UNIFIED SOIL CLASSIFICATION
INCLUDING IDENTIFICATION AND DESCRIPTION

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 3 inches and basing fractions on estimated weights)				GROUP SYMBOLS	TYPICAL NAMES	INFORMATION REQUIRED FOR DESCRIBING SOILS
COARSE GRAINED SOILS More than half of material is larger than No. 200 sieve size 12 (For visual classifications, the " size may be used as equivalent to the No. 4 sieve size)	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.	GW	Well graded gravel's, gravel–sand mixtures; little or no fines	Give typical name; indicate approximate percentages of sand and gravel; max. size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information, and symbol in parentheses.
			Predominantly one size or a range of sizes with some intermediate sizes missing.	GP	Poorly graded gravel's, gravel–sand mixtures; little or no fines	
		GRAVELS WITH FINES (Appreciable amount of fines)	Non–plastic fines (for identification procedures see ML below).	GM	Silty gravels, poorly graded gravel–sand–silt mixtures	
			Plastic fines (for identification procedures see CL below).	GC	Clayey gravels, poorly graded gravel–sand–clay mixtures	For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics.
	SANDS More than half of coarse fraction is smaller than No. 4 sieve size	CLEAN SANDS (Little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.	SW	Well graded sands, gravely sands; little or no fines	
			Predominantly one size or a range of sizes with some intermediate sizes missing.	SP	Poorly graded sands, gravely sands; little or no fines	EXAMPLE:– Silty Sand, gravely; about 20% hard, angular gravel particles ½ – inch maximum size; rounded and subangular sand grains coarse to fine; about 15% non–plastic fines with low dry strength; well compacted and moist in place; alluvial sand; (SM).
		SANDS WITH FINES (Appreciable amount of fines)	Non–plastic fines (for indentification procedures see ML below).	SM	Silty sands, poorly graded sand–silt mixtures	
			Plastic fines (for identification procedures see CL below).	SC	Clayey sands, poorly graded sand–clay mixtures	
FINE GRAINED SOILS More than half of material is smaller than No. 200 sieve size (The No. 200 sieve size is about the smallest particle visible to the naked eye)	IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN No 40 SIEVE SIZE					
		DRY STRENGTH (Crushing Characteristics)	DILATANCY (Reaction to skaking)	TOUGHNESS (Consistency near Plastic Limit)		
	SILTS AND CLAYS Liquid limit less than 50	None to slight	Quick to slow	None	ML	Inorganic silty and very fine sands, rock flour, silty or clayey fine sands with slight plasticity
		Medium to high	None to very slow	Medium	CL	Inorganic clays to low to medium plasticity, gravely clays, sandy clays, silty clays, lean clays
		Slight to medium	Slow	Slight	OL	Organic silts and organic silt–clays of low plasticity
	SILTS AND CLAYS Liquid limit greater than 50	Slight to medium	Slow to none	Slight to medium	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		High to very high	None	High	CH	Inorganic clays of high plasticity, fat clays
		Medium to high	None to very slow	Slight to medium	OH	Inorganic clays of medium to high plasticity
HIGHLY ORGANIC SOILS		Readily identified by color, odor, spongy feel and frequently by fibrous texture.			PT	Peat and other highly organic soils

Give typical name; degree and character of plasticity, amount and maximum size of coarse grains; color in wet condition, odor in any, local or geologic name, and other pertinent descriptive information; and symbol in parentheses.

For undisturbed soils add information on structure, stratification, consistency in undisturbed and remolded states. Moisture and drainage conditions.

EXAMPLE:– Clayey Silt, brown; slightly plastic. small percentage of fine sand. numerous vertical root holes, firm and dry in place, loess, (ML).

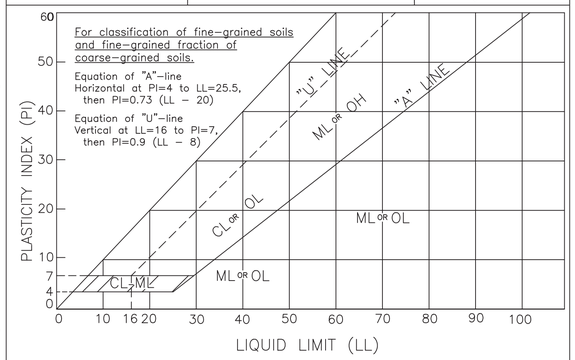
LABORATORY CLASSIFICATION CRITERIA

Use grain size curve identifying the fractions as given under field identification

Determine percentages of gravel and sand from grain size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse grained soils are classified as follows:

Less than 5% GW, GP, SW, SP
More than 12% GM, GC, SM, SC
5% to 12% Bordering cases requiring use of dual symbols.

$C_V = \frac{D_{60}}{D_{10}}$ Greater than 4; $C_C = \frac{(D_{30})2}{D_{10}\ Dep}$ Between one and 3	
Not meeting all gradation requirements for GW	
Atterberg limits below "A" line or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols.
Atterberg limits above "A" line with PI greater than 7	
$Cv = \frac{D\ 60}{D\ 10}$ Greater than 6; $Cc = \frac{(D\ 30)2}{D\ 10\ Dep}$ Between one and 3	
Not meeting all gradation requirements for SW	
Afterberg limits below "A" line or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols.
Afterberg limits above "A" line with PI greater than 7	



FOR LABORATORY CLASSIFICATION OF FINE GRAINED SOILS

* Boundary classifications: – Soils processing characteristics of two groups are designated by combinations of group symbols for Example GW–GC, well graded gravel mixture with clay binder

* All sieve sizes on this chart are US standard.

FIELD IDENTIFICATION PROCEDURES FOR FINE GRAINED SOILS OR FRACTIONS

These procedures are to be performed on the minus No. 40 sieve size particles, in for field classification purposes, screening is not intended, simply remove by hand the coarse particles that interfere with the tests.

DILATANCY (Reaction to shaking)

After removing particles larger than No 40 sieve sieve, prepare a pat striking vigorously against the other of moist soil with a volume of about one–half cubic inch. Add enough water if necessary to make the soil soft but not sticky.

Place the pot in the open palm of one hand and shake horizontally, hand several times. A positive reaction consists of the appearance of water on the surface of the pot which changes to a livery consistency and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface, the pot stiffens, and finally it cracks or crumbles. The rapidity of appearance of water during shaking and of its disappearance during squeezing assist in identifying the character of the times in a soil.

Very fine clean sands give the quickest and most distinct reaction whereas a plastic clay has no reaction inorganic silts, such as a typical rock flour, show a moderately quick reaction.

DRY STRENGTH (Crushing Characteristics)

After removing particles larger than No. 40 sieve size, mold a pot of soil to the consistency of putty, adding water if necessary. Allow the pot to dry completely by oven, sun, or air drying and then test its strength by breaking and crumbling between the fingers. This strength is a measure of the character and quantity of the colloidal fraction contained in the soil. The dry strength increases with increasing plasticity.

High dry strength is characteristic for clays of the CH group A typical inorganic silt possesses only very slight dry strength Silty fine sands and silts have about the same slight dry strength, but can be distinguished by the feel when powdering the dried specimen. Fine sand feels gritty whereas a typical silt has the smooth feel of flour.

Letter symbols in the logs, are group symbols of the Unified soil classification system based on field indent. Copies of Drawing No. 103–D–347, Unified Soil Classification, may be obtained on request office of Director of Design and Construction. Bureau of Reclamation, Denver, Colorado R0225.

TOUGHNESS (Consistency near plastic limit)

After removing particles larger than No. 40 sieve size, a specimen of soil about one–half inch cube in size is molded to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to lose some moisture by evaporation. Then the specimen is rolled out by hand on a smooth surface or between the palms into a thread about one–eighth inch in diameter. The thread is then folded and rerolled repeatedly. During this manipulation, the moisture content is gradually reduced and the specimen stiffens, finally loses its plasticity, and crumbles when the plastic limit is reached.

After the thread crumbles, the pieces should be lumped together and a slight kneading action continued until the lump crumbles.

The tougher the thread near the plastic limit and the stiffer the lump when it finally crumbles, the more potent is the colloidal clay fraction in the soil weakness of the thread at the plastic limit and quick loss of coherence of the lump below the plastic limit indicate either inorganic clay of low plasticity, or materials such as kaolin – type clays and organic clays which occur below the A–line.

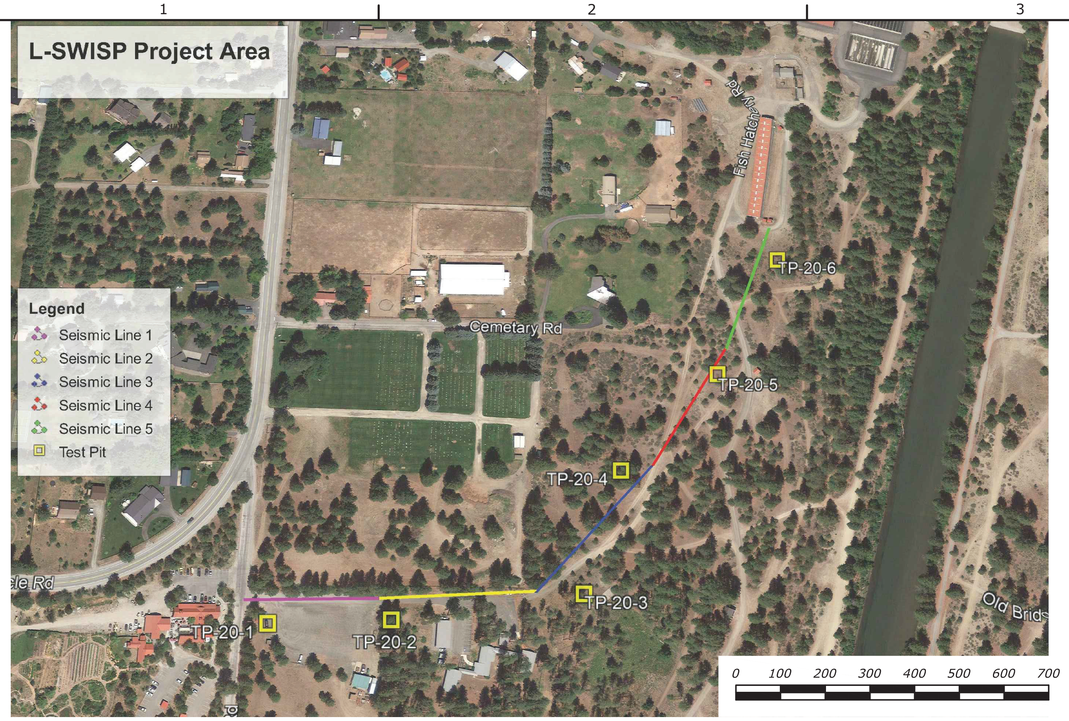
Highly organic clays have a very weak and spongy feel at the plastic limit.

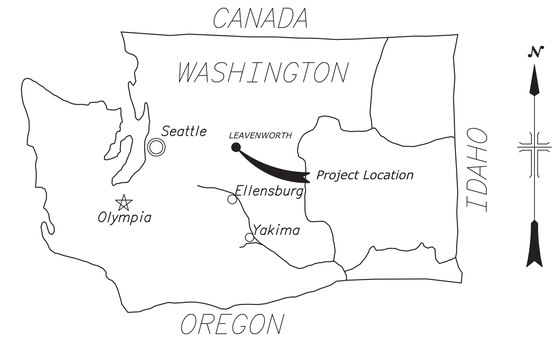
ADOPTED BY – CORPS OF ENGINEERS AND BUREAU OF RECLAMATION 1952

REV NO		
2	2016-03-31 D C.F.S.	FIXED OFFICIAL RENDITION, FONT SPACING AND OTHER VISUAL ONLY ASPECTS.
1	2003– 12 –02 D – G.T.	REVISED PLASTICITY CHART. REDRAWN WITH AUTOCAD SOFTWARE.

DATE AND TIME PLOTTED 12–05–2003
PLOTTED BY Ray Dunbar

103–D–347

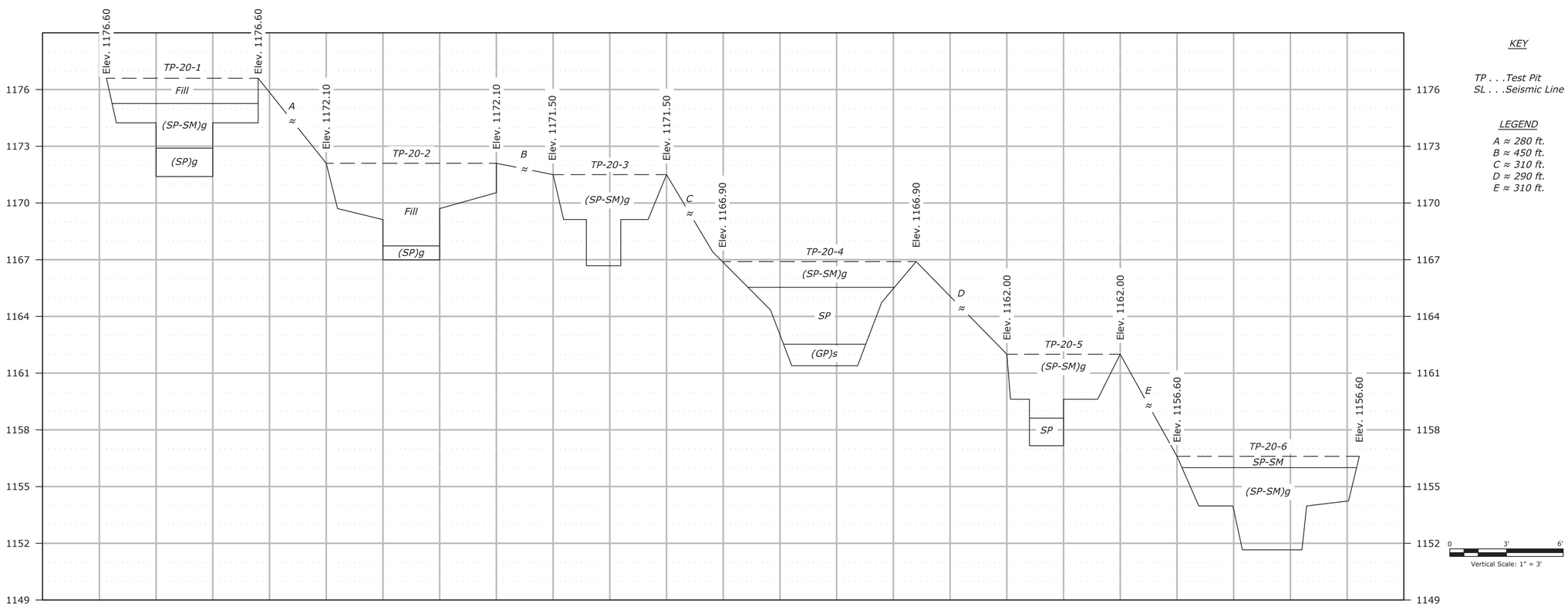




VICINITY MAP
NOT TO SCALE

NOTE:

1. *Review Geologic report, dated: 10/07/2020 for Seismic Line data.*
2. *See dwg -60001 for Seismic line profiles.*
3. *All soil classifications are from field visual analysis.*



KEY

TP . . .Test Pit
SL . . .Seismic Line

LEGEND

A ≈ 280 ft.
B ≈ 450 ft.
C ≈ 310 ft.
D ≈ 290 ft.
E ≈ 310 ft.

BUREAU OF RECLAMATION

ALWAYS THINK SAFETY

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

LEAVENWORTH FISHERIES COMPLEX
U.S. FISH & WILDLIFE SERVICE

LEAVENWORTH NATIONAL FISH HATCHERY

TEST PITS TP-20-1 THRU TP-20-6

Draft Release Only
Not For Distribution

X
DESIGNED Rey Leija
DRAWN Aleksandre Canner
CHECKED
TECH. APPR.
APPROVED
ADMIN APPROVAL -
BOISE, ID 2020-10-02

TEST PITS TP-20-1 THRU TP-20-6

3712-100-60000

SHEET 1

LAST SAVED DATE 2020-10-02
LAST SAVED BY RLEIJA

CAD SYSTEM AutoCAD 23.1S (LMS TECH)
CAD FILENAME 3712-100-60000-RD-1.DWG

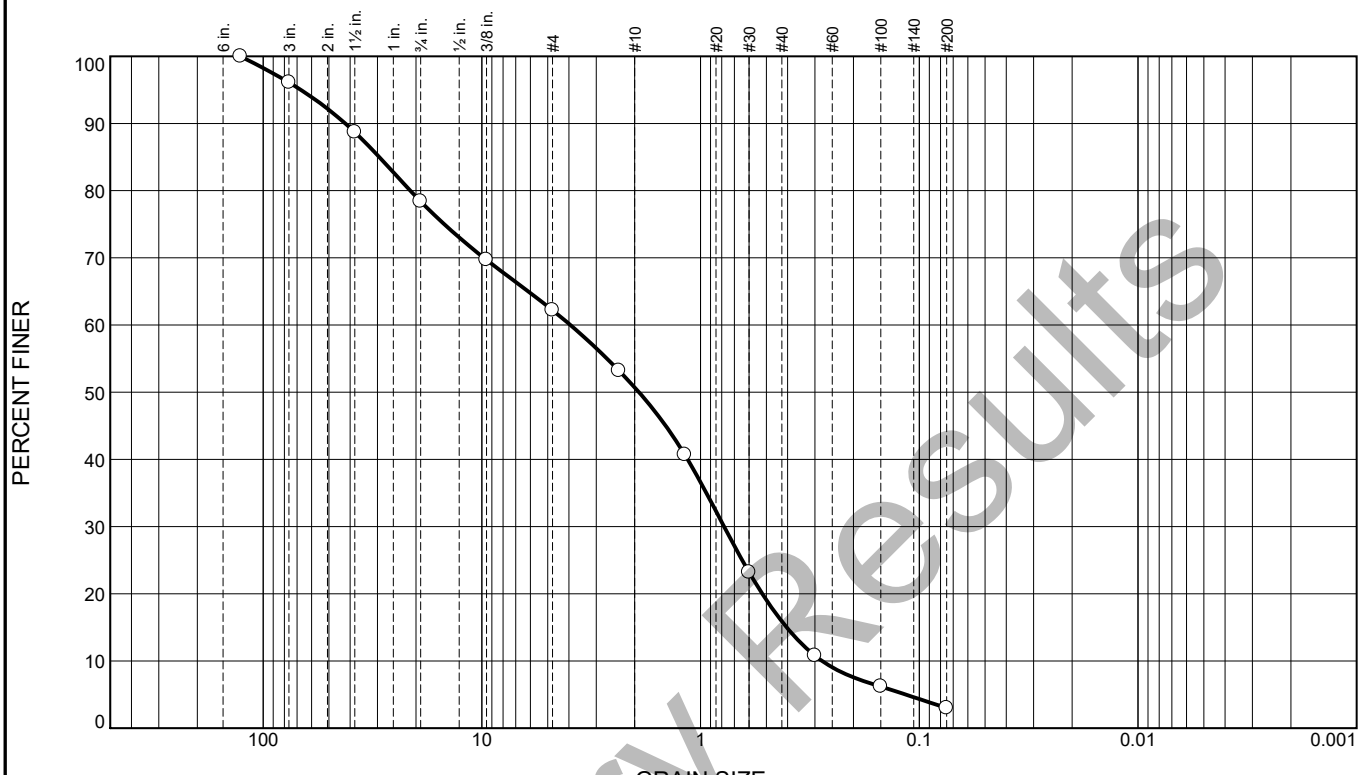
Bureau Of Reclamation	TEST PIT LOG	Hole No.	TP-20-1

Feature: Leavenworth National Fish Hatchery
Project: Columbia Basin
Location: Along pipeline route
Ground Elevation: 1176.6 ft.
Coordinates: 47.55329 (**Northing**) -120.67986 (**Easting**)
Method of Exploration: Caterpillar 308E excavator
Datum: WGS 84, decimal degrees
Logged By: A. Canner
Water Encountered: none
Approx. Dimensions: 20L x 20W x 8.4D Feet
Date Of Exploration: 7/10/2020

FIELD CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000,5005)	% PLUS 3-INCH BY VOLUME		
		3-5 INCH	5-12 INCH	PLUS 12 INCH
(SM)g 0.0 to 2.1	**0.0 to 2.1 ft.: SILTY SAND WITH GRAVEL (SM)g:** About 60% fine to coarse, hard, angular to subangular sand; about 25% fines; about 15% fine to coarse, hard, angular to subangular gravel. **IN PLACE CONDITIONS**: maximum size, 2 inches; loosely compacted; dry; light brown to orange brown; no reaction with HCl.	0	0	0
c(SP-SM)g 2.1 to 6.1	**2.1 to 6.1 ft.: COBBLEY POORLY GRADED SAND WITH SILT AND GRAVEL c(SP-SM)g:** About 70% fine to coarse, hard, angular to subangular sand; about 20% fine to coarse, hard, rounded to subrounded gravel; about 10% fines. **TOTAL SAMPLE (BY VOLUME)**: About 15 % 3- to 5-inch, hard, rounded to subrounded cobbles. Trace 5 to 12-inch, hard, rounded to subrounded cobbles. **IN PLACE CONDITIONS:** Maximum size; 7 inches; loosely compacted; moist; light brown to orange brown; no reaction with HCl.	15	0	0
(SP)g 6.1 to 8.4	**6.1 to 8.4 ft.: POORLY GRADED SAND WITH GRAVEL (SP)g:** About 75% fine to coarse, hard, angular to subangular sand; about 25% fine to coarse, hard, rounded to subrounded gravel. **IN PLACE CONDITIONS:** maximum size; 2 inches, moist; light brown; no reaction with HCl.	0	0	0

NOTES
The mini excavator utilized a 3-foot-wide toothed all purpose bucket. Coordinates collected using recreational grade GPS.

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
3.9	17.7	16.2	11.5	34.8	12.9	3.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5"	100.0		
3"	96.1		
1-1/2"	88.7		
3/4"	78.4		
3/8"	69.7		
#4	62.2		
#8	53.2		
#16	40.7		
#30	23.2		
#50	10.8		
#100	6.2		
#200	3.0		

* (no specification provided)

Material Description

TP-20-1

poorly graded sand with gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Classification

USCS= SP AASHTO= A-1-b

Remarks

Assumed NP for USCS Classification

Source of Sample: TP Super Sacks **Depth:** 8.4-9.9
Sample Number: 73Q-6 **Date:**

BUREAU OF RECLAMATION

Denver, Colorado

Client: US Fish and Wildlife
Project: Leavenworth National Fish Hatchery

Project No: 73Q **Figure**

Tested By: Pfeifer **Checked By:** Brusak

Preliminary Results

Bureau Of Reclamation	TEST PIT LOG	Hole No.	TP-20-2

Feature: Leavenworth National Fish Hatchery

Project: Columbia Basin

Location: Along pipeline route

Ground Elevation: 1172.3 ft.

Coordinates: 47.55329 (**Northing**) -120.67828 (**Easting**)

Method of Exploration: Caterpillar 308E excavator

Datum: WGS 84, decimal degrees

Logged By: A. Canner

Water Encountered: none

Approx. Dimensions: 9W x 13L x 8.2D Feet

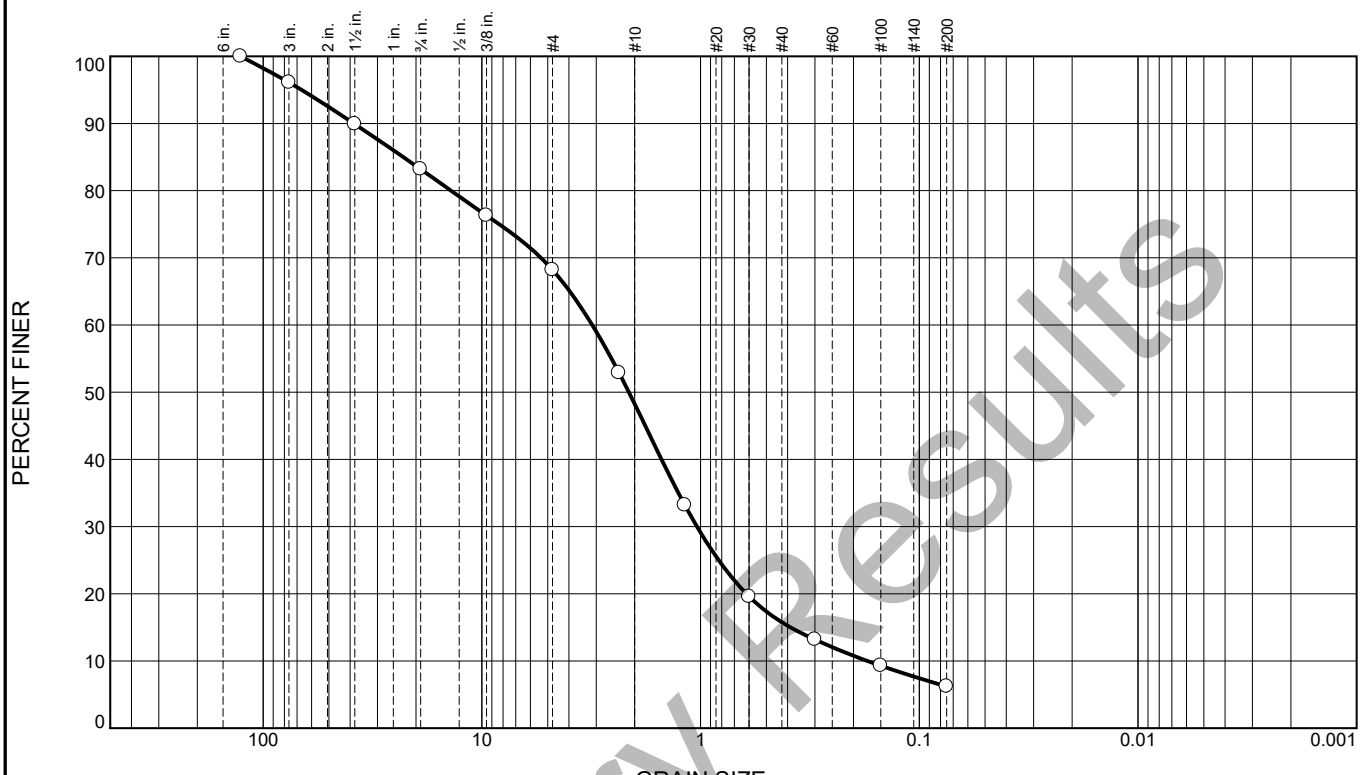
Date Of Exploration: 7/10/2020

FIELD CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000,5005)	% PLUS 3-INCH BY VOLUME		
		3-5 INCH	5-12 INCH	PLUS 12 INCH
(SM)g 0.0 to 7.2	**0.0 to 7.2 ft.: SILTY SAND WITH GRAVEL (SM)g:** About 65% fine to coarse, hard, angular to subangular sand; about 20% fines; about 15% fine to coarse, hard, angular to subangular gravel. **IN PLACE CONDITIONS**: maximum size 1.5 inches; dry; light brown; no reaction with HCl.	0	0	0
(SP)g 7.2 to 8.2	**7.2 to 8.2 ft.: POORLY GRADED SAND WITH GRAVEL (SP)g:** About 70% fine to coarse, hard, angular to subangular sand; about 25% fine to coarse, hard, rounded to subrounded gravel; about 5% fines. **IN PLACE CONDITIONS:** maximum size, 2 inches; loosely compacted; moist; light brown to orange brown; no reaction with HCl.	0	0	0

NOTES

The backhoe utilized a 3-foot-wide toothed all purpose bucket. Advancement was quick and smooth. Advancement ended when ideal depth for ring density test was reached. Coordinates collected using recreational-grade handheld GPS.

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
3.9	12.9	15.0	20.0	32.4	9.6	6.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5"	100.0		
3"	96.1		
1-1/2"	89.9		
3/4"	83.2		
3/8"	76.3		
#4	68.2		
#8	52.9		
#16	33.2		
#30	19.6		
#50	13.2		
#100	9.3		
#200	6.2		

* (no specification provided)

Material Description

TP-20-2

well-graded sand with silt and gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Classification

USCS= SW-SM AASHTO= A-1-a

Remarks

Assumed NP for USCS Classification

Source of Sample: TP Super Sacks **Depth:** 8.2-9.6
Sample Number: 73Q-9 **Date:**

BUREAU OF RECLAMATION

Denver, Colorado

Client: US Fish and Wildlife
Project: Leavenworth National Fish Hatchery

Project No: 73Q **Figure**

Tested By: Pfeifer **Checked By:** Brusak

Preliminary Results

Bureau Of Reclamation	TEST PIT LOG	Hole No.	TP-20-3

Feature: Leavenworth National Fish Hatchery

Project: Columbia Basin

Location: Along pipeline route

Ground Elevation: 1171.5 ft.

Coordinates: 47.55357 -120.67690
Northing **Easting**

Method of Exploration: Caterpillar 308E excavator

Datum: WGS 84, decimal degrees

Logged By: A. Canner

Water Encountered: none

Approx. Dimensions: 12L x 10W x 7.9D Feet

Date Of Exploration: 7/9/2020

FIELD CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000,5005)	% PLUS 3-INCH BY VOLUME		
		3-5 INCH	5-12 INCH	PLUS 12 INCH
(SP-SM)g 0.0 to 7.9	**0.0 to 7.9 ft.: POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM)g:** About 65% fine to coarse, hard, angular to subangular sand; about 25% fine to coarse, hard, rounded to subrounded gravel; about 10% fines. **IN PLACE CONDITIONS:** maximum size, 3 inches; loosely compacted; dry; light brown to orange brown; no reaction with HCl.	0	0	0

Notes

The backhoe utilized a 3-foot-wide toothed all purpose bucket. Coordinates were collected using recreational grade handheld GPS.

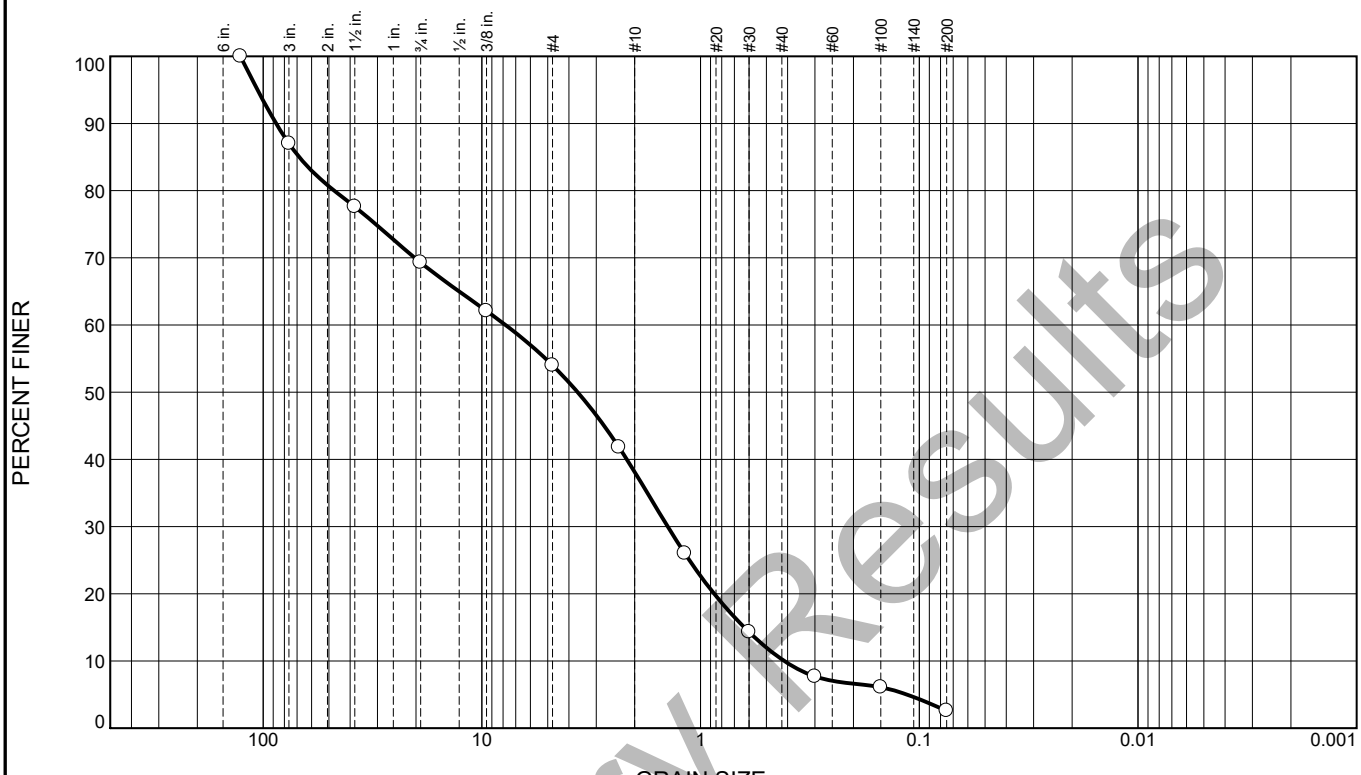
Bureau Of Reclamation	TEST PIT LOG	Hole No.	TP-20-4

Feature: Leavenworth National Fish Hatchery
Project: Columbia Basin
Location: Along pipeline route
Ground Elevation: 1166.9 ft.
Coordinates: 47.55410 (**Northing**) -120.67629 (**Easting**)
Method of Exploration: Caterpillar 308E excavator
Datum: WGS 84, decimal degrees
Logged By: A. Canner
Water Encountered: none
Approx. Dimensions: 20L x 20W x 9.1D Feet
Date Of Exploration: 7/9/2020

FIELD CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000,5005)	% PLUS 3-INCH BY VOLUME: 3-5 INCH	5-12 INCH	PLUS 12 INCH
(SP-SM)gc 0.0 to 2.1	**0.0 to 2.1 ft.: POORLY GRADED SAND WITH SILT GRAVEL AND COBBLES (SP-SM)gc:** About 75% fine to coarse, hard, angular to subangular sand; about 15% fine to coarse, hard, rounded to subrounded gravel; about 10% fines. **TOTAL SAMPLE (BY VOLUME):** Trace 3 to 5-inch, hard, rounded to subrounded cobbles. **IN PLACE CONDITIONS:** maximum size: 4 inches; loosely compacted; dry; light brown to orange brown; no reaction with HCl.	0	0	0
(SP) 2.1 to 7.2	**2.1 to 7.2 ft.: POORLY GRADED SAND (SP):** About 95% fine to coarse, hard, angular to subangular sand; about 5% fines. **IN PLACE CONDITIONS:** moist; light gray to dark brown; no reaction with HCl.	0	0	0
(GP)s 7.2 to 9.1	**7.2 to 9.1 ft.: POORLY GRADED GRAVEL WITH SAND (GP)s:** About 85% fine to coarse, hard, rounded to subrounded gravel; about 15% fine to coarse, hard, angular to subangular sand. **IN PLACE CONDITIONS:** maximum size: 3 inches; moist; light to dark gray; no reaction with HCl.	0	0	0

NOTES
The backhoe utilized a 3-foot-wide toothed all purpose bucket. Advancement was quick and smooth. Advancement ended when ideal depth for ring density test was reached. Coordinates collected using recreational-grade handheld GPS.

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
13.0	17.7	15.3	15.9	27.8	7.7	2.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5"	100.0		
3"	87.0		
1-1/2"	77.6		
3/4"	69.3		
3/8"	62.1		
#4	54.0		
#8	41.8		
#16	26.0		
#30	14.3		
#50	7.7		
#100	6.1		
#200	2.6		

* (no specification provided)

Material Description

TP-20-4

poorly graded sand with gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Classification

USCS= SP AASHTO= A-1-a

Remarks

Assumed NP for USCS Classification

Source of Sample: TP Super Sacks **Depth:** 8.1-8.6
Sample Number: 73Q-14 **Date:**

BUREAU OF RECLAMATION

Denver, Colorado

Client: US Fish and Wildlife
Project: Leavenworth National Fish Hatchery

Project No: 73Q **Figure**

Tested By: Pfeifer **Checked By:** Brusak

Preliminary Results

Bureau Of Reclamation	TEST PIT LOG	Hole No.	TP-20-5

Feature: Leavenworth National Fish Hatchery
Project: Columbia Basin
Location: Along pipeline route
Ground Elevation: 1162.0 ft.
Coordinates: 47.55474 (**Northing**) -120.67569 (**Easting**)
Method of Exploration: Caterpillar 308E excavator
Datum: WGS 84, decimal degrees
Logged By: A. Canner
Water Encountered: none
Approx. Dimensions: 10L x 6W x 8.1D Feet
Date Of Exploration: 7/9/2020

FIELD CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000,5005)	% PLUS 3-INCH BY VOLUME: 3-5 INCH	5-12 INCH	PLUS 12 INCH
(SP-SM)gc 0.0 to 5.8	**0.0 to 5.8 ft.: POORLY GRADED SAND WITH SILT GRAVEL AND COBBLES (SP-SM)gc:** About 70% fine to coarse, hard, angular to subangular sand; about 20% fine to coarse, hard, rounded to subrounded gravel; about 10% fines. **TOTAL SAMPLE (BY VOLUME):** Trace 3- to 5-inch, hard, rounded to subrounded cobbles. **IN PLACE CONDITIONS:** maximum size: 5 inches; loosely compacted; dry; light brown to orange brown; no reaction with HCl.	0	0	0
(SP) 5.8 to 8.1	**5.8 to 8.1 ft.: POORLY GRADED SAND (SP):** About 95% fine to coarse, hard, angular to subangular sand; about 5% fines. **IN PLACE CONDITIONS:** Loosely compacted; moist; light brown; no reaction with HCl.	0	0	0

NOTES
The backhoe utilized a 3-foot-wide toothed all purpose bucket. Advancement was quick and smooth. Advancement ended when target depth was reached. Coordinates were collected using recreational grade handheld GPS.

Bureau Of Reclamation	TEST PIT LOG	Hole No.	TP-20-6

Feature: Leavenworth National Fish Hatchery

Project: Columbia Basin

Location: Along pipeline route

Ground Elevation: 1156.6 ft.

Coordinates: 47.55572 (**Northing**) -120.67492 (**Easting**)

Method of Exploration: Caterpillar 308E excavator

Datum: WGS 84, decimal degrees

Logged By: A. Canner

Water Encountered: none

Approx. Dimensions: 12L x 15W x 8.2D Feet

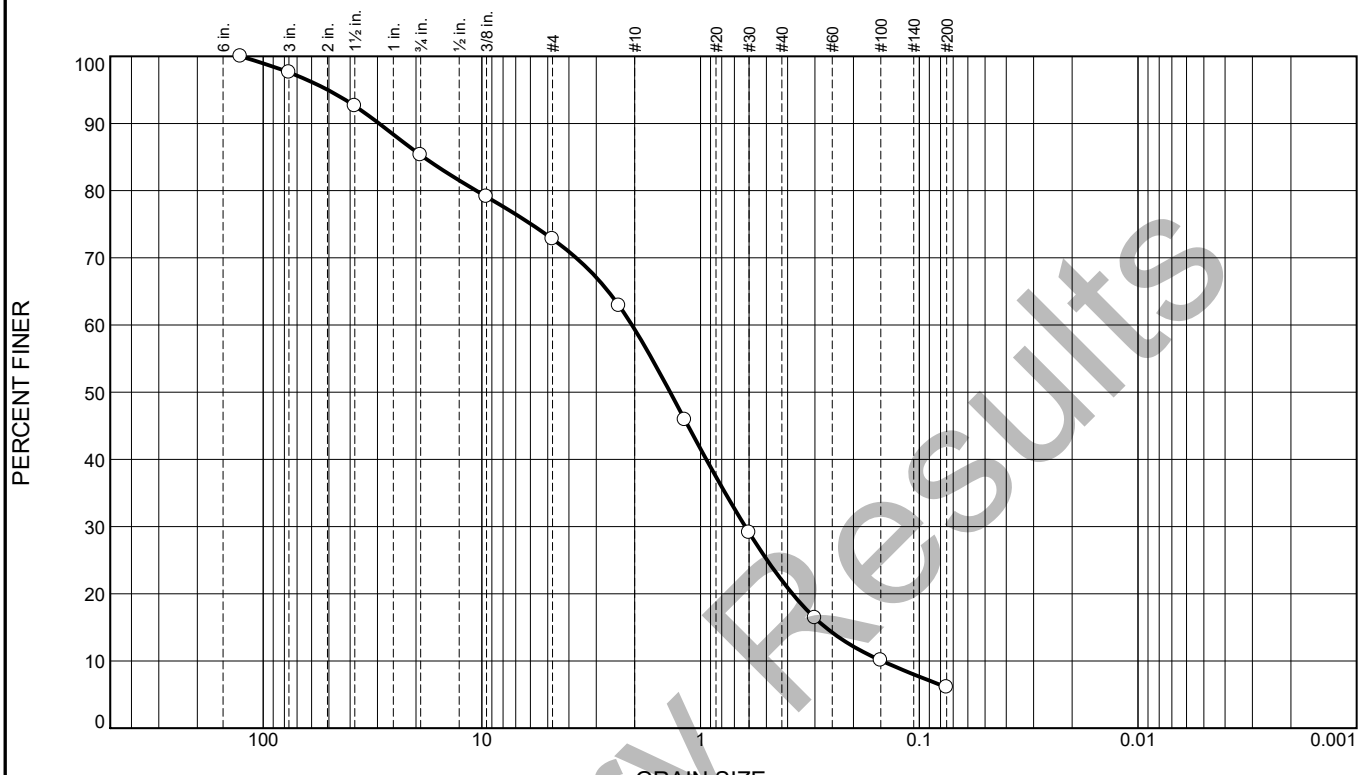
Date Of Exploration: 7/8/2020

FIELD CLASSIFICATION GROUP SYMBOL	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000,5005)	% PLUS 3-INCH BY VOLUME		
		3-5 INCH	5-12 INCH	PLUS 12 INCH
(SP-SM) 0.0 to 1.5	**0.0 to 1.5 ft.: POORLY GRADED SAND WITH SILT (SP-SM):** About 80% fine to coarse, hard, angular to subangular sand; about 10% fine to coarse, hard, subrounded to rounded gravel; about 10% fines. **TOTAL SAMPLE (BY VOLUME):** Trace 3 to 5-inch, hard, rounded to subrounded cobbles. **IN PLACE CONDITIONS:** maximum size, 4 inches; dry; brown; no reaction with HCl	0	0	0
(SP-SM)gc 1.5 to 8.2	**1.5 to 8.2 ft.: POORLY GRADED SAND WITH SILT GRAVEL AND COBBLES (SP-SM)gc:** About 70% fine to coarse, hard, angular to subangular sand; about 20% fine to coarse, hard, subrounded to rounded gravel; about 10% fines. **TOTAL SAMPLE (BY VOLUME):** About 10 % 3- to 5-inch, hard, rounded to subrounded cobbles. Trace 5 to 12-inch, hard, rounded to subrounded cobbles. **IN PLACE CONDITIONS:** maximum size, 6 inches; loosely compacted; dry; light brown to orange brown; no reaction with HCl.	10	0	0

NOTES

The backhoe utilized a 3-foot-wide toothed all purpose bucket. Advancement was quick and smooth. Advancement ended when ideal depth for ring density test was reached. Coordinates collected using recreational-grade handheld GPS.

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
2.4	12.3	12.5	13.5	37.3	15.9	6.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5"	100.0		
3"	97.6		
1-1/2"	92.6		
3/4"	85.3		
3/8"	79.1		
#4	72.8		
#8	62.9		
#16	45.9		
#30	29.1		
#50	16.4		
#100	10.1		
#200	6.1		

* (no specification provided)

Material Description

TP-20-6

well-graded sand with silt and gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Classification

USCS= SW-SM AASHTO= A-1-b

Remarks

Assumed NP for USCS Classification

Source of Sample: TP Super Sacks **Depth:** 8.2-9.8
Sample Number: 73Q-19 **Date:**

BUREAU OF RECLAMATION

Denver, Colorado

Client: US Fish and Wildlife
Project: Leavenworth National Fish Hatchery

Project No: 73Q **Figure**

Tested By: Pfeifer **Checked By:** Brusak

Preliminary Results

Table 1. Ring Density Test Density Results

Test Pit	Depth	Total Unit Weight	Dry Unit Weight
--	ft	lbf/ft^3	lbf/ft^3
TP-20-1	8.4-9.9	142.2	135.7
TP-20-2	8.2-9.6	117.1	109.0
TP-20-4	8.1-8.6	145.1	140.9
TP-20-6	8.2-9.8	95.6	93.6

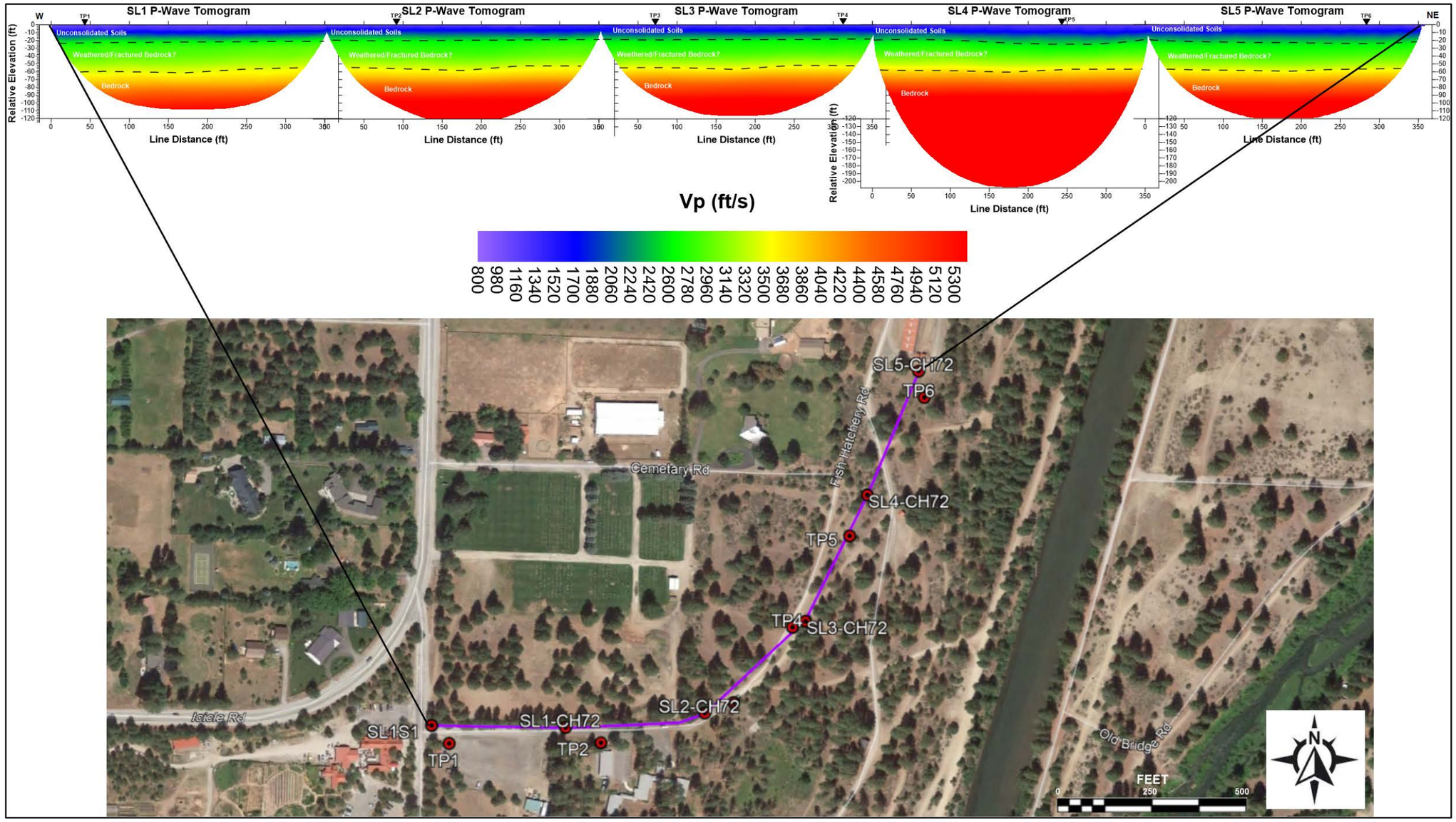


Figure 13.— SL1 though SL5 combined p-wave velocity tomograms: interpreted top of weathered bedrock and competent bedrock are indicated with the dotted and dashed-black lines, respectively. The projected locations of nearby or coincident test pits are indicated on the top of the combined tomograms. The related line-location map is provided in the lower image.

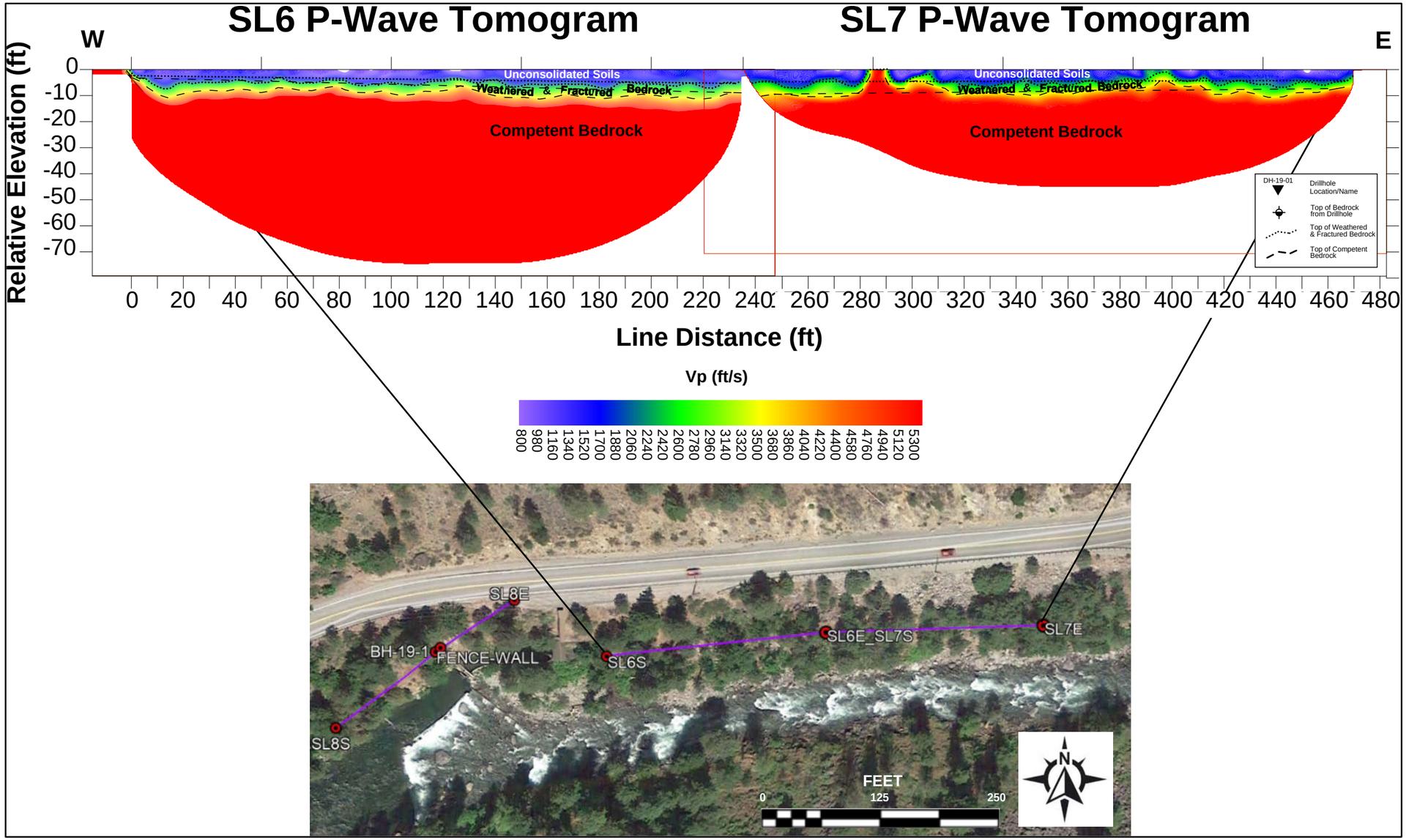


Figure 14.— SL6 and SL7 combined p-wave velocity tomograms: interpreted top of weathered bedrock and competent bedrock are indicated with the dotted and dashed-black lines, respectively. The related line-location map is provided in the lower image.