Puyallup School District
Sparks Stadium
Parking Lot Expansion

Stormwater Site Plan

Prepared for:

Puyallup School District
323 12th St NW
Puyallup, WA 98371

Contact: Les Gerstmann
Phone: (253) 435-6673
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Prepared by:
Sitts & Hill Engineers, Inc.
4815 Center Street
Tacoma, Washington 98409

Contact: Rick Hand, PE
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rickh@sittshill.com

April 2025

Job Number 19,474

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FOUNDATIONS FOR OUR FUTURE

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Plan Preparation

"I hereby state that this Stormwater Site Plan for Sparks Stadium Parking Lot Expansion has been prepared by me or under my supervision and meets the standard of care and expertise which is usual and customary in this community for professional engineers. I understand that the City of Puyallup does not and will not assume liability for the sufficiency, suitability, or performance of the stormwater system prepared by me."

TABLE OF CONTENTS

1 Project Overview and Conditions Summary

1.1 Purpose

The purpose of this report is to comply with stormwater requirements detailed in the Washington State Department of Ecology 2024 Stormwater Management Manual for Western Washington (herein after referred to as the Manual), in accordance with City of Puyallup Phase II Municipal Stormwater Permit (NPDES), City of Puyallup Municipal Code (herein after referred to as PMC) Section 21.10.040, and City of Puyallup Development Engineering Design Guidelines, Section 200 Documents.

1.2 Project Overview

The Puyallup School District (herein after referred to as PSD) proposes to expand the existing parking lot facilities at Sparks Stadium. Sparks Stadium is located at 601 7th Avenue Southwest, Puyallup, WA 98371, on parcel 0420284126 (10.27 acres). See the vicinity map included as Figure 1. The site is zoned PF, Public Facilities and is currently developed with a track and field stadium and parking. The project area is located on the southwest portion of the site and proposes a new pervious pavement parking lot with a vehicle gate, lighting, and landscaping. Offsite, a revision to two driveway approaches to 7th Avenue Southwest and paving a portion of the alley to the west of the site are proposed.

The permits sought for the project include:

- SEPA review (the DNS is included as separate document with this submittal),
- City of Puyallup Conditional Use Permit (CUP,) PLCUP20240081
- City of Puyallup Site Development Permit
- City of Puyallup Right of Way Permit

1.3 Existing Conditions

The existing project site is cleared and graded to slope in the southwesterly direction. The surfacing generally consists of grass with 2 gravel portable building pads and some existing impervious parking lot pavement. Offsite, the site frontage in 7th Avenue Southwest is classified as a major collector and developed as a two lane road with a parking lane and sidewalk on each side.

The site is located in the Clark's Creek Stormwater Basin. Stormwater runoff on the project site generally collects into an existing onsite conveyance system and discharges into the City's stormwater system near the intersection of 7th Ave SW and 5th St SW. We are not aware of any current drainage problems on the site such as conveyance capacity issues or ponding.

The National Resource Conservation Service Web Soil Survey, included in Appendix C, classifies the existing soils as Puyallup Fine Sandy Loam. The Geotechnical Engineering Report, prepared by Migizi Group, Inc., dated February 15, 2022 and included in Appendix D, observed silty sand alluvial soils. The design infiltration rate is 0.5 inches per hour. Groundwater monitoring data shows a seasonally high groundwater table up to 2.75' below the existing grade surface.

The project site is located in the following Critical Area Zones per City of Puyallup and FEMA Flood Zone mapping (included in Figures 3-10): Aquifer Recharge Area, Wellhead Protection Area, Volcanic Hazard Area/Zone, and Seismic Liquefaction Zone.

The site is located in FEMA Zone X and does not lie within Landslide or Wetland critical areas.

1.4 Proposed Conditions

The project includes removal of existing vegetation, gravel, and asphalt pavement for the installation of a new pervious pavement parking lot. Landscaping, lighting, and offsite driveway and alley improvements are also proposed. In the mitigated condition, stormwater runoff on the site will be treated and infiltrated through the pervious pavement section.

The project contains two threshold discharge areas (TDA): the first is named Infiltration, which discharges through the proposed permeable pavement section for full infiltration and the second is named Driveways, which discharges to the city's stormwater system in 5th St SW. Please refer to the tables below for the project areas in each TDA and the Proposed Conditions Exhibit in Appendix A for a depiction of these areas.

TDA:	Infiltration		Driveways	
	SF	Acres	SF	Acres
P. Pavement	22,157	0.509	0	0.000
Imp. Driveway	1,698	0.039	3,619	0.083
Sidewalk	1,459	0.033	595	0.014
Landscaping	11,161	0.256	983	0.023
Total Disturbed	36,475	0.837	5,197	0.119

Requirement Thresholds:	Infiltration SF	Driveways SF
Disturbed Area	36,475	5,197
PGHS	23,855	3,619
New+Replaced HS	25,314	4,214

1.5 Offsite Analysis

There is no stormwater run-on to the site. The adjacent existing parking lot stormwater runoff generally collects into an existing onsite conveyance system and discharges into the city's stormwater system near the intersection of 7th Ave SW and 5th St SW. From there, runoff is conveyed south to a regional stormwater facility for detention and infiltration. The regional stormwater facility is approximately 0.35 miles downstream from the site and is located in the Washington State fairgrounds across Fairview Drive to the southeast from the Washington State Fair RV Park. We are unaware of any existing conveyance capacity or ponding issues in the existing flow path.

The proposed new parking lot addition has no offsite runoff.

2 Discussion of Minimum Requirements

Please refer to the City of Puyallup's adopted DOE Stormwater Manual Flow chart, located in Figure 2, which was used to determine the requirements for this project. The Driveways TDA requires Minimum Requirement 2 applies because there is less than 5,000 square feet of new and replaced hard surfaces. For the Infiltration TDA, Minimum Requirements 1-9 applies to the new hard surfaces and converted vegetation areas because there is more than 5,000 square feet of new hard surfaces. Below is a discussion of the minimum requirements.

2.1 Minimum Requirement #1 – Prepare a Stormwater Site Plan

This Report and accompanying drawings satisfy this requirement.

2.2 Minimum Requirement #2 – Construction Stormwater Pollution Prevention

A Construction Stormwater Pollution Prevention Plan (CSWPPP) and a TESC Plan has been included in the permit submittal under separate documents to satisfy this requirement.

2.3 Minimum Requirement #3 – Source Control for Pollution

Relevant Source Control BMPs are provided in the Operations and Maintenance Manual, included as a separate document for this permit submittal.

2.4 Minimum Requirement #4 – Preservation of Natural Drainage Systems

The project proposes to dispose of stormwater through the permeable pavement into the underlying soils and aquifer, whereby preserving the natural drainage system and outfalls.

2.5 Minimum Requirement #5 – On-site Stormwater Management

According to Section I-3.4.5 of the Manual, the project must Use List #2 BMPs or achieve the LID Performance Standard and apply BMP T5.13 for all landscaped areas. It is proposed to achieve the LID Performance Standard with full infiltration through the pervious pavement section and apply BMP T5.13 for all landscaped areas to meet this requirement.

2.6 Minimum Requirement #6 – Runoff Treatment

The Infiltration TDA has more than 5,000 square feet of pollution generating pervious surfaces, therefore; runoff treatment is required per Section I-3.4.6 of the Manual. The TDA triggers basic treatment requirements and oil control, phosphorous, and metals treatment do not apply. Below is a discussion of the oil control, phosphorous, and metals treatment requirements.

Oil control: the site does not anticipate an average daily trip end use of 300 vehicles per day or more and is not subject to storage of heavy vehicles.
Phosphorous treatment: the site does not lie within a phosphorous sensitive watershed.
Metals treatment: the site does not infiltrate within one quarter mile of a freshwater body.

Treatment is proposed with the pervious pavement in the underlying native sand. Per BMP T5.15: Permeable Pavement, the sand layer under the permeable pavement section (greater than 12 inches) meets basic and metals treatment requirements.

2.7 Minimum Requirement #7 – Flow Control

Full infiltration is proposed through the pervious pavement section. Please refer to the stormwater calculations in Appendix B for results demonstrating the pervious pavement provides 100% infiltration.

2.8 Minimum Requirement #8 – Wetland Protection

There are no wetlands located on or near the project site.

2.9 Minimum Requirement #9 – Operations and Maintenance

A separate Operations & Maintenance Manual has been included with this permit submittal.

3 Declaration of Covenant for Privately Maintained Flow Control and Runoff Treatment BMPs, and LID BMPs

The School District will provide a facility stormwater maintenance covenant at either the project completion or at permit approval.

Figures

Figure 1 - Vicinity Map

Figure 2 - Flow Chart for Determining Requirements for Redevelopment

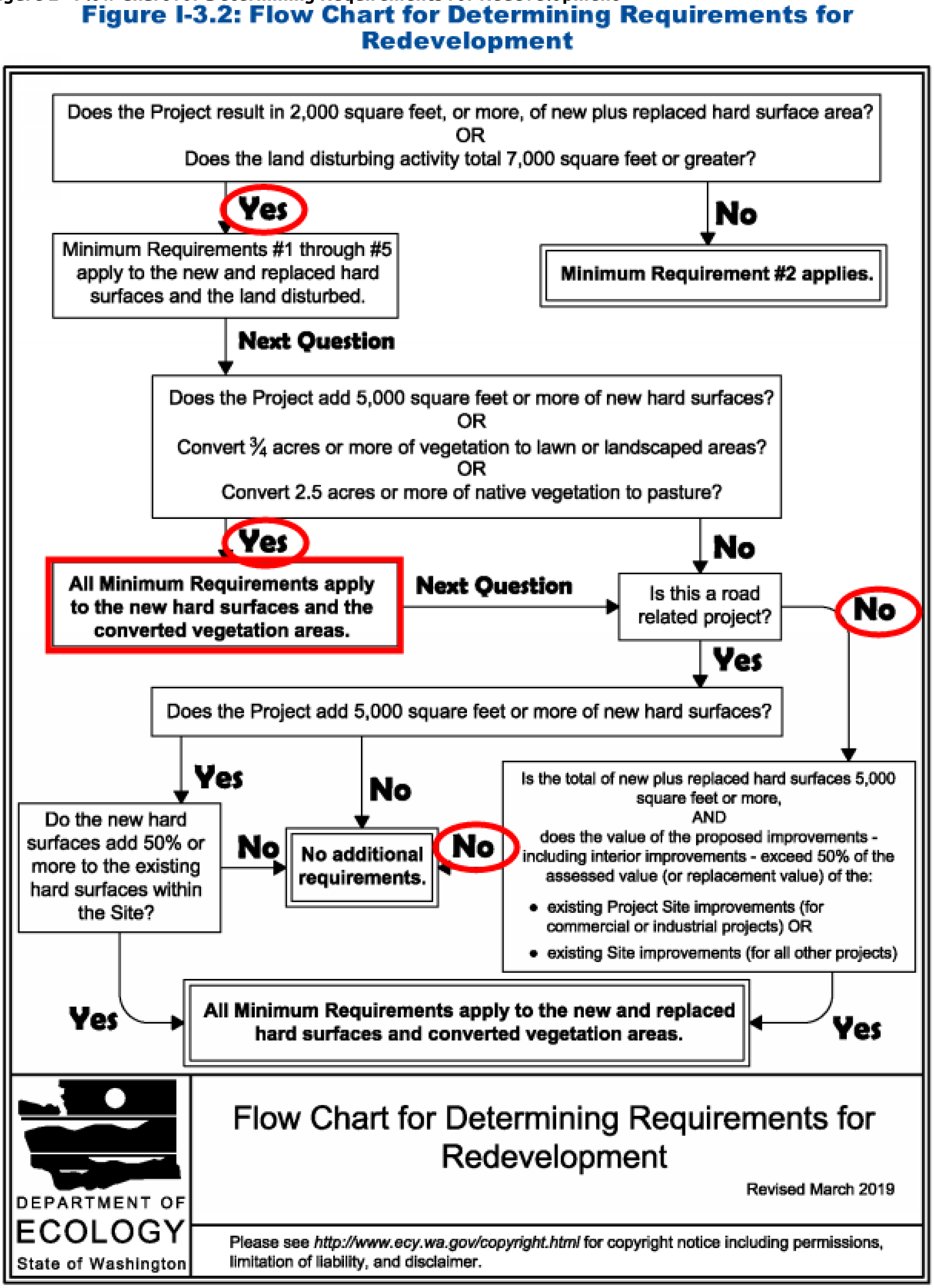

Figure 3 - City of Puyallup Aquifer Recharge Area Mapping

Drinking Water

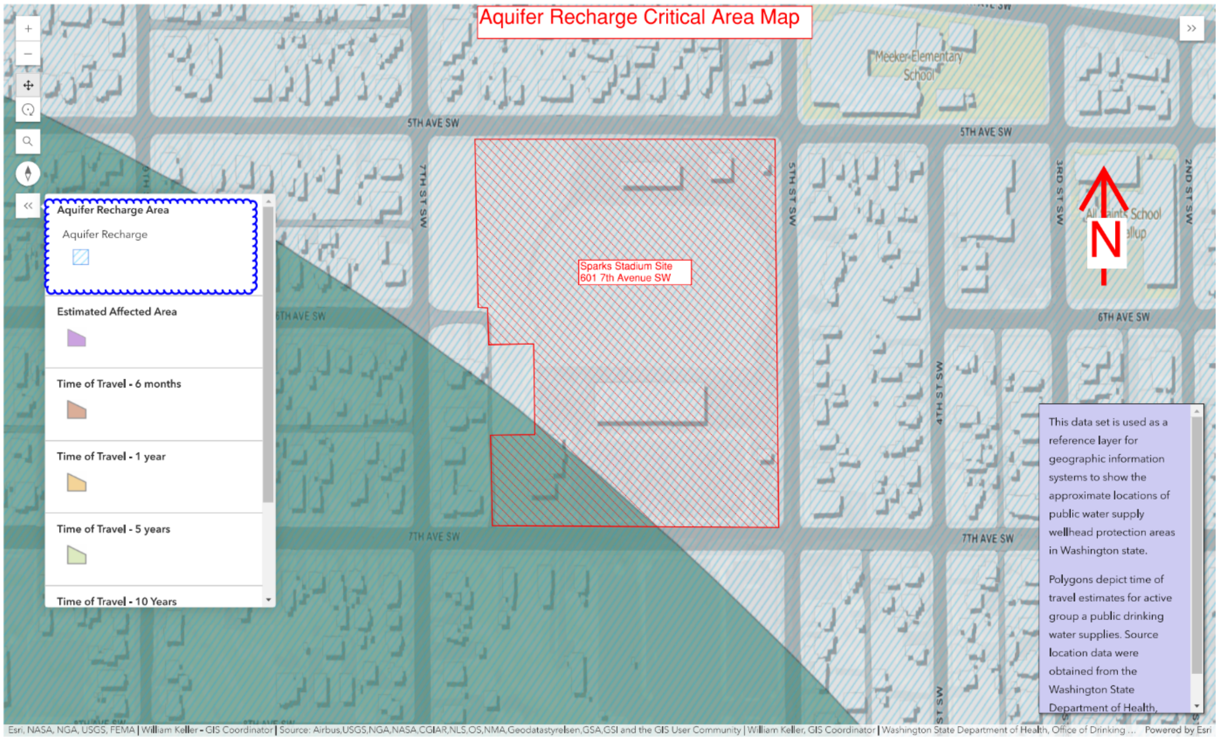

Figure 4 - City of Puyallup Wellhead Protection Mapping

Drinking Water

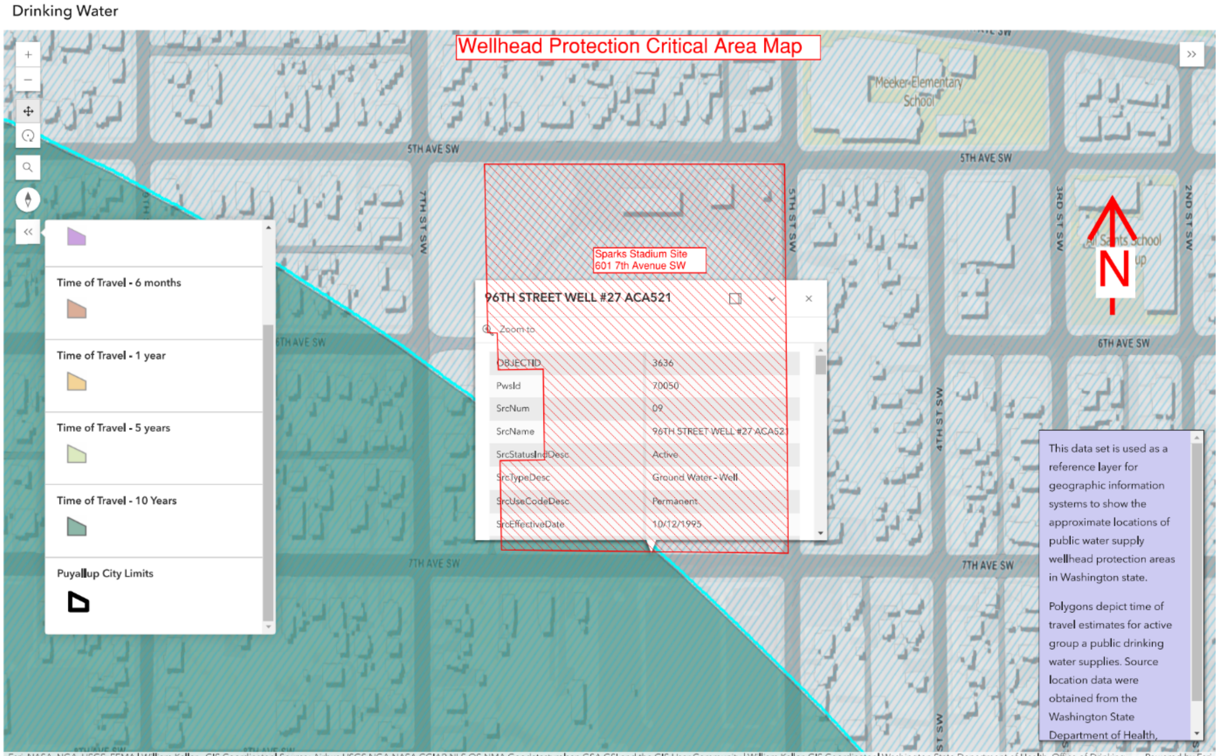

Figure 5 - City of Puyalluo Lakes, Streams and Wetlands mapping

NATURAL ENVIRONMENT

Map 2-7: Lakes, Streams and Wetlands

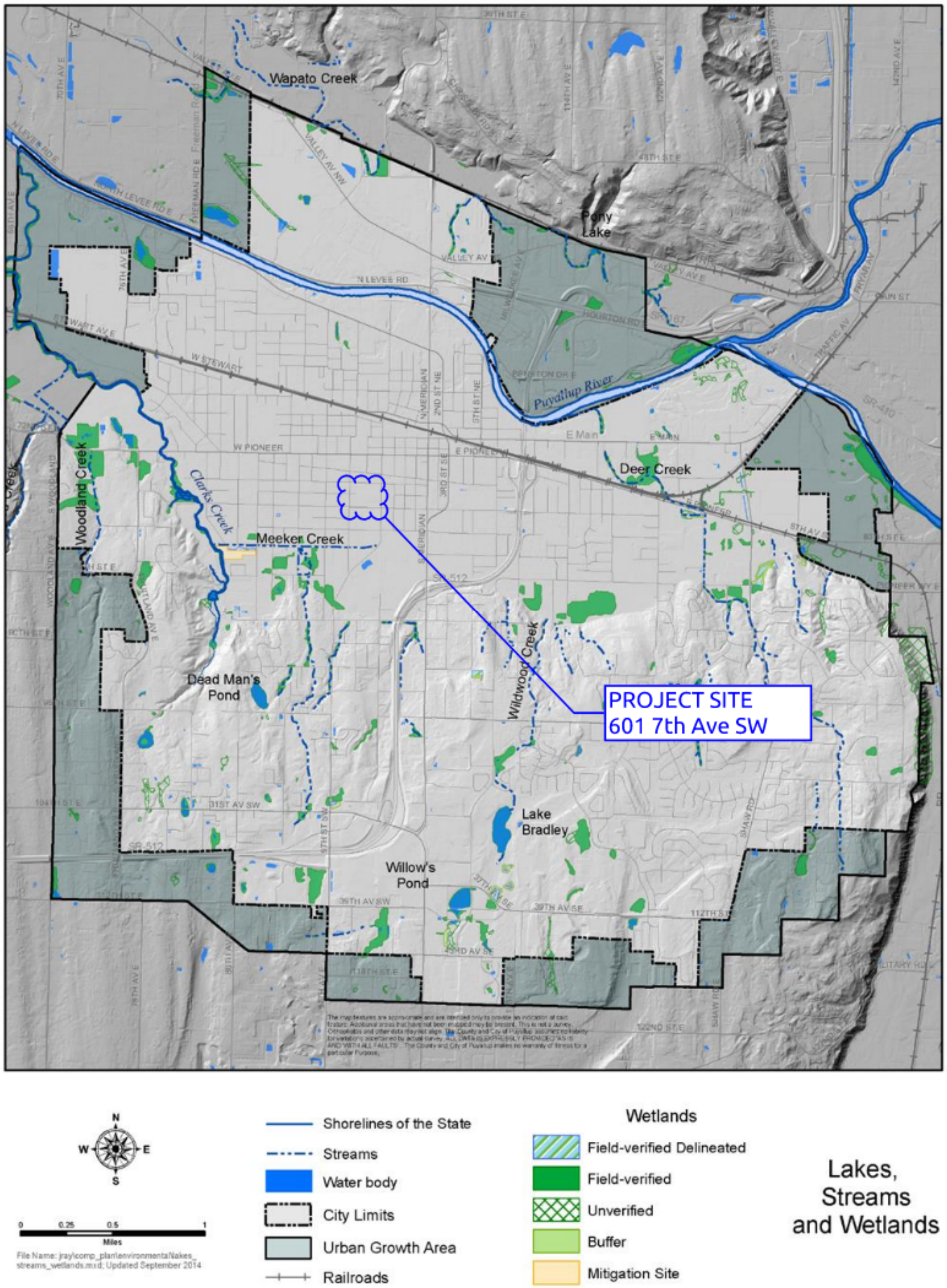

Figure 6 - City of Puyallup Landslide Hazard Mapping

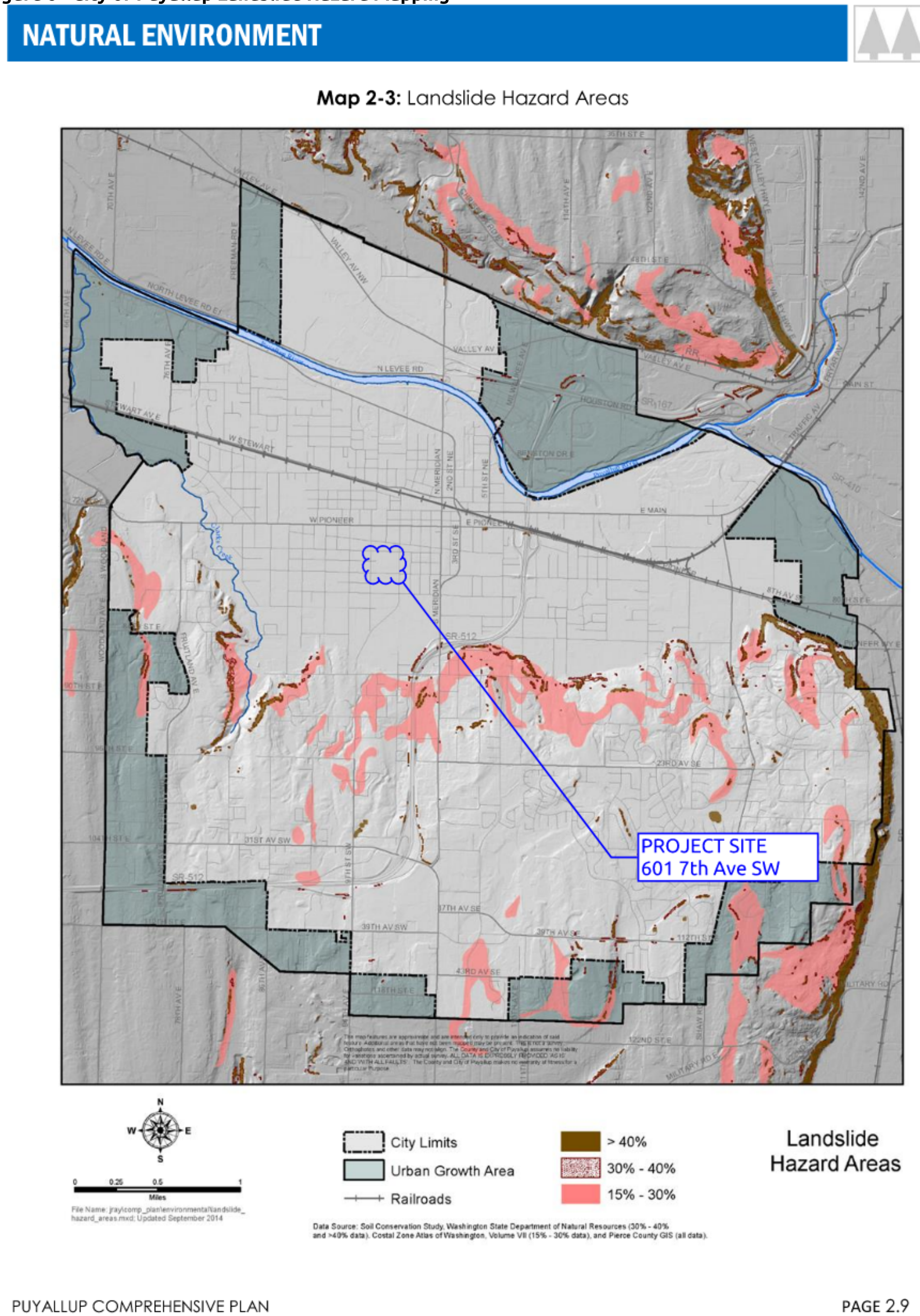

Figure 7 - City of Puyallup Seismic Hazards Areas Mapping

NATURAL ENVIRONMENT

Map 2-2: Seismic Hazards Areas

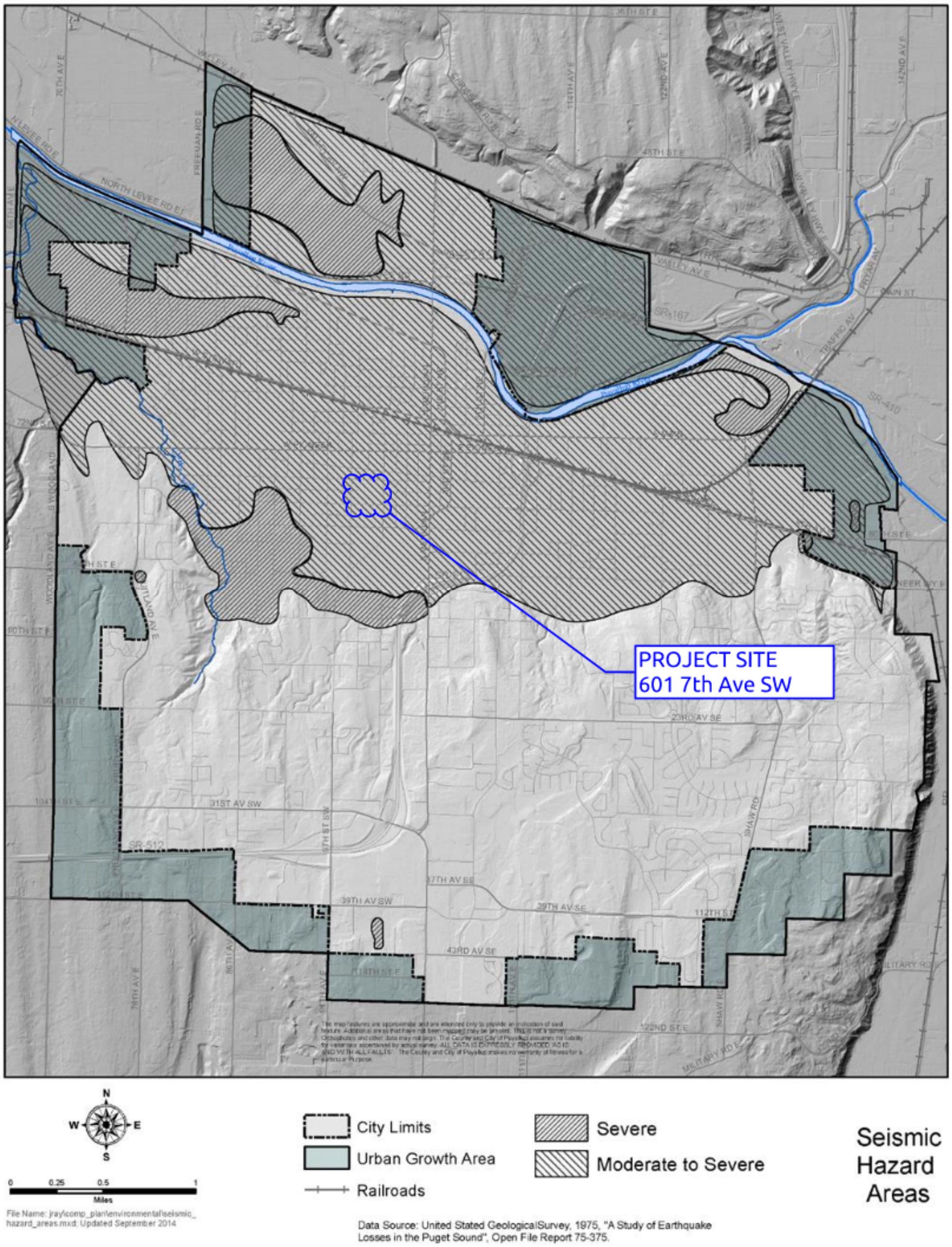

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Figure 8 - City of Puyallup Lahar Hazard Areas Mapping

ArcGIS Web Map

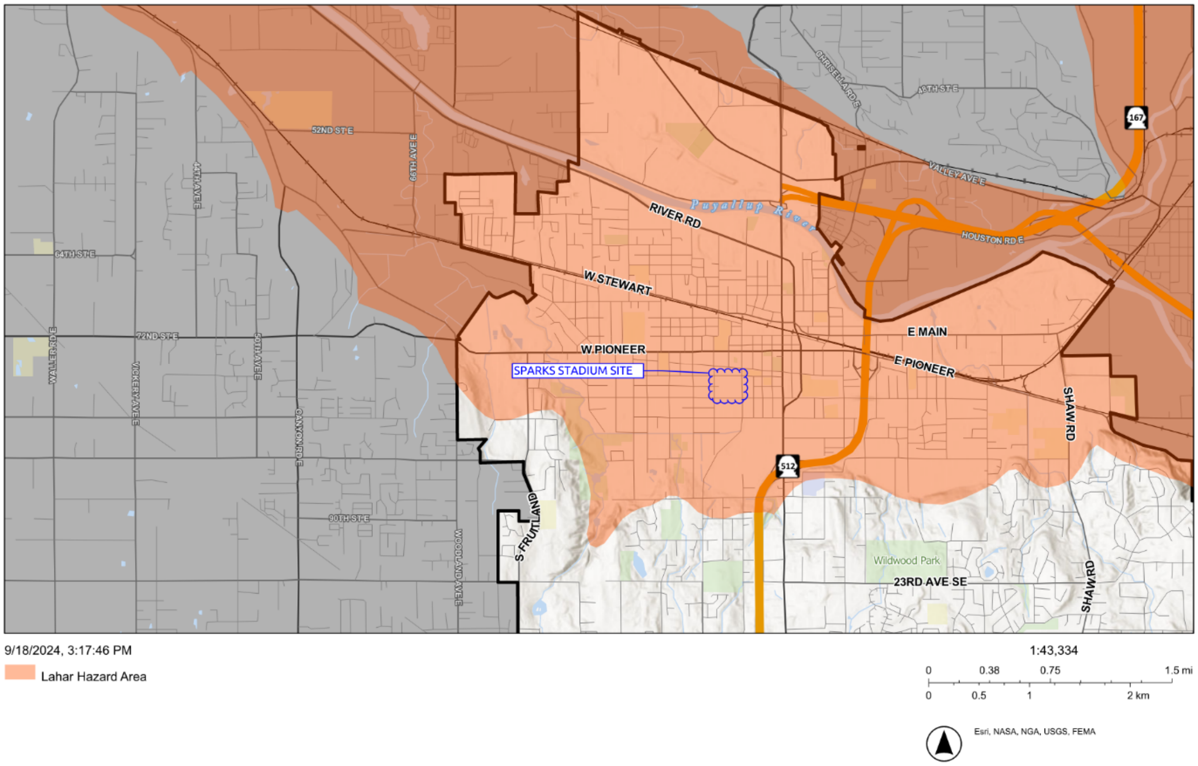
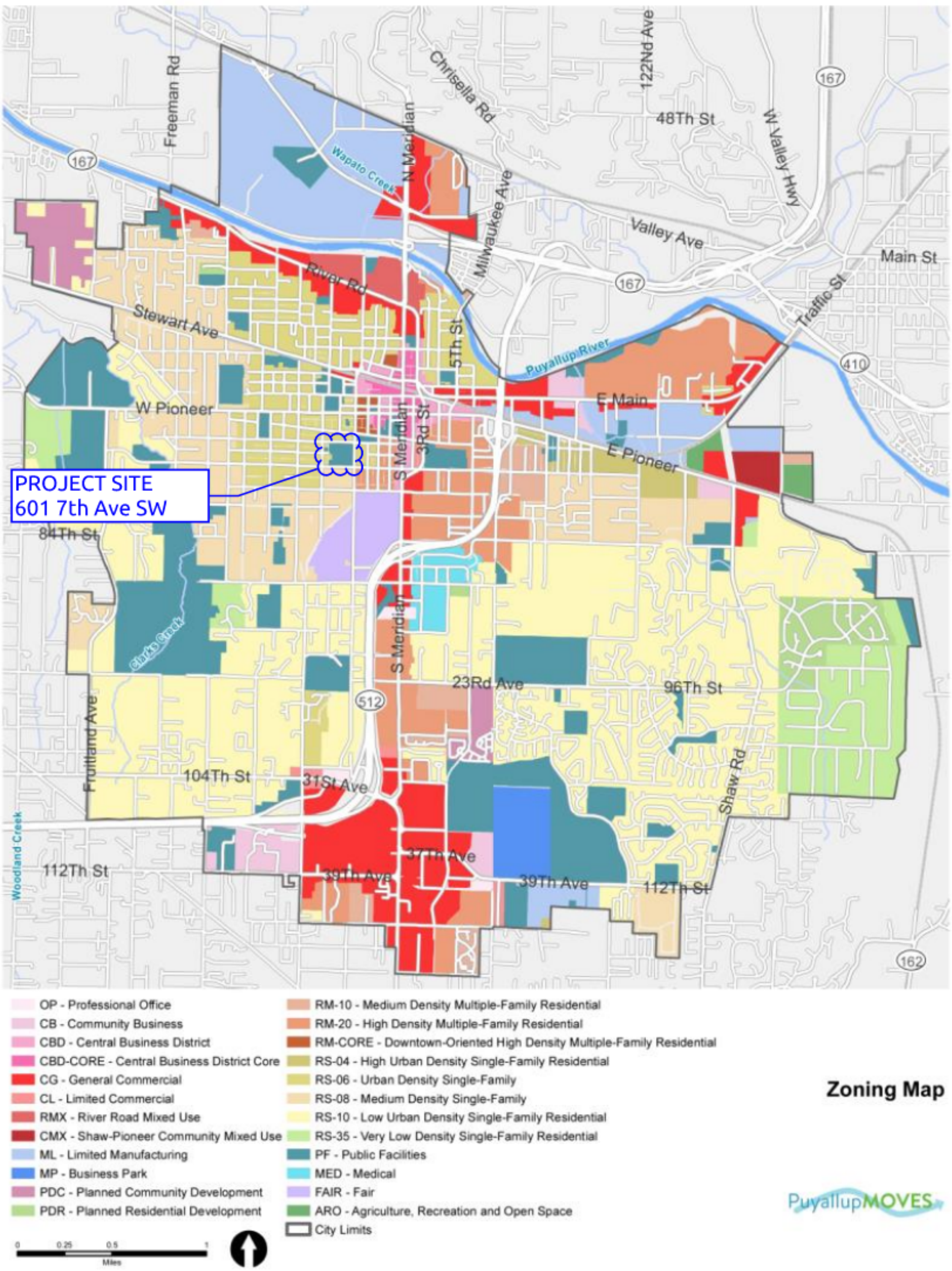


Figure 9 - City of Puyallup Zoning Map

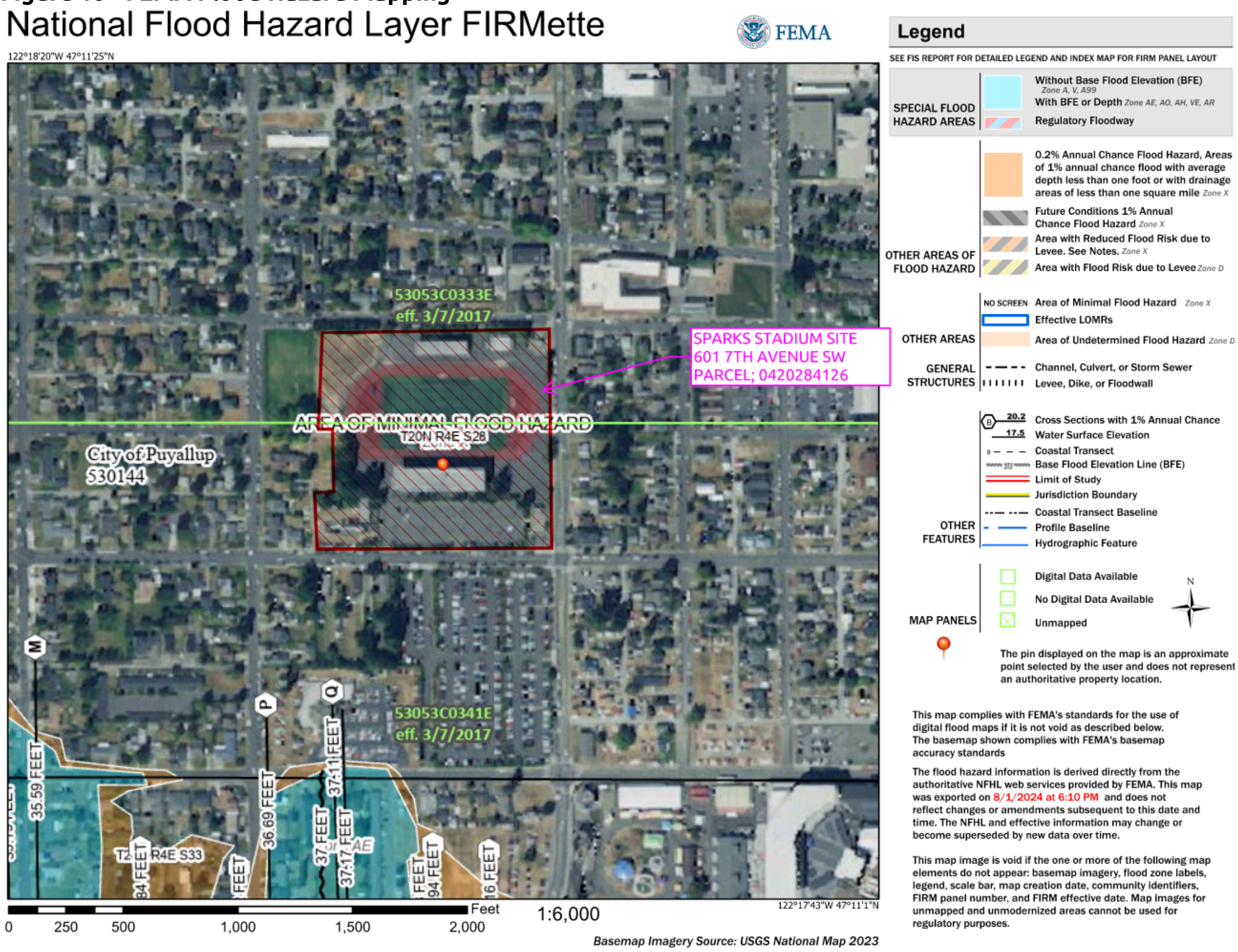
TRANSPORTATION ELEMENT

Map 7-1: Zoning Map



PuyallupMOVES

Figure 10 - FEMA Flood Hazard Mapping



Appendix A Drainage Exhibit

Puyallup School District
Sparks Stadium Parking Lot Expansion
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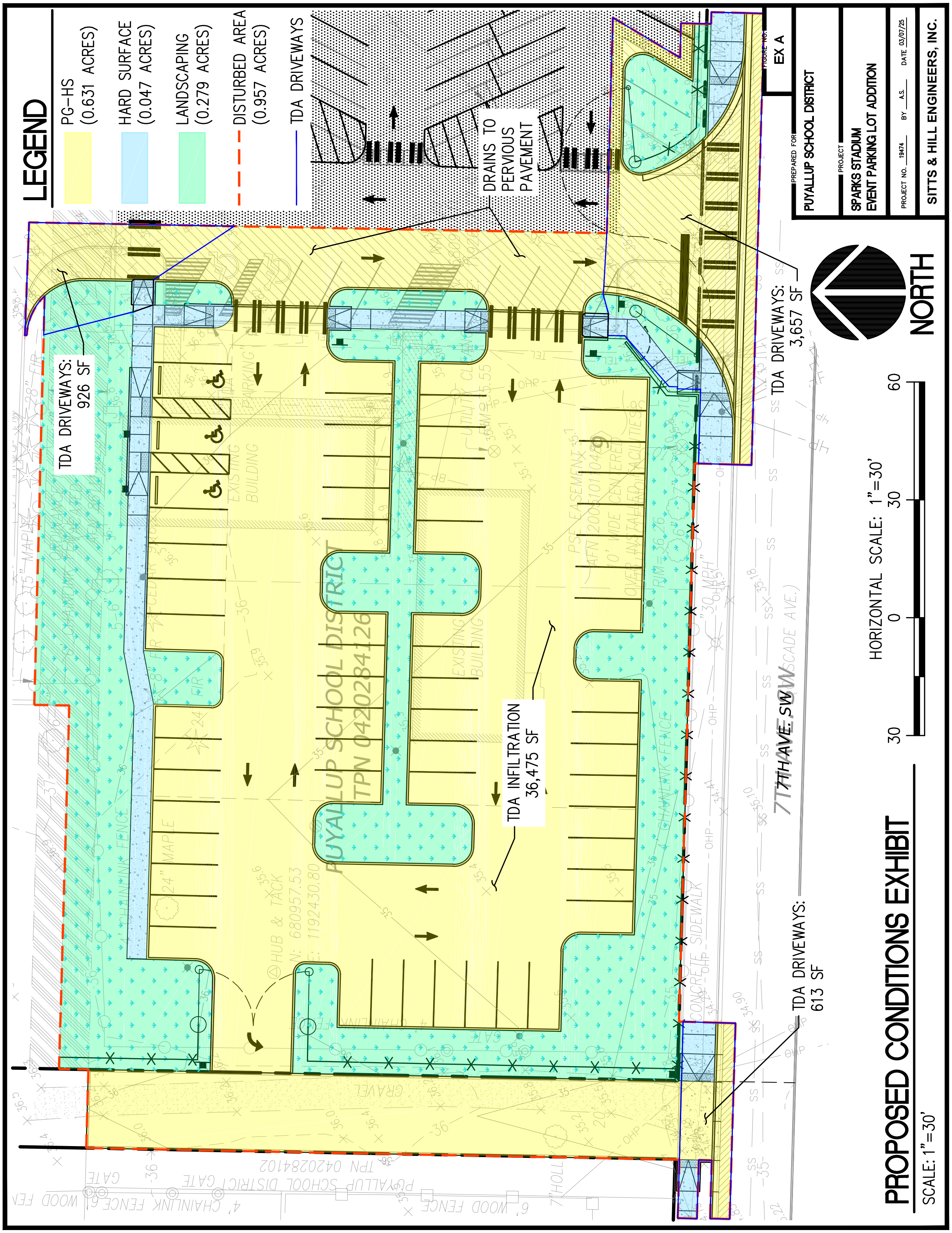
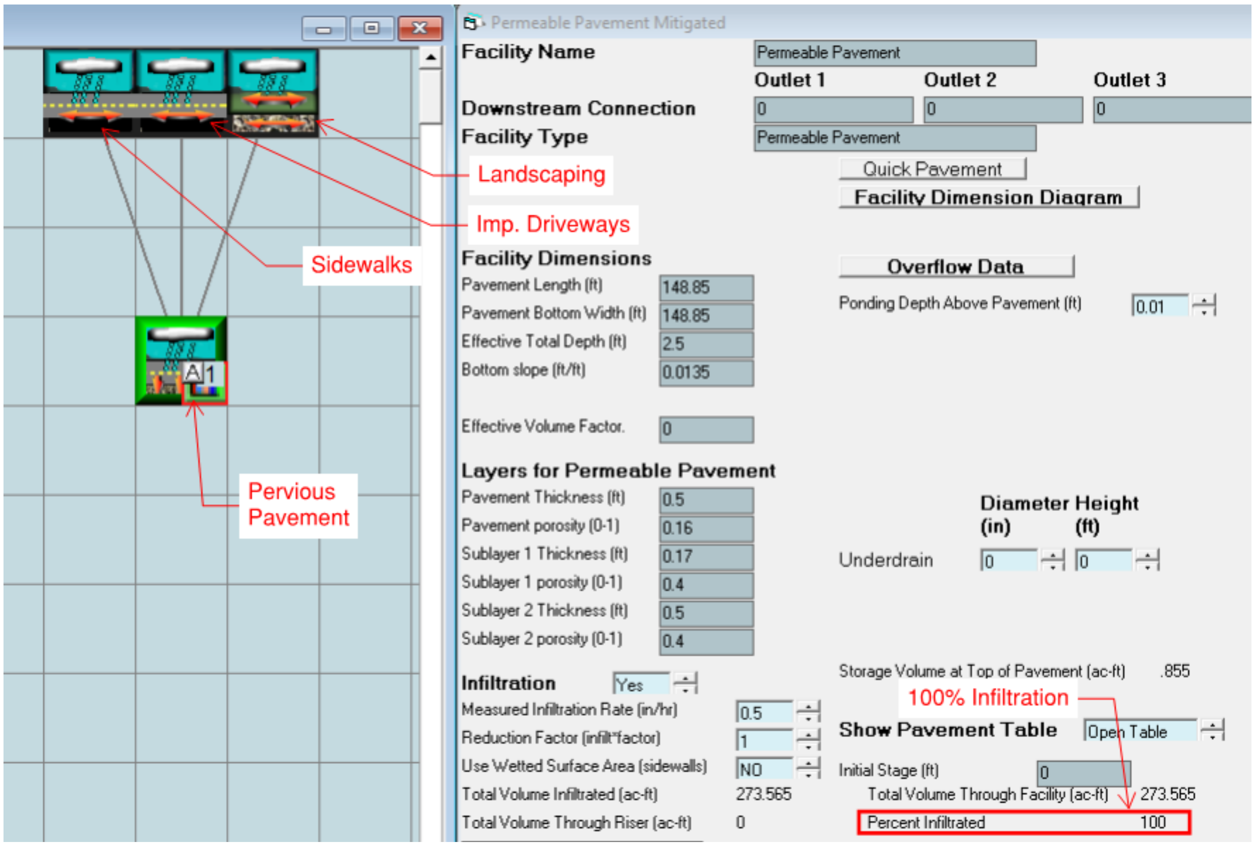
Exhibit A



Appendix B Stormwater Calculations

Stormwater Calculations provided included a continuous hydrology modeling report for the proposed pervious pavement. The stormwater model used is the Department of Ecology approved Western Washington Hydrology Model (WWHM) version dated 2023/01/27. Below is a snippet of the WWHM model demonstrating the pervious pavement section meets 100% infiltration followed by the modeling report.



WWHM2012
PROJECT REPORT

Project Name: Sparks Pervious Pavement
Site Name: Sparks Stadium
Site Address: 601 7th ave sw
City : Puyallup
Report Date: 3/21/2025
Gage : 42 IN EAST
Data Start : 10/01/1901
Data End : 09/30/2059
Precip Scale: 1.00
Version Date: 2023/01/27
Version : 4.2.19

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
C, Lawn, Flat	**.837**
Pervious Total	**0.837**

Impervious Land Use	**acre**
Impervious Total	**0**
Basin Total	**0.837**

Element Flows To:

Surface	**Interflow**	**Groundwater**

MITIGATED LAND USE

Name : Permeable Pavement
Pavement Area: 0.5086 ft.
Pavement Length: 148.85 ft.
Pavement Width: 148.85 ft.
Pavement slope 1: 0.0135 To 1

Pavement thickness: 0.5
Pour Space of Pavement: 0.16
Material thickness of second layer: 0.17
Pour Space of material for second layer: 0.4
Material thickness of third layer: 0.5
Pour Space of material for third layer: 0.4
Infiltration On
Infiltration rate: 0.5
Infiltration safety factor: 1
Total Volume Infiltrated (ac-ft.): 273.565
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 273.565
Percent Infiltrated: 100
Total Precip Applied to Facility: 0
Total Evap From Facility: 22.582

Element Flows To:
Outlet 1 **Outlet 2**

___

Permeable Pavement Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.508	0.000	0.000	0.000
0.0278	0.508	0.005	0.000	0.256
0.0556	0.508	0.011	0.000	0.256
0.0833	0.508	0.017	0.000	0.256
0.1111	0.508	0.022	0.000	0.256
0.1389	0.508	0.028	0.000	0.256
0.1667	0.508	0.033	0.000	0.256
0.1944	0.508	0.039	0.000	0.256
0.2222	0.508	0.045	0.000	0.256
0.2500	0.508	0.050	0.000	0.256
0.2778	0.508	0.056	0.000	0.256
0.3056	0.508	0.062	0.000	0.256
0.3333	0.508	0.067	0.000	0.256
0.3611	0.508	0.073	0.000	0.256
0.3889	0.508	0.079	0.000	0.256
0.4167	0.508	0.084	0.000	0.256
0.4444	0.508	0.090	0.000	0.256
0.4722	0.508	0.096	0.000	0.256
0.5000	0.508	0.101	0.000	0.256
0.5278	0.508	0.107	0.000	0.256
0.5556	0.508	0.113	0.000	0.256
0.5833	0.508	0.118	0.000	0.256
0.6111	0.508	0.124	0.000	0.256
0.6389	0.508	0.130	0.000	0.256
0.6667	0.508	0.135	0.000	0.256
0.6944	0.508	0.137	0.000	0.256
0.7222	0.508	0.140	0.000	0.256
0.7500	0.508	0.142	0.000	0.256
0.7778	0.508	0.144	0.000	0.256
0.8056	0.508	0.146	0.000	0.256
0.8333	0.508	0.149	0.000	0.256
0.8611	0.508	0.151	0.000	0.256

0.8889	0.508	0.153	0.000	0.256
0.9167	0.508	0.156	0.000	0.256
0.9444	0.508	0.158	0.000	0.256
0.9722	0.508	0.160	0.000	0.256
1.0000	0.508	0.162	0.000	0.256
1.0278	0.508	0.165	0.000	0.256
1.0556	0.508	0.167	0.000	0.256
1.0833	0.508	0.169	0.000	0.256
1.1111	0.508	0.171	0.000	0.256
1.1389	0.508	0.174	0.000	0.256
1.1667	0.508	0.176	0.000	0.256
1.1944	0.508	0.190	0.086	0.256
1.2222	0.508	0.204	0.430	0.256
1.2500	0.508	0.218	0.918	0.256
1.2778	0.508	0.232	1.515	0.256
1.3056	0.508	0.247	2.205	0.256
1.3333	0.508	0.261	2.976	0.256
1.3611	0.508	0.275	3.820	0.256
1.3889	0.508	0.289	4.732	0.256
1.4167	0.508	0.303	5.706	0.256
1.4444	0.508	0.317	6.740	0.256
1.4722	0.508	0.331	7.830	0.256
1.5000	0.508	0.345	8.972	0.256
1.5278	0.508	0.360	10.16	0.256
1.5556	0.508	0.374	11.40	0.256
1.5833	0.508	0.388	12.69	0.256
1.6111	0.508	0.402	14.03	0.256
1.6389	0.508	0.416	15.40	0.256
1.6667	0.508	0.430	16.82	0.256
1.6944	0.508	0.444	18.28	0.256
1.7222	0.508	0.459	19.79	0.256
1.7500	0.508	0.473	21.33	0.256
1.7778	0.508	0.487	22.90	0.256
1.8056	0.508	0.501	24.52	0.256
1.8333	0.508	0.515	26.17	0.256
1.8611	0.508	0.529	27.86	0.256
1.8889	0.508	0.543	29.58	0.256
1.9167	0.508	0.557	31.34	0.256
1.9444	0.508	0.572	33.12	0.256
1.9722	0.508	0.586	34.95	0.256
2.0000	0.508	0.600	36.80	0.256
2.0278	0.508	0.614	38.69	0.256
2.0556	0.508	0.628	40.60	0.256
2.0833	0.508	0.642	42.55	0.256
2.1111	0.508	0.656	44.53	0.256
2.1389	0.508	0.671	46.54	0.256
2.1667	0.508	0.685	48.57	0.256
2.1944	0.508	0.699	50.64	0.256
2.2222	0.508	0.713	52.73	0.256
2.2500	0.508	0.727	54.86	0.256
2.2778	0.508	0.741	57.01	0.256
2.3056	0.508	0.755	59.18	0.256
2.3333	0.508	0.769	61.39	0.256
2.3611	0.508	0.784	63.62	0.256
2.3889	0.508	0.798	65.88	0.256
2.4167	0.508	0.812	68.16	0.256
2.4444	0.508	0.826	70.47	0.256

2.4722	0.508	0.840	72.81	0.256
2.5000	0.508	0.854	75.17	0.256

Name : Sidewalk
Bypass: No

Impervious Land Use	**acre**
SIDEWALKS FLAT	**0.033**

Element Flows To:

Outlet 1	**Outlet 2**
Permeable Pavement	

Name : Imp. Driveway
Bypass: No

Impervious Land Use	**acre**
ROADS FLAT	**0.039**

Element Flows To:

Outlet 1	**Outlet 2**
Permeable Pavement	

Name : Landscaping
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
C, Pasture, Flat	**.256**

Element Flows To:

Surface	**Interflow**	**Groundwater**
Permeable Pavement	Permeable Pavement	

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:0.837
Total Impervious Area:0

Mitigated Landuse Totals for POC #1
Total Pervious Area:0.256
Total Impervious Area:0.580639

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.047725
5 year	0.093866
10 year	0.137716
25 year	0.212098
50 year	0.283979
100 year	0.372472

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1902	0.031	0.000
1903	0.022	0.000
1904	0.162	0.000
1905	0.028	0.000
1906	0.011	0.000
1907	0.086	0.000
1908	0.035	0.000
1909	0.048	0.000
1910	0.099	0.000
1911	0.067	0.000
1912	0.337	0.000
1913	0.042	0.000
1914	0.282	0.000
1915	0.024	0.000
1916	0.053	0.000
1917	0.015	0.000
1918	0.030	0.000
1919	0.027	0.000
1920	0.061	0.000
1921	0.044	0.000
1922	0.109	0.000
1923	0.053	0.000
1924	0.022	0.000
1925	0.021	0.000
1926	0.039	0.000
1927	0.022	0.000
1928	0.031	0.000
1929	0.093	0.000
1930	0.027	0.000
1931	0.031	0.000

1932	0.033	0.000
1933	0.040	0.000
1934	0.140	0.000
1935	0.026	0.000
1936	0.043	0.000
1937	0.107	0.000
1938	0.031	0.000
1939	0.012	0.000
1940	0.043	0.000
1941	0.019	0.000
1942	0.101	0.000
1943	0.046	0.000
1944	0.128	0.000
1945	0.037	0.000
1946	0.070	0.000
1947	0.018	0.000
1948	0.071	0.000
1949	0.069	0.000
1950	0.021	0.000
1951	0.024	0.000
1952	0.250	0.000
1953	0.197	0.000
1954	0.037	0.000
1955	0.023	0.000
1956	0.015	0.000
1957	0.035	0.000
1958	0.123	0.000
1959	0.105	0.000
1960	0.022	0.000
1961	0.185	0.000
1962	0.038	0.000
1963	0.020	0.000
1964	0.200	0.000
1965	0.085	0.000
1966	0.024	0.000
1967	0.097	0.000
1968	0.035	0.000
1969	0.038	0.000
1970	0.078	0.000
1971	0.093	0.000
1972	0.310	0.000
1973	0.084	0.000
1974	0.090	0.000
1975	0.205	0.000
1976	0.139	0.000
1977	0.018	0.000
1978	0.130	0.000
1979	0.063	0.000
1980	0.100	0.000
1981	0.043	0.000
1982	0.023	0.000
1983	0.082	0.000
1984	0.071	0.000
1985	0.126	0.000
1986	0.033	0.000
1987	0.102	0.000
1988	0.032	0.000

1989	0.033	0.000
1990	0.048	0.000
1991	0.076	0.000
1992	0.068	0.000
1993	0.044	0.000
1994	0.080	0.000
1995	0.023	0.000
1996	0.090	0.000
1997	0.032	0.000
1998	0.076	0.000
1999	0.017	0.000
2000	0.044	0.000
2001	0.023	0.000
2002	0.194	0.000
2003	0.049	0.000
2004	0.063	0.000
2005	0.210	0.000
2006	0.021	0.000
2007	0.060	0.000
2008	0.050	0.000
2009	0.025	0.000
2010	0.035	0.000
2011	0.016	0.000
2012	0.043	0.000
2013	0.063	0.000
2014	0.040	0.000
2015	0.185	0.000
2016	0.019	0.000
2017	0.051	0.000
2018	0.120	0.000
2019	0.169	0.000
2020	0.085	0.000
2021	0.065	0.000
2022	0.053	0.000
2023	0.056	0.000
2024	0.310	0.000
2025	0.032	0.000
2026	0.065	0.000
2027	0.033	0.000
2028	0.019	0.000
2029	0.046	0.000
2030	0.098	0.000
2031	0.019	0.000
2032	0.017	0.000
2033	0.019	0.000
2034	0.027	0.000
2035	0.101	0.000
2036	0.044	0.000
2037	0.019	0.000
2038	0.104	0.000
2039	0.018	0.000
2040	0.032	0.000
2041	0.043	0.000
2042	0.097	0.000
2043	0.067	0.000
2044	0.062	0.000
2045	0.033	0.000

2046	0.034	0.000
2047	0.027	0.000
2048	0.033	0.000
2049	0.048	0.000
2050	0.049	0.000
2051	0.130	0.000
2052	0.026	0.000
2053	0.035	0.000
2054	0.223	0.000
2055	0.029	0.000
2056	0.018	0.000
2057	0.027	0.000
2058	0.028	0.000
2059	0.128	0.000

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.3374	0.0000
2	0.3102	0.0000
3	0.3098	0.0000
4	0.2823	0.0000
5	0.2503	0.0000
6	0.2233	0.0000
7	0.2096	0.0000
8	0.2052	0.0000
9	0.1995	0.0000
10	0.1971	0.0000
11	0.1935	0.0000
12	0.1852	0.0000
13	0.1851	0.0000
14	0.1694	0.0000
15	0.1623	0.0000
16	0.1401	0.0000
17	0.1388	0.0000
18	0.1303	0.0000
19	0.1301	0.0000
20	0.1277	0.0000
21	0.1275	0.0000
22	0.1264	0.0000
23	0.1227	0.0000
24	0.1204	0.0000
25	0.1090	0.0000
26	0.1069	0.0000
27	0.1054	0.0000
28	0.1039	0.0000
29	0.1024	0.0000
30	0.1010	0.0000
31	0.1007	0.0000
32	0.0996	0.0000
33	0.0990	0.0000
34	0.0979	0.0000
35	0.0971	0.0000
36	0.0969	0.0000
37	0.0935	0.0000
38	0.0927	0.0000

39	0.0904	0.0000
40	0.0901	0.0000
41	0.0861	0.0000
42	0.0851	0.0000
43	0.0851	0.0000
44	0.0839	0.0000
45	0.0817	0.0000
46	0.0802	0.0000
47	0.0779	0.0000
48	0.0764	0.0000
49	0.0762	0.0000
50	0.0713	0.0000
51	0.0712	0.0000
52	0.0698	0.0000
53	0.0695	0.0000
54	0.0676	0.0000
55	0.0670	0.0000
56	0.0668	0.0000
57	0.0655	0.0000
58	0.0651	0.0000
59	0.0632	0.0000
60	0.0630	0.0000
61	0.0627	0.0000
62	0.0622	0.0000
63	0.0606	0.0000
64	0.0602	0.0000
65	0.0556	0.0000
66	0.0535	0.0000
67	0.0534	0.0000
68	0.0526	0.0000
69	0.0515	0.0000
70	0.0501	0.0000
71	0.0485	0.0000
72	0.0485	0.0000
73	0.0482	0.0000
74	0.0479	0.0000
75	0.0477	0.0000
76	0.0462	0.0000
77	0.0458	0.0000
78	0.0445	0.0000
79	0.0444	0.0000
80	0.0440	0.0000
81	0.0436	0.0000
82	0.0431	0.0000
83	0.0428	0.0000
84	0.0428	0.0000
85	0.0426	0.0000
86	0.0426	0.0000
87	0.0419	0.0000
88	0.0398	0.0000
89	0.0396	0.0000
90	0.0387	0.0000
91	0.0377	0.0000
92	0.0377	0.0000
93	0.0367	0.0000
94	0.0365	0.0000
95	0.0352	0.0000

96	0.0352	0.0000
97	0.0350	0.0000
98	0.0347	0.0000
99	0.0345	0.0000
100	0.0343	0.0000
101	0.0333	0.0000
102	0.0333	0.0000
103	0.0333	0.0000
104	0.0332	0.0000
105	0.0331	0.0000
106	0.0326	0.0000
107	0.0325	0.0000
108	0.0324	0.0000
109	0.0324	0.0000
110	0.0323	0.0000
111	0.0310	0.0000
112	0.0309	0.0000
113	0.0308	0.0000
114	0.0307	0.0000
115	0.0297	0.0000
116	0.0292	0.0000
117	0.0281	0.0000
118	0.0278	0.0000
119	0.0273	0.0000
120	0.0272	0.0000
121	0.0271	0.0000
122	0.0271	0.0000
123	0.0269	0.0000
124	0.0262	0.0000
125	0.0257	0.0000
126	0.0250	0.0000
127	0.0240	0.0000
128	0.0240	0.0000
129	0.0236	0.0000
130	0.0235	0.0000
131	0.0230	0.0000
132	0.0228	0.0000
133	0.0227	0.0000
134	0.0222	0.0000
135	0.0221	0.0000
136	0.0219	0.0000
137	0.0216	0.0000
138	0.0215	0.0000
139	0.0213	0.0000
140	0.0205	0.0000
141	0.0203	0.0000
142	0.0195	0.0000
143	0.0191	0.0000
144	0.0190	0.0000
145	0.0190	0.0000
146	0.0189	0.0000
147	0.0189	0.0000
148	0.0183	0.0000
149	0.0179	0.0000
150	0.0177	0.0000
151	0.0176	0.0000
152	0.0169	0.0000

153	0.0166	0.0000
154	0.0164	0.0000
155	0.0154	0.0000
156	0.0151	0.0000
157	0.0117	0.0000
158	0.0114	0.0000

Stream Protection Duration
POC #1
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0239	19069	0	0	Pass
0.0265	13446	0	0	Pass
0.0291	9424	0	0	Pass
0.0317	6687	0	0	Pass
0.0344	4958	0	0	Pass
0.0370	3757	0	0	Pass
0.0396	2948	0	0	Pass
0.0423	2244	0	0	Pass
0.0449	1623	0	0	Pass
0.0475	1264	0	0	Pass
0.0501	990	0	0	Pass
0.0528	792	0	0	Pass
0.0554	649	0	0	Pass
0.0580	523	0	0	Pass
0.0606	426	0	0	Pass
0.0633	350	0	0	Pass
0.0659	307	0	0	Pass
0.0685	268	0	0	Pass
0.0712	250	0	0	Pass
0.0738	227	0	0	Pass
0.0764	216	0	0	Pass
0.0790	204	0	0	Pass
0.0817	193	0	0	Pass
0.0843	179	0	0	Pass
0.0869	172	0	0	Pass
0.0895	158	0	0	Pass
0.0922	146	0	0	Pass
0.0948	135	0	0	Pass
0.0974	124	0	0	Pass
0.1001	116	0	0	Pass
0.1027	108	0	0	Pass
0.1053	105	0	0	Pass
0.1079	98	0	0	Pass
0.1106	95	0	0	Pass
0.1132	93	0	0	Pass
0.1158	88	0	0	Pass
0.1185	83	0	0	Pass
0.1211	76	0	0	Pass
0.1237	67	0	0	Pass
0.1263	64	0	0	Pass
0.1290	60	0	0	Pass
0.1316	57	0	0	Pass

0.1342	54	0	0	Pass
0.1368	54	0	0	Pass
0.1395	52	0	0	Pass
0.1421	48	0	0	Pass
0.1447	46	0	0	Pass
0.1474	44	0	0	Pass
0.1500	43	0	0	Pass
0.1526	40	0	0	Pass
0.1552	38	0	0	Pass
0.1579	37	0	0	Pass
0.1605	37	0	0	Pass
0.1631	35	0	0	Pass
0.1657	33	0	0	Pass
0.1684	33	0	0	Pass
0.1710	31	0	0	Pass
0.1736	29	0	0	Pass
0.1763	28	0	0	Pass
0.1789	28	0	0	Pass
0.1815	28	0	0	Pass
0.1841	28	0	0	Pass
0.1868	25	0	0	Pass
0.1894	25	0	0	Pass
0.1920	25	0	0	Pass
0.1946	24	0	0	Pass
0.1973	21	0	0	Pass
0.1999	20	0	0	Pass
0.2025	20	0	0	Pass
0.2052	19	0	0	Pass
0.2078	18	0	0	Pass
0.2104	17	0	0	Pass
0.2130	16	0	0	Pass
0.2157	16	0	0	Pass
0.2183	16	0	0	Pass
0.2209	16	0	0	Pass
0.2235	14	0	0	Pass
0.2262	14	0	0	Pass
0.2288	14	0	0	Pass
0.2314	13	0	0	Pass
0.2341	13	0	0	Pass
0.2367	13	0	0	Pass
0.2393	13	0	0	Pass
0.2419	13	0	0	Pass
0.2446	13	0	0	Pass
0.2472	12	0	0	Pass
0.2498	12	0	0	Pass
0.2524	10	0	0	Pass
0.2551	10	0	0	Pass
0.2577	10	0	0	Pass
0.2603	10	0	0	Pass
0.2630	10	0	0	Pass
0.2656	10	0	0	Pass
0.2682	10	0	0	Pass
0.2708	10	0	0	Pass
0.2735	10	0	0	Pass
0.2761	10	0	0	Pass
0.2787	10	0	0	Pass
0.2814	10	0	0	Pass

0.2840 7 0 0 Pass

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Permeable Pavement POC	N	248.94			N	100.00			
Total Volume Infiltrated		248.94	0.00	0.00		100.00	0.00	0%	No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Passed

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Appendix C NRCS Soil Survey

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

Pierce County Area, Washington

Sparks Stadium Parking Lot Addition

November 19, 2021

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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Contents

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.

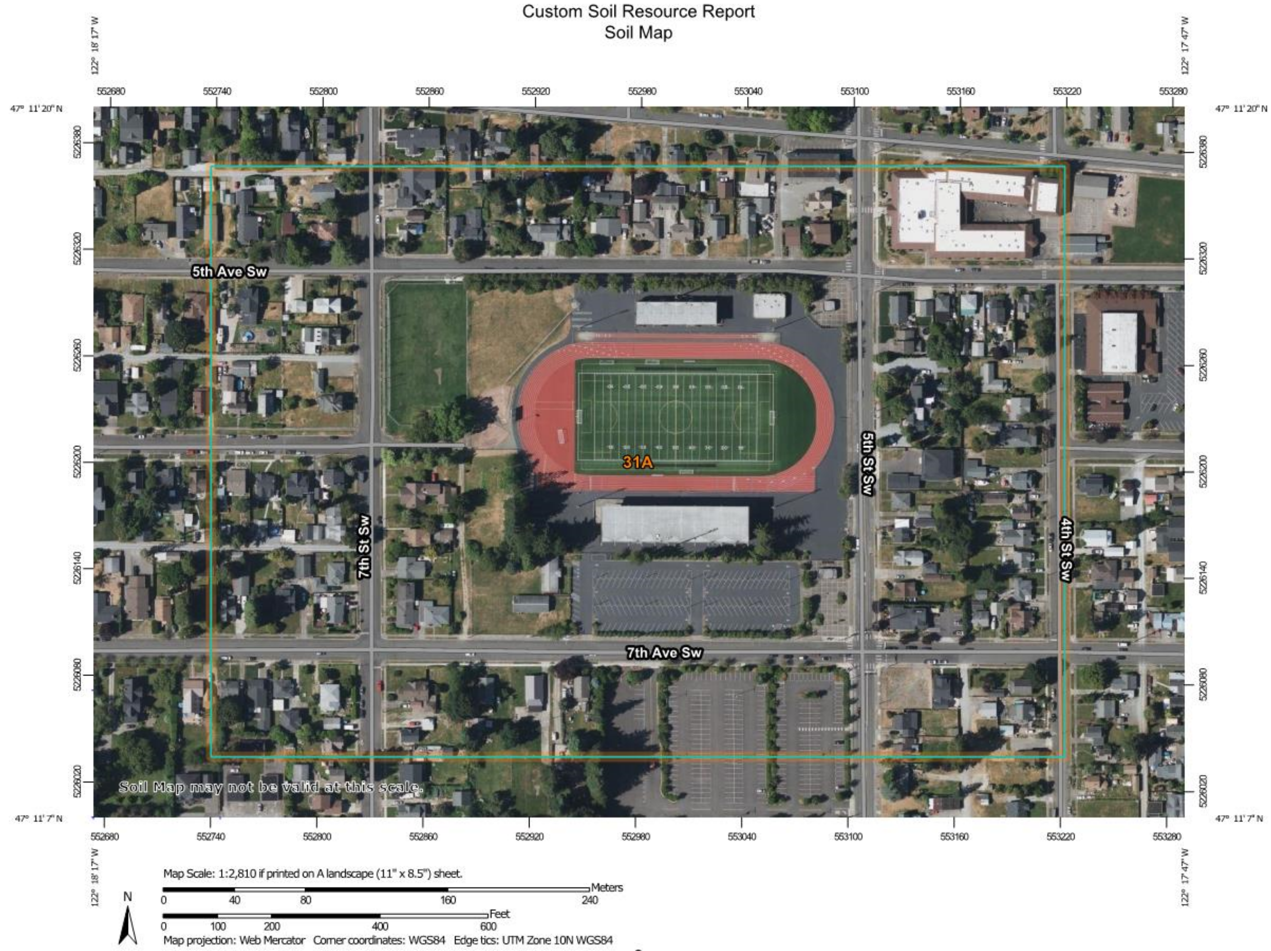
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree 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



9

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: Pierce County Area, Washington
Survey Area Data: Version 17, Aug 31, 2021

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

Date(s) aerial images were photographed: Jul 18, 2020—Aug 2, 2020

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
31A	Puyallup fine sandy loam	39.8	100.0%
Totals for Area of Interest		**39.8**	**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.

Pierce County Area, Washington

31A—Puyallup fine sandy loam

Map Unit Setting

National map unit symbol: 2hq9
Elevation: 0 to 390 feet
Mean annual precipitation: 35 to 60 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 170 to 200 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Puyallup and similar soils: 85 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Puyallup

Setting

Landform: Terraces, flood plains
Parent material: Alluvium

Typical profile

H1 - 0 to 13 inches: ashy fine sandy loam
H2 - 13 to 29 inches: loamy fine sand
H3 - 29 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 48 to 79 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A
Ecological site: F002XA008WA - Puget Lowlands Riparian Forest
Forage suitability group: Droughty Soils (G002XN402WA)
Other vegetative classification: Droughty Soils (G002XN402WA)
Hydric soil rating: No

Minor Components

Briscot, undrained

Percent of map unit: 2 percent
Landform: Depressions
Other vegetative classification: Seasonally Wet Soils (G002XN202WA)
Hydric soil rating: Yes

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Appendix D Geotechnical Report and Monitoring Well Reports

Geotechnical Engineering Report

Sparks Stadium Parking Lot Expansion
615 7th Ave SW
Puyallup, Washington 98371
Parcel No. 5000550290

February 15, 2022

prepared for:

Sitts & Hill Engineers, Inc.
Attention: Richard C. Hand, P.E.
4815 Center Street
Tacoma, WA 98409

prepared by:

Migizi Group, Inc.
PO Box 44840
Tacoma, WA 98448
(253) 537-9400

MGI Project Z0194

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APPENDIX A

MIGIZI GROUP, INC.

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Tacoma, Washington 98448

PHONE (253) 537-9400
FAX (253) 537-9401

February 15, 2022

Sitts & Hill Engineers, Inc.
4815 Center Street
Tacoma, WA 98409

Attention: Richard C. Hand, P.E.

Subject: **Geotechnical Engineering Report**
Sparks Stadium Parking Lot Expansion
615 7th Ave SW
Puyallup, Washington 98371
Parcel No. 0420284126

MGI Project Z0194

Dear Mr. Hand:

Migizi Group, Inc. (MGI) is pleased to submit this report describing the results of our geotechnical evaluation for the proposed Sparks Stadium parking lot expansion at Puyallup High School. We previously prepared an infiltration letter for the Sparks Stadium Grass Practice Field dated December 14, 2016.

This report has been prepared for the exclusive use of Sitts & Hill Engineers, Inc., and their consultants, for specific application to this project, in accordance with generally accepted geotechnical engineering practice.

1.0 SITE AND PROJECT DESCRIPTION

The main campus of the Puyallup High School is located northeast of the intersection of 7th St SW and W Pioneer Ave in downtown Puyallup, Washington, as shown on the enclosed Topographic and Location Map (Figure 1). Adjacent properties to the north and northwest also service the high school, containing a gymnasium, pool, softball/baseball field, portables, and staff and student parking. Sparks Stadium is located south of the high school main campus and serves as the venue for football, soccer and track and field sporting events.

Improvement plans call for the construction of supplemental parking immediately west of the existing stadium parking lot on the south side of the main structure. The proposed improvement area has been under ownership by the Puyallup School District and is occupied by grass fields and portable structures. The new parking lot will join the existing parking lot at grade and will also include one or more entrance improvements. If feasible, the supplemental parking area will be constructed utilizing pervious pavement materials.

2.0 EXPLORATORY METHODS

We explored surface and subsurface conditions at the project site on January 4-5, 2022. Our exploration and evaluation program comprised the following elements:

- Surface reconnaissance of the site,
- Two test pit explorations (designated TP-1 & TP-2), advanced on January 5, 2022,
- One auger boring exploration (designated MW-1) with a 20-foot groundwater monitoring well installed, advanced on January 4, 2022,
- One Small-Scale Pilot Infiltration Test (PIT) (designated INF-1), conducted on January 5, 2022,
- Four groundwater monitoring site visits conducted between January 18, 2022 and February 7, 2022, and
- A review of published geologic and seismologic maps and literature.

Table 1 (page 3) summarizes the approximate functional locations and termination depths of our subsurface explorations, and Figure 2 depicts their approximate relative locations. The following sections describe the procedures used for excavation of the test pits and auger borings.

TABLE 1
APPROXIMATE LOCATIONS AND DEPTHS OF EXPLORATIONS

Exploration	Functional Location	Termination Depth (feet)
TP-1	West-central portion of the site	10
TP-2	South-central portion of the site	9.5
MW-1	North-central portion of the site	21.5

The specific number and locations of our explorations were selected in relation to the existing site features, under the constraints of surface access, underground utility conflicts, and budget considerations.

It should be realized that the explorations performed and utilized for this evaluation reveal subsurface conditions only at discrete locations across the project site and that actual conditions in other areas could vary. Furthermore, the nature and extent of any such variations would not become evident until additional explorations are performed or until construction activities have begun. If significant variations are observed at that time, we may need to modify our conclusions and recommendations contained in this report to reflect the actual site conditions.

2.1 Test Pit Procedures

Our exploratory test pits were excavated with a rubber-tracked, mini-excavator operated by an excavation contractor under subcontract to MGI. An engineering geologist from our firm observed the test pit excavations, collected soil samples, and logged the subsurface conditions.

The enclosed test pit logs indicate the vertical sequence of soils and materials encountered in our test pits, based on our field classifications. Where a soil contact was observed to be gradational or undulating, our logs indicate the average contact depth. We estimated the relative density and consistency of the in-situ soils by means of the excavation characteristics and the stability of the test pit sidewalls. Our logs also indicate the approximate depths of any sidewall caving or groundwater seepage observed in the test pits. The soils were classified visually in general accordance with the system described in Figure A-1, which includes a key to the exploration log. Summary logs of our explorations are included as Figures A-2 and A-3.

2.2 Auger Boring Procedures

Our exploratory boring was advanced through the soil with a hollow-stem auger, using a truck-mounted drill rig, operated by an independent drilling firm working under subcontract to MGI. An engineering geologist from our firm continuously observed the boring, logged the subsurface conditions, and collected representative soil samples. All samples were stored in watertight containers and later transported to a laboratory for further visual examination and testing. After the borings were completed, the boreholes were backfilled in accordance with state requirements.

Throughout the drilling operation, soil samples were obtained at 2½ to 5-foot depth intervals by means of the Standard Penetration Test (SPT) per American Society for Testing and Materials (ASTM:D-1586), or using a large split-spoon sampler. This testing and sampling procedure consists of driving a standard 2-inch-outside-diameter steel split-spoon sampler 18 inches into the soil with a 140-pound hammer free-falling 30 inches. The number of blows struck during the final 12 inches is recorded on the boring logs. If a total of 50 blows are struck within any 6-inch interval, the driving is stopped, and the blow count is recorded as 50 blows for the actual penetration distance. The resulting blow count values indicate the relative density of granular soils and the relative consistency of cohesive soils.

The enclosed boring log describes the vertical sequence of soils and materials encountered in the boring, based primarily on our field classifications and supported by our subsequent laboratory examination and testing. Where a soil contact was observed to be gradational, our logs indicate the average contact depth. Where a soil type changed between sample intervals, we inferred the contact depth. Our log also graphically indicates the blow count, sample type, sample number, and approximate depth of each soil sample obtained from the borings, as well as any laboratory tests performed on these soil samples. If any groundwater was encountered in a borehole, the approximate groundwater depth is depicted on the boring logs. Groundwater depth estimates are typically based on the moisture content of soil samples, the wetted height on the drilling rods, and the water level measured in the borehole after the auger has been extracted. The soils were classified visually in general accordance with the system described in Figure A-1, which includes a key to our exploration logs. A summary log of our exploration is included as Figure A-4.

2.3 Infiltration Test Procedures

In-situ field infiltration testing was performed for determination of a Design Infiltration Rate in general accordance with the Small-Scale PIT procedures, as described in V-5.4 of the 2019 Washington State Department of Ecology Stormwater Management Manual for Western Washington, as adopted by the City of Puyallup. The first step of this test procedure was to identify a suitable soil stratum for stormwater retention, and once completed, perform an excavation within this soil group with a minimum surface area of 12 square feet (sf). Once the excavation was completed, a vertical measuring rod marked in half-inch increments was installed towards the center of the test area. Water was then introduced into the test area, being conveyed through a 4-inch corrugated pipe to a splash block at the bottom of the excavation. Once 12 inches of water was developed at the bottom of the excavation, the test surface was saturated prior to testing. After the saturation period was completed, a steady state flow rate was developed in order to maintain 12 inches of head at the bottom of the test surface. This steady state rate was maintained for one hour. After completion of the steady state period, water was no longer introduced into the excavation, and infiltration of the existing water was allowed. We recorded the falling head rate for one hour, for comparison with the steady state rate.

3.0 SITE CONDITIONS

The following sections present our observations, measurements, findings, and interpretations regarding surface, soil, groundwater, infiltration and seismic conditions, and liquefaction potential.

3.1 Surface Conditions

As previously indicated, the main campus of the Puyallup High School is located northeast of the intersection of 7th St SW and W Pioneer Ave in downtown Puyallup, Washington. Adjacent properties to the north and northwest also service the high school, containing a gymnasium, pool, softball/baseball field, portables, and staff and student parking. Sparks Stadium is located south of the high school main campus and serves as the venue for football, soccer and track and field sporting events. The proposed supplemental parking area is located immediately west of the existing stadium parking lot on the south side of the main structure. This property has been under ownership by the Puyallup School District and is occupied by grass fields and portable structures. The proposed improvement area is elongated lengthwise from east to west, spanning approximately 200 feet along this orientation, and extends upwards of 150 feet from north to south.

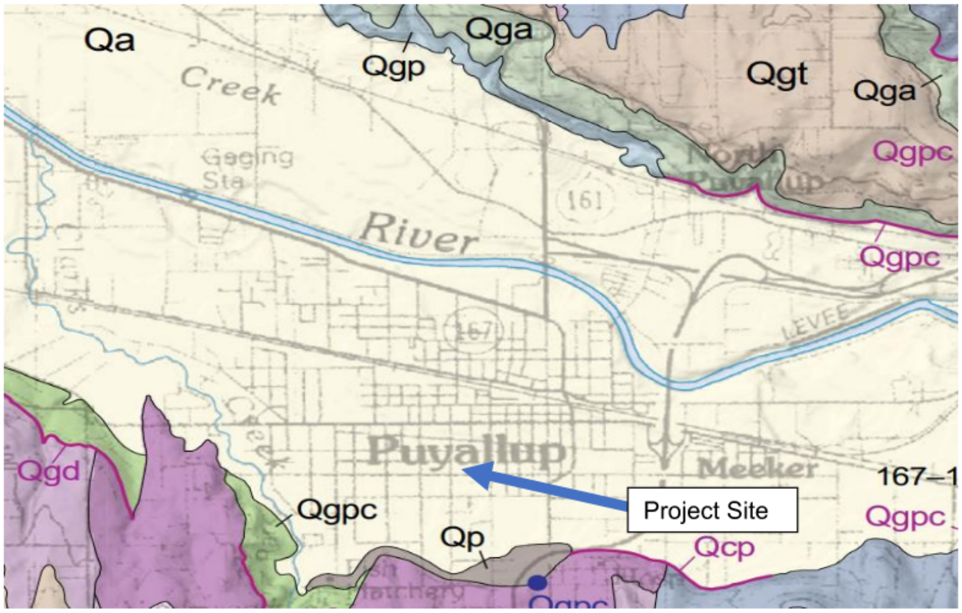
Topographically, the project area is relatively level, with minimal grade change being observed over its extent. Vegetation onsite is largely limited to lawn grasses, though a mature growth of cedar and fir trees line the north margin of the improvement area.

No hydrologic features were observed on site, such as seeps, springs, ponds and streams.

3.2 Soil Conditions

We observed subsurface conditions through the advancement of two test pit explorations and one auger boring exploration adjacent to proposed improvements. Soil conditions were relatively consistent, generally comprised of a surface mantle of sod and topsoil, underlain by fine-grained alluvial soils associated with the flood plains of the Puyallup River. Alluvial soils, as encountered onsite, ranged in composition from a fine sand with silt to mottled sandy silt. In general, the more fine-grained sandy silt horizon was observed in close proximity to existing grade, extending through a depth of approximately 3 feet. Beneath this depth, alluvial soils were primarily comprised of fine silty sand of intermittent lenses of fine sand with silt. Alluvial soils were encountered in a very loose to medium dense in situ condition, with silty sand alluvial soils being observed through the termination of all of our subsurface explorations; a maximum depth of 21 ½ feet.

In the *Geologic Map of the Tacoma 1:100,000-scale Quadrangle, Washington,* as prepared by the Washington State Department of Natural Resources Division of Geology and Earth Resources (WSDNR) (2015), the entire project area is mapped as containing Qa, or Holocene alluvium, which is described as loose, stratified to massively bedded fluvial silt, sand, and gravel; typically, well rounded and moderately to well sorted; locally includes sandy to silty estuarine deposits. The National Cooperative Soil Survey (NCSS) for Pierce County, classifies all soils onsite as 31A – Puyallup fine sandy loam, which reportedly forms from alluvium and produces landforms such as flood plains and terraces. Our field observations generally correspond with the site classification performed by the WSDNR and the NCSS.



Excerpt from the Geologic Map of the Tacoma 1:100,000-scale Quadrangle, Washington (WSDNR)(2015)

The enclosed exploration logs (Appendix A) provide a detailed description of the soil strata encountered in our subsurface explorations.

3.3 Groundwater Conditions

We encountered groundwater at a depth of 5½ to 8½ feet at the time of our subsurface explorations between January 4-5, 2022. Subsequent groundwater monitoring of the well was conducted between January 18th through February 7th of 2022; with four measurements being taken. Seasonally high groundwater rose within 2.75 feet below the rim of the well during our January 18th site visit; with subsequent measurements showing groundwater levels gradually descending. Our groundwater measuring regime will continue along a weekly basis through April of 2022, as dictated in governing stormwater design manuals. Seasonally perched groundwater may also be encountered during an extended period of precipitation due to the poor permeability of site soils and as evidenced by soil mottling.

3.4 Infiltration Conditions

As indicated in the *Soil Conditions* section of this report, the project area is underlain by fine-grained alluvial soils associated with the flood plains of the Puyallup River. This material ranged in composition from fine sand with silt to sandy silt and was typically observed in a very loose to medium dense in situ condition; generally becoming more consolidated with depth. Given the high seasonal water table, as outlined in the previous section, large-scale infiltration facilities, such as trenches, dry wells or ponds, are not feasible for this project. However, we believe that existing hydrogeologic conditions can support pervious pavements, as proposed for this project.

On January 5, 2022, an engineering geologist from MGI performed field infiltration testing using the procedures noted at the onset of this report. The field test (INF-1) was performed towards the southwest corner of the site, between test pit explorations TP-1 and TP-2, as indicated in the attached Figure 2. As described in the *Infiltration Test Procedures* section of this report, there are two complementary portions of the Small PIT procedure used to determine a field infiltration rate: the steady-state period and the falling head period. In our experience, the falling head period is generally more conservative and provides a more accurate evaluation of infiltration conditions. The result of the falling head portion of our Small PIT procedure is recorded in Table 2 (below).

TABLE 2
FALLING HEAD PERIOD TEST RESULTS

Test Pit Exploration	Depth of Test Surface (feet)	Field Infiltration Rate (in/hr)
INF-1	3	1.5

A design infiltration rate is determined by applying an appropriate correction factor to the measured infiltration rate. As described in the SWMMWW, this total correction factor (CF_T) should be equal to:

$$CF_T = CF_v \times CF_t \times CF_m$$

Where CF_v accounts for site variability and number of locations tested, CF_t accounts for uncertainty with the test method, and CF_m accounts for siltation and biofouling. The SWMMWW recommends using a value between 0.33 and 1 for CF_v, a value of 0.5 for CF_t, and a value of 0.9 for CF_m. For this evaluation we used a value of 0.75 for CF_v, giving us a $CF_T = 0.3375$. Applying this value to our measured infiltration rate, we recommend using a design infiltration rate of **0.5 inches per hour** for pervious pavements constructed using the silty sand alluvial deposits that underlie the project area as the primary infiltrative medium.

3.5 Seismic Conditions

The site is in the Puget Sound basin which has experienced several earthquakes. A detailed description of the regional seismicity is beyond the scope of this report; however, previous regional earthquakes can be split into two general categories: 1.) large earthquakes with a moment magnitude greater than 8.0 ($M_W > 8.0$), and 2.) modest size earthquakes with a moment magnitude generally less than 7.25 ($M_W < 7.25$). In all cases, the thickness of the soil between the bedrock and the ground surface can change (usually amplify) the seismically induced ground motions and therefore the inertial loads acting on surface structures.

"Site Class" is a classification system used by the IBC and ASCE 7 to provide some insight to the potential for ground motion amplification. The site class is based on the properties of the upper 100 feet of the soil and rock materials at the site. MGI used a combination of onsite explorations and our review of the geologic mapping of the site to derive a site class for the site. Based on evaluation and the definitions of Site Class as provided in Table 20.3-1 of ASCE 7-16 (as required by the 2018 International Building Code), the soil conditions on this site satisfy the definition of Site Class D. Our evaluation assumes the soil conditions encountered in the bottom of our explorations, and those from nearby properties, is similar to or increasing in density/consistency down to 100 feet below ground surface.

The 2018 IBC considers earthquake shaking having a 2 percent probability of exceedance in 50 years (i.e. a 2475-year return period), as the code-based design requirement. Using the third-party graphical user interface tools made available by the USGS at https://seismicmaps.org, MGI derived the design ground motions to be used for design of the structures. Our evaluation used ASCE 7-16 as the code reference, Risk Category I/II/III, and Site Class D (Default). The results of our evaluation are provided in Table 2 (page 7):

TABLE 3
SEISMIC DESIGN PARAMETERS

Parameter	Value	Basis
Site Class	D	Table 20.3-1 of ASCE 7-16
S_S	1.274	seismicmaps.org
F_a	1.2[A]	seismicmaps.org
S_{MS}	1.528	$= F_a \cdot S_S$, 2018 IBC Eqn. 16-36
S_{DS}	1.019	$= \frac{2}{3} S_{MS}$, 2018 IBC Eqn. 16-38
S_1	0.439	seismicmaps.org
F_V	1.86 [B, C]	2018 IBC
S_{M1}	0.817 [B, C]	$= F_V \cdot S_1$, 2018 IBC Eqn. 16-37
Parameter	**Value**	**Basis**

S_{D1}	0.544 [B, C]	= $^2/_3$ S_{M1}, 2018 IBC Eqn. 16-39
PGA	0.5g	seismicmaps.org
PGA_M	0.6g	seismicmaps.org
T_0	-- [C]	Not applicable
T_S	-- [C]	Not applicable
T_L	6 sec.	seismicmaps.org

Notes:

A. Use the value provided unless the simplified design procedure of ASCE 7 Section 12.14 is used. If this occurs, please contact our office for more information.

B. Based on Table 1613.2.3(2) of the 2018 IBC – An ASCE 7-16 Chapter 21 analysis has not been performed.

C. More detailed seismic design criteria are available upon request. Please contact MGI's office for more information.

3.6 Liquefaction Potential

Liquefaction is a sudden increase in pore water pressure and a sudden loss of soil shear strength caused by shear strains, as could result from an earthquake. Research has shown that saturated, loose, fine to medium sands with a fines (silt and clay) content less than about 20 percent are most susceptible to liquefaction. As with all properties situated within the Puyallup River Valley, site soils exhibit a moderate to high risk to liquefy during a large-scale seismic event. Some degree of post construction settlement should be anticipated in the aftermath of a large-scale seismic event.

4.0 CONCLUSIONS AND RECOMMENDATIONS

Improvement plans call for the construction of supplemental parking immediately west of the existing stadium parking lot on the south side of the main structure. The proposed improvement area has been under ownership by the Puyallup School District and is occupied by grass fields and portable structures. The new parking lot will join the existing parking lot at grade and will also include one or more entrance improvements. If feasible, the supplemental parking area will be constructed utilizing pervious pavement materials. We offer these recommendations:

- Feasibility: Based on our field explorations, research and analyses, the proposed parking lot expansion and onsite stormwater retention appears feasible from a geotechnical standpoint.
- Infiltration Conditions: We recommend using a design infiltration rate of **0.5 inches per hour** for pervious pavements constructed using the silty sand alluvial deposits which underly the site as the primary infiltrative medium. This material was relatively consistent and continuous through the termination of our explorations, a maximum depth of 21½ feet.

The following sections of this report present our specific geotechnical conclusions and recommendations concerning site preparation, asphalt pavement, pervious pavement, and structural fill. The Washington State Department of Transportation (WSDOT) Standard Specifications and Standard Plans cited herein refer to WSDOT publications M41-10, *Standard Specifications for Road, Bridge, and Municipal Construction*, and M21-01, *Standard Plans for Road, Bridge, and Municipal Construction*, respectively.

4.1 Site Preparation

Preparation of the project site should involve erosion control, temporary drainage, clearing, stripping, excavations, cutting, subgrade compaction, and filling.

Erosion Control: Before new construction begins, an appropriate erosion control system should be installed. This system should collect and filter all surface water runoff through silt fencing. We anticipate a system of berms and drainage ditches around construction areas will provide an adequate collection system. Silt fencing fabric should meet the requirements of WSDOT Standard Specification 9-33.2 Table 6. In addition, silt fencing should embed a minimum of 6 inches below existing grade. An erosion control system requires occasional observation and maintenance. Specifically, holes in the filter and areas where the filter has shifted above ground surface should be replaced or repaired as soon as they are identified.

Temporary Drainage: We recommend intercepting and diverting any potential sources of surface or near-surface water within the construction zones before stripping begins. Because the selection of an appropriate drainage system will depend on the water quantity, season, weather conditions, construction sequence, and contractor's methods, final decisions regarding drainage systems are best made in the field at the time of construction. Based on our current understanding of the construction plans, surface and subsurface conditions, we anticipate that curbs, berms, or ditches placed around the work areas will adequately intercept surface water runoff.

Clearing and Stripping: After surface and near-surface water sources have been controlled, sod, topsoil, and root-rich soil should be stripped from the site. Our subsurface explorations indicate that the organic horizon can reach thicknesses of up to 4 to 5 inches. Stripping is best performed during a period of dry weather.

Site Excavations: Based on our explorations, we expect that the vast majority of project excavations will encounter loose to medium dense alluvial sand and silt, which can be readily excavated utilizing standard excavation equipment.

Dewatering: Our explorations and groundwater monitoring regime indicates that seasonally high groundwater levels can rise within 3 feet of existing grade. If groundwater is encountered in shallow excavations above the water table, we anticipate that an internal system of ditches, sump holes, and pumps will be adequate to temporarily dewater excavations. For deeper excavations below the water table, expensive dewater equipment, such as well points, will be necessary in order to temporary dewater excavations.

Temporary Cut Slopes: At this time, final designs and construction sequencing have not been completed. To facilitate project planning we provide the following general comments regarding temporary slopes:

- All temporary soil slopes associated with site cutting or excavations should be adequately inclined to prevent sloughing and collapse,

- Temporary cut slopes in site soils should be no steeper than 1½H:1V, and
- Temporary slopes should conform to Washington Industrial Safety and Health Act (WISHA) regulations.

These general guidelines are necessarily somewhat conservative (steeper temporary slopes may be possible). As the project progresses, temporary grading plans are developed, final site features are better defined, and a contractor is engaged, MGI may modify these general guidelines to allow steeper slopes.

Subgrade Compaction: Exposed subgrades for the foundation of the proposed residences should be compacted to a firm, unyielding state before new concrete or fill soils are placed. Any localized zones of looser granular soils observed within a subgrade should be compacted to a density commensurate with the surrounding soils. In contrast, any organic, soft, or pumping soils observed within a subgrade should be overexcavated and replaced with a suitable structural fill material.

Site Filling: Our conclusions regarding the reuse of onsite soils and our comments regarding wet-weather filling are presented subsequently. Regardless of soil type, all fill should be placed and compacted according to our recommendations presented in the *Structural Fill* section of this report. Specifically, building pad fill soil should be compacted to a uniform density of at least 95 percent (based on ASTM:D-1557).

Onsite Soils: We offer the following evaluation of these onsite soils in relation to potential use as structural fill:

- *Surficial Organic Soil*: Where encountered, surficial organic soils like duff, topsoil, root-rich soil, and organic-rich fill soils are *not* suitable for use as structural fill under any circumstances, due to high organic content. Consequently, this material can be used only for non-structural purposes, such as in landscaping areas.
- *Alluvial Soils*: This soil unit appears directly below the organic-rich topsoil encountered across the project area. Due to fines contents occasionally exceeding 50 percent, these soils are extremely moisture sensitive and will be difficult, if not impossible, to reuse during wet weather conditions. Reuse is not recommended, and this material should only be used for non-structural purposes, such as in landscaping areas.

Permanent Slopes: All permanent cut slopes and fill slopes should be adequately inclined to reduce long-term raveling, sloughing, and erosion. We generally recommend that no permanent slopes be steeper than 2H:1V. For all soil types, the use of flatter slopes (such as 2½H:1V) would further reduce long-term erosion and facilitate revegetation.

Slope Protection: We recommend that a permanent berm, swale, or curb be constructed along the top edge of all permanent slopes to intercept surface flow. Also, a hardy vegetative groundcover should be established as soon as feasible, to further protect the slopes from runoff water erosion. Alternatively, permanent slopes could be armored with quarry spalls or a geosynthetic erosion mat.

4.2 Asphalt Pavement

Since asphalt pavements could potentially be used in the new parking areas and entryways, we offer the following comments and recommendations for pavement design and construction.

Subgrade Preparation: All soil subgrades should be thoroughly compacted, then proof-rolled with a loaded dump truck or heavy compactor. Any localized zones of yielding subgrade disclosed during this proof-rolling operation should be over excavated to a maximum depth of 12 inches and replaced with a suitable structural fill material. All structural fill should be compacted according to our recommendations given in the *Structural Fill* section. Specifically, the upper 2 feet of soils underlying pavement section should be compacted to at least 95 percent (based on ASTM D-1557), and all soils below 2 feet should be compacted to at least 90 percent.

Pavement Materials: For the base course, we recommend using imported washed crushed rock, such as "Crushed Surfacing Base Course" per WSDOT Standard Specification 9-03.9(3) but with a fines content of less than 5 percent passing the No. 200 Sieve. Although our explorations do not indicate a need for a pavement subbase, if a subbase course is needed, we recommend using imported, clean, well-graded sand and gravel such as "Ballast" or "Gravel Borrow" per WSDOT Standard Specifications 9-03.9(1) and 9-03.14, respectively.

Conventional Asphalt Sections: A conventional pavement section typically comprises an asphalt concrete pavement over a crushed rock base course. We recommend using the following conventional pavement sections:

	Minimum Thickness		
Pavement Course	**Automobile Parking Areas**	**Areas Subject to Truck Loads**	**High Traffic Driveways**
Asphalt Concrete Pavement	2 inches	3 inches	4 inches
Crushed Rock Base	4 inches	6 inches	8 inches
Granular Fill Subbase (if needed)	6 inches	9 inches	12 inches

Compaction and Observation: All subbase and base course material should be compacted to at least 95 percent of the Modified Proctor maximum dry density (ASTM D-1557), and all asphalt concrete should be compacted to at least 92 percent of the Rice value (ASTM D-2041). We recommend that an MGI representative be retained to observe the compaction of each course before any overlying layer is placed. For the subbase and pavement course, compaction is best observed by means of frequent density testing. For the base course, methodology observations and hand-probing are more appropriate than density testing.

Pavement Life and Maintenance: No asphalt pavement is maintenance-free. The above-described pavement sections present our minimum recommendations for an average level of performance during a 20-year design life; therefore, an average level of maintenance will likely be required.

Furthermore, a 20-year pavement life typically assumes that an overlay will be placed after about 10 years. Thicker asphalt and/or thicker base and subbase courses would offer better long-term performance but would cost more initially; thinner courses would be more susceptible to "alligator" cracking and other failure modes. As such, pavement design can be considered a compromise between a high initial cost and low maintenance costs versus a low initial cost and higher maintenance costs.

4.3 Pervious Pavement

We understand that pervious pavements will likely be used be used in the new parking areas and entryways. We offer the following comments and recommendations for pavement construction.

Subgrade Preparation: The existing subgrade under all pervious pavements must remain in an uncompacted condition to facilitate water infiltration. Traffic from construction equipment and vehicles should be limited to the extent practical prior to placement of the pavement section.

Any concentrated areas of fines accumulation due to ponding may be removed to a maximum depth of 6 inches. If desired, these areas may be re-leveled using clean sand. Materials meeting the requirements for "Sand Drainage Blanket" in Section 9-03.13(1) of the WSDOT Standard Specifications may be used for this purpose.

We recommend placement of a nonwoven filter fabric such as Mirafi 160N or equal over the prepared subgrade prior to construction of the pervious pavement section.

Construction Observation: We recommend that an MGI representative be retained to observe and document the placement of each course before any overlying layer is placed.

4.4 Structural Fill

The term "structural fill" refers to any material placed under foundations, retaining walls, slab-on-grade floors, sidewalks, pavements, and other structures. Our comments, conclusions, and recommendations concerning structural fill are presented in the following paragraphs.

Materials: Typical structural fill materials include clean sand, gravel, pea gravel, washed rock, crushed rock, well-graded mixtures of sand and gravel (commonly called "gravel borrow" or "pit-run"), and miscellaneous mixtures of silt, sand, and gravel. Recycled asphalt, concrete, and glass, which are derived from pulverizing the parent materials, are also potentially useful as structural fill in certain applications. Soils used for structural fill should not contain any organic matter or debris, nor any individual particles greater than about 6 inches in diameter.

Fill Placement: Clean sand, gravel, crushed rock, soil mixtures, and recycled materials should be placed in horizontal lifts not exceeding 8 inches in loose thickness, and each lift should be thoroughly compacted with a mechanical compactor.

Compaction Criteria: Using the Modified Proctor test (ASTM:D-1557) as a standard, we recommend that structural fill used for various onsite applications be compacted to the following minimum densities:

Fill Application	Minimum Compaction
Asphalt pavement base	95 percent
Asphalt pavement subgrade (upper 2 feet)	95 percent
Asphalt pavement subgrade (below 2 feet)	90 percent

Subgrade Observation and Compaction Testing: Regardless of material or location, all structural fill should be placed over firm, unyielding subgrades prepared in accordance with the *Site Preparation* section of this report. The condition of all subgrades should be observed by geotechnical personnel before filling or construction begins. Also, fill soil compaction should be verified by means of in-place density tests performed during fill placement so that adequacy of soil compaction efforts may be evaluated as earthwork progresses.

Soil Moisture Considerations: The suitability of soils used for structural fill depends primarily on their grain-size distribution and moisture content when they are placed. As the "fines" content (that soil fraction passing the U.S. No. 200 Sieve) increases, soils become more sensitive to small changes in moisture content. Soils containing more than about 5 percent fines (by weight) cannot be consistently compacted to a firm, unyielding condition when the moisture content is more than 2 percentage points above or below optimum. For fill placement during wet-weather site work, we recommend using "clean" fill, which refers to soils that have a fines content of 5 percent or less (by weight) based on the soil fraction passing the U.S. No. 4 Sieve.

5.0 RECOMMENDED ADDITIONAL SERVICES

Because the future performance and integrity of the structural elements will depend largely on proper site preparation, drainage, fill placement, and construction procedures, monitoring and testing by experienced geotechnical personnel should be considered an integral part of the construction process. Subsequently, we recommend that MGI be retained to provide the following post-report services:

- Review all construction plans and specifications to verify that our design criteria presented in this report have been properly integrated into the design,
- Prepare a letter summarizing all review comments (if required),
- Check all completed subgrades for footings and slab-on-grade floors before concrete is poured, in order to verify their bearing capacity, and
- Prepare a post-construction letter summarizing all field observations, inspections, and test results (if required).

6.0 CLOSURE

The conclusions and recommendations presented in this report are based, in part, on the explorations that we observed for this study; therefore, if variations in the subgrade conditions are observed at a later time, we may need to modify this report to reflect those changes. Also, because the future performance and integrity of the project elements depend largely on proper initial site preparation, drainage, and construction procedures, monitoring and testing by experienced geotechnical personnel should be considered an integral part of the construction process. MGI is available to provide geotechnical monitoring of soils throughout construction.

We appreciate the opportunity to be of service on this project. If you have any questions regarding this report or any aspects of the project, please feel free to contact our office.

Respectfully submitted,

MIGIZI GROUP, INC.

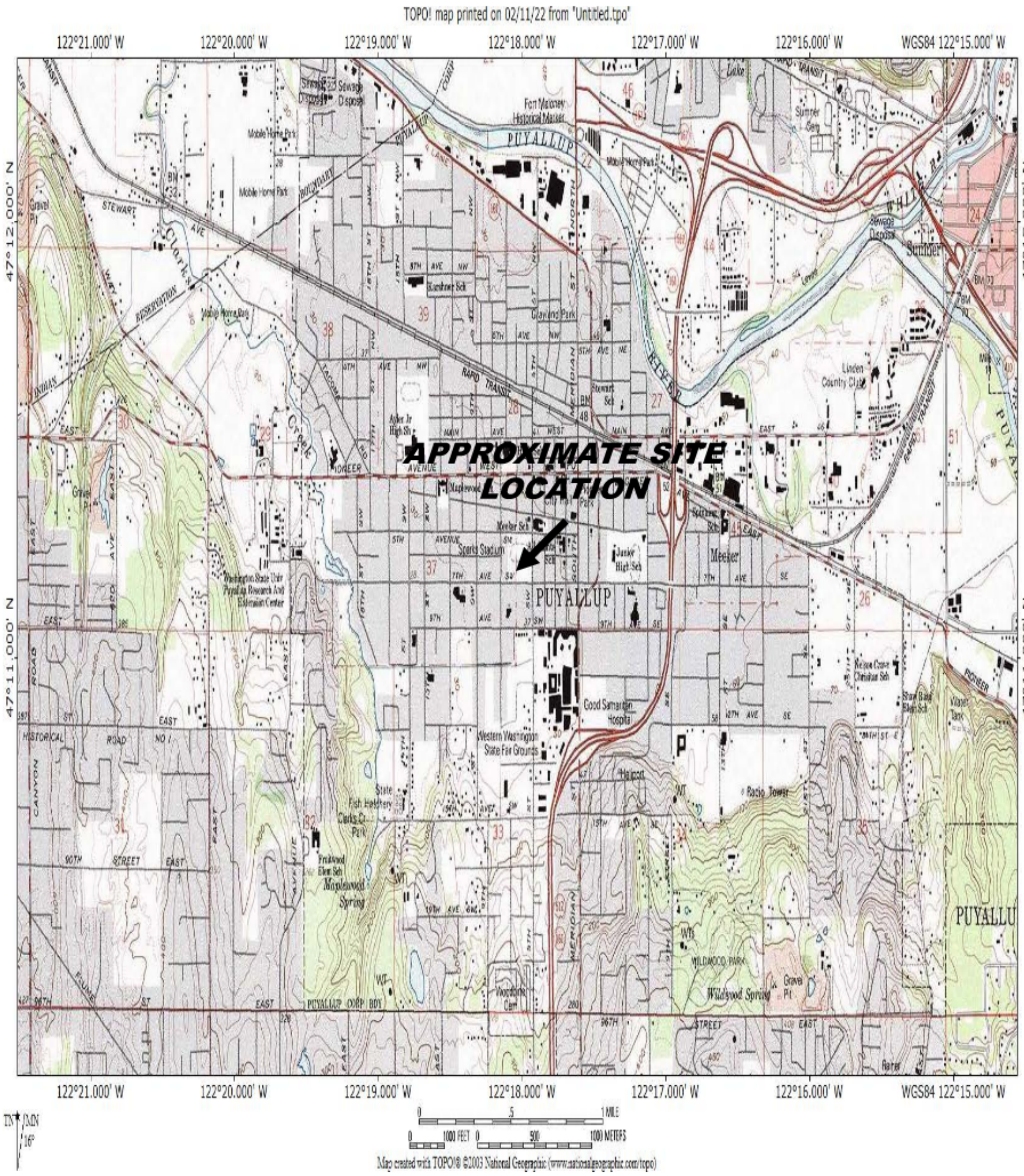
State of Washington Licensed Geologist 21013986 Zachary L. Logan

James E. Brigham State of Washington 20640 Registered Professional Engineer

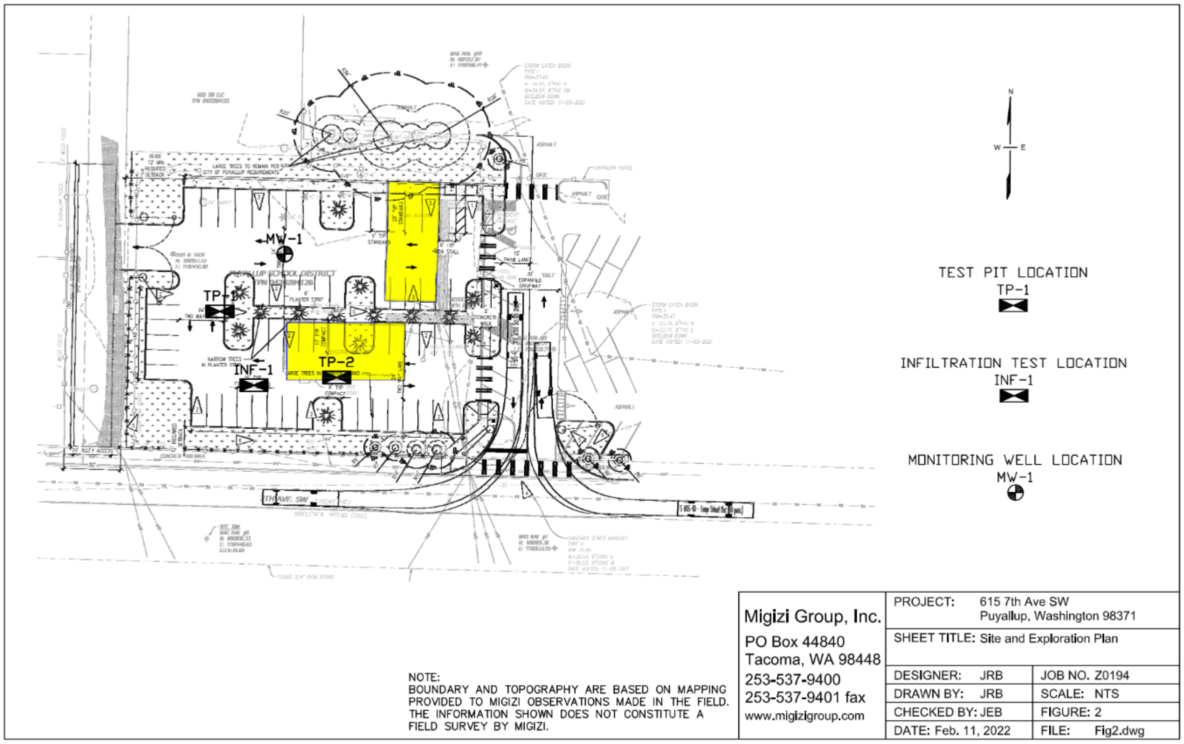
02/15/22

Zach L. Logan, L.G.
Project Geologist

James E. Brigham, P.E.
Senior Principal Engineer



	Location	Job Number	Figure
MIGIZI GROUP	**615 7th Ave SW** **Puyallup, WA 98371**	**Z0194**	**1**
P.O. Box 44840 **Tacoma, WA 98448**	Title **Topographic and Location Map**		Date **02/11/22**


MW-1
TP-1
TP-2
INF-1
N
W
E
TEST PIT LOCATION
TP-1
INFILTRATION TEST LOCATION
INF-1
MONITORING WELL LOCATION
MW-1
NOTE:
BOUNDARY AND TOPOGRAPHY ARE BASED ON MAPPING PROVIDED TO MIGIZI OBSERVATIONS MADE IN THE FIELD. THE INFORMATION SHOWN DOES NOT CONSTITUTE A FIELD SURVEY BY MIGIZI.
Migizi Group, Inc.
PO Box 44840
Tacoma, WA 98448
253-537-9400
253-537-9401 fax
www.migizigroup.com
PROJECT: 615 7th Ave SW Puyallup, Washington 98371
SHEET TITLE: Site and Exploration Plan
DESIGNER: JRB
JOB NO. Z0194
DRAWN BY: JRB
SCALE: NTS
CHECKED BY: JEB
FIGURE: 2
DATE: Feb. 11, 2022
FILE: Fig2.dwg

APPENDIX A
SOIL CLASSIFICATION CHART AND KEY TO TEST DATA

LOG OF TEST PITS AND AUGER BORINGS

MAJOR DIVISIONS				TYPICAL NAMES
COARSE GRAINED SOILS More than Half > #200 sieve	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES
		GRAVELS WITH OVER 15% FINES	GM	SILTY GRAVELS, POORLY GRADED GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS
			SP	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 15% FINES	SM	SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES
			SC	CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES
FINE GRAINED SOILS More than Half < #200 sieve	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS

	Modified California	RV	R-Value
	Split Spoon	SA	Sieve Analysis
	Pushed Shelby Tube	SW	Swell Test
	Auger Cuttings	TC	Cyclic Triaxial
	Grab Sample	TX	Unconsolidated Undrained Triaxial
	Sample Attempt with No Recovery	TV	Torvane Shear
CA	Chemical Analysis	UC	Unconfined Compression
CN	Consolidation	(1.2)	(Shear Strength, ksf)
CP	Compaction	WA	Wash Analysis
DS	Direct Shear	(20)	(with % Passing No. 200 Sieve)
PM	Permeability	∇	Water Level at Time of Drilling
PP	Pocket Penetrometer	▼	Water Level after Drilling(with date measured)

SOIL CLASSIFICATION CHART AND KEY TO TEST DATA

Figure A-1

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LGD A NNNN02 GINT US LAB.GPJ 11/4/05

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Tacoma, WA 98448
Telephone: 253-537-9400

BORING NUMBER MW-1

PAGE 1 OF 1
Figure A-4

CLIENT Sitts & Hill Engineers, Inc.
PROJECT NAME Sparks Stadium Parking Lot Expansion
PROJECT NUMBER Z0194
PROJECT LOCATION 615 7th Ave SW, Puyallup, WA 98371
DATE STARTED 1/4/22 **COMPLETED** 1/4/22
GROUND ELEVATION ______ **HOLE SIZE** 4.25" HSA
DRILLING CONTRACTOR Holocene Drilling Inc.
GROUND WATER LEVELS:
DRILLING METHOD D50 Track Rig
AT TIME OF DRILLING 8.50 ft
LOGGED BY ZLL **CHECKED BY** JEB
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in) (RQD)	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					0.5	Sod and topsoil
				SM		(SM) Red/brown fine silty sand (loose, moist)
	SS S-1	12	7-4-3 (7)		3.0	
				SP-SM		(SP-SM) Gray/brown fine sand with silt (loose, wet)
5	SS S-2	6	0-0-3 (3)		5.5	
				SM		(SM) Gray/brown fine silty sand (very loose, wet)
	SS S-3	12	4-5-4 (9)		8.0	
						(SM) Gray fine silty sand (loose, wet)
10	SS S-4	12	3-3-4 (7)			
15				SM		
	SS S-5	12	4-4-6 (10)			Grades to medium dense
20	SS S-6	12	3-5-8 (13)		21.0	
				SP-SM	21.5	(SP-SM) Gray/brown fine sand with silt (medium dense, wet)

Bottom of borehole at 21.5 feet.

COPY OF GENERAL BH / TP LOGS - FIGURE.GDT - 2/11/22 16:01 - C:\USERS\JESSICABIZAK\DESKTOP\TEST PITS AND BORINGS - GINT\Z0194\Z0194 BORING LOG.GPJ

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Tacoma, WA 98448
Telephone: 253-537-9400

TEST PIT NUMBER TP-1

PAGE 1 OF 1
Figure A-2

CLIENT Sitts & Hill Engineers, Inc.
PROJECT NAME Sparks Stadium Parking Lot Expansion
PROJECT NUMBER Z0194
PROJECT LOCATION 615 7th Ave SW, Puyallup, WA 98371
DATE STARTED 1/5/22 **COMPLETED** 1/5/22
GROUND ELEVATION **TEST PIT SIZE**
EXCAVATION CONTRACTOR Paulman
GROUND WATER LEVELS:
EXCAVATION METHOD Rubber Tracked Mini Excavator
∇ **AT TIME OF EXCAVATION** 6.50 ft Rapid seepage
LOGGED BY ZLL **CHECKED BY** JEB
AT END OF EXCAVATION ---
NOTES
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			0.4	Sod and topsoil
		SM	1.0	(SM) Brown silty sand with gravel (medium dense, moist) (Fill)
2.5		SP-SM	2.5	(SP-SM) Gray fine sand with silt (loose, wet) (Alluvium)
		ML	3.5	(ML) Gray/brown mottled sandy silt (soft, wet) (Alluvium)
5.0 7.5 10.0		SM	10.0	(SM) Gray fine silty sand (loose, wet) (Alluvium) ∇

Severe caving observed from 3.5 to 10 feet
Rapid groundwater seepage observed at 6.5 feet

The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

Bottom of test pit at 10.0 feet.

COPY OF GENERAL BH / TP LOGS - FIGURE.GDT - 2/11/22 15:46 - C:\USERS\JESSICA\BIZAK\DESKTOP\TEST PITS AND BORINGS - GINT\Z0194\Z0194 TEST PITS.GPJ

Migizi Group, Inc.
PO Box 44840
Tacoma, WA 98448
Telephone: 253-537-9400

TEST PIT NUMBER TP-2

PAGE 1 OF 1
Figure A-3

CLIENT Sitts & Hill Engineers, Inc.	**PROJECT NAME** Sparks Stadium Parking Lot Expansion
PROJECT NUMBER Z0194	**PROJECT LOCATION** 615 7th Ave SW, Puyallup, WA 98371
DATE STARTED 1/5/22 **COMPLETED** 1/5/22	**GROUND ELEVATION** **TEST PIT SIZE**
EXCAVATION CONTRACTOR Paulman	**GROUND WATER LEVELS:**
EXCAVATION METHOD Rubber Tracked Mini Excavator	**AT TIME OF EXCAVATION** 5.50 ft Rapid seepage
LOGGED BY ZLL **CHECKED BY** JEB	**AT END OF EXCAVATION** ---
NOTES	**AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			0.3	Sod and topsoil
		SM	1.0	(SM) Brown silty sand (loose, moist) (Alluvium)
2.5		ML	3.0	(ML) Gray/brown mottled sandy silt (soft, wet) (Alluvium)
5.0 / 7.5		SM	9.5	(SM) Gray fine silty sand (loose, wet) (Alluvium)

Severe caving observed from 3 to 10 feet
Rapid groundwater seepage observed at 5.5 feet

The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

Bottom of test pit at 9.5 feet.

COPY OF GENERAL BH / TP LOGS - FIGURE.GDT - 2/11/22 15:46 - C:\USERS\JESSICABIZAK\DESKTOP\TEST PITS AND BORINGS - GINT\Z0194\Z0194 TEST PITS.GPJ

DAILY FIELD REPORT

MIGIZI GROUP

☐ PO Box 44840, Tacoma, WA 98448 (253) 537-9400 office • (253) 537-9401 fax
☐ 17921 Bothell Everett Hwy, Ste 102, Bothell, WA 98012 (425) 398-2300 office • (425) 398-2333 fax

PROJECT NAME: Sparks Stadium Parking Lot Expansion		PROJECT NO.: Z0194	FIELD REPORT NO.: 1
ADDRESS: 615 7th Ave SW		DATE: 1/18/22	PAGE: 1OF1
CITY OR COUNTY: Puyallup	PERMIT NO.:	ARRIVAL TIME:	DEPARTURE TIME:
CLIENT: Sitts & Hill Engineers	MIGIZI PROJECT MANAGER / PHONE NO.: James Brigham 253-537-9400		
GENERAL CONTRACTOR:	MIGIZI FIELD REPRESENTATIVE / PHONE NO.: Zach Logan 360-689-5810		
SUBCONTRACTOR:	WEATHER: O'cast		
TYPE OF WORK PERFORMED: Monitoring Well Measurements			
EQUIPMENT USED:			

COMMENTS

Rep onsite to perform monitoring well measurement at MW-1. At 10:25 am, water levels were 2.76 feet below rim of well.

The contents of this field report were discussed with the contractor's on-site representative.

MIGIZI Group, Inc., Field Representative

☐ A preliminary copy of this field report was left on site. All recommendations contained herein are subject to change pending review by the Migizi project manager.

MIGIZI Group, Inc., Project Manager

DAILY FIELD REPORT

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PROJECT NAME Sparks Stadium Parking Lot Expansion		PROJECT NO. Z0194	FIELD REPORT NO. 2
ADDRESS 615 7th Ave SW		DATE 01/25/22	PAGE 1 OF 1
CITY OR COUNTY Puyallup	PERMIT NO.	ARRIVAL TIME 9:30 am	DEPARTURE TIME
CLIENT Sitts & Hill Engineers	MIGIZI PROJECT MANAGER / PHONE NO. James Brigham 253-537-9400		
GENERAL CONTRACTOR	MIGIZI FIELD REPRESENTATIVE / PHONE NO. Zach Logan 360-689-5810		
SUBCONTRACTOR	WEATHER O'cast		
TYPE OF WORK PERFORMED Monitoring Well Measurements			
EQUIPMENT USED			

COMMENTS

Rep onsite to perform monitoring well measurement at MW-1. At 9:30 am, water levels were 2.74 feet below rim of well.

The contents of this field report were discussed with the contractor's on-site representative.	MIGIZI Group, Inc., Field Representative
☐ A preliminary copy of this field report was left on site. All recommendations contained herein are subject to change pending review by the Migizi project manager.	MIGIZI Group, Inc., Project Manager

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PROJECT NAME: Sparks Stadium Parking Lot Expansion			PROJECT NO.: Z0194	FIELD REPORT NO.: 3
ADDRESS: 615 7th Ave SW			DATE: 02/01/22	PAGE: 1 OF 1
CITY OR COUNTY: Puyallup	PERMIT NO.:		ARRIVAL TIME: 9:45 am	DEPARTURE TIME:
CLIENT: Sitts & Hill Engineers	MIGIZI PROJECT MANAGER / PHONE NO.: James Brigham 253-537-9400			
GENERAL CONTRACTOR:	MIGIZI FIELD REPRESENTATIVE / PHONE NO.: Zach Logan 360-689-5810			
SUBCONTRACTOR:	WEATHER: O'cast			
TYPE OF WORK PERFORMED: Monitoring Well Measurements				
EQUIPMENT USED:				

COMMENTS

Rep onsite to perform monitoring well measurement at MW-1. At 9:45 am, water levels were 3.68 feet below rim of well.

The contents of this field report were discussed with the contractor's on-site representative.

MIGIZI Group, Inc., Field Representative

☐ A preliminary copy of this field report was left on site. All recommendations contained herein are subject to change pending review by the Migizi project manager.

MIGIZI Group, Inc., Project Manager

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PROJECT NAME: Sparks Stadium Parking Lot Expansion		PROJECT NO.: Z0194	FIELD REPORT NO.: 4
ADDRESS: 615 7th Ave SW		DATE: 02/07/22	PAGE: 1 OF 1
CITY OR COUNTY: Puyallup	PERMIT NO.:	ARRIVAL TIME: 10:25 am	DEPARTURE TIME:
CLIENT: Sitts & Hill Engineers	MIGIZI PROJECT MANAGER / PHONE NO.: James Brigham 253-537-9400		
GENERAL CONTRACTOR:	MIGIZI FIELD REPRESENTATIVE / PHONE NO.: Zach Logan 360-689-5810		
SUBCONTRACTOR:	WEATHER: O'cast		
TYPE OF WORK PERFORMED: Monitoring Well Measurements			
EQUIPMENT USED:			

COMMENTS

Rep onsite to perform monitoring well measurement at MW-1. At 10:25 am, water levels were 4.27 feet below rim of well.

The contents of this field report were discussed with the contractor's on-site representative.	[signature] MIGIZI Group, Inc., Field Representative
☐ A preliminary copy of this field report was left on site. All recommendations contained herein are subject to change pending review by the Migizi project manager.	[signature] MIGIZI Group, Inc., Project Manager

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PROJECT NAME Sparks Stadium Parking Lot Expansion		PROJECT NO. Z0194	FIELD REPORT NO. 6
ADDRESS 615 7th Ave SW		DATE 02/21/22	PAGE 1 OF 1
CITY OR COUNTY Puyallup	PERMIT NO.	ARRIVAL TIME	DEPARTURE TIME
CLIENT Sitts & Hill Engineers	MIGIZI PROJECT MANAGER / PHONE NO. James Brigham 253-537-9400		
GENERAL CONTRACTOR	MIGIZI FIELD REPRESENTATIVE / PHONE NO. Zach Logan 360-689-5810		
SUBCONTRACTOR	WEATHER O'cast		
TYPE OF WORK PERFORMED Monitoring Well Measurements			
EQUIPMENT USED			

COMMENTS

Rep onsite to perform monitoring well measurement at MW-1. At 10:15 am, water levels were 4.73 feet below rim of well.

-End-

The contents of this field report were discussed with the contractor's on-site representative.	[signature] MIGIZI Group, Inc., Field Representative
☐ A preliminary copy of this field report was left on site. All recommendations contained herein are subject to change pending review by the Migizi project manager.	[signature] MIGIZI Group, Inc., Project Manager

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PROJECT NAME Sparks Stadium Parking Lot Expansion		PROJECT NO. Z0194	FIELD REPORT NO. 7
ADDRESS 615 7th Ave SW		DATE 03/21/22	PAGE 1 OF 1
CITY OR COUNTY Puyallup	PERMIT NO.	ARRIVAL TIME	DEPARTURE TIME
CLIENT Sitts & Hill Engineers	MIGIZI PROJECT MANAGER / PHONE NO. James Brigham 253-537-9400		
GENERAL CONTRACTOR	MIGIZI FIELD REPRESENTATIVE / PHONE NO. Zach Logan 360-689-5810		
SUBCONTRACTOR	WEATHER O'cast		
TYPE OF WORK PERFORMED Monitoring Well Measurements			
EQUIPMENT USED			

COMMENTS

Rep onsite to perform monitoring well measurement at MW-1. At 1:30 pm, water levels were 4.62 feet below rim of well.

-End-

The contents of this field report were discussed with the contractor's on-site representative.	MIGIZI Group, Inc., Field Representative
☐ A preliminary copy of this field report was left on site. All recommendations contained herein are subject to change pending review by the Migizi project manager.	MIGIZI Group, Inc., Project Manager