fine healed joints.  -61.5 to -62 ft, fractured rock, randomly oriented.			
60								
61								
62								
63								
64	3-HQ	54%	34%	2 3 0	-63.6 to -65.8 ft, joints are bet- ween 10 and 20 deg., planar, smooth to rough, secondary mineralization visible, no healed joints.  -66.5 to -69.4 ft, joints are between 5 and 20 deg., planar, smooth to rough, secondary mineralization (light green), some healed joints		BASALT, dark grey, fine grained, fresh, hard, no vesicles, difficult to scratch.	Driller indicated areas of sudden drops, material changes from hard to soft.  Core broken to fit box. (11:35-11:55) Core broken to fit box.
65								
66								
67								
68	4-HQ	100%	100%	0 0 1 1			BASALT, dark grey, fine grained, fresh, hard, no vesicles, difficult to scratch.	
69								
70					End boring at El.-69.4 ft (CRD).			



**CH2MHILL**

PROJECT NUMBER: 159184.B1.CD

BORING NUMBER: DH-87-1

Sheet: 1 of 1

## ROCK CORE LOG

PROJECT: Columbia River Channel Deepening

LOCATION: River Mile 88

BARGE ELEVATION: 2.4 ft CRD

DRILLING CONTRACTOR: Geotech Explorations, Tualatin, OR

DRILLING METHOD AND EQUIPMENT: HQ-triple core barrel - CME-75

ORIENTATION: Vertical

WATER LEVEL: Fluctuating

START: 8/21/00

FINISH: 8/21/00

LOGGER: H. Guettel

NEGATIVE ELEVATION CRD (FT)	CORE NUMBER	CORE RECOVERY	DISCONTINUITIES		GRAPHIC LOG	LITHOLOGY	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING, ROD DROPS, TEST RESULTS, ETC.
			RQD (%)	FRACTURES PER FOOT			
46						Water. -46	
47	1-HQ	100%	0%	>20	-46 to -49.2 ft, broken up basalt fragments, angular, secondary mineralization		
48				>20			
49				>20	-49.2 to -51.6 ft, highly fractured, randomly oriented joints, planar, rough, secondary mineralization		
50				>20			
51	2-HQ	100%	0%	>20	-51.6 to -53.3 ft, highly fractured, randomly oriented joints, planar, rough.		
52				>15			
53				>15	-53.3 to -54.3 ft, highly fractured, randomly oriented joints, planar, rough.		
54				>10			
55	3-HQ	100%	46%	>8	-54.3 to -56.2 ft, joints are 0 to 20 deg., randomly oriented, planar, rough.		
56				5			
57					End boring at El.-56.2 ft (CRD).		
58							
59							
60							
61							
62							
63							
64							
65							



CH2MHILL

PROJECT NUMBER: 159184.B1.CD

BORING NUMBER: DH-87-2

Sheet: 1 of 1

## ROCK CORE LOG

PROJECT: Columbia River Channel Deepening

LOCATION: River Mile 88

BARGE ELEVATION: 1.9 ft CRD

DRILLING CONTRACTOR: Geotech Explorations, Tualatin, OR

DRILLING METHOD AND EQUIPMENT: HQ-triple core barrel - CME-75

ORIENTATION: Vertical

WATER LEVEL: Fluctuating

START: 8/23/00

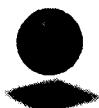
FINISH: 8/23/00

LOGGER: H. Guettel

NEGATIVE ELEVATION CRD (FT)	CORE NUMBER	CORE RECOVERY	DISCONTINUITIES		GRAPHIC LOG	LITHOLOGY	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING, ROD DROPS, TEST RESULTS, ETC.
			RQD (%)	FRACTURES PER FOOT			
41						Water.	
42						-42	
43			N/A			River bottom sediments.	
44	1-HQ	60%	0%	>10		-43	
45				>10		BASALT FRAGMENTS, dark grey, fine grained, fresh, gravel size, some small vesicles, angular to subangular, possibly broken up in place due to previous blasting activities.	
46	2-HQ	87%	0%	>10		-47.8	
47				>10			
48				>10		BASALT, dark grey, fine grained, fresh, hard, some vesicles, difficult to scratch, no reaction (field compressive strength).	(9:45-10:15)
49	3-HQ	100%	0%	>10			Core looks like it is in place.
50				>10			
51	4-HQ	100%	0%	+5			(10:45-11:30)
52							
53							
54							
55							
56							
57							
58							
59							
60							

End boring at El.-51.3 ft (CRD).

Boring terminated after core bit sheared off.



**CH2MHILL**

PROJECT NUMBER: 159184.B1.CD

BORING NUMBER: DH-87-3

Sheet: 1 of 1

## ROCK CORE LOG

PROJECT: Columbia River Channel Deepening

LOCATION: River Mile 88

BARGE ELEVATION: 2 to 2.5 ft CRD

DRILLING CONTRACTOR: Geotech Explorations, Tualatin, OR

DRILLING METHOD AND EQUIPMENT: HQ-triple core barrel - CME-75

ORIENTATION: Vertical

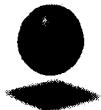
WATER LEVEL: Fluctuating

START: 8/22/00

FINISH: 8/22/00

LOGGER: H. Guettel

NEGATIVE ELEVATION CRD (FT)	CORE NUMBER	CORE RECOVERY	DISCONTINUITIES		GRAPHIC LOG	LITHOLOGY	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING, ROD DROPS, TEST RESULTS, ETC.
			RQD (%)	FRACTURES PER FOOT		DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS	
44						Water. -44.2	
45	1-HQ	100%	0%	>10	-44.2 to -48.7 ft, intensely fractured rock, random joints, mostly 0 to 10 deg. and 60 deg. to vertical, secondary mineralization visible, planar, rough.	X	Driller indicated river bottom at El.-44.2 ft (CRD). (12:15-13:45)
46				>10			Blasting previously conducted in the area.
47				>10			
48				8	-48.7 to -49.7 ft, mostly 0 deg joints, some randomly oriented.	X	Hard drilling.
49				8+	-49.7 to -50.7, randomly oriented joints.	X	(14:00-14:35)
50	2-HQ	100%	10%	11+	-50.7 to -52.5 ft, mostly 0 to 10 deg. joints, some randomly oriented, secondary mineralization, planar, rough, hairline cracks.	X	All core looked like it was in place bedrock.
51				9+			
52				>10	-52.5 to -53.7 ft, randomly fractured broken up rock, secondary mineralization.	X	(14:38-14:50)
53	3-HQ	100%	25%	5+	-53.7 to -54.5 ft, 2 joints, 10 deg., rough, healed joints.	X	
54				1			
55					End boring at El.-54.5 ft (CRD).		
56							
57							
58							
59							
60							
61							
62							
63							



CH2MHILL

PROJECT NUMBER: 159184.B1.CD

BORING NUMBER: DH-87-4

Sheet: 1 of 1

## ROCK CORE LOG

PROJECT: Columbia River Channel Deepening

LOCATION: River Mile 88

BARGE ELEVATION: 2.2 ft CRD

DRILLING CONTRACTOR: Geotech Explorations, Tualatin, OR

DRILLING METHOD AND EQUIPMENT: HQ-triple core barrel - CME-75

ORIENTATION: Vertical

WATER LEVEL: Fluctuating

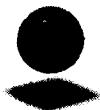
START: 8/22/00

FINISH: 8/22/00

LOGGER: H. Guettel

NEGATIVE ELEVATION CRD (FT)	CORE NUMBER	CORE RECOVERY	DISCONTINUITIES			GRAPHIC LOG	LITHOLOGY	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING, ROD DROPS, TEST RESULTS, ETC.
			RQD (%)	FRACTURES PER FOOT	DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS			
44							Water -44.3	Uneven ground surface.
45								Driller indicated river bottom at El.-44.3 ft (CRD). (9:00-10:20)
46								Core looks like in place bedrock.
47	1-HQ	100%	18%	>12	-44.3 to -48 ft, intensely to highly fractured, random joints, planar, rough secondary mineralization visible in joints, hairline cracks.		BASALT, dark grey, fine grained, fresh, hard, some vesicles, difficult to scratch with knife, field compressive strength test shows no reaction, some iron staining at top 1".	Hard bumpy drilling.
48				>10				
49				>12				
50				3	-48 to -49.3 ft, joints are between 10 and 60 deg., highly fractured.			
51				4				
52				5+				
53	2-HQ	100%	45%	6+	-49.3 to -50.2 ft, joints are randomly oriented, some 10 deg, and 45 to 50 deg.		BASALT, dark grey, fine grained, fresh, hard, some vesicles, difficult to scratch with knife, field compressive strength test shows no reaction.	(10:30-11:00)
54				4+	-50.2 to -52.2 ft, predominately 0 to 20 deg, joints, some vertical joints.			
55				5+	-52.2 to -54.3 ft, randomly oriented joints, 10 to 60 deg., planar, rough, intensely to highly fractured, secondary mineralization.			Blasting previously conducted in the area.
56				6+				
57								
58								
59								
60								
61								
62								
63								

End boring at El.-54.3 ft (CRD).



**CH2MHILL**

**PROJECT NUMBER: 159184.B1.CD**

**BORING NUMBER: DH-88-1**  
Sheet: 1 of 1

# ROCK CORE LOG

## **PROJECT: Columbia River Channel Deepening**

**LOCATION:** River Mile 88

**BARGE ELEVATION: 3.3 ft CRD**

**DRILLING CONTRACTOR:** Geotech Explorations, Tualatin, OR

**DRILLING METHOD AND EQUIPMENT: HQ-triple core barrel - CME-75**

**ORIENTATION:** Vertical

#### **WATER LEVEL: Fluctuating**

**START: 8/21/00**

FINISH: 8/21/00

LOGGER: H. Guettel



**CH2MHILL**

**PROJECT NUMBER: 159184.B1.CD**

**BORING NUMBER: DH-88-2**

Sheet: 1 of 1

## **ROCK CORE LOG**

## **PROJECT: Columbia River Channel Deepening**

**LOCATION:** River Mile 88

**BARGE ELEVATION: 3 to 3.3 ft CRD**

**DRILLING CONTRACTOR:** Geotech Explorations, Tualatin, OR

#### **DRILLING METHOD AND EQUIPMENT: HQ-triple core barrel - CME-75**

**ORIENTATION:** Vertical

#### **WATER LEVEL:** Fluctuating

START: 8/18/00

**FINISH: 8/18/00**

LOGGER: H. Guettel

## **APPENDIX C**

# **Photographs**

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## **Test Pits**

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# Test Pits



**"Sea Vulture"—Barge Used for  
Test Pits and Jet Probe Holes**

IMG001.JPG

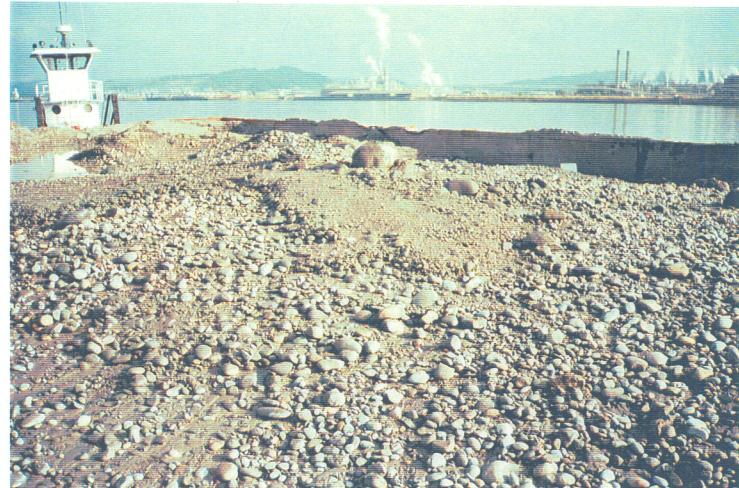


**"Sea Vulture"**

IMG002.JPG

## Test Pits

---



**Materials Encountered in TP-1**

IMG003.JPG



**Materials Encountered in TP-5**

IMG006.JPG

## Test Pits

---



**Materials Encountered in TP-7**

IMG008.JPG



**Materials Encountered in TP-8**

IMG009.JPG

## Test Pits

---



**Materials Encountered in TP-11**

IMG010.JPG



**Materials Encountered in TP-30**

IMG011.JPG

## Test Pits

---



**Materials Encountered in TP-30**

IMG012.JPG



**Materials Encountered in TP-19**

IMG015.JPG

## Test Pits

---



**Materials Encountered in TP-19**

IMG016.JPG



**Materials Encountered in TP-22**

IMG017.JPG

## Test Pits

---



**Materials to Be Returned to the Water**

IMG018.JPG



**Materials Encountered in TP-21**

IMG019.JPG

## Test Pits

---



**Materials Encountered in TP-23**

IMG021.JPG



**Tugboat "Nova"**

IMG022.JPG

## Test Pits

---



**Dozer Piling up Material from TP-13**

IMG023.JPG



**Materials Encountered in TP-15**

IMG024.JPG

## Test Pits

---



**Clamshell Bucket Recovering Material from TP-31**  
IMG025.JPG



**Materials Encountered in TP-18**  
IMG026.JPG

## Test Pits

---



**Materials Encountered in TP-25**

IMG027.JPG



**Materials Encountered in TP-26**

IMG028.JPG

# Test Pits

---



**Materials Encountered in TP-32**

IMG029.JPG



**Materials Encountered in TP-29**

IMG031.JPG

## Test Pits

---



**Materials Encountered in TP-36**  
BOULDER2.JPG



**Materials Encountered in TP-36**  
BOULDERS1.JPG

## Test Pits

---



**Barge Crew Marking Cable of Clamshell Bucket in  
1-Foot Increments**

CABLE\_MARKING.JPG

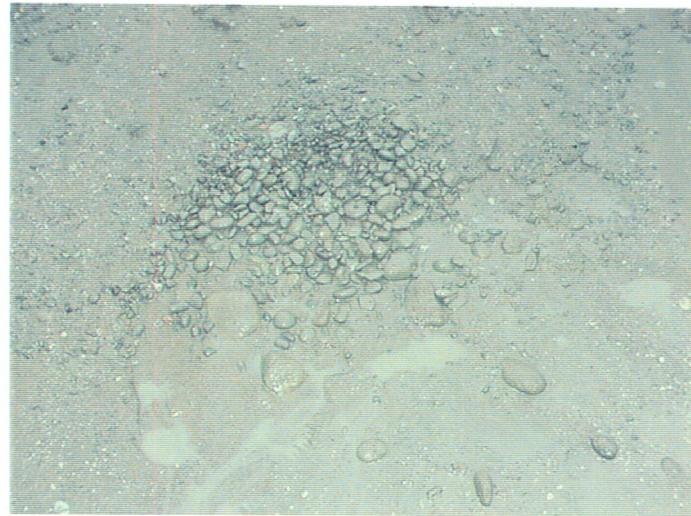


**Derrick and Flattop Barge Used for Test Pits**

DERRICKNFLATTOP.JPG

## Test Pits

---



**Materials Encountered in TP-40**  
GRAVELS.JPG



**Flattop Barge and Tugboat ("Nova")**  
DUMP\_BARGE\_SMALL\_TUG.JPG

## Test Pits

---



**Materials Encountered in TP-38**  
RIVER\_GRAVEL2.JPG



**Materials Encountered in TP-38**  
RIVER\_GRAVEL1.JPG

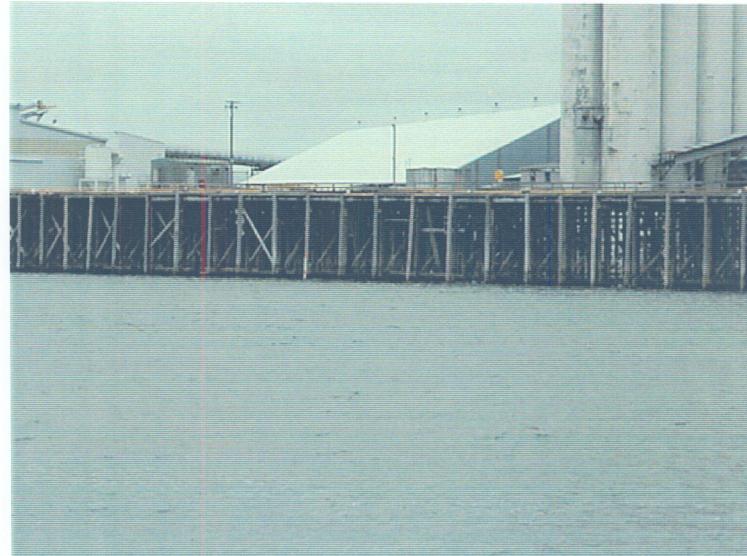
## Test Pits

---



**Materials Encountered in TP-36**

ROCK.JPG



**Staff Gauge**

STAFF\_GAGE.JPG

## Test Pits

---



**Materials Encountered in TP-39**

TP\_.JPG



**Tree Stump in TP-39**

TP\_STUMP.JPG

## Test Pits

---



**Materials Encountered in TP-40**  
TP40.JPG



**Materials Encountered in TP-40**  
TP40\_2.JPG

## **Jet Probes**

# Jet Probes



**Jet Probe Pipe and Water Hose Assembly**

R010001.JPG

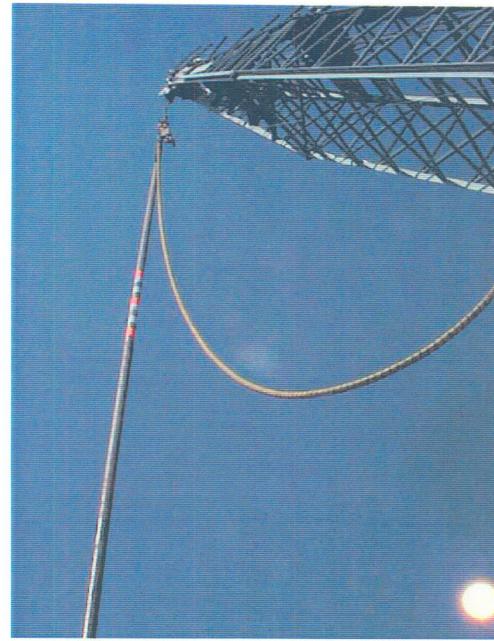


**Jet Probe Pressure Produced from 175-psi Pump Pressure**

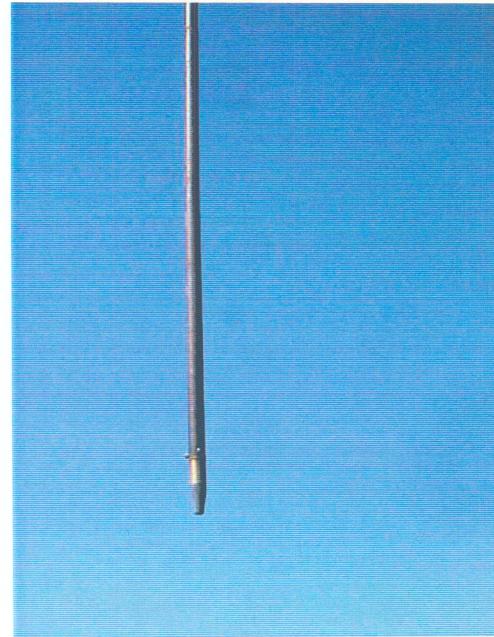
R010005.JPG

# Jet Probes

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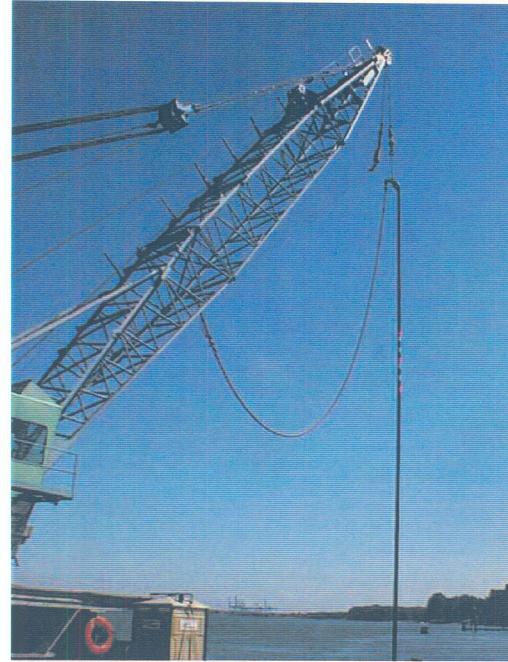
**Jet Probe Attached to Tip of Boom**  
R0100006.JPG



**Jet Probe Nozzle**  
R0100008.JPG

# Jet Probes

---



**Jet Probe Operations Setup**  
R01000015.JPG



**4600 Manitowoc Derrick, "Sea Vulture"**  
R01000016.JPG

## Jet Probes

---

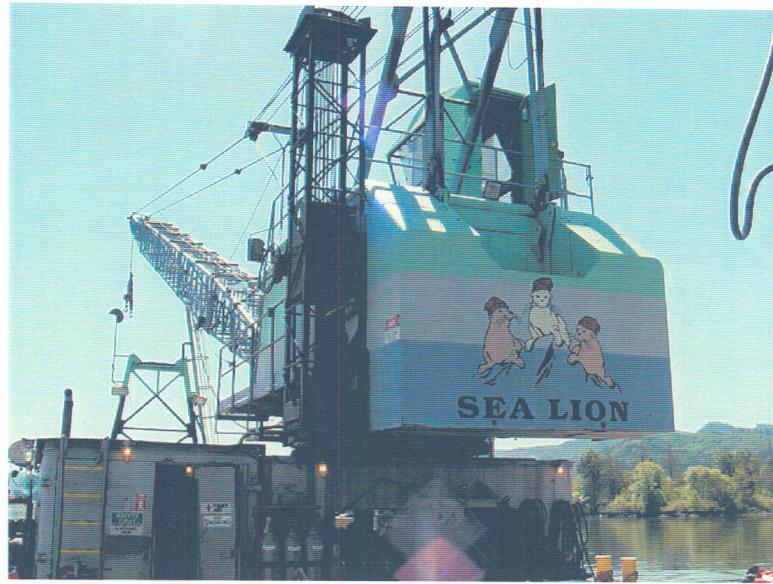


**Pump Used for Jet Probe Operations**

R01000017.JPG

## **Core Drilling**

# Core Drilling



**"Sea Lion" Derrick Barge**

DSC00133.JPG



**Motorboat Used to Get onto Barge**

DSC00132.JPG

# Core Drilling

---



**Tugboat "Viking"**

DSC00135.JPG



**Drill Setup**

DSC00134.JPG

# Core Drilling

---



**Drill Rig Setup**

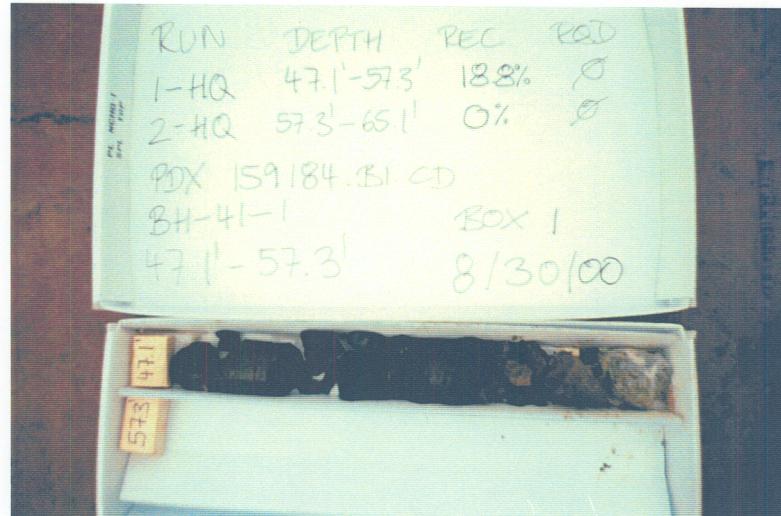
DSC00145.JPG



**Drill Rig**

IMG067.JPG

# Core Drilling



DH-41-1, 47.1 to 57.3 feet, Box 1

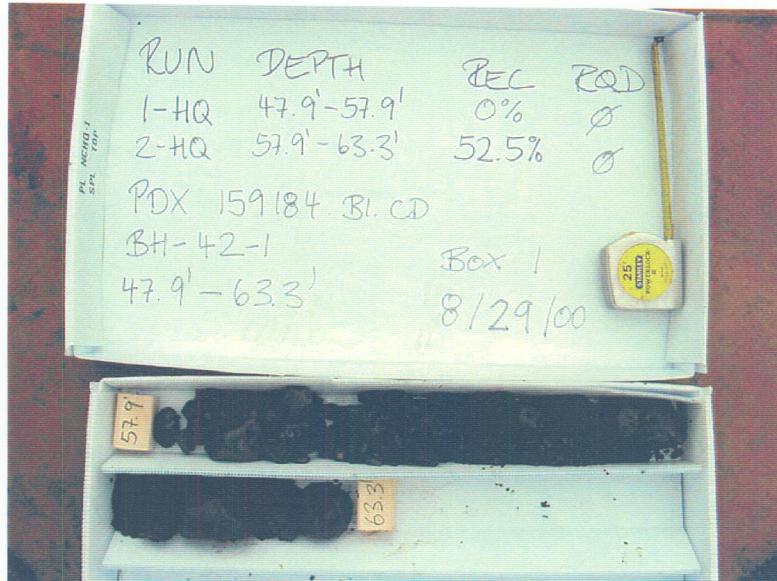
IMG058.JPG



DH-41-2, 47.5 to 63.5 feet, Box 1

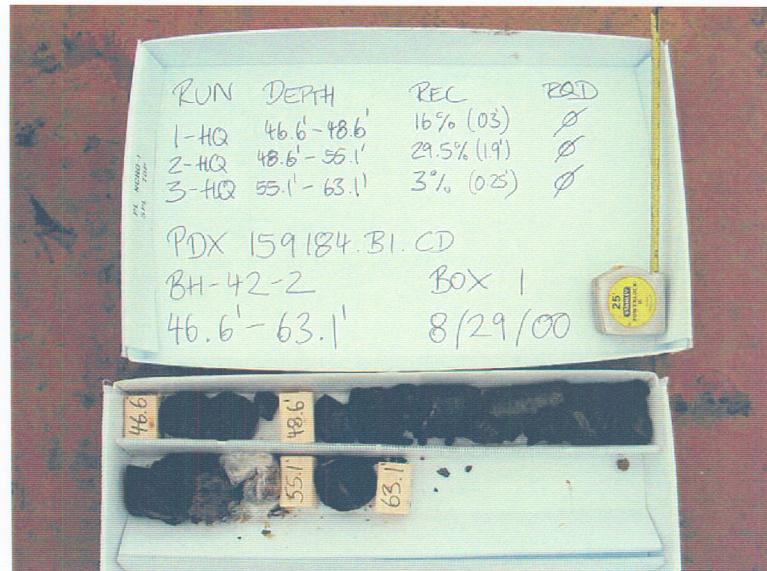
IMG149.JPG

# Core Drilling



DH-42-1, 47.9 to 63.3 feet, Box 1

DSC00142.JPG



DH-42-2, 46.6 to 63.1 feet, Box 1

DSC00140.JPG

# Core Drilling



**DH-42-5, 51 to 64.5 feet, Box 1**

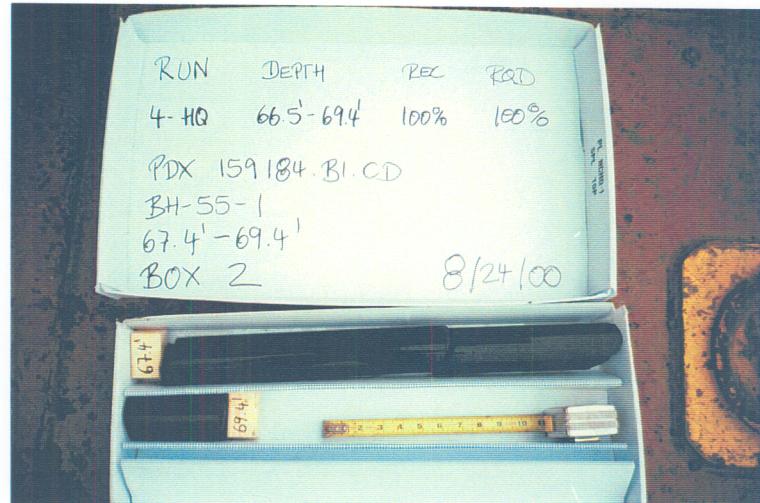
DSC00139.JPG



**DH-55-1, 51.5 to 67.4 feet, Box 1**

IMG069.JPG

# Core Drilling



DH-55-1, 67.4 to 69.4 feet, Box 2  
IMG070.JPG



DH-87-1, 46 to 54.3 feet, Box 1  
IMG040.JPG

# Core Drilling



**DH-87-1, 53.3 to 56.2 feet, Box 2**

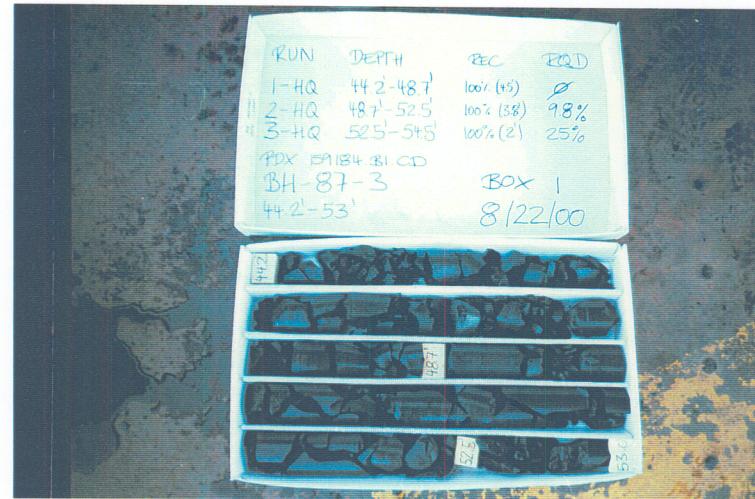
IMG042.JPG



**DH-87-2, 43 to 51.3 feet, Box 1**

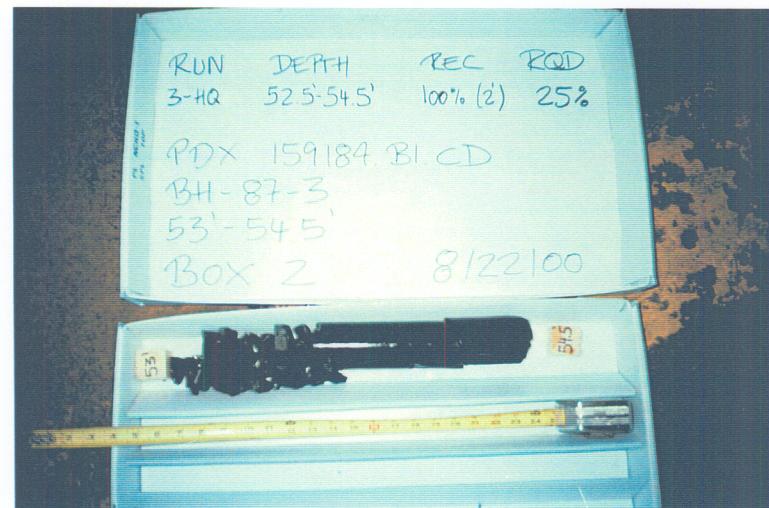
IMG073.JPG

# Core Drilling



DH-87-3, 44.2 to 53 feet, Box 1

IMG071.JPG



DH-87-3, 53 to 54.5 feet, Box 2

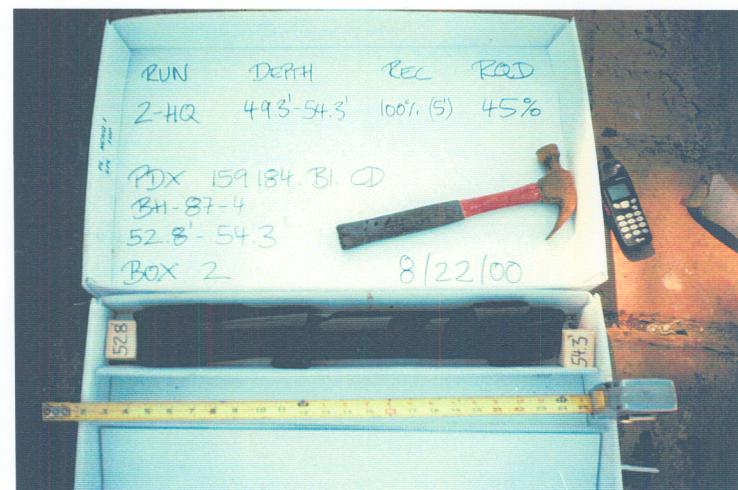
IMG076.JPG

# Core Drilling



DH-87-4, 44.3 to 52.8 feet, Box 1

IMG037.JPG



DH-87-4, 52.8 to 54.3 feet, Box 2

IMG039.JPG

# Core Drilling



DH-88-1, 46.2 to 54.2 feet, Box 1

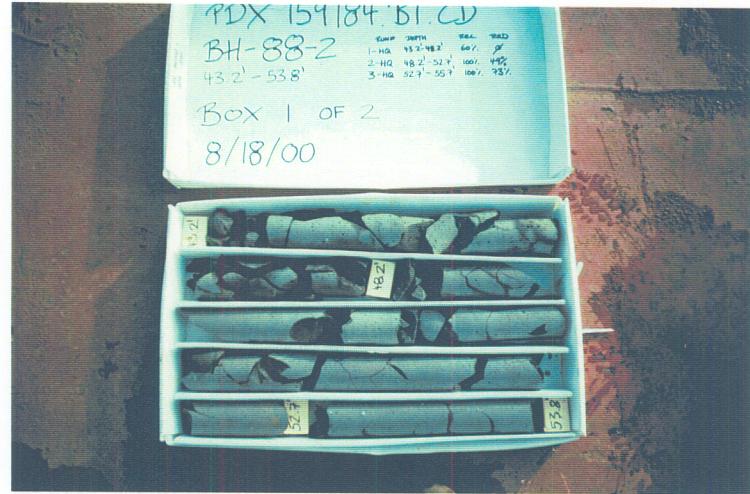
IMG055.JPG



DH-88-1, 54.2 to 56.2 feet, Box 2

IMG048.JPG

# Core Drilling



DH-88-2, 43.2 to 53.8 feet, Box 1

IMG057.JPG



DH-88-2, 53.8 to 55.7 feet, Box 2

IMG053.JPG

## **APPENDIX D**

# **Contour Maps**

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The following maps are for those exploration areas where 10 or more explorations were conducted.

The contours shown are estimated based on explorations, whether drill holes or jet probes, which indicated a top of rock elevation (based on the core sample if a drill hole or refusal if a jet probe).

The elevation of the jet probe refusal or the drill hole core top of rock are indicated.

If refusal was not encountered, the bottom elevation of the jet probe is indicated.

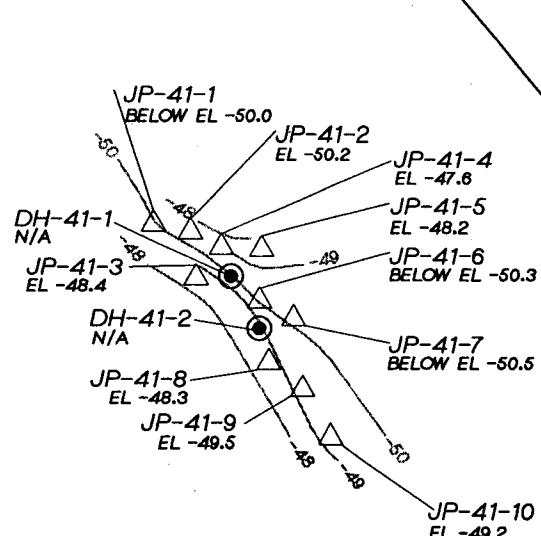
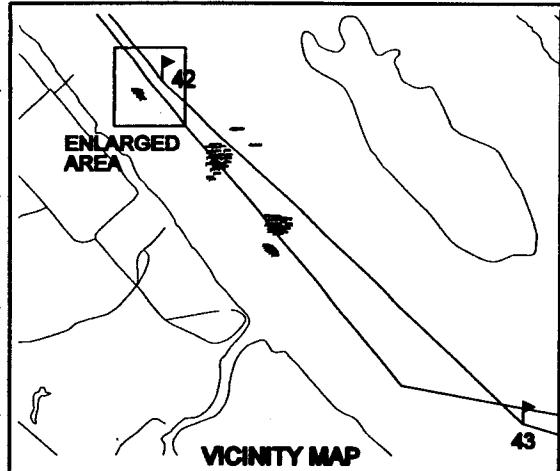
If the drill hole did not encounter rock, it is indicated with a N/A.

The contour locations are based on our judgement and should be used with caution.

US ARMY CORPS OF ENGINEERS  
PORTLAND DISTRICT

**AREA 42.5  
SHEET 1 OF 3**

**COLUMBIA RIVER CHANNEL DEEPENING  
PED EXPLORATIONS**



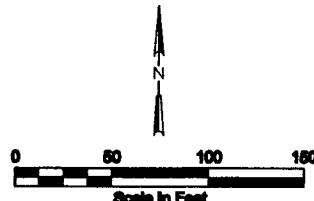
**LEGEND:**

- ▶ RIVERMILES
- DRILL HOLE
- △ JET PROBE
- TEST PIT

EL -48.3 JET PROBE REFUSAL ELEVATION

(EL -47.0) TOP OF BEDROCK ELEVATION.

N/A NOT APPLICABLE, NO REFUSAL OR  
BEDROCK ENCOUNTERED



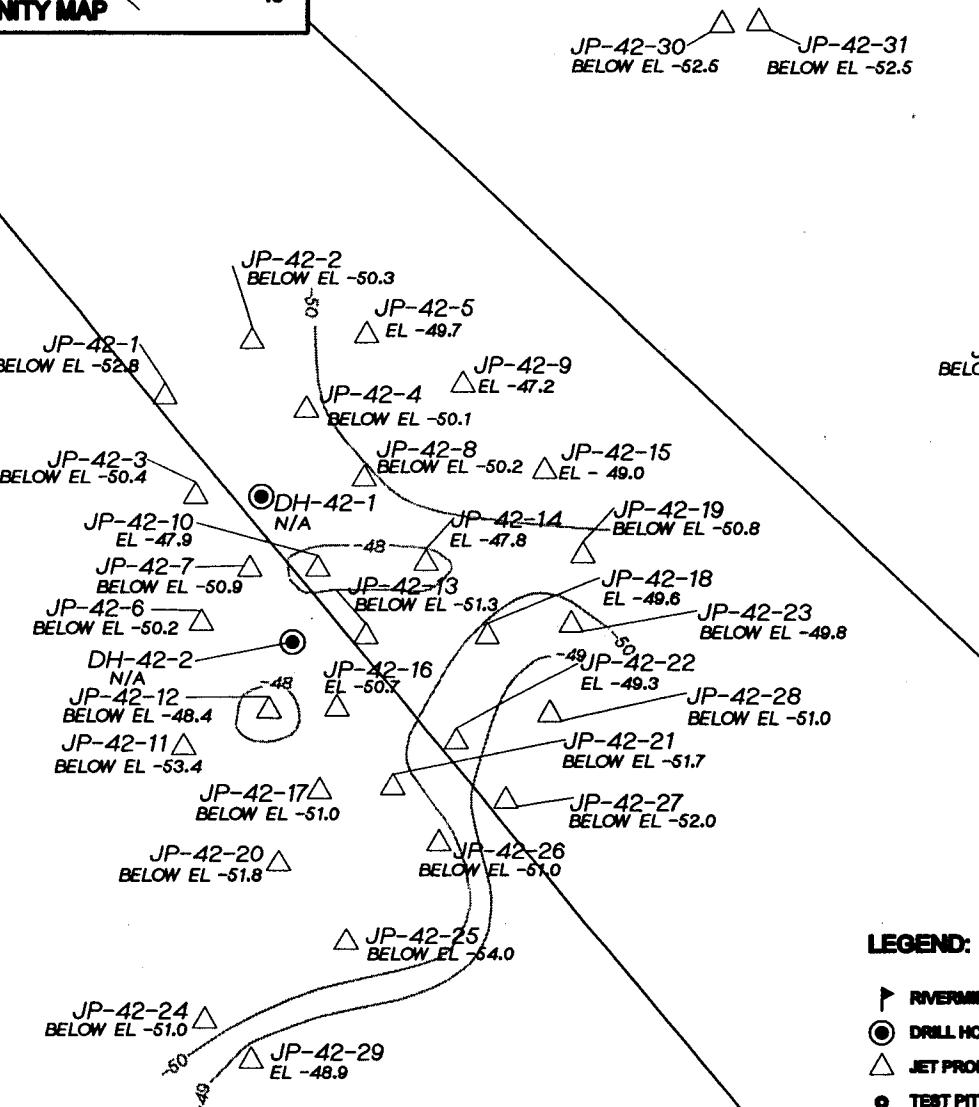
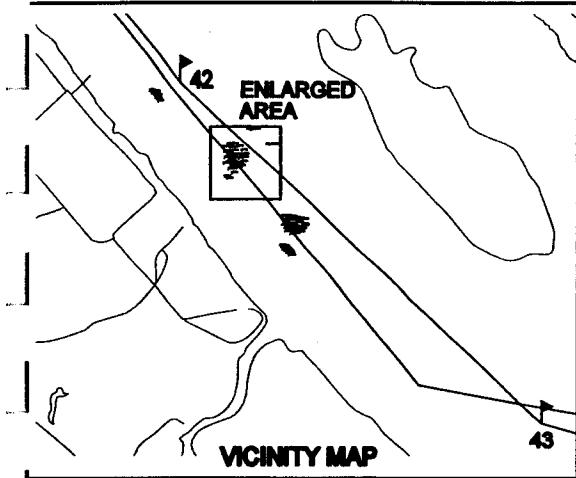
PROJECTION: STATE PLANE, OREGON NORTH  
ZONE, NAD 27.  
PRODUCED BY GIS, SURVEY AND MAPPING  
SECTION, CENWP-EC-HM

P:\MONTGOM\784CAD\60784-005.dgn 08-NOV-2000

**CH2MHILL**

**AREA 42.5  
SHEET 2 OF 3**

**COLUMBIA RIVER CHANNEL DEEPENING  
PED EXPLORATIONS**



**LEGEND:**

- RIVERMILES
- DRILL HOLE
- △ JET PROBE
- TEST PIT

EL -48.3 JET PROBE REFUSAL ELEVATION  
(EL -47.0) TOP OF BEDROCK ELEVATION.

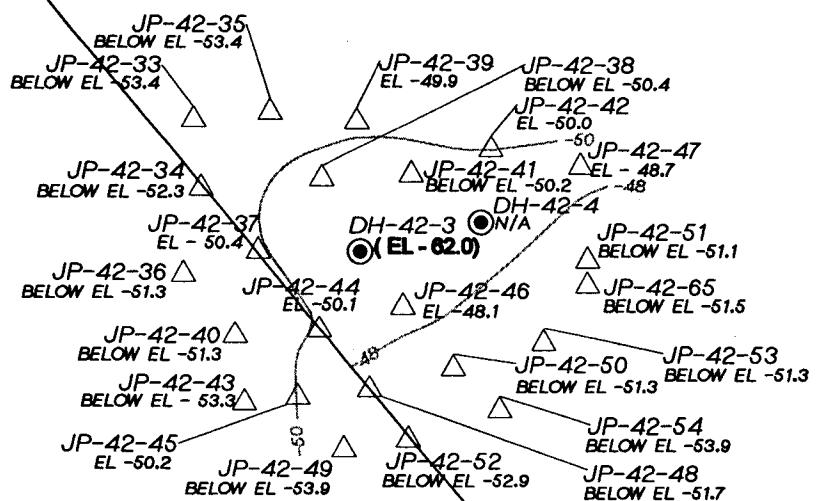
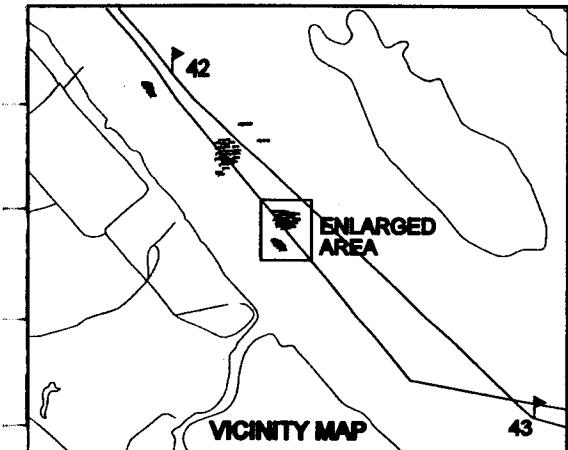
N/A NOT APPLICABLE, NO REFUSAL OR  
BEDROCK ENCOUNTERED

0 50 100 150  
Scale In Feet

US ARMY CORPS OF ENGINEERS  
PORTLAND DISTRICT

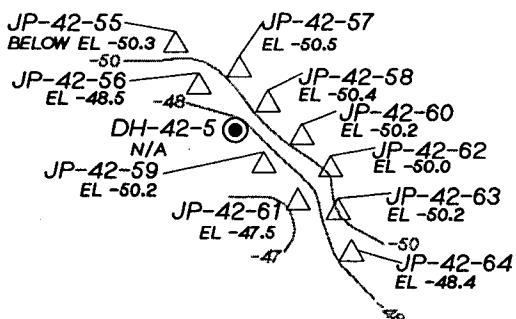
**AREA 42.5  
SHEET 3 OF 3**

**COLUMBIA RIVER CHANNEL DEEPENING  
PED EXPLORATIONS**



WASHINGTON  
OREGON

NO BEDROCK  
EXPECTED ABOVE  
EL -50



**LEGEND:**

- RIVERMILES
- DRILL HOLE
- △ JET PROBE
- ◎ TEST PIT

EL -48.3 JET PROBE REFUGAL ELEVATION

(EL -47.0) TOP OF BEDROCK ELEVATION.

N/A NOT APPLICABLE, NO REFUGAL OR  
BEDROCK ENCOUNTERED

0 50 100 150  
Scale In Feet

PROJECTION: STATE PLANE, OREGON NORTH  
ZONE, NAD 27.  
PRODUCED BY GIS, SURVEY AND MAPPING  
SECTION, CENNWP-EC-HM

P:\\MONTGOM\\754\\CAD\\60764-01.dgn 08-NOV-2000

**CH2MHILL**

US ARMY CORPS OF ENGINEERS  
PORTLAND DISTRICT

**AREA 58**  
**SHEET 1 OF 2**

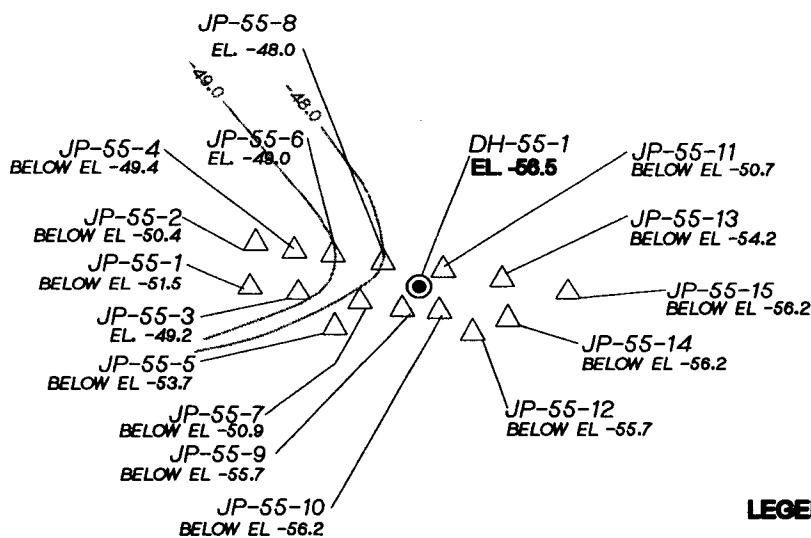
**COLUMBIA RIVER CHANNEL DEEPENING**  
**PED EXPLORATIONS**

WASHINGTON

ENLARGED  
AREA

OREGON

VICINITY MAP



**LEGEND:**

- RIVERMILES
- DRILL HOLE
- △ JET PROBE
- TEST PIT

EL -48.3 JET PROBE REFUSAL ELEVATION  
(EL -47.0) TOP OF BEDROCK ELEVATION.

N/A NOT APPLICABLE, NO REFUSAL OR  
BEDROCK ENCOUNTERED

**AREA 88**  
**SHEET 1 OF 2**

**COLUMBIA RIVER CHANNEL DEEPENING  
PED EXPLORATIONS**

ENLARGED AREA

VICINITY MAP

0 50 100 150  
Scale in Feet

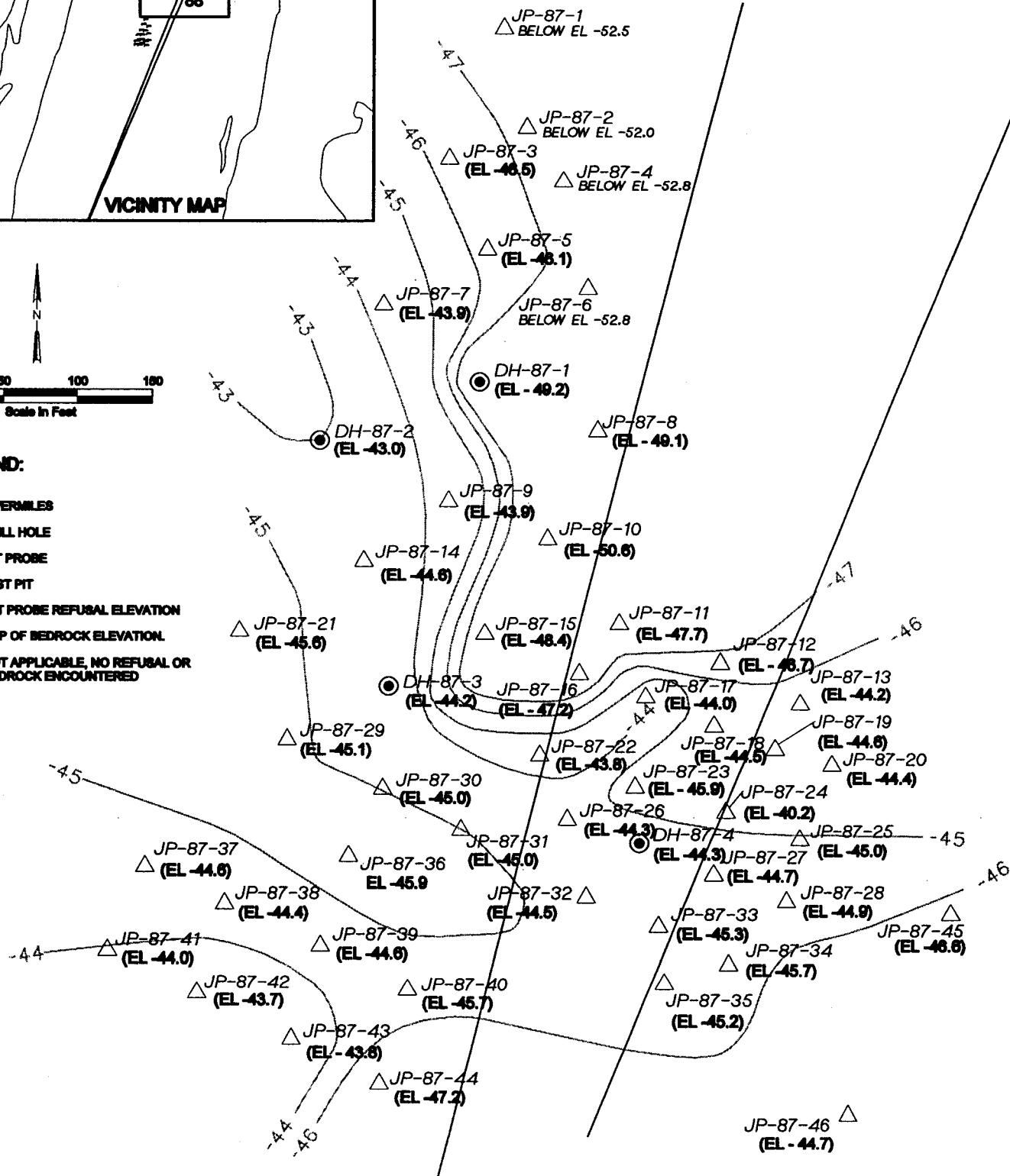
**LEGEND:**

- RIVERMILES
- DRILL HOLE
- △ JET PROBE
- TEST PIT

EL -48.3 JET PROBE REFUSAL ELEVATION

(EL -47.0) TOP OF BEDROCK ELEVATION.

N/A NOT APPLICABLE, NO REFUSAL OR  
BEDROCK ENCOUNTERED



**AREA 88**  
**SHEET 2 OF 2**

**COLUMBIA RIVER CHANNEL DEEPENING**  
**PED EXPLORATIONS**

ENLARGED  
AREA

VICINITY MAP

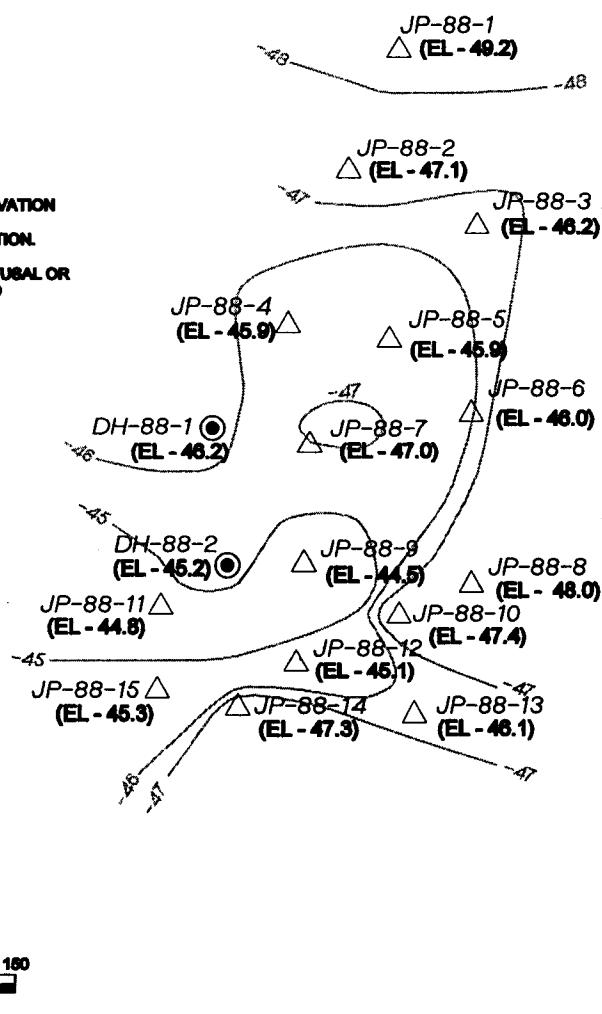
**LEGEND:**

- RIVERMILES
- DRILL HOLE
- △ JET PROBE
- TEST PIT

EL -48.3 JET PROBE REFUSAL ELEVATION

(EL - 47.0) TOP OF BEDROCK ELEVATION.

N/A NOT APPLICABLE, NO REFUSAL OR  
BEDROCK ENCOUNTERED



**LEGEND:**

- RIVERMILES
- DRILL HOLE
- △ JET PROBE
- TEST PIT