FOWLER CREEK GUEST RANCH

EXHIBIT 22

SOILS REPORT AND STATEMENT

SEPTIC ADEQUACY ANALYSIS

For

Fowler Creek Trails

Prepared by:

WESTERN PACIFIC ENGINEERING and SURVEY
1224 S. Pioneer Way, Suite A
Moses Lake, Washington 98837
(509) 765-1023

WPES Project Number 23525
November 2023

TABLE OF CONTENTS

ENGINEERS SPECIAL INSPECTORS PLANNERS SURVEYORS
WESTERN PACIFIC ENGINEERING & SURVEY
WESTERN PACIFIC PLAZA
1224 S. PIONEER WAY, SUITE A
MOSES LAKE, WASHINGTON 98837
OFFICE: (509) 765-1023

November 27th, 2023

Fowler Creek Properties
Attn: Pat Deneen
P.O. Box 808
Cle Elum WA 98922

SUBJECT: Septic system site analysis for a portion of the Northeast Quarter of Section 3, Township 19 North, Range 14, W.M near Cle Elum, Washington.
WPES Project No. 23525

Dear Mr. Deneen,

Western Pacific Engineering & Survey, Inc. (WPES) is pleased to provide you with this summary of our field investigations, findings, conclusions, and recommendations for the development of septic systems on your parcels located near Cle Elum, Washington (see Plate 1).

Our soils investigation services were supplied in accordance with your request on October 25th, 2023. The site analysis requested was to cover the west half of the Northeast Quarter of Section 3. Specifically, you requested that this office review the site soils and determine if it is adequate for the proper treatment and disposal of residential septic effluent. Additionally, we were to provide some guidance on the design of the drainfields. This report was not intended to provide the design of the septic system on each lot as the breadth of the development is not currently understood. Others will need to do an actual on-site design based on the location, type and size of development. For purposes of this report, it was assumed that the septic system would service single family homes or a RV campground. Both facilities would be designed for residential strength waste utilizing septic systems designed according to WAC 246-272A in which the septic system would collect and discharge less than 3,500 gallons per day.

GEOTECHNICAL INVESTIGATION

Site Investigation

Excavation of the test pits occurred on November 10th, 2023. The weather was cloudy and cool with an average temperature of 38°F. All test pit locations were loosely backfilled with native soils after completion of the excavation. WPES was not asked to verify the compaction of any of the backfill materials placed in the excavated pits, nor is it typical for WPES to initiate this work.

The locations of the excavated test pits are shown on Plate 2, while the soil logs for the test pits are tabulated and logged on Plates 3 through 11. Excavation of the test pits was done utilizing a mini-excavator at locations determined by the client. The project site is a fairly dense forest of smaller trees. A narrow pathway has been constructed through the forest. Test Pits were located in areas not far off of the cleared pathway, generally in more open areas where the excavator could work without clearing trees. The cleared pathway follows the common lot line of several parcels under investigation.

Subsurface Conditions

The first layer of soils found in the test pits was a black layer of organics that were being broken down. This material, called compost for this report, was comprised of leaves, twigs and other decomposing organic material from the forest. It ranged from six to eighteen inches in thickness. The organic layer was then followed by a layer of loamy medium to fine sand. This material was the predominate soil found on the project site. At different locations the fineness of the sand varied slightly, with some of the test pits having more course material. This material generally continued down to the base of the excavations.

In a few of the test pits we found some layers of gravel. In some cases, the gravel layers were thick and in some cases the gravel layers were thin. In Test Pit #5, the gravel was found to have loamy medium to fine sand both above and below the gravel. Test Pit #9 was unique in that it contained a large fraction of broken gravel to the base of the test pit. Test Pit #5 was also unique in that under a layer of gravel was a layer of silty clay.

Records Review

As part of our site investigation, the USDA tabular soils database was consulted for relevant soils information. Copies of this mapping data is included in the appendix. The USDA information includes tabular data to a depth of sixty inches (60"). The area is covered with sandy loams followed by a layer of gravelly sandy loam. In our test pits we found that the sand fraction of the soils was considerably higher than in the USDA tabular data. Our analysis also found that the silt/clay fraction was considerably less, hence the slightly differing classifications. However, the tabular loading rates are about the same for both soils.

Also, as part of our investigation we reviewed local well logs. There were a few well logs in the area, however none at our project site. The logs varied considerably in description so no absolute

judgment concerning their applicability to the site could be made. From the logs, we found that generally the soils are fine textured at the surface, moving to more claylike the lower you excavate. Water was then found lower in the phyllite layer in low to medium quantities. Depth to water varied from less than twenty feet to an average of about fifty to seventy-five feet.

SOIL STABILITY AND SOIL RECOMMENDATIONS

The soils found in the test pits are suitable for proper treatment and disposal of septic effluent. During our investigation we found Type 1, Type 3 and Type 4 soils. The septic system designer will need to do a site specific evaluation at the time of design as to ascertain which infiltration value to use.

Test Pit #1 contained loamy medium sands, or Type 3, soils with a loading rate of 0.8 gallons per square foot per day. This is Per Table V, WAC 246-272A-0220 and Table VIII, WAC 246-272A-0234. For a single family home located in this area, Treatment Level E is required per Table VI, WAC 246-272A-0230. This can be accomplished with a gravity system. If a community system was constructed here, pressure distribution would be required. In a significant number of the other test pits, this same finding can be made.

At Test Pit #2, the soils were finer with a loamy fine sand as the predominate soil. The finer nature of the sands would lend themselves to a Type 4 soils, however the presence of the gravelly layer might preclude the use of a gravity system. Due to separation issues, and with the finer soils, a loading rate of 0.6 gallons per square foot per day should be used with a system meeting Treatment Level B. This treatment level includes timed pressure distribution. At this location, the septic should also be built near the surface to optimize the vertical separation between the septic system and the gravel layer. The area around Test Pit #5 should also be constructed this way.

At Test Pit #9, the soils meet the definition of Type 1, due to the significant rock in the soil. In these soils a sand lined bed would be constructed under the drainfield composed of at least 24" of concrete sand, per Department of Health requirements. However, the designer should consider the use of a lower loading rate as the loamy sands between the gravels will not perc at the tabulated rate. It is recommended that the drainfield be designed at a rate of 0.8 gallons per square foot per day.

Test Pit #7 is a difficult area due to the intermittent band of gravel. The soil is sufficient for treatment and disposal; however, the soil profile does not meet one of the requirements of the WAC. If the soils were to be treated as Type 1, there is insufficient drainage to accommodate the high loading rate. If the soils were to be treated as Type 3, the gravels could laterally displace the effluent with improper treatment. Finally, the gravel layer is too shallow for what would be a normal septic drainfield layout. In this area, it may be appropriate to find other locations with a slightly different cross section in order to fit the WAC requirements better. Directly adjacent to

this site, the soil was identical to Test Pit #1, so suitable soil is available nearby for treatment and disposal.

In the vicinity of Test Pit #1 a residential septic system would have a trench consisting of three (3) EZ flow 12" bundles laid side by side, about twenty-four inches (24") below the surface. Of the three bundles, one bundle would have a 4" perforated pipe, placed between two other solid bundles. A typical residential home would have about one hundred fifty feet of trench.

A pressurized septic system in the vicinity of Test Pit #2, would utilize a one-and-a-half-inch (1-1/2") diameter PVC pipe in a gravel bed of clean one inch (1") drain rock. These laterals would typically have three sixteenths inch (3/16") orifices spaced at six feet (6') on center. A typical residential home would have about two hundred feet of trench.

CONCLUSION

In conclusion, the soils found in the test pits are suitable for proper treatment and disposal of septic effluent subject to the guidance, recommendations, and limitations of this analysis. While this report is not intended to provide the design of the septic system on each lot, it does contain relevant information for the development of a system to accommodate single family homes or an RV Campground type of development.

LIMITATIONS

The subsurface conditions would be geotechnically suitable for construction as long as the previously listed and explained design recommendations and considerations are taken into account.

WPES's discoveries, assumptions, recommendations, interpretations, and suggestions are solely for the use of Fowler Creek Trails. No warranty, either expressed or implied, is made. Conditions described are for the test pits only; should different conditions be encountered at any time, WPES should be contacted to ensure that the integrity of the project is maintained. Misinterpretation of this report and our findings by others can lead to costly errors. Therefore, WPES cannot be responsible for the interpretation by others of the data, information, suggestions, or recommendations made herein. WPES should be retained to advise the design team and to provide a design review before plans go out to bid to assure that our recommendations are followed.

In conclusion, we appreciate having the opportunity to provide you with this report. If you have any questions or require further information, please contact our office.

Sincerely,

Nathaniel D Nofziger, P.E.
WESTERN PACIFIC ENGINEERING & SURVEY, INC

NOTE: THIS IS NOT A COPY OF THE FULL REPORT. THIS REPORT IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE OF A PORTION OF THE FULL REPORT. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION, IS KEPT ON FILE AT THE OFFICE OF WERSTERN PACIFIC ENGINEERING AND SURVEY, INC. AND HAS BEEN RECEIVED BY THE CLIENT. A COPY MAY BE OBTAINED UPON REQUEST.

APPENDICES AND ATTACHMENTS

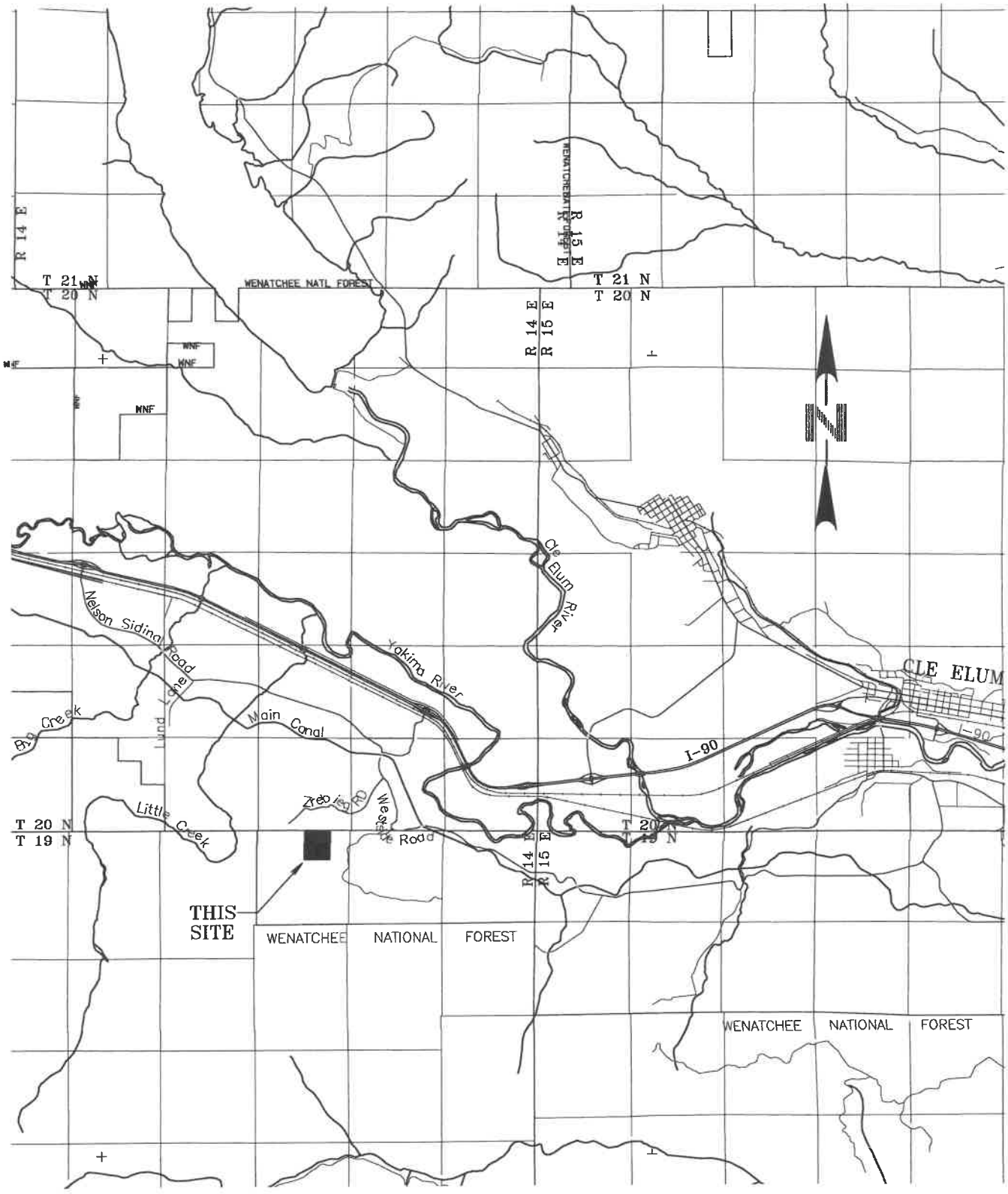
Vicinity Maps
Plates 1 and 2 show the location of the proposed site and the locations of the test pits within the proposed site.

Test Pit Logs
Plates 3 through 11 show the test pit logs and the layers of soil encountered, in the order that the test pits were excavated.

Photographs
A series of photographs showing the excavation of the test pits is included. The photos show the typical excavated pits, the texture of the soils in the pits and the excavated material, along with some of the more unique characteristics encountered.

Sieve Reports
Included are the mechanical analysis of the soils found in the excavations.

USDA Information
Included for reference is USDA soils information. The information provided includes data on erodibility of the soils, swelling of soils due to moisture content, percolation rates and plasticity.



WESTERN PACIFIC ENGINEERING & SURVEY
A TERRA DEVELOPMENT SERVICES CORPORATION
1224 South Pioneer Way
Moses Lake, WA
T:(509)765-1023

FOWLER CREEK TRAIL

Vicinity Map

Cle Elum, Washington

DRAWN BY: NDN	DATE:	WPE PROJECT #:	Scale: 1" = N/A
CHECKED BY: NDN	Nov. 2023	23525	PLATE NO.: 01

WESTERN PACIFIC
ENGINEERING & SURVEY
A TERRA DEVELOPMENT SERVICES CORPORATIONS

1224 South
Pioneer Way, Suite A
Moses Lake, WA
T: (509)765-1023

DATE:
November 27, 2023

WPES Project #:
23525

Fowler Creek Trails

PLATE NO.: 02 Test Pit Locations

Cle Elum, Washington

WESTERN PACIFIC ENGINEERING & SURVEY
1224 S. Pioneer Way, Moses Lake, Washington
T: (509)765–1023

TEST PIT LOG

PROJECT: Fowler Creek Trails	BORING LOCATION: See Plate No. 2
WPES PRO. No.: 23525	BORING NAME: Test Pit #1
FIELD TESTS AND PROCEEDURES	DATE PERFORMED: November 10, 2023
	SURFACE ELEVATION: n/a
	LOGGED BY: Nathan Nofziger
	ENGINEER : Nathan Nofziger
	EXPLORATION BY: Mini–Excavator

PENETROMETER (tsf)	IN PLACE DRY DENSITY (pcf)	MOISTURE CONTENT (%)	IN PLACE WET DENSITY (pcf)	SAMPLE DEPTH	DEPTH (ft)	GRAPHIC LOG	VISUAL DESCRIPTION AND REMARKS
							Heavy Organics / Compost
				4'	5		Sandy Loam
							Excavation Limit
					10		
					15		

Plate No. 3

WESTERN PACIFIC ENGINEERING & SURVEY
1224 S. Pioneer Way, Moses Lake, Washington
T: (509)765–1023

TEST PIT LOG

PROJECT: Fowler Creek Trails	BORING LOCATION: See Plate No. 2
WPES PRO. No.: 23525	BORING NAME: Test Pit #2
FIELD TESTS AND PROCEEDURES	DATE PERFORMED: November 10, 2023
	SURFACE ELEVATION: n/a
	LOGGED BY: Nathan Nofziger
	ENGINEER : Nathan Nofziger
	EXPLORATION BY: Mini–Excavator

PENETROMETER (tsf)	IN PLACE DRY DENSITY (pcf)	MOISTURE CONTENT (%)	IN PLACE WET DENSITY (pcf)	SAMPLE DEPTH	DEPTH (ft)	GRAPHIC LOG	VISUAL DESCRIPTION AND REMARKS
							Heavy Organics / Compost
							Sandy Loam
					5		Sandy Loam with Some Gravel
							Excavation Limit
					10		
					15		

Plate No. 4

WESTERN PACIFIC ENGINEERING & SURVEY
1224 S. Pioneer Way, Moses Lake, Washington
T: (509)765–1023

TEST PIT LOG

PROJECT: Fowler Creek Trails	BORING LOCATION: See Plate No. 2
WPES PRO. No.: 23525	BORING NAME: Test Pit #3
FIELD TESTS AND PROCEEDURES	DATE PERFORMED: November 10, 2023
	SURFACE ELEVATION: n/a
	LOGGED BY: Nathan Nofziger
	ENGINEER : Nathan Nofziger
	EXPLORATION BY: Mini–Excavator

PENETROMETER (tsf)	IN PLACE DRY DENSITY (pcf)	MOISTURE CONTENT (%)	IN PLACE WET DENSITY (pcf)	SAMPLE DEPTH	DEPTH (ft)	GRAPHIC LOG	VISUAL DESCRIPTION AND REMARKS
							Heavy Organics / Compost
							Sandy Loam
					5		
							Excavation Limit
					10		
					15		

Plate No. 5

WESTERN PACIFIC ENGINEERING & SURVEY
1224 S. Pioneer Way, Moses Lake, Washington
T: (509)765–1023

TEST PIT LOG

PROJECT: Fowler Creek Trails	BORING LOCATION: See Plate No. 2
WPES PRO. No.: 23525	BORING NAME: Test Pit #4
FIELD TESTS AND PROCEEDURES	DATE PERFORMED: November 10, 2023
	SURFACE ELEVATION: n/a
	LOGGED BY: Nathan Nofziger
	ENGINEER : Nathan Nofziger
	EXPLORATION BY: Mini–Excavator

PENETROMETER (tsf)	IN PLACE DRY DENSITY (pcf)	MOISTURE CONTENT (%)	IN PLACE WET DENSITY (pcf)	SAMPLE DEPTH	DEPTH (ft)	GRAPHIC LOG	VISUAL DESCRIPTION AND REMARKS
							Heavy Organics / Compost
				4'	5		Sandy Loam
							Excavation Limit
					10		
					15		

Plate No. 6

WESTERN PACIFIC ENGINEERING & SURVEY
1224 S. Pioneer Way, Moses Lake, Washington
T: (509)765-1023

TEST PIT LOG

PROJECT: Fowler Creek Trails	BORING LOCATION: See Plate No. 2
WPES PRO. No.: 23525	BORING NAME: Test Pit #5
FIELD TESTS AND PROCEEDURES	DATE PERFORMED: November 10, 2023
	SURFACE ELEVATION: n/a
	LOGGED BY: Nathan Nofziger
	ENGINEER : Nathan Nofziger
	EXPLORATION BY: Mini-Excavator

PENETROMETER (tsf)	IN PLACE DRY DENSITY (pcf)	MOISTURE CONTENT (%)	IN PLACE WET DENSITY (pcf)	SAMPLE DEPTH	DEPTH (ft)	GRAPHIC LOG	VISUAL DESCRIPTION AND REMARKS
							Heavy Organics / Compost
							Sandy Loam
					5		Sandy Loam with Some Gravel
							Silty Clay
							Excavation Limit
					10		
					15		

Plate No. 7

WESTERN PACIFIC ENGINEERING & SURVEY
1224 S. Pioneer Way, Moses Lake, Washington
T: (509)765–1023

TEST PIT LOG

PROJECT: Fowler Creek Trails	BORING LOCATION: See Plate No. 2
WPES PRO. No.: 23525	BORING NAME: Test Pit #6
FIELD TESTS AND PROCEEDURES	DATE PERFORMED: November 10, 2023
	SURFACE ELEVATION: n/a
	LOGGED BY: Nathan Nofziger
	ENGINEER : Nathan Nofziger
	EXPLORATION BY: Mini–Excavator

PENETROMETER (tsf)	IN PLACE DRY DENSITY (pcf)	MOISTURE CONTENT (%)	IN PLACE WET DENSITY (pcf)	SAMPLE DEPTH	DEPTH (ft)	GRAPHIC LOG	VISUAL DESCRIPTION AND REMARKS
							Heavy Organics / Compost
							Sandy Loam
					5		
							Excavation Limit
					10		
					15		

Plate No. 8

WESTERN PACIFIC ENGINEERING & SURVEY
1224 S. Pioneer Way, Moses Lake, Washington
T: (509)765–1023

TEST PIT LOG

PROJECT: Fowler Creek Trails	BORING LOCATION: See Plate No. 2
WPES PRO. No.: 23525	BORING NAME: Test Pit #7
FIELD TESTS AND PROCEEDURES	DATE PERFORMED: November 10, 2023
	SURFACE ELEVATION: n/a
	LOGGED BY: Nathan Nofziger
	ENGINEER : Nathan Nofziger
	EXPLORATION BY: Mini–Excavator

PENETROMETER (tsf)	IN PLACE DRY DENSITY (pcf)	MOISTURE CONTENT (%)	IN PLACE WET DENSITY (pcf)	SAMPLE DEPTH	DEPTH (ft)	GRAPHIC LOG	VISUAL DESCRIPTION AND REMARKS
							Heavy Organics / Compost
							Sandy Loam
					5		Gravels – Type 1
							Sandy Loam
							Excavation Limit
					10		
					15		

Plate No. 9

WESTERN PACIFIC ENGINEERING & SURVEY
1224 S. Pioneer Way, Moses Lake, Washington
T: (509)765–1023

TEST PIT LOG

PROJECT: Fowler Creek Trails	BORING LOCATION: See Plate No. 2
WPES PRO. No.: 23525	BORING NAME: Test Pit #8
FIELD TESTS AND PROCEEDURES	DATE PERFORMED: November 10, 2023
	SURFACE ELEVATION: n/a
	LOGGED BY: Nathan Nofziger
	ENGINEER : Nathan Nofziger
	EXPLORATION BY: Mini–Excavator

PENETROMETER (tsf)	IN PLACE DRY DENSITY (pcf)	MOISTURE CONTENT (%)	IN PLACE WET DENSITY (pcf)	SAMPLE DEPTH	DEPTH (ft)	GRAPHIC LOG	VISUAL DESCRIPTION AND REMARKS
							Heavy Organics / Compost
							Sandy Loam
					5		
							Excavation Limit
					10		
					15		

PLATE No.: 10

WESTERN PACIFIC ENGINEERING & SURVEY
1224 S. Pioneer Way, Moses Lake, Washington
T: (509)765–1023

TEST PIT LOG

PROJECT: Fowler Creek Trails	BORING LOCATION: See Plate No. 2
WPES PRO. No.: 23525	BORING NAME: Test Pit #9
FIELD TESTS AND PROCEEDURES	DATE PERFORMED: November 10, 2023
	SURFACE ELEVATION: n/a
	LOGGED BY: Nathan Nofziger
	ENGINEER : Nathan Nofziger
	EXPLORATION BY: Mini–Excavator

PENETROMETER (tsf)	IN PLACE DRY DENSITY (pcf)	MOISTURE CONTENT (%)	IN PLACE WET DENSITY (pcf)	SAMPLE DEPTH	DEPTH (ft)	GRAPHIC LOG	VISUAL DESCRIPTION AND REMARKS
							Heavy Organics / Compost
							Sandy Loam
							Gravels – Type 1
					5		Loamy Gravels – Type 1
							Excavation Limit
					10		
					15		

PLATE No.: 11

Fowler Creek Trails

WESTERN PACIFIC
ENGINEERING & SURVEY

Description:

This is a photo of Test Pit #1. The dark soils are the decomposed organics of the forest floor, while the lighter soil in the sandy loam.

WPES Project #23525	November 10th, 2023	Photo #1

Fowler Creek Trails

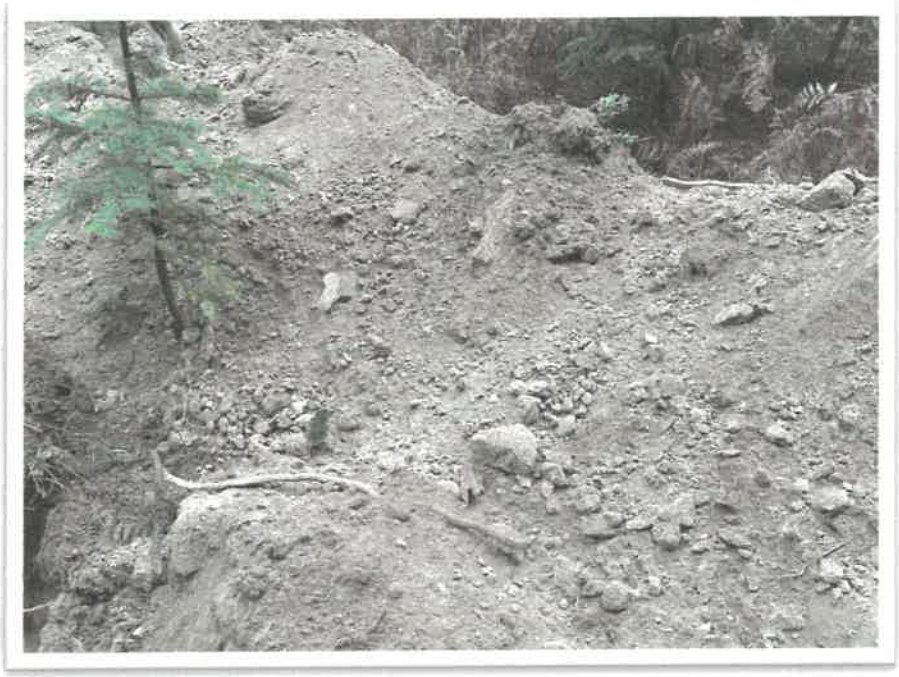
WESTERN PACIFIC
ENGINEERING & SURVEY

Description:

This is the excavated Test Pit #2. Again you can see the dark band of the decomposed organics and then the lighter spoils pile.

WPES Project #23463	November 10th, 2023	Photo #2

Fowler Creek Trails



WESTERN PACIFIC
ENGINEERING & SURVEY

Description:

This is a close view of the spoils from Test Pit #6.

WPES Project #23525	November 10th, 2023	Photo #3

Fowler Creek Trails

WESTERN PACIFIC
ENGINEERING & SURVEY

Description:

This is a photo of the completed Test Pit #5. Here you can see a band of gravels toward the bottom of the test pit.

WPES Project #23463	November 10th, 2023	Photo #4

Fowler Creek Trails

WESTERN PACIFIC ENGINEERING & SURVEY

Description:

This is Test Pit #7, which again has a band of gravels. This band is thin and you can see that the sandy loams continue under the band of gravel.

WPES Project #23525	November 10th, 2023	Photo #5

Fowler Creek Trails

WESTERN PACIFIC ENGINEERING & SURVEY

Description:

This is Test Pit #9. In this test pit significant gravel was found, especially in the lower part of the test pit.

WPES Project #23463	November 10th, 2023	Photo #6

Fowler Creek Trails		
		WESTERN PACIFIC ENGINEERING & SURVEY **Description:** This is the spoils from Test Pit #9. Notice the larger percentage of gravels in the soil matrix.
WPES Project #23525	November 10th, 2023	Photo #7

WESTERN PACIFIC ENGINEERING & SURVEY
1224 South Pioneer Way, Moses Lake, Washington
T: (509)765-1023

USDA SOIL CLASSIFICATION
SIEVE ANALYSIS REPORT

Report To: Fowler Creek Trails, LLC
Pat Deneen
PO Box 808
Cle Elum, WA 98922

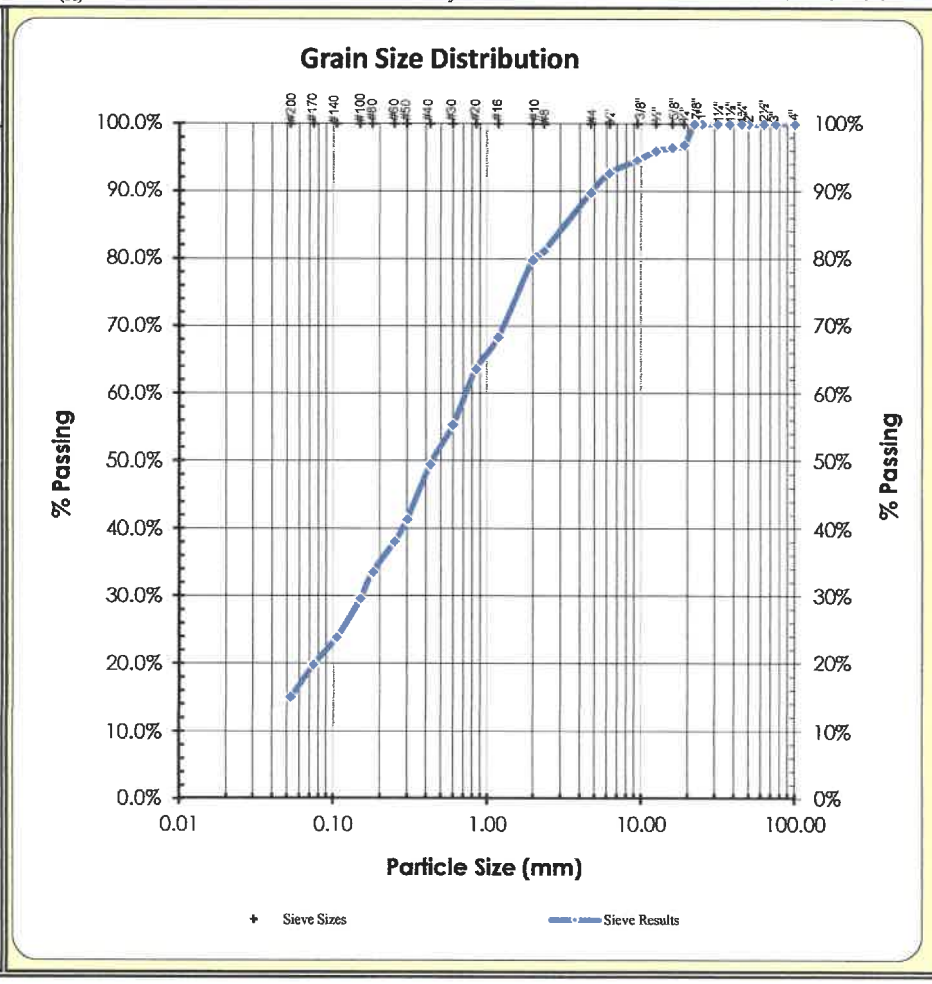
Date Sampled: 11/10/23
Date Received: 11/10/23
Date Tested: 11/20/23
Sampled By: WPE
Sample Method: N/A

Project #: 23525
Sample #: 135
Source: TP#1 @4'
Description: Native

Procedure: ASTM C136

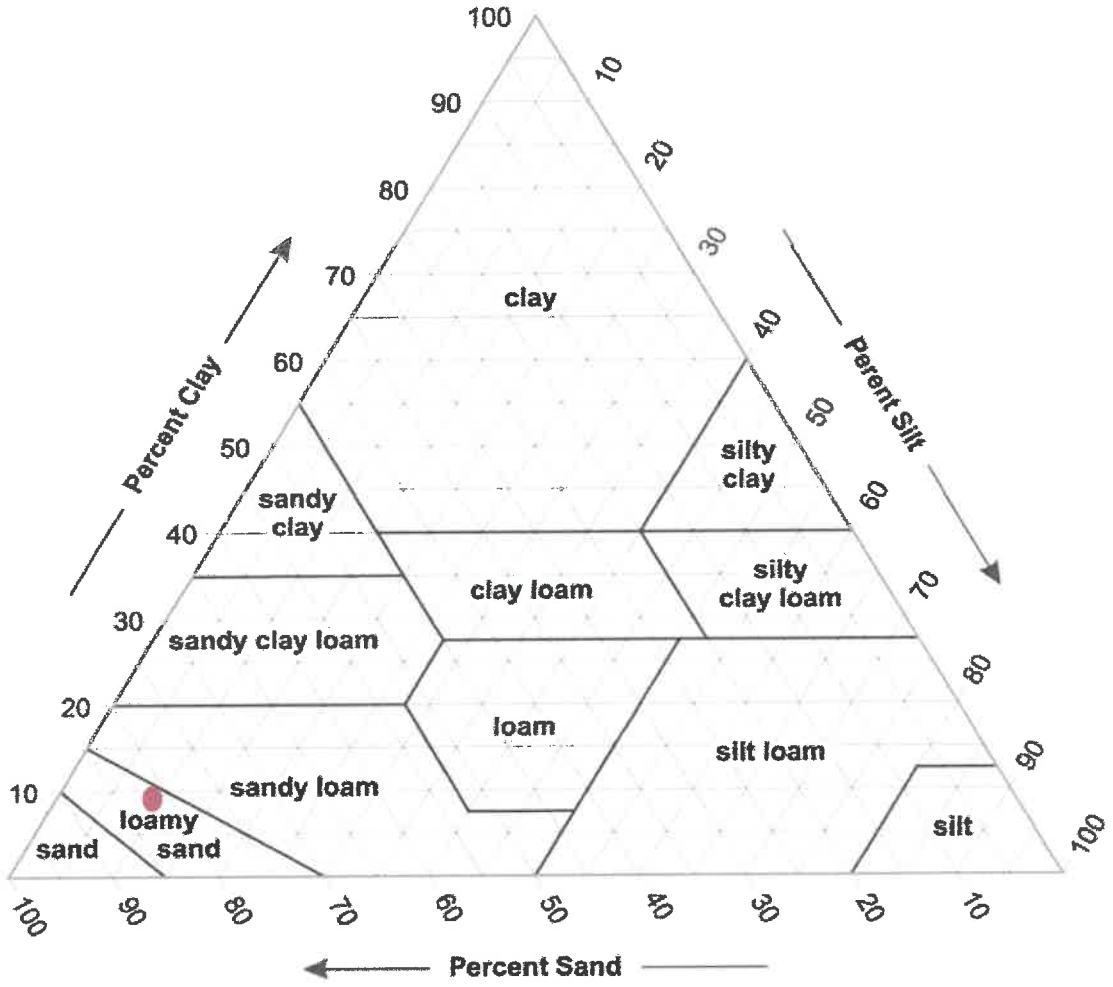
$D_{(10)}$= 0.035	mm	% Gravel = 20.19%	Coeff. of Curvature, C_C = 0.89
$D_{(30)}$= 0.153	mm	% Sand = 213.37%	Coeff. of Uniformity, C_U = 20.97
$D_{(60)}$= 0.741	mm	% Silt & Clay = -153.76%	Fineness Modulus= 2.43

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing
6.00"	150.00		100%
4.00"	100.00		100%
3.00"	75.00		100%
2.50"	63.00		100%
2.00"	50.00		100%
1.75"	45.00		100%
1.50"	37.50		100%
1.25"	31.50		100%
1.00"	25.00		100%
7/8"	22.40		100%
3/4"	19.00	97%	97%
5/8"	16.00		96%
1/2"	12.50	96%	96%
3/8"	9.50	95%	95%
1/4"	6.30	93%	93%
#4	4.75	90%	90%
#8	2.360		81%
#10	2.000	80%	80%
#16	1.180		68%
#20	0.850	64%	64%
#30	0.600		55%
#40	0.425	49%	49%
#50	0.300		41%
#60	0.250		38%
#80	0.180	34%	34%
#100	0.150		30%
#140	0.106		24%
#200	0.075	20%	20%
#270	0.053	15.0%	15.0%



Technician: David S.
Engineer: Nathan Nofziger, P.E.

WESTERN PACIFIC ENGINEERING & SURVEY
1224 South Pioneer Way, Moses Lake, Washington
T: (509)765-1023



Note: Silt-Clay fraction estimated based on the texture and interpolation.

WESTERN PACIFIC ENGINEERING & SURVEY
1224 South Pioneer Way, Moses Lake, Washington
T: (509)765-1023

USDA SOIL CLASSIFICATION
SIEVE ANALYSIS REPORT

Report To: Fowler Creek Trails, LLC
Pat Deneen
PO Box 808
Cle Elum, WA 98922

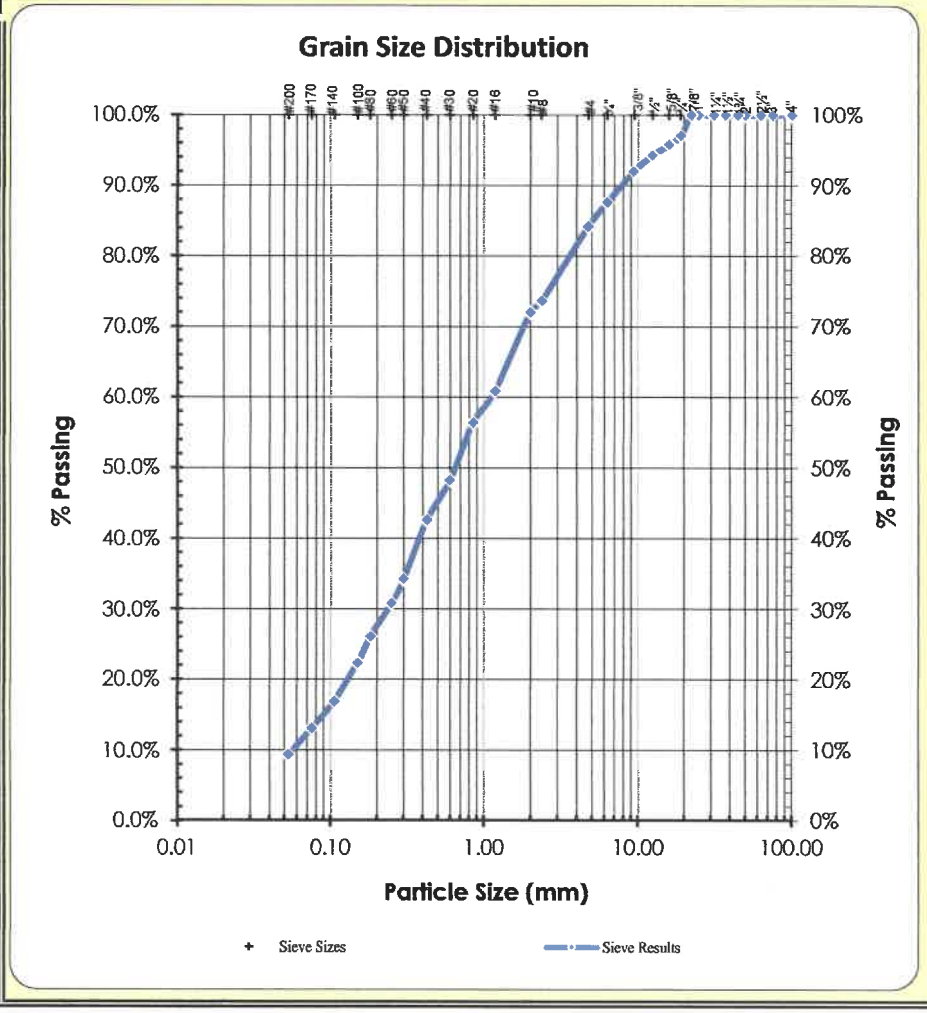
Date Sampled: 11/10/23
Date Received: 11/10/23
Date Tested: 11/20/23
Sampled By: WPE
Sample Method: N/A

Project #: 23525
Sample #: 136
Source: TP#4@4'
Description: Native

Procedure: ASTM C136

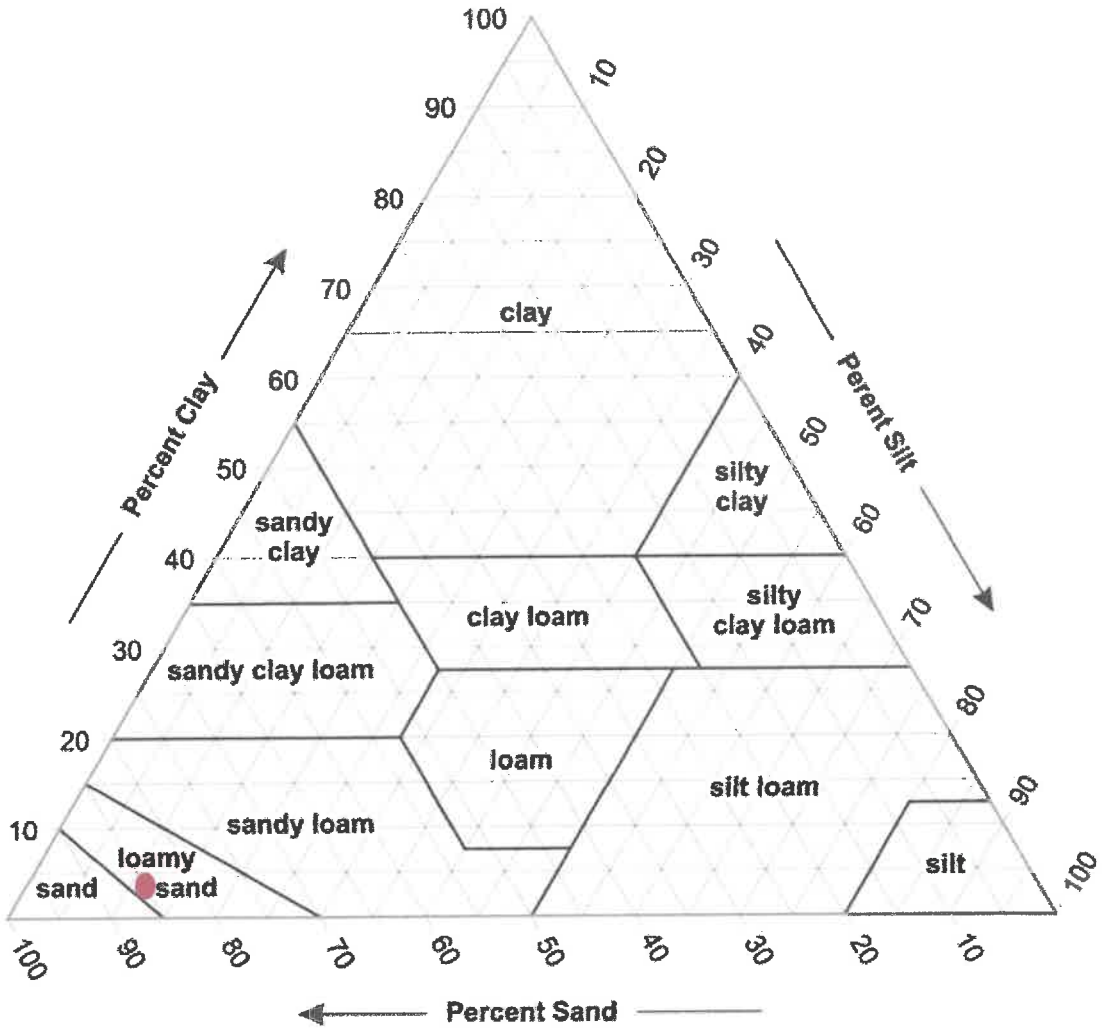
$D_{(10)}$= 0.057 mm	% Gravel = 28.02%	Coeff. of Curvature, C_C = 0.89
$D_{(30)}$= 0.238 mm	% Sand = 233.95%	Coeff. of Uniformity, C_U = 19.68
$D_{(60)}$= 1.120 mm	% Silt & Clay = -189.98%	Fineness Modulus= 2.88

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing
6.00"	150.00		100%
4.00"	100.00		100%
3.00"	75.00		100%
2.50"	63.00		100%
2.00"	50.00		100%
1.75"	45.00		100%
1.50"	37.50		100%
1.25"	31.50		100%
1.00"	25.00		100%
7/8"	22.40		100%
3/4"	19.00	97%	97%
5/8"	16.00		96%
1/2"	12.50	94%	94%
3/8"	9.50	92%	92%
1/4"	6.30	88%	88%
#4	4.75	84%	84%
#8	2.360		74%
#10	2.000	72%	72%
#16	1.180		61%
#20	0.850	56%	56%
#30	0.600		48%
#40	0.425	43%	43%
#50	0.300		34%
#60	0.250		31%
#80	0.180	26%	26%
#100	0.150		22%
#140	0.106		17%
#200	0.075	13%	13%
#270	0.053	9.3%	9.3%



Technician: David S.
Engineer: Nathan Nofziger, P.E.

WESTERN PACIFIC ENGINEERING & SURVEY
1224 South Pioneer Way, Moses Lake, Washington
T: (509)765-1023



Note: Silt-Clay fraction estimated based on the texture and interpolation.

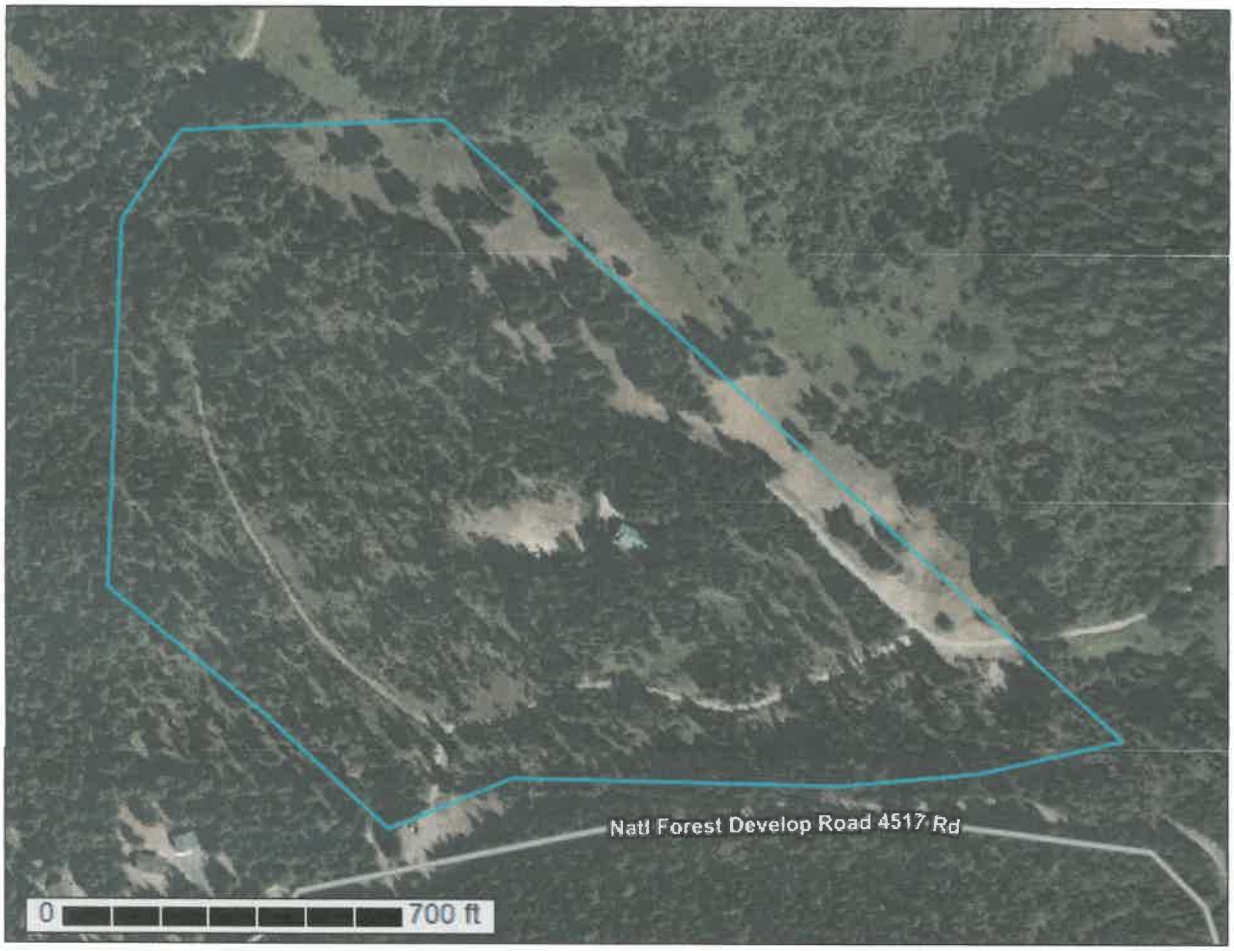
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Kittitas County Area, Washington



November 13, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

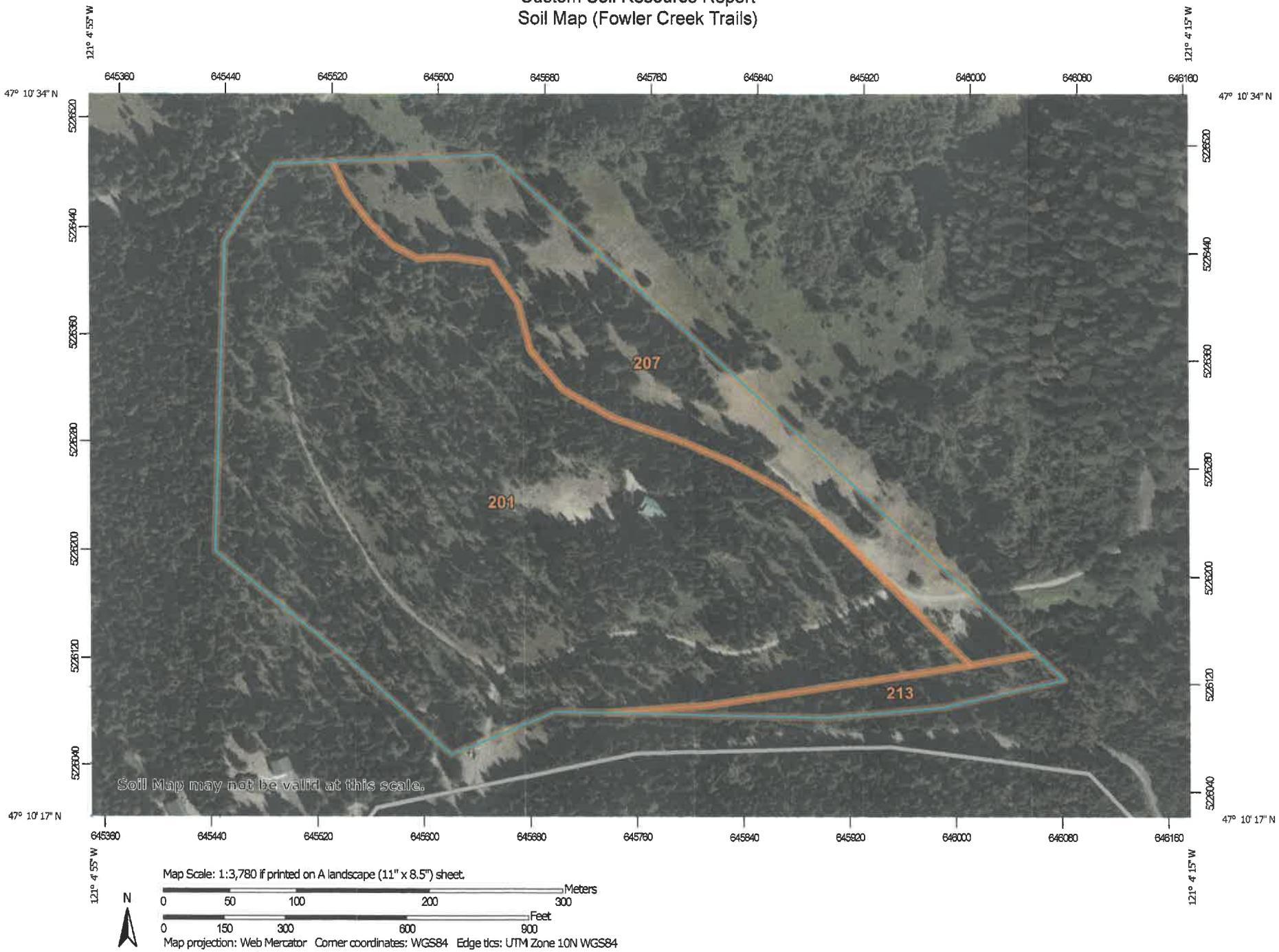
alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map (Fowler Creek Trails)



Map Scale: 1:3,780 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Kittitas County Area, Washington
Survey Area Data: Version 16, Aug 29, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 6, 2022—Sep 8, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (Fowler Creek Trails)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
201	Roslyn ashy sandy loam, 0 to 5 percent slopes	31.7	75.3%
207	Quicksell loam, 0 to 5 percent slopes	8.9	21.2%
213	Roslyn ashy sandy loam, moist, 3 to 25 percent slopes	1.5	3.5%
Totals for Area of Interest		**42.1**	**100.0%**

Map Unit Descriptions (Fowler Creek Trails)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate

pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Kittitas County Area, Washington

201—Roslyn ashy sandy loam, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2ktv
Elevation: 1,900 to 2,400 feet
Mean annual precipitation: 30 to 40 inches
Mean annual air temperature: 43 to 45 degrees F
Frost-free period: 85 to 115 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Roslyn and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Roslyn

Setting

Landform: Terraces
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Glacial drift with a mantle of loess and volcanic ash

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
H1 - 1 to 8 inches: ashy sandy loam
H2 - 8 to 15 inches: ashy sandy loam
H3 - 15 to 37 inches: loam
H4 - 37 to 49 inches: gravelly loam
H5 - 49 to 60 inches: gravelly loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: F006XD002WA - Cool Frigid Xeric Ashy Slopes (Grand Fir Cool Dry Grass)
Other vegetative classification: grand fir/common snowberry/pinegrass (CWS336)
Hydric soil rating: No

Minor Components

Nard

Percent of map unit: 10 percent
Hydric soil rating: No

Volperie

Percent of map unit: 5 percent
Hydric soil rating: No

207—Quicksell loam, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2kv2
Elevation: 1,800 to 3,100 feet
Mean annual precipitation: 25 to 40 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 90 to 120 days
Farmland classification: Prime farmland if irrigated and drained

Map Unit Composition

Quicksell and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Quicksell

Setting

Landform: Terraces
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium

Typical profile

H1 - 0 to 5 inches: loam
H2 - 5 to 20 inches: clay loam
H3 - 20 to 43 inches: clay
H4 - 43 to 60 inches: clay loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: 20 to 40 inches to abrupt textural change
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 5 to 15 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C/D
Ecological site: F006XB001WA - Frigid Xeric Mountain Slopes (Douglas-fir Moderately Dry Shrub/Herb)
Other vegetative classification: Douglas-fir/common snowberry/pinegrass (CDS638)
Hydric soil rating: No

Minor Components

Swauk

Percent of map unit: 10 percent
Hydric soil rating: No

Roslyn

Percent of map unit: 5 percent
Hydric soil rating: No

Teanaway

Percent of map unit: 5 percent
Hydric soil rating: No

213—Roslyn ashy sandy loam, moist, 3 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2kv7
Elevation: 1,900 to 2,400 feet
Mean annual precipitation: 30 to 40 inches
Mean annual air temperature: 43 to 45 degrees F
Frost-free period: 85 to 115 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Roslyn, moist, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Roslyn, Moist

Setting

Landform: Kame terraces, terraces, valley sides
Down-slope shape: Concave, linear
Across-slope shape: Concave, convex
Parent material: Glacial drift with a mantle of loess and volcanic ash

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
H1 - 1 to 8 inches: ashy sandy loam
H2 - 8 to 15 inches: ashy sandy loam

H3 - 15 to 37 inches: loam
H4 - 37 to 60 inches: gravelly loam

Properties and qualities

Slope: 3 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: F006XD001WA - Frigid Moist Xeric Ashy Slopes (Grand Fir Warm Moist Shrub/Herb)
Other vegetative classification: grand fir/vine maple (CWS551)
Hydric soil rating: No

Minor Components

Bertolotti

Percent of map unit: 5 percent
Hydric soil rating: No

Nard

Percent of map unit: 5 percent
Hydric soil rating: No

Quicksell

Percent of map unit: 5 percent
Hydric soil rating: No

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Engineering Properties (Fowler Creek Trails)

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Hydrologic soil group is a group of soils having similar runoff potential under similar storm and cover conditions. The criteria for determining Hydrologic soil group is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Listing HSGs by soil map unit component and not by soil series is a new concept for the engineers. Past engineering references contained lists of HSGs by soil series. Soil series are continually being defined and redefined, and the list of soil series names changes so frequently as to make the task of maintaining a single national list virtually impossible. Therefore, the criteria is now used to calculate the HSG using the component soil properties and no such national series lists will be maintained. All such references are obsolete and their use should be discontinued. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonal high water table, saturated hydraulic conductivity after prolonged wetting, and depth to a layer with a very slow water transmission

rate. Changes in soil properties caused by land management or climate changes also cause the hydrologic soil group to change. The influence of ground cover is treated independently. There are four hydrologic soil groups, A, B, C, and D, and three dual groups, A/D, B/D, and C/D. In the dual groups, the first letter is for drained areas and the second letter is for undrained areas.

The four hydrologic soil groups are described in the following paragraphs:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group

index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Percentage of rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

References:

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Engineering Properties–Kittitas County Area, Washington														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
201—Roslyn ashy sandy loam, 0 to 5 percent slopes														
Roslyn	85	B	0-1	Moderately decomposed plant material	PT	A-8	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	60-75-100	50-65-90	—	—
			1-8	Ashy sandy loam	SM	A-4	0- 0- 0	0- 0- 0	95-98-100	90-95-100	60-65-70	35-40-45	20-28 -35	NP-3 -5
			8-15	Ashy sandy loam	SM	A-4	0- 0- 0	0- 0- 0	95-98-100	90-95-100	60-65-70	35-40-45	20-28 -35	NP-5 -10
			15-37	Loam, gravelly loam	SC-SM	A-4	0- 0- 0	0- 0- 0	70-83-95	60-75-90	50-60-70	35-43-50	20-25 -30	5-7 -10
			37-49	Very gravelly sandy loam, gravelly loam, gravelly sandy loam	GM, SM, GC-GM, SC-SM	A-1, A-2, A-4	0- 3- 5	0-10- 20	45-63-80	35-53-70	20-38-55	15-33-50	15-20 -25	NP-3 -5
			49-60	Extremely gravelly loamy sand, extremely gravelly sandy loam, gravelly loam, very gravelly sandy loam	GM, GC-GM, GP-GM	A-1, A-2, A-4	0- 3- 5	0-13- 25	30-50-70	20-40-60	10-28-45	5-23- 40	15-20 -25	NP-3 -5

Engineering Properties–Kittitas County Area, Washington														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
207—Quicksell loam, 0 to 5 percent slopes														
Quicksell	80	C/D	0-5	Loam	CL-ML	A-4	0- 0- 0	0- 0- 0	100-100-100	90-95-100	75-78-80	55-58-60	25-28-30	5-7 -10
			5-20	Clay loam, loam	CL, CL-ML	A-4, A-6	0- 0- 0	0- 0- 0	100-100-100	90-95-100	75-83-90	55-65-75	25-30-35	5-10-15
			20-43	Clay	CH, MH	A-7	0- 0- 0	0- 0- 0	95-98-100	85-93-100	75-83-90	60-68-75	50-55-60	20-25-30
			43-60	Clay loam, clay, gravelly clay	CL	A-7	0- 0- 0	0- 0- 0	90-95-100	70-85-100	65-78-90	50-60-70	40-45-50	15-20-25
213—Roslyn ashy sandy loam, moist, 3 to 25 percent slopes														
Roslyn, moist	85	B	0-1	Moderately decomposed plant material	PT	A-8	0- 0- 0	0- 0- 0	100-100-100	100-100-100	60-75-100	50-65-90	—	—
			1-8	Ashy sandy loam	SM	A-4	0- 0- 0	0- 0- 0	95-98-100	90-95-100	60-65-70	35-40-45	20-28-35	NP-3 -5
			8-15	Ashy sandy loam	SM	A-4	0- 0- 0	0- 0- 0	95-98-100	90-95-100	60-65-70	35-40-45	20-28-35	NP-5 -10
			15-37	Loam, gravelly loam	SC-SM	A-4	0- 0- 0	0- 0- 0	70-83-95	60-75-90	50-60-70	35-43-50	20-25-30	5-7 -10
			37-60	Loam, gravelly loam, cobbly loam	SC	A-6, A-2, A-4	0- 3- 5	0-13- 25	65-80-95	55-70-85	40-53-65	30-40-50	20-28-35	5-10-15

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf