From:	Rikki Schmitt
To:	Kelly Bacon (CD)
Subject:	Brown & Jackson SEPA Response
Date:	Thursday, December 10, 2020 4:06:49 PM
Attachments:	B&J Response to Comments letter.pdf Exhibit C.pdf Exhibit B.pdf B&J Response Matrix.xlsx Exhibit A.pdf

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Hi Kelly-

I have attached the following in regards to our SEPA Response.

- Response Letter
- Exhibit A – Brown & Jackson's Biosolids Permit Application as submitted to Ecology
- Exhibit B – Wetland and Stream Delineation Report prepared by Avia Environmental Consulting
- Exhibit C – December 3, 2020 Letter from Plateau Archeological Investigations, LLC
- Response Matrix

Thank you,
Rikki Schmitt

Brown & Jackson Septic/Portable Toilets

107 North Main St

Ellensburg, WA 98926

509-925-1564

brownandjackson107@gmail.com

A family run business for over 40 years

December 10, 2020

Kittitas County Development Services
Attn: Kelly Bacon
411 N Ruby St, Suite 2
Ellensburg, WA 98926

Subject: SEPA Application (SE-20-00003)
Brown & Jackson's Initial Response to Public Comments

Dear Ms. Bacon,

Brown & Jackson, Inc. (Brown & Jackson) appreciates the opportunity to provide an initial response to the public comments that your office has received regarding Brown & Jackson's SEPA Application (SE-20-00003), relating to the construction of two storage ponds on Kittitas County Parcel No. 295134 (Property). As longtime residents and business owners in Kittitas County, we have approached site selection and project design with care in an effort to provide sustainable biosolids management in the county while minimizing any potential impacts from the proposed storage ponds. The proposed project will utilize land application of biosolids to provide the beneficial use of improving soil quality for the purposes of growing crops and return approximately 106 acres of arable land that has lain fallow for several years back to productive use.

As members of this community, Brown & Jackson takes the concerns expressed by the public very seriously and, as a result, has decided to proceed with additional studies that address many of the questions raised by commenters with the hope that this additional information will assuage the concerns raised. Specifically, Brown & Jackson has retained appropriately qualified environmental professionals to survey the project areas regarding cultural resources, wetlands, and critical areas. The completed wetland and critical areas report is attached. A letter summarizing the cultural resources assessment is also attached, which will be supplemented upon receipt of the final cultural resource assessment report. Based on the recommendations of the cultural resources professional, Brown & Jackson's

engineers are in the process of adjusting the pond design to entirely avoid any potential impacts to cultural resources. As a result, Brown & Jackson will supplement the information provided to Kittitas County Development Services upon completion of the design modification.

Compliance with Applicable Laws and Regulations

Brown & Jackson wishes to reassure the community of its intent to obtain and comply with any and all permits and authorizations required by federal, state, and local laws and regulations. For example, Brown & Jackson is currently working with the Washington State Department of Ecology (Ecology) to obtain coverage under the General Permit for Biosolids Management (Biosolids Permit). Washington's Biosolids Permit was specifically designed to ensure compliance with the state and federal requirements for projects of this kind and addresses many of the concerns expressed in the public comments. Brown & Jackson's application for coverage under the Biosolids Permit includes detailed descriptions of the storage ponds, an Engineering Report; a Site Specific Land Application Plan (SSLAP), a General Land Application Plan (GLAP), a Crop Management Plan, a Sampling and Analysis Plan for Soil Sampling; a contingency/temporary disposal plan, a Spill Prevention & Response Plan, and an Operation and Closure Plan. We have attached a copy of the completed application, with all attachments, to this letter as Exhibit A for the convenience of the County.

The proposed storage ponds will be constructed with multiple layer HDPE liners to minimize the risk of leakage, along with a leak detection system designed to provide rapid notification in the unlikely event of a leak. Additionally, the Operation and Closure Plan prepared in support of Brown & Jackson's application for coverage under the Biosolids Permit sets forth the steps that will be taken in the unlikely event that a leak is detected. The SSLAP and GLAP provide information regarding the proposed land application program, which has been designed to ensure consistent, uniform, and orderly land application of septage at agronomic rates to improve soil quality for crop production. The SSLAP also demonstrates how Brown & Jackson will comply with applicable sampling requirements, land application methodology, buffer requirements, erosion control requirements, and groundwater protection measures.

Odor

Brown & Jackson has designed the storage ponds, day-to-day operations, and annual land application program to implement best practices to mitigate odor. Potential odor related to the storage ponds will be mitigated by minimizing turbulence and agitation to the ponds, avoiding "free fall" of septage by extending receiving pipes below the water surface, and by using quick disconnect fittings between pumper truck and the receiving station. Each of these best management practices is recommended in Chapter 12 of the EPA's "Guide to Septage Treatment and Disposal."

Potential odor related to land application activities will be mitigated by both limiting the frequency of land application to once per year and promptly incorporating the land-applied septage into the soil by disking it into the soil within six hours of application. Odor mitigation by incorporation is recognized by both the EPA and Ecology.

Section 11.5 of Ecology's General Permit for Biosolids Management outlines the requirements of reducing Vector Attraction and thus the potential for nuisance odors. Incorporating the septage 6 hours after application is a common practice for reducing vector attraction and has been accepted by Ecology.

Land Use

The Property is zoned AG-20. Within the AG-20 zone, "utilities" are an allowed use. *See* KCC 17.15.060.1. The term "utilities" is defined in Chapter 17.61 of the Kittitas County Code (Code), which is cross-referenced by KCC 17.15.060.2. Chapter 17.61 of the Code defines "utilities" as follows:

> [T]he supply, ***treatment*** and distribution, as appropriate, of gas, gas meter stations, municipal domestic and irrigation water, ***sewage***, storm water, electricity, telephone, fiber-optic and cable television. Such utilities consist of both the service activity along with the physical facilities necessary for the utilities to be supplied, except for associated facilities and special utilities as defined herein.

KCC 17.61.010 (emphasis added). Under the plain language of this provision, the "treatment . . . of . . . sewage" is a permitted use within the County's AG-20 zone and, therefore, on the Property.

The Code defines "sewage" as "[t]he water-carried human or household waste from residences, buildings, industrial and commercial establishments, or other places, together with such groundwater infiltration, and other waste as may be present." KCC 13.04.010. Septage falls squarely within this definition.

While the Code does not define "treatment," the usual and ordinary meaning of the term "treatment" is the "subjection of something to the action of an agent or process."[1] The initial screening that the septage will be subjected to before it is deposited into the storage ponds constitutes "treatment," a conclusion that is bolstered by relevant Ecology regulations:

> Except for sewage sludge approved for long-term disposal in accordance with WAC 173-308-300(9), all biosolids (including septage) or sewage sludge must be ***treated*** by a process such as ***physical***

[1] *See* https://www.merriam-webster.com/dictionary/treatment?utm_campaign=sd&utm_medium=serp&utm_source=jsonld.

> ***screening*** or another method to significantly remove manufactured inerts prior to final disposition.

See WAC 173-308-205(1) (emphasis added). (As set forth in the Operation & Closure Plan relating to the proposed storage ponds, the "screening of the septage prior to land application will be through a Screenco Mega Screen 600 receiving station, a bar screen system that meets the requirements of WAC 173-308-205.")

In short, the storage ponds fall within the scope of sewage treatment, making them a utility and, therefore, an allowable use on the Property.

Traffic

Traffic to and from the site, post development, is expected to be minimal. In full operation, Brown & Jackson anticipates only 3-4 trucks traveling to and from the site per day, during typical working hours. Traffic from farming activities will be seasonal, correlating to planting and harvesting seasons, and consistent with typical practices within similar agricultural land.

Water Rights

During the construction of the proposed storage ponds, the water used to mitigate dust pollution and erosion will be provided by the contractor. This is typical practice for construction and grading activities in rural areas. For water to be used in farming activities, Brown & Jackson has secured water rights through the Kittitas County Reclamation District. Most farmland in the area is serviced by the water provided by the reclamation district, and this site is no exception.

Wetlands & Critical Areas

Brown & Jackson retained Avia Environmental Consulting (Avia) to evaluate the property for critical areas on and adjacent to the property. The report Avia prepared to document their methodology, observations, conclusions, and recommendations (Avia Report) is attached to this letter as Exhibit B. Avia determined that the proposed storage ponds are located entirely outside of any applicable regulatory buffer for critical areas (Avia Report at page 1). Avia also concluded that, although the existing access road crosses stream buffers, it is not expected to impact the function of critical areas or buffers and the remaining buffer provides more than compensatory area in additional buffer (Avia Report at pages 1, 5).

Cultural Resources

Brown & Jackson retained Plateau Archaeological Investigations (Plateau) to conduct a cultural resource survey of the Property. The letter summarizing Plateau's methodology, observations, findings, and recommendations is attached to this letter as Exhibit C; Brown & Jackson will submit the final report as soon as it is available. The cultural resource survey identified an area of precontact lithic scatter in the vicinity of the proposed storage ponds. Accordingly, Brown &

Jackson's engineers are in the process of adjusting the pond design to entirely avoid any potential impacts to this area. In addition, all ground-disturbing activities associated with the project will be carried out under the guidance of an inadvertent discovery plan.

We trust that this information will be helpful as the County continues to process our application. To the extent that you have any additional questions, or need any additional information, please do not hesitate to contact me.

Sincerely,

Rikki Schmitt

Exhibits

Exhibit A	Brown & Jackson's submitted application for General Permit for Biosolids Management (Biosolids Permit).
Exhibit B	*Wetland and Stream Delineation Report for Parke Creek Property, Kittitas County, Washington,* prepared by Avia Environmental Consulting; October 2020.
Exhibit C	December 3, 2020 letter from Plateau Archaeological Investigations, LLC to Ms. Rikki Schmitt re: Archaeological Survey of the Brown & Jackson Ponds Project, Kittitas County, Washington.

Exhibit A

Brown & Jackson's submitted application for General Permit for Biosolids Management (Biosolids Permit)

DEPARTMENT OF ECOLOGY
State of Washington

2015 Application for Coverage Under the General Permit for Biosolids Management

1. Facility Information	
Name of Facility	Brown & Jackson
Owner	Brown & Jackson, Inc.
Ownership Status	☐ **Federal** ☐ **State** ☐ **Local** ☒ **Private** ☐ **Other:**
Physical Address	Access near the intersection of Parke Creek Road & Christensen Road In Ellensburg, WA
Mailing Address	107 North Main Street, Ellensburg, WA 98926
Permit Number	Pending Approval

2. Facility Contacts		
	Primary Contact	**Responsible Official**
Name	Rikki Schmitt	Tyler Schmitt
Title	Office Manager	President
Phone	O: 509-925-1564 C:509-929-4785	O: 509-925-1564 C: 509-929-1705
Email	brownandjackson107@gmail.com	tyschmitt128@gmail.com

3. **Facility type** (*check all that apply*)
☐ Major sewage treatment facility (design *flow of ≥1 mgd or serving a population of ≥10,000*)
☐ Minor sewage treatment facility (design *flow of <1 mgd and serving a population of <10,000*)
☐ Class I sewage treatment facility (*have a pretreatment program or designated as Class I*)
☐ Composting facility (*receive biosolids or sewage sludge for composting*)
☒ Septage management facility (*land apply or prepare septage for land application*)
☐ Beneficial use facility (*receive biosolids from others for direct land application*)
☐ Lagoon facility *(all solids are stored in lagoons)*
☐ Out-of-State (importing material to a facility within Washington State)
☐ Other—describe:

DEPARTMENT OF ECOLOGY
State of Washington

2015 Application for Coverage Under the General Permit for Biosolids Management

4. Other Permits (*check all that apply*)	
☐ National Pollutant Discharge Elimination System (NPDES) – Permit Number:	
☐ State Waste Discharge – Permit Number:	
☐ National Emission Standards for Hazardous Pollutants Preconstruction	
☐ Prevention of Significant Deterioration Program	
☐ Ocean Dumping	☐ Nonattainment Program
☐ Stormwater Discharge	☐ Underground Injection Control Program
☐ Dredge or Fill	☐ Hazardous Waste Management Program
☒ Other – Describe: None	

5. Pathogen Reduction (*check all that apply; see WAC 173-308-170 or WAC 173-308-270[3]*)	
Class A	**Class B**
☐ Alternative 1 (*time/temperature*)	☐ Alternative 1 (7 *samples*)
☐ Alternative 2 (*pH/time/temperature/% solids*)	Alternative 2 (*process to significantly reduce pathogens [PSRP]*) ☐ Aerobic digestion ☐ Air drying ☐ Anaerobic digestion ☐ Composting ☐ Liming (septage, see below)
Alternative 3 (*process to further reduce pathogens [PFRP]*) ☐ Composting ☐ Heat drying ☐ Heat treatment ☐ Pasteurization ☐ Beta ray irradiation ☒ Gamma ray irradiation ☐ Thermophilic aerobic digestion	
☐ Alternative 4 (*PFRP equivalent*)	☐ Alternative 3 (*PSRP equivalent*)
Septage	☐ **Sent for Further Treatment**
☐ Injection	
☒ Incorporation	☐ **Did not meet requirements** (explain):
☐ pH stabilization	

DEPARTMENT OF ECOLOGY
State of Washington

2015 Application for Coverage Under the General Permit for Biosolids Management

6. Vector Attraction Reduction (*see* ***WAC 173-308-180*** *or* ***WAC 173-308-270[3]***)	
☐ Alternative 1 (*38% volatile solids reduction*) ☐ Alternative 1a (*bench test-anaerobic*) ☐ Alternative 1b (*bench test-aerobic*)	☐ Alternative 4 (*pH stabilization*)
	☐ Alternative 5 (*≥75% solids*)
	☐ Alternative 6 (*≥90% solids*)
☐ Alternative 2 (*SOUR*)	☐ Alternative 7 (*injection*)
☐ Alternative 3 (*aerobic process*)	☒ Alternative 8 (*incorporation*)
☐ **Sent for Further Treatment**	☐ Did not meet requirements (explain):

7. Pollutants *(not applicable to septage unless required by permit; see* ***WAC 173-308-160****)*	
Number of pollutant monitoring events in the past year:	N/A
Pollutants Exceeding Table 1 or 3 Values:	**N/A**

8. Process, Production & Storage	
How are your biosolids produced and managed?	Biosolids are composed of septage that Brown and Jackson pumps from various local residential and commercial septic tanks. Biosolids are to be placed in storage ponds, and then land applied in the designated areas once a year.
Planned Changes?	No known planned changes
Average Production (+/- 10 dry tons)	EST. 94.2 Dry Tons; Assuming 2% solids in septage
How often and what time of year testing conducted?	Testing occurs once a year, prior to land application
Who hauls your biosolids?	Brown & Jackson will be hauling the biosolids to the site from a variety of residential and commercial sources
Where do your biosolids go? How much?	Biosolids will be stored in a series of ponds that are designed hold 1.13 Million gallons of biosolids
If you are not a Lagoon Facility proceed to Section 9 (all lagoon facilities must answer the following)	

DEPARTMENT OF ECOLOGY
State of Washington

2015 Application for Coverage Under the General Permit for Biosolids Management

Date of last measured depth. How much has accumulated?	N/A, storage ponds have not yet been constructed
When was the last dredging event?	N/A
Do you plan to dredge during this permit cycle?	Yes, Once a year

9. Attachments (Check off each requirement for your facility type)

Wastewater Treatment Plants that DO NOT Land Apply Biosolids

☐ **Vicinity Map.** The map must extend at least 1 mile around the perimeter of the facility and any associated treatment or storage facilities. The map must also show the location and means of access.

☐ **Facility Schematic.** The Facility Schematic must show how you process and/or manage biosolids.

☐ **State Environmental Policy Act (SEPA).** The act of applying for coverage under this permit triggers a requirement for review under SEPA. This does not necessarily mean that a new SEPA threshold determination will be required.

☐ **Contingency Plan.** Describe your plans for handling biosolids in the event that your biosolids cannot be sent to their usual end use location or fail to meet quality goals.
☐ **N/A.** We have long-term treatment (lagoons).

☐ **Biosolids/Soil Sampling & Analysis Plan (SAP).** A Biosolids/Soil Sampling and Analysis Plan is required when you sample your biosolids and land application site(s).
☐ **N/A.** We have long term treatment or send for further treatment.

☐ **Analytical Data.** The past two years of data related to your biosolids, land application site soil, and/or land application site waters.
☐ **N/A.** We have long term treatment or send for further treatment and have no data.

☐ **Spill Prevention & Response Plan.** Required if you or your agent transport your biosolids.

Wastewater Treatment Plants that Land Apply Biosolids

☒ **Vicinity Map.** The map must extend at least 1 mile around the perimeter of the facility and any associated treatment or storage facilities. The map must also show the location and means of access.

☒ **Facility Schematic.** The Facility Schematic must show how you process and/or manage biosolids.

DEPARTMENT OF ECOLOGY
State of Washington

2015 Application for Coverage Under the General Permit for Biosolids Management

☒ **Contingency Plan.** Describe your plans for handling biosolids in the event that your biosolids cannot be sent to their usual end use location or fail to meet quality goals.
☐ **N/A.** We have long-term treatment (lagoons).

☒ **Analytical Data.** The past two years of data related to your biosolids, land application site soil, and/or land application site waters.

☒ **Spill Prevention & Response Plan.** Required if you or your agent transport your biosolids.

☒ **Biosolids/Soil Sampling & Analysis Plan (SAP).** A Biosolids/Soil Sampling and Analysis Plan is required when you sample your biosolids and land application site(s).

☒ **Site Specific Land Application Plan (SSLAP).** Required for every site where non-exceptional quality biosolids are applied.

☒ **General Land Application Plan (GLAP).** To maintain the option of proposing new sites for applying non-exceptional quality biosolids during the term of this permit.

☐ **State Environmental Policy Act (SEPA).** The act of applying for coverage under this permit triggers a requirement for review under SEPA. This does not necessarily mean that a new SEPA threshold determination will be required.

☐ **Public Notice.** Depending on your operation you may be required to conduct Public Notice as part of submitting this application.

Beneficial Use Facilities

☐ **Vicinity Map.** The map must extend at least 1 mile around the perimeter of the facility and any associated treatment or storage facilities. The map must also show the location and means of access.

☐ **Spill Prevention & Response Plan.** Required if you or your agent transport your biosolids.

☐ **Analytical Data.** The past two years of data related to your biosolids, land application site soil, and/or land application site waters.

☐ **Biosolids/Soil Sampling & Analysis Plan (SAP).** A Biosolids/Soil Sampling and Analysis Plan is required when you sample your biosolids and land application site(s).

☐ **Site Specific Land Application Plan (SSLAP).** Required for every site where non-exceptional quality biosolids are applied.

2015 Application for Coverage Under the General Permit for Biosolids Management

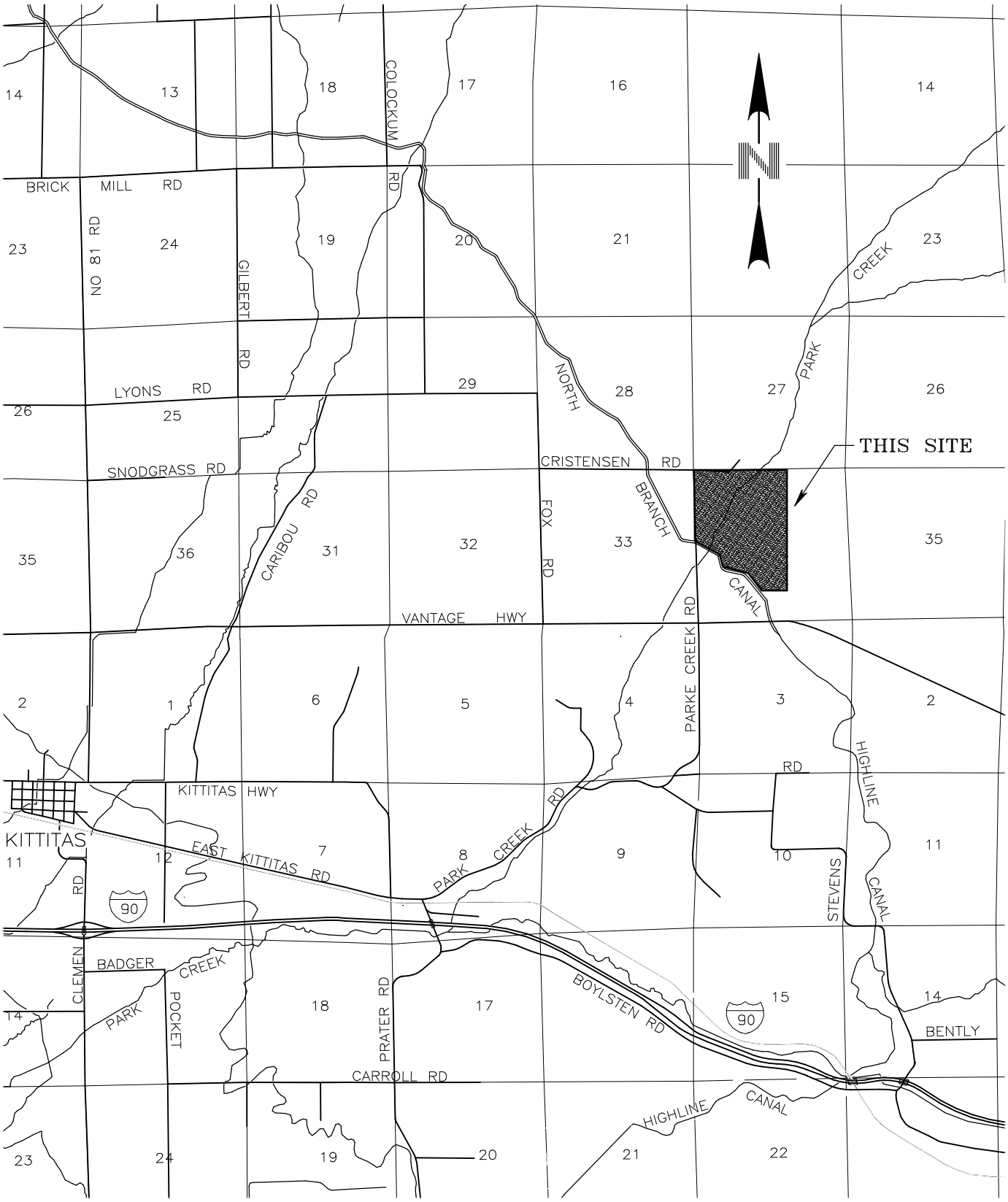
☐ **General Land Application Plan (GLAP).** To maintain the option of proposing new sites for applying non-exceptional quality biosolids during the term of this permit.
☐ **State Environmental Policy Act (SEPA).** The act of applying for coverage under this permit triggers a requirement for review under SEPA. This does not necessarily mean that a new SEPA threshold determination will be required, but any decisions regarding what is needed in order to comply with SEPA must be made by the SEPA Lead Official.
☐ **Public Notice.** Depending on your operation you may be required to conduct Public Notice as part of submitting this application.
Other
☐ **Temporary Disposal Plan.** Required if you dispose sewage sludge in a landfill on a temporary basis (see WAC 173-308-300(8)).
☐ **N/A.** We do not send (or plan to send) any sewage sludge to a landfill.

10. Certification Statement (*must be signed by the **Responsible Official listed above**) (see **WAC 173-308-310***)

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Responsible Official Signature _____ Date

Responsible Official Name and Title _____,_____



WESTERN PACIFIC ENGINEERING & SURVEY
A TERRA DEVELOPMENT SERVICES CORPORATION

1328 East Hunter Place
Moses Lake, WA
T:(509)765-1023
F:(509)765-1298

BROWN & JACKSON

Land Application Site Vicinity Map

DRAWN BY: NDN	DATE:	WPE PROJECT #:	Scale: 1" = 5000'
CHECKED BY: NDN	April 14, 2020	20410	PLATE NO.: 01

Subject: Re: Progress - Brown & Jackson Ponds
From: Rikki Schmitt <rikkischmitt1@gmail.com>
Date: 6/3/2020, 9:24 AM
To: Brittney Oliver <boliver@wpeinc.net>

Good morning Brittney-

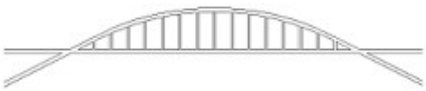
Here is our Spill Prevention & Response Plan

Our Contingency Plan for septage that does not meet our quality standards will be taken to the Kittitas Solid Waste facility, where we currently dump all of our material. Quality standards will be assessed by our pumping technician. If the load has an excessive amount of 'fog' i.e. fats, oils, or grease we will take the load to the Kittitas County Solid Waste Facility. In the occasion that we pump leachate, we will take that to the Kittitas County Leachate Pond.

Let me know if I need to clarify anything further.

Thanks
Rikki

On Tue, Jun 2, 2020 at 7:47 AM Brittney Oliver <boliver@wpeinc.net> wrote:

> Rikki,
>
> A couple of more questions for you:
>
> 1. Do you guys have a current "Spill Prevention and Response Plan"? and Can you please send me a copy?
>
> 2. We have to include a contingency plan that describes your plans for handling biosolids in the event that your biosolids cannot be sent to their usual end use location (i.e. planned land application) or fail to meet quality goals. Nathan mentioned that in the event you cannot land apply the plan is to transport to Kittitas County Biosolids Management Facility. Can you provide any more details or processes regarding this?
>
> Thank you,
>
> Brittney Oliver, P.E.
>
> 
>
> **WESTERN PACIFIC ENGINEERING & SURVEY, INC.**
> PIONEER WAY PROFESSIONAL CENTER
> 1328 E, HUNTER PLACE
> MOSES LAKE, WASHINGTON 98837
>
> Phone: (509)765-1023
> Fax: (509)765-1298
>
> On 6/1/2020 12:39 PM, Rikki Schmitt wrote:
>
> > 107 North Main Street is the billing and physical address for Brown & Jackson

Brown & Jackson Septic/Portable Toilets

Spill Prevention & Response Plan

This spill prevention/Response Plan is being submitted as required by the General Permit for Biosolids Management. Brown & Jackson hauls septage daily to 4G Farms located on Parke Creek Road in Ellensburg, WA. Kittitas County Parcel No. 295134. Septage is discharged to septage lagoons through a screen on the property and land applied on the same parcel.

Haul routes for our vehicles to access the Parke Creek Property

There are multiple Haul Routes to access 4G Farms. Due to the fact that our septic technicians pump all throughout the county multiple routes will be used.

1)East on Vantage Hwy-North on Naneum Rd-East on Lyons Rd- South on Fox Rd-East on Christensen Rd-Parke Creek Rd
2)East on Vantage Hwy-North on Fox Rd-East on Christensen Rd-Parke Creek Rd
3)East on Vantage Hwy-North on Parke Creek Rd

Spill Prevention Measures

To minimize the possibility of a spill, Brown & Jackson has implemented the following measures:

- All vehicles are regularly inspected and serviced.
- Drivers never exceed the posted speed limit and only travel at speeds appropriate for current road conditions.
- Vehicles guaranteed “leak-proof” upon purchase and regularly examined to ensure no leaking occurs.

Equipment to Address A Spill

In order to promptly and properly respond to a spill all Brown & Jackson transportation vehicles will be equipped with the following:

- A copy of the current Spill Prevention & Response Plan
- A cell phone
- Gloves and personal safety equipment
- A shovel
- Plastic bags
- Bagged hydrated lime, or other type of diluted bleach solution

Brown & Jackson Septic/Portable Toilets

Spill Prevention & Response Plan

Spill Response Measures

In the event of a spill, the following measures will be taken:

1. Place reflective traffic cones along the roadway leading up to the spill (use flares if needed).
2. If the spill poses a risk to public or environmental health or is odorous, use hydrated lime to cover exposed septage.
3. If the spill is large, contact the Brown & Jackson staff to have them contact a local excavation or pumping company to excavate or pump all biosolids and place back into the hauling truck.
4. If the spill is on a state or interstate roadway and may obstruct traffic for an extended period, contact the appropriate Department of Transportation regional office.
5. Contact the biosolids coordinator at the Department of Ecology's Central Regional Office as soon as possible, but not more than 24 hours following the spill. Unless waived by Ecology, submit a written explanation of the spill within 5 days. The written explanation must include the following:
    a. A description of the spill and its cause.
    b. The exact date and time of the spill, and, if it has not been cleaned-up, the anticipated time when cleanup will occur.
    c. Steps taken or planned to reduce, eliminate, and prevent recurrence of spills.
6. Contact the appropriate staff at the local health department in the county where the spill occurs.
7. If a spill may have affected natural resources other than fish or wildlife, contact the appropriate Department of Natural Resources regional office.
8. If a spill may have affected fish or wildlife, contact the appropriate Department of Fish and Wildlife regional office.

Brown & Jackson Septic/Portable Toilets

Spill Prevention & Response Plan

Contacts:

Emergency: 911
Tyler Schmtt-Brown & Jackson: 509-929-1705
Department of Ecology-Central Regional Office: 509-575-2490
Department of Ecology-Canming Xiao: 509-575-2842
Department of Ecology, Biosolids Coordinator, Kyle Dorsey (contact regardless of location of spill): 360-407-6393
Kittitas County Health Department: 509-962-7515
Washington State Patrol/Ellensburg Office: 509-925-5303
Kittitas County Sheriff's Office: 509-962-7525
Department of Transportation: 509-962-9874
Department of Natural Resources: 509-925-8510
Department of Fish and Wildlife-Jennifer Nelson: 509-961-6639

Brown & Jackson Septage Land Application Site

Prepared by

Kyle E. Bair, PhD, CPSS

Soiltest Farm Consultants, Inc.

Crop Management Plan

Site Inspection: 4/29/2020

Report Preparation: 5/4/2020

2925 Driggs Dr.

Moses Lake, WA 98837

509.765.1622

Introductory Information

The proposed site is approximately 200 total acres and is located northeast of the town of Kittitas, WA. The GPS coordinates are: 47.011003N, -120.319585W. The topography of the field is generally south facing with predominantly gentle slopes (0-3%) with some areas of moderate to steep slopes (5-30%). Park Creek runs through the property from north to south. Site elevation is 2190ft at the highest point on the NE corner of the site and 2053ft on the south end.

The northwest corner of the field been pasture for cattle, and there is an area to the south east of that with irrigation that was farmed many years ago. The east half of the site is native ground with sagebrush and native perennial bunch grasses and will likely not be used/suitable for septage application. The dominant soil series on the site is a Terlan-Durtash-Selah complex. This accounts for 47.4% of the acreage while the Wipple, Nitzel, Mitta, and Weirman series comprises the rest. These series are differentiated mostly by the slope and fraction of course/cobbly rock material in the topsoil. The Terlan-Durtash-Selah complex that lies north of the creek is very rocky/cobbly and would be difficult to use as farm ground (other than animal pasture). The best area for application is the Nitzel and an area of Terlan-Durtash-Selah complex on the south end of the property; an area of approximately 70acres. The soil in this area is at least 2ft deep with less rock and gentle slopes. The site contains no debris or fill, and a water table was not apparent in any of the test cores.

According to the suitability rating from the USDA-NRCS Web Soil Survey, classification for use as a land application of municipal sewage sludge site is “very limited” for the soils on the property.

The attached documents contain soil series maps, use ratings for septic drain fields, taxonomic and unit descriptions for the area of interest. These documents were obtained from the USDA-NRCS Web Soil Survey website.

Crop Management Plan

The purpose of land application of process water is to treat the water in a way that not only safeguards surface and groundwater, but also makes beneficial use of the water and any included plant nutrients. To achieve this, the input of constituents to the lands must match the uptake or consumption of the constituents by crops and soil microorganisms. This process consists of first, measuring the output of process water constituents and, second, measuring the constituent removal rate for the crops harvested. The net loading rates are calculated as the difference between additions and removals. When planning the loading rates in commercial crop production fields, the nutrients applied in commercial fertilizers and the residual nutrients left in the soil from previous activities must be included in the accounting

process. Annual soil testing is used to monitor concentrations of the constituents in the soil to predetermine the application of process water.

The following tables show some potential crops and the amount of nutrient removal that can be expected at a given plant nutrient concentration (for nitrogen and salts) and yield, The amount that the crop needs to produce well, the supply available in the soil (based on test data) and lastly application rates to maintain land application goals.

Table 1

Crop	Potential Yield	Units	% DM	% Nitrogen	% Ash
Alfalfa	4	ton/acre	90	3.2	11
Soft Wheat	70	bu/acre	92	2.4	1.9
Hard Wheat	60	bu/acre	92	2.6	2.2
Grass Hay	3	ton/acre	75	1.5	1.6
Grazing*	0.74	ton/acre	85	1.6	1.6

* Assume 90 AUMs at 26.2 lbs of dry matter intake per day

Table 1 gives typical yield and crop nutrient concentrations for common land application crops. The concentration values are based on typical analyses of the crops from central Washington.

Table 2

	Lbs/acre Removed		
	DM	**Nitrogen**	**Ash**
Alfalfa	7200	230	792
Soft Wheat	3864	93	73
Hard Wheat	3312	86	73
Grass Hay	4500	68	72
Grazing	1258	20	20

Table 2 is the amount of nitrogen and salts (ash) that the crop will remove in harvested material based on the yield and concentration data from Table 1. This data should not be used exclusively to determine application rates. For example, Hard Wheat removes 86 lbs N/acre, but applying nitrogen at this rate is insufficient and will not maximize crop yield. This is the amount removed in the grain and the nitrogen needed to grow stalks, leaves and other plant parts is not included here.

Table 3	Nitrogen Agronomic Rate (lbs/acre)
Alfalfa	Legume crop--No additional N needed
Soft Wheat	182
Hard Wheat	198
Grass Hay	130
Grazing	100

Table 3 shows the amount of nitrogen needed by a crop (beyond what is available in the soil) to produce the crop at the yields indicated in Table 1. These are based on University guidelines for crop production based on soil analysis levels.

Table 4	Soil Nitrogen Supply (lbs/acre)
Alfalfa	121
Soft Wheat	121
Hard Wheat	121
Grass Hay	121
Grazing	121

This table shows the amount of available nitrogen that is currently present in the soil. This was determined from samples collected on 4/29/2020 and is calculated as follows: Sum of Test N (lbs/acre) = (1-3ft Nitrate (ppm) + 1ft Ammonium (ppm))*4 + 20*OM (%)

Table 5	Nitrogen Application Rate (lbs/acre)	AAR* gal/acre/year	Total Gallons at 70 Acres
Alfalfa	230	88,462	6,192,308
Soft Wheat	61	23,462	1,642,308
Hard Wheat	77	29,615	2,073,077
Grass Hay	9	3,462	242,308
Grazing	-21	-8,077	-565,385

* EPA calculation (annual application rate = N/0.0026). N is the nitrogen needed by the crop.

Table 5 shows the nitrogen application rates for each crop in lbs/acre. This is the nitrogen agronomic rate from Table 3, less the soil nitrogen supply in Table 4. Because alfalfa is capable of producing its own nitrogen, there is no agronomic rate and the removal rate is used instead. Using the EPA calculation, gallons to be applied per acre per year are also given. Lastly, the total volume per year (assuming 70 arable acres) that could be applied to each crop is shown for planning purposes.

Recommendations

Without a serious investment of time and money, I can't see any of the area north of the creek being suitable for land application of septage and crop production. The soil is very shallow and cobbly and will be incredibly difficult to till and plant. It could obviously still be used as pasture ground, but then the nitrogen supplied by the septage would exceed what a grass pasture would need to grow.

The area that has wheel lines and an old circle seems to be the most logical place to apply the septage. The wheel line area soil is at least 3ft deep and would be productive, if responsibly managed. Further, the area to the south (with the old circle) also has deeper soil (at least 2ft) and large rocks are less prevalent. The total of this area is approximately 70 acres.

Because alfalfa is a legume crop, it is a desirable choice for nutrient treatment. In a 3-4 year rotation with wheat or a grass hay, the potential for nutrient loading beyond crops needs will be minimal given an expected annual volume of 1.2 million gallons. The NRCS soil survey lists these soils as "very limited" based on flooding and depth to groundwater. Based on the topography and soils of the site, I believe that application of septage is feasible if applied during the dry season (late spring to early fall). There were not indications that the water table in this area was shallow and no sign of flooding was observed.

Soil Analysis Results

Brown & Jackson Land Application Site

Depth	1:1 pH s.u.	Walkley-Black Organic Matter %	Nitrate-N mg/kg	KCl Ammonium-N mg/kg	Dry Comb. Total N %	Olsen Phosphorus mg/kg	NH4OAc Potassium mg/kg	DTPA-Sorb. Sulfate-S mg/kg	Amm. Repl. CEC meq/100g
0-12"	7.4	2.7	2.4	8.1	0.167	16	936	6	19.1
13-24"	8.3	1.7	3.9	2.4	0.117	5	557	1	20.2
25-36"	8.5	1.3	2.4	1.3	0.092	3	550	3	19.8

Sum of Tested N **121** **lbs/acre**

The Soil Science Society of America
Soils Certification Board

has conferred upon

Kyle Edward Bair, PhD

the designation of

Certified Professional Soil Scientist

By successfully fulfilling the requirements, passing a rigorous examination,
subscribing to the Certified Professional Soil Scientist
Code of Ethics and committing to ongoing professional development.

Certification effective from
1/1/2019 to **12/31/2020**

Certification Number: **327799**

CPSS

Certified Professional
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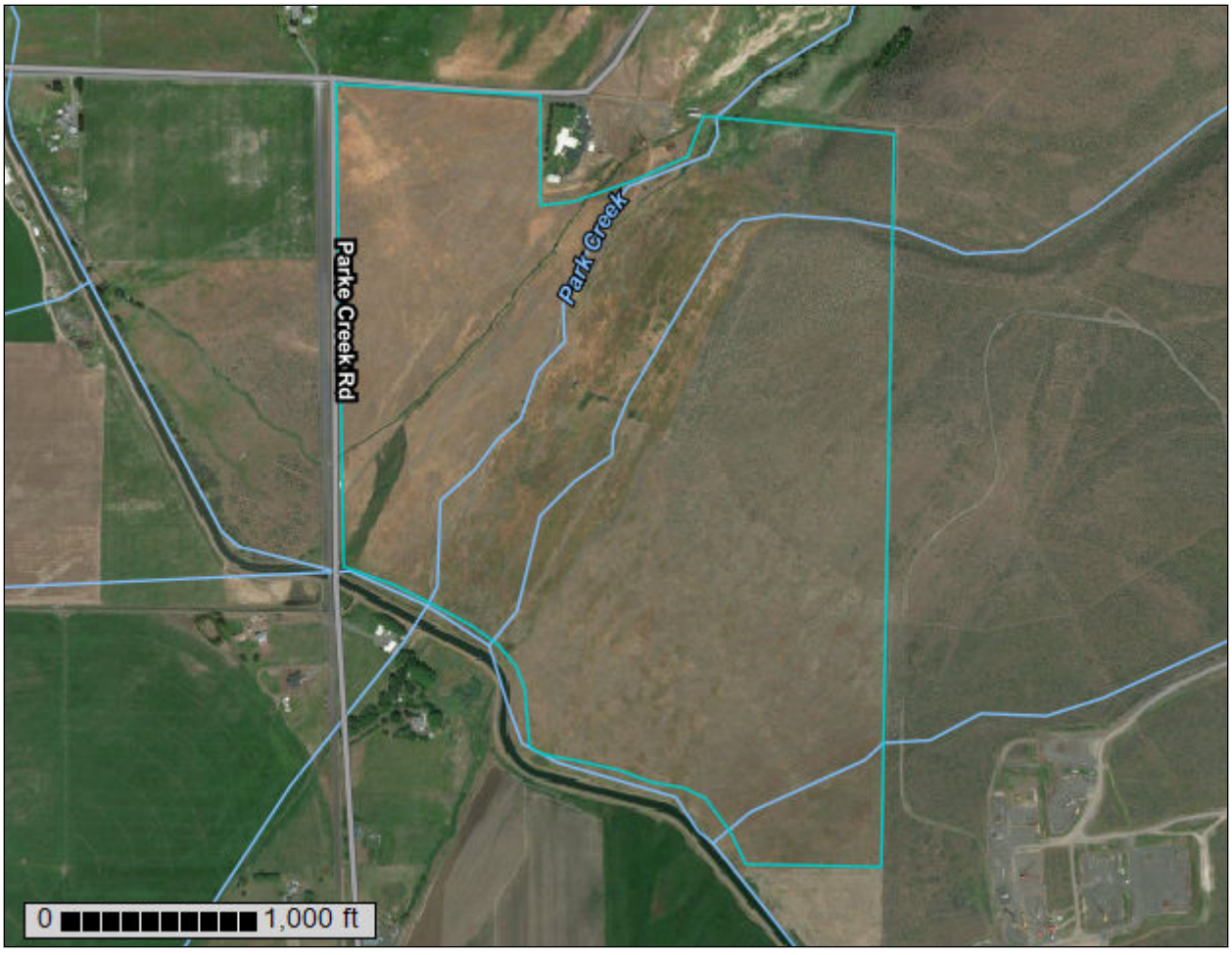
Natural Resources Conservation Service

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

Brown & Jackson



April 30, 2020

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.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

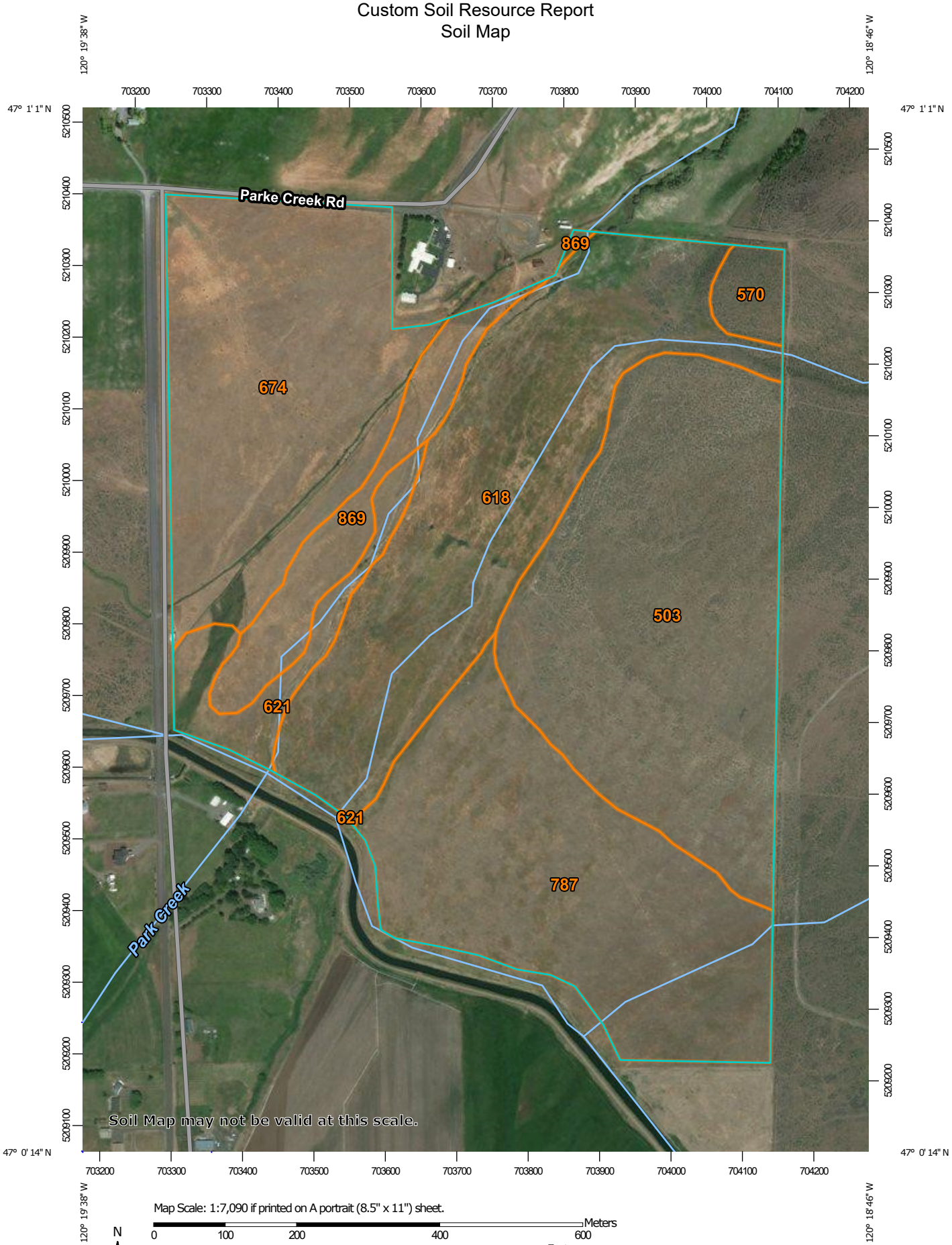
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

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



Map Scale: 1:7,090 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 300 600 1200 1800

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 12, Sep 16, 2019

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

Date(s) aerial images were photographed: Jul 3, 2014—Sep 21, 2016

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

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
503	Terlan-Durtash-Selah complex, 5 to 15 percent slopes	52.1	25.9%
570	Wipple cobbly clay loam, 15 to 30 percent slopes	3.0	1.5%
618	Nitzel ashy silt loam, gravelly substratum, 0 to 2 percent	44.8	22.3%
621	Mitta ashy silt loam, flooded, 0 to 2 percent slopes	7.4	3.7%
674	Durtash gravelly loam, 3 to 10 percent slopes	40.6	20.2%
787	Terlan-Durtash-Selah complex, 2 to 5 percent slopes	43.3	21.5%
869	Weirman complex, drained, 0 to 5 percent slopes	10.1	5.0%
Totals for Area of Interest		**201.3**	**100.0%**

Map Unit Descriptions

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

503—Terlan-Durtash-Selah complex, 5 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2l1x
Elevation: 1,500 to 2,500 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Terlan and similar soils: 40 percent
Durtash and similar soils: 35 percent
Selah and similar soils: 20 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Terlan

Setting

Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over alluvium

Typical profile

H1 - 0 to 7 inches: gravelly loam
H2 - 7 to 15 inches: gravelly clay loam
H3 - 15 to 18 inches: very gravelly loam
H4 - 18 to 26 inches: cemented material
H5 - 26 to 60 inches: cemented material

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: 10 to 20 inches to duripan
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Very low (about 2.6 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: DRY STONY 10-16 PZ (R008XY201WA)
Hydric soil rating: No

Description of Durtash

Setting

Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium with loess in the upper part

Typical profile

H1 - 0 to 5 inches: gravelly loam
H2 - 5 to 14 inches: very gravelly clay loam
H3 - 14 to 19 inches: extremely gravelly clay
H4 - 19 to 29 inches: cemented material
H5 - 29 to 60 inches: cemented material

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: 10 to 20 inches to duripan
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.01 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: DRY STONY 10-16 PZ (R008XY201WA)
Hydric soil rating: No

Description of Selah

Setting

Landform: Terraces
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loess and alluvium

Typical profile

H1 - 0 to 9 inches: loam
H2 - 9 to 17 inches: silty clay loam
H3 - 17 to 21 inches: cobbly clay loam
H4 - 21 to 31 inches: cemented material
H5 - 31 to 60 inches: cemented material

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: 20 to 40 inches to duripan
Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 3 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: DRY LOAMY 10-16 PZ (R008XY101WA)
Hydric soil rating: No

Minor Components

Benwy

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

570—Wipple cobbly clay loam, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: 2l3v
Elevation: 1,200 to 3,200 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Wipple

Setting

Landform: Hillslopes, structural benches
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Colluvium from basalt with minor amounts of loess in the surface

Typical profile

H1 - 0 to 7 inches: cobbly clay loam
H2 - 7 to 11 inches: very gravelly clay loam
H3 - 11 to 30 inches: very gravelly clay
H4 - 30 to 50 inches: very cobbly clay loam
H5 - 50 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: STONY 10-16 PZ (R008XY202WA)
Hydric soil rating: No

Minor Components

Argabak

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

Clerf

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

Vantage

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

618—Nitzel ashy silt loam, gravelly substratum, 0 to 2 percent

Map Unit Setting

National map unit symbol: 2l58
Elevation: 1,500 to 2,000 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 150 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Nitzel, gravelly substratum, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nitzel, Gravelly Substratum

Setting

Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium with an influence of volcanic ash in the upper part

Typical profile

H1 - 0 to 8 inches: ashy silt loam
H2 - 8 to 29 inches: ashy loam
H3 - 29 to 46 inches: loam
H4 - 46 to 60 inches: sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately 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: About 29 to 46 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Mitta

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

Tanaha

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

621—Mitta ashy silt loam, flooded, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2l5c

Elevation: 1,500 to 2,300 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 150 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Mitta, Flooded

Setting

Landform: Flood plains, fan aprons, fan skirts, inset fans
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Alluvium mixed with volcanic ash in the upper part

Typical profile

H1 - 0 to 6 inches: ashy silt loam
H2 - 6 to 15 inches: ashy silt loam
H3 - 15 to 34 inches: ashy silt loam
H4 - 34 to 49 inches: silty clay loam
H5 - 49 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 34 to 49 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 10.0
Available water storage in profile: High (about 11.7 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Nack

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

Opnish

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

Woldale

Percent of map unit: 5 percent

Hydric soil rating: No

674—Durtash gravelly loam, 3 to 10 percent slopes

Map Unit Setting

National map unit symbol: 2l6z
Elevation: 1,500 to 2,500 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Durtash, Gravelly

Setting

Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium with loess in the upper part

Typical profile

H1 - 0 to 5 inches: gravelly loam
H2 - 5 to 14 inches: very gravelly clay loam
H3 - 14 to 19 inches: extremely gravelly clay
H4 - 19 to 29 inches: cemented material
H5 - 29 to 60 inches: cemented material

Properties and qualities

Slope: 3 to 10 percent
Depth to restrictive feature: 10 to 20 inches to duripan
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.01 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D

Ecological site: DRY STONY 10-16 PZ (R008XY201WA)
Hydric soil rating: No

Minor Components

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

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

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

787—Terlan-Durtash-Selah complex, 2 to 5 percent slopes

Map Unit Setting
National map unit symbol: 2l8x
Elevation: 1,600 to 2,600 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition
Terlan and similar soils: 40 percent
Durtash and similar soils: 30 percent
Selah and similar soils: 25 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Terlan

Setting
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over alluvium

Typical profile
H1 - 0 to 7 inches: gravelly loam
H2 - 7 to 15 inches: gravelly clay loam
H3 - 15 to 18 inches: very gravelly loam
H4 - 18 to 26 inches: cemented material
H5 - 26 to 60 inches: cemented material

Properties and qualities
Slope: 2 to 5 percent
Depth to restrictive feature: 10 to 20 inches to duripan

Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Very low (about 2.6 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: DRY STONY 10-16 PZ (R008XY201WA)
Hydric soil rating: No

Description of Durtash

Setting

Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium with loess in the upper part

Typical profile

H1 - 0 to 5 inches: gravelly loam
H2 - 5 to 14 inches: very gravelly clay loam
H3 - 14 to 19 inches: extremely gravelly clay
H4 - 19 to 29 inches: cemented material
H5 - 29 to 60 inches: cemented material

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: 10 to 20 inches to duripan
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.01 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: DRY STONY 10-16 PZ (R008XY201WA)
Hydric soil rating: No

Description of Selah

Setting

Landform: Terraces
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loess and alluvium

Typical profile

H1 - 0 to 9 inches: loam
H2 - 9 to 17 inches: silty clay loam
H3 - 17 to 21 inches: cobbly clay loam
H4 - 21 to 31 inches: cemented material
H5 - 31 to 60 inches: cemented material

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: 20 to 40 inches to duripan
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 3 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Ecological site: DRY LOAMY 10-16 PZ (R008XY101WA)
Hydric soil rating: No

Minor Components

Benwy

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

869—Weirman complex, drained, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2lct
Elevation: 400 to 2,900 feet

Mean annual precipitation: 7 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Weirman, very gravelly sandy loam, and similar soils: 55 percent
Weirman, very cobbly sandy loam, and similar soils: 40 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Weirman, Very Gravelly Sandy Loam

Setting

Landform: Flood plains, terraces
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium

Typical profile

H1 - 0 to 5 inches: very gravelly sandy loam
H2 - 5 to 15 inches: very gravelly loamy sand
H3 - 15 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: 3 to 18 inches to strongly contrasting textural stratification
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Very low (about 0.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: STONY BOTTOM 6-10 PZ (R007XY403WA)
Hydric soil rating: No

Description of Weirman, Very Cobbly Sandy Loam

Setting

Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium

Typical profile

H1 - 0 to 4 inches: very cobbly sandy loam
H2 - 4 to 15 inches: very gravelly loamy sand
H3 - 15 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 0 to 5 percent

Depth to restrictive feature: 3 to 18 inches to strongly contrasting textural stratification
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: About 42 to 60 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: Very low (about 0.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Kayak

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

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

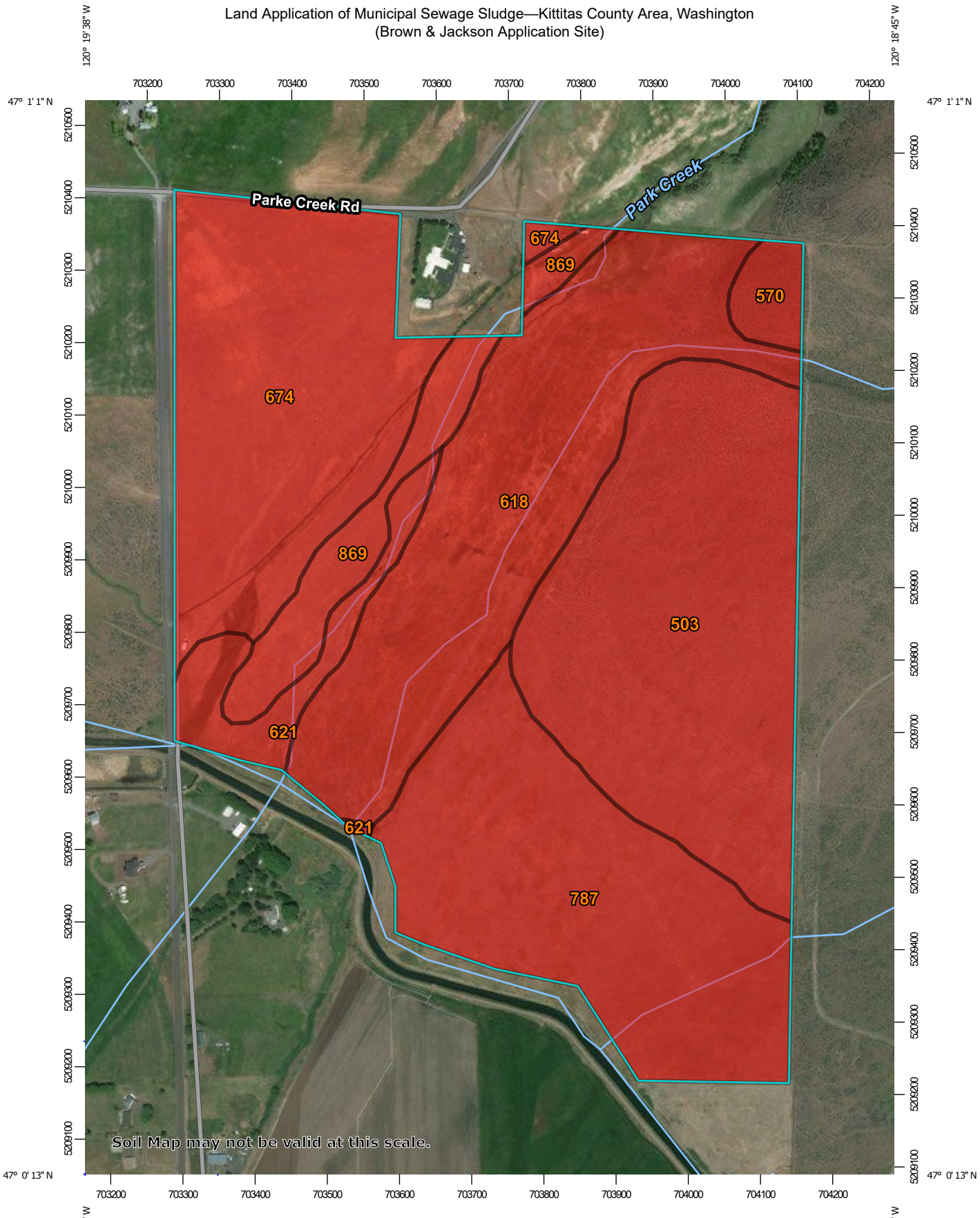
United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

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

Land Application of Municipal Sewage Sludge—Kittitas County Area, Washington
(Brown & Jackson Application Site)



Map Scale: 1:7,220 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 100 200 400 600

Feet
0 350 700 1400 2100

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 Rating Polygons

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Soil Rating Lines

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Soil Rating Points

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

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 12, Sep 16, 2019

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

Date(s) aerial images were photographed: Jul 3, 2014—Sep 21, 2016

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.

Land Application of Municipal Sewage Sludge

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
503	Terlan-Durtash-Selah complex, 5 to 15 percent slopes	Very limited	Terlan (40%)	Slow water movement (1.00)	52.1	25.4%
				Depth to cemented pan (1.00)		
				Droughty (1.00)		
				Slope (0.16)		
			Durtash (35%)	Slow water movement (1.00)		
				Depth to cemented pan (1.00)		
				Droughty (1.00)		
				Slope (0.16)		
			Selah (20%)	Slow water movement (1.00)		
				Depth to cemented pan (0.99)		
				Droughty (0.83)		
				Slope (0.16)		
570	Wipple cobbly clay loam, 15 to 30 percent slopes	Very limited	Wipple (85%)	Slope (1.00)	3.2	1.6%
				Slow water movement (1.00)		
				Cobble content (0.98)		
				Droughty (0.39)		
618	Nitzel ashy silt loam, gravelly substratum, 0 to 2 percent	Very limited	Nitzel, gravelly substratum (90%)	Flooding (1.00)	45.4	22.1%
				Depth to saturated zone (0.89)		
621	Mitta ashy silt loam, flooded, 0 to 2 percent slopes	Very limited	Mitta, flooded (85%)	Flooding (1.00)	7.8	3.8%
				Depth to saturated zone (0.62)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Slow water movement (0.22)		
				Sodium content (0.18)		
674	Durtash gravelly loam, 3 to 10 percent slopes	Very limited	Durtash, gravelly (80%)	Slow water movement (1.00)	42.5	20.7%
				Depth to cemented pan (1.00)		
				Droughty (1.00)		
787	Terlan-Durtash-Selah complex, 2 to 5 percent slopes	Very limited	Terlan (40%)	Slow water movement (1.00)	43.5	21.2%
				Depth to cemented pan (1.00)		
				Droughty (1.00)		
			Durtash (30%)	Slow water movement (1.00)		
				Depth to cemented pan (1.00)		
				Droughty (1.00)		
			Selah (25%)	Slow water movement (1.00)		
				Depth to cemented pan (0.99)		
				Droughty (0.83)		
869	Weirman complex, drained, 0 to 5 percent slopes	Very limited	Weirman, very gravelly sandy loam (55%)	Filtering capacity (1.00)	10.8	5.2%
				Flooding (1.00)		
				Droughty (1.00)		
				Strongly contrasting textural stratification (1.00)		
			Weirman, very cobbly sandy loam (40%)	Filtering capacity (1.00)		
				Flooding (1.00)		
				Droughty (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Strongly contrasting textural stratification (1.00)		
				Cobble content (0.32)		
Totals for Area of Interest					**205.2**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Very limited	205.2	100.0%
Totals for Area of Interest	**205.2**	**100.0%**

Description

Application of sewage sludge not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. Sewage sludge is the residual product of the treatment of municipal sewage. The solid component consists mainly of cell mass, primarily bacteria cells that developed during secondary treatment and have incorporated soluble organics into their own bodies. The sludge has small amounts of sand, silt, and other solid debris. The content of nitrogen varies. Some sludge has constituents that are toxic to plants or hazardous to the food chain, such as heavy metals and exotic organic compounds, and should be analyzed chemically prior to use.

The content of water in the sludge ranges from about 98 percent to less than 40 percent. The sludge is considered liquid if it is more than about 90 percent water, slurry if it is about 50 to 90 percent water, and solid if it is less than about 50 percent water.

The ratings are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the sludge is applied, and the method by which the sludge is applied. The properties that affect absorption, plant growth, and microbial activity include saturated hydraulic conductivity (Ksat), depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, available water capacity, reaction, salinity, and bulk density. The wind erodibility group, soil erosion factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of sludge. Permanently frozen soils are unsuitable for waste treatment.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect agricultural waste management. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated

rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

BROWN AND JACKSON

SAMPLING AND ANALYSIS PLAN

A GUIDE FOR SOIL SAMPLING

JUNE 2020

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4.0 SHIPPING SAMPLES 7

1.0 Introduction

An important part of the Brown and Jackson land application program is based upon valid analytical data derived from relatively small samples. The collection of a sample and its proper preservation during shipment is critical for obtaining reliable analytical results.

Currently the sample collection and testing is to be performed by Soiltest Farm Consultants, Inc. They will follow this sampling plan and adhere to the requirements set forth in WAC chapter 173-308. In the event that Soiltest cannot conduct the required sampling or testing, other labs shall be chosen per the requirements outlined in this plan and WAC chapter 173-308.

Analysis of priority pollutants (also referred to as 503 metals) and pathogens provide the basis for establishing Class B biosolids. Nutrient concentrations are used to determine agronomic rates when biosolids are land applied. The analysis of biosolids will follow the methods outlined in WAC 173-308-140. Biosolids sampling frequency is set forth in WAC 173-308-150. Samples shall be tested for the pollutants in section WAC 173-308-160.

Soil sampling at land application sites provides important crop nutrient data. To develop an appropriate agronomic rate the nitrogen in the soil and biosolids must be taken into account along with the predicted nitrogen uptake by the crop. Accurate assessment of soil nitrogen is dependent on good sampling techniques.

This plan will describe what's involved in sampling soils in the application areas. The intent is to be complete and concise so that sample collection, preservation, and shipment to a lab may be performed with little or no assistance outside this document.

2.0 Selecting a Lab

Currently the plan is to contract with Soiltest Farm Consultants, inc. Laboratory to perform the necessary soil sampling and testing that is required. Should there come a time when Soiltest is unable to perform the required soil sampling and testing, an alternate analytical laboratory must meet be accredited by the Washington State Department of Ecology.

This Ecology website provides accreditation details of labs and the methods for which they are accredited: https://fortress.wa.gov/ecy/laboratorysearch/

Make sure the analytical laboratory can provide the analysis required, including:

- Meet needed turn-around-times for lab reports when samples are delivered. You should call and check if you have time constraints;
- Make sure that the lab understands how to report the results (e.g. dry-weight basis, mg/kg, etc.)

3.0 Soil Sampling

Background: Soil sampling is an important element in the biosolids program. Soil samples are used to determine the quantity of septage to land apply on a given field. The analysis measures available nitrogen, phosphorus, and other constituents in the soil, typically in the top 3 feet. Separate samples

will be collected for the 1st, 2nd, and 3rd foot of soil in a given field. All the samples sent to a lab for analysis will be made up of at least 15 sub-samples collected from specific locations evenly distributed across the entire field. The objective is to gather a "composite" sample that is representative of the overall soil in the field being sampled. In order to collect 3 composite samples (top foot, 2nd foot, and 3rd foot) from a 25 acre field , a minimum of 60 sub-samples are necessary—20 from each foot of soil. See Table 5.1 to see how many sub samples are needed by field size.

The timing of sampling may vary depending upon the planned septage application date(s) and the purpose for which the data is being collected. Contact your regional biosolids coordinator if you have questions. Early growing season samples provide data on nutrient carryover from the previous year. Late spring & early summer samples may provide information on mineralization of organic matter after soils warm-up and fall sampling can provide information on what's left over after crops are harvested. Ecology may request any or all of the above samples to be collected and analyzed depending on the crops, soils, and farming practices.

For more information on collecting soil samples go to:
https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/ec628.pdf
"A guide to Collecting Soil Samples for Farms and Gardens" by Melissa Fery, Jeff Choate, and Elizabeth Murphy

For more information on Baseline Soil Nitrate go to:
https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/em9281.pdf
"Baseline Soil Nitrogen Mineralization: Measurement and Interpretation" by D.M. Sullivan, A.D. Moore, E. Verhoeven and L.J. Brewer

For more information on nitrate testing go to:
https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/em8832.pdf
"Post-Harvest Soil Nitrate Testing for Manured Cropping Systems West of the Cascades" by D.M. Sullivan and C.G. Cogger.

3.1 Tools Needed for Soil Sampling

- Sample chain-of-custody forms
- Sharpie® pens and ink pens
- Soil sample bags—bags from your lab are best, but you can use new Ziploc bags
- Clean buckets labeled by depth (so you don't put the 2-foot sample in the 1-foot bucket)
- Field book to record field description, dates, and information on sample location.
- Clean large spoon to mix samples
- Soil sampler (e.g. hand auger, probe, etc.)
- Cooler for samples
- Sufficient Ice
- Shipping labels if delivered by courier

Table 3.1: Sub-Samples Needed by Field Size to Create a Composite Sample

Field Size in Acres	Sub-Samples Required
5-20	15
20-40	20
40-80	25
< 80	30

3.2 Sampling Procedures and Common Soil Analysis

Pre-Application composite soil samples will be collected at each site where the septage will be applied. Soil samples shall be collected independently for the top foot of soil (0"–12"depth) and the second foot of soil (12"–24" depth). A minimum of 15 individual samples, typically taken as soil cores 10-12" in length, shall be collected from the indicated depths. Pre-application composite samples will be analyzed for pollutant concentrations as defined in WAC 173-308-160.

The soil samples shall be analyzed for total N (or TKN), N03-N, and NH4-N. Table 3.2, below, lists typical constituents in which soils are tested for and tier definitions. The individual samples shall be evenly distributed across an application unit to ensure that the composite sample is representative of the soil across the entire application unit.

Note: For sites that have not previously received septage, concentrations of the Priority Pollutants per WAC 173-308-160, Table 1) shall be determined for the top foot of the soil.

The process for sampling is as follows:

1) Determine the field size and refer to Table 3.1.
2) All samples must be taken within the boundaries of the field where land application will occur. **Bring the field map with you** so samples are not located in areas outside permitted boundaries;
3) **Plan in advance** how you will cover the field evenly with the number of samples you need to take.
4) Be aware of areas that don't represent the field overall, such as eroded areas and rocky outcrops and avoid taking samples in these locations.
5) At each sampling location, remove the loose, organic matter on the surface of the soil to create a place where the soil probe will be inserted.
6) Using the soil sampling probe, collect soil in 12-inch intervals to desired depth or until refusal. Be careful to replace the sampler back into the same hole for the 2nd and 3rd foot samples.
7) If multiple 12-inch intervals are being collected (i.e. you are collecting 1, 2, & 3 foot intervals) ensure that you have appropriately labeled buckets for holding the respective subsamples.
8) After collecting each subsample move to the next subsample location along your pattern and repeat sample collection process.
9) Once the appropriate number of subsamples are collected to create a composite sample, mix them together thoroughly and fill a properly labeled lab sample bag.
10) Once the samples are bagged and properly marked immediately fill out the Chain of Custody. **Crosscheck the samples with the chain of custody form to verify the information is correct**.
11) **It's critical to preserve the samples on ice immediately**. Cooling the samples stops biological activity that will change the results--cool below 39^0 F (4^0 C) but do not allow to freeze. The soil-bags must be kept cooled until they reach the lab.
12) Place the chain of custody form in a Ziploc® bag and include it with samples inside the cooler.

Table 3.2 Common Soil Analysis	
Constituent	**What is it?**
NH_4-N	Nitrogen in the form of ammonia. It is a form of mineral nitrogen, is directly plant available, and common in mineral fertilizer. **This is required when sampling for agronomic rates in the biosolids program.**
NO_3-N	Nitrogen in the form of nitrate. It is another form of mineral nitrogen, is directly plant available and common in fertilizer. (NO_3 is derived from oxidizing NH_4.) **This is required when sampling for agronomic rates in the biosolids program.**
Total Nitrogen	Organic Nitrogen & NH4-N ***& NO3-N***. *See difference from TKN.* *-Subtracting mineral nitrogen (NH_4-N and NO_3-N) from this number can give an estimate of nitrogen in soil organic matter.*
TKN	Total Kjehldahl Nitrogen: Organic nitrogen & NH4-N; ***no NO3-N***. *-Subtracting NH_4-N from this number can give an estimate of nitrogen in soil organic matter.*
P	Phosphorus is an important nutrient plants need in relatively large amounts. When analyzing soil on the west side of the Cascades use the Bray method, on the east of the Cascades use the Olsen method. **This is recommended when sampling for agronomic rates in the biosolids program.**
S	Sulfur is an important nutrient plants need in relatively large amounts. **This is recommended when sampling for agronomic rates in biosolids program.**
K	Potassium is an important nutrient plants need in relatively large amounts
pH	A measure of soil acidity. The scale runs from 0 (extremely acid) to 14 (extremely basic). Battery acid is near zero and liquid drain cleaner is near 14. Most agricultural soils are between 5 and 8. Most crops do best between 6.0 – 7.5. **This is recommended when sampling for agronomic rates in biosolids program.**
CEC	Cation Exchange Capacity is a measure of a soil's capacity to retain elements such as K^+, Ca^{2+}, Mg^{2+}, and Na^+. Generally speaking, sandy soils have low CEC and soil with high organic matter and clay have higher CEC. **This is recommended when making an initial assessment of a field.**
% Organic Matter	Organic matter is important for holding water & nutrients, supporting microorganisms, and creating soil structure. It also mineralizes nitrogen and micro-nutrients. For every 1% organic matter about 20 lbs per acre of plant available nitrogen is mineralized each year. **Recommended when making an initial assessment of a field and reassessed periodically.**

Note: The cost of soil analysis varies among labs. Many labs offer pricing for a suite of analytes for less than the sum of individual analytes. Good sampling and quality analysis is essential for achieving high yields and consistent outcomes over time without leaching nutrients or burning up crops.

4.0 Shipping Samples

Be sure that the chain of custody form is accurate! Place the completed Chain of custody form into a Ziploc® bag, seal, and place it into the shipping container. This keeps the paperwork legible when it arrives at the lab.

1) Ensure lids are sealed tightly and you have adequate ice. Hot and sunny afternoons can easily heat samples and damage them—samples must be kept cool at all times until reaching the lab.
2) Check necessary pickup and delivery times when shipping samples so as to minimize hold times.

GENERAL LAND APPLICATION PLAN

Submitted as an addendum to Brown and Jackson
Application for Coverage
Under the General Permit for Septage Management

This plan is developed in accordance to Chapter 173-308-90004 WAC, Appendix 4: Minimum Content for a General Land Application Plan.

Document Date: June 2020

PREFACE

This document is written in accordance with WAC 173-308, Appendix 4, Minimum Content for a General Land Application Plan. The purpose of this plan is:

- Provide broad information about the geographical area where Brown and Jackson land applies septage;
- Set forth general site selection criteria where new fields can be identified and added to Brown and Jackson permit coverage;
- Describe general management guidelines for areas receiving septage;
- Public Notice procedures for adding new fields to Brown and Jackson permit coverage.

1) *GEOGRAPHICAL AREA*

Septage storage and land application sites are located in Kittitas County, Washington. The geographical area described in this document is located in Section 34, Township 18 North, Range 20 East, W.M.

The water resource inventory area (WRIA), or watershed, where septage may be applied under Brown and Jackson's permit coverage is known as the Upper Yakima Watershed (WRIA 39).

2) SITE SELECTION CRITERIA

Brown and Jackson desires to maximize the beneficial use of the septage products we manage. To meet this goal, potential land application sites are selected with a preference for productive soils and for soils that can be substantially improved with septage land application. Septage will be applied to sites managed for:

- Commercial agriculture;
- Pasture and rangeland;

Sites are evaluated on a case by case basis for suitability based on a number of factors including:

- topography/slopes;
- Soils;
- Depth to groundwater;
- Precipitation;
- Zoning:
- Neighboring land use;
- Access and storage

Site/Soil attributes generally not suitable for land application of Septage:

- Persistent anaerobic soil conditions (presence of gleyed soils or mottling);
- Hardpans or lithic layers within 12 inches of the surface;
- Slopes exceeding 25%;
- Sites immediately adjacent to residential areas.

Sites proposed for septage application that have a seasonal groundwater depth of less than 3' below the surface will be managed by a *Ground Water Protection Plan* detailed in the *Operations / Site Specific Land Application Plan*.

The Washington State Department of Ecology Publication #93-80, *Biosolids Management Guidelines for Washington State* as revised in July 2000, and any subsequent revisions, shall be used a guide for site selection. Additional site selection and design assistance is provided by University of Washington and Washington State University biosolids researchers, extension agents, or professional soil scientists.

Soiltest Farm Consultants, Inc. performed a crop management plan that details the site specific areas that are most suitable for land application. The report dated May 4th, 2020 states that "The best area for application is the Nitzel and an area of Terlan-Durtash-Selah complex on the south end of the property; an area of approximately 70acres."

3) SITE MANAGEMENT

Brown and Jackson will manage all sites in accordance with Chapter 173-308 WAC, any applicable *Operations/Site Specific Land Application Plan(s),* and all conditions noted in the letter providing Final Coverage under the *General Permit for Biosolids Management*.

4) ADVANCE NOTICE TO THE PERMITTING AUTHORITY FOR NEW OR EXPANDED LAND APPLICATION SITES.

The following outlines the procedure for proposing a new land application site or expansion of an existing land application site under this General Land Application Plan:

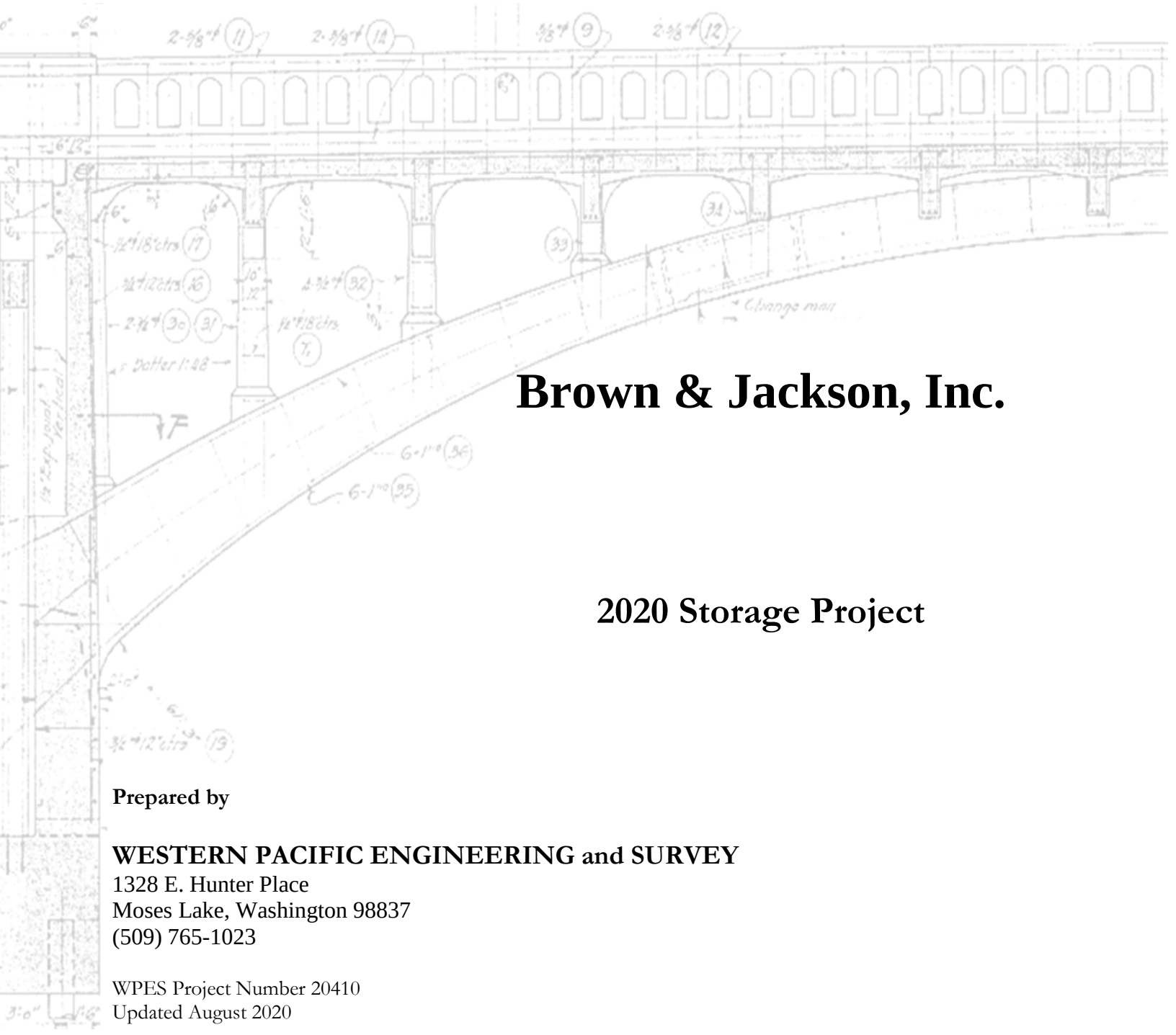
- Advance notice to the Department of Ecology that includes the information contained in WAC 173-308-90003, Appendix 3: Items 1, 2, 7, 8, 9, 12, and 13. This information may be submitted electronically or by hard copy to the regional Biosolids Coordinator.
- Review of the site by Ecology;
- Concurrence of both Brown and Jackson and Ecology about a land application site details to include, but not be limited to: 1) field size and location, 2) buffers, 3) truck access, 4) septage on-site storage, 5) any application restrictions or requirements.

5) ADVANCE PUBLIC NOTICE FOR NEW OR EXPANDED LAND APPLICATION SITES

When a new land application site or expansion of an existing land application site is proposed, Brown and Jackson will complete the requirements listed in Section 4 above, ***Advance Notice to the Permitting Authority for New or Expanded Land Application Sites.*** Subsequent to completion of those requirements, the site shall be posted in accordance with WAC 173-308-310(13)(g), (h),(i),(j), and (k).

After the proposed site has been posted for a minimum of 30 days, Ecology shall evaluate any public comments received. Following that evaluation, Ecology shall provide Brown and Jackson a permitting decision in writing that either approves or denies coverage under the General Permit for Biosolids Management.

ENGINEERING REPORT



Brown & Jackson, Inc.

2020 Storage Project

Prepared by

WESTERN PACIFIC ENGINEERING and SURVEY
1328 E. Hunter Place
Moses Lake, Washington 98837
(509) 765-1023

WPES Project Number 20410
Updated August 2020

ENGINEERS SPECIAL INSPECTORS PLANNERS SURVEYORS

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PIONEER WAY PROFESSIONAL CENTER
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MOSES LAKE, WASHINGTON 98837
OFFICE: (509) 765-1023
FAX: (509) 765-1298

August 13, 2020

Brown & Jackson, Inc.
Attn: Rikki Schmitt
107 N Main Street
Ellensburg, WA 98926

SUBJECT: Engineering Report for Septage Storage Ponds Located near Ellensburg, Washington in Kittitas County.
WPES Project No. 20410

Dear Ms. Schmitt,

Western Pacific Engineering & Survey, Inc. is pleased to provide you with this report concerning construction of the new holding ponds located on Kittitas County Tax Parcel No. 295134, near Ellensburg, Washington. The Washington State department of Ecology is requesting an engineering report covering the purpose of the project, the daily operation of the project, the design assumptions for the project and the design calculations for the ponds.

Brown & Jackson, Inc. has been providing septic services both residential and commercial clients near Ellensburg Washington for nearly 25 years. With the construction industry in the area going year-round, a booming real estate market, and an abundance of old septic systems, business is good and wastewater is collected year-round. Last year, Brown & Jackson collected 1.14 million gallons of wastewater. In the past, all of this wastewater was transported to other third party treatment sites.

In an effort to streamline their business Brown & Jackson is constructing two new collection ponds to store the septage so that it may be land applied. The Parcel in which the ponds are located, also contains the various areas in which the land application will occur. In total, there is about 106 acres of land that is readily available to accept the land application of the wastewater.

The disposal site is located near the intersection of Christensen Road and Parke Creek Road. The site is undeveloped with the exception of a gravel access road and bridge canal crossings on the north end of the site. The site is primarily surrounded by undeveloped property, with the exception of Washington State DSHS building to the north, and the Western WA Operating Engineers facility to the southeast. Because of the site's isolation, it is ideal for the proposed usage.

The construction of two (2) holding ponds have been proposed for the disposal site. The construction of the ponds are necessary to comply with current Washington Department of Ecology Requirements concerning the land application of wastewater. The septage will be stored in the ponds until the fall, when it will be pumped out and disked into the designated farmed areas located on the same parcel. The septage will be disked into the ground to aid the growth of the winter wheat and other potential crops.

Daily Operations

With the new ponds constructed, the day to day operation of the land application area will be more cohesive. Septic pump trucks will arrive via Park Creek Road and enter the property on the northern portion of the site. They will proceed down the gravel access road to the storage ponds. Once arriving at the chosen storage pond, the truck will dump its load through the screen table resting on the pond berm and over the liner, which will in turn drain through a hose into the pond.

The wastewater can be applied to the ground, via permit, as long as the ground is not frozen. The plan is to pump the septage from the ponds and land apply each fall. The Septage will be pumped from the ponds with trucks and then distributed to the designated farmed locations. The distributed septage will be disked into the ground using standard farming equipment.

Basis of Design

During the design of the wastewater ponds several design assumptions had to be made and several technical challenges were required to be overcome.

Demand: A typical work week is five days. During each work day, the fleet of pump trucks can accumulate an average of 3,000 gallons of effluent per day, with a maximum capacity to pump 5,000 gallons of effluent per day. For design purposes, it was assumed that the peak inflow rate to the ponds will be 5,000 gallons per day.

Site: The project site is sloping from the northeast to the southwest and generally has a mix of gravely loams and silt loams, as outlined in the Custom Soil Resource Report for Kittitas County, Washington published by the USDA. These materials found on site range from moderately drained to well drained, however they tend to have a moderately low capacity to transmit water. The floor of the ponds would need to be slopped at 2% to generally match the existing terrain and to provide flow to the leak detection system and a cleanout sump. The upward lip of the pond near the access route, needed to be near grade for truck access, while being slightly higher than grade to keep water runoff from entering the pond.

Air Quality: For this site sit was not anticipated that and advanced design would be needed to address air quality. The ponds are located in a fairly remote area with only the Parke Creek Youth Group Home located to the west of the proposed ponds. The prevailing wind direction data gathered from the Western Regionals Climate Center shows that, in this area, the wind primarily blows from the northwest. Any smell that may arise from the ponds is not expected to negatively impact the air quality of the group home tenants.

Water Balance: A spreadsheet showing the water balance for the project has been included in the appendix of this report. The water balance spreadsheet shows the incoming wastewater throughout the year. The spreadsheet also includes rates for monthly precipitation and for evaporation. In summary, the balance showed that for year round storage, the ponds would need to have combined storage for 1,061,232 gallons of water.

The approximate number of work days was estimated based on historical calendars and the actual number of days may vary slightly from month to month but should average to 255 days per year. It is also important to remember that the five thousand gallons hauled on any given work day is a peak flow rate with average actual flow rates being closer to three thousand gallons per day. Significant Federal holidays were also removed from the work day count.

Monthly precipitation values used in the water balance calculations were the decennial climate normal values obtained from NOAA National Centers for Environmental Information for Ellensburg. The Monthly net precipitation, in gallons, was then calculated based on the area of the surface of the pond.

Monthly evaporation was retrieved from the Western Regional Climate Center for Washington State. The site specific monthly evaporation rates were then calculated based on site's centralized proximity to the measured locations of Lake Kahess, Quincy, Prosser, and Tieton Dam. The yearly total from these four locations was platted on an isopluvial map, and the location of the Brown & Jackson Ponds was plotted to determine the site specific yearly evaporation. Then Since Quincy is the closest location, the percentage of precipitation of each month from the Quincy data was used to determine the inches of evaporation each month at the Brown & Jackson site, based on the yearly value obtained from the isopluvial map. A copy of the isopluvial map crated in these calculations can be found in the appendix.

The evaporation volume was calculated based on the expected surface area of the pond each month. For the first month, the evaporation volume calculations used the area of the bottom of the pond as the evaporation surface area. For the months following, the area of the bottom of the pond plus a prorated portion of the surface area of the pond when it is full, was used for the evaporation area calculations. These areas were multiplied by the adjusted evaporation rate. The Adjusted evaporation rate was calculated using a 0.9 multiplier to account for some reduced evaporation due to higher TDS and TSS levels in this pond over the water rate used in the department of commerce measurements.

The minimum required receiving acres column is a simple calculation not to show how much to irrigate, rather to show that the operating plan does not exceed the current number of irrigatable acres based on a requirement that no more than 36,000 gallons of wastewater go to a given acre per year. With this balance, we found that at least a total acreage of 27.7 acres is needed. With over 100 acres of readily available land to be irrigated and farmed, there is sufficient area within the site that is available for proper wastewater disposal.

Construction Materials: Northwest linings was chosen to be the lining provider for the project. They have three materials that are ideally suited for the construction of storage ponds and these will be incorporated into the design of the ponds. One product in particular, the knobbed "Drain Liner" has 0.13 inch bumps that separate the two pond liners. This material allows for the free flow of liquid to the leak detection system, and reduces construction time and costs. For purposes of design, two liners meeting a minimum 60mils of thickness are required.

Stormwater: For this site, the Stormwater design considerations were for a 25-year 24-hour storm. Additionally, the site of the ponds places them near the top of a rise adjacent to native undisturbed soils. With the land to the north being used as farmland, and the minimal grade change of the adjacent land, it is expected that limited to no runoff will reach the storage ponds. The edges of the ponds are slightly raised above the adjacent grade, so that in the event of a severe storm the nearby surface runoff will be directed around the ponds.

Also winter precipitation, occurring when the ponds are full, typically takes the form of snow and ice, which typically does not generate runoff. Should rain occur, the warmer rains typically thaw the ground sufficiently to absorb most runoff. However, with the edges of the ponds raised from the native ground, any Stormwater runoff that may occur will be re-directed away from the ponds.

Number of Ponds: Western Pacific Engineering and Survey was requested to design two (2) ponds sized to handle the expected yearly volumes of wastewater.

Copies of the stormwater and evaporation information as well as the liner product information is included in the appendix of the report.

Design Results

A design for the storage ponds has been included with the construction drawings. The completed pond designs resulted in a stored wastewater volume of approximately 624,000 gallons in Pond 1 and approximately 626,000 gallons in Pond 2, for a combined storage capacity of 1.25 million gallons.

The volume of the ponds was calculated via computer software in which a three-dimensional model of the finished surface of the pond was compared to a fixed elevation datum being eighteen inches (18") below the pond berm. The pond's final is about 20% oversized based on the conservative design requirements previously mentioned and tabulated in the water balance.

For purposes of design an action leakage rate of 0.156 gpm was calculated. This value is based on a 2mm design/construction flaw or hole in the primary liner of the pond. Moderate flows of water passage in the liner are to be expected due to the molecular passage of atoms through the membrane. However, at this leakage rate it is estimated that the sump and leak detection system will show results in a couple of days as compared to molecular passage which may take years. Should the leakage detection sump fill with water, the pond will need to be drained and repaired.

(The leakage rate was calculated based on Giroud's Equation assuming a full storage pond at the shallow end.)

The composite liner system for this pond is comprised of a smooth 60mil HDPE liner and a knobbed 60mil HDPE liner. The smooth liner is placed on the bottom while the knobbed liner is placed on top, with the knobs down. This creates a space of about 0.13" between the liners for water to flow. Based on testing performed by the manufacturer, the knobbed liner has a transmissivity of $0.0045m^2/s$ at a slope of 1%. This material is then capable of flowing many times the action leakage rate in a fairly narrow width. (Over 7gpm at 1m of channel width.) Due to the small space between the liners and the gradient, hydraulic head pressure will push leaked wastewater toward the leak detection sump area. The use of the knobbed liner will provide superior results as the flow through a sand or pea gravel layer will be more prone to clogging due to bio-mat development in the smaller pour area provided by those types of material.

Water Table

A series of six test holes were dug along the length of Parke Creek, within the property and approximately 75 feet from the creek. The test holes are approximately four to five feet in depth and were dug in March 2020. With the site generally sloping to the southwest, the bottom of the test pits are at a lover elevation than the bottom of the proposed ponds. As of June 4th, 2020 there has been no water present in the test holes. More information on these test holes can be found in the appendix.

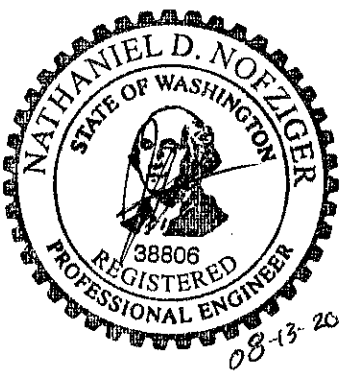
Additionally, Western Pacific Engineering and Survey reviewed the Washington State Department of Ecology's website for well information surrounding the land application field and the storage ponds. The website showed several wells located south of the site and a couple locate to the north, as well. The reports for these nearby wells shows the water table between 100 and 200 feet below the surface.

Summary

In conclusion, we appreciate having the opportunity to provide you with this report of our findings regarding your project. Please find the attachments in the appendix and the construction drawings for your reference. If you have any questions or require further information, please contact our office.

Sincerely,

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



Appendices and Attachments

Water Balance:

The water balance for the storage ponds total capacity is included.

Stormwater Information:

Attached is the 1981-2010 normal precipitation data for Ellensburg from the NOAA National Centers for Environmental Information. This data was accessed from their website at: https://www.ncdc.noaa.gov/cdo-web/datatools/normals

Evaporation Information:

Included is a portion of the Evaporation Data collected by the Western Regional Climate Center, and accessed via their website at: https://wrcc.dri.edu/Climate/comp_table_show.php?stype=pan_evap_avg

Also attached is the isopluvial map created to help calculate the site specific evaporation rates.

Prevailing Wind Information:

Included is a portion of the Prevailing Wind Direction Data collected by the Western Regional Climate Center, and accessed via their website at: https://wrcc.dri.edu/Climate/comp_table_show.php?stype=wind_dir_avg

Liner Production Information:

Attached is the product information for the Geotextile, the smooth liner and the knobbed liner.

Pond Volume Calculation:

Included is the computer printout from the volume calculation for each of the ponds.

Test Hole Information:

Included is client provided information in regards to the test holes dug in the vicinity of Parke Creek.

Western Pacific Engineering Survey, Inc.
Brown and Jackson Water Balance:

Month	Approx. Work days	Flow per Day (GPD)	Total Accumilated Waste (gallons)	Monthly Precip. (inches)	Net Precip.* (gallons)	Monthly Evap.** (inches)	Adjusted Monthly Evap.*** (Inches)	Net Evap.**** (gallons)	Pond Volume (gallons)	Expected Wihdawls (gallons)	Min. Required Receaving Acres
October	23	5000	115000	0.6	17635	2.41	2.17	(1346)	131289	996356	
November	19	5000	95000	1.24	36446	0.00	0.00	0	262734	0	
December	20	5000	100000	1.56	45851	0.00	0.00	0	408585	0	
January	22	5000	110000	1.19	34976	0.00	0.00	0	553561	0	
February	20	5000	100000	0.82	24101	0.00	0.00	0	677662	0	
March	20	5000	100000	0.68	19986	0.00	0.00	0	797649	0	
April	22	5000	110000	0.61	17929	5.34	4.81	(49958)	875620	0	
May	24	5000	120000	0.65	19105	7.46	6.72	(78838)	935886	0	
June	21	5000	105000	0.59	17341	8.34	7.51	(98225)	960002	0	
July	22	5000	110000	0.33	9699	9.46	8.51	(122750)	956952	0	
August	22	5000	110000	0.24	7054	7.90	7.11	(112078)	961928	0	
September	20	5000	100000	0.45	13226	5.12	4.61	(78798)	996356	0	
Req'd Pond Volume									996,356		27.7
Total Working Days	255								**Total Irrigated Acres**		27.7

Evaporation FS*** 0.9

Actual Volume of Ponds 1,220,933
1.2253981

Notes:

* The Area used in the net precipitation caclulations was 47146 square feet. This is the Cumliative Surface area of the pond expected to received precipitation.

** Evaporation Rates were caclulated based on the data available for the nearest locations, refer to the Engineering Report for more information.

*** A reduction in the evaporation rate to compensate for the added solids in the liqud compared to pure water.

**** The Area used in the net evaporation caclulation was pro rated for the number of Months following the Pond being emptied.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Summary of Monthly Normals
1981-2010

Generated on 08/10/2020

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 1480 ft. Lat: 46.9692° N Lon: -120.5400° W
Station: **ELLENSBURG, WA US USC00452505**

Precipitation (in.)								
	Totals	**Mean Number of Days**				**Precipitation Probabilities Probability that precipitation will be equal to or less than the indicated amount**		
	Means	**Daily Precipitation**				**Monthly Precipitation vs. Probability Levels**		
Month	**Mean**	**>= 0.01**	**>= 0.10**	**>= 0.50**	**>= 1.00**	**0.25**	**0.50**	**0.75**
01	1.19	9.4	4.2	0.3	-7777	0.59	1.12	1.58
02	0.82	6.9	3.0	0.2	0.0	0.33	0.69	1.30
03	0.68	6.8	2.3	0.1	-7777	0.25	0.58	1.00
04	0.61	6.9	2.3	-7777	0.0	0.30	0.55	0.97
05	0.65	7.4	2.2	0.1	0.0	0.39	0.58	0.85
06	0.59	6.0	1.9	0.2	0.0	0.19	0.41	0.84
07	0.33	2.8	0.9	0.1	0.0	0.05	0.24	0.54
08	0.24	2.5	0.7	-7777	-7777	0.03	0.12	0.26
09	0.45	3.2	1.2	0.3	-7777	0.03	0.19	0.73
10	0.60	5.9	1.7	0.1	0.0	0.29	0.49	0.80
11	1.24	9.9	3.9	0.4	-7777	0.68	1.10	1.81
12	1.56	10.3	4.8	0.5	-7777	0.65	1.34	2.11
Summary	8.96	78.0	29.1	2.3	0.0	3.78	7.41	12.79

-7777: a non-zero value that would round to zero

Empty or blank cells indicate data is missing or insufficient occurrences to compute value

Evaporation Stations

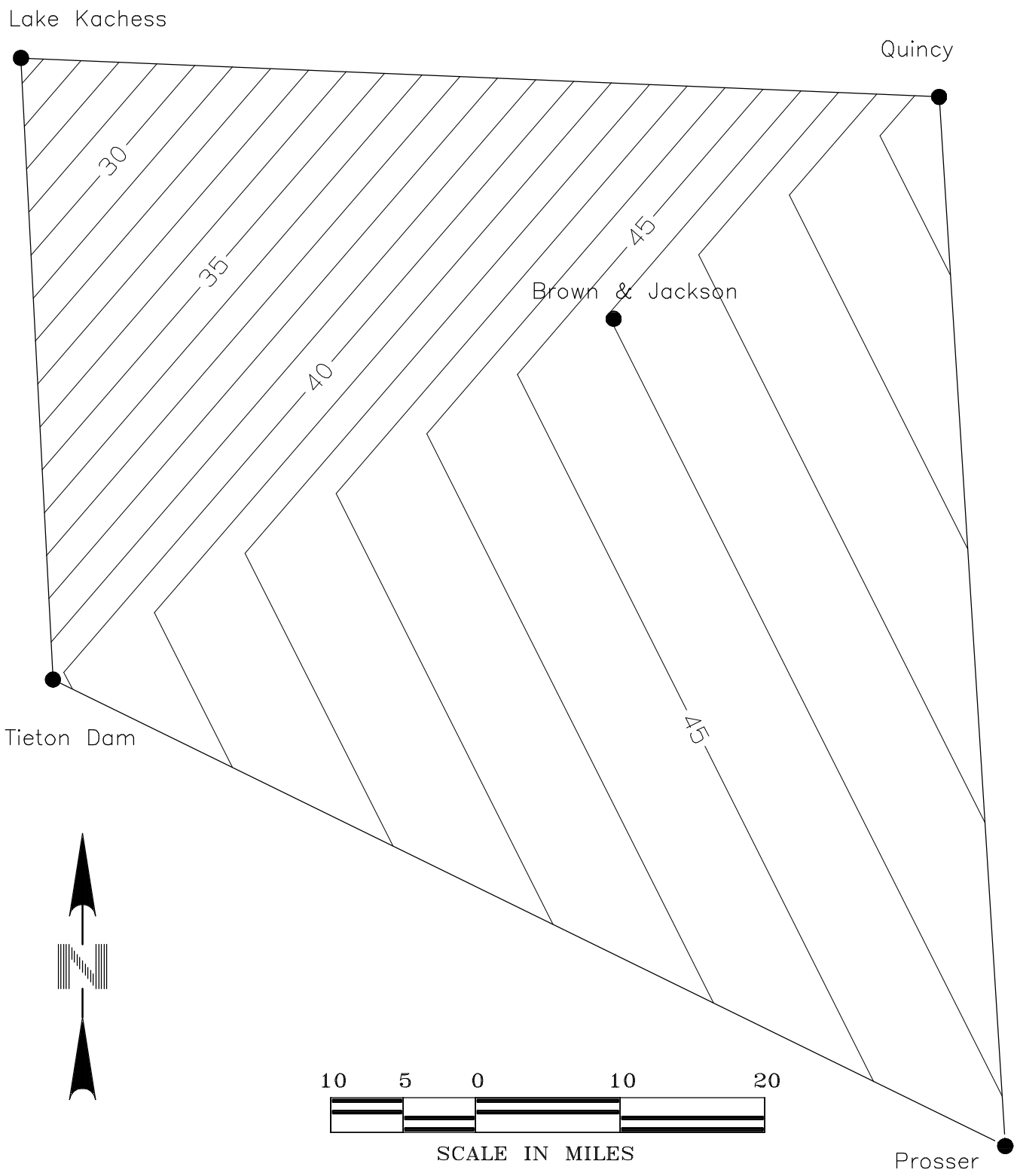
Standard daily pan evaporation is measured using the four-foot diameter Class A evaporation pan. The pan water level reading is adjusted when precipitation is measure to obtain the actual evaporation. Most Class A pans are installed above ground, allowing effects such as radiation on the side walls and heat exchnges with the pan material. These effects tend to increase the evaporation totals. The amounts can then be adjusted by multiplying the totals b 0.70 or 0.80 to more closely estimate the evaporation from naturally existing surfaces such as a shallow lake, wet soil or other moist natural surfaces.

Many stations do not measure pan evaportation during winter months. A "0.00" total indicates no measuement is taken. Stations marked with an asterisk (*) have estimated totals computed from meteorological measurements using a form of the Penman equation.

WASHINGTON
MONTHLY AVERAGE PAN EVAPORATION (INCHES)

	PERIOD OF RECORD	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
BELLINGHAM 2 N	1948-1985	0.00	0.00	0.00	2.75	4.59	5.35	6.28	5.56	3.34	1.22	0.00	0.00	29.09
BELLINGHAM 3 SSW	1985-2005	0.00	0.00	0.00	0.00	3.77	4.69	5.31	4.50	2.65	1.39	0.00	0.00	22.31
BUMPING LAKE	1931-1967	0.00	0.00	0.00	0.00	4.01	4.13	5.58	4.63	3.19	2.34	0.00	0.00	23.88
CONNELL 1 W	1960-2003	0.00	0.00	0.00	5.43	8.35	9.89	11.90	10.77	6.88	3.00	0.00	0.00	56.22
ELTOPIA 6 W	1954-1973	0.00	0.00	3.23	5.46	6.61	7.73	9.36	7.56	4.93	2.45	0.83	0.00	48.16
ELTOPIA 8 WSW	1974-2005	0.00	0.00	0.00	4.44	6.10	7.05	8.07	7.04	4.44	2.06	0.62	0.00	39.82
LAKE KACHESS	1931-1977	0.00	0.00	0.00	2.37	3.78	4.82	6.12	5.12	3.20	0.00	0.00	0.00	25.41
LIND 3 NE EXP STN	1931-2005	0.00	0.00	0.00	5.35	8.02	9.40	12.02	10.44	6.87	2.59	0.00	0.00	54.69
MOSES LAKE 3 E	1943-1979	0.00	0.00	0.00	5.51	7.50	8.78	10.29	8.10	5.53	2.79	0.00	0.00	48.50
OROVILLE 1 S	1960-1970	0.00	0.00	0.00	4.49	5.82	6.36	7.42	6.22	4.28	1.99	0.00	0.00	36.58
OTHELLO 6 ESE	1941-2002	0.00	0.00	0.00	5.40	7.60	9.00	10.77	9.14	6.12	2.92	0.00	0.00	50.95
PROSSER 4 NE	1931-2005	0.00	0.00	2.49	4.86	6.57	7.50	8.61	7.09	4.73	2.48	0.80	0.69	45.82
PUYALLUP 2 W EXP STN	1931-1995	0.00	0.71	1.58	2.46	3.97	4.63	5.61	4.97	2.92	1.28	0.61	0.00	28.74
QUINCY 1 S	1941-2005	0.00	0.00	0.00	5.76	8.05	9.00	10.20	8.52	5.52	2.60	0.00	0.00	49.65
RIMROCK TIETON DAM	1947-1977	0.00	0.00	0.00	0.00	5.35	7.08	15.41	6.71	3.70	1.63	0.00	0.00	39.88
SEATTLE MAPLE LEAF R	1941-1960	0.61	0.82	1.80	3.26	4.64	5.12	6.70	5.19	3.49	1.62	0.74	0.53	34.52
SPOKANE WSO AIRPORT	1889-2005	0.00	0.00	0.00	4.66	7.27	8.57	11.28	10.22	6.41	0.00	0.00	0.00	48.41
WALLA WALLA 3 W ENT LA	1931-1962	0.00	0.00	0.00	4.79	6.26	7.61	9.72	7.95	4.78	2.58	0.00	0.00	43.69
WENATCHEE EXP STN	1950-1997	0.00	0.00	0.00	4.74	6.87	7.87	9.38	7.83	4.19	0.00	0.00	0.00	40.88
WHITMAN MISSION	1962-2005	0.00	0.00	0.00	4.58	6.58	8.17	10.34	9.08	5.52	2.84	0.00	0.00	47.11
WIND RIVER	1901-1977	0.00	0.00	0.00	2.91	4.19	4.64	6.15	4.97	3.31	1.62	0.00	0.00	27.79
YAKIMA WSO AP	1946-2005	0.00	0.00	0.00	5.27	7.62	8.71	10.42	9.29	5.90	0.00	0.00	0.00	47.21

Source: https://wrcc.dri.edu/Climate/comp_table_show.php?stype=pan_evap_avg



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BROWN & JACKSON
EVAPORATION MAP
Kittitas County, Washington

DRAWN BY: BNO CHECKED BY: NDN	DATE: August 2020	WPE PROJECT #: 20410	Scale: 1" = 10 mi

Prevailing Wind Direction

Prevailing wind direction is based on the hourly data from 1992-2002 and is defined as the direction with the highest percent of frequency. Many of these locations have very close secondary maximum which can lead to noticeable differences month to month.

All directions are where the wind blows FROM.

WASHINGTON

PREVAILING WIND DIRECTION

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
ARLINGTON AP, WA (KAWO). WI	SSE	SSE	S	S	NW	NW	NW	NW	NW	SSE	SSE	SSE	SSE
BELLINGHAM AP, WA (KBLI). W	S	S	S	S	S	S	S	S	S	S	S	NNE	S
BREMERTON MUNI AP, WA (KPWT)	SSW	SSW	SSW	SSW	SSW	SSW	SSW	NE	NE	SSW	SSW	SSW	SSW
DEER PARK AP, WA (KDEW). WI	N	NNE	S	S	S	S	S	S	SSE	N	N	N	S
ELLENSBURG AP, WA (KELN). W	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	E	E	NW
EPHRATA AIRPORT, WA (KEPH).	N	N	N	N	S	S	S	S	N	N	N	N	N
EVERETT-PAINE FIELD, WA (KPA	S	S	S	S	N	N	N	N	N	S	S	S	N
FORT LEWIS AAF, WA (KGRF).	S	S	S	S	S	S	S	S	S	S	S	S	S
FRIDAY HARBOR AP, WA (KFHR).	SE	SE	SE	WSW	SW	SW	SW	SE	SE	SE	SE	SE	SE
HANFORD, WA (KHMS). WIND RO	NW	NW	NW	W	NW	NW	NW	NW	W	W	NW	NW	NW
HOQUIAM AIRPORT, WA (KHQM).	E	E	E	W	W	W	W	W	W	E	E	E	E
KELSO-LONGVIEW AP, WA (KKLS)	SSE	S	S	S	N	WNW	N	N	N	SSE	SSE	SSE	SSE
MOSES LAKE AP, WA (KMWH). W	N	N	N	N	S	SSW	S	N	N	N	N	N	N
OLYMPIA AP, WA (KOLM). WIND	S	S	S	S	S	S	SSW	S	S	S	S	S	S
OMAK AIRPORT, WA (KOMK). WI	S	S	N	N	N	N	N	N	N	N	S	S	N
PASCO-TRI CITIES AP, WA (KPS	NW	NW	SW	SW	SW	SW	SW	SSW	NNW	SW	SW	NW	SW
PORT ANGELES AP, WA (KCLM).	WSW	SW	W	W	W	W	W	W	W	W	SW	SW	W
PULLMAN-MOSCOW AP, WA (KPUW)	E	E	E	SW	WSW	WSW	WSW	WSW	WSW	E	E	E	E
QUILLAYUTE AP, WA (KUIL). W	ENE	ENE	S	S	W	W	W	S	S	ENE	ENE	ENE	S
RENTON MUNI AP, WA (KRNT).	S	S	S	S	S	S	NNW	S	NNW	S	S	S	S
SCAPPOOSE AIRPORT, WA (KSPB)	S	S	S	N	N	N	N	N	N	W	SSE	S	N
SEATTLE-BOEING FIELD, WA (KB	S	S	S	S	S	S	NW	NW	NW	SSE	SSE	SSE	S
SEATTLE-TACOMA AP, WA (KSEA)	S	S	S	S	SSW	SSW	SW	N	N	S	S	S	S
SHELTON AIRPORT, WA (KSHN).	SW	SW	WSW	WSW	WSW	WSW	WSW	WSW	WSW	SW	SW	SW	WSW
SKYKOMISH AP, WA (S88). WIN	SSE	SSE	NW	S	NW	NW	NW	NW	NW	S	SSE	S	NW
SPOKANE-FAIRCHILD AFB, WA (K	SSW	NE	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW
SPOKANE-FELTS FIELD, WA (KSF	SW	SSW	SW	SSW	SSW	SSW	NNE	NNE	NNE	NNE	SSW	SW	SW
SPOKANE-GEIGER FIELD, WA (KG	NE	NE	S	S	SSW	S	S	SW	S	S	NE	NE	S
STAMPEDE PASS, WA (KSMP). W	E	E	E	WSW	WSW	WSW	WSW	WSW	SW	WSW	E	E	WSW
TACOMA NARROWS AP, WA (KTIW)	S	S	S	S	S	S	N	S	N	S	S	S	S
TACOMA-MCCHORD AFB, WA (KTCM	S	S	S	S	S	S	S	S	S	S	S	S	S
TOLEDO AIRPORT, WA (KTDO).	S	S	S	S	NW	NW	NW	NW	NW	S	S	S	S
VANCOUVER AIRPORT, WA (KVUO)	ESE	ESE	ESE	NW	NW	NW	NW	NW	NW	ESE	ESE	ESE	ESE
WALLA WALLA AP, WA (KALW).	S	S	S	S	S	S	S	S	S	S	S	S	S
WENATCHEE AP, WA (KEAT). WI	W	WNW	W	WNW	WNW	WNW	WNW	WNW	WNW	WNW	WNW	WNW	WNW
WHIDBEY ISLAND NAS-OAK HARBO	SE	ESE	SE	W	W	W	WSW	W	W	ESE	SE	E	W
YAKIMA AIRPORT, WA (KYKM).	W	W	W	W	W	W	W	W	W	W	W	W	W

Source: https://wrcc.dri.edu/Climate/comp_table_show.php?stype=wind_dir_avg

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High Density Polyethylene (HDPE) Geomembrane - Smooth

Properties	Test Method	Test Value							Testing Frequency (minimum)
		30 mils	40 mils	50 mils	60 mils	80 mils	100 mils	120 mils	
Thickness (min. avg.) • Lowest individual of 10 values	D5199	Nom. -10%	Nom. -10%	Nom. -10%	Nom. -10%	Nom. -10%	Nom. -10%	Nom. -10%	Per Roll
Density (min. avg.)	D 1505/D 792	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	200, 000 lb
Tensile Properties (min. avg.) • yield strength • break strength • yield elongation • break elongation	D 6693 Type IV	 63 lb./in. 114 lb./in. 12% 700%	 84 lb./in. 152 lb./in. 12% 700%	 105 lb./in. 190 lb./in. 12% 700%	 126 lb./in. 228 lb./in. 12% 700%	 168 lb./in. 304 lb./in. 12% 700%	 210 lb./in. 380 lb./in. 12% 700%	 252 lb./in. 456 lb./in. 12% 700%	20,000 lb.
Tear Resistance (min. avg.)	D 1004	21 lb.	28 lb.	35 lb.	42 lb.	56 lb.	70 lb.	84 lb.	45,000 lb.
Puncture Resistance (min. avg.)	D 4833	54 lb.	72 lb.	90 lb.	108 lb.	144 lb.	180 lb.	216 lb.	45,000 lb.
Stress Crack Resistance	D 5397 (App.)	500 hr.	500 hr.	500 hr.	500 hr.	500 hr.	500 hr.	500 hr.	Per GRI-GM10
Carbon Black Content (range)	D 4218	2.0-3.0%	2.0-3.0%	2.0-3.0%	2.0-3.0%	2.0-3.0%	2.0-3.0%	2.0-3.0%	20,000 lb.
Carbon Black Dispersion	D 5596	note (1)	note (1)	note (1)	note (1)	note (1)	note (1)	note (1)	45,000 lb.
Oxidative Induction Time (OIT) (min. avg.) (a) Standard OIT --or— (b) High Pressure OIT	 D 3895 D 5855	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	200,000 lb.
Oven Aging at 85°C (a) Standard OIT (min. avg.) - % retained after 90 days --or— (b) High Pressure OIT (min. avg.) - % retained after 90 days	D5721 D 3895 D 5855	 55% 80%	 55% 80%	 55% 80%	 55% 80%	 55% 80%	 55% 80%	 55% 80%	per each formulation
UV Resistance (a) Standard OIT (min. avg.) --or-- (b) High Pressure OIT (min. avg.) - % retained after 1600 hrs. (2)	D 7238 D 3895 D 5855	 N.R (3) 50%	 N.R (4) 50%	 N.R (3) 50%	 N.R (3) 50%	 N.R (3) 50%	 N.R (3) 50%	 N.R (3) 50%	per each formulation

(1) Carbon black dispersion (only near spherical agglomerates) for 10 different views:
9 in Categories 1 or 2 and 1 in Category 3

(2) UV resistance is based on percent retained value regardless of the original HP-OIT value.

(3) Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.

The information and data contained herein are believed to be accurate and reliable. Northwest Linings makes no warranty of any kind and accepts no responsibility for the results obtained through application of this information

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PermeaTex 4080 Nonwoven Geotextile

PermeaTex™ 4080 consists of nonwoven, polypropylene, needle-punched geotextile products that are recommended for drainage, filtration, separation, and soil reinforcement applications. Specific areas of use are subdrainage under roadways and playing fields, foundations, railway construction, rock buttresses, and slope drains. These geotextile products are resistant to ultraviolet degradation and to biological and chemical environments found in normal soil areas.

PHYSICAL PROPERTY	UNIT US Values	TEST METHOD	MARV VALUES US Values
Weight (Typical)	oz./s.y.	ASTM D3776	8
Grab Tensile	lbs	ASTM D4632	205
Grab Elongation	%	ASTM D4632	50
CBR Puncture	Lbs	ASTM D6241	525
Trapezoidal Tear	Lbs	ASTM D4533	80
Mullen Burst	psi	ASTM D3786	400
A.O.S.	U.S. Sieve	ASTM D4751	80
Water Permeability	cm/sec	ASTM D4491	0.38
Water Flow Rate	gpm/s.f.	ASTM D4491	90
Water Permittivity	sec	ASTM D4491	1.40
U.V. Resistance (500 Hours)	%	ASTM D4355	70

Note: Minimum average roll values are based on a 95% confidence level.

PermeaTex™ Geotextile Products are manufactured by various manufacturers for distribution by Northwest Linings. PermeaTex™ is a trade name of Northwest Linings and any use of this name without the express written consent of Northwest Linings is strictly prohibited.

The information and data contained herein are believed to be accurate and reliable. Northwest Linings makes no warranty of any kind and accepts no responsibility for the results obtained through application of this information.

High Density Polyethylene Drain Liner®

Product Data

Property	Test Method	Frequency	Minimum Average Values			
Thickness (nominal), mil (mm)	ASTM D5994	Per Roll	50 (1.25)	60 (1.5)	80 (2.0)	100 (2.5)
Thickness (lowest individual), mil (mm)			45 (1.15)	54 (1.35)	72 (1.8)	90 (2.25)
Drainage Stud Height, mil (mm)	ASTM D7466	2nd Roll	130 (3.3)	130 (3.3)	130 (3.3)	130 (3.3)
Density, g/cc, minimum	ASTM D792, Method B	200,000 lb	0.94	0.94	0.94	0.94
Tensile Properties (both directions)	ASTM D6693, Type IV					
Strength @ Yield, lb/in width (N/mm)	2 in/minute	20,000 lb	110 (19.3)	132 (23.1)	176 (30.8)	220 (38.5)
Elongation @ Yield, % (GL=1.3in)			13	13	13	13
Strength @ Break, lb/in width (N/mm)			110 (19.3)	132 (23.1)	176 (30.8)	220 (38.5)
Elongation @ Break, % (GL=2.0in)			300	300	300	300
Tear Resistance, lbs. (N)	ASTM D1004	45,000 lb	38 (169)	40 (178)	53 (236)	64 (285)
Puncture Resistance, lbs. (N)	ASTM D4833	45,000 lb	80 (356)	95 (422)	126 (560)	158 (703)
Carbon Black Content, % (range)	ASTM D4218	20,000 lb	2 - 3	2 - 3	2 - 3	2 - 3
Carbon Black Dispersion (Category)	ASTM D5596	45,000 lb	Only near spherical agglomerates: 10 views in Cat. 1 or 2			
Stress Crack Resistance (SP-NCTL), hrs.	ASTM D5397 Appendix	200,000 lb	500	500	500	500
Oxidative Induction Time, minutes	ASTM D3895, 200°C, 1 atm O_2	200,000 lb	≥140	≥140	≥140	≥140

Agru America's geomembranes are certified to pass Low Temp. Brittleness via ASTM D746 (-80°C), Dimensional Stability via ASTM D1204 (±2% @ 100°C). Oven Aging and UV Resistance are tested per GRI GM 13. These product specifications meet or exceed GRI's GM13.

Supply Information (Standard Roll Dimensions)

Thickness		Width		Length		Area (approx.)	
mil	mm	ft	m	ft	m	ft^2	m^2
50	1.25	23	7	300	91.4	6,900	640
60	1.5	23	7	300	91.4	6,900	640
80	2.0	23	7	300	91.4	6,900	640
100	2.5	23	7	300	91.4	6,900	640

Note:

Average roll weight is 4,000 lbs (1,814 kg) for 100 mil and 3,000 lbs (1,300 kg) for other thicknesses. All rolls are supplied with two slings. Rolls are wound on a 6" core. Special length available upon request. Roll length and width have a tolerance of ±1%. The weight values may change due to project specifications (i.e. absolute minimum thickness or special length) or shipping requirments (i.e. international contanerized shipments).

All information, recommendations and suggestions appearing in this literature concerning the use of our products are based upon tests and data believed to be reliable; however, it is the users responsibility to determine the suitability for their own use of the products described herein. Since the actual use by others is beyond our control, no guarantee or warranty of any kind, expressed or implied, is made by Agru America as to the effects of such use or the results to be obtained, nor does Agru America assume any liability in connection herewith. Any statement made herein may not be absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations. Nothing herein is to be construed as permission or as a recommendation to infringe any patent.

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SURFACE TO DATUM VOLUME REPORT

Pond 1

Western Pacific Engineering and Survey

Project: N:\20410\Drafting\20410e1.drwg.pro
Report Generated: Wednesday, June 3, 2020 9:44:58 AM

Where the DTM surface is above the datum the volume is reported as fill.
Where the DTM surface is below the datum the volume is reported as excavation.

Shrinkage/swell factors: Excavation 1.0000 Fill 1.0000

DTM Surface Layer Name	Number of Points	Datum Elevation
DTM POND	509	2,126.50

Volume limited to that within the constraining boundary - Object 9490
Area within boundary: 18,897.15 Sq. Ft. (0.4338 Acres)
Total triangulated area: 18,889.89 Sq. Ft. (0.4337 Acres)

Excavation Volume Beneath Datum (Cu. Yd.)	Fill Volume Above Datum(Cu. Yd.)
3,089.2	76.3

Net Difference: 3,012.9 Cu. Yd. excess volume beneath datum

SURFACE TO DATUM VOLUME REPORT

Pond 2

Western Pacific Engineering and Survey

Project: N:\20410\Drafting\20410e1.drwg.pro
Report Generated: Wednesday, June 3, 2020 9:43:18 AM

Where the DTM surface is above the datum the volume is reported as fill.
Where the DTM surface is below the datum the volume is reported as excavation.

Shrinkage/swell factors: Excavation 1.0000 Fill 1.0000

DTM Surface Layer Name	Number of Points	Datum Elevation
DTM POND	509	2,131.00

Volume limited to that within the constraining boundary - Object 9554
Area within boundary: 18,897.15 Sq. Ft. (0.4338 Acres)
Total triangulated area: 18,889.89 Sq. Ft. (0.4337 Acres)

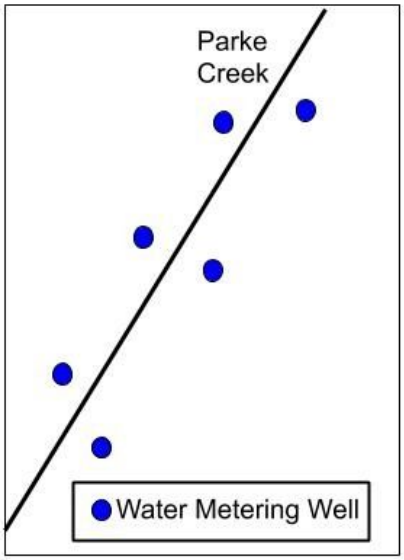
Excavation Volume Beneath Datum (Cu. Yd.)	Fill Volume Above Datum(Cu. Yd.)
3,101.3	69.2

Net Difference: 3,032.1 Cu. Yd. excess volume beneath datum

Brown & Jackson Septic/Portable Toilets

Parke Creek Water Metering Wells

Wells (depicted in Blue) measure 4-5’ Deep and are 75’ off Parke Creek



Date	Water Present?
March 5 2020	No Water Present
April 7 2020	No Water Present
May 8 2020	No Water Present
June 4 2020	No Water Present

N 89°02'01" E 1110.38'

27
34

S 01°19'12" E 2711.88'

311.6'

29.5'

40 20 0 40 80 120
SCALE IN FEET

CALL 811
BEFORE YOU DIG

Sheet Index

C1.1 Layout Plan
C1.2 Grading Plan
C1.3 Pond Cross Sections
C1.4 Project Specifications

NOTES

1. The vertical datum for the project is equal to NAVD88. The elevation of the brass cap monument marking the northwest corner .

2. Where Shown Contours were electronically derived from field measurements corresponding to an approximate fifty foot grid pattern or from aerial survey and can be considered are only as accurate as would be expected from the density of the GPS measurements. Other topographic elements were also derived from these same field measurements.

3. As per the scope of work, utility locations are based on field measurements taken from marks found on the ground. All underground utility locations should be considered approximate. As per the contract, no locate was performed.

4. Property boundary information is taken from the C&K Marchel Short Plat (AFN 200912300006), the Record of Survey for Western Washington Operating Engineers (AFN 2004010900046), the Kittitas County Short Plat No. 80-3 (AFN 454286), the Property Survey for a part of the SW 1/4 of S 34, T 18 N, R 20 E (AFN 1997010080012), the H&C Trust Short Plat (AFN 201604140024), and the property deed for the project site.

5. Combined, the ponds area designed to hold 1,130,000 gallons of sewage 18" below the top liner.

LEGEND

- Found Section Corner
- Property Corner
- Edge of Creek
- SHLD — Edge of Existing Roadway
- EP — Edge of Existing Asphalt
- X — Existing Fenceline
- R/W — County Road Right of Way
- R/W — KRD Right of Way
- Existing Contour Line
- SHLD — Edge of Gravel Haul Route
- Design Contours
- Existing Grade Break
- Design Grade Break

DSHS Property Line

Provide Lockable Gate at the Entry to the Site

Existing Driveway

Park Creek

Historically Assumed Section Line

Install Silt Fence

Existing Creek Crossing

Existing Creek Crossing

Proposed Haul Road

DSHS Line of Occupation

Seasonal

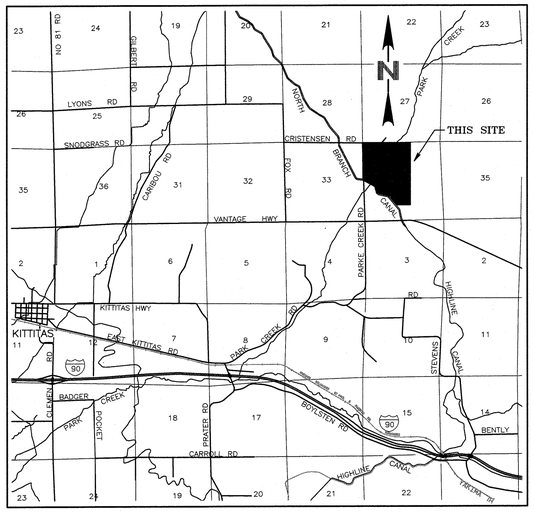
POND 1

203.7'
23.0'
34.3'
23.6'
49.4'
95.0'
23.0'
12.0'
14.0'
12.0'

POND 2

19.3'
130.4'
22.3'
18.0'
12.0'
31.5'
95.0'

VICINITY MAP
NOT TO SCALE



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No.	Revision	Date	By
01	DOE Engineering Comments	08/20	BNO

BROWN & JACKSON
2020 Storage Pond Project
Layout Plan

Kittitas County Washington

Designed by NDN
Drawn by Tml/NDN
Checked by NDN
Project No. 20410
Date: April 2020
Scale:
Hor. 1" = 40'
Vert. 1" = N/A
Sec 34, T 18 N, R 20 E

SHEET NO.
C1.1

201834

File --- Project Desc.: N:\20410\Drafting\20410lat1.revl.dwg.pro Date: Thu Aug 13, 2020

N 89°02'01" E 1110.38'

27
34

S 01°19'12" E 2711.88'

40 20 0 40 80 120
SCALE IN FEET
CONTOUR INTERVALS = 2'

CALL 811 BEFORE YOU DIG

LEGEND

- Found Section Corner
- Property Corner
- Edge of Creek
- SHLD — Edge of Existing Roadway
- EP — Edge of Existing Asphalt
- Existing Fenceline
- R/W — County Road Right of Way
- R/W — KRD Right of Way
- Existing Contour Line
- SHLD — Edge of Gravel Haul Route
- Design Contours
- Existing Grade Break
- Design Grade Break

Park Creek

Seasonal

Install Silt Fence

Existing Creek Crossing

Existing Creek Crossing

Proposed Haul Road

Recover needed fill material from easterly hill side. Minimize depth so that no large excavation pits are left once construction is completed,

POND 1
TG=2127.82
TG=2120.75
TG=2125.53
TG=2128.50
TG=2128.00
BG=2116.30
BG=2117.89
BG=2120.39
BG=2120.39
BG=2117.89
BG=2116.30
BG=2116.00
TG=2127.82
TG=2132.32
TG=2132.50
TG=2132.50

POND 2
BG=2120.80
BG=2122.39
TG=2124.89
TG=2132.32
TG=2123.22
TG=2124.89
BG=2122.39
BG=2120.80
BG=2120.50
TG=2132.32

0%

2110
2120
2130
2140
2150
2160

File --- Project Desc.: N:\20410\Drafting\20410ret.revl.dwg,pro Date: Thu Aug 13, 2020

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No.	Revision	Date	By
01	DOE Engineering Comments	08/20	BNO

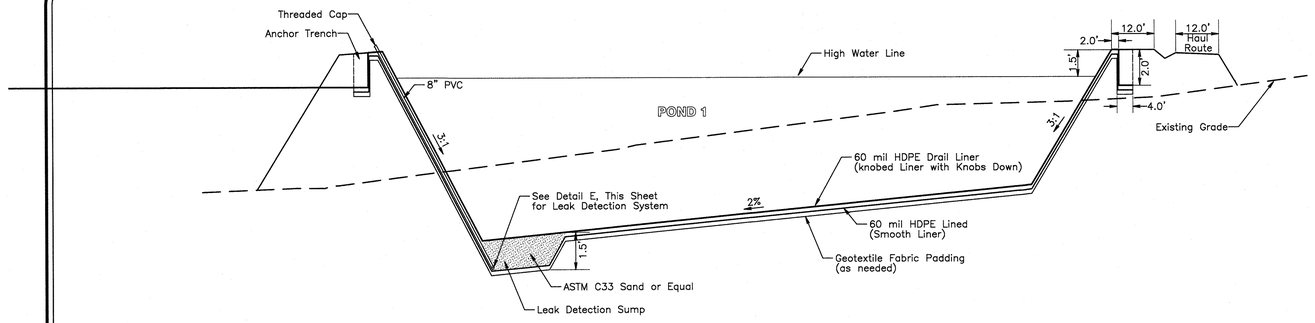
BROWN & JACKSON
2020 Storage Pond Project
Grading Plan

Kittitas County Washington

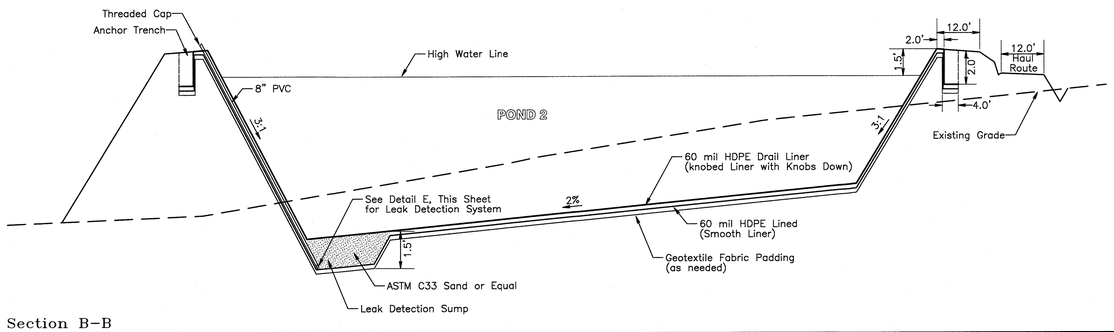
Designed by NDN
Drawn by Tml/NDN
Checked by NDN
Project No. 20410
Date: April 2020
Scale:
Hor. 1" = 40'
Vert. 1" = N/A
Sec 34, T 18 N, R 20 E

SHEET NO.
C1.2

201834



A Section A–A
Scale: 1"=20' Horz.



B Section B–B
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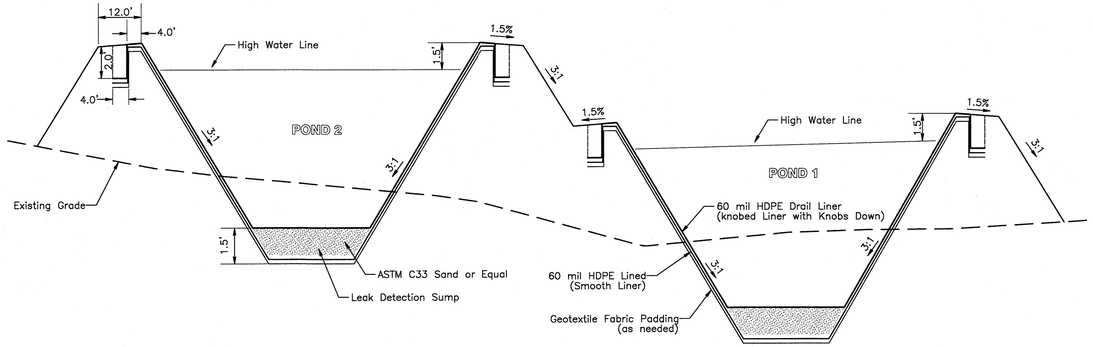
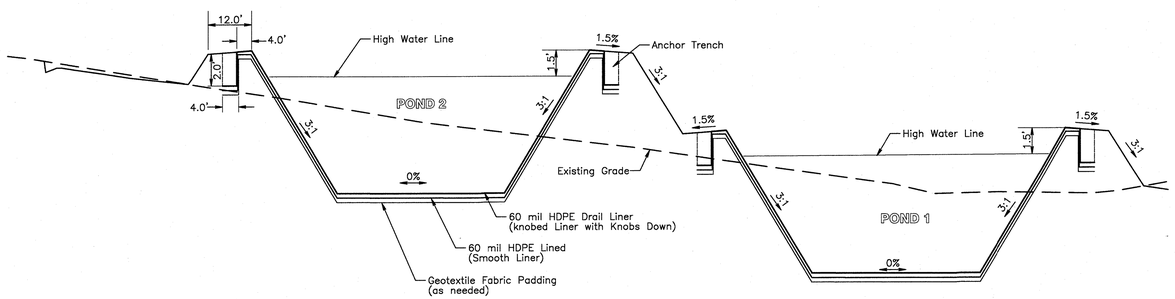
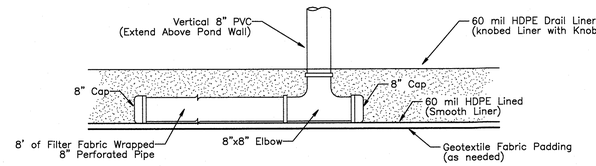


C Section C–C
Scale: 1"=20' Horz.



D Section D–D
Scale: 1"=20' Horz.



E Leak Detection Detail
N.T.S.

LINER NOTES

1. Geotextile Fabric Padding: Geotextile fabric shall be PermeaTex 4080 nonwoven geotextile. Geotextile fabric shall be 8oz per yard with a minimum grab tinsile strength of 205 pounds.

2. Smooth Liner: Smooth liner shall be a AGRU Smooth 60 mil HDPE liner. Liner shall have a minimum yield strength of 125 lb/in and shall have a minimum puncture resistance of 108 pounds.

3. Knobbed Liner: Knobbed liner shall be a AGRU Drain Liner 60 mil liner. Liner shall have 0.13" wide and tall knobs. Liner shall have a minimum yield strength of 132 lb/in and shall have a minimum puncture resistance of 95 pounds.

GENERAL SPECIFICATIONS

Standard Specifications:

This pond design was intended for the construction of two septage storage ponds located on Kittitas County tax parcel number 295134.

The Washington State Department of Transportation "Standard Specifications for Road, Bridge and Municipal Construction" 2018 Edition, and referred to as the "Standard Specifications", are hereby part of the contract plans. Any inconsistency in the parts of the contract including these contract plans shall be brought to the attention of Western Pacific Engineering & Survey, Inc., prior to construction. During the performance of the work, if the contractor discovers any conflict, error, ambiguity, or discrepancy within the contract plans, contractor shall report it immediately, in writing, to Western Pacific Engineering & Survey, Inc., and to the responsible agency's designated engineer. The Standard Specifications can be obtained at the following web sites:

https://www.wsdot.wa.gov/Publications/Manuals/M41-10.htm

Special Provisions:

The following special provisions and responsible agency standards amend the Standard Specifications. The contractor shall do all work in accordance with the contract plans, these special provisions, responsible agency standards, and the Standard Specifications.

1-06.1 Approval of Materials:

Delete the first paragraph and replace with the following: The Contractor shall submit a written list of all materials to the Engineer prior to construction. Submittals for all non-standard materials used in the project shall be reviewed and approved by the governing agency prior to use. The contractor shall provide materials submitted for all non-standard materials to the respective agencies. All materials shall be approved by the design engineer prior to the start of construction.

1-06.2(1) Sampling and Testing for Acceptance:

Modify the section as follows: The word Engineer or Project engineer shall refer to the owner and their designated inspector.

Special inspection shall be as follows, unless modified by the design engineer due to field conditions.

Soil embankment shall be randomly tested for compaction with a minimum of one test per 10,000 square feet, but no less than three tests per four feet of lift.

Inspection and testing of the liner shall be as listed in the Liner Specifications Section.

Continuous on-site inspection of the liner installation shall be performed by a third party inspection agency.

1-07.1 Laws to be Observed:

This Section is supplemented by adding the following:

Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

1. All persons on the site or who may be affected by the work;
2. All the work and materials and equipment to be incorporated therein, whether in storage on or off the site; and
3. Other property at site or adjacent thereto.

Contractor shall comply with all applicable laws and regulations related to the safety of persons or property including WISHA and OSHA regulations.

It is the responsibility of the Contractor to obtain all necessary permits and pay all associated fees to perform the work required by these plans.

1-07.17 Utilities and Similar Facilities:

This Section is supplemented by adding the following: The contractor shall be responsible for verifying the location, dimension and depth of all existing utilities prior to construction, whether shown on the contract plans or not. Locations of said utilities as shown on the contract plans are based upon the best-known records available and are subject to a degree of unknown variation. If conflict should occur, the contractor shall immediately advise the design engineer to prepare a design revision. Approval of the design revision from the engineer and design engineer shall be obtained prior to proceeding with construction. It is the contractor's responsibility to notify the appropriate utilities involved prior to the start of any excavation. Call 811 for utility locates two working days prior to excavation. The contractor shall make all necessary arrangements, for construction of utilities shown on the contract plans and/or indicated in the contract document, with the serving utility. The contractor shall perform all work and shall furnish and install all materials as required by the utility. In cases where the serving utility furnishes materials and/or installs some components, the contractor shall furnish and/or install all other items of work not provided by the utility that are necessary for a complete and functioning utility system.

1-08.0 Prosecution and Progress: Preliminary Matters:

This Section is supplemented with the following: The contractor shall have and maintain on the job site during the performance of the work complete sets or copies of the following documents:

1. Contract plans which have been approved for construction by the responsible agencies;
2. Responsible agency standards applicable to the construction operations; and
3. One set of record drawings

All work shall be constructed according to the approved contract plans and standard specifications. Any deviation from the approved contract plans will require written approval from the engineer. The contractor shall keep and maintain on the site one set of record drawings. The contractor shall mark on the record drawings all project conditions, locations, configurations, and any other changes or deviations which may vary from the details represented on the original contract plans. When construction is complete, the record drawings shall be submitted to the design engineer for use in preparing permanent record drawings.

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No.	Revision	Date	By
01	DOE Engineering Comments	08/20	BNO

BROWN & JACKSON
2020 Storage Pond Project
Pond Cross Sections
Kittitas County Washington

Designed by NDN
Drawn by Tml/NDN
Checked by NDN
Project No. 20410
Date: April 2020
Scale:
Hor. 1" = N/A
Vert. 1" = N/A
Sec 34, T 18 N, R 20 E

SHEET NO.
C1.3

201834

File --- Project Desc.: N:\20410\Drafting\20410e1revl.dwg.pro Date: Thu Aug 13, 2020

GENERAL SPECIFICATIONS CONTINUED

1-08.0 Prosecution and Progress: Preliminary Matters: (continued)

The contractor shall obtain and have available, copies of the applicable responsible agency standards at the job site during the related construction operations.

Prior to performing any work, the contractor shall contact and coordinate with the engineer to set up scheduling of inspections. Utility systems will be inspected for approval by the respective utility entity.

2-01 Clearing, grubbing and Roadside Cleanup:

The description shall be supplemented as follows: clearing, grubbing, stripping and cleanup shall be performed in accordance with 2-01. Clearing - prior to the start of any earthwork, all existing vegetation, debris, rubble, asphalt pavement, etc., shall be removed from the project area and disposed of at an approved waste site secured by the contractor. Excavation and grading outside of the right-of-way shall comply with the current edition of the International Building Code. All slopes shall be a maximum of 3 horizontal to 1 vertical (3H:1V unless otherwise noted on the contract plans.

2-03 Excavation and Embankment:

This Section is revised and supplemented by the following: Prior to any excavation, including trenching, strip all organic topsoil. The subgrade for embankments shall be prepared by stripping topsoil and then compact (proof roll) the subgrade to at least 95 percent of the maximum density. Embankment material shall be native soils less than 8" in greatest diameter.

Compaction - All materials and layers shall be placed and compacted to 95% in loose layers not exceeding eight inches in thickness. The contractor shall be responsible for importing and/or exporting all materials as required to construct the earthwork and surfacing to the lines and grades shown on the approved contract plans.

Finished Surfaces- The contractor shall provide a finished surface on which to lay the geotextile fabric that is free from all sharp and angular stones. Therefore provide a compacted 1" minimum of loamy native soils between the embankment and the geotextile fabric. Loamy soils shall be 1/2" minus material.

2-03.3(14)D Compaction and Moisture Control Tests:

Maximum density shall be determined by the ASTM D1557 test method for maximum density/optimum moisture. The contractor shall provide all necessary excavation, vibratory compaction equipment, and labor to facilitate the taking of compaction tests. The contractor shall provide all necessary test pits and additional work as directed by the owners representative. The contractor shall provide the responsible agency an opportunity to be present during compaction testing. All compaction results shall be with referral to required maximum densities.

4-04.3(5) Shaping and Compaction:

Replace the first sentence of the first paragraph with the following: Immediately following spreading and final shaping, each layer of surfacing shall be compacted at least 95 percent of the density determined by the control tests. In areas of proposed landscaping, compaction need not exceed 90 percent.

8-01 Erosion Control and Water Pollution Control:

Add the following to the Section: the contractor shall provide temporary ditching, sediment ponds, silt fencing, rock construction entrance and/or other measures to assure that siltation control is provided and maintained during construction. The contractor shall take all necessary precautions to assure that silt-laden water does not enter existing and new filtration systems. All storm facilities shall be flushed and cleaned prior to final acceptance.

LINER SPECIFICATIONS

I. INTRODUCTION

Geosynthetic components of lining systems which are addressed in this manual are HDPE/LLDPE Geomembranes. The contractor shall recognize that specific documentation of the specific installation is required to substantiate this Quality Control Program.

II. HDPE/LLDPE GEOMEMBRANE INSTALLATION

A. Earth Work

1. The general and/or earthwork contractor shall be responsible for preparing and maintaining the subgrade in a condition suitable for liner installation unless agreed otherwise.

2. Surfaces to be lined shall be smooth and free of debris, roots, and angular or sharp rocks to a depth of four (4) inches. All fill shall consist of well-graded material free of organics, trash, clayballs or other harmful matter. No sharp edged stones, stones larger than one (1) inch diameter or hard objects shall be allowed within the top four (4) inches of the subgrade. The surface shall be compacted in accordance with project specifications but in no event below the minimum required to provide a firm unyielding foundation sufficient to permit the movement of vehicles and welding equipment over the surface without causing rutting or other harmful effects. The subgrade shall have no sudden sharp or abrupt changes in grade.

3. The earthwork contractor shall protect the subgrade from becoming too dry, flooding and freezing. Protection, if required, may consist of a thin plastic protective cover (or other material as approved by the engineer) installed over the subgrade until the placement of the liner begins. Subgrade found to have cracks greater than 1/2 inch in width or depth or which exhibit swelling, heaving or other similar conditions shall be reworked by the general contractor to remove these defects.

4. Surface acceptance: Upon request, contractor will provide the Owner's Representative with a written acceptance of the surface lined. This acceptance will be limited to an amount of area that contractor lined in a particular work shift. Subsequent repairs to the subgrade and the surface shall remain the responsibility of the earthwork contractor.

B. Crest Anchorage System

1. The anchor trench shall be excavated by the earthwork contractor to lines and widths shown on the design drawings prior to geomembrane placement.

2. Corners in the anchor trench shall be slightly rounded where the geomembrane enters the trench to minimize sharp bends in the liner.

C. Preparation for Geomembrane Deployment

1. Panel Layout: Prior to liner deployment, layout drawings shall be produced to indicate the panel configuration and location of seams.

2. Identification: Each panel used shall be given a numeric or alpha-numeric identifier with a logical progression. This identification shall also include the date of deployment and manufacturing roll number.

D. Field Panel Placement

1. Location: contractor will attempt to install field panels at the location indicated on the layout drawing. If panels are positioned in a location other than that indicated on the layout drawings, the revised location shall be noted in the field on a layout drawing which will be modified at the completion of the project to reflect actual panel locations.

2. Weather Conditions: Geomembrane deployment shall not be done during any precipitation, in the presence of excessive moisture (i.e. fog, dew), in an area of standing or ponded water, or during high winds.

3. Method of Deployment:

1. The method and equipment used to deploy the panels must not damage the geomembrane or the supporting subgrade surface.

2. No personnel working on the liner will smoke, wear shoes that can damage the geomembrane, or engage in actions which could result in damage to the geomembrane.

3. Adequate temporary ballast and/or anchoring, (i.e. sandbags,) which will not damage the geomembrane, will be placed to prevent uplift of the liner by wind.

4. The geomembrane will be deployed in a manner to minimize wrinkles.

5. Any damage to a panel of geomembrane will be repaired in accordance with Section IV. Any area of a panel seriously damaged (torn, twisted, or crimped) will be marked, repaired, and/or removed from the work area with resulting seaming and/or repairs performed in accordance with Section IV of this document.

E. Field Seaming

1. General Requirements:

1. Layout: In general, seams shall be oriented parallel to the slope (down hill), horizontal seams on slopes shall be kept to a minimum. Whenever possible, horizontal seams should be located not less than five (5) feet from the toe of the slope. Each seam shall be numbered in a manner compatible with the panel layout drawing for documentation of seam testing results.

2. Personnel: All personnel performing seaming operations shall be trained in the operation of the equipment being used and will qualify by successfully welding a test seam as described herein. The project foreman will provide direct supervision of all personnel seaming to verify proper welding procedures are followed.

F. Equipment:

1. Fusion Welding: Fusion Welding consists of placing a heated wedge, mounted on a self propelled vehicular unit, between two (2) overlapped sheets such that both sheets are heated to temperatures ranging from 600 degrees °F. to 850 degrees °F. After being heated by the wedge, the overlapped edges pass through a set of preset pressure rollers which compress the panels together forming a continuous homogenous fusion weld. The fusion welder is equipped with a temperature readout device which continuously monitors the temperature of the wedge.

2. Extrusion Fillet Welding: Extrusion welding consists of introducing a ribbon of molten resin along the edge of the seam overlap to the two sheets to be welded. The molten polymer causes some of the material of each sheet to be liquefied resulting in a homogeneous bond between the molten weld bead and the surfaces of the sheets. The extrusion welder is equipped with gauges giving the temperature in the apparatus and the preheat temperature at the nozzle.

G. Seam Preparation:

1. Fusion Welding:
   a. Overlap the panels approximately four (4) to 6 (six) inches.
   b. Clean the seam area prior to seaming to assure the area is clean and free of moisture, dust, dirt and debris.
   c. It is acceptable to grind the overlap at butt seams the to facilitate airtesting through this seam area.
   d. Adjust the panels so that seams are aligned with the fewest possible number of wrinkles and "fishmouths".

2. Extrusion Welding:
   a. Overlap the panels a minimum of three (3) inches.
   b. Temporarily bond the panels to be welded taking care not to damage the geommembrane.
   c. Clean the seam area prior to seaming to assure the area is clean and free of moisture, dust dirt and debris of any kind prior to grinding.
   d. Grind seam overlap and weld within15 minutes of grinding. In manner that does not cause excessive damage the geomembrane.
   e. Purge the extruder prior to beginning the seam to remove all heat-degraded Extrudate from the barrel.
   f. Keep welding rod clean and dry.

H. Test Seams: Test seams shall be performed at the beginning of each seaming period or at least once each five to six hours for each seaming apparatus used that day. Test seams shall be made on fragment pieces of the liner and under the same conditions as actual seams.

1. Test Seam Length: The test seam shall be at least three feet long, made by joining 2 pieces at least 9" in width.

2. Sample Procedures:
   a. Visually inspect the seam for squeeze out, footprint, pressure and general appearance.
   b. Two samples one inch wide shall be cut from the test seam. The samples shall then be tested in peel and shall not fail in the seam. A passing test shall be exhibit film tear bond (FTB). If a sample fails, the entire procedure shall be repeated.

3. If any of the second set of samples fail, the machine shall not be accepted and used for seaming until the problem is corrected and 2 passing tests are achieved.

4. After completion of the test the remaining portion of the test seam shall be discarded. Documentation of the test seams will be maintained by listing date, time (am or pm), machine I.D. number, operators initials, temperature control setting and test results.

5. Passing test results records shall be maintained on contractor's test weld report form.

6. If test samples are to act as destructive samples then the sample shall be marked, logged and saved. I

I. General Seaming Procedures:

1. Seaming shall extend past the outside edge of the containment area and can continue to the area to be placed in the anchor trench.

2. While welding a seam, monitor and maintain the proper overlap.

3. Inspect seam area to assure area is clean and free of moisture, dust, dirt and debris of any kind.

4. While welding a seam, monitor temperature gauges to assure proper settings are maintained and that the machine is operating properly.

5. Align wrinkles at the seam overlap to allow welding through a wrinkle.

6. Fishmouths or wrinkles at seam overlaps that cannot be welded through shall be cut along the ridge in order to achieve a flat overlap. The cut area shall be seamed. Any portion where the overlap is inadequate shall be patched with an oval or round patch extending six inches beyond the cut in all directions.

7. All cross/butt seams between two rows of seamed panels shall have the overlaps trimed back to prevent the wedge of the welder from becoming stuck in the overlap. It is acceptable to grind the overlap at butt seams the facilitate airtesting through this seam area.

8. All "T" joints shall have the overlap from the wedge welder seam trimmed back to allow an extrusion fillet weld. Then grind four (4) to six (6) inches on either side of the seam and extrusion weld all of the area prepared by grinding.

SECTION III Seam Testing-Quality & Control-Geomembranes

A. Concept: contractor installation crews will non-destructively test all field seams over their full length using air pressure testing, vacuum testing or other approved method, to verify the continuity and integrity of the seams.

B. Air Pressure Testing: The weld seam created by the fusion welding process is composed of two welded seams separated by an unwelded channel approximately 3/8 of an inch wide. This channel permits seams to be tested by inflating the sealed channel with air to a predetermined pressure and observing the stability of the pressurized channel over time.

C. Equipment for air testing:

1. An air pump (manual or motor driven) capable of generating and sustaining a pressure of 30 PSI.

2. A rubber hose with fittings and connections.

3. A sharp hollow needle with a pressure gauge capable of reading and sustaining a pressure of 30 PSI.

4. Procedure for air testing:

5. Seal both ends of the seam to be tested.

6. Insert needle in the sealed channel.

7. Inflate the test channel to a pressure between 25 to 30 PSI, in accordance with the following schedule, close valve, and allow time for the injected air to come into equilibrium in the channel. Observe initial pressure after this time. Set the initial pressure to between 27 and 30 psi. After five minutes of testing, the pressure drop shall be no less than 4psi.

8. Observe and record the air pressure five minutes after the relaxing period ends. If loss of pressure exceeds the value above or if the pressure does not stabilize, locate the faulty area and repair.

9. Upon completion of the pressure test the end of the seam opposite the pressure gauge is cut. A decrease in gauge pressure must be observed or the air channel will be considered blocked and the test will be repeated after the blockage is corrected.

10. Remove needle and seal resulting hole by extrusion welding.

11. Record test results on non-destructive test form.

12. In the event of a Non-Complying Air pressure test, the following procedure shall be followed.

13. Check seam-end seals and retest seams.

14. If non-compliance reoccurs, cut one inch samples from each end of the seam and additional samples at the distance specified.

15. Perform destructive field peel test on the samples.

16. If all samples pass destructive testing remove the overlap left by the wedge welder and perform an Air Pressure/Soap Test or vacuum test.

17. If a leak is detected by the air pressure/soap or the vacuum test, repair by extrusion welding. Test repair by vacuum testing.

18. If no leak is discovered air pressure/soap testing, the seam will pass non-destructive testing.

19. If no leak is discovered by vacuum testing, the seam will pass non-destructive testing.

20. If one or more samples fail the peel test, additional samples will be taken.

21. When two passing samples are located, the seam between these two locations will be considered complying. The area outside of this length will be considered non-complying and the entire length extrusion welded.

22. Test the entire length of the repaired seam by vacuum testing.

D. Air Pressure Testing/Soap Testing: This test is used when the seam fails the air pressure test due to slow pressure loss. The procedure is to constantly supply pressure to the seam air channel while spraying the length with a soap and water solution and visually examining the seam for bubbles. Note: This option is not recommended during high wind conditions.

1.Equipment for Air Pressure/Soap Testing:
   a. The same equipment as the air pressure test.
   b. A soap solution and means to apply the solution.

2. Procedure for Air Pressure/Soap Testing:
   a. Trim excess overlap material off at edge of seam
   b. Insert needle gauge assembly in opposite ends of the seam to be tested to show that pressure is continuous throughout the channel.
   c. Maintain 30 psi
   d. Apply soap solution to the weld edge and visually examine for bubbles.
   e. If no bubbles appear the problem is with the inside track "secondary weld". This seam is acceptable providing it has passed peel tests.
   f. If any bubbles appear on the outside track. Primary weld , repair defect by extrusion welding and vacuum test the repair.

E. Vacuum Testing: This test is used when the geometry of the weld makes air pressure testing impossible or impractical or when attempting to locate the precise location of a defect believed to exist after air pressure testing.

1. Equipment for vacuum testing:
   a. Vacuum box consisting of a rigid housing, a transparent viewing window, a soft neoprene gasket attached to the bottom, port hole or valve assembly and a vacuum gauge.
   b. Vacuum pump assembly or compressor with a venturi equipped with a pressure controller and pipe connections.
   c. A rubber pressure/vacuum hose with fittings and connections.
   d. A soap solution with a means to apply the solution.

2. Procedure for Vacuum Testing:
   a. Trim excess overlap from seam.
   b. Apply soap solution to the area to be tested.
   c. Place the vacuum box over the area and apply sufficient downward pressure to seal the box against the liner. Activate the vacuum motor and look for soap bubbles
   d. Ensure that a leak-tight seal is created.
   e. For a period of not less than five seconds, examine the geomembrane through the viewing window for the presence of soap bubbles.
   f. If no bubbles appear after five seconds, turn off the motor and move overlap and repeat the process.

3. Procedure for non-complying test:
   a. Mark all areas where soap bubbles appear and repair the marked areas.
   b. Retest repaired areas.

F. Destructive Testing: The purpose of destructive testing is to determine and evaluate seam strength. These tests require direct sampling and thus subsequent patching, therefore destructive testing should be held to a minimum to reduce the amount of repairs required.

1. Procedure for Destructive Testing: Destructive test samples shall be marked and cut out randomly at a minimum average frequency of one test location every 500 feet of seam length. Additional test may be taken in areas of contamination, offset welds, visible crystallinity or other potential cause of faulty welds.

1) Sample Size:
   a) The sample should be twelve inches wide with a seam fourteen inches long centered lengthwise in the sample.
   b) Ten one inch sample shall be cut from each end of the test seam for field testing on a calibrated field tensiometer. 5 in Peel and 5 in Shear.

2) If field peel samples pass with FTB and the shear samples pass it will be assumed the sample passes destructive testing. An additional portion of the sample test strip can be sent to a third party laboratory for testing to evaluate seam strength and confirm field testing if required.
   a) Procedure in the event of Destructive Test Failure:

1. Cut additional field samples for testing a minimum of ten (10) feet either side of the Test test these according to section 2. If the samples pass then reconstruct seam between the passing samples with the extrusion welder.

2. Heat tack the overlap along the length of the seam to be reconstructed and extrusion weld

3. Vacuum test the extrusion weld.

4. If either of the samples fails then additional samples are taken in accordance with the above procedure until passing samples are found.

5. In the case of reconstructed seams exceeding 150 feet, a sample must be taken and pass destructive testing

6. All destructive seam samples tested by Northwest Linings will be numbered and recorded on a destructive seam test form.

SECTION IV Defects and Repairs

A. Inspection

1. The Superintendent shall conduct a detailed walk through and visually check all seams and non-seam areas of the geomembrane for defects, holes, blisters and signs of damage during installation.

2. All other contractor installation personnel shall at all times, be on the lookout for any damaged areas. Damaged areas shall be marked and repaired.

B. Repair procedures: Any portion of the geomembrane showing a flaw, or failing destructive or nondestructive test shall be repaired. Several methods exist for repairs, and the decision as to the appropriate method shall be made by contractor's Project Superintendent. Methods available for repair:

1. Patching - used to repair large holes, tears and destructive sample locations. All patches shall extend at least six inches beyond the defect and all corners of patches shall be rounded.

2. Grinding and welding - used to repair sections of extruded seams.

3. Spot welding or seaming - used to repair small tears, pinholes or other minor localized flaws.

4. Capping - used to repair lengths of failed extruded areas.

5. Removal of a bad seam and replacement with a strip of new material seamed into place.

C. Verification of Repairs:

1. Every repair shall be non-destructively tested using the methods set out in this manual Repairs which pass the non-destructive test shall be deemed adequate. Large repairs may require a destructive test. Repair test results shall be logged on a repair report form. The repair location shall be recorded on a record drawing.

NATHANIEL D. MOFFIGER — STATE OF WASHINGTON — 20816 — REGISTERED PROFESSIONAL ENGINEER

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Services in Washington and Idaho

No.	Revision	Date	By
01	DOE Engineering Comments	08/20	BNO

BROWN & JACKSON
2020 Storage Pond Project
Project Specifications
Kittitas County Washington

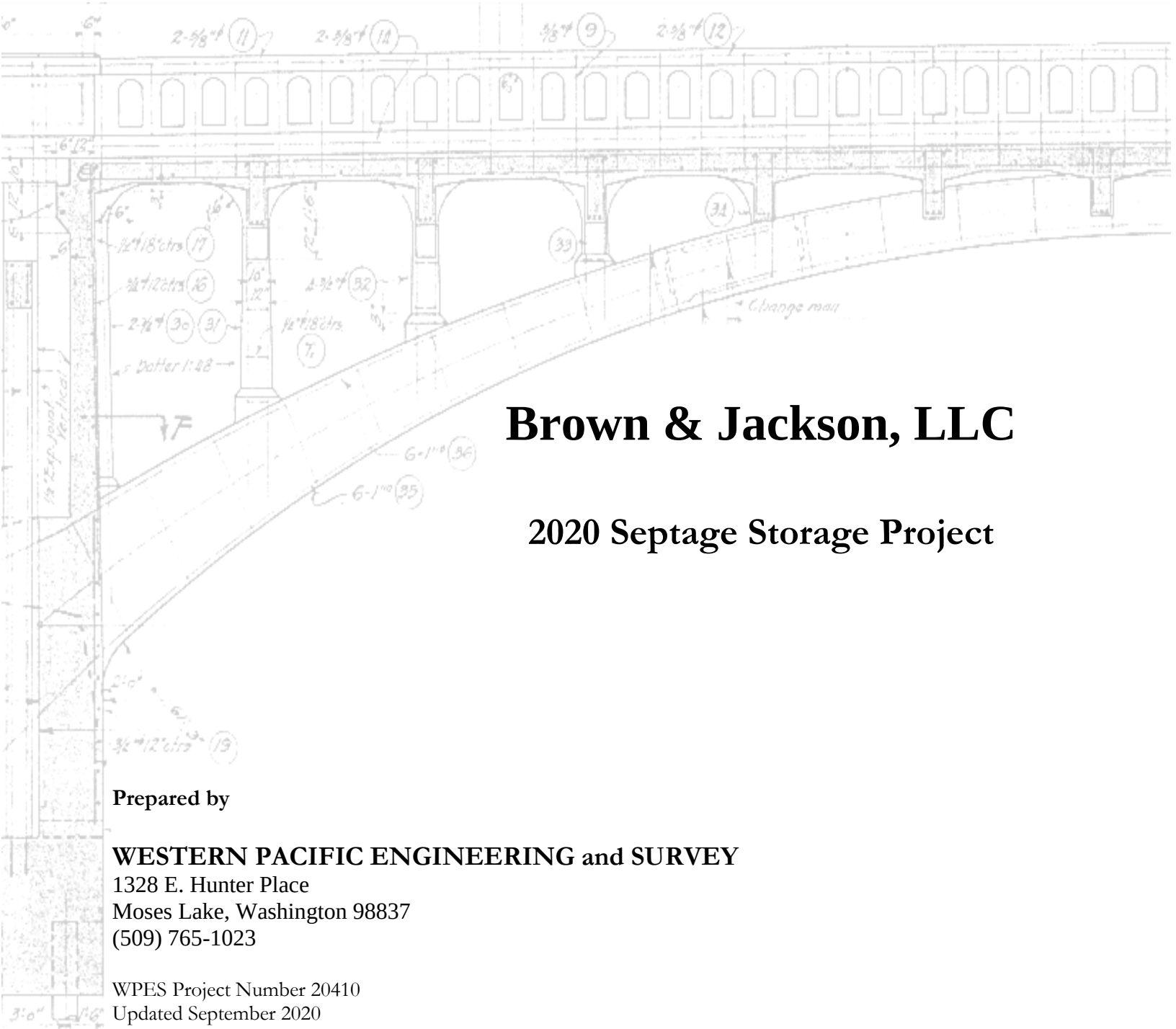
Designed by NDN
Drawn by Tml/NDN
Checked by NDN
Project No. 20410
Date: April 2020
Scale:
Hor. 1" = N/A
Vert. 1" = N/A
Sec 34, T 18 N, R 20 E

SHEET NO.
C1.4

201834

File --- Project Desc: N:\20410\Drafting\20410det.dwgpro Date: Thu Aug 13, 2020

OPERATION & CLOSURE PLAN



Brown & Jackson, LLC

2020 Septage Storage Project

Prepared by

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WPES Project Number 20410
Updated September 2020

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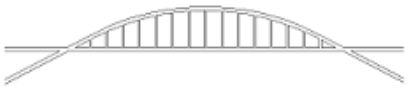


Introduction

This Operation and Closure Plan was developed for 4G Farms and Brown & Jackson, Inc. as part of their application for coverage under the General Permit for Biosolids Management through the Washington State Department of Ecology. This plan has been prepared pursuant to the requirements set forth in the Washington Administrative Code (WAC) Chapter 173-350-330.

It is the responsibility of the owner and/or facility operator to remain in compliance with the performance standards of WAC Chapter 173-350-330. Additionally, the owner and/or operator are responsible for keeping and following the operation and closure plan set forth in this document. If necessary this plan may be modified or updated with the approval, or at the direction, of the jurisdictional health department.

The intent of this document is to describe the facilities operation and convey to site operation personnel the concept of operation intended by facility's design engineer. This plan of operation and closure must be available for inspection at the request of the jurisdictional health department.

Project Summary

In an effort to streamline their business Brown & Jackson is constructing two new collection ponds to store the septage so that it may be land applied. This Beneficial Use Facility is located on Kittitas County Tax Parcel No. 295134, near the intersection of Christensen Road and Parke Creek Road in the western half of Section 34, Township 18 North, Range 20 East, W.M. The site in which the septage is being stored and land applied is owned by 4G Farms, an agricultural entity of Brown & Jackson, LLC.

The site will contain a series of storage ponds to hold the septage that is pumped from a variety of commercial and residential sources around the greater Ellensburg and Kittitas area. The septage will be stored in the ponds until the late summer/early fall, when it will be pumped out and disked into the designated farmed areas located on the same parcel. The septage will be disked into the ground to aid the growth of the winter wheat and other potential crops.

Types of Waste

Per WAC 173-308-080, Septage is defined as "liquid or solid material removed from septic tanks, cess pools, portable toilets, type III marine sanitation devices, vault toilets, RV holding tanks, or similar systems that only receive domestic sewage. Septage may also include commercial or industrial septage mixed with domestic septage if approved in accordance with the provisions in WAC 173-308-020 (3)(g)".

Specifically the waste being transported to the storage ponds on this site is pumped from a variety of residential and commercial sources in the Kittitas and Ellensburg area. The Septage is hauled

to the site, screened prior to entry to the storage ponds, and then once a year pumped out of the ponds and land applied. The septage is land applied following the Site Specific Land Application Plan, approved by the Washington State Department of Ecology.

Handling of Waste

The septage received on-site will be stored in lined storage ponds that are constructed per the engineer's design. The septage is screened before being pumped into the storage ponds, and all personnel of Brown & Jackson are trained to operate the pump trucks, screens and all associated and necessary equipment.

The screening of the septage prior to land application will be through a Screenco Mega Screen 600 receiving station, a bar screen system that meets the requirements of WAC 173-308-205. This ensures that any unacceptable waste is not entering the storage ponds. The rejected waste retained on the screens will be disposed of via the on-site dumpsters and then hauled off site to a landfill.

To ensure that the storage ponds do not overflow and that the required minimum freeboard of 18" is maintained, a depth gauge giving visual indication of the maximum liquid level shall be visible from the point in which septage will enter the storage ponds.

General Facility Operations

Septic pump trucks will arrive via Park Creek Road and enter the property on the northern portion of the site. They will proceed down the gravel access road to the storage ponds. Once arriving at the chosen storage pond, the truck will dump its load through the screen receiving station, which will in turn drain into the pond.

The wastewater can be applied to the ground, via permit, as long as the ground is not frozen. The plan is to pump the septage from the ponds and land apply each fall. The Septage will be pumped from the ponds with trucks and then land applied at agronomic rates to the designated farming locations. The applied septage will then be disked into the ground using standard farming equipment within 6 hours of application.

In order to maintain the safety of the public, the gate at the main entry to the site will remain locked when there is no one on site. Brown & Jackson will ensure that the necessary emergency responders have access to the site.

Additionally, it is the owner's responsibility to maintain the fences, signs, and access roads in site. Fences should be inspected periodically and repairs when necessary. Signs designating the activities of the site shall be kept in in good condition and remain legible. Access roads and gravel surfacing shall be maintained so that emergency vehicles may reach the site.

Should dust control be needed in area of the facility, Brown & Jackson will provide a water truck to spray areas as necessary. Additionally, should rodents, insects, or other vectors become an issue, Brown & Jackson will contact Kittitas County Health for guidance of best practices to reduce and remove the nuances.

Given the remote location of the storage ponds, it is not anticipated that the odors will be a nuisance. Additionally, since the septage is being disked into the ground within 6 hours of application, the overall odors associated with the land application areas should be minimal. Should the facility owner or operator notice or be made aware of nuisance odors, a biosolids odor control specialist will be contracted to audit the odors and provide recommendations for remediation. Brown & Jackson will keep systematic records of any odor complaints that they may receive, along with how the complaint was addressed and resolved.

Facility Maintenance

The owner and/or operator, will inspect the storage ponds on a regular basis to maintain the facility, prevent malfunctions, deterioration, operator errors and discharges that may cause or lead to the release of wastes to the environment that could pose a threat to human health.

Per WAC 173-350-330 (6) (a) (v), these Inspections must be conducted as needed, but at least weekly, to ensure that facility is meeting the operational standards. Facility inspection reports must be maintained in the operating records kept at the office of Brown & Jackson.

Additionally, once a year when the septage is land applied, the ponds will be emptied and cleaned. Once the septage has been pumped out and land applied, any sludge remaining at the bottom will be sprayed with water trucks to clean the bottom of the ponds. This watered down septage sludge will be pumped out and sent through the bar screen before being land applied. Any unwanted debris will be disposed of in the on-site dumpster.

While the ponds are empty and clean, the owner and/or operator will inspect the liner thoroughly for any potential damage or signs of leaking. Also, while the ponds are empty, the owner will have the change to perform any other in depth quality check that may be needed. Record of these annual inspection must be maintained in the operating records kept at the office of Brown & Jackson.

During this thorough inspection of the pond liners, the Washington State Department of Ecology must be given sufficient and have the opportunity to be present during the liner inspections. Per WAC 173-350-330 (6) (a) (ix) inspections of the owner or operator must inspect surface impoundment liners for leaks no less frequently than every five years.

Leak detection shall be performed utilizing the ponds built in leak detection system shown on the engineered drawings. Each pond has a capped pvc pipe at the top of the berm wall. The operator will remove the threaded lid and insert the probe of a water level meter to reach the sump of the pond. Specifically, a Solnist 101 P7 Water Level Meter has been purchased for this purpose. If no

liquid has been detected then the pond liner is operating correctly and the cap can simply be threaded back on.

If there is liquid detected in the pipe, than that is a sign that a leak may have occurred. However, there are other potential reasons that could result in liquid in the sump, for example, there could be an accumulation of moisture from the air entrained liner layers. Due to this fact, the liquid detected in the pipe shall be first sampled and tested for water quality. Water quality testing should be performed by a qualified lab. Brown & Jackson will collect the water sample and take it to Eurofins Cascade Analytical Lab in Yakima, Washington.

Should the water quality tests show that no septage is present than no action is needed. Should septage be present in the water sample taken, then the entirety septage from that pond shall be removed. The removed septage may be pumped into the other pond, or hauled off site to Kittitas County Disposal. Once the septage has been removed, a visual inspection of the liner must take place. If needed a liner specialist may be contracted to develop a solution.

Record Retention

As previously mentioned in this plan all dump slips, inspection reports, evidence of maintenance, and other documents associated with the operation of the storage pons and land application site will be maintained by Brown & Jackson. The Hard copies of these records will be retained at Brown & Jackson office, located at 107 N Main Street in Ellensburg, Washington. All records must be kept for a minimum of five years and shall be available upon request by the Kittitas Health Department.

Additionally, the owner must prepare and submit and annual facility report to the Kittitas County Health Department and the Department of Ecology by April 1st of each year. This annual facility report must detail the facilities activities during the previous calendar and at a minimum include the following information:

- The name and address of the facility
- The calendar year covered by the report
- Results of leak detection system monitoring
- Results of liner inspections
- Any additional information that may be required as a condition of the permit

Safety Planning

In case of a fire on site, Kittitas County Fire Department will be the responding emergency service. Should any Brown & Jackson personnel be in need of emergency services, current protocol is to get to a safe location, call emergency services, and then inform the owner.

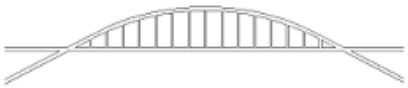
Should a leak in the ponds be detected, personnel shall immediately inform the owner. It is the responsibility of the owner to begin the process of emptying the ponds once notification has been made, so that the pond liner may be fixed.

In the case of a spill or leak, the owner shall work with and inform both Doe and DOH with 24 hours. The owner shall report and document the cleanup and any associated improvements or repairs. If needed a liner specialist any be contracted to fix any leak.

Closure Plan

Should the owner decide to close up and quit using the septage storage ponds, the following item must occur:

1. The owner is responsible for notifying the Kittitas county health department and the department of ecology sixty days in advance of the closure.
2. All septage shall be pumped out of the closing pond with pump trucks.
3. The owner is responsible for removing all the septage from the storage ponds to a facility that conforms with regulations for handling the septage. The Kittitas County Solids Waste Disposal site accepts septage for disposal into their liquid waste evaporation lagoons.
4. The owner is responsible for removing the pond liners, as to not create a safety hazard.



SITE SPECIFIC LAND APPLICATION PLAN FOR Brown and Jackson

This Plan is a component of Brown & Jackson, Inc. Application for Coverage Under the General Permit for Biosolids Management

The site described in this plan is located in: Kittitas County

The area described in this plan is located in Water Resource Inventory Area: WRIA 39 - Upper Yakima Watershed

The Legal Description of the site is:

The Northwest Quarter and that portion of the Northeast Quarter of the Southwest Quarter lying above the right of way of the canal of the Kittitas Reclamation District, in Section 34, in Township 18 North, Range 20 East. In the County of Kittitas, State of Washington.

EXCEPTING THEREFROM:

1. That portion of the North Half of the Northwest Quarter of Section 34, Township I8 North, Range 20 East, W M., Kittitas County, Washington which is bounded by a line described as follows: Beginning at the Northwest corner of said Section 34; thence N 90°00'00" E, along the North boundary of said Section 34, 1173.78 feet to the true point of beginning; thence N 90°00'00" E, 434 30 feet; thence S 501.50 feet; thence S 90°00'00" W, 434.30 feet; thence North 501.50 feet to the true point of beginning,

2. Right of way of Parke Creek County Road along the Westerly boundary thereof.

Version 1.0 Date: June 2020

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1.0 Ownership, Management, and Landowner Agreements

Land Owner: 4G FARMS LLC (an entity of Brown & Jackson, Inc.)

Primary Contact: Rikki Schmitt
107 North Main Street
Ellensburg, WA 98926
509-925-1564
brownandjackson107@gmail.com

Site Location: A portion of the Western half of Section 34, Township 18 North, Range 20 East, W.M., Kittitas County, Washington. The site can be accessed from near the intersection of Christensen Road and Parke Creek Road in Ellensburg, Washington.

Parcel No.: 295134

See Appendix 1 – Land Owner Agreement

2.0 Introduction

The site is located on Kittitas County Tax Parcel No. 295134, located in the western half of Section 34, Township 18 North, Range 20 East, W.M. This Beneficial Use Facility will contain a series of storage ponds to hold the septage that is pumped from a variety of commercial and residential sources around the greater Ellensburg and Kittitas area. The ponds will store the septage until it is land applied to the designated farmland. The land in which the septage is being applied is owned by 4G Farms, an agricultural entity of Brown & Jackson, LLC.

This facility has regulatory obligations under WAC 173-308, Septage Management. This document outlines the plans and procedures for land application. The Washington State Department of Ecology has permitting and oversight authority for the implementation of this plan.

The Goals of this plan include the following:

- Establish a septage land application program sufficient to meet the Beneficial Use of Septage requirements as defined in WAC 173-308-080;
- Describe the procedures required for soil sampling within the Application Units;
- Document allowable activities regarding the storage, handling, and application methods for Septage land application at this facility;
- Structure the procedures for land application to achieve the following objectives:
    - Insure consistent, uniform, and orderly land application of septage at approved agronomic rates
    - Improve soil characteristics including tilth, fertility, and stability
    - Provide the amount of nitrogen necessary for the optimum growth of a targeted vegetation type.
    - Define crop management practices that enhance the targeted vegetation type while limiting noxious weeds
    - Limit nutrient loss through leaching of mineral nitrogen.

The Washington State Department of Ecology is the permitting authority and conducts oversight of rates and land application procedures. Septage will be applied at agronomic rates for the purposes of fertilization and soil improvement.

3.0 Definitions

Agricultural land - is land on which a food crop, feed crop, or fiber crop is grown. This includes range land and land used as pasture.

Agronomic rate- is the biosolids application rate that provides the amount of nitrogen necessary for the optimum growth of targeted vegetation, and that will not result in the violation of applicable standards or requirements for the protection of ground or surface water as established under chapter 90.48 RCW and related rules including chapters 173-200 and 173-201A WAC.

Application Units- delineated areas where septage is applied.

Beneficial use facility - means a receiving-only facility consisting of a site or sites where biosolids from other treatment works treating domestic sewage are applied to the land for beneficial use, which has been permitted as a treatment works treating domestic sewage in accordance with the provisions of WAC 173-308-310, and that has been designated as a beneficial use facility through the permitting process.

Beneficial use of biosolids - means the application of biosolids to the land for the purposes of improving soil characteristics including tilth, fertility, and stability to enhance the growth of vegetation consistent with protecting human health and the environment.

Septage - is liquid or solid material removed from septic tanks, cess pools, portable toilets, type III marine sanitation devices, vault toilets, pit toilets, RV holding tanks, or similar systems that receive only domestic sewage. Septage may also include commercial or industrial septage mixed with domestic septage if approved in accordance with the provisions in WAC 173-308-020 (3)(g).

Septage management facility - means a person who applies septage to the land or one that treats septage for application to the land.

Summer Fallow - to plow and work (land) in summer in order to prepare for sowing in the fall or the following spring : plow and let lie fallow

4.0 Maps

Septage shall only be applied to specifically identified areas as shown on maps attached to, or as an addendum to, this Site Specific Land Application Plan.

The land application units for this site are identified on the attached site map, and are labeled as Farm Area ‘A’, Farm Area ‘B’, and Farm Area ‘C’. Septage shall only be applied to these specific identified application units. Additionally, these designations shall be used in referencing the individual areas for the agronomic rate calculations.

Table 4.0: Application Acreage

Land Application Area Designation	Area available for Land Application (Acres)
Farm Area 'A'	26
Farm Area 'B'	10
Farm Area 'C'	70
Total	106

4.1 General Location Map
A vicinity Map of the site is included in the appendix.

4.2 Site Map or Field Map
The following maps are located in the appendix:

- Site Map
- Adjacent Well Site Map
- Zoning Map
- Ownership Map
- Flood Map

4.3 Soils Map
Included in the appendix is: Custom Soil Resource Report for Kittitas County Area, Washington.

5.0 Buffers
Septage applied to Application Units identified in this Site Specific Land Application Plan shall maintain the minimum buffer widths shown below. These buffers shall be identified on Application Unit maps.

- Public roadways; 50'
- Dwellings: 200'
- Property line: 100' if property owner is not part of the project; variable if the adjacent property owner is associated with the land application project and agrees to a reduced buffer
- Breaks in the topography resulting in slopes exceeding 15%: 25'
- Surface water (perennial):100'
- Surface water (intermittent): 100'
- Domestic, irrigation, or sampling wells:100'

For this site it is important to note the required 100' buffers from Park Creel and the Seasonal Canal that run through the project site. Additionally, locates to the south of the site is the KRD North Branch Canal, which also has a required 100 foot setback for any land application.

6.0 Application Unit Approval

All Application Units authorized for Septage land application shall be approved by the Washington State Department of Ecology in advance of land applying Septage. Application units must, at a minimum, meet the requirements set forth in sections 4 and 5 above before being reviewed for approval. Ecology reserves the right to exercise professional judgment when evaluating proposed application units regarding their suitability to meet the objectives set forth in this plan.

7.0 Septage Application Rate Determination

One of the objectives of this plan is to achieve uniform septage application rates over each individual application unit in the late summer/early fall of each year during what is considered the summer fallow period. At that time septage will be pumped out from the ponds, sprayed on to the field evenly at agronomic rates, and disked into the soil within 6 hours after application.

Following the summer fallow period and the septage application to each application unit, the area shall be seeded with winter wheat. It is anticipated that harvesting of the wheat will occur the following year.

Application equipment shall be capable of providing reasonably even application in accordance with the approved agronomic application rates.

Agronomic application rates shall be determined prior to any land application of septage. A revised agronomic rate will calculated by Soiltest (or another selected and approved lab) and will be evaluated by the Department of Ecology. These calculations shall be performed for each application unit where septage is to be applied. In developing each new application rate, annual soil sampling shall occur. The soil samples shall be tested for organic matter, TKN, ammonium, and nitrate.

The calculated application rates for the septage shall be used based on the following:

- Plant nitrogen uptake or crop requirement at 2.5 pounds of available nitrogen per bushel of wheat
- An estimate of 40 bushels of wheat produced per acre (unless the grower has records to indicate higher production)
- The soil nitrogen data
- And the professional judgement of the Department of Ecology

Per WAC 173-308-270, the net nitrogen requirement, in ponds per acre, shall be divided by the constant 0.0026 in order to determine the gallons per acre of septage to be applied annually.

Ecology shall have 14 calendar days for review of soil sampling data, so that they may provide an agronomic rate recommendation. The 14 day review period shall start after the properly collected soil sampling data is received by the Department of Ecology.

Per WAC 173-308-270 Equation 3, the septage must be applied at a rate not exceeding the rate determined by the following equation:

$AAR = N \div 0.0026$

AAR: annual application rate in gallons per acre per 3650-day period

N: amount of nitrogen in ponds per acre per 365-pay period needed by the crop or vegetation grown on the land (subtract and nitrogen supplied by other sources)

To determine the distance (in feet) over which a load of liquid septage should be spread to meet the application rate, use the following equation (per WAC 173-308-270 equation 4):

$Drive\ Length\ (feet) = gallons \div spread\ width\ (in\ feet) x\ 43{,}560 \div AAR$

AAR: annual application rate in gallons per acre per 365-day period calculated using equation 3

8.0 Methods of Application

Land application of the septage may be conducted with any equipment suitable for the purpose and the material being land applied. Land application methods will be even and consistent in accordance with the calculated application rate (see section 9).

Equipment that may be used includes:

- Rear- and side-discharge manure spreaders for dewatered biosolids.
- Spray irrigation equipment for liquid biosolids.
- Injectors for liquid biosolids.
- Other equipment as approved by Ecology.

The septage will meet the vector attraction reduction requirements in WAC 173-308-180 and may be surface-applied without a requirement for incorporation. “Vector attraction” is the primarily odorous characteristic of septage that attracts rodents, flies, or other organisms capable of transporting infectious agents.

9.0 Timing of Septage Applications

Land application of septage will take place during normal farming hours. Septage will be applied during daylight hours when weather and site conditions allow for proper application and management. Septage will not be applied if the soil is overly saturated, frozen, of there is excessive snow cover, or if site conditions exist such that adequate infiltration or incorporation is precluded. Damage to soil structure shall be avoided by limiting equipment use during periods when soils are wet.

10.0 Vector and Pathogen Requirements

Vector an pathogen requirements are both met through incorporation into the soil. The septage will be incorporated into the soil within 6 hours after application.

11.0 Septage Staging and On-Site Storage

Septage will be produced off site and then hauled and delivered to the septage ponds by Brown & Jackson, LLC. All septage delivered to Brown and Jackson shall be accompanied by a haul ticket or other documentation record containing the following information:

- Name of Hauling Company and Driver’s Name
- Name of Septage Source or Generator
- Date of Delivery
- Ticket or Invoice Number
- Weight of Septage delivered in pounds, wet tons, or dry tons.

On site storage areas will be visibly posted with signage to notify unauthorized persons to not enter the site until septage has been applied and the site restriction has been met. The site is on private property and no trespassing rules may be enforced by the landowners as needed.

Septage will be stored in a planned series of ponds located well within the property line of the site. The septage being delivered to the site will be coming from a variety of sources, and per the department of Ecology a Sampling Plan has been developed. The septage will be stored on site for several months, until it is land applied approximately once a year.

12.0 Screening Requirements

Per WAC 173-308-205, septage stored on site stall be physically screened though a bar screen with a maximum opening of 3/8 inches, in order to remove any unwanted material prior to land application.

The screening of the septage prior to land application on this site will be through a Screenco Mega Screen 600 receiving station, a bar screen system that meets the requirements of WAC 173-308-205. This ensures that any unacceptable waste is not entering the storage ponds. The rejected waste retained on the screens will be disposed of via the on-site dumpsters and then hauled off site to a landfill.

13.0 Incorporation of Land Applied Septage

Per WAC 173-308-210 (4) (b), the septage will be incorporated into the soil within six hours after application to the land. As discussed previously the septage will be disked in to the soil, within six hours of application.

14.0 Soil Sampling Requirements

Pre-Application composite soil samples will be collected at each site where the septage will be applied. Soil samples shall be collected independently for the top foot of soil (0”–12”depth) and the second foot of soil (12”–24” depth). A minimum of 15 individual samples, typically taken as soil cores 10-12” in length, shall be collected from the indicated depths.

As described in the Sampling and Analysis Plan that has been prepared for this site, An independent contractor will take the composite samples, as described above, for each individual application unit that will be receiving septage. The soil samples shall be analyzed for total N (or TKN), N03-N,NH4-N, and organic matter. The individual samples shall be evenly distributed across an application unit to ensure that the composite sample is representative of the soil across the entire application unit.

Pre-application composite samples will be analyzed for pollutant concentrations as defined in WAC 173-308-160. Refer to the Soil Sampling Plan, located in the appendix, for more detailed information. The testing results of the samples shall be submitted to the Department of Ecology.

Note: For sites that have not previously received septage, concentrations of the Priority Pollutants per WAC 173-308-160, Table 1) shall be determined for the top foot of the soil.

15.0 Cropping Practices and Livestock Management

Dryland winter wheat is the primary crop to be planted on soils receiving biosolids applications at Brown and Jackson. Some alfalfa, soft wheat, hard wheat, grass hay, and other crops may be also grown. Site management criteria will be appropriate to the farmer’s plan including, crop type and projected crop yield.

Dryland farming sites are typically planted once a year in the late-summer or early-fall. On occasion, all or portions of the fields may be re-cropped to spring wheat or other crop as determined by the farmer. Re-cropping is a common practice that is performed to return a field to its proper or preferred rotation. Recropping may also be done to control weeds, to minimize pest pressures, for nutrient management or to increase crop production in favorable years.

Crops grown on these sites may be used for human and or livestock consumption. It is anticipated that the crops grown on site will be sold for animal feed production. Per the General Permit, crop harvest waiting periods will be 30 days after biosolids application for food, feed, or fiber crops. At this time, no

livestock graze at this site. Should this change, livestock grazing will be restricted for 30 days after biosolids application.

Depending on the farming activities the following information may be collected and documented for nitrogen and pathogen management and review by Ecology.

- Field/ Unit Management Logs, Biosolids Land Application Records, Application Rate Calculators
    - Crops- Name/Type, Crop Nitrogen Requirements, Harvest Frequency, Crop Removal (i.e. removal of Nitrogen) Quantity
    - Tillage- such as plowing, disking, harrowing- Dates, Frequency
    - Planting/ Crop changes, over seeding
    - Irrigation frequency, duration, quantity
    - Biosolids application- date, time, management unit, quantity, WWTF source, weather, soil condition/moisture; ground water level
    - Other added nutrients or amendments
    - Livestock- type, frequency, duration, quantity, manure nitrogen contribution factor
    - Weather- precipitation, temperatures
- Post-Harvest soils test results

16.0 Other Nutrient Sources and Soil Amendments

Any use of other nutrient sources or soil amendments will be taken into consideration when determining septage application rates. This may include manures and residual mineralization of soil amendments recently applied to the site.

Cover crops may be used to improve the soil by adding organic matter, to control weeds, stabilize soil, and scavenge leftover nutrients.

17.0 Groundwater Protection Plan

Agriculture dryland and irrigated farming sites are typically located above the groundwater table for effective crop production. It is not anticipated that any land applications will occur from December to late-March, which are generally considered relatively high precipitation months. Average annual precipitation for the Ellensburg area is nine inches. Available data suggests that depth to groundwater is greater than 100 feet throughout the project area.

Land application of septage will not occur if groundwater levels are with three feet of the ground surface. Land applications on sites that may be affected by high water tables may be temporarily restricted on specific areas of a site as determined by Ecology. The Department of Ecology's guidance on Assessing Seasonal High Groundwater may be referenced as needed.

18.0 Erosion Control Plan

Agricultural sites are typically managed to control erosion, given that farmers rely on their soil for their livelihood. The farming community is very knowledgeable in farming practices that help minimize soil erosion. Many farms in Kittitas County have adopted reduced tillage system practices (1) leave soil mostly undisturbed and (2) leave high levels of crop residues behind that provide ground cover and can significantly reduce soil erosion.

Biosolids are a nutrient-rich, organic product that returns valuable nutrients and carbon to the land. Biosolds enrich soils and increase soil tilth by adding organic matter keeping sites productive and healthy. There is evidence that biosolids applications help reduce wind and water erosion effects.

Application sites will be managed to control erosion. Growers will adhere to the requirements of their erosion control contracts or agreements as prescribed. This may include considerations of slope, timing of application, site conditions, and distance to surface waters. Depending upon the site and details of land application activities, an Erosion Control Plan may be written in an as-needed basis. NECS and FSA erosion control contact information may be made available upon request.

19.0 Noxious Weed Plan

Landowners are required to control the spread of noxious weeds in accordance with RCW 17.10.140, Owners Duty to Control Spread of Noxious Weeds.

Land application procedures that result in the spread of noxious weeds will be interpreted by Ecology as not meeting the Beneficial Use requirements of WAC 173-308-080.

Agricultural sites are typically managed to control weeds and usually will not be subject to this requirement.

20.0 Restricting Site Access

The access points to this site are identified on the Site Map, and can be found in the appendix. An informational "Restricted Access" sign shall be posted at the primary entrances to the site for at least 30

SEPTAGE MANAGEMENT APPLICATION SITE

Septage Applied: 4G Farms has applied septage to this site as a soil amendment. Management of applied septage at this site is in compliance with WAC *Chapter 173-308, Biosolids Management,* the *General Permit for Biosolids Management,* and our *Site Specific Land Application Plan.*

Contact information for 4G Farms is:
Rikki Schmitt
107 North Main Street
Ellensburg, WA 98926
Phone: 509-929-2469

Contact Information for the Permitting Authorities for this project are:

Jesse Cox
Environmental Health Specialist
Kittitas County Environmental Health
507 N. Nanum St. Suite 102
Ellensburg WA 98926
Phone: 509-962-7515
environmentalhealth@co.kittitas.wa.us

Canming Xiao
Solid Waste Management Program
Washington State Department of Ecology
1250 W. Alder Street
Union Gap, WA 98903-0009
Phone: 509-575-2842
CXIA461@ECY.WA.GOV

Harvesting of plant material is not allowed without written permission from 4G Farms.

ACCESS IS RESTRICTED TO PERSONS INVOLVED IN THIS PROJECT AND REGULATORY PERSONNEL

days following the land application of septage, Per WAC 173-308-210. The informational sign must contain the following information:

Additionally, signs (informational or "no trespassing" will also be placed around the perimeter of the property as deemed appropriate by Brown and Jackson or the Department of Ecology. Entering improved property without permission of the land owner or person who has right of possession (lease holder) is a violation of state law. The posting of signs noting the site is restricted adds an additional measure for public protection and also signals that the land is not open for public access.

Restricted Access Minimum Buffers Applied to Fields

Property Lines	10 feet
Fence Liens	10 feet
Secondary Roads	10 feet
On Site Dwellings	120 feet
Off Site Dwellings	50 feet
Outbuildings	10 feet

21.0 Recordkeeping

Specific records of land application activities shall be kept. These records shall be available for inspection by Ecology upon request. As a minimum, the following information shall be included and maintained in the land application site records:

- Sampling and analysis data you were responsible to obtain or that you used to make decisions on land application.
- The source of biosolids delivered.
- The amount of biosolids delivered.
- The amount of biosolids applied.
- The number of acres on which biosolids were applied.
- The rate of application.
- The date biosolids were applied.
- The targeted vegetation and its nitrogen requirement.
- Information on how site management and access restrictions were met, including for livestock.
- Information on how vector attraction reduction requirements were met if biosolids were required to be tilled or injected.
- The amount in storage.

Appendixes

1.0 – Land Owner Agreement

3.1 – Vicinity Map

3.2 – Site Maps

- Preliminary Site Map
- Adjacent Well Site Map
  - Corresponding Well Logs
- Zoning Map
- Ownership Map
- Firmette Flood Map

3.3 – USDA Custom Soil Resource Report for Kittitas County Area, Washington

Brown & Jackson *Septic/Portable Toilets*

107 North Main Street
Ellensburg, WA 98926

509-925-1564
brownandjackson107@gmail.com

Land Owner Agreement

Brown & Jackson Inc and it's agricultural entity, 4G Farms LLC, understands and acknowledges the applicability and requirements of Chapter 173-308 WAC regarding the storage and application of septage on our property on Parke Creek Road in Ellensburg, WA. Kittitas County Parcel No. 295134. As we have been a family run septic/portable toilet business for over 40 years we are committed to working with the Department of Ecology, soil experts, engineers, and liner professionals to ensure success with this endeavor.

Additionally, authorized individuals from the Department of Ecology and the jurisdictional health department may access these properties to inspect and insure that the biosolids rule requirements are being met.

The undersigned certifies that they are the landowner(s) of record and have the full and complete authority to make the approval stated herein:

Brown & Jackson Inc.

Tyler Schmitt-President

Dan Schmitt-Vice President

Terri Schmitt-Secretary

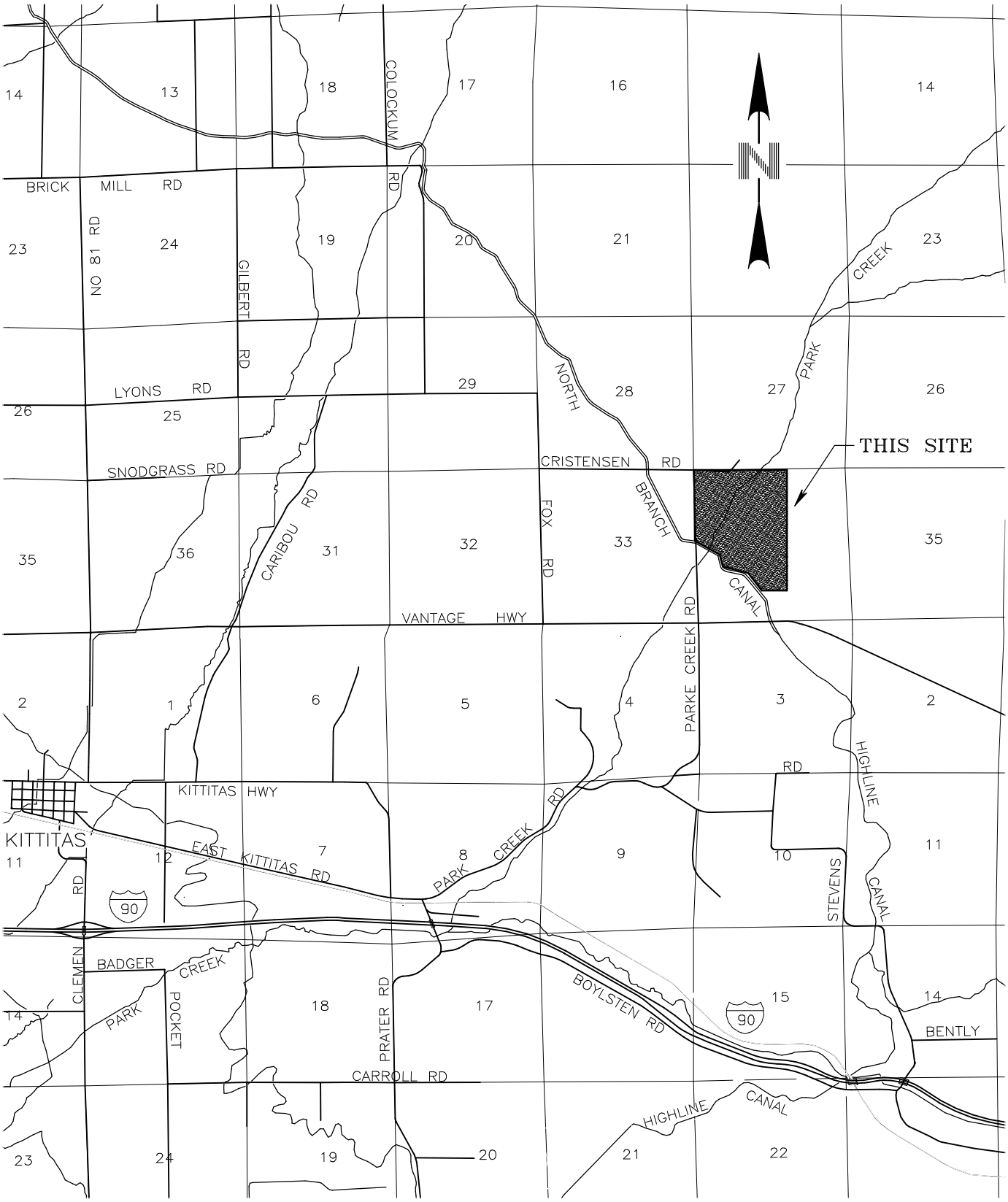
4G Farms LLC

Tyler Schmitt-Member

Rikki Schmitt-Managing Member

Dan Schmitt-Member

Terri Schmitt-Member



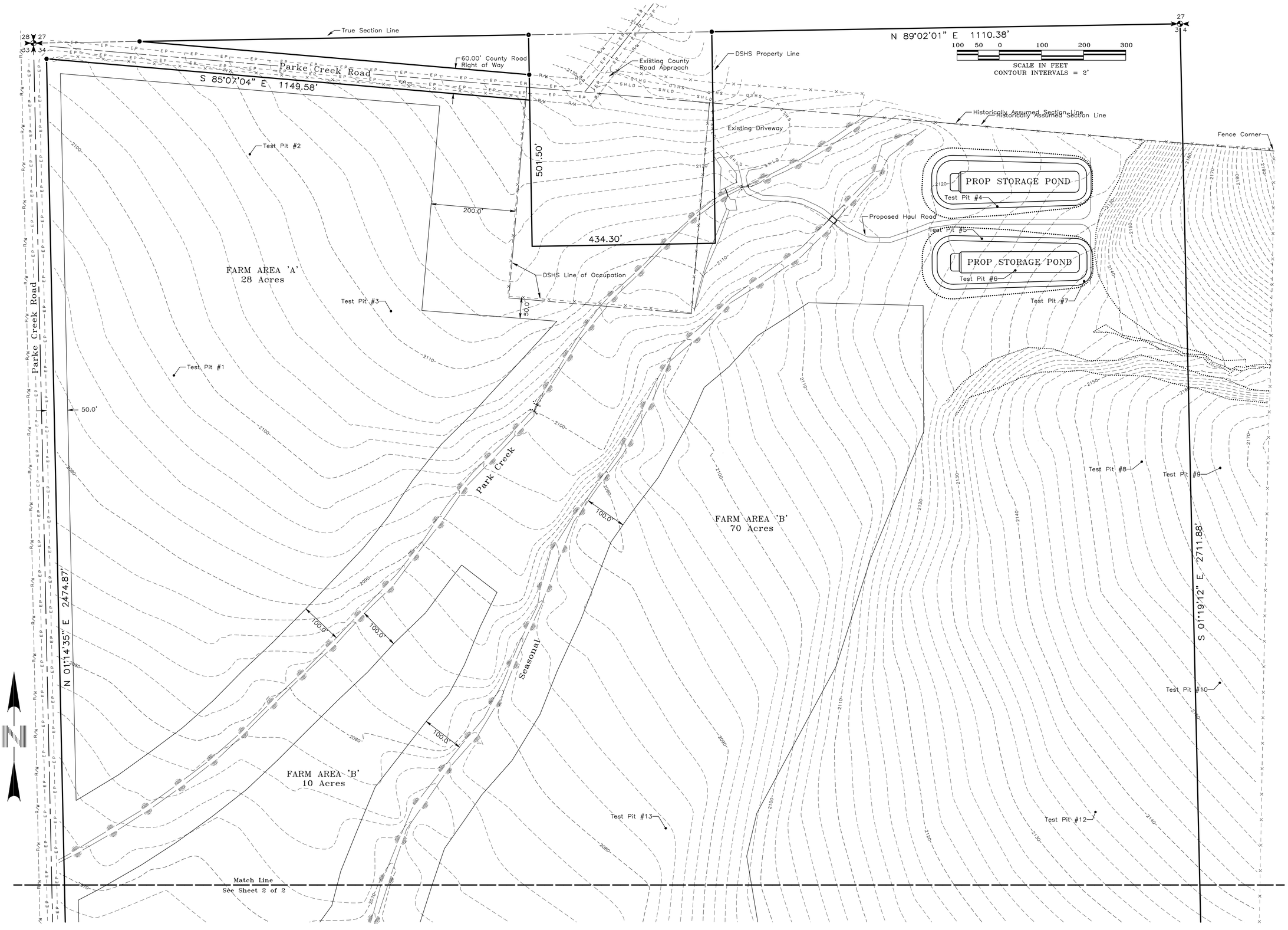
WESTERN PACIFIC ENGINEERING & SURVEY
A TERRA DEVELOPMENT SERVICES CORPORATION

1328 East Hunter Place
Moses Lake, WA
T:(509)765-1023
F:(509)765-1298

BROWN & JACKSON

Land Application Site Vicinity Map

DRAWN BY: NDN	DATE:	WPE PROJECT #:	Scale: 1" = 5000'
CHECKED BY: NDN	April 14, 2020	20410	PLATE NO.: 01



NATHANIEL D. NOFZIGER
STATE OF WASHINGTON
38806
REGISTERED
PROFESSIONAL ENGINEER

WESTERN PACIFIC
ENGINEERING & SURVEY
A TERRA DEVELOPMENT SERVICES CORPORATION
1328 E. Hunter Place, Moses Lake, Washington
T:(509)765-1023 F:(509)765-1298
Services in Washington and Idaho

No.	Revision	Date	By

BROWN & JACKSON
Land Application Site
Preliminary
Site Map

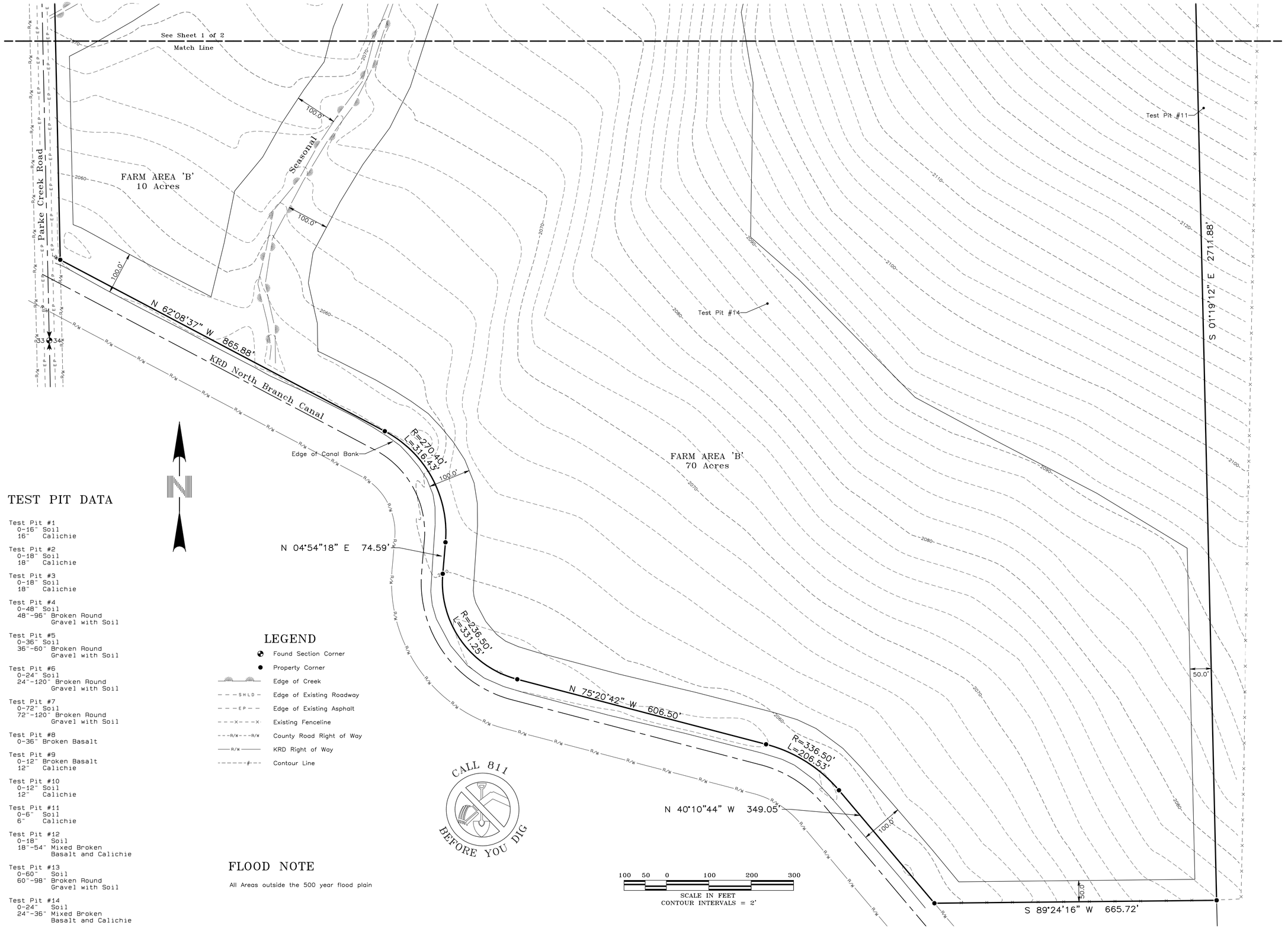
Kittitas County Washington

Designed by NDN
Drawn by Tml/NDN
Checked by NDN
Project No. 20102
Date: April 2020
Scale:
Hor. 1" = 3'
Vert. 1" = N/A
Sec 34, T 18 N, R 20 E

SHEET NO.
1 of 2

201834

File --- Project Desc.: K:\20410\Drafting\20410et1sitemap.pro Date: Fri Apr 24, 2020



TEST PIT DATA

Test Pit #1
0-16" Soil
16" Calichie

Test Pit #2
0-18" Soil
18" Calichie

Test Pit #3
0-18" Soil
18" Calichie

Test Pit #4
0-48" Soil
48"-96" Broken Round Gravel with Soil

Test Pit #5
0-36" Soil
36"-60" Broken Round Gravel with Soil

Test Pit #6
0-24" Soil
24"-120" Broken Round Gravel with Soil

Test Pit #7
0-72" Soil
72"-120" Broken Round Gravel with Soil

Test Pit #8
0-36" Broken Basalt

Test Pit #9
0-12" Broken Basalt
12" Calichie

Test Pit #10
0-12" Soil
12" Calichie

Test Pit #11
0-6" Soil
6" Calichie

Test Pit #12
0-18" Soil
18"-54" Mixed Broken Basalt and Calichie

Test Pit #13
0-60" Soil
60"-98" Broken Round Gravel with Soil

Test Pit #14
0-24" Soil
24"-36" Mixed Broken Basalt and Calichie

LEGEND

- Found Section Corner
- Property Corner
- Edge of Creek
- SHLD — Edge of Existing Roadway
- EP — Edge of Existing Asphalt
- X — Existing Fenceline
- R/W — County Road Right of Way
- R/W — KRD Right of Way
- # — Contour Line

CALL 811 BEFORE YOU DIG

FLOOD NOTE

All Areas outside the 500 year flood plain

100 50 0 100 200 300
SCALE IN FEET
CONTOUR INTERVALS = 2'

File --- Project Desc: X:\20410\Drafting\20410at-sitemap.pro Date: Fri Apr 24, 2020

NATHANIEL D. NOFZIGER — STATE OF WASHINGTON — 38806 — REGISTERED PROFESSIONAL ENGINEER

WESTERN PACIFIC ENGINEERING & SURVEY
A TERRA DEVELOPMENT SERVICES CORPORATION
1328 E. Hunter Place, Moses Lake, Washington
T:(509)765-1023 F:(509)765-1298
Services in Washington and Idaho

No.	Revision	Date	By

BROWN & JACKSON
Land Application Site
Preliminary Site Map

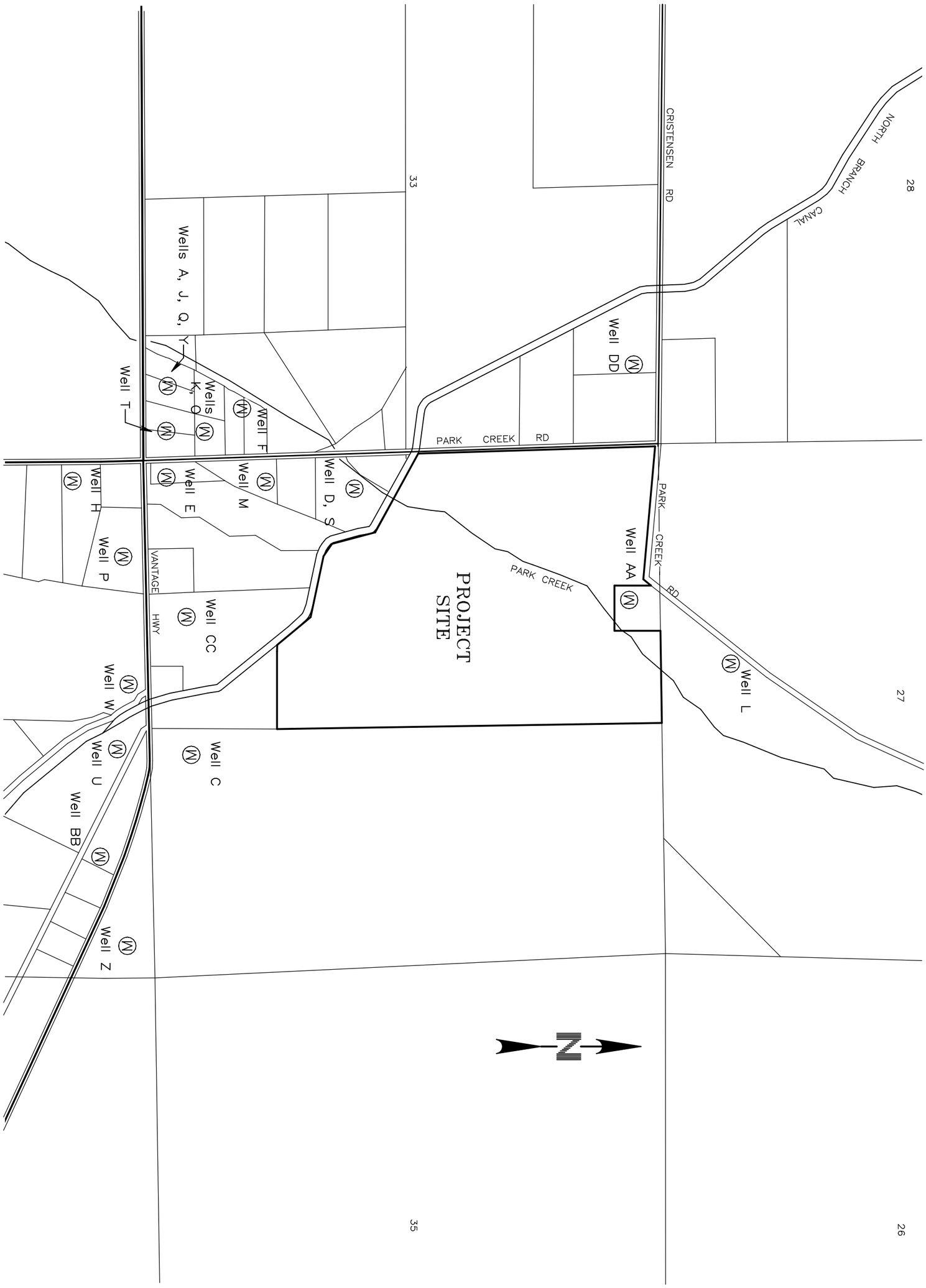
Kittitas County Washington

Designed by NDN
Drawn by Tml/NDN
Checked by NDN
Project No. 20102
Date: April 2020
Scale:
Hor. 1" = 3'
Vert. 1" = N/A
Sec 34, T 18 N, R 20 E

SHEET NO.
2 of 2

201834

File -- X:\20410\Drafting\Vicemap.pro Date: Fri Apr 24, 2020



BROWN & JACKSON

Land Application Site

Adjacent Well Site Map

Grant County Washington

No.	Revision	Date	By

Designed by NDN
Drawn by Tml/NDN
Checked by NDN
Project No. 20410
Date: April 2020
Scale: Hor. 1" = 1000'
Vert. 1" = N/A
Sec 34, T 18 N, R 20 E

SHEET NO. C1.1

WESTERN PACIFIC ENGINEERING & SURVEY
A TERRA DEVELOPMENT SERVICES CORPORATION
1328 E. Hunter Place, Moses Lake, Washington
T:(509)765-1023 F:(509)765-1298

Well A

RECEIVED
JUL 11 2000
DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

File Original with Department of Ecology
Second Copy - Owner's Copy
Third Copy - Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Notice of Intent WI08913
UNIQUE WELL I.D. # AEQ 998
Water Right Permit No.

(1) **OWNER:** Name Bill Mills Address P.O. 1079, Kittitas, WA. 98934

(2) **LOCATION OF WELL:** County Kittitas SE 1/4 SE 1/4 Sec 33 T 18 N.R. 20 WM

(2a) **STREET ADDRESS OF WELL:** (or nearest address)

TAX PARCEL NO.:

R

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

(4) **TYPE OF WORK:** Owner's number of well (if more than one) '00 JUL -7 PM 12:07
☑ New Well Method: ☐ Dug ☐ Bored
☐ Deepened ☐ Cable ☐ Driven
☐ Reconditioned ☑ Rotary ☐ Jetted
☐ Decommission CASHIER'S OFFICE

(5) **DIMENSIONS:** Diameter of well 6 inches
Drilled 140 feet. Depth of completed well 140 ft.

(6) **CONSTRUCTION DETAILS**
Casing Installed:
☐ Welded 6" Diam. from +4 ft. to 90 ft.
☑ Liner installed 4" Diam. from -10 ft. to 140 ft.
☐ Threaded " Diam. from ft. to ft.

Perforations: ☑ Yes ☐ No
Type of perforator used skillsaw
SIZE of perforations 1/4 in. by 1/4 in.
100 perforations from 100 ft. to 140 ft.

Screens: ☐ Yes ☑ No ☐ K-Pac Location
Manufacturer's Name
Type Model No.
Diam. Slot Size from ft. to ft.
Diam. Slot Size from ft. to ft.

Gravel/Filter packed: ☐ Yes ☑ No ☐ Size of gravel/sand
Material placed from ft. to ft.

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

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

(8) **WATER LEVELS:** Land-surface elevation above mean sea level ft.
Static level 40 ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☐ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 20 gal./min. with ft. drawdown after 2½ hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

(10) **WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION**
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered.

MATERIAL	FROM	TO
dirt/cobbles	0	10
cement gravel	10	90
medium basalt	90	140

DEPT. OF ECOLOGY Received JUL 14 2000 CENTRAL REGION OFFICE

Work Started June 13, 2000 Completed June 15, 2000

WELL CONSTRUCTION CERTIFICATION:

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

Type or Print Name Mike Mansfield License No. 2361
(Licensed Driller/Engineer)
Trainee Name Jeremy Bach License No. 2536
Drilling Company Bach Drilling Co.
(Signed) Mike Mansfield License No. 2361
(Licensed Driller/Engineer)
Address 3340 Wilson Creek Rd
Contractor's Registration No. MikeBDC133N4 Date June 22, 2000

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (360) 407-6600. The TDD number is (360) 407-6006.

ECY 050-1-20 (11/98)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy Owner's Copy
Third Copy Driller's copy 147438

WATER WELL REPORT

STATE OF WASHINGTON

Notice of Intent W171665
UNIQUE WELL I D # AKO429
Water Right Permit No

(1) OWNER Name BRUCE KATOCS Address 16781 VANTAGE HWY ELLENSBURG, WA 98926

(2) LOCATION OF WELL County KITTITAS SE 1/4 SW 1/4 Sec 34 T 18 N R 20 WM

(2a) STREET ADDRESS OF WELL (or nearest address) 16781 VANTAGE HWY ELLENSBURG WA 98926

TAX PARCEL NO 182034 000 0006

P

(3) PROPOSED USE
[X] Domestic [ ] Industrial [ ] Municipal
[ ] Irrigation [ ] Test Well [ ] Other
[ ] DeWater

(4) TYPE OF WORK Owner's number of well (If more than one)
[X] New Well Method
[ ] Deepened [ ] Dug [ ] Bored
[ ] Reconditioned [ ] Cable [ ] Driven
[ ] Decommission [X] Rotary [ ] Jetted

(5) DIMENSIONS Diameter of well 6 inches
Drilled 223 feet Depth of completed well 223 ft

(6) CONSTRUCTION DETAILS
Casing Installed
[X] Welded 6 Diam from +4 ft to 145 ft
[X] Liner installed 4 1/2 Diam from 123 ft to 223 ft
[ ] Threaded Diam from ft to ft

Perforations [X] Yes [ ] No
Type of perforator used SKILLSAW
SIZE of perforations 1/8 in by 6 in
25 perforations from 203 ft to 223 ft
perforations from ft to ft
perforations from ft to ft

Screens [ ] Yes [X] No [ ] K Pac Location
Manufacturer's Name
Type Model No
Diam Slot size from ft to ft
Diam Slot size from ft to ft

Gravel/Filter packed [ ] Yes [X] No [ ] Size of gravel/sand
Material placed from ft to ft

Surface seal [X] Yes [ ] No To what depth? 145 ft
Material used in seal BENTONITE
Did any strata contain unusable water? [ ] Yes [X] No
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP Manufacturer's Name
Type H P

(8) WATER LEVELS Land surface elevation above mean sea level ft
Static level 107 ft below top of well Date 2/26/2004
Artesian pressure lbs per square inch Date
Artesian water is controlled by (Cap valve etc)

(9) WELL TESTS Drawdown is amount water level is lowered below static level
Was a pump test made? [ ] Yes [X] No If yes by whom?
Yield gal /min with ft drawdown after hrs
Yield gal /min with ft drawdown after hrs
Yield gal /min with ft drawdown after hrs

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

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal /min with ft drawdown after hrs
Airtest 60 gal /min with stem set at 220 ft for 1 hrs
Artesian flow g p m Date
Temperature of water Was a chemical analyses made? [ ] Yes [X] No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION
Formation Describe by color character size of material and structure and the kind and nature of the material in each stratum penetrated with at least one entry for each change of information Indicate all water encountered

MATERIAL	FROM	TO
SOIL & BOLDERS	0	1
CLAY & BOLDERS	1	14
BROKEN BASALT & BOLDERS & CLAY BROWN	14	66
BROKEN BASALT & CLAY	66	84
BASALT	84	90
SOFT BASALT GREY BROWN & CLAY BROWN	90	124
BASALT DARK GREY & BROWN	124	173
BASALT GREY	173	195
BASALT GREY BROWN	195	216
BASALT GREY BLACK BROWN BROKEN SHALE	216	
CLAY		223
60 GPM @ 220		
40 GPM @ 140		

DEPT OF ECOLOGY Received MAR 17 2004 REGION OFFICE

Work Started 2/25/2004 19 Completed 2/26/2004 19

WELL CONSTRUCTION CERTIFICATION

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

Type or Print Name TOM MCGUIRE License No 0357
(Licensed Driller/Engineer)
Trainee Name License No
Drilling Company RICK POULIN WELL DRILLING
(Signed) Tom McGuire License No 0357
(Licensed Driller/Engineer)
Address 1301 LANCASTER RD SELAH, WA 98942
Contractor's Registration No RICKPWD042J2 Date 2/26/2004 19

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer For special accommodation needs contact the Water Resources Program at (360) 407 6600 The TDD number is (360) 407 6006

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Well C

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Well D

368410

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W36922
Unique Well I.D. #
Water Right Permit No.

(1) OWNER: Name MARCHEL, CHRIS Address ROUTE 3, BOX 1131 ELLENSBURG, WA 98926-

(2) LOCATION OF WELL: County KITTITAS - W 1/4 SW 1/4 Sec 34 T 18 N., R 20 WM
(2a) STREET ADDRESS OF WELL (or nearest address) ,

(3) PROPOSED USE: DOMESTIC

(4) TYPE OF WORK: Owner's Number of well (If more than one) 1
DEEPENED Method: ROTARY

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 64 ft. Depth of completed well 160 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 5 " Dia. from +2 ft. to 131 ft.
WELDED " Dia. from ft. to ft.
" Dia. from ft. to ft.

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

Screens: NO
Manufacturer's Name
Type Model No.
Diam. slot size from ft. to ft.
Diam. slot size from ft. to ft.

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

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

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

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level 52 ft. below top of well Date 05/05/94
Artesian Pressure lbs. per square inch Date
Artesian water controlled by

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

Recovery data
Time Water Level Time Water Level Time Water Level

Date of test / /
Bailer test gal/min. ft. drawdown after hrs.
Air test 22 gal/min. w/ stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? NO

(10) WELL LOG

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

MATERIAL	FROM	TO
BROKEN BASALT	96	115
BASALT HARD	115	130
BROKEN BASALT	130	160
	160	

MAY-25 [illegible]

Work started 05/03/94 Completed 05/05/94

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

NAME PONDEROSA DRILLING
(Person, firm, or corporation) (Type or print)

ADDRESS E [illegible] BROADWAY

[SIGNED] Dennis J Olsen License No. 2154

Contractor's Registration No. PO-ND-EI*248JE Date 05/19/94

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Well E

368411

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W089871
Unique Well I.D. # ACP575
Water Right Permit No.

(1) OWNER: Name **MARCHEL, CHRIS** Address **9120 PARK CREEK ROAD ELLENSBURG, WA 98926-**

(2) LOCATION OF WELL: County **KITTITAS** - W 1/2 SW 1/4 Sec 34 T 18 N., R 20 WM

(2a) STREET ADDRESS OF WELL (or nearest address) ,

(3) PROPOSED USE: **DOMESTIC**

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

(5) DIMENSIONS: Diameter of well **6** inches
Drilled **160** ft. Depth of completed well **160** ft.

(6) CONSTRUCTION DETAILS:
Casing installed: **6** " Dia. from **+2** ft. to **113** ft.
WELDED " Dia. from ft. to ft.
" Dia. from ft. to ft.

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

Screens: **NO**
Manufacturer's Name
Type Model No.
Diam. slot size from ft. to ft.
Diam. slot size from ft. to ft.

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

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

(7) PUMP: Manufacturer's Name
Type **NONE** H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level **70** ft. below top of well Date **04/14/98**
Artesian Pressure lbs. per square inch Date
Artesian water controlled by

(10) WELL LOG M, N

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

MATERIAL	FROM	TO
CLAY BROWN	0	2
GRAVEL CEMENTED	2	58
BASALT BROKEN MEDIUM	58	64
CEMENTED GRAVEL BASALT	64	
------- W/WATER	64	91
BASALT FRACTURED MEDIUM	91	
------- W/WATER	91	127
BASALT BLACK MEDIUM	127	152
BASALT FRACTURED BROWN	152	
------- BLACK W/WATER	152	160

RECEIVED
APR 29 1998

Work started **04/13/98** Completed **04/14/98**

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

Recovery data
Time Water Level Time Water Level Time Water Level

Date of test / /
Bailer test gal/min. ft. drawdown after hrs.
Air test **30** gal/min. w/ stem set at **160** ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? **NO**

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

NAME **FOGLE PUMP & SUPPLY, INC.**
(Person, firm, or corporation) (Type or print)

ADDRESS **POB 1450, AIRWAY HTS. WA.**

[SIGNED] Todd Surely/mo License No. **2321**

Contractor's
Registration No. **FOGLEPS095L4** Date 04/21/98

Well F

File Original with Department of Ecology 97991

Second Copy - Owner's Copy
Third Copy - Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Notice of Intent W113449

UNIQUE WELL I D # AFE 239

Water Right Permit No

(1) OWNER. Name Dale Brusius Address 220 mt Rainier Place nw Issaquah Wa 98027

(2) LOCATION OF WELL. County Kittitas SE 1/4 SE 1/4 Sec 33 T 18 N R 20 WM

(2a) STREET ADDRESS OF WELL: (or nearest address) ell.

TAX PARCEL NO

R

(3) PROPOSED USE. [X] Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ] DeWater

(4) TYPE OF WORK Owner's number of well (if more than one)
[X] New Well Method
[ ] Deepened [ ] Dug [ ] Bored
[ ] Reconditioned [ ] Cable [ ] Driven
[ ] Decommission [X] Rotary [ ] Jetted

(5) DIMENSIONS Diameter of well 10x6 inches
Drilled 145 feet. Depth of completed well 145 ft.

(6) CONSTRUCTION DETAILS
Casing Installed.
[X] Welded 6 " Diam from +2 ft to -102 ft
[ ] Liner installed " Diam from ft to ft.
[ ] Threaded " Diam from ft to ft

Perforations [ ] Yes [X] No
Type of perforator used
SIZE of perforations in by in
perforations from ft to ft

Screens [ ] Yes [X] No [ ] K-Pac Location
Manufacturer's Name
Type Model No
Diam Slot Size from ft to ft
Diam Slot Size from ft to ft

Gravel/Filter packed [ ] Yes [X] No [ ] Size of gravel/sand
Material placed from ft to ft

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

(7) PUMP Manufacturer's Name
Type H P

(8) WATER LEVELS Land-surface elevation above mean sea level ft
Static level 51 ft below top of well Date 3/5/01
Artesian pressure lbs per square inch Date
Artesian water is controlled by
(Cap, valve, etc)

(9) WELL TESTS Drawdown is amount water level is lowered below static level
Was a pump test made? [ ] Yes [ ] No If yes, by whom?
Yield gal /min with ft drawdown after hrs
Yield gal /min with ft drawdown after hrs
Yield gal /min with ft drawdown after hrs
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
	ESTIMATED AIRLIFT				

Date of test
Bailer test gal./min with ft drawdown after hrs
Airtest 30-35 gal./min with ft drawdown after hrs
Artesian flow g p m Date
Temperature of water Was a chemical analysis made? [ ] Yes [X] No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION
Formation Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information Indicate all water encountered

MATERIAL	FROM	TO
Topsoil Drk Brn M	0	3
Cemented Gravel Drk Brn MH	3	31
Broken Basalt Clay Brn Blk MH	31	75
Broken Basalt Sandstone Brn Blk MH	75	91
Basalt Brn Blk H	91	108
Source Basalt Brn Blk M	108	145

Work Started 3/2/01 Completed 3/5/01

WELL CONSTRUCTION CERTIFICATION

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

Type or Print Name Chris Hayes License No 1908
(Licensed Driller/Engineer)

Trainee Name License No

Drilling Company Waterman Well Drilling Inc

(Signed) License No 1908
(Licensed Driller/Engineer)

Address 106 Beinman Ln Selah Wa 98942

Contractor's Registration No WATERWD022DB Date 3/6/01

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer For special accommodation needs, contact the Water Resources Program at (360) 407-6600 The TDD number is (360) 407-6006

ECY 050-1-20 (11/98)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Well H

WATER WELL REPORT

Original & 1st copy - Ecology, 2nd copy - owner, 3rd copy - driller

Construction/Decommission *("x" in circle)*
○ Construction 170170
○ Decommission *ORIGINAL CONSTRUCTION Notice of Intent Number*_____

CURRENT Notice of Intent No. W170991
Unique Ecology Well ID Tag No. ALF 359
Water Right Permit No. _____

Property Owner Name Dave & Nichole Burke
Well Street Address Park Creek
City Ellensburg County Kittitas
Location NW 1/4- 1/4 NW 1/4 Sec 03 Twn 17 R 20 EWM or WWM *circle one*
Lat/Long: (s,t,r still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____
Tax Parcel No. 17200030510002

PROPOSED USE: ☑ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other_____

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

DIMENSIONS: Diameter of well 6 inches, drilled 125 ft.
Depth of completed well 125 ft.

CONSTRUCTION DETAILS
Casing Installed: ☑ Welded 6" Diam. from +2 ft. to 45 ft.
☑ Liner installed 4" Diam. from -10 ft. to 125 ft.
☐ Threaded _____" Diam. from _____ ft. to _____ ft.

Perforations: ☑ Yes ☐ No
Type of perforator used Skil Saw
SIZE of perfs 7 in. by 1/4 in. and no. of perfs 300 from 80 ft. to 125 ft.

Screens: ☐ Yes ☑ No ☐ K-Pac Location_____
Manufacturer's Name_____
Type_____ Model No._____
Diam._____ Slot Size_____ from_____ ft. to_____ ft.
Diam._____ Slot Size_____ from_____ ft. to_____ ft.

Gravel/Filter packed: ☐ Yes ☑ No ☐ Size of gravel/sand_____
Materials placed from_____ ft. to_____ ft.

Surface Seal: ☑ Yes ☐ No To what depth? 45 ft
Materials used in seal Bentonite
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water?_____ Depth of strata_____
Method of sealing strata off_____

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

WATER LEVELS: Land-surface elevation above mean sea level_____ ft.
Static level 30 ft. below top of well Date 7-6-05
Artesian pressure_____ lbs. per square inch Date_____
Artesian water is controlled by_____ (cap,valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level.
Was a pump test made? ☐ Yes ☐ No If yes, by whom?_____
Yield:_____ gal./min. with_____ ft. drawdown after_____ hrs.
Yield:_____ gal./min. with_____ ft. drawdown after_____ hrs.
Yield:_____ gal./min. with_____ ft. drawdown after_____ hrs.
Recovery data (time taken as zero when pump turned off)(water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test_____
Bailer test_____ gal./min. with _____ ft. drawdown after_____ hrs.
Airtest 20 gal./min. with stem set at 120 ft. for 2 hrs.
Artesian flow_____ g.p.m. Date_____
Temperature of water_____ Was a chemical analysis made? ☐ Yes ☐ No

CONSTRUCTION OR DECOMMISSION PROCEDURE
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
top soil	0	2
Brown Basalt med	2	15
Black Basalt Hard	15	45
Brown Black Basalt	45	85
Black Brown Basalt	85	125
water		

DEPT OF ECOLOGY Received AUG 0 2 2005 CENTRAL REGIONAL OFFICE

Start Date 7-5-05 Completed Date 7-6-05

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

☑ Driller ☐ Engineer ☐ Trainee Name (Print) Mike Morefield
Driller/Engineer/Trainee Signature Mike Morefield
Driller or Trainee License No. 2361

If trainee, licensed driller's Signature and License no._____

Drilling Company Water Man Well Drilling
Address P.O. Box 246
City, State, Zip Selah Wa 98942
Contractor's Registration No. WATERMW022DB Date 7/11/05

Ecology is an Equal Opportunity Employer. ECY 050-1-20 (Rev 4/01)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report. I Report.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Well J

38255

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W50927
Unique Well I.D. # ABW466
Water Right Permit No.

(1) OWNER: Name CHRISTIANSON, DENNIS Address 15531 VANTAGE HIGHWAY ELLENSBURG, WA 98926-

(2) LOCATION OF WELL: County KITTITAS - SE 1/4 SE 1/4 Sec 33 T 18 N., R 20E WM
(2a) STREET ADDRESS OF WELL (or nearest address) ,

R

(3) PROPOSED USE: DOMESTIC

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

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 260 ft. Depth of completed well 260 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Dia. from +2 ft. to 125 ft.
WELDED 4 " Dia. from -6 ft. to 260 ft.
" Dia. from ft. to ft.

Perforations: YES
Type of perforator used SKILL SAW
SIZE of perforations 1/8 in. by 6 in.
102 perforations from 240 ft. to 260 ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: NO
Manufacturer's Name
Type Model No.
Dia. slot size from ft. to ft.
Dia. slot size from ft. to ft.

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

Surface seal: YES To what depth? 18 ft.
Material used in seal BENTONITE
Did any strata contain unusable water? YES
Type of water? OTHER Depth of strata ft.
Method of sealing strata off OVERBURE

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

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level 81 ft. below top of well Date 02/17/95
Artesian Pressure lbs. per square inch Date
Artesian water controlled by

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

Recovery data
Time Water Level Time Water Level Time Water Level

Date of test / /
Bailer test gal/min. ft. drawdown after hrs.
Air test 25 gal/min. w/ stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? NO

(10) WELL LOG

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

MATERIAL	FROM	TO
COBBLES LOAM BROWN	0	7
COBBLES BOULDERS HARD	7	36
SANDSTONE BROWN GRAVEL	36	42
CEMENTED GRAVEL COBBLES	42	52
SANDSTONE BROWN MEDIUM	52	56
CEMENTED GRAVEL HARD	56	137
BROKEN BASALT SHALE	137	210
POROUS BASALT RED	210	260
	260	

RECEIVED
MAR 6 1995

Work started 02/14/95 Completed 02/17/95

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

NAME PONDEROSA DRILLING
(Person, firm, or corporation) (Type or print)

ADDRESS E 6010 BROADWAY

[SIGNED] License No. 2060 OR07

Contractor's
Registration No. PO-ND-EI*240JE Date 02/23/95

Well K

File Original with Department of Ecology
Second Copy - Owner's Copy
Third Copy - Driller's Copy 107039

WATER WELL REPORT
STATE OF WASHINGTON

Notice of Intent W123134
UNIQUE WELL I D # AFH-374
Water Right Permit No

(1) **OWNER:** Name Gary Huss Address 71 Duffy Rd., Ellenburg

(2) **LOCATION OF WELL:** County Kittitas SE 1/4 SE 1/4 Sec 33 T 18 N R 20 WM

(2a) **STREET ADDRESS OF WELL:** (or nearest address) 71 Duffy Rd.

TAX PARCEL NO.

R

(3) **PROPOSED USE:** [X] Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ] DeWater

(4) **TYPE OF WORK:** Owner's number of well (if more than one)
[X] New Well Method [ ] Deepened [ ] Dug [ ] Bored [ ] Reconditioned [ ] Cable [ ] Driven [ ] Decommission [X] Rotary [ ] Jetted

(5) **DIMENSIONS:** Diameter of well 6 inches
Drilled 125 feet Depth of completed well 125 ft

(6) **CONSTRUCTION DETAILS**
Casing Installed.
[X] Welded 6 " Diam from +1 ft to 90 ft
[X] Liner installed 4½ " Diam from 65 ft to 125 ft
[ ] Threaded " Diam from ft to ft

Perforations: [X] Yes [ ] No
Type of perforator used Skill Saw
SIZE of perforations 3/16 in by 5 in
80 perforations from 105 ft to 125 ft

Screens: [ ] Yes [X] No [ ] K-Pac Location
Manufacturer's Name
Type Model No
Diam Slot Size from ft to ft
Diam Slot Size from ft to ft

Gravel/Filter packed: [ ] Yes [X] No [ ] Size of gravel/sand
Material placed from ft to ft

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

(7) **PUMP:** Manufacturer's Name
Type HP

(8) **WATER LEVELS:** Land-surface elevation above mean sea level 1760 ft
Static level 50 ft below top of well Date 4-21-00
Artesian pressure lbs per square inch Date
Artesian water is controlled by (Cap, valve, etc)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? [ ] Yes [X] No If yes, by whom?
Yield gal /min. with ft drawdown after hrs
Yield gal /min with ft drawdown after hrs
Yield gal /min with ft drawdown after hrs
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal /min with ft drawdown after hrs
Airtest 75 gal /min with ft drawdown after 1 hrs
Artesian flow g p m Date 4-21-00
Temperature of water 56 Was a chemical analysis made? [ ] Yes [X] No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION
Formation Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information Indicate all water encountered

MATERIAL	FROM	TO
Topsoil	0	6
Cemented Gravel & Br. Clay	6	108
Br. & Gray Basalt	108	113
Br. Porus Basalt & Hd. Br. Clay & Water	113	125

RECEIVED JUN 2 2000 DEPARTMENT OF ECOLOGY CENTRAL REGION

RECEIVED JUN 30 DEPARTMENT OF ECOLOGY CENTRAL REGION

Work Started 4-19-, 00 Completed 4-21-, 00

WELL CONSTRUCTION CERTIFICATION:

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

Type or Print Name Jerry Rank License No 1435
(Licensed Driller/Engineer)

Trainee Name License No
Drilling Company Oasis Drilling
(Signed) Jerry L. Rank License No 1435
(Licensed Driller/Engineer)
Address 2017 S. 16th. Ave., Union Gap
Contractor's Registration No OASISD*072J9 Date 4-23-, 00

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer For special accommodation needs, contact the Water Resources Program at (360) 407-6600 The TDD number is (360) 407-6006

ECY 050-1-20 (11/98)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Well L

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

WATER WELL REPORT
STATE OF WASHINGTON

Application No. G4-24083
Permit No. G4-24083P

(1) OWNER: Name Howard Clerf Address

(2) LOCATION OF WELL: County Kittitas SW ¼ E½ ¼ Sec. 27 T. 18 N., R 20 W.M. L P

ng and distance from section or subdivision corner

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

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

(5) DIMENSIONS: Diameter of well 8" inches.
Drilled 465 ft. Depth of completed well 465 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: ..." Diam. from ... ft. to ... ft.
Threaded ☐ ..." Diam. from ... ft. to ... ft.
Welded ☑ 8" Diam. from 0 ft. to 110 ft.

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

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

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

Surface seal: Yes ☑ No ☐ To what depth? 110 ft.
Material used in seal Cement Grout
Did any strata contain unusable water? Yes ☐ No ☑
Type of water? Depth of strata
Method of sealing strata off pressure grout

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

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level ft. below top of well Date
Artesian pressure 95 lbs. per square inch Date Sept. 9, 76
Artesian water is controlled by Valve (Cap, valve, etc.)

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

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

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow 2000 g.p.m. Date Sept. 9, 1976
Temperature of water 68 Was a chemical analysis made? Yes ☐ No ☑

(10) WELL LOG:

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

MATERIAL	FROM	TO
Dirt, Cobbles	0	16
Broken rock	16	100
Hard black basalt	100	120
Soft broken basalt	120	122
25-80 gpm		
Hard basalt	122	140
Soft broken basalt	140	141
Hard black basalt	141	203
Soft basalt blue clay (increase flow)	230	380
Med. basalt	380	400
Soft basalt	400	410
Med. basalt	410	450
Soft basalt	450	455
Hard black basalt	455	465

RECEIVED
SEP 13 1976
DEPARTMENT OF ECOLOGY
CENTRAL REGIONAL OFFICE

Work started ..., 19... Completed ..., 19...

WELL DRILLER'S STATEMENT:

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

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

Address

[Signed] (Well Driller)

License No. 22 W Date Sept. 10, 1976

(USE ADDITIONAL SHEETS IF NECESSARY)

S. F. No. 7356—OS—(Rev. 4-71).

Well M

8736

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

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 086885

UNIQUE WELL I.D. #

Water Right Permit No.

(1) OWNER: Name Jack Loftis Address Rt. 3 Box 585, Ellensburg, WA 98926

(2) LOCATION OF WELL: County Kittitas W½ ¼ SW ¼ Sec. 34 T. 18 N., R. 20 W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address)

(3) PROPOSED USE: [X] Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ] DeWater

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

Abandoned [ ] New well [X] Method: Dug [ ] Bored [ ] Deepened [ ] Cable [ ] Driven [ ] Reconditioned [ ] Rotary [X] Jetted [ ]

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 160 feet. Depth of completed well 160 ft.

(6) CONSTRUCTION DETAILS:

Casing Installed: 6 " Diam. from +2 ft. to 126 ft.
Welded [X] PVC 4 " Diam. from 20 ft. to 160 ft.
Liner Installed [X]
Threaded [ ] " Diam. from ft. to ft.

Perforations: Yes [X] No [ ] PVC Liner
Type of perforator used Skill Saw
SIZE of perforations 6 in. by 1/8 in.
102 perforations from 140 ft. to 160 ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes [ ] No [X]
Manufacturer's Name
Type Model No
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

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

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

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

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

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [X] If yes, by whom?
Yield: 40 gal./min. with ft. drawdown after hrs.
" ESTIMATED AIRLIFT " "
" " " "

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

Time	Water Level	Time	Water Level	Time	Water Level

Date of test

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

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

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

MATERIAL	FROM	TO
Loam, Dark Brown, Soft	0	3
Cobbles, Boulders, Hard	3	7
Gravel, Boulders, Hard	7	18
Cemented Gravels, Brown, Hard	18	36
Sandstone, Brown, Medium Soft	36	48
Cemented Gravels, Brown, Hard	48	52
Sandstone, Tan, Medium	52	56
Gravels/Sand, Tan/Black, Med. Hard	56	125
Porous Basalt, Black/Red, Hard	125	160

MAY 14 1993

6" Drive Shoe Utilized

Work started 4-28-93, 19. Completed 4-29-93, 19

WELL CONSTRUCTOR CERTIFICATION:

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

NAME Ponderosa Drilling & Development, Inc. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address E. 6010 Broadway, Spokane, WA 99212

(Signed) (WELL DRILLER) License No. 2060

Contractor's Registration No. PO-ND-EI*248JE (Dave Ricard)

Date April 30, 1993

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20 (10/87) -1329-

The Dep The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Well N

WATER WELL REPORT

STATE OF WASHINGTON ECOLOGY — Original & 1st copy - Ecology, 2nd copy - owner, 3rd copy - driller

Construction/Decommission *("x" in circle)*

(X) Construction

( ) Decommission *ORIGINAL CONSTRUCTION Notice of Intent Number* 193100

CURRENT Notice of Intent No. W208268

Unique Ecology Well ID Tag No. ALE 956

Water Right Permit No. _____

Property Owner Name James Kelly J

Well Street Address 9741 Parke Creek road

City Ellensburg County: Kittitas

Location NE 1/4 - 1/4 SE 1/4 Sec 33 Twn 18N R 20 (EWM) or WWM *circle one*

Lat/Long: (s,t,r still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No. 18-20-33040-0028

PROPOSED USE: (X) Domestic ( ) Industrial ( ) Municipal ( ) DeWater ( ) Irrigation ( ) Test Well ( ) Other _____

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

(X) New Well ( ) Reconditioned *Method:* ( ) Dug ( ) Bored ( ) Driven ( ) Deepened ( ) Cable (X) Rotary ( ) Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 160 ft. Depth of completed well 160 ft.

CONSTRUCTION DETAILS

Casing Installed: (X) Welded 6" Diam. from +3 ft. to 65 ft.

(X) Liner installed 4" Diam. from -5 ft. to 160 ft.

( ) Threaded _____" Diam. from _____ ft. to _____ ft.

Perforations: (X) Yes ( ) No

Type of perforator used Skilsaw

SIZE of perfs 12 in. by 1/4 in. and no. of perfs 350 from 60 ft. to 160 ft.

Screens: ( ) Yes (X) No ( ) K-Pac Location _____

Manufacturer's Name _____

Type _____ Model No. _____

Diam. _____ Slot Size _____ from _____ ft. to _____ ft.

Diam. _____ Slot Size _____ from _____ ft. to _____ ft.

Gravel/Filter packed: ( ) Yes (X) No ( ) Size of gravel/sand _____

Materials placed from _____ ft. to _____ ft.

Surface Seal: (X) Yes ( ) No To what depth? 20 ft

Materials used in seal Bentonite

Did any strata contain unusable water? ( ) Yes (X) No

Type of water? _____ Depth of strata _____

Method of sealing strata off _____

PUMP: Manufacturer's Name _____

Type: _____ H.P. _____

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

Static level 73 ft. below top of well Date 4/4/06

Artesian pressure _____ lbs. per square inch Date _____

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

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

Was a pump test made? ( ) Yes (X) No If yes, by whom? _____

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

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

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

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

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____

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

Airtest 15-18 gal./min. with stem set at 140 ft. for 2 1/2 hrs.

Artesian flow _____ g.p.m. Date _____

Temperature of water _____ Was a chemical analysis made? ( ) Yes (X) No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
top soil	0	5
gravel	5	50
Clay	50	55
gravel	55	60
rock	60	100
gravel	100	115
rock	115	145
broken rock	145	160

DEPT. OF ECOLOGY Received APR 14 2006 CENTRAL REGION OFFICE

Start Date 4/3/06 Completed Date 4/4/06

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

(X) Driller ( ) Engineer ( ) Trainee Name (Print) Jeremy Bach

Driller/Engineer/Trainee Signature _____

Driller or Trainee License No. # 2536

Drilling Company Bach Drilling

Address 3340 Wilson Creek

City, State, Zip Ellensburg WA 98926

Contractor's Registration No. MFKEBWC133W4 Date 4/4/06

If trainee, licensed driller's Signature and License no. _____

Ecology is an Equal Opportunity Employer. ECY 050-1-20 (Rev 4/01)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Well O

WATER WELL REPORT

ECOLOGY Original & 1st copy Ecology 2nd copy owner 3rd copy driller

Construction/Decommission (x in circle)
- [X] Construction 150367
- [ ] Decommission *ORIGINAL CONSTRUCTION Notice of Intent Number*

CURRENT
Notice of Intent No W-171241

Unique Ecology Well ID Tag No AKO-125

Water Right Permit No

Property Owner Name JANET PEEK R

Well Street Address 180 Duffy Rd

City Ellensburg County Kittitas

Location SE 1/4 1/4 SE 1/4 Sec 33 Twn 18 R 20 (E/W/M) circle one

Lat/Long (s,t r still REQUIRED) Lat Deg ____ Lat Min/Sec ____ Long Deg ____ Long Min/Sec ____

Tax Parcel No 18-20-33040-0033

PROPOSED USE [X] Domestic [ ] Industrial [ ] Municipal [ ] DeWater [ ] Irrigation [ ] Test Well [ ] Other

TYPE OF WORK Owner's number of well (if more than one)
[X] New Well [ ] Reconditioned Method [ ] Dug [ ] Bored [ ] Driven [ ] Deepened [ ] Cable [X] Rotary [ ] Jetted

DIMENSIONS Diameter of well 6 inches drilled ____ ft
Depth of completed well ____ ft

CONSTRUCTION DETAILS
Casing Installed: [X] Welded 6 Diam from +2 ft to 92½ ft
[X] Liner installed 4½ Diam from 65 ft to 145 ft
[ ] Threaded ____ Diam from ____ ft to ____ ft

Perforations [X] Yes [ ] No
Type of perforator used Skil saw
SIZE of perfs ¼ in by 6 in and no of perfs 80 from 65 ft to 145 ft

Screens [ ] Yes [X] No [ ] K Pac Location
Manufacturer's Name
Type Model No
Diam Slot Size from ft to ft
Diam Slot Size from ft to ft

Gravel/Filter packed [ ] Yes [X] No [ ] Size of gravel/sand
Materials placed from ft to ft

Surface Seal [X] Yes [ ] No To what depth? 20 ft
Materials used in seal Bentonite
Did any strata contain unusable water? [ ] Yes [X] No
Type of water? Depth of strata
Method of sealing strata off

PUMP Manufacturer's Name
Type H P

WATER LEVELS Land surface elevation above mean sea level ____ ft
Static level 45 ft below top of well Date 4/30/04
Artesian pressure ____ lbs per square inch Date
Artesian water is controlled by
(cap valve etc)

WELL TESTS Drawdown is amount water level is lowered below static level
Was a pump test made? [ ] Yes [X] No If yes by whom?
Yield ____ gal/min with ____ ft drawdown after ____ hrs
Yield ____ gal/min with ____ ft drawdown after ____ hrs
Yield ____ gal/min with ____ ft drawdown after ____ hrs
Recovery data (time taken as zero when pump turned off)(water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test ____ gal/min with ____ ft drawdown after ____ hrs
Airtest 30 gal/min with stem set at 140 ft for 2 hrs
Artesian flow ____ g p m Date
Temperature of water ____ Was a chemical analysis made? [ ] Yes [X] No

CONSTRUCTION OR DECOMMISSION PROCEDURE
Formation Describe by color character size of material and structure and the kind and nature of the material in each stratum penetrated with at least one entry for each change of information Indicate all water encountered (USE ADDITIONAL SHEETS IF NECESSARY)

MATERIAL	FROM	TO
TOP SOIL	0	3
CEMENTED GRAVEL	3	25
BROKEN BASALT-BROWN	25	49
CLAY-WATER	49	75
BROWN BLACK-BROKEN	75	91
BASALT-CLAY		
BROWN BLACK	91	108
BASALT-WATER	108	145

DEPT OF ECOLOGY Received JUN 10 2004 CENTRAL REGION OFFICE

Start Date 4/26/04 Completed Date 4/30/04

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

[X] Driller [ ] Engineer [ ] Trainee Name (Print) Craig Wamsley Drilling Company Hidden Rivers Drilling

Driller/Engineer/Trainee Signature

Address 1450 Gibson Rd

Driller or Trainee License No 2405 City State Zip Selah, WA 98942

Contractor's Registration No HIDDERB010DB Date

If trainee, licensed driller's Signature and License no

Ecology is an Equal Opportunity Employer ECY 050 1 20 (Rev 4/01)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Well P

Please print, sign and return to the Department of Ecology

Water Well Report

Original – Ecology, 1st copy – owner, 2nd copy – driller

Construction/Decommission

☐ Construction

☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* 168929

Current Notice of Intent No. W170985

Unique Ecology Well ID Tag No. AKL 788 D

Water Right Permit No. _____

Property Owner Name Joe Shield

Well Street Address 16300 Vantage Hwy.

City Ellensburg County Kittitas

Location NW 4-1/4 NW 1/4 Sec 03 Twn 17 R 20 ☐ EWM ☐ WWM ☐ circle one

Lat/Long (s, t, r still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No. 17200305/10001

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

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

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

DIMENSIONS: Diameter of well 6 inches, drilled 125 ft. Depth of completed well 125 ft.

CONSTRUCTION DETAILS

Casing Installed: ☑ Welded 6" Diam. from +2 ft. to 85 ft.; ☐ Liner installed _____" Diam. from _____ ft. to _____ ft.; ☐ Threaded _____" Diam. from _____ ft. to _____ ft.

Perforations: ☐ Yes ☑ No

Type of perforator used _____

SIZE of perfs _____ in. by ____ in. and no. of perfs _____ from _____ ft. to _____ ft.

Screens: ☐ Yes ☑ No ☐ K-Pac Location _____

Manufacturer's Name _____

Type _____ Model No. _____

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

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

Gravel/Filter packed: ☐ Yes ☑ No ☐ Size of gravel/sand _____

Materials placed from _____ ft. to _____ ft.

Surface Seal: ☑ Yes ☐ No To what depth? 20 ft.

Material used in seal Bentonite

Did any strata contain unusable water? ☐ Yes ☐ No

Type of water? _____ Depth of strata _____

Method of sealing strata off _____

PUMP: Manufacturer's Name _____

Type: _____ H.P. _____

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

Static level 50 ft. below top of well Date 3-16-05

Artesian pressure _____ lbs. per square inch Date _____

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

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

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

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

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

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

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

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____

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

Airtest 25 gal./min. with stem set at 120 ft. for 2 hrs.

Artesian flow _____ g.p.m. Date _____

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

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information indicate all water encountered. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Top Soil	0	9
Tan Clay + Sandstone	9	29
Brown Black Basalt	29	65
Black Basalt	65	85
Hard Black Basalt	85	125

DEPT. OF ECOLOGY Received MAR 23 2005 CENTRAL REGION OFFICE

Start Date 3-15-05 Completed Date 3-16-05

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

Driller/Engineer/Trainee Name (Print) Mike Morefield

Driller/Engineer/Trainee Signature Mike Morefield

Driller or trainee License No. 2361

Drilling Company Waterman Well Drilling Inc

Address P.O. Box 246

City, State, Zip Selah Wa 98942

Contractor's Registration No. WATERWD022DB Date 3/18/05

If TRAINEE, Driller's Licensed No. Levi Morefield

Driller's Signature _____

Ecology is an Equal Opportunity Employer. ECY 050-1-20 (Rev 2/03)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Well Q

WATER WELL REPORT

ECOLOGY Original & 1st copy Ecology 2nd copy owner 3rd copy driller

Construction/Decommission (x in circle) 118936
- [x] Construction
- [ ] Decommission *ORIGINAL CONSTRUCTION Notice of Intent Number*_____

CURRENT Notice of Intent No W 113533

Unique Ecology Well ID Tag No AHK361

Water Right Permit No _____

Property Owner Name Jonathan Goss R

Well Street Address 108 Duffy Rd.

City Ellensburg **County** Kittitas

Location SE 1/4- 1/4 SE 1/4 **Sec** 33 **Twn** 18 **R** 20 EWM or WWM *circle one*

Lat/Long (s t,r still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No 18-20-33040-0034

PROPOSED USE [x] Domestic [ ] Industrial [ ] Municipal [ ] DeWater [ ] Irrigation [ ] Test Well [ ] Other_____

TYPE OF WORK Owner's number of well (if more than one)_____
- [x] New Well [ ] Reconditioned *Method* [ ] Dug [ ] Bored [ ] Driven [ ] Deepened [ ] Cable [x] Rotary [ ] Jetted

DIMENSIONS Diameter of well 6 inches drilled 143 ft
Depth of completed well 143 ft

CONSTRUCTION DETAILS
Casing Installed: [x] Welded 6 Diam from +2 ft to 101 ft
[ ] Liner installed _____ Diam from _____ ft to _____ ft
[ ] Threaded _____ Diam from _____ ft to _____ ft

Perforations [ ] Yes [x] No
Type of perforator used_____
SIZE of perfs_____in by_____in and no of perfs_____ from _____ft to _____ft

Screens [ ] Yes [x] No [ ] K Pac Location_____
Manufacturer's Name_____
Type_____ Model No _____
Diam _____ Slot Size_____ from_____ft to_____ft
Diam _____ Slot Size_____ from_____ft to_____ft

Gravel/Filter packed [ ] Yes [x] No [ ] Size of gravel/sand_____
Materials placed from_____ft to_____ft

Surface Seal [x] Yes [ ] No To what depth? 18 ft
Materials used in seal Bentonite
Did any strata contain unusable water? [ ] Yes [ ] No
Type of water?_____ Depth of strata_____
Method of sealing strata off_____

PUMP Manufacturer's Name_____
Type _____ H P _____

WATER LEVELS Land surface elevation above mean sea level_____ft
Static level 45 ft below top of well Date 6-24-02
Artesian pressure_____lbs per square inch Date_____
Artesian water is controlled by_____ (cap valve etc)

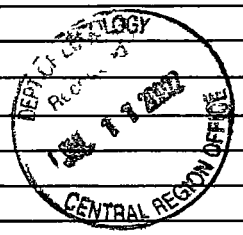
WELL TESTS Drawdown is amount water level is lowered below static level
Was a pump test made? [ ] Yes [ ] No If yes by whom?_____
Yield _____gal /min with_____ft drawdown after_____hrs
Yield _____gal /min with_____ft drawdown after_____hrs
Yield _____gal /min with_____ft drawdown after_____hrs
Recovery data (time taken as zero when pump turned off)(water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test_____
Bailer test_____gal /min with _____ft drawdown after_____hrs
Airtest 45 gal./min with stem set at 140 ft for 1 hrs
Artesian flow_____g p m Date_____
Temperature of water_____ Was a chemical analysis made? [ ] Yes [ ] No

CONSTRUCTION OR DECOMMISSION PROCEDURE
Formation Describe by color character size of material and structure and the kind and nature of the material in each stratum penetrated with at least one entry for each change of information Indicate all water encountered (USE ADDITIONAL SHEETS IF NECESSARY)

MATERIAL	FROM	TO
Top Soil	0	3
Silt	3	10
Gravel	10	25
Cemented Gravel	25	36
Sandstone	36	40
Gravel	40	75
Clay & Gravel	75	80
Basalt Black & Brown Broken	80	143



Start Date 6-20-02 Completed Date 6-24-02

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

[x] Driller [ ] Engineer [ ] Trainee Name (Print) Gary Lydia
Driller/Engineer/Trainee Signature Gary Lydia
Driller or Trainee License No 1023

Drilling Company Apple Valley Well Drilling
Address PO Box 55
City State Zip Selah Wa.
Contractor's Registration No Applevw*wd1 Date 6-24-02

If trainee, licensed driller's Signature and License no _____

Ecology is an Equal Opportunity Employer ECY 050 1 20 (Rev 4/01)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Well S 4/86

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

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 28749

Water Right Permit No. NN

(1) OWNER: Name KEN McKENZIE Address Park Creek Rd.

(2) LOCATION OF WELL: County Kittitas NW ¼ SW ¼ Sec. 34 T. 18 N., R. 20 W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address)

(3) PROPOSED USE: [X] Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ] DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one)
Abandoned [ ] New well [X] Method: Dug [ ] Bored [ ] Deepened [ ] Cable [ ] Driven [ ] Reconditioned [ ] Rotary [X] Jetted [ ]

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

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from +4 ft. to 120 ft.
Welded [X] Liner installed [ ] Threaded [ ]
" Diam. from ____ ft. to ____ ft.
" Diam. from ____ ft. to ____ ft.

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

Screens: Yes [ ] No [ ]
Manufacturer's Name
Type ____ Model No.
Diam. ____ Slot size ____ from ____ ft. to ____ ft.
Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel packed: Yes [ ] No [ ] Size of gravel
Gravel placed from ____ ft. to ____ ft.

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

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

(8) WATER LEVELS: Land-surface elevation above mean sea level ____ ft.
Static level 42 ft. below top of well Date 11-7-90
Artesian pressure ____ lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

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

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

Time	Water Level	Time	Water Level	Time	Water Level

Date of test

Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.
Airtest 40 gal./min. with stem set at 155 ft. for 2 hrs.
Artesian flow ____ g.p.m. Date
Temperature of water ____ Was a chemical analysis made? Yes [ ] No [ ]

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

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

MATERIAL	FROM	TO
DIRT + COBBLES	0	4
HARD PAN + COBBLES	4	12
SANDSTONE + GRAVEL	12	20
CEMENTED GRAVEL	20	80
CEMENTED GRAVEL WITH LAYERS OF BASALT	80	115
MED. BROWN + BLACK BASALT	115	160

RECEIVED
DEC 6 1990
DEPARTMENT OF ECOLOGY
CENTRAL REGION OFFICE

ENTERED
ENTERED

Work started 11-6 19 90 completed 11-7 19 90

WELL CONSTRUCTOR CERTIFICATION:

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

NAME Bach Drilling (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address Rt 5 Box 1010 Ellensburg, WA.

(Signed) Mike Bach (WELL DRILLER) License No. 22

Contractor's Registration No. MIKE BOC 133N4 Date 11-12 19 90

(USE ADDITIONAL SHEETS IF NECESSARY)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy - Owner's Copy
Third Copy - Driller's copy

90592

WATER WELL REPORT

STATE OF WASHINGTON

Notice of Intent W122112
UNIQUE WELL I D # AFH314
Water Right Permit No

(1) OWNER. Name LEN CARDWELL Address 36 DUFFY RD, ELLENSBURG, WA 98926

(2) LOCATION OF WELL County KITTATAS - SE 1/4 1/4 Sec 33 T 18 N,R 20 WM

(2a) STREET ADDRESS OF WELL (or nearest address) DUFFY RD E-BURG

TAX PARCEL NO. 18-20-33040-0032

JKQR

(3) PROPOSED USE [X] Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ] DeWater

(4) TYPE OF WORK Owner's number of well (if more than one)
[X] New Well Method
[ ] Deepened [ ] Dug [ ] Bored
[ ] Reconditioned [ ] Cable [ ] Driven
[ ] Decommission [X] Rotary [ ] Jetted

(5) DIMENSIONS Diameter of well 6 inches
Drilled 253 feet Depth of completed well 253 ft

(6) CONSTRUCTION DETAILS:
Casing Installed:
[X] Welded 6 " Diam from +2 ft to 99 ft
[X] Liner installed 4 /12 " Diam from 93 ft to 253 ft
[ ] Threaded " Diam from ft to ft

Perforations [X] Yes [ ] No
Type of perforator used SKILL SAW
SIZE of perforations 1/8 in by 8 in
25 perforations from 233 ft to 253 ft
perforations from ft to ft
perforations from ft to ft

Screens [ ] Yes [X] No [ ] K-Pac Location
Manufacturer's Name
Type Model No
Diam Slot size from ft to ft
Diam Slot size from ft to ft

Gravel/Filter packed [ ] Yes [X] No [ ] Size of gravel/sand
Material placed from ft to ft

Surface seal [X] Yes [ ] No To what depth? 85 ft
Material used in seal BENTINITE
Did any strata contain unusable water? [ ] Yes [X] No
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP Manufacturer's Name
Type HP

(8) WATER LEVELS Land-surface elevation above mean sea level ft
Static level 35 ft below top of well Date 9/27/2000
Artesian pressure lbs per square inch Date
Artesian water is controlled by (Cap, valve, etc)

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

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

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal /min with ft drawdown after hrs
Airtest 60 + gal /min with stem set at 250 ft for hrs
Artesian flow g p m Date
Temperature of water Was a chemical analysis made? [ ] Yes [X] No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION
Formation Describe by color character size of material and structure and the kind and nature of the material in each stratum penetrated with at least one entry for each change of information Indicate all water encountered

MATERIAL	FROM	TO
TOP SOIL	0	12
GRAVEL AND CLAY	12	52
BASALT BLACK AND BROWN BROKEN	52	85
BASALT GREY, BLACK AND BROWN LAYERS	85	220
CLAY WHITE AND SHALE LAYERS	220	250
SANDSTONE	250	253
10 GPM @ 80		
25 GPM @ 120		
50 GPM @ 200		
60+ GPM @ 250		

DEPT OF ECOLOGY Received OCT 2 5 2000 CENTRAL REGION OFFICE

Work Started 9/26/2000 , 19 Completed 9/27/2000 , 19

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

Type or Print Name RICK POULIN License No 942
(Licensed Driller/Engineer)
Trainee Name License No
Drilling Company RICK POULIN WELL DRILLING
(Signed) Rick Poulin License No 942
(Licensed Driller/Engineer)
Address 1301 LANCASTER RD SELAH, WA 98942
Contractor's Registration No RICKPWD042J2 Date 9/29/00 , 19

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer For special accommodation needs, contact the Water Resources Program at (360) 407-6600 The TDD number is (360) 407-6006

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Well T

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

WELL LOG CHANGE FORM

Instructions: Record any change made to the well log record on this form. Append this form to the well log image. File with the original.

WCL Log ID (Required) _____ Well Log ID _____

Regional Office: ☑CRO ☐ERO ☐NWRO ☐SWRO

Type of Well: ☐ Water ☐ Resource

Notice of Intent: _____ Ecology Well ID Tag No. _____

Property (Well) Owner's Name _____
Well Street Address _____
City _____ County _____ Zip Code _____

Location: ____1/4-1/4 ____1/4 Sec ____ Twn ____ R ____ E or W (Circle One)

Lat./Long: (Required) Lat. Deg. _____ Lat. Min/Sec _____
Long. Deg. _____ Long. Min/Sec _____
Horizontal Collection Method Code _____

Tax Parcel No _____

Type of Work: ☐ New Well ☐ Reconditioned ☐ Deepened
Well Log Received Date __/__/__
Well Diameter ___ (in inches) Well Depth _____ (in feet) Well Completed Date __/__/__

Driller's Ecology License No. _____
Trainee's Ecology License No. _____

Reason/Source of Change (Required)
INTERNAL CORRECTION - IMAGE UNCHANGED

Signature of Well Log Tracker (Required) EG Date 1-19-05

Well U

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

WATER WELL REPORT
STATE OF WASHINGTON

Application No. .....
Permit No. G4-24875P

(1) OWNER: Name M. G. Weeks Address .....

(2) LOCATION OF WELL: County Kittitas — NW¼ NE¼ Sec. 3 T. 17 N., R. 20 W.M.
and distance from section or subdivision corner

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

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

(5) DIMENSIONS: Diameter of well 8 inches.
Drilled 456 ft. Depth of completed well 456 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 8 " Diam. from 0 ft. to 68 ft.
Threaded ☐ ..... " Diam. from ..... ft. to ..... ft.
Welded ☒ ..... " Diam. from ..... ft. to ..... ft.

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

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

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

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

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

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

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

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

Time	Water Level	Time	Water Level	Time	Water Level

Date of test .....
Bailer test 100 gal./min. with ..... ft. drawdown after ..... hrs.
Artesian flow ..... g.p.m. Date .....
Temperature of water ..... Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

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

MATERIAL	FROM	TO
Cement Gravel	0	68
Red Black Basalt	68	300
Brown Basalt W/Sandrock	300	400
Interbeds Waterbearing		
Black Basalt	400	420

Work started July 1, 19 79 Completed July 29, 19 79

WELL DRILLER'S STATEMENT:

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

NAME Bach Drilling Company
(Person, firm, or corporation) (Type or print)

Address Rt. 5, Box 1010 Ellensburg

[Signed] [redacted]
(Well Driller)

License No. [redacted] 19 80

(USE ADDITIONAL SHEETS IF NECESSARY)

DK 1.02.81

ECY 050-1-20

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Well W

98031

File Original with Department of Ecology
Second Copy - Owner's Copy
Third Copy - Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Notice of Intent W 113538

UNIQUE WELL I D # AFE 248

Water Right Permit No _____

(1) **OWNER** Name Mark Johnson Address 16730 Vantage Hwy Ell Wa 98926

(2) **LOCATION OF WELL** County Kittitas NE 1/4 NE 1/4 Sec 03 T 17 N R 20 WM

(2a) **STREET ADDRESS OF WELL** (or nearest address) _____ A

TAX PARCEL NO _____

(3) **PROPOSED USE** [X] Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ] DeWater

(4) **TYPE OF WORK** Owner's number of well (if more than one) _____
[X] New Well Method [ ] Deepened [ ] Dug [ ] Bored [ ] Reconditioned [ ] Cable [ ] Driven [ ] Decommission [X] Rotary [ ] Jetted

(5) **DIMENSIONS** Diameter of well 10 X 6 inches
Drilled 182 feet Depth of completed well 182 ft

(6) **CONSTRUCTION DETAILS**
Casing Installed
[X] Welded PVC 6" Diam from +2 ft to -60 ft
[X] Liner installed 6" Diam from -7 ft to -182 ft
[ ] Threaded _____" Diam from _____ ft to _____ ft

Perforations [X] Yes [ ] No
Type of perforator used SKILSAW
SIZE of perforations 7/4 in by 1/8 in
~~140~~ 104 perforations from 142 ft to 182 ft

Screens [ ] Yes [X] No [ ] K Pac Location _____
Manufacturer's Name _____
Type _____ Model No _____
Diam _____ Slot Size _____ from _____ ft to _____ ft
Diam _____ Slot Size _____ from _____ ft to _____ ft

Gravel/Filter packed [ ] Yes [X] No [ ] Size of gravel/sand _____
Material placed from _____ ft to _____ ft

Surface seal [X] Yes [ ] No To what depth? 18 ft
Material used in seal Bentonite
Did any strata contain unusable water? [ ] Yes [X] No
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) **PUMP** Manufacturer's Name _____
Type _____ H P _____

(8) **WATER LEVELS** Land-surface elevation above mean sea level _____ ft
Static level 87 ft below top of well Date 4/16/01
Artesian pressure _____ lbs per square inch Date _____
Artesian water is controlled by _____ (Cap valve etc)

(9) **WELL TESTS** Drawdown is amount water level is lowered below static level
Was a pump test made? [ ] Yes [X] No If yes by whom? _____
Yield _____ gal /min with _____ ft drawdown after _____ hrs
Yield _____ gal /min with _____ ft drawdown after _____ hrs
Yield _____ gal /min with _____ ft drawdown after _____ hrs
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

ESTIMATED AIRLIFT

Date of test _____
Bailer test _____ gal./min with _____ ft drawdown after _____ hrs
Airtest 30 gal./min with _____ ft drawdown after _____ hrs
Artesian flow _____ g p m Date _____
Temperature of water _____ Was a chemical analysis made? [ ] Yes [X] No

(10) **WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION**
Formation Describe by color character size of material and structure, and the kind and nature of the material in each stratum penetrated with at least one entry for each change of information Indicate all water encountered

MATERIAL	FROM	TO
Topsoil Brn M	0	2
Cemented Gravel Clay Sandstone & Tan Brn Blk MH	2	47
BASALT Brn Blk H	47	158
Fracture BASALT Brn Gry H	158	182

Work Started 4/13/01 Completed 4/16/01

WELL CONSTRUCTION CERTIFICATION

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

Type or Print Name Chris Hayes License No 1908
(Licensed Driller/Engineer)

Trainee Name _____ License No _____
Drilling Company Water Man Well Drilling
(Signed) _____ License No 1908
(Licensed Driller/Engineer)
Address 106 Berriman Ln Selah Wa
Contractor's Registration No WATERWD022DB Date 4/18/01

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer For special accommodation needs contact the Water Resources Program at (360) 407-6600 The TDD number is (360) 407-6006

ECY 050-1-20 (11/98)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

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

WATER WELL REPORT
STATE OF WASHINGTON

Application No. G-24876
Permit No. .....

(1) **OWNER:** Name MARTIN G. WERKES Address RT 3 Box 239 KITTITAS, WN.

(2) **LOCATION OF WELL:** County KITTITAS NE ¼ SE ¼ Sec. 33 T. 18 N., R. 20 E W.M.

Bearing and distance from section or subdivision corner

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

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

(5) **DIMENSIONS:** Diameter of well 8" inches.
Drilled 625 ft. Depth of completed well 625' ft.

(6) **CONSTRUCTION DETAILS:**
Casing installed: 12" Diam. from +1 ft. to 95' ft.
Threaded ☐ 8" Diam. from 95 ft. to 320 ft.
Welded ☒ ..." Diam. from ... ft. to ... ft.

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

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

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

Surface seal: Yes ☒ No ☐ To what depth? 320' ft.
Material used in seal SAND CEMENT
Did any strata contain unusable water? Yes ☒ No ☐
Type of water? ... Depth of strata 325' - 326'
Method of sealing strata off CASED + CEMENTED

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

(8) **WATER LEVELS:** Land-surface elevation above mean sea level .... 1990' ft.
Static level 156' ft. below top of well Date 7/29/77
Artesian pressure ... lbs. per square inch Date ....
Artesian water is controlled by ... (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom? ....
Yield: 1500 gal./min. with ... ft. drawdown after ... hrs.
no test " " " "
" " " "

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

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ....
Bailer test ... gal./min. with ... ft. drawdown after ... hrs.
Artesian flow ... g.p.m. Date ....
Temperature of water 48° Was a chemical analysis made? Yes ☐ No ☒

(10) **WELL LOG:**

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

MATERIAL	FROM	TO
OVERBURDEN	0	3
basalt boulders	3	20
MED BASALT	20	100
MED Broken basalt / water bearing	100	150
SOFT BASALT	150	190
SOFT Broken basalt	190	285
MED Broken basalt water / bearing	285	300
Hard basalt	300	395
MED Broken basalt / water bearing	395	400
MED hard basalt	400	510
WATER BEARING @ 440' - 460		
Very Hard basalt.	510	625
water - 100-125'		
275'-325'		
440'		
460'		
500'		
560'		
450 - 625'		

Work started 6/27, 19 77 Completed 7/18, 19 77

WELL DRILLER'S STATEMENT:

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

NAME Woodrow Well Drilling C-326
(Person, firm, or corporation) (Type or print)

Address PO Box 293 - Sunnyside, Wn.

[Signed] ... (Well Driller)

License No. 666 Date 7/26, 19 77

(USE ADDITIONAL SHEETS IF NECESSARY)

S. F. No. 7256—OS—(Rev. 4-71)
ECY-070-28

Well Y

Please print, sign and return to the Department of Ecology Well Z

Water Well Report

Original – Ecology, 1st copy – owner, 2nd copy – driller

Construction/Decommission

☐ Construction
☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* 174704

Current Notice of Intent No. W-170969
Unique Ecology Well ID Tag No. ALF-231
Water Right Permit No. B
Property Owner Name OPERATING ENGINEERS
Well Street Address P.O. Box 629
City KITTITAS County KITTITAS
Location NW 1/4-1/4 NE 1/4 Sec 03 Twn 17 R 20 ☐ EWM ☐ WWM (circle one)
Lat/Long (s, t, r still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____
Tax Parcel No. 17-20-03000000-1

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

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

DIMENSIONS: Diameter of well 6 inches, drilled 210 ft.
Depth of completed well 210 ft.

CONSTRUCTION DETAILS
Casing Installed: ☒ Welded 6" Diam. from +2 ft. to 107 ft.
☒ Liner installed 4 1/2" Diam. from 90 ft. to 210 ft.
☐ Threaded _____" Diam. from _____ ft. to _____ ft.

Perforations: ☒ Yes ☐ No
Type of perforator used SKILLSAW
SIZE of perfs 1/4 in. by 6 in. and no. of perfs 50 from 90 ft. to 210 ft.

Screens: ☐ Yes ☐ No ☐ K-Pac Location _____
Manufacturer's Name _____
Type _____ Model No. _____
Diam. _____ Slot size _____ from _____ ft. to _____ ft.
Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel/Filter packed: ☐ Yes ☒ No ☐ Size of gravel/sand _____
Materials placed from _____ ft. to _____ ft.

Surface Seal: ☒ Yes ☐ No To what depth? 107 ft.
Material used in seal BENTONITE
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

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

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 134 ft. below top of well Date 3/21/05
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☐ No If yes, by whom? _____
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest 60+ gal./min. with stem set at 205 ft. for 1 hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? ☐ Yes ☒ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information indicate all water encountered. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
DIRT	0	3
GRAVEL	3	6
HARDPAN + COBBLES	6	12
BROWN CLAY & GRAVEL	12	44
BOULDERS + CLAY	44	65
BROKEN BASALT CLAY-BOULDERS	65	86
BROWN BASALT	86	91
BROWN BASALT - HARD	91	163
BLACK + BROWN BASALT	163	172
BLACK BASALT HARD	172	182
BROWN BASALT	182	194
	194	210

DEPT. OF ECOLOGY Received JUN 22 2005 CENTRAL REGION OFFICE

Start Date 3/16/05 Completed Date 3/18/05

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

Driller/Engineer/Trainee Name (Print) CURTIS VANSLYKE
Driller/Engineer/Trainee Signature _____
Driller or trainee License No. 2428

Drilling Company HIDDEN RIVERS DRILLING
Address P.O. Box 993
City, State, Zip SUMAS, WA 98942
Contractor's Registration No HIDDEN*010DB Date 3/21/05

If TRAINEE,
Driller's Licensed No. _____
Driller's Signature _____

Ecology is an Equal Opportunity Employer. ECY 050-1-20 (Rev 2/03)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Well AA

9397

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 08680

UNIQUE WELL I.D. # D

Water Right Permit No.

[redacted] Name Park Creek Boys Home Address Park Creek

LOCATION OF WELL: County Kittitas NW¼ NW¼ Sec 34 T. 18 N., R. 20 W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address)

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

(4) TYPE OF WORK: Owner's number of well (if more than one) 2

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

(5) DIMENSIONS: Diameter of well _____ inches.

Drilled _____ feet. Depth of completed well _____ ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 8 " Diam. from 0 ft. to 20 ft.

Welded ☑ 6 " Diam. from +2 ft. to 298 ft.

Liner installed ☐

Threaded ☐ _____ " Diam. from _____ ft. to _____ ft.

Perforations: Yes ☐ No ☑

Type of perforator used _____

SIZE of perforations _____ in. by _____ in.

_____ perforations from _____ ft. to _____ ft.

_____ perforations from _____ ft. to _____ ft.

_____ perforations from _____ ft. to _____ ft.

Screens: Yes ☐ No ☑

Manufacturer's Name _____

Type _____ Model No. _____

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

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

Gravel packed: Yes ☐ No ☑ Size of gravel _____

Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes ☑ No ☐ To what depth? 25 ft.

Material used in seal CEMENT

Did any strata contain unusable water? Yes ☐ No ☐

Type of water? _____ Depth of strata _____

Method of sealing strata off _____

(7) PUMP: Manufacturer's Name _____

Type: _____ H.P. _____

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

Static level 260 ft. below top of well Date _____

Artesian pressure _____ lbs. per square inch Date _____

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

(9) WELL TESTS: Drawdown is amount water level is lowered below static level

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

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

" " " "

" " " "

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

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____

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

Airtest 15 gal./min. with stem set at 360 ft. for 1 hrs.

Artesian flow _____ g.p.m. Date _____

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

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

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

MATERIAL	FROM	TO
Dirt - clay	0	10
Medium Black Basalt	10	140
Sandstone	140	180
Medium Basalt	180	340
Fractured Basalt	340	360

RECEIVED
AUG 27 1993
DEPARTMENT OF ECOLOGY
CENTRAL REGION OFFICE

Work started 6-28, 19. Completed 7-12, 1993

WELL CONSTRUCTOR CERTIFICATION:

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

NAME Bach Drilling Co. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address R+5, Box 1010, Ellensburg, WA.

(Signed) Mike Bach (WELL DRILLER) License No. 22

Contractor's Registration No. MIKEBOC133N4 Date 7-15, 1993

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20 (10/87) -1329- 18

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report

DEPARTMENT OF ECOLOGY
State of Washington

Water Resources Program
Well Tagging Form

RECEIVED
SEP 19 2016
Dept of Ecology
Central Regional Office

Unique Well ID Tag Number: BJA 353

Use this form ONLY if an Water Well Report IS FOUND
Attach the original well report to this form

If a Water Well Report is **not** available contact the Well Construction and Licensing Office wclo@ecy.wa.gov or 360-407-6650 to request a *Water Well Report for an Existing Well* form.

Well Ownership

First name	Last name
Parke Creek Treatment Facility	
Street Address: 11042 Parke Creek Rd	
City: Ellensburg	State: WA / Zip Code: 98926

Location of Well *** Township, Range, and Section is required.**

Well Address: 11042 Parke Creek Rd				
City: Ellensburg			County: Kittitas	
¼ - (¼): NW	¼: NW	Township: 18 North	Range: 20 ☒ E or ☐ W	Section: 34
Latitude	Degrees		Minutes	Seconds
Longitude	Degrees		Minutes	Seconds
Elevation at land surface ____ ☐ feet ☐ meters *(check one)*				
Tax Parcel Number: 085134				

Well Characteristics

Location of Well Identification Tag: Attached to the wellhead inside the well house

D	C	B	A
E	F	G	H
M	L	K	J
N	P	Q	R

Scale 1:24,000 (1" = 2,000')

Indicate the location of the well within the Section by drawing a dot at that point

Section "J"

Comments: _____

Well BB

WATER WELL REPORT

Original & 1st copy - Ecology, 2nd copy - owner, 3rd copy - driller

Construction/Decommission *("x" in circle)*
(●) Construction 177027
( ) Decommission *ORIGINAL CONSTRUCTION Notice of Intent Number*_____

CURRENT
Notice of Intent No. W186959
Unique Ecology Well ID Tag No. AEF427
Water Right Permit No. _____
Property Owner Name Richard Guthrie
Well Street Address 580 Sunrise Lane
City Kittitas County: Kittitas
Location ~~1/4~~ 1/4- 1/4 NE 1/4 Sec 3 Twn 17N R 20E EWM or WWM *circle one*
Lat/Long: NE (s,t,r still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec A
Tax Parcel No. 17-20-03000-0025

PROPOSED USE: (●) Domestic ( ) Industrial ( ) Municipal ( ) DeWater ( ) Irrigation ( ) Test Well ( ) Other_____

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

DIMENSIONS: Diameter of well 6 inches, drilled 160 ft.
Depth of completed well 160 ft.

CONSTRUCTION DETAILS
Casing Installed: (●) Welded 6" Diam. from +4 ft. to 55 ft.
(●) Liner installed 4" Diam. from -5 ft. to 160 ft.
( ) Threaded _____" Diam. from _____ ft. to _____ ft.

Perforations: (●) Yes ( ) No
Type of perforator used Skilsaw
SIZE of perfs 1/2 in. by 1/4 in. and no. of perfs 200 from 80 ft. to 160 ft.

Screens: ( ) Yes (●) No ( ) K-Pac Location_____
Manufacturer's Name_____
Type_____ Model No._____
Diam._____ Slot Size_____ from_____ ft. to_____ ft.
Diam._____ Slot Size_____ from_____ ft. to_____ ft.

Gravel/Filter packed: ( ) Yes (●) No ( ) Size of gravel/sand_____
Materials placed from_____ ft. to_____ ft.

Surface Seal: (●) Yes ( ) No To what depth? 20 ft
Materials used in seal cement/bentonite
Did any strata contain unusable water? ( ) Yes (●) No
Type of water?_____ Depth of strata_____
Method of sealing strata off_____

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

WATER LEVELS: Land-surface elevation above mean sea level_____ ft.
Static level 76 ft. below top of well Date July 9 2005
Artesian pressure n/a lbs. per square inch Date_____
Artesian water is controlled by n/a (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level.
Was a pump test made? ( ) Yes (●) No If yes, by whom?_____
Yield:_____ gal./min. with_____ ft. drawdown after_____ hrs.
Yield:_____ gal./min. with_____ ft. drawdown after_____ hrs.
Yield:_____ gal./min. with_____ ft. drawdown after_____ hrs.
Recovery data (time taken as zero when pump turned off)(water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test_____
Bailer test_____ gal./min. with _____ ft. drawdown after_____ hrs.
Airtest 15-18 gal./min. with stem set at 140 ft. for 2½ hrs.
Artesian flow n/a g.p.m. Date_____
Temperature of water_____ Was a chemical analysis made? ( ) Yes (●) No

MATERIAL	FROM	TO
dirt	0	5
gravel	5	48
rock	48	160

CENTRAL REGION OFFICE RECEIVED JUL 0 8 2005 DEPT OF ECOLOGY

Start Date July 8 Completed Date July 9 2005

CONSTRUCTION OR DECOMMISSION PROCEDURE
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered. (USE ADDITIONAL SHEETS IF NECESSARY.)

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

(●) Driller ( ) Engineer ( ) Trainee Name (Print) Jeremy Bach
Driller/Engineer/Trainee Signature _____
Driller or Trainee License No. 2536

Drilling Company Bach Well Drilling
Address 3340 Wilson Creek
City, State, Zip Ellensburg WA 98926
Contractor's Registration No. BACHEBDC132MT Date July 9 2005

If trainee, licensed driller's Signature and License no._____

Ecology is an Equal Opportunity Employer. ECY 050-1-20 (Rev 4/01)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report. I Report.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Well CC

368409

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W089878
Unique Well I.D. # ACP594
Water Right Permit No.

(1) OWNER: Name **BOWERS, RON** Address **205 SOUTH SAMPSON ELLENSBURG, WA 98926-**

(2) LOCATION OF WELL: County **KITTITAS** - 1/4 **SW** 1/4 Sec **34** T **18** N., R **20E** WM

(2a) STREET ADDRESS OF WELL (or nearest address) ,

(3) PROPOSED USE: **DOMESTIC**

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

(5) DIMENSIONS: Diameter of well **6** inches
Drilled **140** ft. Depth of completed well **140** ft.

(6) CONSTRUCTION DETAILS:
Casing installed: **6** " Dia. from **+2** ft. to **80** ft.
LINER **4** " Dia. from **-10** ft. to **140** ft.
" Dia. from ft. to ft.

Perforations: **YES**
Type of perforator used **SKILL SAW**
SIZE of perforations **1/8** in. by **6** in.
40 perforations from **120** ft. to **140** ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: **NO**
Manufacturer's Name
Type Model No.
Diam. slot size from ft. to ft.
Diam. slot size from ft. to ft.

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

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

(7) PUMP: Manufacturer's Name
Type **NONE** H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level **70** ft. below top of well Date **04/14/98**
Artesian Pressure lbs. per square inch Date
Artesian water controlled by

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

Recovery data
Time Water Level Time Water Level Time Water Level

Date of test / /
Bailer test gal/min. ft. drawdown after hrs.
Air test **20+** gal/min. w/ stem set at **140** ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? **NO**

(10) WELL LOG C, D, E, F

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

MATERIAL	FROM	TO
CLAY BROWN	0	1
CEMENTED GRAVEL COBBLES	1	
------- BROWN CLAY	1	27
CEMENTED GRAVEL BASALT	27	
------- W/LENSES	27	82
BASALT FRACTURED W/WATER	82	140

RECEIVED
APR 29 1998

Work started **04/14/98** Completed **04/15/98**

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

NAME **FOGLE PUMP & SUPPLY, INC.**
(Person, firm, or corporation) (Type or print)

ADDRESS **POB 1450, AIRWAY HTS. WA.**

[SIGNED] Todd Lively /mc License No. **2321**

Contractor's Registration No. **FOGLEPSO95L4** Date **04/21/98**

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Please print, sign and return to the Department of Ecology Well DD

Water Well Report

Original – Ecology, 1st copy – owner, 2nd copy – driller

Construction/Decommission

☒ Construction
☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* W244255

192783

Current
Notice of Intent No. W244255
Unique Ecology Well ID Tag No. ALE 625
Water Right Permit No. B
Property Owner Name Ron S. Axtman
Well Street Address Christensen Rd
City Ellensburg County Kittitas 19
Location NW 1/4-1/4 NE 1/4 Sec 33 Twn 18 R 20 EWM or WWM ☒ circle one
Lat/Long (s, t, r still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____
Tax Parcel No. 18-20-3300-0011

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

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

DIMENSIONS: Diameter of well 6 inches, drilled 220 ft.
Depth of completed well 220 ft.

CONSTRUCTION DETAILS
Casing Installed: ☒ Welded 6" Diam. from +2 ft. to 118 ft.
☒ Liner installed 4" Diam. from -5 ft. to 220 ft.
☐ Threaded _____" Diam. from _____ ft. to _____ ft.

Perforations: ☐ Yes ☒ No
Type of perforator used _____
SIZE of perfs _____ in. by _____ in. and no. of perfs _____ from _____ ft. to _____ ft.

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

Gravel/Filter packed: ☐ Yes ☒ No ☐ Size of gravel/sand _____
Materials placed from _____ ft. to _____ ft.

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

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

WATER LEVELS: Land-surface elevation above mean sea level _____ ft
Static level 84 ft. below top of well Date 3/11/06
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom? _____
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest 17 gal./min. with stem set at 215 ft. for 2 hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? ☐ Yes ☒ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information indicate all water encountered. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Top Soil	0	1
Cemented Gravel	1	11
Brown Clay & Gravel	11	116
Black Basalt	116	191
Black & Brown Basalt and Water	191	220

DEPT OF ECOLOGY Received MAR 21 2006 CENTRAL REGION OFFICE

Start Date 3/10/06 Completed Date 3/11/06

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

Driller/Engineer/Trainee Name (Print) Mitch Mathews
Driller/Engineer/Trainee Signature Mitch Mathews
Driller or trainee License No. 1247

Drilling Company MATHEWS Drilling
Address 2317 Rd 10.2 NE
City, State, Zip Moses Lake, Wa 98837
Contractor's Registration No. MATHEDC117BS Date 3/11/06

If TRAINEE,
Driller's Licensed No. _____
Driller's Signature _____

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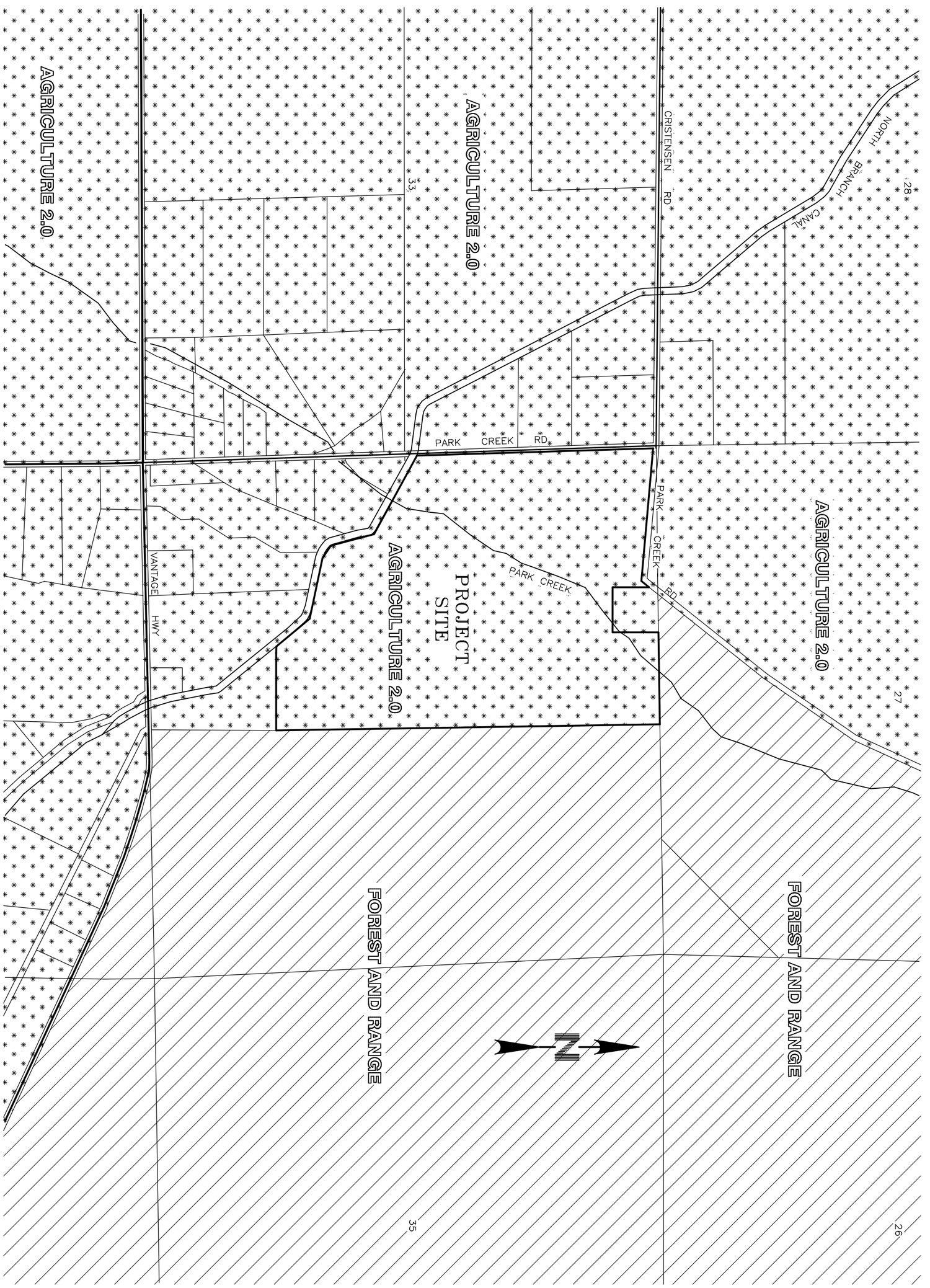


BROWN & JACKSON

Land Application Site

Zoneing Map

Grant County Washington

No.	Revision	Date	By

Designed by NDN
Drawn by Tml/NDN
Checked by NDN
Project No. 20410
Date: April 2020
Scale: Hor. 1" = 1000'
Vert. 1" = N/A
Sec 34, T 18 N, R 20 E

SHEET NO. C1.2

WESTERN PACIFIC ENGINEERING & SURVEY
A TERRA DEVELOPMENT SERVICES CORPORATION
1328 E. Hunter Place, Moses Lake, Washington
T:(509)765-1023 F:(509)765-1298

PROPERTY OWNERS

1. KATOCS, BRUCE C ETUX
   16781 VANTAGE HWY
   ELLENSBURG, WA 98926

2. SHRINER, DONALD Q. ETUX
   181 SUNSET RD
   ELLENSBURG, WA 98926

3. MONTES, GUADALUPE ETUX &
   LOPEZ, ESPERANZA
   14915 182ND AVE SE
   MONROE, WA 98272-1131

4. HANNAH, CHRISTOPHER L
   16300 VANTAGE HWY
   ELLENSBURG, WA 98926-5067

5. ROST, BO J ETUX
   16671 VANTAGE HIGHWAY
   ELLENSBURG, WA 98926

6. BOWERS, RONALD R
   16621 VANTAGE HWY
   ELLENSBURG, WA 98926-7001

7. MARCHEL, CHRIS W & KAROLYN M
   6271 VANTAGE HWY
   ELLENSBURG, WA 98926-5014

8. RAMSEY, JEFFREY & CINDY SUE
   9120 PARKE CREEK RD
   ELLENSBURG, WA 98926-7009

9. CUNNINGHAM, JAMES L & CARMEN R
   9290 PARKE CREEK RD
   ELLENSBURG, WA 98926-7018

10. WEYNA, ROBERT H & PRISCILLA W
    9311 PARKE CREEK RD
    ELLENSBURG, WA 98926-6663

11. DERTING, CLYDE ETUX
    9341 PARK CREEK RD
    ELLENSBURG, WA 98926

12. KELLY, JAMES E ETUX
    9741 PARKE CREEK RD
    ELLENSBURG, WA 98926-5095

13. MCMILLAN, WYNN L
    9440 PARKE CREEK RD
    ELLENSBURG, WA 98926

14. POFAHL, ERICH T
    9610 PARKE CREEK RD
    ELLENSBURG, WA 98926-7016

15. BYERS, CHERY
    9810 PARKE CREEK RD
    ELLENSBURG, WA 98926-5004

16. ONEILL, JULIE J & TOM
    9811 PARKE CREEK RD
    ELLENSBURG, WA 98926-5004

17. CARDWELL, PHIL L & BRENDA L
    1290 CHRISTENSEN RD
    ELLENSBURG, WA 98926-7011

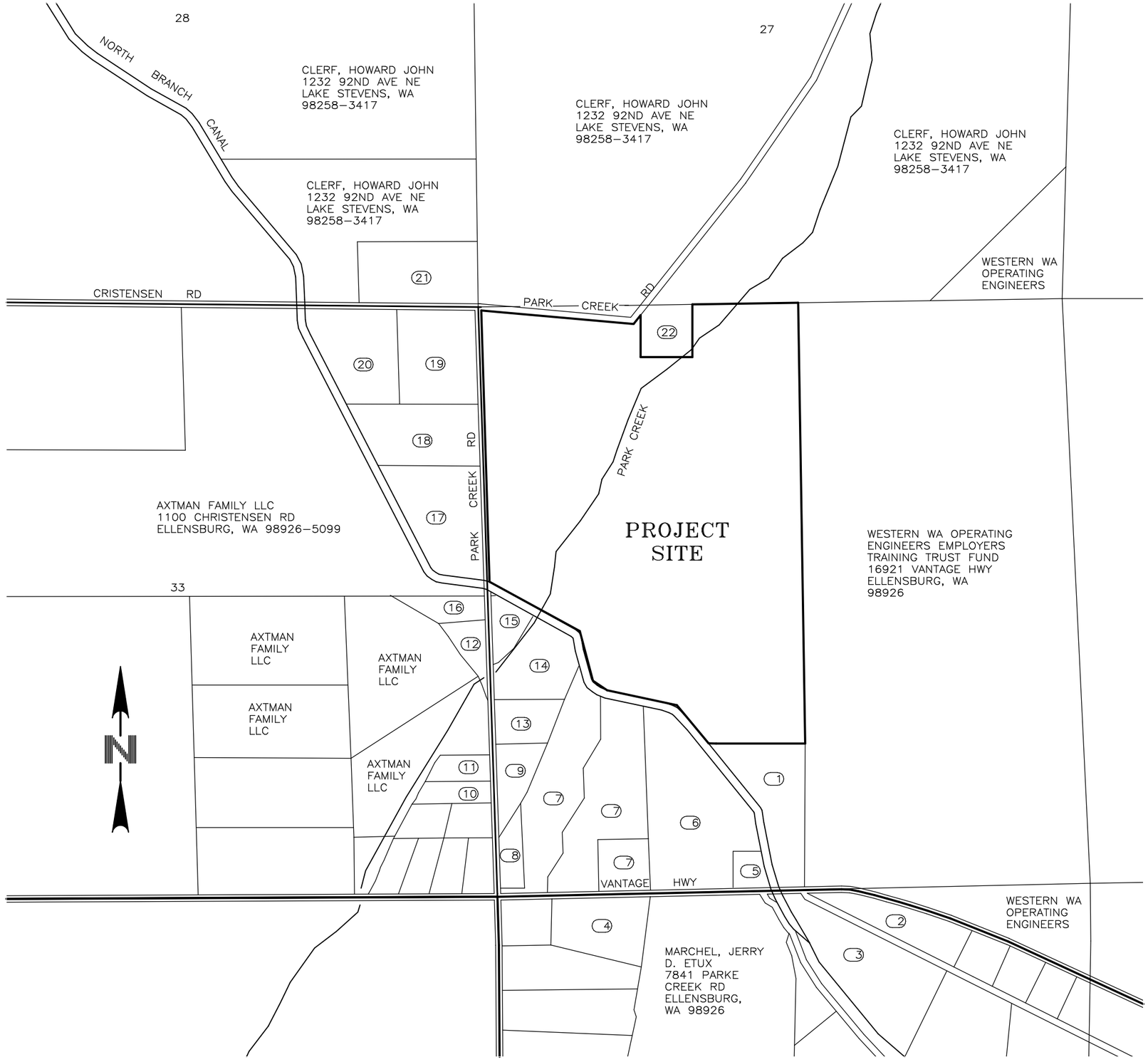
18. BISHOP, SHAWN C & STACY L
    1290 CHRISTENSEN RD
    ELLENSBURG, WA 98926-7011

19. CARDWELL, CATRENA M
    PO BOX 887
    KITTITAS, WA 98934-0887

20. H&C TRUST
    1290 CHRISTENSEN RD
    ELLENSBURG, WA 98926-7011

21. SLYFIELD, HUNTER J
    1671 CHRISTENSEN RD
    ELLENSBURG, WA 98926-7012

22. STATE OF WASH (DSHS)
    PARKE CREEK GROUP HOME
    11042 PARKE CREEK RD
    ELLENSBURG, WA 98926



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T:(509)765-1023 F:(509)765-1298

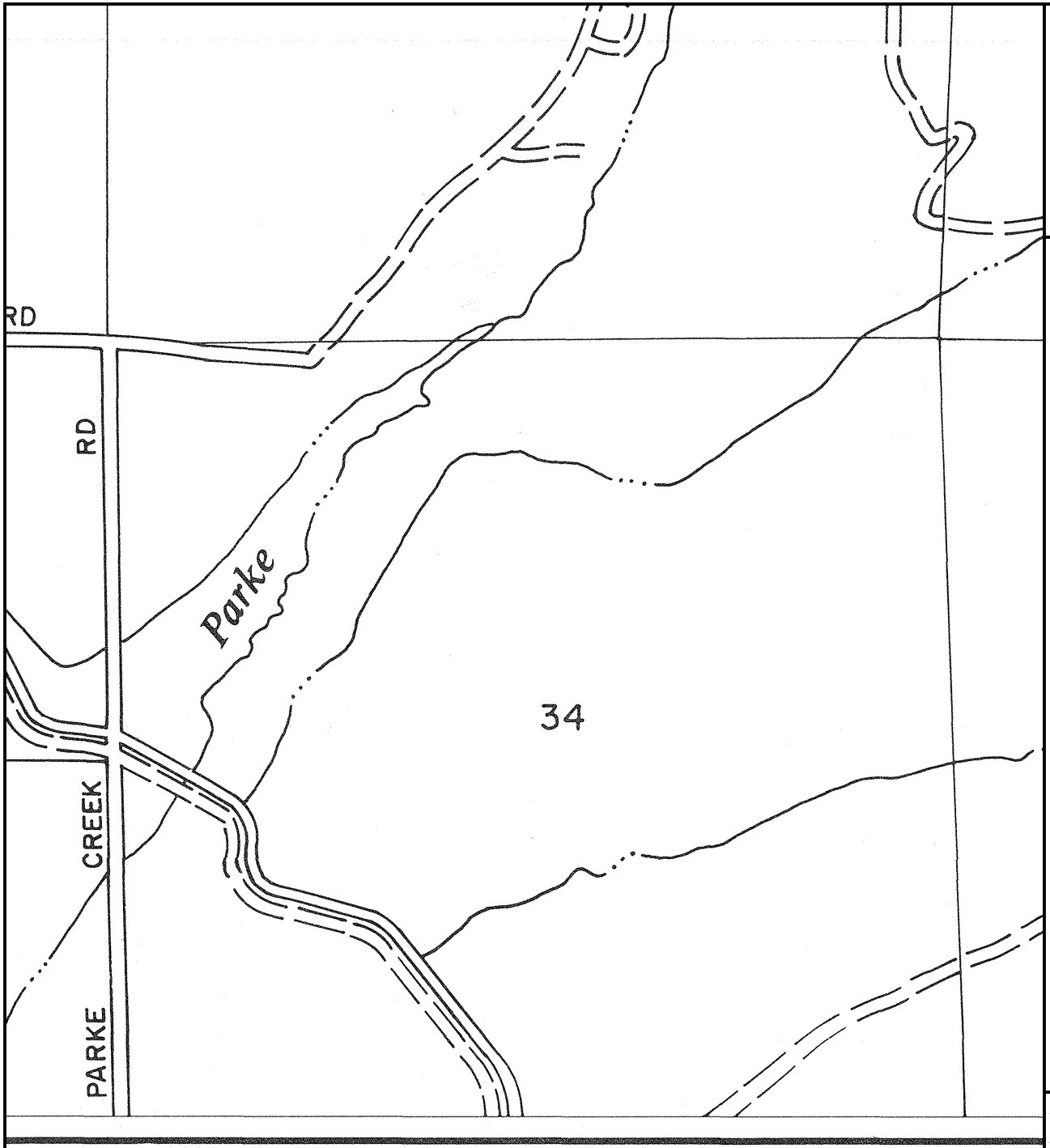
No.	Revision	Date	By

BROWN & JACKSON
Land Application Site
Ownership Map
Grant County Washington

Designed by NDN
Drawn by Tml/NDN
Checked by NDN
Project No. 20410
Date: April 2020
Scale:
Hor. 1" = 1000'
Vert. 1" = N/A
Sec 34, T 18 N, R 20 E

SHEET NO.
C1.3

File -- X:\20410\Drafting\Vicemap.pro Date: Fri Apr 24, 2020



APPROXIMATE SCALE

1000 0 1000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

KITTITAS COUNTY, WASHINGTON

(UNINCORPORATED AREAS)

PANEL 465 OF 700

(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
530095 0465 B

EFFECTIVE DATE:
MAY 5, 1981

federal emergency management agency
federal insurance administration

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

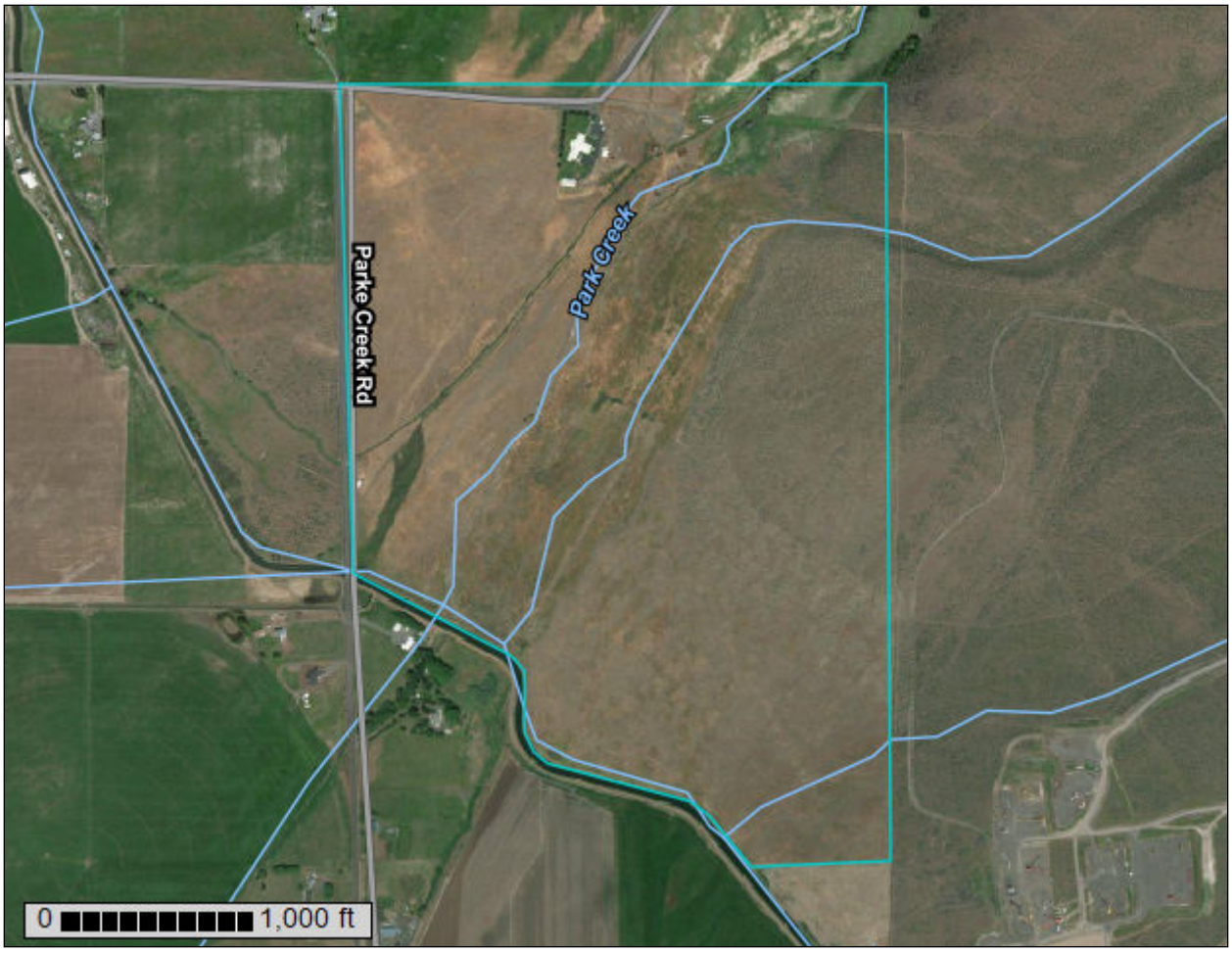
United States Department of Agriculture

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



April 10, 2020

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.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

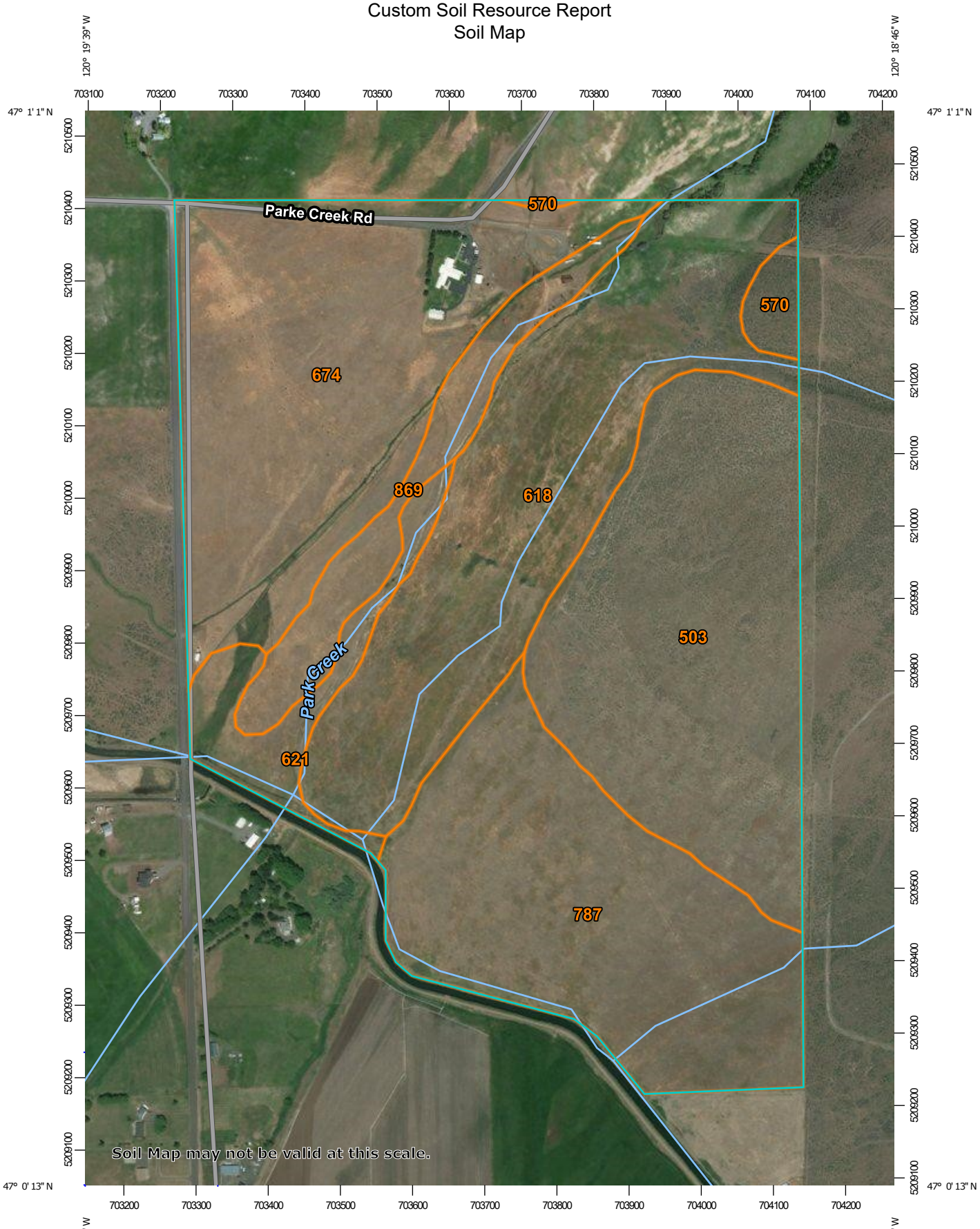
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

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



Map Scale: 1:7,220 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 100 200 400 600

Feet
0 350 700 1400 2100

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 12, Sep 16, 2019

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

Date(s) aerial images were photographed: Jul 3, 2014—Sep 21, 2016

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

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
503	Terlan-Durtash-Selah complex, 5 to 15 percent slopes	50.0	22.3%
570	Wipple cobbly clay loam, 15 to 30 percent slopes	2.6	1.2%
618	Nitzel ashy silt loam, gravelly substratum, 0 to 2 percent	48.8	21.8%
621	Mitta ashy silt loam, flooded, 0 to 2 percent slopes	9.1	4.1%
674	Durtash gravelly loam, 3 to 10 percent slopes	54.2	24.2%
787	Terlan-Durtash-Selah complex, 2 to 5 percent slopes	47.1	21.0%
869	Weirman complex, drained, 0 to 5 percent slopes	12.2	5.4%
Totals for Area of Interest		**224.0**	**100.0%**

Map Unit Descriptions

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

503—Terlan-Durtash-Selah complex, 5 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2l1x
Elevation: 1,500 to 2,500 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Terlan and similar soils: 40 percent
Durtash and similar soils: 35 percent
Selah and similar soils: 20 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Terlan

Setting

Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over alluvium

Typical profile

H1 - 0 to 7 inches: gravelly loam
H2 - 7 to 15 inches: gravelly clay loam
H3 - 15 to 18 inches: very gravelly loam
H4 - 18 to 26 inches: cemented material
H5 - 26 to 60 inches: cemented material

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: 10 to 20 inches to duripan
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Very low (about 2.6 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: DRY STONY 10-16 PZ (R008XY201WA)
Hydric soil rating: No

Description of Durtash

Setting

Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium with loess in the upper part

Typical profile

H1 - 0 to 5 inches: gravelly loam
H2 - 5 to 14 inches: very gravelly clay loam
H3 - 14 to 19 inches: extremely gravelly clay
H4 - 19 to 29 inches: cemented material
H5 - 29 to 60 inches: cemented material

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: 10 to 20 inches to duripan
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.01 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: DRY STONY 10-16 PZ (R008XY201WA)
Hydric soil rating: No

Description of Selah

Setting

Landform: Terraces
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loess and alluvium

Typical profile

H1 - 0 to 9 inches: loam
H2 - 9 to 17 inches: silty clay loam
H3 - 17 to 21 inches: cobbly clay loam
H4 - 21 to 31 inches: cemented material
H5 - 31 to 60 inches: cemented material

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: 20 to 40 inches to duripan
Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 3 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: DRY LOAMY 10-16 PZ (R008XY101WA)
Hydric soil rating: No

Minor Components

Benwy

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

570—Wipple cobbly clay loam, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: 2l3v
Elevation: 1,200 to 3,200 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Wipple

Setting

Landform: Hillslopes, structural benches
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Colluvium from basalt with minor amounts of loess in the surface

Typical profile

H1 - 0 to 7 inches: cobbly clay loam
H2 - 7 to 11 inches: very gravelly clay loam
H3 - 11 to 30 inches: very gravelly clay
H4 - 30 to 50 inches: very cobbly clay loam
H5 - 50 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: STONY 10-16 PZ (R008XY202WA)
Hydric soil rating: No

Minor Components

Argabak

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

Clerf

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

Vantage

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

618—Nitzel ashy silt loam, gravelly substratum, 0 to 2 percent

Map Unit Setting

National map unit symbol: 2l58
Elevation: 1,500 to 2,000 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 150 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Nitzel, gravelly substratum, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nitzel, Gravelly Substratum

Setting

Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium with an influence of volcanic ash in the upper part

Typical profile

H1 - 0 to 8 inches: ashy silt loam
H2 - 8 to 29 inches: ashy loam
H3 - 29 to 46 inches: loam
H4 - 46 to 60 inches: sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately 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: About 29 to 46 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Mitta

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

Tanaha

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

621—Mitta ashy silt loam, flooded, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2l5c

Elevation: 1,500 to 2,300 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 150 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Mitta, Flooded

Setting

Landform: Flood plains, fan aprons, fan skirts, inset fans
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Alluvium mixed with volcanic ash in the upper part

Typical profile

H1 - 0 to 6 inches: ashy silt loam
H2 - 6 to 15 inches: ashy silt loam
H3 - 15 to 34 inches: ashy silt loam
H4 - 34 to 49 inches: silty clay loam
H5 - 49 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 34 to 49 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 10.0
Available water storage in profile: High (about 11.7 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Nack

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

Opnish

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

Woldale

Percent of map unit: 5 percent

Hydric soil rating: No

674—Durtash gravelly loam, 3 to 10 percent slopes

Map Unit Setting

National map unit symbol: 2l6z
Elevation: 1,500 to 2,500 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Durtash, Gravelly

Setting

Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium with loess in the upper part

Typical profile

H1 - 0 to 5 inches: gravelly loam
H2 - 5 to 14 inches: very gravelly clay loam
H3 - 14 to 19 inches: extremely gravelly clay
H4 - 19 to 29 inches: cemented material
H5 - 29 to 60 inches: cemented material

Properties and qualities

Slope: 3 to 10 percent
Depth to restrictive feature: 10 to 20 inches to duripan
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.01 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D

Ecological site: DRY STONY 10-16 PZ (R008XY201WA)
Hydric soil rating: No

Minor Components

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

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

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

787—Terlan-Durtash-Selah complex, 2 to 5 percent slopes

Map Unit Setting
National map unit symbol: 2l8x
Elevation: 1,600 to 2,600 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition
Terlan and similar soils: 40 percent
Durtash and similar soils: 30 percent
Selah and similar soils: 25 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Terlan

Setting
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over alluvium

Typical profile
H1 - 0 to 7 inches: gravelly loam
H2 - 7 to 15 inches: gravelly clay loam
H3 - 15 to 18 inches: very gravelly loam
H4 - 18 to 26 inches: cemented material
H5 - 26 to 60 inches: cemented material

Properties and qualities
Slope: 2 to 5 percent
Depth to restrictive feature: 10 to 20 inches to duripan

Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Very low (about 2.6 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: DRY STONY 10-16 PZ (R008XY201WA)
Hydric soil rating: No

Description of Durtash

Setting

Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium with loess in the upper part

Typical profile

H1 - 0 to 5 inches: gravelly loam
H2 - 5 to 14 inches: very gravelly clay loam
H3 - 14 to 19 inches: extremely gravelly clay
H4 - 19 to 29 inches: cemented material
H5 - 29 to 60 inches: cemented material

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: 10 to 20 inches to duripan
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.01 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: DRY STONY 10-16 PZ (R008XY201WA)
Hydric soil rating: No

Description of Selah

Setting

Landform: Terraces
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loess and alluvium

Typical profile

H1 - 0 to 9 inches: loam
H2 - 9 to 17 inches: silty clay loam
H3 - 17 to 21 inches: cobbly clay loam
H4 - 21 to 31 inches: cemented material
H5 - 31 to 60 inches: cemented material

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: 20 to 40 inches to duripan
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 3 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Ecological site: DRY LOAMY 10-16 PZ (R008XY101WA)
Hydric soil rating: No

Minor Components

Benwy

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

869—Weirman complex, drained, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2lct
Elevation: 400 to 2,900 feet

Mean annual precipitation: 7 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Weirman, very gravelly sandy loam, and similar soils: 55 percent
Weirman, very cobbly sandy loam, and similar soils: 40 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Weirman, Very Gravelly Sandy Loam

Setting

Landform: Flood plains, terraces
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium

Typical profile

H1 - 0 to 5 inches: very gravelly sandy loam
H2 - 5 to 15 inches: very gravelly loamy sand
H3 - 15 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: 3 to 18 inches to strongly contrasting textural stratification
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Very low (about 0.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: STONY BOTTOM 6-10 PZ (R007XY403WA)
Hydric soil rating: No

Description of Weirman, Very Cobbly Sandy Loam

Setting

Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium

Typical profile

H1 - 0 to 4 inches: very cobbly sandy loam
H2 - 4 to 15 inches: very gravelly loamy sand
H3 - 15 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 0 to 5 percent

Depth to restrictive feature: 3 to 18 inches to strongly contrasting textural stratification
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: About 42 to 60 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: Very low (about 0.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Kayak

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.

Land Management

This folder contains a collection of tabular reports that present soil interpretations related to land management. The reports (tables) include all selected map units and components for each map unit, limiting features and interpretive ratings. Land management interpretations are tools designed to guide the user in evaluating existing conditions in planning and predicting the soil response to various land management practices, for a variety of land uses, including cropland, forestland, hayland, pastureland, horticulture, and rangeland. Example interpretations include suitability for a variety of irrigation practices, log landings, haul roads and major skid trails, equipment operability, site preparation, suitability for hand and mechanical planting, potential erosion hazard associated with various practices, and ratings for fencing and waterline installation.

Nitrate Leaching Potential (WA)

These interpretations are designed to evaluate the potential for nitrate-nitrogen to be transmitted through the soil profile below the root zone by percolating water for both nonirrigated and irrigated conditions. Leaching nitrates have the potential to contaminate shallow and deep aquifers used for drinking water. The ratings are based on inherent soil and climate properties that affect nitrate leaching, and do not account for management practices such as nitrogen fertilizer application rates and timing, crop rotation, or irrigation water management.

The following soil and climate factors are used in the interpretation criteria:

1. *Mean annual precipitation minus potential evapotranspiration* - this factor provides an estimate of the amount of water that is available to move through the soil profile on an annual basis. Potential evaporation is estimated from mean annual

air temperature, using an algorithm developed by the National Soil Survey Center, using the Hamon potential evapotranspiration method.

2. *Water travel time through the entire soil profile* - this factor uses the saturated hydraulic conductivity (Ksat) and thickness of each soil horizon, to estimate the number of hours that would be required for a given volume of water to move through the entire soil profile. One advantage of this method for accounting for the rate of water movement is that the properties and thickness of each soil horizon are accounted for, rather than using an average saturated hydraulic conductivity for the entire profile. This method accounts for subtle differences between soils in texture, structure, horizon thickness, and depth to water-restricting layers.

3. *Available water capacity* - this factor accounts for the cumulative amount of water available to plants that the entire soil profile can hold at field capacity to a depth of 150 cm. The more water the soil profile can hold, the less water is available for deep leaching.

4. *Depth and duration of water table* - this factor uses a water table index based on the minimum average depth to a water table, and the number of months that the water table is present during the months of April through October. It is used to account for the loss of nitrates to the atmosphere as nitrous oxide or nitrogen gas due to denitrification under anaerobic conditions caused by water saturation. The higher the water table and the longer it’s duration, the larger the quantity of nitrates that would potentially be lost to the atmosphere, and therefore not be available for deep leaching.

5. *Slope gradient adjusted for hydrologic soil group* - the steeper the slope gradient, the higher the potential surface runoff, resulting in less water available to move through the soil profile.

The nonirrigated and irrigated interpretations use the same factors in the criteria, but they are weighted differently. For example, the *Mean Annual Precipitation minus Potential Evapotranspiration* factor is weighted more heavily in the nonirrigated interpretation, because supplemental water is applied in the irrigated condition, and precipitation is less important.

The ratings indicate the potential for nitrate leaching below the root zone, based on inherent soil and climate properties. A *Low* rating indicates a low potential for nitrates to leach below the root zone. A *High* rating indicates a high potential for nitrates to leach below the root zone. The *Moderate* and *Moderately high* rating indicate intermediate potentials.

Report—Nitrate Leaching Potential (WA)

[Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential for nitrate leaching for all factors, except the "denitrification due to saturation" and "slope" factors. For these factors, the greater the value, the lower the potential for nitrate leaching.

Nitrate Leaching Potential (WA)–Kittitas County Area, Washington					
Map symbol and soil name	Pct. of map unit	Nitrate leaching potential, irrigated (WA)		Nitrate leaching potential, nonirrigated (WA)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
503—Terlan-Durtash-Selah complex, 5 to 15 percent slopes					
Terlan	40	High	0.97	Moderate	0.38
		Water travel time	1.00	Water travel time	1.00
		Water holding capacity	0.88	Water holding capacity	0.88
Durtash	35	Moderate	0.45	Low	0.20
		Water holding capacity	0.90	Water holding capacity	0.90
		Water travel time	0.25	Water travel time	0.25
Selah	20	High	0.90	Moderate	0.36
		Water travel time	0.91	Water travel time	0.91
		Water holding capacity	0.86	Water holding capacity	0.86
570—Wipple cobbly clay loam, 15 to 30 percent slopes					
Wipple	85	Low	0.15	Low	0.01
		Water holding capacity	0.88	Water holding capacity	0.88
		Slope	0.12	Slope	0.12
618—Nitzel ashy silt loam, gravelly substratum, 0 to 2 percent					
Nitzel, gravelly substratum	90	Moderately high	0.61	Low	0.22
		Water travel time	0.88	Water travel time	0.88
621—Mitta ashy silt loam, flooded, 0 to 2 percent slopes					
Mitta, flooded	85	Moderate	0.33	Low	0.12
		Water travel time	0.47	Water travel time	0.47
674—Durtash gravelly loam, 3 to 10 percent slopes					
Durtash, gravelly	80	Moderate	0.45	Low	0.20
		Water holding capacity	0.90	Water holding capacity	0.90
		Water travel time	0.25	Water travel time	0.25

Nitrate Leaching Potential (WA)–Kittitas County Area, Washington					
Map symbol and soil name	Pct. of map unit	Nitrate leaching potential, irrigated (WA)		Nitrate leaching potential, nonirrigated (WA)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
787—Terlan-Durtash-Selah complex, 2 to 5 percent slopes					
Terlan	40	High	0.97	Moderate	0.38
		Water travel time	1.00	Water travel time	1.00
		Water holding capacity	0.88	Water holding capacity	0.88
Durtash	30	Moderate	0.45	Low	0.20
		Water holding capacity	0.90	Water holding capacity	0.90
		Water travel time	0.25	Water travel time	0.25
Selah	25	High	0.90	Moderate	0.36
		Water travel time	0.91	Water travel time	0.91
		Water holding capacity	0.86	Water holding capacity	0.86
869—Weirman complex, drained, 0 to 5 percent slopes					
Weirman, very gravelly sandy loam	55	High	0.99	Moderate	0.40
		Water travel time	1.00	Water travel time	1.00
		Water holding capacity	0.99	Water holding capacity	0.99
Weirman, very cobbly sandy loam	40	High	0.99	Moderate	0.40
		Water travel time	1.00	Water travel time	1.00
		Water holding capacity	0.99	Water holding capacity	0.99

Soil Chemical Properties

This folder contains a collection of tabular reports that present soil chemical properties. The reports (tables) include all selected map units and components for each map unit. Soil chemical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil chemical properties include pH, cation exchange capacity, calcium carbonate, gypsum, and electrical conductivity.

Chemical Soil Properties

This table shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

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

Cation-exchange capacity is the total amount of extractable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

Effective cation-exchange capacity refers to the sum of extractable cations plus aluminum expressed in terms of milliequivalents per 100 grams of soil. It is determined for soils that have pH of less than 5.5.

Soil reaction is a measure of acidity or alkalinity. It is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil.

Gypsum is expressed as a percent, by weight, of hydrated calcium sulfates in the fraction of the soil less than 20 millimeters in size. Gypsum is partially soluble in water. Soils that have a high content of gypsum may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio (SAR) is a measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration. Soils that have SAR values of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced saturated hydraulic conductivity and aeration, and a general degradation of soil structure.

Chemical Soil Properties–Kittitas County Area, Washington								
Map symbol and soil name	**Depth**	**Cation-exchange capacity**	**Effective cation-exchange capacity**	**Soil reaction**	**Calcium carbonate**	**Gypsum**	**Salinity**	**Sodium adsorption ratio**
	In	*meq/100g*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
503—Terlan-Durtash-Selah complex, 5 to 15 percent slopes								
Terlan	0-7	10-20	—	5.6-7.3	0	0	0.0-2.0	0
	7-15	15-25	—	6.1-7.3	0	0	0.0-2.0	0
	15-18	15-25	—	7.4-8.4	5-15	0	0.0-2.0	0-2
	18-26	—	—	—	—	—	—	—
	26-60	—	—	—	—	—	—	—
Durtash	0-5	10-20	—	6.1-7.8	0	0	0	0
	5-14	25-50	—	7.4-8.4	1-5	0	0.0-2.0	0-1
	14-19	30-50	—	7.4-8.4	1-5	0	0.0-2.0	0-1
	19-29	—	—	—	—	—	—	—
	29-60	—	—	—	—	—	—	—
Selah	0-9	10-20	—	6.1-7.3	0	0	0	0
	9-17	10-20	—	6.6-7.8	0	0	0	0
	17-21	20-30	—	7.4-7.8	0-3	0	0.0-2.0	0-2
	21-31	—	—	—	—	—	—	—
	31-60	—	—	—	—	—	—	—
570—Wipple cobbly clay loam, 15 to 30 percent slopes								
Wipple	0-7	20-30	—	6.6-7.3	0	0	0	0
	7-11	35-50	—	6.6-7.8	0	0	0	0
	11-30	35-50	—	7.4-8.4	0	0	0.0-2.0	0
	30-50	25-50	—	7.4-8.4	1-5	0	0.0-2.0	0-2
	50-60	—	—	—	—	—	—	—

Chemical Soil Properties–Kittitas County Area, Washington								
Map symbol and soil name	**Depth**	**Cation-exchange capacity**	**Effective cation-exchange capacity**	**Soil reaction**	**Calcium carbonate**	**Gypsum**	**Salinity**	**Sodium adsorption ratio**
	In	*meq/100g*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
618—Nitzel ashy silt loam, gravelly substratum, 0 to 2 percent								
Nitzel, gravelly substratum	0-8	15-25	—	6.1-7.3	0	0	0	0
	8-29	10-20	—	6.6-7.3	0	0	0	0
	29-46	10-20	—	6.6-7.3	0	0	0	0
	46-60	10-20	—	6.6-7.3	0	0	0	0
621—Mitta ashy silt loam, flooded, 0 to 2 percent slopes								
Mitta, flooded	0-6	20-30	—	7.9-9.0	0-1	0	0.0-4.0	1-10
	6-15	20-30	—	7.9-9.0	0-1	0	0.0-4.0	1-10
	15-34	20-30	—	7.4-8.4	0	0	0.0-2.0	0-5
	34-49	20-30	—	7.4-8.4	0	0	0.0-2.0	0-5
	49-60	20-30	—	7.4-7.8	0	0	0.0-2.0	0-5
674—Durtash gravelly loam, 3 to 10 percent slopes								
Durtash, gravelly	0-5	10-20	—	6.1-7.8	0	0	0	0
	5-14	25-50	—	7.4-8.4	1-5	0	0.0-2.0	0-1
	14-19	30-50	—	7.4-8.4	1-5	0	0.0-2.0	0-1
	19-29	—	—	—	—	—	—	—
	29-60	—	—	—	—	—	—	—

Chemical Soil Properties–Kittitas County Area, Washington								
Map symbol and soil name	**Depth**	**Cation-exchange capacity**	**Effective cation-exchange capacity**	**Soil reaction**	**Calcium carbonate**	**Gypsum**	**Salinity**	**Sodium adsorption ratio**
	In	*meq/100g*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
787—Terlan-Durtash-Selah complex, 2 to 5 percent slopes								
Terlan	0-7	10-20	—	5.6-7.3	0	0	0.0-2.0	0
	7-15	15-25	—	6.1-7.3	0	0	0.0-2.0	0
	15-18	15-25	—	7.4-8.4	5-15	0	0.0-2.0	0-2
	18-26	—	—	—	—	—	—	—
	26-60	—	—	—	—	—	—	—
Durtash	0-5	10-20	—	6.1-7.8	0	0	0	0
	5-14	25-50	—	7.4-8.4	1-5	0	0.0-2.0	0-1
	14-19	30-50	—	7.4-8.4	1-5	0	0.0-2.0	0-1
	19-29	—	—	—	—	—	—	—
	29-60	—	—	—	—	—	—	—
Selah	0-9	10-20	—	6.1-7.3	0	0	0	0
	9-17	10-20	—	6.6-7.8	0	0	0	0
	17-21	20-30	—	7.4-7.8	0-3	0	0.0-2.0	0-2
	21-31	—	—	—	—	—	—	—
	31-60	—	—	—	—	—	—	—

Chemical Soil Properties–Kittitas County Area, Washington								
Map symbol and soil name	**Depth**	**Cation-exchange capacity**	**Effective cation-exchange capacity**	**Soil reaction**	**Calcium carbonate**	**Gypsum**	**Salinity**	**Sodium adsorption ratio**
	In	*meq/100g*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
869—Weirman complex, drained, 0 to 5 percent slopes								
Weirman, very gravelly sandy loam	0-5	10-20	—	6.6-7.8	0	0	0	0
	5-15	10-15	—	6.6-7.8	0	0	0	0
	15-60	5.0-10	—	6.6-7.8	0	0	0	0
Weirman, very cobbly sandy loam	0-4	10-20	—	6.6-7.8	0	0	0	0
	4-15	10-15	—	6.6-7.8	0	0	0	0
	15-60	5.0-10	—	6.6-7.8	0	0	0	0

Soil Erosion

This folder contains a collection of tabular reports that present soil erosion factors and groupings. The reports (tables) include all selected map units and components for each map unit. Soil erosion factors are soil properties and interpretations used in evaluating the soil for potential erosion. Example soil erosion factors can include K factor for the whole soil or on a rock free basis, T factor, wind erodibility group and wind erodibility index.

Conservation Planning

This report provides those soil attributes for the conservation plan for the map units in the selected area. The report includes the map unit symbol, the component name, and the percent of the component in the map unit. It provides the soil description along with the slope, runoff, T Factor, WEI, WEG, Erosion class, Drainage class, Land Capability Classification, and the engineering Hydrologic Group and the erosion factors Kf, the representative percentage of fragments, sand, silt, and clay in the mineral surface horizon. Missing surface data may indicate the presence of an organic surface layer. Further information on these factors can be found in the National Soil Survey Handbook section 618 found at the url http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_054223#00 .

Soil properties and interpretations for conservation planning. The surface mineral horizon properties are displayed. Organic surface horizons are not displayed.

Conservation Planning–Kittitas County Area, Washington																	
Map symbol and soil name	Pct. of map unit	Slope RV	USLE Slope Length ft.	Runoff	T Factor	WEI	WEG	Erosion	Drainage	NIRR LCC	Hydrologic Group	Surface					
												Depths in.	Kf Factor	Frag-ments RV	Sand RV	Silt RV	Clay RV
503—Terlan-Durtash-Selah complex, 5 to 15 percent slopes																	
Terlan	40	10.0	—	—	1	48	6	—	Well drained	6s	D	0 - 7	.37	18	43	38	18
Durtash	35	10.0	—	—	1	38	7	—	Well drained	7s	D	0 - 5	.37	24	42	37	20
Selah	20	10.0	—	—	2	56	5	—	Well drained	3e	C	0 - 9	.32	6	43	39	17
570—Wipple cobbly clay loam, 15 to 30 percent slopes																	
Wipple	85	23.0	—	—	3	38	7	—	Well drained	4e	C	0 - 7	.24	30	35	33	31
618—Nitzel ashy silt loam, gravelly substratum, 0 to 2 percent																	
Nitzel, gravelly substratum	90	1.0	—	—	5	56	5	—	Moderately well drained	3w	C	0 - 7	.32	2	26	52	21
621—Mitta ashy silt loam, flooded, 0 to 2 percent slopes																	
Mitta, flooded	85	1.0	—	—	5	56	5	—	Somewhat poorly drained	3w	C	0 - 5	.32	2	7	70	22
674—Durtash gravelly loam, 3 to 10 percent slopes																	
Durtash, gravelly	80	7.0	—	—	1	38	7	—	Well drained	7s	D	0 - 5	.37	24	42	37	20

Conservation Planning–Kittitas County Area, Washington																	
Map symbol and soil name	Pct. of map unit	Slope RV	USLE Slope Length ft.	Runoff	T Factor	WEI	WEG	Erosion	Drainage	NIRR LCC	Hydrologic Group	Surface					
												Depths in.	Kf Factor	Frag-ments RV	Sand RV	Silt RV	Clay RV
787—Terlan-Durtash-Selah complex, 2 to 5 percent slopes																	
Terlan	40	4.0	—	—	1	48	6	—	Well drained	6s	D	0 - 7	.37	18	43	38	18
Durtash	30	4.0	—	—	1	38	7	—	Well drained	7s	D	0 - 5	.37	24	42	37	20
Selah	25	4.0	—	—	2	56	5	—	Well drained	3s	C	0 - 9	.32	6	43	39	17
869—Weirman complex, drained, 0 to 5 percent slopes																	
Weirman, very gravelly sandy loam	55	3.0	—	—	3	48	6	—	Somewhat excessively drained	4s	A	0 - 5	.20	40	69	24	6
Weirman, very cobbly sandy loam	40	3.0	—	—	3	48	6	—	Moderately well drained	4w	A	0 - 3	.20	43	69	24	6

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.

Physical Soil Properties

This table shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

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

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity (Ksat), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear

extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates in the table are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity (Ksat) is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil.

Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and Ksat. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook."

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Reference:
United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. (http://soils.usda.gov)

Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Physical Soil Properties–Kittitas County Area, Washington														
Map symbol and soil name	**Depth**	**Sand**	**Silt**	**Clay**	**Moist bulk density**	**Saturated hydraulic conductivity**	**Available water capacity**	**Linear extensibility**	**Organic matter**	**Erosion factors**			**Wind erodibility group**	**Wind erodibility index**
										Kw	**Kf**	**T**		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
503—Terlan-Durtash-Selah complex, 5 to 15 percent slopes														
Terlan	0-7	-43-	-39-	15-19- 22	1.15-1.25-1.35	4.00-9.00-14.00	0.13-0.14-0.15	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.24	.37	1	6	48
	7-15	-34-	-38-	24-28- 32	1.25-1.35-1.45	4.00-9.00-14.00	0.11-0.15-0.18	3.0- 4.5- 5.9	1.0- 1.5- 2.0	.20	.37			
	15-18	-38-	-36-	24-26- 32	1.25-1.35-1.45	4.00-9.00-14.00	0.10-0.12-0.14	3.0- 4.5- 5.9	0.5- 0.8- 1.0	.15	.37			
	18-26	—	—	—	—	0.01-0.20-0.42	0.00-0.00-0.00	—	—					
	26-60	—	—	—	—	0.01-0.20-0.42	0.00-0.00-0.00	—	—					
Durtash	0-5	-42-	-38-	15-20- 25	1.15-1.23-1.30	4.00-9.00-14.00	0.13-0.15-0.17	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.20	.37	1	7	38
	5-14	-31-	-31-	35-38- 60	1.25-1.35-1.45	0.42-0.91-1.40	0.08-0.10-0.11	3.0- 4.5- 5.9	0.5- 1.3- 2.0	.10	.32			
	14-19	-22-	-28-	40-50- 60	1.25-1.35-1.45	0.42-0.91-1.40	0.08-0.10-0.11	3.0- 4.5- 5.9	0.5- 1.3- 2.0	.05	.24			
	19-29	—	—	—	—	0.07-0.25-0.42	0.00-0.00-0.00	—	—					
	29-60	—	—	—	—	0.07-0.25-0.42	0.00-0.00-0.00	—	—					
Selah	0-9	-43-	-40-	15-18- 20	1.10-1.23-1.35	4.00-9.00-14.00	0.17-0.19-0.20	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.32	.32	2	5	56
	9-17	-18-	-54-	22-28- 30	1.30-1.40-1.50	1.40-3.00-4.00	0.17-0.19-0.20	3.0- 4.5- 5.9	0.5- 1.3- 2.0	.49	.49			

Physical Soil Properties–Kittitas County Area, Washington														
Map symbol and soil name	**Depth**	**Sand**	**Silt**	**Clay**	**Moist bulk density**	**Saturated hydraulic conductivity**	**Available water capacity**	**Linear extensibility**	**Organic matter**	**Erosion factors**			**Wind erodibility group**	**Wind erodibility index**
										Kw	**Kf**	**T**		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
	17-21	-34-	-32-	30-34- 38	1.30-1.40-1.50	1.40-3.00-4.00	0.13-0.15-0.17	3.0- 4.5- 5.9	0.5- 0.8-1.0	.17	.32			
	21-31	—	—	—	—	0.00-0.21-0.42	0.00-0.00-0.00	—	—					
	31-60	—	—	—	—	0.00-0.21-0.42	0.00-0.00-0.00	—	—					
570—Wipple cobbly clay loam, 15 to 30 percent slopes														
Wipple	0-7	-35-	-34-	27-31- 35	1.10-1.20-1.30	1.40-7.70-14.00	0.14-0.17-0.19	0.0- 1.5- 2.9	1.0- 1.5-2.0	.10	.24	3	7	38
	7-11	-33-	-32-	30-35- 40	1.25-1.38-1.50	0.42-0.91-1.40	0.04-0.07-0.10	3.0- 4.5- 5.9	0.5- 1.3-2.0	.10	.32			
	11-30	-17-	-28-	50-55- 60	1.25-1.38-1.50	0.42-0.91-1.40	0.04-0.07-0.10	3.0- 4.5- 5.9	0.5- 0.8-1.0	.05	.20			
	30-50	-33-	-32-	32-35- 60	1.25-1.40-1.55	0.42-2.21-4.00	0.06-0.09-0.12	3.0- 4.5- 5.9	0.0- 0.3-0.5	.10	.28			
	50-60	—	—	—	—	—	—	—	—					

Physical Soil Properties–Kittitas County Area, Washington														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
618—Nitzel ashy silt loam, gravelly substratum, 0 to 2 percent														
Nitzel, gravelly substratum	0-8	-26-	-53-	18-21- 24	1.10-1.20-1.30	4.00-9.00-14.00	0.17-0.19-0.20	0.0- 1.5- 2.9	2.0- 3.0-4.0	.32	.32	5	5	56
	8-29	-39-	-37-	20-24- 27	1.10-1.20-1.30	4.00-9.00-14.00	0.17-0.19-0.20	0.0- 1.5- 2.9	1.0- 2.0-3.0	.32	.32			
	29-46	-39-	-37-	20-25- 30	1.20-1.28-1.35	4.00-9.00-14.00	0.17-0.19-0.20	0.0- 1.5- 2.9	1.0- 2.0-3.0	.32	.32			
	46-60	-65-	-19-	14-16- 18	1.25-1.33-1.40	14.00-28.00-42.00	0.11-0.12-0.13	0.0- 1.5- 2.9	0.5- 1.8-3.0	.20	.20			
621—Mitta ashy silt loam, flooded, 0 to 2 percent slopes														
Mitta, flooded	0-6	- 7-	-70-	19-23- 25	1.00-1.15-1.30	4.00-9.00-14.00	0.19-0.20-0.21	0.0- 1.5- 2.9	3.0- 4.0-5.0	.32	.32	5	5	56
	6-15	- 7-	-70-	19-23- 25	1.00-1.15-1.30	4.00-9.00-14.00	0.19-0.20-0.21	0.0- 1.5- 2.9	2.0- 3.5-5.0	.37	.37			
	15-34	- 7-	-70-	19-23- 25	1.00-1.15-1.30	4.00-9.00-14.00	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 1.5-2.0	.49	.49			
	34-49	- 9-	-64-	25-28- 30	1.15-1.28-1.40	1.40-3.00-4.00	0.17-0.19-0.21	3.0- 4.5- 5.9	0.5- 1.3-2.0	.43	.43			
	49-60	- 9-	-64-	25-28- 30	1.25-1.33-1.40	1.40-3.00-4.00	0.17-0.19-0.21	3.0- 4.5- 5.9	0.0- 0.3-0.5	.49	.49			

Physical Soil Properties–Kittitas County Area, Washington														
Map symbol and soil name	**Depth**	**Sand**	**Silt**	**Clay**	**Moist bulk density**	**Saturated hydraulic conductivity**	**Available water capacity**	**Linear extensibility**	**Organic matter**	**Erosion factors**			**Wind erodibility group**	**Wind erodibility index**
										Kw	**Kf**	**T**		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
674—Durtash gravelly loam, 3 to 10 percent slopes														
Durtash, gravelly	0-5	-42-	-38-	15-20- 25	1.15-1.23-1.30	4.00-9.00-14.00	0.13-0.15-0.17	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.20	.37	1	7	38
	5-14	-31-	-31-	35-38- 60	1.25-1.35-1.45	0.42-0.91-1.40	0.08-0.10-0.11	3.0- 4.5- 5.9	0.5- 1.3- 2.0	.10	.32			
	14-19	-22-	-28-	40-50- 60	1.25-1.35-1.45	0.42-0.91-1.40	0.08-0.10-0.11	3.0- 4.5- 5.9	0.5- 1.3- 2.0	.05	.24			
	19-29	—	—	—	—	0.07-0.25-0.42	0.00-0.00-0.00	—	—					
	29-60	—	—	—	—	0.07-0.25-0.42	0.00-0.00-0.00	—	—					

Physical Soil Properties–Kittitas County Area, Washington														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
787—Terlan-Durtash-Selah complex, 2 to 5 percent slopes														
Terlan	0-7	-43-	-39-	15-19- 22	1.15-1.25-1.35	4.00-9.00-14.00	0.13-0.14-0.15	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.24	.37	1	6	48
	7-15	-34-	-38-	24-28- 32	1.25-1.35-1.45	4.00-9.00-14.00	0.11-0.15-0.18	3.0- 4.5- 5.9	1.0- 1.5- 2.0	.20	.37			
	15-18	-38-	-36-	24-26- 32	1.25-1.35-1.45	4.00-9.00-14.00	0.10-0.12-0.14	3.0- 4.5- 5.9	0.5- 0.8- 1.0	.15	.37			
	18-26	—	—	—	—	0.01-0.20-0.42	0.00-0.00-0.00	—	—					
	26-60	—	—	—	—	0.01-0.20-0.42	0.00-0.00-0.00	—	—					
Durtash	0-5	-42-	-38-	15-20- 25	1.15-1.23-1.30	4.00-9.00-14.00	0.13-0.15-0.17	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.20	.37	1	7	38
	5-14	-31-	-31-	35-38- 60	1.25-1.35-1.45	0.42-0.91-1.40	0.08-0.10-0.11	3.0- 4.5- 5.9	0.5- 1.3- 2.0	.10	.32			
	14-19	-22-	-28-	40-50- 60	1.25-1.35-1.45	0.42-0.91-1.40	0.08-0.10-0.11	3.0- 4.5- 5.9	0.5- 1.3- 2.0	.05	.24			
	19-29	—	—	—	—	0.07-0.25-0.42	0.00-0.00-0.00	—	—					
	29-60	—	—	—	—	0.07-0.25-0.42	0.00-0.00-0.00	—	—					
Selah	0-9	-43-	-40-	15-18- 20	1.10-1.23-1.35	4.00-9.00-14.00	0.17-0.19-0.20	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.32	.32	2	5	56
	9-17	-18-	-54-	22-28- 30	1.30-1.40-1.50	1.40-3.00-4.00	0.17-0.19-0.20	3.0- 4.5- 5.9	0.5- 1.3- 2.0	.49	.49			

Physical Soil Properties–Kittitas County Area, Washington														
Map symbol and soil name	**Depth**	**Sand**	**Silt**	**Clay**	**Moist bulk density**	**Saturated hydraulic conductivity**	**Available water capacity**	**Linear extensibility**	**Organic matter**	**Erosion factors**			**Wind erodibility group**	**Wind erodibility index**
										Kw	**Kf**	**T**		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
	17-21	-34-	-32-	30-34- 38	1.30-1.40-1.50	1.40-3.00-4.00	0.13-0.15-0.17	3.0- 4.5- 5.9	0.5- 0.8-1.0	.17	.32			
	21-31	—	—	—	—	0.00-0.21-0.42	0.00-0.00-0.00	—	—					
	31-60	—	—	—	—	0.00-0.21-0.42	0.00-0.00-0.00	—	—					
869—Weirman complex, drained, 0 to 5 percent slopes														
Weirman, very gravelly sandy loam	0-5	-69-	-24-	5- 7- 8	1.20-1.30-1.40	4.00-23.00-42.00	0.07-0.09-0.10	0.0- 1.5- 2.9	1.0- 1.5-2.0	.10	.20	3	6	48
	5-15	-80-	-16-	2- 4- 5	1.35-1.45-1.55	42.00-92.00-141.00	0.07-0.09-0.10	0.0- 1.5- 2.9	1.0- 1.5-2.0	.10	.24			
	15-60	-82-	-17-	0- 1- 2	1.50-1.60-1.70	141.00-423.00-705.00	0.01-0.02-0.02	0.0- 1.5- 2.9	0.0- 0.3-0.5	.05	.28			
Weirman, very cobbly sandy loam	0-4	-69-	-24-	5- 7- 8	1.20-1.30-1.40	4.00-23.00-42.00	0.07-0.09-0.10	0.0- 1.5- 2.9	1.0- 1.5-2.0	.05	.20	3	6	48
	4-15	-80-	-16-	2- 4- 5	1.35-1.45-1.55	42.00-92.00-141.00	0.07-0.09-0.10	0.0- 1.5- 2.9	1.0- 1.5-2.0	.10	.24			
	15-60	-82-	-17-	0- 1- 2	1.50-1.60-1.70	141.00-423.00-705.00	0.01-0.02-0.02	0.0- 1.5- 2.9	0.0- 0.3-0.5	.05	.28			

Engineering Properties

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*
503—Terlan-Durtash-Selah complex, 5 to 15 percent slopes														
Terlan	40	D	0-7	Gravelly loam	CL, CL-ML, SC, SC-SM	A-4	0- 0- 0	0- 5- 10	75-80-85	70-75-80	60-68-75	40-50-60	25-28-30	5-7 -10
			7-15	Gravelly clay loam, gravelly loam	CL, GC, SC	A-6	0- 0- 0	0- 8- 15	70-78-85	65-73-80	55-65-75	40-50-60	30-33-35	10-13-15
			15-18	Gravelly loam, very gravelly loam, gravelly clay loam	CL, GC, SC	A-6	0- 0- 0	0-13- 25	60-70-80	50-63-75	45-58-70	35-45-55	30-33-35	10-13-15
			18-26	Cemented material	—	—	—	—	—	—	—	—	—	—
			26-60	Cemented material	—	—	—	—	—	—	—	—	—	—
Durtash	35	D	0-5	Gravelly loam	CL, GC, SC	A-4, A-6	0- 0- 0	0- 5- 10	65-75-85	60-68-75	55-63-70	45-53-60	25-30-35	5-10-15
			5-14	Very gravelly clay loam, very cobbly clay loam, extremely gravelly clay	GC, GP-GC	A-2	0- 5- 10	10-25-40	30-45-60	25-38-50	15-28-40	5-20- 35	40-53-65	20-30-40
			14-19	Extremely gravelly clay, very gravelly clay	GC	A-2	0- 5- 10	5-23- 40	30-50-70	25-43-60	15-25-35	5-15- 25	55-65-75	30-40-50
			19-29	Cemented material	—	—	—	—	—	—	—	—	—	—
			29-60	Cemented material	—	—	—	—	—	—	—	—	—	—
Selah	20	C	0-9	Loam	CL, CL-ML	A-4	0- 0- 0	0- 0- 0	95-98-100	85-93-100	75-88-100	55-70-85	20-23-25	5-7 -10
			9-17	Silty clay loam, clay loam, silt loam	CL	A-6	0- 0- 0	0- 3- 5	95-98-100	85-93-100	75-85-95	55-70-85	30-35-40	10-15-20

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*
			17-21	Clay loam, gravelly clay loam, cobbly clay loam	CL, GC, SC	A-6, A-7	0- 0- 0	0-10- 20	65-80-95	55-73-90	50-68-85	45-58-70	35-43-50	15-20-25
			21-31	Cemented material	—	—	—	—	—	—	—	—	—	—
			31-60	Cemented material	—	—	—	—	—	—	—	—	—	—
570—Wipple cobbly clay loam, 15 to 30 percent slopes														
Wipple	85	C	0-7	Cobbly clay loam	CL	A-6	0- 0- 0	25-33-40	80-90-100	70-85-100	65-83-100	50-65-80	30-35-40	10-13-15
			7-11	Very gravelly clay loam, very cobbly clay loam	GC	A-2, A-6	0- 5- 10	5-10- 15	50-58-65	40-48-55	35-43-50	30-38-45	30-35-40	10-15-20
			11-30	Very gravelly clay, very cobbly clay, extremely cobbly clay	GC	A-2, A-7	0- 5- 10	5-25- 45	45-58-70	35-48-60	25-43-60	20-36-50	65-70-75	40-45-50
			30-50	Very cobbly clay, extremely cobbly clay loam, very cobbly clay loam	GC	A-2, A-7	0- 5- 10	15-30-45	45-58-70	35-48-60	30-45-60	25-38-50	40-53-65	15-28-40
			50-60	Unweathered bedrock	—	—	—	—	—	—	—	—	—	—

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*
618—Nitzel ashy silt loam, gravelly substratum, 0 to 2 percent														
Nitzel, gravelly substratum	90	C	0-8	Ashy silt loam	CL	A-6	0- 0- 0	0- 0- 0	100-100 -100	95-98-1 00	90-95-1 00	65-75-85	25-30 -35	10-13-1 5
			8-29	Ashy loam, ashy silt loam	CL	A-6	0- 0- 0	0- 0- 0	100-100 -100	95-98-1 00	85-93-1 00	60-70-80	25-30 -35	10-13-1 5
			29-46	Loam, silt loam, clay loam	CL	A-6	0- 0- 0	0- 0- 0	100-100 -100	95-98-1 00	85-93-1 00	60-70-80	25-30 -35	10-13-1 5
			46-60	Sandy loam	CL, CL-ML	A-4	0- 0- 0	0- 0- 0	100-100 -100	95-98-1 00	65-75-85	50-60-70	20-25 -30	5-7 -10
621—Mitta ashy silt loam, flooded, 0 to 2 percent slopes														
Mitta, flooded	85	C	0-6	Ashy silt loam	CL	A-6	0- 0- 0	0- 0- 0	100-100 -100	95-98-1 00	90-95-1 00	65-75-85	25-30 -35	10-13-1 5
			6-15	Ashy silt loam	CL	A-6	0- 0- 0	0- 0- 0	100-100 -100	95-98-1 00	90-95-1 00	65-75-85	25-30 -35	10-13-1 5
			15-34	Ashy silt loam, ashy loam	CL	A-6	0- 0- 0	0- 0- 0	100-100 -100	95-98-1 00	90-95-1 00	65-75-85	25-30 -35	10-13-1 5
			34-49	Silty clay loam, clay loam, silt loam	CL	A-6	0- 0- 0	0- 0- 0	100-100 -100	90-95-1 00	85-93-1 00	60-70-80	30-35 -40	15-18-2 0
			49-60	Silty clay loam, clay loam, loam	CL	A-6	0- 0- 0	0- 0- 0	100-100 -100	90-95-1 00	85-93-1 00	60-70-80	30-35 -40	15-18-2 0

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*
674—Durtash gravelly loam, 3 to 10 percent slopes														
Durtash, gravelly	80	D	0-5	Gravelly loam	CL, GC, SC	A-4, A-6	0- 0- 0	0- 5- 10	65-75-85	60-68-75	55-63-70	45-53-60	25-30-35	5-10-15
			5-14	Very gravelly clay loam, very cobbly clay loam, extremely gravelly clay	GC, GP-GC	A-2	0- 5- 10	10-25-40	30-45-60	25-38-50	15-28-40	5-20- 35	40-53-65	20-30-40
			14-19	Extremely gravelly clay, very gravelly clay	GC	A-2	0- 5- 10	5-23- 40	30-50-70	25-43-60	15-25-35	5-15- 25	55-65-75	30-40-50
			19-29	Cemented material	—	—	—	—	—	—	—	—	—	—
			29-60	Cemented material	—	—	—	—	—	—	—	—	—	—

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*
787—Terlan-Durtash-Selah complex, 2 to 5 percent slopes														
Terlan	40	D	0-7	Gravelly loam	CL, CL-ML, SC, SC-SM	A-4	0- 0- 0	0- 5- 10	75-80-85	70-75-80	60-68-75	40-50-60	25-28-30	5-7 -10
			7-15	Gravelly clay loam, gravelly loam	CL, GC, SC	A-6	0- 0- 0	0- 8- 15	70-78-85	65-73-80	55-65-75	40-50-60	30-33-35	10-13-15
			15-18	Gravelly loam, very gravelly loam, gravelly clay loam	CL, GC, SC	A-6	0- 0- 0	0-13- 25	60-70-80	50-63-75	45-58-70	35-45-55	30-33-35	10-13-15
			18-26	Cemented material	—	—	—	—	—	—	—	—	—	—
			26-60	Cemented material	—	—	—	—	—	—	—	—	—	—
Durtash	30	D	0-5	Gravelly loam	CL, GC, SC	A-4, A-6	0- 0- 0	0- 5- 10	65-75-85	60-68-75	55-63-70	45-53-60	25-30-35	5-10-15
			5-14	Very gravelly clay loam, very cobbly clay loam, extremely gravelly clay	GC, GP-GC	A-2	0- 5- 10	10-25-40	30-45-60	25-38-50	15-28-40	5-20- 35	40-53-65	20-30-40
			14-19	Extremely gravelly clay, very gravelly clay	GC	A-2	0- 5- 10	5-23- 40	30-50-70	25-43-60	15-25-35	5-15- 25	55-65-75	30-40-50
			19-29	Cemented material	—	—	—	—	—	—	—	—	—	—
			29-60	Cemented material	—	—	—	—	—	—	—	—	—	—
Selah	25	C	0-9	Loam	CL, CL-ML	A-4	0- 0- 0	0- 0- 0	95-98-100	85-93-100	75-88-100	55-70-85	20-23-25	5-7 -10
			9-17	Silty clay loam, clay loam, silt loam	CL	A-6	0- 0- 0	0- 3- 5	95-98-100	85-93-100	75-85-95	55-70-85	30-35-40	10-15-20

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*
			17-21	Clay loam, gravelly clay loam, cobbly clay loam	CL, GC, SC	A-6, A-7	0- 0- 0	0-10- 20	65-80-95	55-73-90	50-68-85	45-58-70	35-43-50	15-20-25
			21-31	Cemented material	—	—	—	—	—	—	—	—	—	—
			31-60	Cemented material	—	—	—	—	—	—	—	—	—	—
869—Weirman complex, drained, 0 to 5 percent slopes														
Weirman, very gravelly sandy loam	55	A	0-5	Very gravelly sandy loam	GM, GP-GM	A-1	0- 3- 5	0- 3- 5	40-50-60	30-40-50	15-25-35	5-15- 25	15-18-20	NP-3 -5
			5-15	Very gravelly loamy sand	GP, GP-GM, SP, SP-SM	A-1	0- 3- 5	0- 8- 15	40-50-60	30-40-50	5-15- 25	0- 3- 5	0-5 -10	NP
			15-60	Extremely gravelly loamy sand, very gravelly loamy sand, very gravelly sand, extremely gravelly sand	GP, GP-GM	A-1	0- 3- 5	10-25-40	30-40-50	10-28-45	5-13- 20	0- 5- 10	0-5 -10	NP
Weirman, very cobbly sandy loam	40	A	0-4	Very cobbly sandy loam	GM, SM	A-1	10-15-20	20-23-25	50-58-65	40-48-55	15-23-30	10-18-25	15-18-20	NP-3 -5
			4-15	Very gravelly loamy sand	GP, GP-GM, SP, SP-SM	A-1	0- 3- 5	0- 8- 15	40-50-60	30-40-50	5-15- 25	0- 3- 5	0-5 -10	NP
			15-60	Extremely gravelly loamy sand, very gravelly loamy sand, very gravelly sand, extremely gravelly sand	GP, GP-GM	A-1	0- 3- 5	10-25-40	30-40-50	10-28-45	5-13- 20	0- 5- 10	0-5 -10	NP

Water Features

This folder contains tabular reports that present soil hydrology information. The reports (tables) include all selected map units and components for each map unit. Water Features include ponding frequency, flooding frequency, and depth to water table.

Hydrologic Soil Group and Surface Runoff

This table gives estimates of various soil water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

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.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

Surface runoff refers to the loss of water from an area by flow over the land surface. Surface runoff classes are based on slope, climate, and vegetative cover. The concept indicates relative runoff for very specific conditions. It is assumed that the surface of the soil is bare and that the retention of surface water resulting from irregularities in the ground surface is minimal. The classes are negligible, very low, low, medium, high, and very high.

Report—Hydrologic Soil Group and Surface Runoff

Absence of an entry indicates that the data were not estimated. The dash indicates no documented presence.

Hydrologic Soil Group and Surface Runoff–Kittitas County Area, Washington			
Map symbol and soil name	**Pct. of map unit**	**Surface Runoff**	**Hydrologic Soil Group**
503—Terlan-Durtash-Selah complex, 5 to 15 percent slopes			
Terlan	40	—	D
Durtash	35	—	D
Selah	20	—	C
570—Wipple cobbly clay loam, 15 to 30 percent slopes			
Wipple	85	—	C
618—Nitzel ashy silt loam, gravelly substratum, 0 to 2 percent			
Nitzel, gravelly substratum	90	—	C
621—Mitta ashy silt loam, flooded, 0 to 2 percent slopes			
Mitta, flooded	85	—	C
674—Durtash gravelly loam, 3 to 10 percent slopes			
Durtash, gravelly	80	—	D
787—Terlan-Durtash-Selah complex, 2 to 5 percent slopes			
Terlan	40	—	D
Durtash	30	—	D
Selah	25	—	C
869—Weirman complex, drained, 0 to 5 percent slopes			
Weirman, very gravelly sandy loam	55	—	A
Weirman, very cobbly sandy loam	40	—	A

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

Exhibit B

Wetland and Stream Delineation Report for Parke Creek Property, Kittitas County, Washington, prepared by Avia Environmental Consulting; October 2020

Avia Environmental Consulting

Serving the Puget Sound Area and North-Central Washington
www.AviaEnvironmental.com

Wetland and Stream Delineation Report
Parke Creek Property
Kittitas County, Washington

October 2020

Prepared by:

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Project location:

Address: Kittitas County, WA
Parcel No.: 295134

Prepared for:

Rikki Schmitt

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Figure 1. Subject Property. Source: Kittitas County COMPAS 2
Figure 2. Defunct drainage pipe and area depicted as wetland in NWI. 3
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1 Introduction and Executive Summary

The landowner/applicant seeks to build two storage ponds with an access road on a vacant property in unincorporated Kittitas County (see included plans). The property is encumbered by two water courses with regulatory buffers and contains small wetlands and Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) polygons. This report describes critical areas on and adjacent to the property.

Field work was performed on October 16, 2020. Areas east of the onsite streams (Figure 1) were evaluated for the presence of streams, wetlands, and PHS. Each of these critical areas types had been previously identified as present or possibly present on state databases. Two streams and two small areas meeting wetland criteria were discovered during the site visit. The PHS area was assessed for its suitability to support priority species.

It was determined by the visiting wetland and wildlife biologists that the proposed storage ponds are to be located entirely outside of any applicable regulatory buffer for critical areas. The proposed access to the ponds will cross stream buffers but is not expected to impact the function of critical areas or buffers.

2 Project Area

The 197.92-acre subject property (see Figure 1) is on the east side of Parke Creek Road immediately south of the junction with Christensen Road, northeast of Ellensburg. It is within Water Resource Inventory Area (WRIA) 39. Land to the north, south, and west is largely in agriculture, and a large tract of high quality shrub-steppe extends eastward from the center of the property through adjoining properties. Parke Creek and a second unnamed stream run roughly northeast-to-southwest through the parcel.

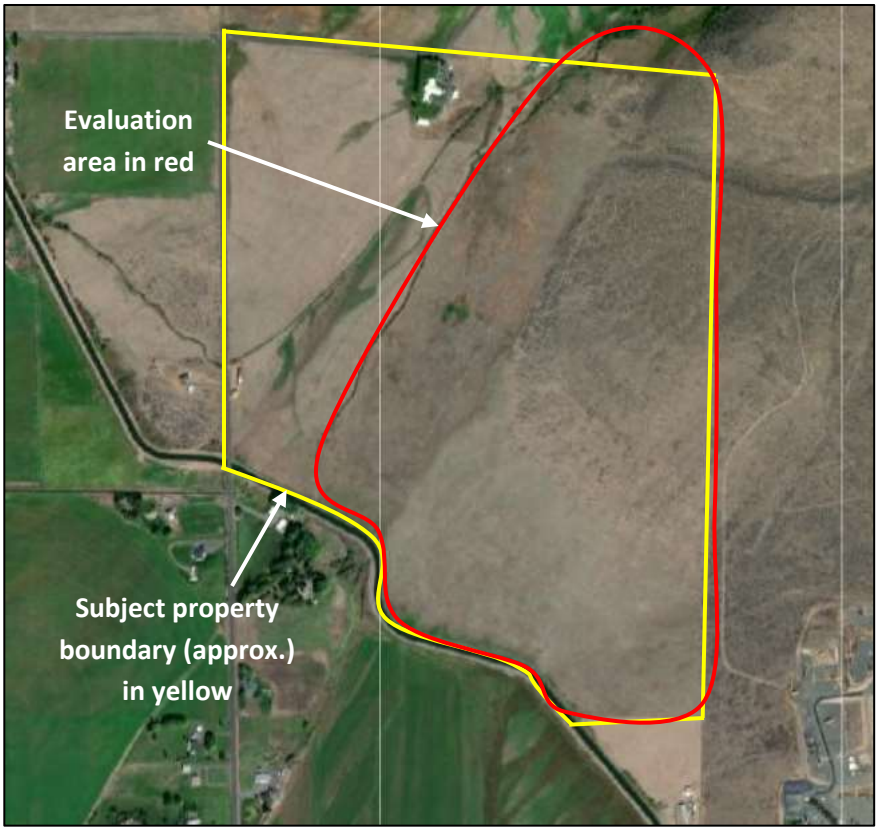

Figure 1. Subject Property. Source: Kittitas County COMPAS

There are presently no structures on the property apart from a bridge spanning the unnamed creek. A gravel drive runs from the entry gate on Parke Creek Road over the bridge but not further into the property, although informal tracks run deeper into the parcel. Vegetation outside of the shrub-steppe area is mostly mown pasture grasses with scattered occurrences of soft rush (*Juncus effusus*), bulrush (*Typha latifolia*), and thistle (*Cirsium* sp.), as well as small clusters of Pacific willow (*Salix lucida*) along the creeks.

3 METHODS

3.1 Documentation

A documentation search was conducted and included local inventories, the Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) database, state, and federal threatened and endangered species lists, the National Wetland Inventory (NWI), WDFW's SalmonScape database, and Natural Resources Conservation Service (NRCS) soils maps.

3.2 Field Study

We investigated all areas east of the onsite streams and within 300 feet of the proposed ponds. Methodology used for wetland determination was that of the Washington State Department of Ecology's (Ecology) *Wetland Identification and Delineation Manual* (Manual) and *Arid West Regional Supplement*. Soil, hydrology, and

vegetation were examined throughout the property to determine whether they fit criteria set forth in the Manual. Data were recorded at five of these points, marked with orange flagging. Data forms are included in this report as Appendix A. Wetlands were rated using Ecology's 2014 update of the Washington State Wetland Rating System for Western Washington.

4 CRITICAL AREAS AND HABITAT

4.1 Wetlands

County and national (National Wetland Inventory (NWI)) databases indicate the presence of a palustrine emergent wetland in roughly the center of the property. Its depicted location is in the area surrounding a defunct above-ground pipe, which presumably discharged water historically (Figure 2). The area was investigated thoroughly for evidence of wetland vegetation, soils, and hydrology. Data were collected in a small part of the area that supported wetland facultative vegetation, specifically soft rush and bulrush (DP 5 in Figure 3). Soils are highly compacted, very dark grayish brown (10YR 3/2) loam, and no evidence of wetland hydrology was observed. The entire area has been heavily grazed by cows.

It is not unusual that the NWI denotes a wetland where one does not occur. The inventory in this area is likely based on aerial photographs which may be deceiving due to the past presence of discharge water. As well, none of the site soils on the NRCS survey are hydric. Based on field observations and collected data, the area identified in the NWI does not meet wetland criteria are put forth in the Manual.

Figure 2. Defunct drainage pipe and area depicted as wetland in NWI.

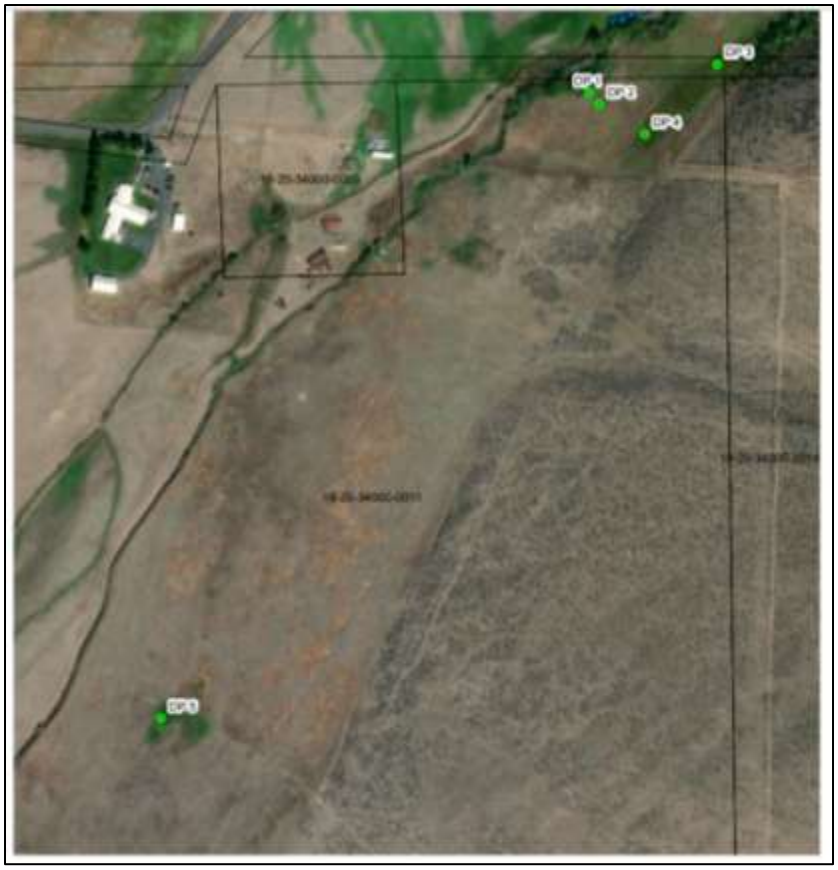

Figure 3. Data point and critical areas locations.

Two small areas meeting wetland criteria were identified. The first point (DP1 in Figure 3) is fully within the OHWM of the easternmost stream and less than 10,000 sf in area, and any regulatory or functional buffer, if applied, would be full contained with the stream's 100-foot buffer. The second area meeting wetland criteria is mostly offsite but extends into the northeast corner of the subject property (DP 3 in Figure 3). Figure 4 is a photograph taken from the south edge of this wetland. The wetland is on a very gradual slope, drains to the south, and is fed by groundwater, precipitation, and a seep. Vegetation consists of soft rush, bulrush, and common couch (*Elymus repens*). Soils are black (10YR 2/1) silt loam with an approximately 2% occurrence of strong brown (7.5YR 4/6) redoximorphic features (concentration). Surface water, saturation, and a high (10-inch) water table were present in various locations within the wetland during the site visit. The wetland rates as Category IV (14 points) using the slope HGM, and is well below the 1-acre threshold for wetlands of any category requiring buffers (Kittitas County Code (KCC) 7A.04.020). As well, the edge of the wetland is more than 200 feet from the proposed ponds, and thus beyond all regulatory buffers for all wetland categories. For these reasons, the wetland will not be impacted by development actions and was not flagged.

Areas along the onsite streams (see Section 4.3) that support wetland facultative vegetation were investigated for the presence of associated wetlands. No areas met hydrology criteria, and no areas with wetland vegetation or soils occurred outside of the streams' ordinary high water marks (OHWM). Figure 5 depicts the approximate locations of streams, wetlands, and proposed ponds. Note that the ponds and streams are accurately depicted on the included plan set. The PHS polygons are shown in Appendix B.

Figure 4. Grazed wetland located partially on the subject parcel. The wetland extends to the edge of the small trees in the background.

4.2 Streams

Ordinary high water marks (OHWM) of the two streams on the property were surveyed and are shown on the site plan and estimated in Figure 5. The Washington Department of Natural Resources classification of Parke Creek is Type 2. The most restrictive buffer for a Type 2 stream, 100 feet, has been applied to both streams Kittitas County Code (KCC) (17A.07.010.2). As depicted in the included plans, the proposed ponds are located outside of these buffers.

A graveled road over an existing informal track is necessary to provide access to the ponds. This will extend from the existing gravel lot and stream crossings eastward across the stream buffer. No impact to the streams is expected, and the footprint is presently highly compacted soil and has been used as an informal road in the past. As well, the remaining buffer is essentially expanded in all other areas, most of which support more native vegetation than the road area, providing a more than compensatory area in additional buffer. The averaging meets the requirements of KCC 17A.07.010.5 in that:

a) The averaging is necessary to avoid an extraordinary hardship to the applicant caused by circumstances peculiar to the property, as no other reasonable access exists and the property could otherwise not support any use.
b) The riparian habitat contains variations in sensitivity due to existing physical characteristics. As described, grazing and vehicular use of the property have resulted in varying soil and vegetative characteristics.

c) The proposed use would be located adjacent to areas where buffer width is reduced, and that such land uses will not have a significant adverse impact to the habitat and its buffer; the proposed ponds are situated outside of the regulatory buffers and also avoid the intact shrub-steppe habitat and slopes.

d) That buffer width averaging will not adversely impact riparian habitat functions and values. The road will not be paved and is confined to the width necessary. As stated, it avoids sensitive and intact native habitat.

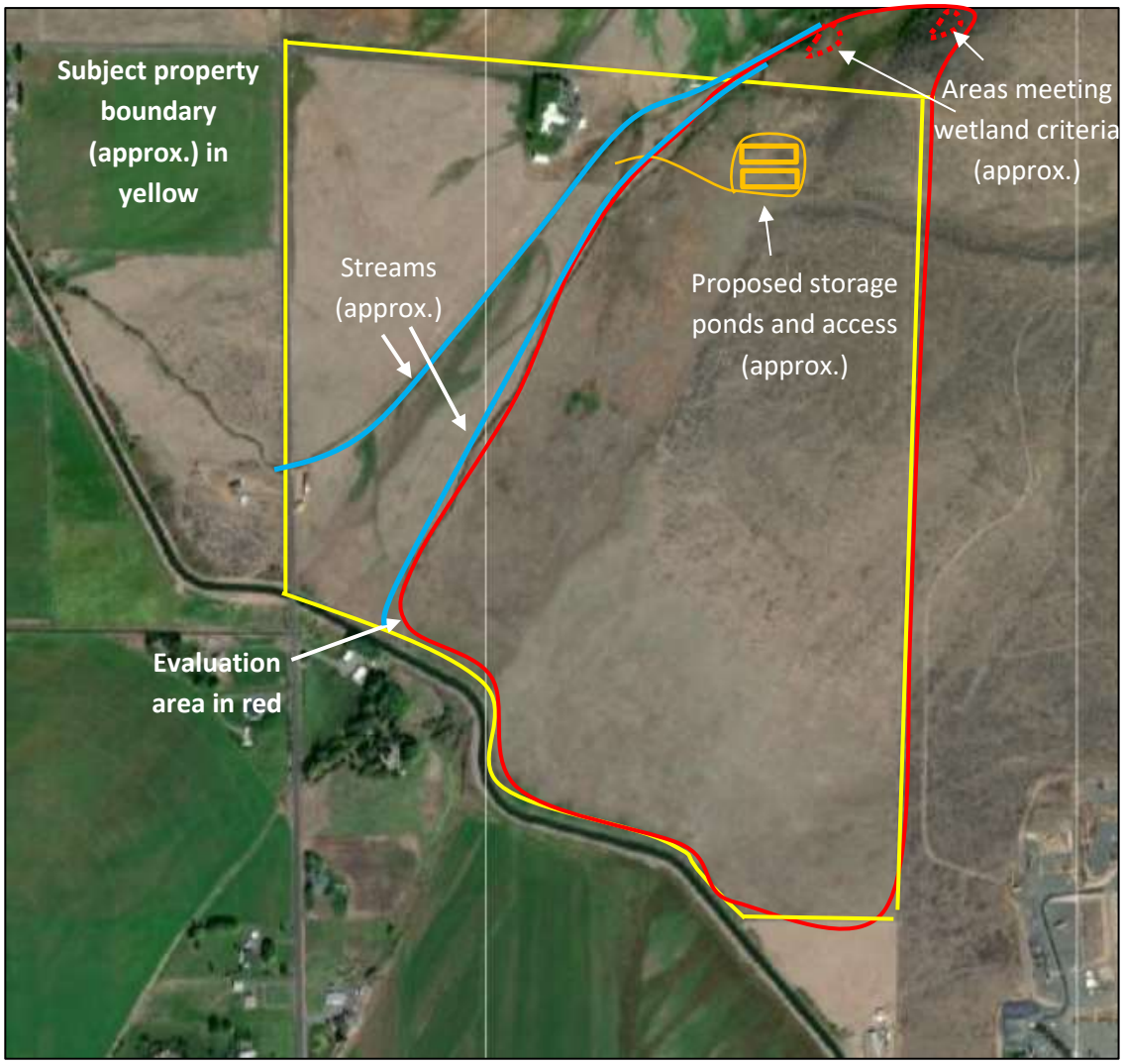

Figure 5. Critical areas locations (approximate) on subject property. See plan set for surveyed locations.

4.3 Priority Habitats and Species

In addition to rainbow trout (*Oncorhynchus mykiss*) in Parke Creek and the area identified on the NWI database, a PHS polygon for terrestrial habitat (shrub-steppe) and masked data for golden eagle (*Aquila chrysaetos*) habitat are depicted within the parcel (Appendix B). The proposal avoids intrusion into the shrub-steppe habitat. Masked habitat in the PHS database does not identify actual occurrences, and the subject parcel does not contain suitable nesting or roosting sites for the species. No impacts to the species due the proposed ponds is expected.

4.4 Non-Critical Area Habitat

The whole of the property excluding the streams, wetlands, bridge, and gravel drive is heavily grazed pasture with a mix of blue grasses (*Poa* sp.), wheatgrass (*Agropyron* sp.), common couch grass, common weedy herbaceous species, and heavily browsed willow (*Salix* sp.) saplings. Soil and hydrology information in areas not meeting wetland criteria is detailed on the data forms for DP 2, DP 4, and DP 5 in Appendix A.

Appendix A

Data Forms

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Parke Creek | City/County: Kittitas | Sampling Date: 10/16/2020

Applicant/Owner: Schmitt | State: wa | Sampling Point: DP1

Investigator(s): S. Tomassi, A. Lutes | Section, Township, Range: Sec 34 T18N R20E

Landform (hillslope, terrace, etc.): riverine | Local relief (concave, convex, none): concave | Slope (%): 5

Subregion (LRR): B | Lat: 47.0160 | Long: -120.3165 | Datum: NAD83HARN

Soil Map Unit Name: Nitzel ashy silt loam gravelly substratum 0-2% slopes | NWI Classification: upland

Are climatic / hydrologic conditions on the site typical for this time of year? ◉ Yes ○ No (If no, explain in Remarks.)

Are Vegetation ☑, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? ◉ Yes ○ No

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	◉ Yes	○ No
Hydric Soil Present?	◉ Yes	○ No
Wetland Hydrology Present?	◉ Yes	○ No

Is the Sampled Area within a Wetland? ◉ Yes ○ No

Remarks:
Although vegetation is heavilty grazed, determination was not affected because dominant plant species were identifiable.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft x 15ft)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status
1. *Salix lasiandra*	40	Y	100.0	FACW
2.				
3.				
4.				
	40	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft x 15ft)				
1. *Salix lasiandra*	30	Y	100.0	FACW
2.				
3.				
4.				
5.				
	30	= Total Cover		
Herb Stratum (Plot size: 5ft x 5ft)				
1. *Elymus repens*	45	Y	52.9	FAC
2. *Urtica dioica*	5	N	5.9	FAC
3. *pasture grasses*	35	Y	41.2	FAC
4.				
5.				
6.				
7.				
8.				
	85	= Total Cover		
Woody Vine Stratum (Plot size:)				
1.				
2.				
		= Total Cover		

% Bare Ground in Herb Stratum | % Cover of Biotic Crust

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	70	x 2 =	140
FAC species	85	x 3 =	255
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	155 (A)		395 (B)

Prevalence Index = B/A = 2.548

Hydrophytic Vegetation Indicators:

- ☑ Dominance Test is >50%
- ☑ Prevalence Index is ≤3.0¹
- ☐ Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? ◉ Yes ○ No

Remarks:
pasture grasses assume FAC

SOIL

Sampling Point: DP1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)		%	Redox Features Color (moist)		%	Type[1]	Loc[2]	Texture	Remarks
0-14	7.5YR	3/1	98	2.5YR	4/6	2	C	M	fine sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (LRR C)
- ☐ 1 cm Muck (A9) (LRR D)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) (LRR C)
- ☐ 2 cm Muck (A10) (LRR B)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? ◉ Yes ○ No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (Nonriverine)
- ☐ Sediment Deposits (B2) (Nonriverine)
- ☐ Drift Deposits (B3) (Nonriverine)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thick Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☑ Water Marks (B1) (Riverine)
- ☐ Sediment Deposits (B2) (Riverine)
- ☑ Drift Deposits (B3) (Riverine)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? ○ Yes ◉ No Depth (inches): _____

Water Table Present? ○ Yes ◉ No Depth (inches): _____

Saturation Present? (includes capillary fringe) ○ Yes ◉ No Depth (inches): _____

Wetland Hydrology Present? ◉ Yes ○ No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Parke Creek | City/County: Kittitas | Sampling Date: 10/16/2020

Applicant/Owner: Schmitt | State: wa | Sampling Point: DP2

Investigator(s): S. Tomassi, A. Lutes | Section, Township, Range: Sec 34 T18N R20E

Landform (hillslope, terrace, etc.): flat | Local relief (concave, convex, none): none | Slope (%): 5

Subregion (LRR): B | Lat: 47.0160 | Long: -120.3165 | Datum: NAD83HARN

Soil Map Unit Name: Nitzel ashy silt loam gravelly substratum 0-2% slopes | NWI Classification: upland

Are climatic / hydrologic conditions on the site typical for this time of year? ◉ Yes ○ No (If no, explain in Remarks.)

Are Vegetation ☑, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? ◉ Yes ○ No

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	◉ Yes	○ No	**Is the Sampled Area within a Wetland?**	○ Yes ◉ No
Hydric Soil Present?	○ Yes	◉ No		
Wetland Hydrology Present?	○ Yes	◉ No		

Remarks:
Although vegetation is heavilty grazed, determination was not affected because dominant plant species were identifiable.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft x 15ft)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status
1.				
2.				
3.				
4.				
	= Total Cover			
Sapling/Shrub Stratum (Plot size: 15ft x 15ft)				
1.			#######	#N/A
2.				
3.				
4.				
5.				
	= Total Cover			
Herb Stratum (Plot size: 5ft x 5ft)				
1. *Elymus repens*	90	Y	90.0	FAC
2. *Agropyron cristatum*	10	N	10.0	UPL
3.				
4.				
5.				
6.				
7.				
8.				
	100 = Total Cover			
Woody Vine Stratum (Plot size:)				
1.				
2.				
	= Total Cover			

% Bare Ground in Herb Stratum | % Cover of Biotic Crust

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	90	x 3 =	270
FACU species	0	x 4 =	0
UPL species	10	x 5 =	50
Column Totals:	100 (A)		320 (B)

Prevalence Index = B/A = 3.200

Hydrophytic Vegetation Indicators:

- ☑ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0¹
- ☐ Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? ◉ Yes ○ No

Remarks:
pasture grasses assume FAC

SOIL

Sampling Point: DP2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix			Redox Features					
(inches)	Color (moist)		%	Color (moist)		%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR	3/3	100						Sandy Loam	
6-14	2.5Y	5/1	100						Fine Sandy Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (LRR C)
- ☐ 1 cm Muck (A9) (LRR D)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) (LRR C)
- ☐ 2 cm Muck (A10) (LRR B)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? ○ Yes ◉ No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (Nonriverine)
- ☐ Sediment Deposits (B2) (Nonriverine)
- ☐ Drift Deposits (B3) (Nonriverine)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thick Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (Riverine)
- ☐ Sediment Deposits (B2) (Riverine)
- ☐ Drift Deposits (B3) (Riverine)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? ○ Yes ◉ No Depth (inches): _____

Water Table Present? ○ Yes ◉ No Depth (inches): _____

Saturation Present? (includes capillary fringe) ○ Yes ◉ No Depth (inches): _____

Wetland Hydrology Present? ○ Yes ◉ No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Parke Creek | City/County: Kittitas | Sampling Date: 10/16/2020

Applicant/Owner: Schmitt | State: wa | Sampling Point: DP3

Investigator(s): S. Tomassi, A. Lutes | Section, Township, Range:

Landform (hillslope, terrace, etc.): flat | Local relief (concave, convex, none): convex | Slope (%): 5

Subregion (LRR): B | Lat: 47.0160 | Long: -120.3165 | Datum: NAD83HARN

Soil Map Unit Name: Nitzel ashy silt loam gravelly substratum 0-2% slopes | NWI Classification: upland

Are climatic / hydrologic conditions on the site typical for this time of year? ◉ Yes ○ No (If no, explain in Remarks.)

Are Vegetation ☑ , Soil ☐ , or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? ◉ Yes ○ No

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	◉ Yes	○ No	**Is the Sampled Area within a Wetland?**	◉ Yes ○ No
Hydric Soil Present?	◉ Yes	○ No		
Wetland Hydrology Present?	◉ Yes	○ No		

Remarks:
Although vegetation is heavilty grazed, determination was not affected because dominant plant species were identifiable.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft x 15ft)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status
1.				
2.				
3.				
4.				
	= Total Cover			
Sapling/Shrub Stratum (Plot size: 15ft x 15ft)				
1.			#######	#N/A
2.				
3.				
4.				
5.				
	= Total Cover			
Herb Stratum (Plot size: 5ft x 5ft)				
1. *Elymus repens*	40	Y	44.4	FAC
2. *Typha latifolia*	40	Y	44.4	OBL
3. *Juncus effusus*	10	N	11.1	FACW
4.				
5.				
6.				
7.				
8.				
	90 = Total Cover			
Woody Vine Stratum (Plot size:)				
1.				
2.				
	= Total Cover			

% Bare Ground in Herb Stratum | % Cover of Biotic Crust

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	40	x 1 =	40
FACW species	10	x 2 =	20
FAC species	40	x 3 =	120
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	90 (A)		180 (B)

Prevalence Index = B/A = 2.000

Hydrophytic Vegetation Indicators:

- ☑ Dominance Test is >50%
- ☑ Prevalence Index is ≤3.0¹
- ☐ Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? ◉ Yes ○ No

Remarks:
associated with hillside seep

SOIL

Sampling Point: DP3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)		%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-14	10YR	2/1	98	7.5YR	4/6	2	C	M	Silt Loam	
	---									

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (LRR C)
- ☐ 1 cm Muck (A9) (LRR D)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) (LRR C)
- ☐ 2 cm Muck (A10) (LRR B)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? ◉ Yes ○ No

Remarks:
no redox

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☑ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1) (Nonriverine)
- ☐ Sediment Deposits (B2) (Nonriverine)
- ☐ Drift Deposits (B3) (Nonriverine)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thick Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (Riverine)
- ☐ Sediment Deposits (B2) (Riverine)
- ☐ Drift Deposits (B3) (Riverine)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? ◉ Yes ○ No Depth (inches): _____

Water Table Present? ◉ Yes ○ No Depth (inches): 10

Saturation Present? (includes capillary fringe) ◉ Yes ○ No Depth (inches): 8

Wetland Hydrology Present? ◉ Yes ○ No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Parke Creek | City/County: Kittitas | Sampling Date: 10/16/2020

Applicant/Owner: Schmitt | State: wa | Sampling Point: DP4

Investigator(s): S. Tomassi, A. Lutes | Section, Township, Range:

Landform (hillslope, terrace, etc.): flat | Local relief (concave, convex, none): none | Slope (%): 5

Subregion (LRR): B | Lat: 47.0160 | Long: -120.3165 | Datum: NAD83HARN

Soil Map Unit Name: Nitzel ashy silt loam gravelly substratum 0-2% slopes | NWI Classification: upland

Are climatic / hydrologic conditions on the site typical for this time of year? ◉ Yes ○ No (If no, explain in Remarks.)

Are Vegetation ☑, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? ◉ Yes ○ No

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	◉ Yes	○ No	**Is the Sampled Area within a Wetland?** ○ Yes ◉ No
Hydric Soil Present?	○ Yes	◉ No	
Wetland Hydrology Present?	○ Yes	◉ No	

Remarks:
Although vegetation is heavilty grazed, determination was not affected because dominant plant species were identifiable.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft x 15ft)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status
1.				
2.				
3.				
4.				
	= Total Cover			
Sapling/Shrub Stratum (Plot size: 15ft x 15ft)				
1.				
2.				
3.				
4.				
5.				
	= Total Cover			
Herb Stratum (Plot size: 5ft x 5ft)				
1. *Elymus repens*	45	Y	45.0	FAC
2. *Typha latifolia*	20	Y	20.0	OBL
3. *Juncus effusus*	35	Y	35.0	FACW
4.				
5.				
6.				
7.				
8.				
	100 = Total Cover			
Woody Vine Stratum (Plot size:)				
1.				
2.				
	= Total Cover			

% Bare Ground in Herb Stratum | % Cover of Biotic Crust

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	20	x 1 =	20
FACW species	35	x 2 =	70
FAC species	45	x 3 =	135
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		225 (B)

Prevalence Index = B/A = 2.250

Hydrophytic Vegetation Indicators:

- ☑ Dominance Test is >50%
- ☑ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? ◉ Yes ○ No

Remarks:

SOIL

Sampling Point: DP4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)		%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-14	10YR	4/2	100					Sandy Loam	
	---								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (LRR C)
- ☐ 1 cm Muck (A9) (LRR D)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) (LRR C)
- ☐ 2 cm Muck (A10) (LRR B)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? ○ Yes ◉ No

Remarks:
no redox

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (Nonriverine)
- ☐ Sediment Deposits (B2) (Nonriverine)
- ☐ Drift Deposits (B3) (Nonriverine)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thick Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (Riverine)
- ☐ Sediment Deposits (B2) (Riverine)
- ☐ Drift Deposits (B3) (Riverine)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? ○ Yes ◉ No Depth (inches): _____

Water Table Present? ○ Yes ◉ No Depth (inches): _____

Saturation Present? (includes capillary fringe) ○ Yes ◉ No Depth (inches): _____

Wetland Hydrology Present? ○ Yes ◉ No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Evidence of seasonal drainage patterns

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Parke Creek | City/County: Kittitas | Sampling Date: 10/16/2020

Applicant/Owner: Schmitt | State: wa | Sampling Point: DP5

Investigator(s): S. Tomassi, A. Lutes | Section, Township, Range:

Landform (hillslope, terrace, etc.): flat | Local relief (concave, convex, none): none | Slope (%): 5

Subregion (LRR): B | Lat: 47.0160 | Long: -120.3165 | Datum: NAD83HARN

Soil Map Unit Name: Nitzel ashy silt loam gravelly substratum 0-2% slopes | NWI Classification: upland

Are climatic / hydrologic conditions on the site typical for this time of year? ◉ Yes ○ No (If no, explain in Remarks.)

Are Vegetation ☑, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? ◉ Yes ○ No

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	◉ Yes	○ No	**Is the Sampled Area within a Wetland?** ○ Yes ◉ No
Hydric Soil Present?	○ Yes	◉ No	
Wetland Hydrology Present?	○ Yes	◉ No	

Remarks:
Although vegetation is heavilty grazed, determination was not affected because dominant plant species were identifiable.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft x 15ft)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status
1.				
2.				
3.				
4.				
	= Total Cover			
Sapling/Shrub Stratum (Plot size: 15ft x 15ft)				
1.				
2.				
3.				
4.				
5.				
	= Total Cover			
Herb Stratum (Plot size: 5ft x 5ft)				
1.				
2. *Typha latifolia*	80	Y	80.0	OBL
3. *Juncus effusus*	20	Y	20.0	FACW
4.				
5.				
6.				
7.				
8.				
	100 = Total Cover			
Woody Vine Stratum (Plot size:)				
1.				
2.				
	= Total Cover			

% Bare Ground in Herb Stratum | % Cover of Biotic Crust

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	80	x 1 =	80
FACW species	20	x 2 =	40
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		120 (B)

Prevalence Index = B/A = 1.200

Hydrophytic Vegetation Indicators:

☑ Dominance Test is >50%

☑ Prevalence Index is ≤3.0¹

☐ Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? ◉ Yes ○ No

Remarks:

SOIL

Sampling Point: DP5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-14	10YR 3/2	100					Loam	very compacted
	---							

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (LRR C)
- ☐ 1 cm Muck (A9) (LRR D)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) (LRR C)
- ☐ 2 cm Muck (A10) (LRR B)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? ○ Yes ◉ No

Remarks:
area is extremely compacted

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (Nonriverine)
- ☐ Sediment Deposits (B2) (Nonriverine)
- ☐ Drift Deposits (B3) (Nonriverine)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
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- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thick Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (Riverine)
- ☐ Sediment Deposits (B2) (Riverine)
- ☐ Drift Deposits (B3) (Riverine)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? ○ Yes ◉ No Depth (inches): _____

Water Table Present? ○ Yes ◉ No Depth (inches): _____

Saturation Present? (includes capillary fringe) ○ Yes ◉ No Depth (inches): _____

Wetland Hydrology Present? ○ Yes ◉ No

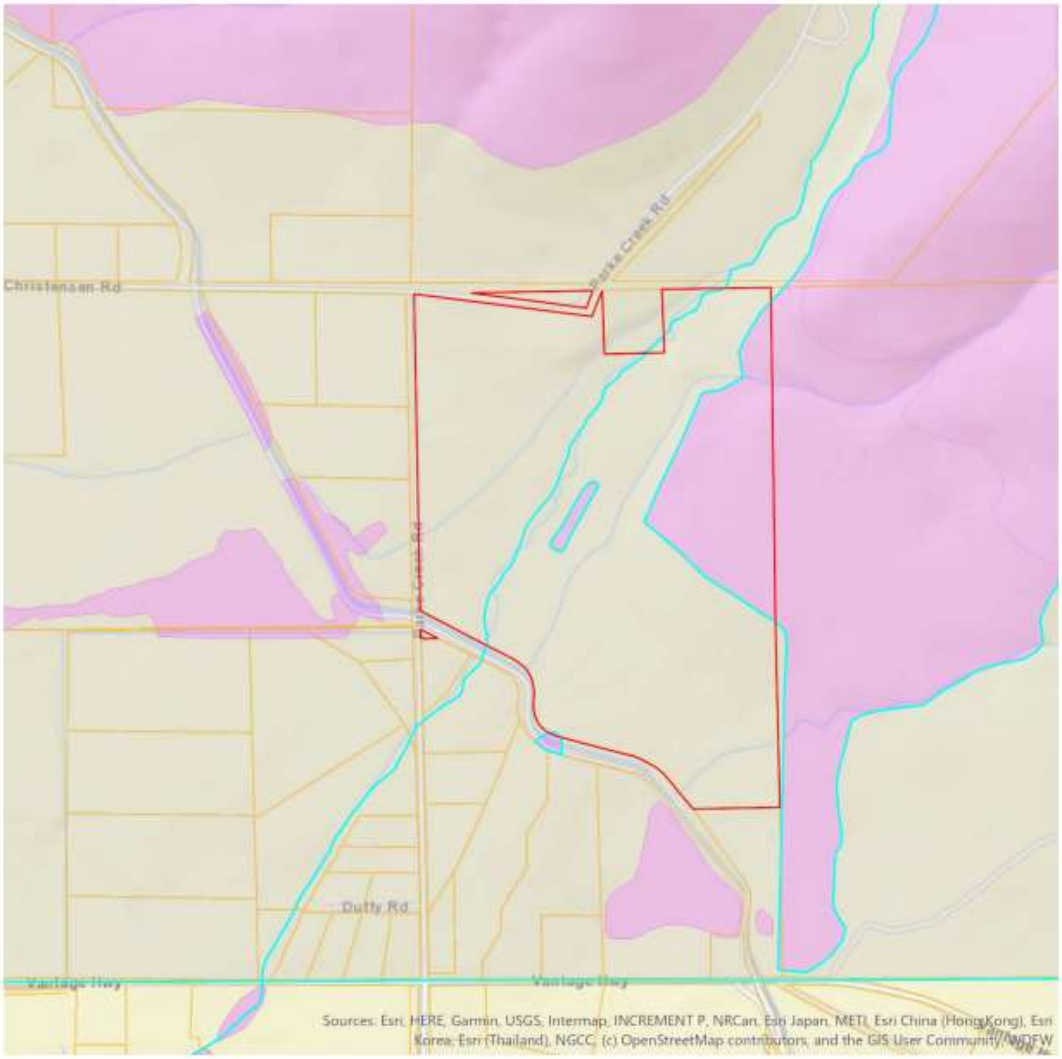
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Appendix B

PHS Map and Report

Priority Habitats and Species on the Web



Report Date: 10/19/2020, Parcel ID: 18-20-34000-0011

PHS Species/Habitats Overview:

Occurence Name	Federal Status	State Status	Generalized Location
Rainbow Trout	N/A	N/A	No
Shrub-steppe	N/A	N/A	No
Freshwater Emergent Wetland	N/A	N/A	No
Golden eagle	N/A	Candidate	Yes

PHS Species/Habitats Details:

Rainbow Trout	
Scientific Name	*Oncorhynchus mykiss*
Priority Area	Occurrence/Migration
Site Name	Park Creek
Accuracy	NA
Notes	LLID: 1204747469396, Fish Name: Rainbow Trout, Run Time: Unknown or not Applicable, Life History: Resident
Source Record	3996
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversity/soc/soc.htm
Geometry Type	Lines

Shrub-steppe	
Priority Area	Terrestrial Habitat
Site Name	QUILOMENE
Accuracy	1/4 mile (Quarter Section)
Notes	VERY LARGE INTACT TRACT OF HIGH QUALITY SHRUB-STEPPE WITH GOOD SHRUB COVER AND LIMITED PATCHES OF INVASIVES. BORDERED BY FORESTED RIDGES AND COLUMBIA RIVER.SOME RECENT FIRE HISTORY AND SOME LIMITED DEVELOPMENT OCCURRING.
Source Record	920479
Source Dataset	PHSREGION
Source Name	DOWNES, SCOTT WDFW
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: PALUSTRINE - NWI Code: PEMC
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: PALUSTRINE - NWI Code: PEMC
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Golden eagle	
Scientific Name	*Aquila chrysaetos*
Notes	This polygon mask represents one or more records of the above species or habitat occurrence. Contact PHS Data Release (360-902-2543) for obtaining information about masked sensitive species and habitats.
Federal Status	N/A
State Status	Candidate
PHS Listing Status	PHS Listed Occurrence
Sensitive	Y
SGCN	Y
Display Resolution	TOWNSHIP
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00026

DISCLAIMER. This report includes information that the Washington Department of Fish and Wildlife (WDFW) maintains in a central computer database. It is not an attempt to provide you with an official agency response as to the impacts of your project on fish and wildlife. This information only documents the location of fish and wildlife resources to the best of our knowledge. It is not a complete inventory and it is important to note that fish and wildlife resources may occur in areas not currently known to WDFW biologists, or in areas for which comprehensive surveys have not been conducted. Site specific surveys are frequently necessary to rule out the presence of priority resources. Locations of fish and wildlife resources are subject to variation caused by disturbance, changes in season and weather, and other factors. WDFW does not recommend using reports more than six months old.

Exhibit C

December 3, 2020 letter from Plateau Archeological Investigations, LLC to Ms. Rikki Schmitt re: Archaeological Survey of the Brown & Jackson Ponds Project, Kittitas County, Washington

PLATEAU
ARCHAEOLOGICAL INVESTIGATIONS, LLC

December 3, 2020

Ms. Rikki Schmitt
Brown & Jackson
2202 E. 1st Avenue
Ellensburg, WA 98926

Re: Archaeological Survey of the Brown & Jackson Ponds Project, Kittitas County, Washington.

Dear Rikki,

As you are aware, Plateau Archaeological Investigations, LLC is conducting a cultural resource survey of the proposed Brown & Jackson Ponds Project. The Brown & Jackson Ponds project required completion of a Washington State Environmental Policy Act (SEPA) checklist. During the SEPA permitting process, Kittitas County Public Works initiated consultation with the Washington State Department of Archaeology and Historic Preservation (DAHP) and the Yakama National Cultural Resource Program (Yakama Nation). Both DAHP and the Yakama Nation expressed concerns regarding the potential for encountering archaeological resources during the undertaking. Both parties recommended that a professional archaeological survey of the project area be carried out prior to ground-disturbing activities. The Brown & Jackson Ponds Project Area (Project Area) covers a 3.3 acre portion of Parcel 295134, and lies within Section 34 of Township 18 North, Range 20 East, Willamette Meridian (Figure 1).

Prior to fieldwork, Plateau conducted a background review of the project area to identify if any known archaeological sites or historic properties are present on, or adjacent to, the Project Area. Two precontact era lithic scatters (45KT2254 and 45KT2255) lie between 0.75 - 1.0 mile northeast of the Project Area.

Survey work was completed in accordance with the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44716, September 29, 1983) and under the supervision of Principal Investigator, David Harder. Plateau archaeologists Justin Fitzpatrick and Moira Riggs conducted the cultural resource survey on October 28 and November 3, 4, 5, 6, 24, and 25. The limits of the Project Area were identified using project plans provided by Brown & Jackson. Survey conditions were in the mid 30s to 40s, intermittent overcast, intermittent wind, and intermittent rain.

P.O. Box 714
Pullman, WA 99163
(509) 332-3830 VOICE/FAX

The Plateau archaeologists conducted a pedestrian survey over all portions of the Project Area, and excavated 69 subsurface probes throughout. The subsurface probes ranged in depth from 15.0-55.1 in (38-140 cm), averaging 39.5 in (100.3 cm) in depth . The survey and subsurface investigations of the Brown & Jackson Ponds Project resulted in the discovery of a precontact lithic scatter (temporary identified as: PAI-JF-101). The site is a precontact era lithic scatter.

Based upon the existing information, this resource may be eligible for listing in the NRHP, however, additional sampling would be needed to confirm this determination. The findings will be included within our final report, and within a site form submitted to the DAHP and the Yakama Nation for comment. Without further testing, all ground-disturbing activities will be prohibited within the site boundaries. Additionally, all ground-disturbing activities associated with the project will be carried out under the guidance of an inadvertent discovery plan (IDP). The IDP will provide guidance for action should additional archaeological materials be encountered during the undertaking.

Should ground-disturbing activities reveal any cultural materials (e.g., structural remains, Euroamerican artifacts, or Native American artifacts), activity will cease and the Washington State Historic Preservation Officer should be notified immediately. The results and recommendations in this document concern the specified area of potential effect. The proponent is advised that the results and recommendations reported herein do not apply to areas of potential effect altered or expanded post the cultural resource survey. A supplementary cultural resource review will be necessary should the area of potential effect be altered or changed, as per 36 CFR 800.4.

If ground disturbing activities encounter human skeletal remains during the course of construction, then all activity ***will*** cease that may cause further disturbance to those remains. The area of the find will be secured and protected from further disturbance to those remains. The area of the find will be secured and protected from further disturbance until the State provides notice to proceed. The finding of human skeletal remains ***will*** be reported to the county medical examiner/coroner ***and*** local law enforcement in the most expeditious manner possible. The remains will not be touched, moved, or further disturbed. The county medical examiner/coroner will assume jurisdiction over the human skeletal remains and make a determination of whether those remains are forensic or non-forensic. If the county medical examiner/coroner determines the remains are non-forensic, then they will report that finding to the DAHP who will then take jurisdiction over the remains. The DAHP will notify any appropriate cemeteries and all affected tribes of the find. The State Physical Anthropologist will make a determination of whether the remains are Indian or Non-Indian and report that finding to any appropriate cemeteries and affected tribes. The DAHP will then handle all consultation with the affected parties as to the future preservation, excavation, and disposition of the remains.

Sincerely,

Justin Fitzpatrick

SE-20-00003 Brown and Jackson Lagoon Ponds Comment Matrix

Comment Author	Comment Summary	Applicant Response Summary	Staff Response
Kittitas County CDS (Building)	Any buildings or structures will need a building permit and must comply with the most current adopted codes and standards for Washington State and Kittitas County	At this time, Brown & Jackson does not plan to construct any buildings or structures as part of the proposal. However, Brown & Jackson agrees that if any buildings or structures are planned, it will obtain the appropriate building permits from Kittitas County and will comply with the codes and standards for Washington State and Kittitas County.	
Department of Archaeology & Historic Preservation	The proposed project location has been identified of having high potential for archaeological resources. DAHP has recommended a professional archaeological survey of the project areas prior to ground disturbing activities. Consultation with concerned Tribes is recommended regarding cultural resource issues. Section 106 of the National Historic Preservation Act must be followed if any federal funds or permits are associated with this proposal.	Plateau Archaeological Investigations (Plateau) conducted a cultural resource survey of the Property. A letter summarizing Plateau's methodology, observations, findings and recommendations was attached to Brown & Jackson's response to comments as Exhibit C. The cultural resource survey identified an area of precontact lithic scatter. Brown & Jackson's engineers are in the process of modifying the pond design to entirely avoid impacts to this area. In addition, all ground-disturbing activities associated with the project will be carried out under the guidance of an inadvertent discovery plan. No federal funds or permits are associated with this proposal; therefore Section 106 NHPA is not applicable.	
State of Washington Department of Children, Youth, and Families	DCYF stated their concerns for the proposal within close proximity of the Parke Creek community facility without sufficient evaluation of whether it is an authorized use, expressed further concern with the potential environmental impacts and human health and safety concerns and requests further and more specific analysis of the environmental impacts such proposal would create, such as odor impacts, aerosolization of septage from the ponds and land application. DCYF is not in support of the project or the issuance of an MDNS and requested denial of the proposal.	Regarding authorized land use, please see Brown & Jackson's response to comments at pages 3-4. Regarding concerns over odor from the storage ponds or land application, please see Brown & Jackson's response to comments at pages 2-3.	
Kittitas County Public Health	KCPH referenced KCC 13.04.200(5) requiring a sewage lagoon utilized to dump the contents removed from septic tanks or any other sewage collection receptacles would be subject to the Health Officers approval before any waste could be dumped and stored at the location. Concerns were raised in regards to areas of surface and ground water and the need for Vector control established along the collection sites proximity to eisting residences, along with a mitigation plan including preventative measures to protect environmental health issues.	Brown & Jackson will seek KCPH authorization prior to beginning use of the proposed storage ponds and will comply with the applicable requirements of KCC 13.04.200(5).	
Kittitas Reclamation District/ Cascadia Law Group	Cascadia Law Group provided codes that support the proposed use is not an authoried use in the Agriculture 20 zone and argue it is categorized as wastewater treatment, not authorized in the A-20 Zone. Cascadia Law Group stated that the proposed activity would better serve the community and county by using the county landfill and receiving facility for property treatement and handling, or an alternate site should be identified, due to the safety concerns regarding health, water and environmental concerns. The Kittitas Reclamation District stated that the subject proposal is severly lacking in scope of impacts on environment, KRD infratructure, and downstream irrigators. They voice concern over the irrigation water provided to agriculture downstream from the proposed project and the potential impacts the septage would have on the KRD canal through various potential pathways. KRD does not believe the project to be an authorized use in the agricultural zone.	Regarding authorized land use, please see Brown & Jackson's response to comments at pages 3-4. Regarding concerns over odor, please see Brown & Jackson's response to comments at pages 2-3. Regarding concerns over potential surface water or groundwater impacts, land application methods, timing, and location, please see Exhibit A to Brown & Jackson's response to comments.	
Kittitas Valley Fire and Rescue	KVFR defers to Kittitas County Fire Marshal for Fire Code matters. During construction, KVFR needs to understand any traffic impacts and be notified if they envision confined space rescue needs.	Brown & Jackson will provide notification to KVFR in the event that confined space rescue needs are anticipated. Regarding anticipated traffic impacts, please see Brown & Jackson's response to comments at page 4.	
Kittitas County Public Works	KCPW commented on the requirements for the following: Commercial Access, Private Bridge, engineered stormwater requirements, Haul Road agreements, and the floodplain.	Brown & Jackson will comply with the applicable requirements and work with KCPW to obtain any applicable permits prior to operation.	

Operating Engineers Regional Training Program	Stated their full opposition to an approval of the SEPA application and moving forward with the proposed project in this location. The fully functional training facility will be adversely affected by the emissions associated with the proposed ponds.	Regarding concerns over odor, please see Brown & Jackson's response to comments at pages 2-3.	
Washington State Fish and Wildlife	WDFW commented on the likely hood of needing a Hydraulic Project Approval for improvemet to the roadway and/or water crossings and additional work associate with construction of the storage ponds. More detailed drawings will be needed to show the elevations of each proposed element relative to the surrounding water bodies. Numerous "Fish and Wildlife Habitat Conservation Areas" are near the proposed project and need to be taken into consideration. WDFW recommends: a qualified professioal identify all critical areas and potential impacts and necessary mitigation measures, A full hydraulic and hydrologic resport for WDFW's review be completed prior to approval of the project, Installation of permanent fencing of the riparian habitats and the planting of riparian species along the banks.	Brown & Jackson retained an Avia Environmental Consulting (Avia) to perform the appropriate survey for wetlands and critical areas. Avia's report is attached to Brown & Jackson's response to comments as Exhibit B.	
Washington State Department of Ecology	DOE recommends the County request a wetland investigation be conducted prior to determination	Brown & Jackson retained an Avia Environmental Consulting (Avia) to perform the appropriate survey for wetlands and critical areas. Avia's report is attached to Brown & Jackson's response to comments as Exhibit B.	
Yakama Nation Cultural Resources Program	Yakama Nation CRP is requesting an archaeological survey be completed for this proposal	Plateau Archaeological Investigations (Plateau) conducted a cultural resource survey of the Property. A letter summarizing Plateau's methodology, observations, findings and recommendations was attached to Brown & Jackson's response to comments as Exhibit C. The cultural resource survey identified an area of precontact lithic scatter. Brown & Jackson's engineers are in the process of modifying the pond design to entirely avoid impacts to this area. In addition, all ground-disturbing activities associated with the project will be carried out under the guidance of an inadvertent discovery plan.	
Alison R. Shriner, Axman Farms, Barry Brunson, Bill Stansbery, Bob & Cindy Knudtson, Bruce & Zoe Katocs, Carolyn Fein & Ian Halcott, Clinton Van de Venter, Dale & Susan Beach, Dale Brusius, Darin Dodd, David & Georgia Arnold, David A. Mowat, David Yound, Debbie Young, Deena Pruatt, Dennis & Jo Bunger, Diane Roznik, Don & Barbra Weber, Don Shriner, Gayl Curtiss, GT Farms LLC, Herman & Cheryl Cornelius, Jeff and Leslie Bray, Jennifer & David Martin, Jennifer Beaulieu, Jennifer Orcuctt-Patteson, Jenny Webber, Jesse Cox, Jim & Diane Skaggs, Jim & Mary Kelly, Joe H. Paul, Karlin Ekberg,	Stated their concerns for Health of the local community, Air pollution, property values, ground water, the requirement for wastewater holding tanks, water runoff and the impacts a leak would have on ground water and well water, runoff from the now in the mountains and flooding, the lack of wildlife identified in the application, the lack of the Spill Response Plan referenced in the appication along with the Department of Ecology's General Biosolids Permit filed by Brown & Jackson, ph level testing methods of the biosolids and land application procedures, suggested that septage lagoons do not fit the spirit of the Agriculture Zone.	Regarding authorized land use, please see Brown & Jackson's response to comments at pages 3-4. Regarding concerns over odor, please see Brown & Jackson's response to comments at pages 2-3. Regarding concerns over potential surface water or groundwater impacts; land application methods, timing, and location; spill response; and compliance with Ecology's General Biosolids Permit, please see Exhibit A to Brown & Jackson's response to comments.	

Kathy Hull, Kelly Schott, Kenneth F. Jochimsen, Kevin & Megan Haydon, Larry Best, Larry Lowther, Lucinda Anderson, Mark Patteson, Mary Ann Hawk, Meghan Anderson, Michelle Adams, Nels & Char Sorenson, Norm Peck, Old Vantage Hwy and Park Creek Residents c/o Gary Bye, Paul & Judy Kjosness, Rodney & Janielle Paul, Sage & Kimmi Shelton, Sandy Braden, Sara Moorehead, Scott & Kay Shelton, Shawn & Chery Byers, Sky & Karri Shelton, Steve & Bonnie Hendrickson, Sylvia Shriner, Tom & Julie O'Neill, Toni Taylor, Trinity Farms - Mike Forman, Venture Farms - Harland & Jody Radomske, Verne & Mary Rainey,	Stated their concerns for Health of the local community, Air pollution, property values, ground water, the requirement for wastewater holding tanks, water runoff and the impacts a leak would have on ground water and well water, runoff from the snow in the mountains and flooding, the lack of wildlife identified in the application, the lack of the Spill Response Plan referenced in the appication along with the Department of Ecology's General Biosolids Permit filed by Brown & Jackson, ph level testing methods of the biosolids and land application procedures, suggested that septage lagoons do not fit the spirit of the Agriculture Zone.	Regarding authorized land use, please see Brown & Jackson's response to comments at pages 3-4. Regarding concerns over odor, please see Brown & Jackson's response to comments at pages 2-3. Regarding concerns over potential surface water or groundwater impacts; land application methods, timing, and location; spill response; and compliance with Ecology's General Biosolids Permit, please see Exhibit A to Brown & Jackson's response to comments. Regarding wildlife and critical areas, please see Avia Report attached as Exhibit B to Brown & Jackson's response to comments.	