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January 14, 2021

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 just under one million 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 26.3 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. The ponds are located adjacent to hillsides to the north and southeast that converge to an arroyo that is located just southeast of the ponds. The ponds are designed and graded in such a manner that the runoff from the hillsides and arroyo will flow into the two foot (2 ft.) deep and two foot (2 ft.) wide channel. This channel diverts the flow of the runoff around the pond and to the native grade to the north and west of the ponds. Additionally, the edges of the ponds are raised above the adjacent grade, so that in the event of a severe storm the nearby surface runoff will be directed around the ponds.

Based on the surrounding topography the arroyo has the potential to collect Stormwater runoff from an approximately one square mile (1 sq. mi.) area of hillsides. Using an SCS Type 1A Regional Storm Hydrograph, it was determined that the maximum design flow of surface runoff from the hillsides would be approximately 4.9 cubic feet per second (4.9 ft^3/s). Using Manning's equation, a roughness coefficient of 0.029 and a slope of two percent (2%), it was determined that the shallow trapezoidal channel, designed to divert the flow, has a capacity of handling a maximum flow that is larger than the design flow of surface runoff by safety factor greater than two.

Also, winter precipitation that occurs when the ponds are full typically takes the form of snow and ice. Snow and Ice does not typically generate large amounts of runoff. Should rain occur the warmer rains typically that the ground sufficiently to absorb most of the expected runoff. However, with the edges of the ponds raised from the native ground and the channel to divert the flow of runoff, 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.

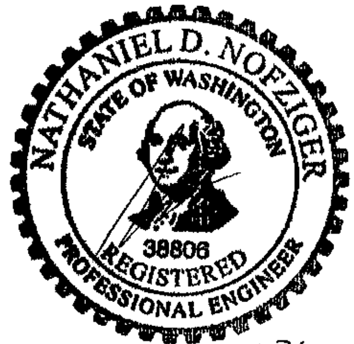
Additionally, Western Pacific Engineering and Survey reviewed the Washington State Department of Ecology’s website for well information surrounding the land application field and the storage ponds. The website showed several wells located south of the site and a couple locate to the north, as well. The 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



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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

Other Items included:

- An exhibit showing the run off area considered
- Precipitation map of a 25-Year, 24-Hour Storm
- Run off Calculations

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	14235	2.41	2.17	(1346)	127889	945583	
November	19	5000	95000	1.24	29419	0.00	0.00	0	252308	0	
December	20	5000	100000	1.56	37011	0.00	0.00	0	389319	0	
January	22	5000	110000	1.19	28233	0.00	0.00	0	527551	0	
February	20	5000	100000	0.82	19454	0.00	0.00	0	647006	0	
March	20	5000	100000	0.68	16133	0.00	0.00	0	763139	0	
April	22	5000	110000	0.61	14472	5.34	4.81	(49958)	837653	0	
May	24	5000	120000	0.65	15421	7.46	6.72	(78838)	894236	0	
June	21	5000	105000	0.59	13998	8.34	7.51	(98225)	915009	0	
July	22	5000	110000	0.33	7829	9.46	8.51	(122750)	910088	0	
August	22	5000	110000	0.24	5694	7.90	7.11	(112078)	913705	0	
September	20	5000	100000	0.45	10676	5.12	4.61	(78798)	945583	0	
Req'd Pond Volume									945,583		26.3
Total Working Days	255									**Total Irrigated Acres**	26.3

Evaporation FS*** 0.9

Actual Volume of Ponds 1,365,580

Notes:

* The Area used in the net precipitation caclulations was 38036 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

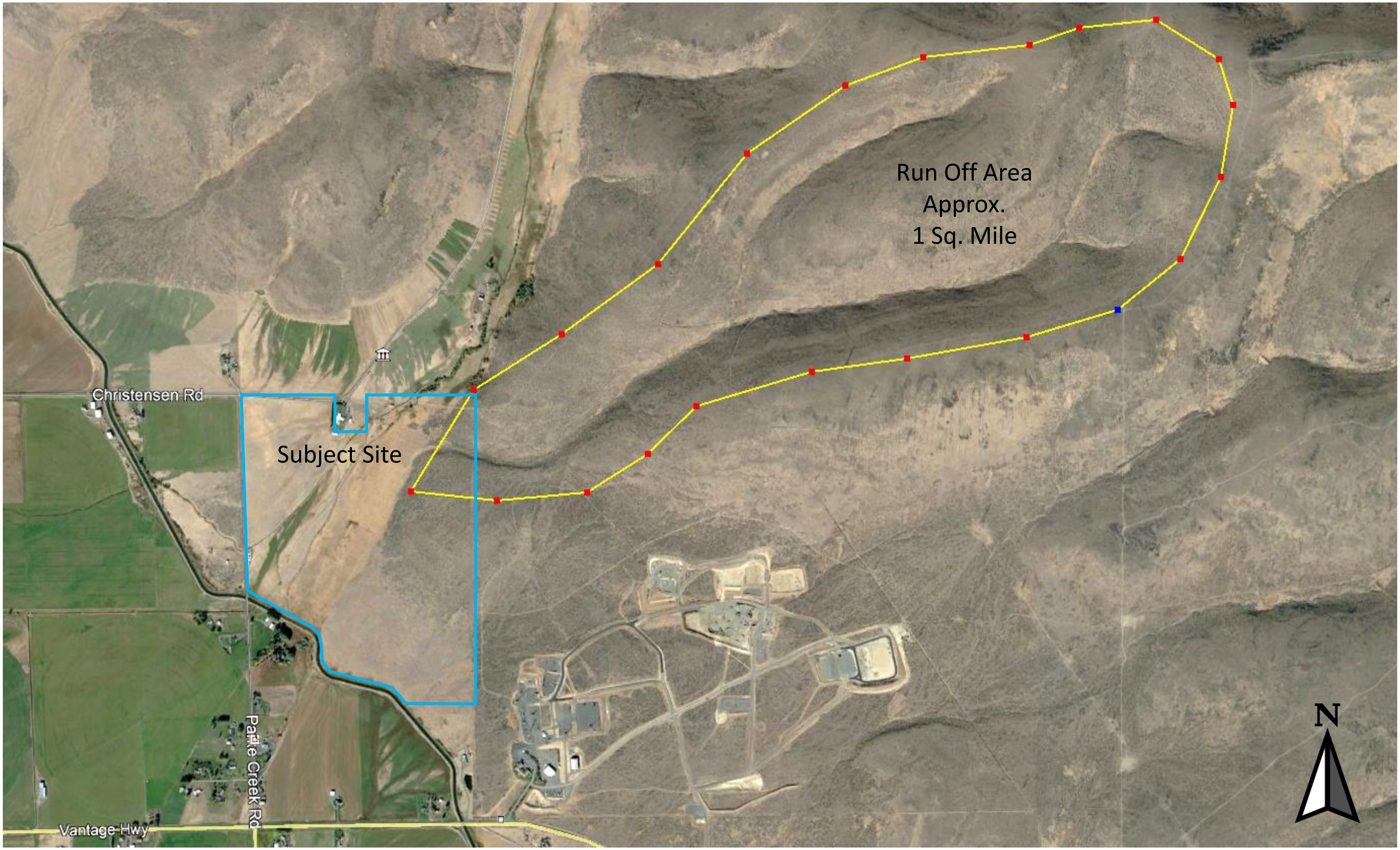
National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

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



WESTERN PACIFIC
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A TERRA DEVELOPMENT SERVICES CORPORATIONS

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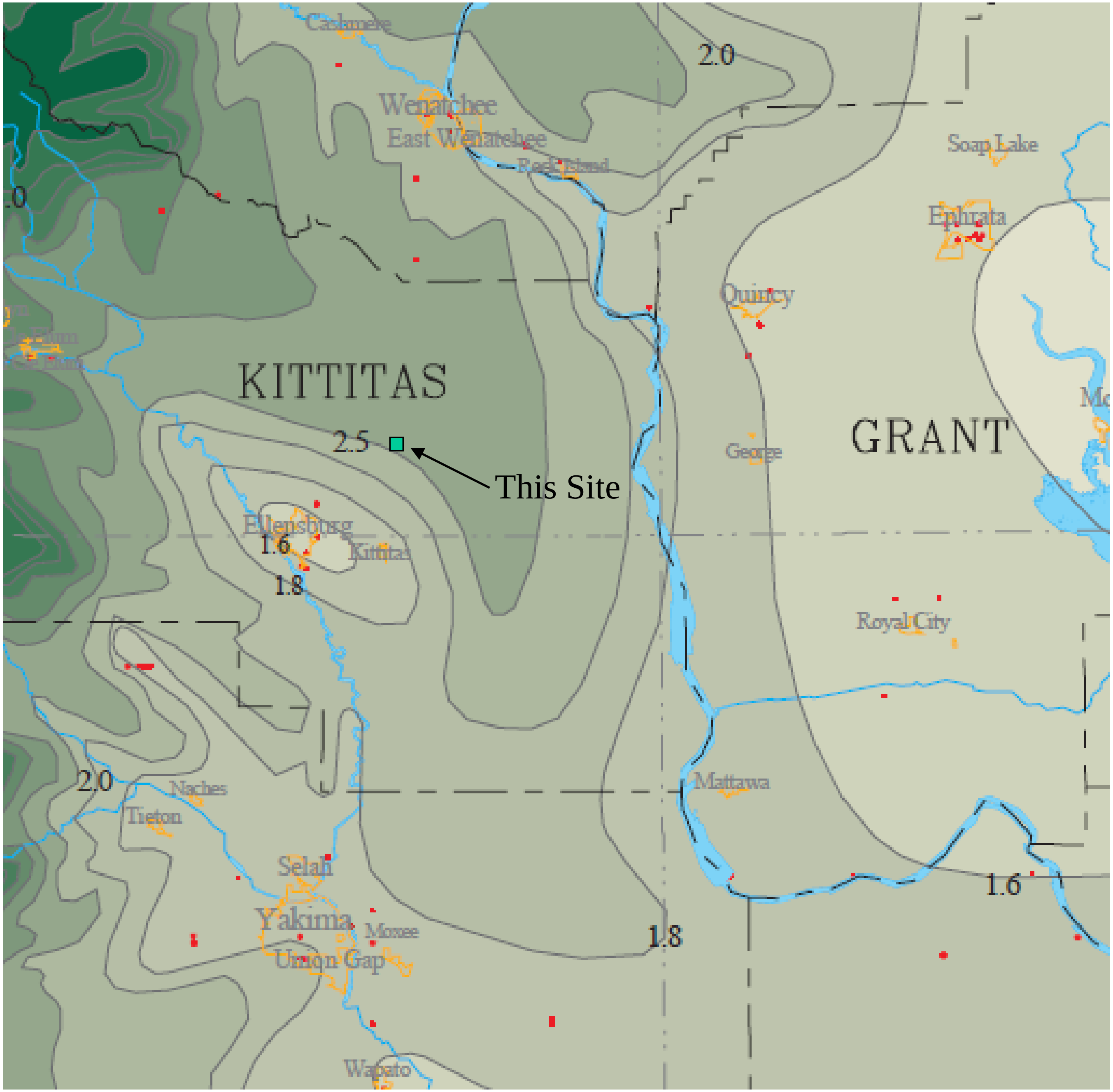
DATE:
January 2021

WPES Project #:
20410

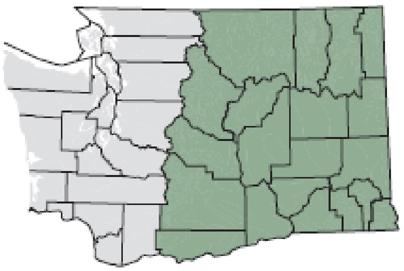
BROWN & JACKSON

Stormwater Run Off

Kittitas County, Washington



Eastern Washington Stormwater Manual



25-Year 24-Hour Isopluvials

Source: NOAA Atlas 2, Volume IX, 1973

Precipitation in inches

County(2003, 1:24,000)
City(2003, 1:24,000)
Latitude/Longitude(1/10 degree)
Isopluvial(1973, 1:2,000,000)
NOAA/NWS Station(1931-1998)

N

Scale 1:1,600,000

Miles

0 16.5 33

Water Quality Program

WASHINGTON STATE DEPARTMENT OF ECOLOGY

GIS Technical Services

02/25/04

Figure_4.3.5

SCS Type 1A Regional Storm - Central Basin

Area (acres) = 640 | P (inches) = 3 | d_t (min)= 6 | Tc (min) = 5

W= 0.375

Pervious Area (acres) = 640 | CN = 47 | S = 11.28 | 0.2S = 2.26 | **Max Design Flow** **4.905**

Impervious Area (acres) = 0 | CN = 98 | S = 0.20 | 0.2S = 0.04

1 Time Increment	2.0 Time Hours	2 Time (min)	3 Rainfall Distribution (Fraction)	4 Incremental Rainfall (inches)	5 Accum. Rainfall (inches)	6 Pervious Acc. Run (inches)	7 Pervious Inc. Run (inches)	8 Impervious Acc. Run (inches)	9 Impervious Inc. Run (inches)	10 Total Runoff (inches)	11 Instant Flow (inches)	12 Design Flow Rate (cfs)
1	0.0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	0.1	6	0.002	0.006	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3	0.2	12	0.002	0.006	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4	0.3	18	0.002	0.006	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5	0.4	24	0.002	0.006	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6	0.5	30	0.002	0.006	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7	0.6	36	0.002	0.006	0.036	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8	0.7	42	0.002	0.006	0.042	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9	0.8	48	0.002	0.006	0.048	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10	0.9	54	0.002	0.006	0.054	0.000	0.000	0.001	0.001	0.000	0.000	0.000
11	1.0	60	0.002	0.006	0.060	0.000	0.000	0.002	0.001	0.000	0.000	0.000
12	1.1	66	0.003	0.009	0.069	0.000	0.000	0.003	0.002	0.000	0.000	0.000
13	1.2	72	0.003	0.009	0.078	0.000	0.000	0.006	0.002	0.000	0.000	0.000
14	1.3	78	0.003	0.009	0.087	0.000	0.000	0.009	0.003	0.000	0.000	0.000
15	1.4	84	0.003	0.009	0.096	0.000	0.000	0.012	0.003	0.000	0.000	0.000
16	1.5	90	0.003	0.009	0.105	0.000	0.000	0.015	0.004	0.000	0.000	0.000
17	1.6	96	0.003	0.009	0.114	0.000	0.000	0.019	0.004	0.000	0.000	0.000
18	1.7	102	0.003	0.009	0.123	0.000	0.000	0.024	0.004	0.000	0.000	0.000
19	1.8	108	0.003	0.009	0.132	0.000	0.000	0.028	0.005	0.000	0.000	0.000
20	1.9	114	0.003	0.009	0.141	0.000	0.000	0.033	0.005	0.000	0.000	0.000
21	2.0	120	0.003	0.009	0.150	0.000	0.000	0.038	0.005	0.000	0.000	0.000
22	2.1	126	0.003	0.009	0.159	0.000	0.000	0.043	0.005	0.000	0.000	0.000
23	2.2	132	0.003	0.009	0.168	0.000	0.000	0.049	0.005	0.000	0.000	0.000
24	2.3	138	0.004	0.012	0.180	0.000	0.000	0.056	0.008	0.000	0.000	0.000
25	2.4	144	0.003	0.009	0.189	0.000	0.000	0.062	0.006	0.000	0.000	0.000
26	2.5	150	0.003	0.009	0.198	0.000	0.000	0.068	0.006	0.000	0.000	0.000
27	2.6	156	0.003	0.009	0.207	0.000	0.000	0.075	0.006	0.000	0.000	0.000
28	2.7	162	0.003	0.009	0.216	0.000	0.000	0.081	0.006	0.000	0.000	0.000
29	2.8	168	0.004	0.012	0.228	0.000	0.000	0.090	0.009	0.000	0.000	0.000
30	2.9	174	0.003	0.009	0.237	0.000	0.000	0.096	0.007	0.000	0.000	0.000
31	3.0	180	0.003	0.009	0.246	0.000	0.000	0.103	0.007	0.000	0.000	0.000
32	3.1	186	0.003	0.009	0.255	0.000	0.000	0.110	0.007	0.000	0.000	0.000
33	3.2	192	0.003	0.009	0.264	0.000	0.000	0.117	0.007	0.000	0.000	0.000
34	3.3	198	0.003	0.009	0.273	0.000	0.000	0.124	0.007	0.000	0.000	0.000
35	3.4	204	0.004	0.012	0.285	0.000	0.000	0.133	0.009	0.000	0.000	0.000
36	3.5	210	0.003	0.009	0.294	0.000	0.000	0.140	0.007	0.000	0.000	0.000
37	3.6	216	0.003	0.009	0.303	0.000	0.000	0.147	0.007	0.000	0.000	0.000
38	3.7	222	0.004	0.012	0.315	0.000	0.000	0.157	0.010	0.000	0.000	0.000
39	3.8	228	0.004	0.012	0.327	0.000	0.000	0.167	0.010	0.000	0.000	0.000
40	3.9	234	0.003	0.009	0.336	0.000	0.000	0.175	0.007	0.000	0.000	0.000
41	4.0	240	0.004	0.012	0.348	0.000	0.000	0.185	0.010	0.000	0.000	0.000
42	4.1	246	0.004	0.012	0.360	0.000	0.000	0.195	0.010	0.000	0.000	0.000
43	4.2	252	0.003	0.009	0.369	0.000	0.000	0.202	0.008	0.000	0.000	0.000
44	4.3	258	0.004	0.012	0.381	0.000	0.000	0.213	0.010	0.000	0.000	0.000
45	4.4	264	0.004	0.012	0.393	0.000	0.000	0.223	0.010	0.000	0.000	0.000
46	4.5	270	0.004	0.012	0.405	0.000	0.000	0.233	0.010	0.000	0.000	0.000
47	4.6	276	0.004	0.012	0.417	0.000	0.000	0.244	0.010	0.000	0.000	0.000
48	4.7	282	0.004	0.012	0.429	0.000	0.000	0.254	0.011	0.000	0.000	0.000
49	4.8	288	0.004	0.012	0.441	0.000	0.000	0.265	0.011	0.000	0.000	0.000
50	4.9	294	0.005	0.015	0.456	0.000	0.000	0.278	0.013	0.000	0.000	0.000
51	5.0	300	0.004	0.012	0.468	0.000	0.000	0.289	0.011	0.000	0.000	0.000
52	5.1	306	0.005	0.015	0.483	0.000	0.000	0.303	0.013	0.000	0.000	0.000
53	5.2	312	0.004	0.012	0.495	0.000	0.000	0.313	0.011	0.000	0.000	0.000
54	5.3	318	0.005	0.015	0.510	0.000	0.000	0.327	0.014	0.000	0.000	0.000
55	5.4	324	0.005	0.015	0.525	0.000	0.000	0.341	0.014	0.000	0.000	0.000
56	5.5	330	0.005	0.015	0.540	0.000	0.000	0.354	0.014	0.000	0.000	0.000
57	5.6	336	0.005	0.015	0.555	0.000	0.000	0.368	0.014	0.000	0.000	0.000
58	5.7	342	0.005	0.015	0.570	0.000	0.000	0.382	0.014	0.000	0.000	0.000
59	5.8	348	0.005	0.015	0.585	0.000	0.000	0.396	0.014	0.000	0.000	0.000
60	5.9	354	0.005	0.015	0.600	0.000	0.000	0.410	0.014	0.000	0.000	0.000
61	6.0	360	0.006	0.018	0.618	0.000	0.000	0.426	0.017	0.000	0.000	0.000
62	6.1	366	0.006	0.018	0.636	0.000	0.000	0.443	0.017	0.000	0.000	0.000
63	6.2	372	0.006	0.018	0.654	0.000	0.000	0.460	0.017	0.000	0.000	0.000
64	6.3	378	0.006	0.018	0.672	0.000	0.000	0.477	0.017	0.000	0.000	0.000
65	6.4	384	0.007	0.021	0.693	0.000	0.000	0.497	0.020	0.000	0.000	0.000
66	6.5	390	0.006	0.018	0.711	0.000	0.000	0.514	0.017	0.000	0.000	0.000
67	6.6	396	0.006	0.018	0.729	0.000	0.000	0.531	0.017	0.000	0.000	0.000
68	6.7	402	0.006	0.018	0.747	0.000	0.000	0.548	0.017	0.000	0.000	0.000
69	6.8	408	0.006	0.018	0.765	0.000	0.000	0.565	0.017	0.000	0.000	0.000
70	6.9	414	0.006	0.018	0.783	0.000	0.000	0.582	0.017	0.000	0.000	0.000
71	7.0	420	0.007	0.021	0.804	0.000	0.000	0.602	0.020	0.000	0.000	0.000
72	7.1	426	0.007	0.021	0.825	0.000	0.000	0.622	0.020	0.000	0.000	0.000
73	7.2	432	0.008	0.024	0.849	0.000	0.000	0.645	0.023	0.000	0.000	0.000

74	7.3	438	0.008	0.024	0.873	0.000	0.000	0.668	0.023	0.000	0.000	0.000
75	7.4	444	0.009	0.027	0.900	0.000	0.000	0.694	0.026	0.000	0.000	0.000
76	7.5	450	0.010	0.030	0.930	0.000	0.000	0.723	0.029	0.000	0.000	0.000
77	7.6	456	0.021	0.063	0.993	0.000	0.000	0.784	0.061	0.000	0.000	0.000
78	7.7	462	0.024	0.072	1.065	0.000	0.000	0.854	0.070	0.000	0.000	0.000
79	7.8	468	0.024	0.072	1.137	0.000	0.000	0.924	0.070	0.000	0.000	0.000
80	7.9	474	0.024	0.072	1.209	0.000	0.000	0.994	0.070	0.000	0.000	0.000
81	8.0	480	0.022	0.066	1.275	0.000	0.000	1.059	0.065	0.000	0.000	0.000
82	8.1	486	0.014	0.042	1.317	0.000	0.000	1.100	0.041	0.000	0.000	0.000
83	8.2	492	0.013	0.039	1.356	0.000	0.000	1.139	0.038	0.000	0.000	0.000
84	8.3	498	0.010	0.030	1.386	0.000	0.000	1.168	0.029	0.000	0.000	0.000
85	8.4	504	0.010	0.030	1.416	0.000	0.000	1.197	0.029	0.000	0.000	0.000
86	8.5	510	0.008	0.024	1.440	0.000	0.000	1.221	0.024	0.000	0.000	0.000
87	8.6	516	0.009	0.027	1.467	0.000	0.000	1.248	0.027	0.000	0.000	0.000
88	8.7	522	0.009	0.027	1.494	0.000	0.000	1.274	0.027	0.000	0.000	0.000
89	8.8	528	0.007	0.021	1.515	0.000	0.000	1.295	0.021	0.000	0.000	0.000
90	8.9	534	0.008	0.024	1.539	0.000	0.000	1.319	0.024	0.000	0.000	0.000
91	9.0	540	0.007	0.021	1.560	0.000	0.000	1.339	0.021	0.000	0.000	0.000
92	9.1	546	0.007	0.021	1.581	0.000	0.000	1.360	0.021	0.000	0.000	0.000
93	9.2	552	0.006	0.018	1.599	0.000	0.000	1.378	0.018	0.000	0.000	0.000
94	9.3	558	0.006	0.018	1.617	0.000	0.000	1.395	0.018	0.000	0.000	0.000
95	9.4	564	0.006	0.018	1.635	0.000	0.000	1.413	0.018	0.000	0.000	0.000
96	9.5	570	0.005	0.015	1.650	0.000	0.000	1.428	0.015	0.000	0.000	0.000
97	9.6	576	0.006	0.018	1.668	0.000	0.000	1.446	0.018	0.000	0.000	0.000
98	9.7	582	0.005	0.015	1.683	0.000	0.000	1.461	0.015	0.000	0.000	0.000
99	9.8	588	0.006	0.018	1.701	0.000	0.000	1.478	0.018	0.000	0.000	0.000
100	9.9	594	0.005	0.015	1.716	0.000	0.000	1.493	0.015	0.000	0.000	0.000
101	10.0	600	0.005	0.015	1.731	0.000	0.000	1.508	0.015	0.000	0.000	0.000
102	10.1	606	0.005	0.015	1.746	0.000	0.000	1.523	0.015	0.000	0.000	0.000
103	10.2	612	0.005	0.015	1.761	0.000	0.000	1.538	0.015	0.000	0.000	0.000
104	10.3	618	0.005	0.015	1.776	0.000	0.000	1.553	0.015	0.000	0.000	0.000
105	10.4	624	0.004	0.012	1.788	0.000	0.000	1.564	0.012	0.000	0.000	0.000
106	10.5	630	0.005	0.015	1.803	0.000	0.000	1.579	0.015	0.000	0.000	0.000
107	10.6	636	0.005	0.015	1.818	0.000	0.000	1.594	0.015	0.000	0.000	0.000
108	10.7	642	0.004	0.012	1.830	0.000	0.000	1.606	0.012	0.000	0.000	0.000
109	10.8	648	0.005	0.015	1.845	0.000	0.000	1.621	0.015	0.000	0.000	0.000
110	10.9	654	0.005	0.015	1.860	0.000	0.000	1.636	0.015	0.000	0.000	0.000
111	11.0	660	0.004	0.012	1.872	0.000	0.000	1.648	0.012	0.000	0.000	0.000
112	11.1	666	0.004	0.012	1.884	0.000	0.000	1.659	0.012	0.000	0.000	0.000
113	11.2	672	0.005	0.015	1.899	0.000	0.000	1.674	0.015	0.000	0.000	0.000
114	11.3	678	0.004	0.012	1.911	0.000	0.000	1.686	0.012	0.000	0.000	0.000
115	11.4	684	0.004	0.012	1.923	0.000	0.000	1.698	0.012	0.000	0.000	0.000
116	11.5	690	0.004	0.012	1.935	0.000	0.000	1.710	0.012	0.000	0.000	0.000
117	11.6	696	0.004	0.012	1.947	0.000	0.000	1.722	0.012	0.000	0.000	0.000
118	11.7	702	0.004	0.012	1.959	0.000	0.000	1.734	0.012	0.000	0.000	0.000
119	11.8	708	0.004	0.012	1.971	0.000	0.000	1.746	0.012	0.000	0.000	0.000
120	11.9	714	0.003	0.009	1.980	0.000	0.000	1.755	0.009	0.000	0.000	0.000
121	12.0	720	0.004	0.012	1.992	0.000	0.000	1.766	0.012	0.000	0.000	0.000
122	12.1	726	0.004	0.012	2.004	0.000	0.000	1.778	0.012	0.000	0.000	0.000
123	12.2	732	0.003	0.009	2.013	0.000	0.000	1.787	0.009	0.000	0.000	0.000
124	12.3	738	0.004	0.012	2.025	0.000	0.000	1.799	0.012	0.000	0.000	0.000
125	12.4	744	0.004	0.012	2.037	0.000	0.000	1.811	0.012	0.000	0.000	0.000
126	12.5	750	0.004	0.012	2.049	0.000	0.000	1.823	0.012	0.000	0.000	0.000
127	12.6	756	0.004	0.012	2.061	0.000	0.000	1.835	0.012	0.000	0.000	0.000
128	12.7	762	0.003	0.009	2.070	0.000	0.000	1.844	0.009	0.000	0.000	0.000
129	12.8	768	0.004	0.012	2.082	0.000	0.000	1.856	0.012	0.000	0.000	0.000
130	12.9	774	0.003	0.009	2.091	0.000	0.000	1.865	0.009	0.000	0.000	0.000
131	13.0	780	0.004	0.012	2.103	0.000	0.000	1.876	0.012	0.000	0.000	0.000
132	13.1	786	0.004	0.012	2.115	0.000	0.000	1.888	0.012	0.000	0.000	0.000
133	13.2	792	0.003	0.009	2.124	0.000	0.000	1.897	0.009	0.000	0.000	0.000
134	13.3	798	0.004	0.012	2.136	0.000	0.000	1.909	0.012	0.000	0.000	0.000
135	13.4	804	0.004	0.012	2.148	0.000	0.000	1.921	0.012	0.000	0.000	0.000
136	13.5	810	0.003	0.009	2.157	0.000	0.000	1.930	0.009	0.000	0.000	0.000
137	13.6	816	0.003	0.009	2.166	0.000	0.000	1.939	0.009	0.000	0.000	0.000
138	13.7	822	0.004	0.012	2.178	0.000	0.000	1.951	0.012	0.000	0.000	0.000
139	13.8	828	0.003	0.009	2.187	0.000	0.000	1.960	0.009	0.000	0.000	0.000
140	13.9	834	0.004	0.012	2.199	0.000	0.000	1.972	0.012	0.000	0.000	0.000
141	14.0	840	0.003	0.009	2.208	0.000	0.000	1.981	0.009	0.000	0.000	0.000
142	14.1	846	0.003	0.009	2.217	0.000	0.000	1.990	0.009	0.000	0.000	0.000
143	14.2	852	0.004	0.012	2.229	0.000	0.000	2.002	0.012	0.000	0.000	0.000
144	14.3	858	0.003	0.009	2.238	0.000	0.000	2.010	0.009	0.000	0.000	0.000
145	14.4	864	0.003	0.009	2.247	0.000	0.000	2.019	0.009	0.000	0.000	0.000
146	14.5	870	0.004	0.012	2.259	0.000	0.000	2.031	0.012	0.000	0.008	0.003
147	14.6	876	0.003	0.009	2.268	0.000	0.000	2.040	0.009	0.000	0.084	0.035
148	14.7	882	0.003	0.009	2.277	0.000	0.000	2.049	0.009	0.000	0.177	0.107
149	14.8	888	0.004	0.012	2.289	0.000	0.000	2.061	0.012	0.000	0.379	0.235
150	14.9	894	0.003	0.009	2.298	0.000	0.000	2.070	0.009	0.000	0.391	0.348
151	15.0	900	0.003	0.009	2.307	0.000	0.000	2.079	0.009	0.000	0.483	0.415
152	15.1	906	0.003	0.009	2.316	0.000	0.000	2.088	0.009	0.000	0.574	0.500
153	15.2	912	0.004	0.012	2.328	0.000	0.000	2.100	0.012	0.000	0.908	0.681
154	15.3	918	0.003	0.009	2.337	0.001	0.000	2.109	0.009	0.000	0.787	0.806
155	15.4	924	0.003	0.009	2.346	0.001	0.000	2.118	0.009	0.000	0.878	0.826
156	15.5	930	0.003	0.009	2.355	0.001	0.000	2.127	0.009	0.000	0.968	0.899
157	15.6	936	0.003	0.009	2.364	0.001	0.000	2.136	0.009	0.000	1.058	0.985
158	15.7	942	0.004	0.012	2.376	0.001	0.000	2.148	0.012	0.000	1.551	1.225

159	15.8	948	0.003	0.009	2.385	0.001	0.000	2.156	0.009	0.000	1.268	1.364
160	15.9	954	0.003	0.009	2.394	0.002	0.000	2.165	0.009	0.000	1.358	1.326
161	16.0	960	0.003	0.009	2.403	0.002	0.000	2.174	0.009	0.000	1.447	1.383
162	16.1	966	0.003	0.009	2.412	0.002	0.000	2.183	0.009	0.000	1.536	1.465
163	16.2	972	0.003	0.009	2.421	0.002	0.000	2.192	0.009	0.000	1.625	1.552
164	16.3	978	0.003	0.009	2.430	0.003	0.000	2.201	0.009	0.000	1.714	1.640
165	16.4	984	0.003	0.009	2.439	0.003	0.000	2.210	0.009	0.000	1.803	1.729
166	16.5	990	0.003	0.009	2.448	0.003	0.000	2.219	0.009	0.000	1.891	1.817
167	16.6	996	0.003	0.009	2.457	0.004	0.000	2.228	0.009	0.000	1.979	1.906
168	16.7	1002	0.003	0.009	2.466	0.004	0.000	2.237	0.009	0.000	2.067	1.994
169	16.8	1008	0.003	0.009	2.475	0.004	0.000	2.246	0.009	0.000	2.155	2.082
170	16.9	1014	0.003	0.009	2.484	0.005	0.000	2.255	0.009	0.000	2.242	2.169
171	17.0	1020	0.003	0.009	2.493	0.005	0.000	2.264	0.009	0.000	2.329	2.257
172	17.1	1026	0.003	0.009	2.502	0.005	0.000	2.273	0.009	0.000	2.417	2.344
173	17.2	1032	0.003	0.009	2.511	0.006	0.000	2.282	0.009	0.000	2.503	2.431
174	17.3	1038	0.003	0.009	2.520	0.006	0.000	2.291	0.009	0.000	2.590	2.518
175	17.4	1044	0.003	0.009	2.529	0.006	0.000	2.300	0.009	0.000	2.677	2.604
176	17.5	1050	0.003	0.009	2.538	0.007	0.000	2.309	0.009	0.000	2.763	2.691
177	17.6	1056	0.003	0.009	2.547	0.007	0.000	2.317	0.009	0.000	2.849	2.777
178	17.7	1062	0.002	0.006	2.553	0.008	0.000	2.323	0.006	0.000	1.947	2.493
179	17.8	1068	0.003	0.009	2.562	0.008	0.000	2.332	0.009	0.000	2.992	2.475
180	17.9	1074	0.003	0.009	2.571	0.009	0.000	2.341	0.009	0.000	3.077	2.895
181	18.0	1080	0.003	0.009	2.580	0.009	0.000	2.350	0.009	0.000	3.163	3.064
182	18.1	1086	0.003	0.009	2.589	0.010	0.001	2.359	0.009	0.001	3.248	3.170
183	18.2	1092	0.002	0.006	2.595	0.010	0.000	2.365	0.006	0.000	2.213	2.840
184	18.3	1098	0.003	0.009	2.604	0.010	0.001	2.374	0.009	0.001	3.389	2.811
185	18.4	1104	0.003	0.009	2.613	0.011	0.001	2.383	0.009	0.001	3.474	3.277
186	18.5	1110	0.003	0.009	2.622	0.012	0.001	2.392	0.009	0.001	3.558	3.456
187	18.6	1116	0.002	0.006	2.628	0.012	0.000	2.398	0.006	0.000	2.419	3.106
188	18.7	1122	0.003	0.009	2.637	0.012	0.001	2.407	0.009	0.001	3.699	3.071
189	18.8	1128	0.003	0.009	2.646	0.013	0.001	2.416	0.009	0.001	3.783	3.573
190	18.9	1134	0.002	0.006	2.652	0.013	0.000	2.422	0.006	0.000	2.568	3.275
191	19.0	1140	0.003	0.009	2.661	0.014	0.001	2.431	0.009	0.001	3.922	3.253
192	19.1	1146	0.003	0.009	2.670	0.015	0.001	2.440	0.009	0.001	4.005	3.786
193	19.2	1152	0.002	0.006	2.676	0.015	0.000	2.446	0.006	0.000	2.717	3.467
194	19.3	1158	0.003	0.009	2.685	0.016	0.001	2.455	0.009	0.001	4.144	3.439
195	19.4	1164	0.002	0.006	2.691	0.016	0.000	2.461	0.006	0.000	2.809	3.467
196	19.5	1170	0.003	0.009	2.700	0.017	0.001	2.470	0.009	0.001	4.282	3.526
197	19.6	1176	0.003	0.009	2.709	0.018	0.001	2.479	0.009	0.001	4.365	4.124
198	19.7	1182	0.002	0.006	2.715	0.018	0.000	2.485	0.006	0.000	2.955	3.776
199	19.8	1188	0.003	0.009	2.724	0.019	0.001	2.494	0.009	0.001	4.502	3.740
200	19.9	1194	0.002	0.006	2.730	0.019	0.000	2.499	0.006	0.000	3.047	3.766
201	20.0	1200	0.003	0.009	2.739	0.020	0.001	2.508	0.009	0.001	4.638	3.823
202	20.1	1206	0.002	0.006	2.745	0.020	0.000	2.514	0.006	0.000	3.138	3.872
203	20.2	1212	0.003	0.009	2.754	0.021	0.001	2.523	0.009	0.001	4.774	3.935
204	20.3	1218	0.002	0.006	2.760	0.022	0.001	2.529	0.006	0.001	3.228	3.985
205	20.4	1224	0.002	0.006	2.766	0.022	0.001	2.535	0.006	0.001	3.264	3.431
206	20.5	1230	0.003	0.009	2.775	0.023	0.001	2.544	0.009	0.001	4.964	3.943
207	20.6	1236	0.002	0.006	2.781	0.023	0.001	2.550	0.006	0.001	3.354	4.105
208	20.7	1242	0.003	0.009	2.790	0.024	0.001	2.559	0.009	0.001	5.099	4.196
209	20.8	1248	0.002	0.006	2.796	0.025	0.001	2.565	0.006	0.001	3.444	4.253
210	20.9	1254	0.002	0.006	2.802	0.025	0.001	2.571	0.006	0.001	3.480	3.660
211	21.0	1260	0.003	0.009	2.811	0.026	0.001	2.580	0.009	0.001	5.287	4.203
212	21.1	1266	0.002	0.006	2.817	0.027	0.001	2.586	0.006	0.001	3.569	4.372
213	21.2	1272	0.002	0.006	2.823	0.027	0.001	2.592	0.006	0.001	3.605	3.783
214	21.3	1278	0.003	0.009	2.832	0.028	0.001	2.601	0.009	0.001	5.474	4.350
215	21.4	1284	0.002	0.006	2.838	0.029	0.001	2.607	0.006	0.001	3.694	4.525
216	21.5	1290	0.002	0.006	2.844	0.029	0.001	2.613	0.006	0.001	3.729	3.915
217	21.6	1296	0.003	0.009	2.853	0.030	0.001	2.622	0.009	0.001	5.660	4.500
218	21.7	1302	0.002	0.006	2.859	0.031	0.001	2.628	0.006	0.001	3.817	4.679
219	21.8	1308	0.002	0.006	2.865	0.031	0.001	2.634	0.006	0.001	3.853	4.046
220	21.9	1314	0.002	0.006	2.871	0.032	0.001	2.640	0.006	0.001	3.888	3.914
221	22.0	1320	0.002	0.006	2.877	0.032	0.001	2.646	0.006	0.001	3.923	3.908
222	22.1	1326	0.003	0.009	2.886	0.033	0.001	2.655	0.009	0.001	5.950	4.679
223	22.2	1332	0.002	0.006	2.892	0.034	0.001	2.661	0.006	0.001	4.011	4.905
224	22.3	1338	0.002	0.006	2.898	0.035	0.001	2.667	0.006	0.001	4.045	4.247
225	22.4	1344	0.002	0.006	2.904	0.035	0.001	2.673	0.006	0.001	4.080	4.109
226	22.5	1350	0.002	0.006	2.910	0.036	0.001	2.679	0.006	0.001	4.115	4.101
227	22.6	1356	0.002	0.006	2.916	0.037	0.001	2.685	0.006	0.001	4.150	4.125
228	22.7	1362	0.002	0.006	2.922	0.037	0.001	2.691	0.006	0.001	4.185	4.157
229	22.8	1368	0.002	0.006	2.928	0.038	0.001	2.697	0.006	0.001	4.219	4.191
230	22.9	1374	0.002	0.006	2.934	0.039	0.001	2.703	0.006	0.001	4.254	4.225
231	23.0	1380	0.002	0.006	2.940	0.039	0.001	2.709	0.006	0.001	4.289	4.260
232	23.1	1386	0.002	0.006	2.946	0.040	0.001	2.714	0.006	0.001	4.323	4.294
233	23.2	1392	0.002	0.006	2.952	0.041	0.001	2.720	0.006	0.001	4.358	4.329
234	23.3	1398	0.002	0.006	2.958	0.041	0.001	2.726	0.006	0.001	4.392	4.363
235	23.4	1404	0.002	0.006	2.964	0.042	0.001	2.732	0.006	0.001	4.426	4.398
236	23.5	1410	0.002	0.006	2.970	0.043	0.001	2.738	0.006	0.001	4.461	4.432
237	23.6	1416	0.002	0.006	2.976	0.043	0.001	2.744	0.006	0.001	4.495	4.466
238	23.7	1422	0.002	0.006	2.982	0.044	0.001	2.750	0.006	0.001	4.529	4.501
239	23.8	1428	0.002	0.006	2.988	0.045	0.001	2.756	0.006	0.001	4.563	4.535
240	23.9	1434	0.002	0.006	2.994	0.045	0.001	2.762	0.006	0.001	4.598	4.569
241	24.0	1440	0.002	0.006	3.000	0.046	0.001	2.768	0.006	0.001	4.632	4.603

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.

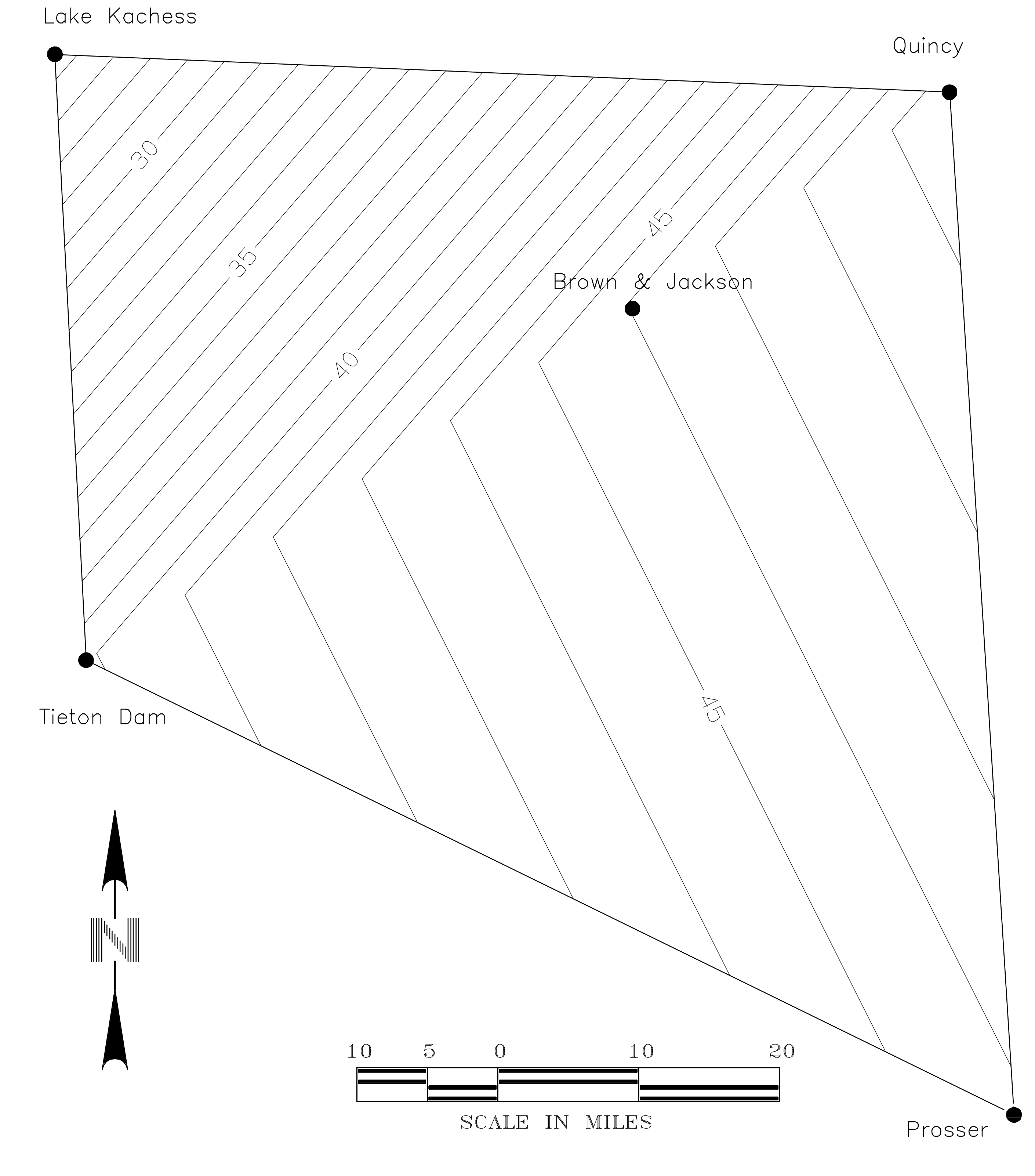
Many stations do not measure pan evaportation during winter months. A "0.00" total indicates no measuement is taken. Stations marked with an asterisk (*) have estimated totals computed from meteorological measurements using a form of the Penman equation.

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.

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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.

High Density Polyethylene
Drain Liner®

Product Data

Property	Test Method	Frequency	Minimum Average Values			
Thickness (nominal), mil (mm) Thickness (lowest individual), mil (mm)	ASTM D5994	Per Roll	50 (1.25) 45 (1.15)	60 (1.5) 54 (1.35)	80 (2.0) 72 (1.8)	100 (2.5) 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) Strength @ Yield, lb/in width (N/mm) Elongation @ Yield, % (GL=1.3in) Strength @ Break, lb/in width (N/mm) Elongation @ Break, % (GL=2.0in)	ASTM D6693, Type IV 2 in/minute	20,000 lb	 110 (19.3) 13 110 (19.3) 300	 132 (23.1) 13 132 (23.1) 300	 176 (30.8) 13 176 (30.8) 300	 220 (38.5) 13 220 (38.5) 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 mil	Thickness mm	Width ft	Width m	Length ft	Length m	Area (approx.) ft^2	Area (approx.) 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)

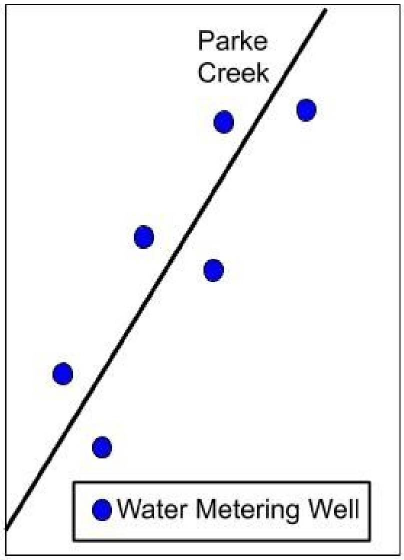
Excavation Volume Beneath Datum (Cu. Yd.)	Fill Volume Above Datum(Cu. Yd.)
3,101.3	69.2

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