Preliminary Drainage Report

Puyallup High School Portables

711, 721 & 701 West Main
Puyallup, WA 98371

Prepared for
Puyallup School District
c/o Studio Meng Strazzara
2001 Western Ave, Suite 200
Seattle, WA 98121
206.587.3797

Prepared by
JMJ Team
905 Main Street, Suite 200
Sumner, WA 98390
206.596.2020
Justin Jones, PE

April 5, 2024

PROJECT ENGINEER'S CERTIFICATION

"I hereby state that this Drainage Control Plan for the Puyallup High School Portables has been prepared by me or under my supervision and meets minimum 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 drainage facilities prepared by me."

Justin Jones, PE

04-05-2024

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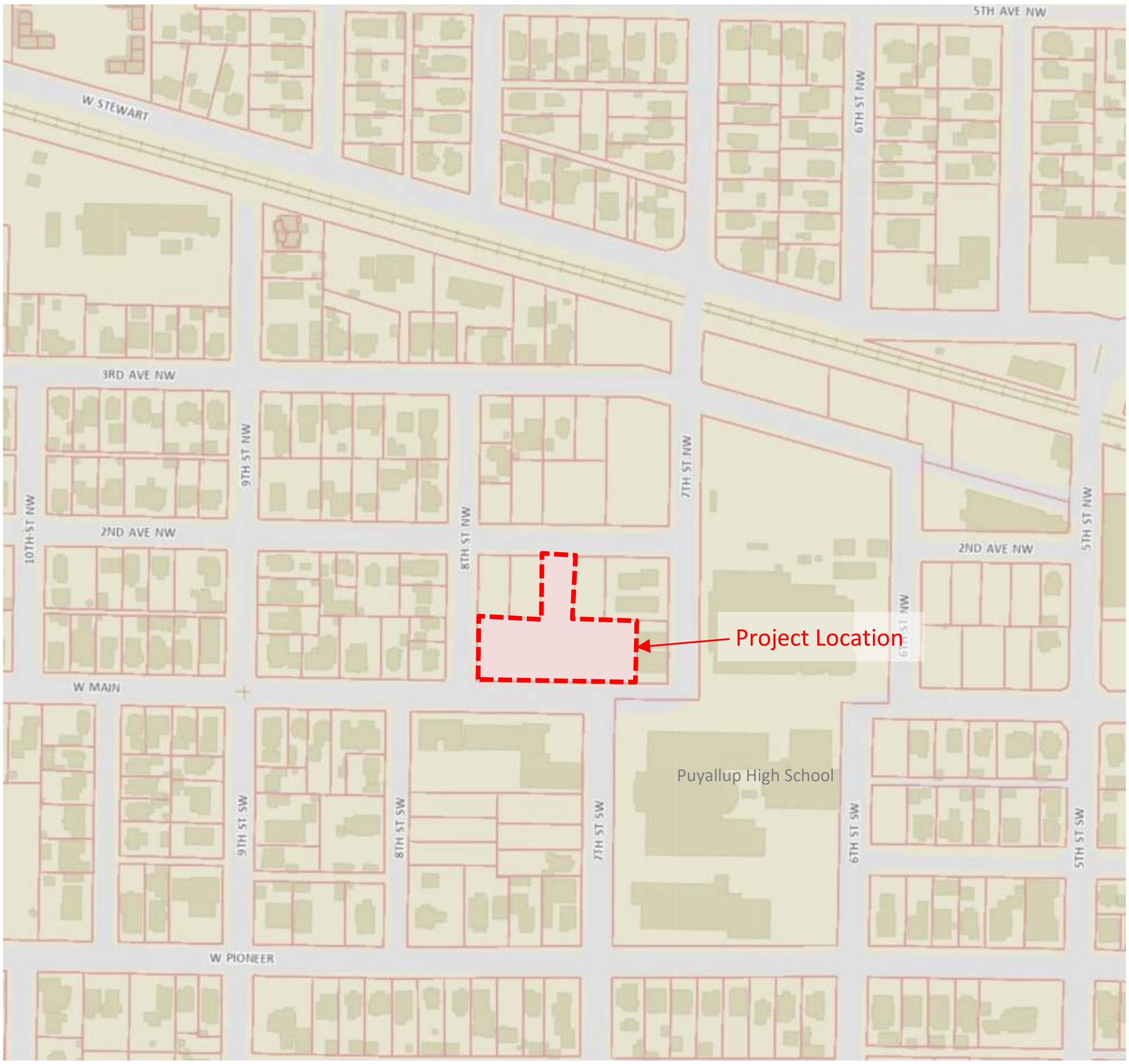
PROJECT OVERVIEW AND VICINITY MAP

The Puyallup High School Portables project is located at the intersection of West Main and 7th Street SW in the City of Puyallup. The project site includes parcels 5870000231, 5870000190, 5870000200, and 5870000171, with a total lot area of 1.00 AC. The project has a total site area of 0.38 acres. The site is currently developed as a PF – Public Facilities lot. New development on-site includes the construction of 3 portable classroom buildings, open-graded gravel pad, and the construction of permeable asphalt walkways. The stormwater approach is to fully infiltrate runoff on-site.



Vicinity Map

Proposed Site Area Map

EXISTING CONDITIONS SUMMARY

The Puyallup High School Portables project has a lot area of 1.00 acre. The existing site consists of landscaping, asphalt parking lot, and existing portables east of the parking lot. The site is fairly flat and has a slight slope towards the north and west side of the property.

The existing storm system consists of downspout dispersion and gravity pipe conveyance system. Runoff from roof disperses onto parking lot and is captured via Contech Catch Basin Inlet Filter that connects to the City of Puyallup stormwater system along West Main. Runoff is then conveyed to the Puyallup River via gravity pipe conveyance system.

The site is located within Lahar Hazard area.

There are no critical areas within site.

PROPOSED CONDITIONS SUMMARY

The proposed development is located in the landscaped area west of the existing parking lot. New development includes the construction of 3 portable classroom buildings, perforated aluminum landing, and site improvements.

The proposed development will result in an addition of 8,678 SF of new impervious surfaces within the project site area. Total land disturbing activity on-site to be approximately 14,165 SF. Minimum requirements 1-9 will apply to this project. Lot Coverage Table has been provided in the report following.

Site improvements include the construction of permeable open-graded gravel pad, permeable asphalt walkways, landscaping, and stormwater conveyance and infiltration gallery. The portables will also have utility service connections for power and communications.

Stormwater runoff from the new portables will be collected via roof downspouts and conveyed to an infiltration gallery to be fully infiltrated. Runoff from aluminum landing will drain through the perforated surface and be collected on the permeable gravel pad where stormwater will fully infiltrate into native soils. Runoff from permeable asphalt walkways will infiltrate through the porous surface and fully infiltrate into native soils.

Infiltration suitability was evaluated during the wet season (December 1st - April 1st) to determine infiltration rate and groundwater separation. Small PIT tests and groundwater monitoring were performed in accordance with the 2019 Stormwater Management Manual for Western Washington (DOE Manual) to determine infiltration feasibility. The infiltration rate was determined to be 0.64 in/hr (corrected). Infiltration Report has been provided in Appendix D.

LOT COVERAGE

The following tables show the existing and proposed lot coverage for the Puyallup High School Portables project site.

Existing Lot Coverage – 43,574 SF (1.00 AC) Lot Area			
Coverage	**Area (SF)**	**Area (Acres)**	**% of Site**
Impervious			
Roof	1,722	0.04	
Concrete Sidewalk	964	0.03	
Asphalt Parking Lot	6,686	0.15	
Total Site Impervious	**9,372**	**0.22**	**22.0%**
Pervious			
Landscape	34,202	0.78	
Total Site Pervious	**34,202**	**0.78**	**78.0%**

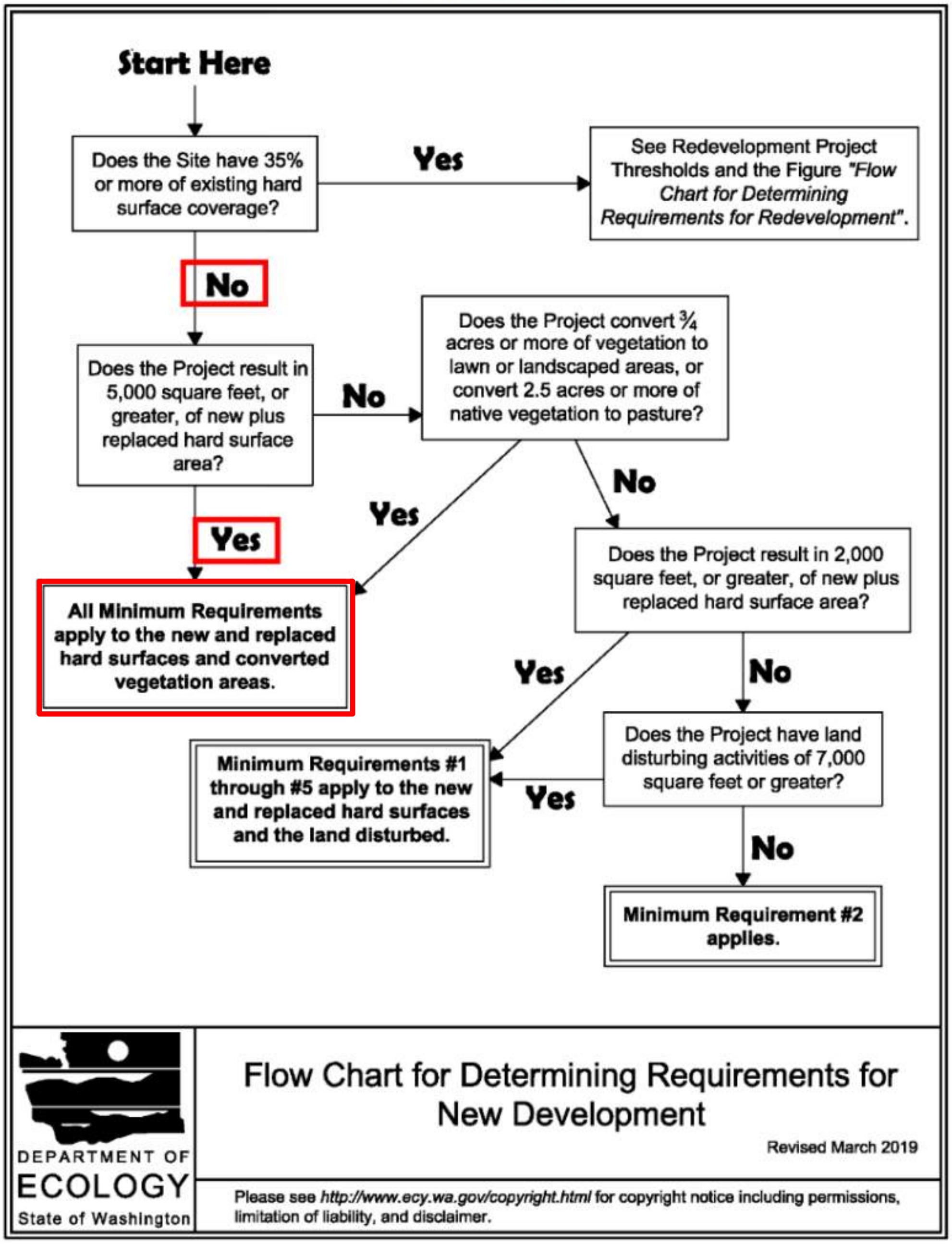
Proposed Lot Coverage – 43,574 SF (1.00 AC) Lot Area			
Coverage	**Area (SF)**	**Area (Acres)**	**% of Site**
Impervious			
Ex. Roof	1,722	0.04	
Ex. Concrete Sidewalk	964	0.03	
Ex. Asphalt Parking Lot	6,686	0.15	
New Roof	5,785	0.12	
New Permeable Asphalt Sidewalk	663	0.02	
New Permeable Gravel Pad	1,570	0.04	
New Perforated Aluminum Landing	660	0.02	
Total New Impervious	**8,678**	**0.20**	**20.0%**
Total Site Impervious	**18,050**	**0.42**	**42.0%**
Pervious			
Landscape	25,524	0.58	
Total Site Pervious	**25,524**	**0.58**	**58.0%**

Thank

SUMMARY OF MINIMUM REQUIREMENTS

The City of Puyallup adopts the 2019 Stormwater Management Manual for Western Washington (DOE Manual). Volume 1 of the DOE Manual describes the minimum requirements for a development project. Using the flowchart below, Minimum Requirements #1-9 applies to the project site.

Figure I-3.1: Flow Chart for Determining Requirements for New Development



MINIMUM REQUIREMENT 1: PREPARATION OF STORMWATER SITE PLANS

Stormwater Site Plan drawings have been prepared per the City of Puyallup development codes and the 2019 Stormwater Management Manual for Western Washington (DOE Manual), see Appendix A.

MINIMUM REQUIREMENT 2: CONSTRUCTION STORMWATER POLLUTION PREVENTION

A Temporary Erosion and Sediment Control Plan has been prepared per the City of Puyallup development codes and the 2019 DOE Manual and is included in this report, see Appendix A. Construction Stormwater Pollution Prevention measures may include storm drain inlet protection; construction entrance; silt fence and a sediment trap.

MINIMUM REQUIREMENT 3: SOURCE CONTROL OF POLLUTION

Source control BMPs will be implemented to minimize stormwater contamination and help comply with the DOE Manual. BMP's for the project may include:

- *Inspect and clean treatment BMPs, conveyance systems, and catch basins as needed, and determine necessary O & M Improvements.*
- *Clean catch basins when the depth of deposits reaches 60-percent of the sump depth as measured from the bottom of basin to the invert of the lowest pipe into or out of the basin.*
- *Clean woody debris in a catch basin as frequently as needed to ensure proper operation of the catch basin.*

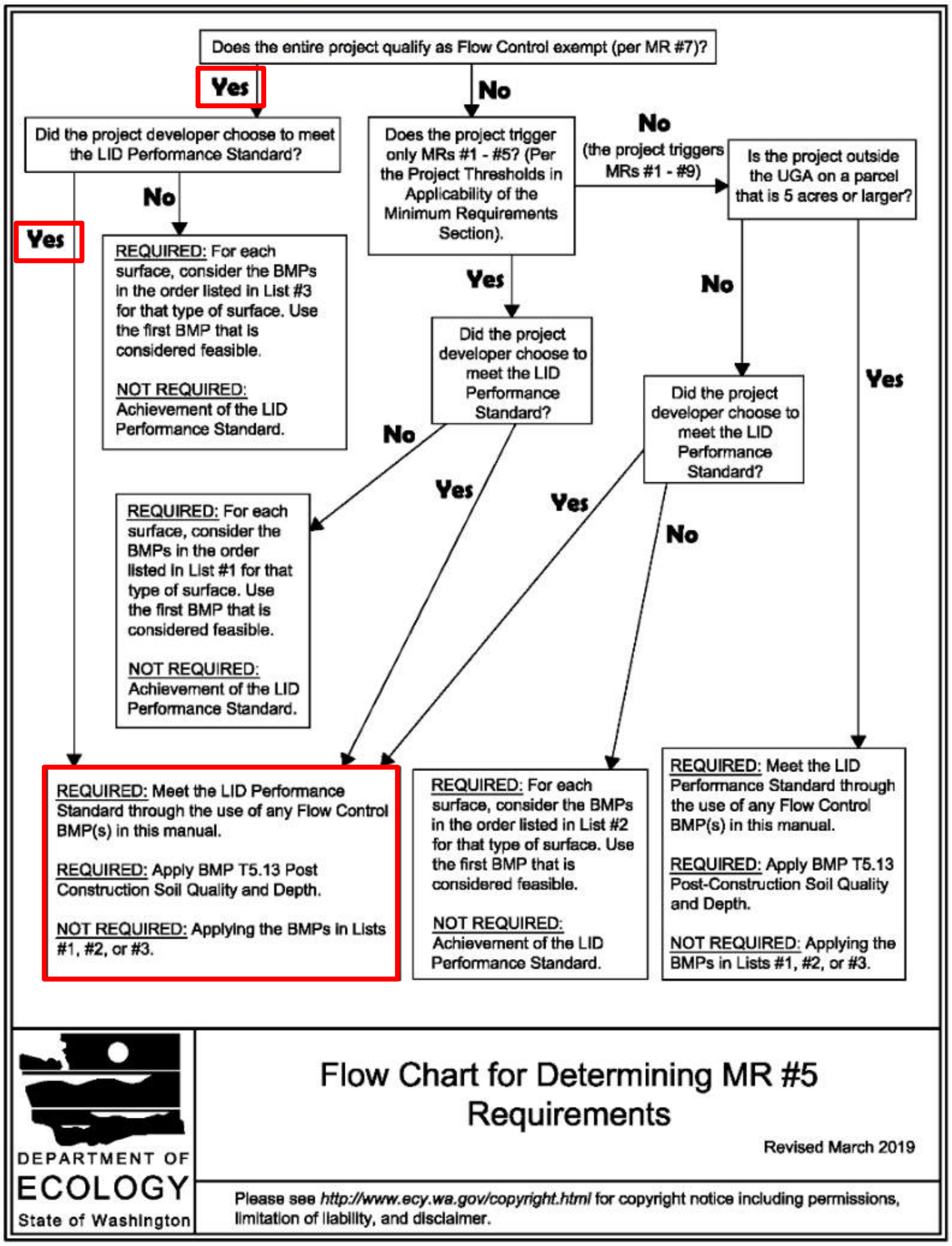
MINIMUM REQUIREMENT 4: PRESERVATION OF NATURAL DRAINAGE SYSTEMS AND OUTFALLS

Natural drainage for the developed site area surface flows towards the north and west side of the site and infiltrates into native soil. The project proposes to maintain natural drainage patterns and discharge at natural location.

MINIMUM REQUIREMENT 5: ONSITE STORMWATER MANAGEMENT

Per Figure I-3.3 of the 2019 DOE Manual, the Puyallup High School Portables project is required to either meet LID Performance Standards or utilize List #3 to determine appropriate stormwater management BMPs for various surfaces. This project proposes to meet LID Performance Standards.

Figure I-3.3: Flow Chart for Determining MR #5 Requirements



To meet LID Performance Standards, stormwater discharges must match developed discharge durations to pre-developed discharge rates from 8% of the 2-year peak flow to the full 50-year flow.

The following BMPs were considered for the site:

- Roofs:
    - Downspout Full Infiltration:

      Downspout Full Infiltration was evaluated and was deemed feasible for the site. Runoff from proposed roof areas will be routed to the infiltration gallery and infiltrate 100% of roof runoff into native soils. The infiltration galleries have been sized utilizing the WWHM model for a gravel trench bed based on the following criteria:

        - Infiltration rate: 0.64 in/hr
        - Drain Rock Basin with a porosity of 0.33.
        - 12” Drainage/Storage Layer.
        - Minimum 1-foot of separation between the bottom of the infiltration gallery and the seasonal high groundwater level.

    A 441 SF gallery was determined to be the minimum area needed to fully infiltrate runoff from a single portable, see Appendix C for WWHM modeling. The project proposes a 1,325 SF gallery to manage runoff from all (3) three portables.

- Other Hard Surfaces:
    - Permeable Pavements:

      Permeable Pavements were evaluated for the management of runoff from the gravel pad and asphalt walkway. This BMP was deemed feasible for the project. Runoff will permeate through the open-graded gravel pad and asphalt walkway and fully infiltrate into native soils. The permeable pavements have been sized utilizing the WWHM model based on the following criteria:

        - Infiltration rate: 0.64 in/hr

- Layers for each surface type:

    - Gravel Pad: 10" Open-Graded Gravel (0.33 porosity)

    - Asphalt Walkways: 4" Porous Asphalt (0.33 porosity)
      6" Permeable Ballast (0.33 porosity)

- Minimum 1-foot of separation between the bottom of the permeable pavement and the seasonal high groundwater level.

The modeling determined that the proposed layers was sufficient to infiltrate 100% of runoff. See Appendix C for WWHM modeling.

- Lawn and Landscaped Areas:

    - This project is required to retain and protect undisturbed soil in areas not being developed and, prior to completion of the project, amend all new, replaced, and disturbed topsoil (including construction lay-down areas) with organic matter in accordance with BMP T5.13 of the 2019 DOE Manual.

This project proposes to infiltrate 100% of influent runoff on-site, resulting in no net gain of stormwater discharge from the developed site; therefore, this project meets or exceeds the LID Performance Threshold.

MINIMUM REQUIREMENT 6: RUNOFF TREATMENT

Per the 2019 DOE Manual, Runoff Treatment is required if the site Threshold Discharge Area (TDA) has a total of 5,000 SF of pollution generating hard surfaces (PGHS) or 3/4 acres of pollution generating pervious surfaces (PGPS). The Puyallup High School Portables project does not meet these thresholds as the site does not propose any PGHS or PGPS; therefore, runoff treatment is not required on-site.

MINIMUM REQUIREMENT 7: FLOW CONTROL

Per 2019 DOE Manual, Flow Control BMPs are required if the site TDA meets any of the following thresholds:

- TDAs that have a total of 10,000 SF or more of effective impervious surfaces, or
- TDAs that convert 3/4 acres or more of native vegetation, pasture, scrub/shrub, or unmaintained non-native vegetation to lawn or landscape, or convert 2.5 acres or more of native vegetation to pasture, and from which there is a surface discharge in a natural or man-made conveyance system from the TDA, or
- TDAs that through a combination of effective hard surfaces and converted vegetation areas cause a 0.15 cubic feet per second (cfs) or greater increase in the 100-year flow frequency as estimated using an approved continuous simulation model and 15-minute time step.

Effective impervious surfaces can be defined as those impervious surfaces that are connected via sheet flow or discrete conveyance to a drainage system. Impervious surfaces are considered ineffective if approved runoff modeling methods indicate that the entire runoff file is infiltrated.

The Puyallup High School Portables project is proposing to infiltrate 100% of runoff file using an infiltration gallery and permeable pavements; therefore, all proposed impervious areas are deemed ineffective. Since the project is not proposing any effective impervious, TDA Thresholds stated above are not triggered and Flow Control BMPs are not required.

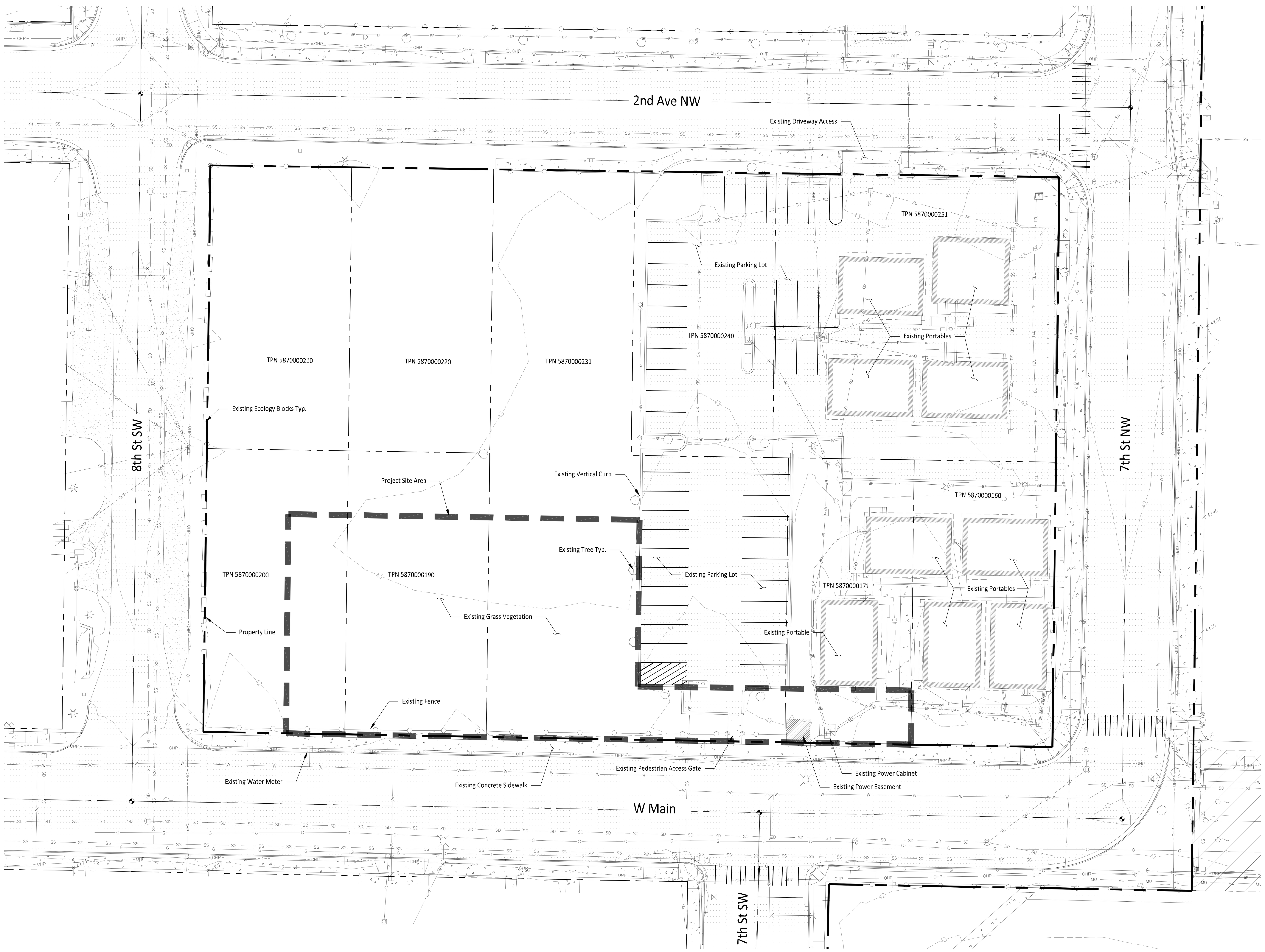
MINIMUM REQUIREMENT 8: WETLAND PROTECTION

This minimum requirement applies only to TDAs whose stormwater discharges to wetlands. This project does not propose to discharge stormwater to wetlands; therefore, this minimum requirement does not apply to the project.

MINIMUM REQUIREMENT 9: OPERATION AND MAINTENANCE

An operation and maintenance manual shall be provided for Stormwater Management BMPs in accordance with the 2019 DOE Manual. This manual will be developed prior to building occupancy.

APPENDIX A



LEGEND

- Found Monument As Noted
- Calculated Monument Position
- Found Rebar / Iron Pipe As Notes
- Survey Control Point, As Noted
- Sanitary Sewer Manhole
- Sanitary Sewer Clean Out
- Storm Manhole
- Storm Catch Basin
- Storm Culvert
- Storm Clean Out
- Roof Drain
- Water Valve
- Water Meter
- Fire Hydrant
- Fire Department Connection
- Water Blow Off
- Post Indicator Valve
- Irrigation Control Valve
- Gas Valve
- Gas Meter
- Utility Pole
- Guy Anchor
- Junction Box
- Power Vault
- Power Cabinet
- Power Manhole
- Light Pole
- Utility Vault
- Electric Meter
- Power Transformer
- Column
- Bollard
- Gate Post
- Communications Vault
- Communications Manhole
- Telephone Cabinet
- Sign
- Mailbox
- Flag Pole
- Deciduous Tree
- Evergreen Tree
- TPN — Tax Parcel Number
- FF — Finish Floor Elevation
- Road Centerline
- SD — Storm Drain Line
- SS — Sanitary Sewer Line
- W — Buried Water Line
- G — Buried Gas Line
- BP — Buried Power Line
- TEL — Buried Telecommunications Line
- OHP — Overhead Power Line
- Chain Link Fence
- Wood Fence
- SD — Record Storm Line
- SS — Record Sanitary Line
- Asphalt Surface
- Concrete Surface
- Gravel Surface

HORIZONTAL DATUM

Washington Plane Coordinate System, South Zone,
NAD 83/2011
Based on GPA observation utilizing the Washington State Reference Network (WSRN)

Measured south 88°57'44" east between two found monuments along west main st. at the intersections with 8th st nw and 7th st nw

VERTICAL DATUM

NAVD88
Based on GPS observation utilizing the WSRN with NGS GEOID18 Loaded

Temporary Benchmark Elevation = 41.76
Description: Rebar & Control Cap #12
Located at the intersection of West Main & 7th ST NW
SE of the radial curb line

SITE DATA

- Total Lot Area: 43,574 SF (1.00 AC)
- Total Project Site Area: 16,587 SF (0.38 AC)
- Tax Parcel Numbers: 5870000171, 5870000190, 5870000200, 5870000231
- Zoning: PF- Public Facilities

EXISTING LOT COVERAGE

Total Lot Area	43,574 SF (1.00 AC)		
Coverage	Area (SF)	Area (AC)	% of Site
Impervious			
Roof	1,722	0.04	
Concrete Sidewalk	964	0.03	
Asphalt Parking Lot	6,686	0.15	
Total Site Impervious	9,372	0.22	22.0%
Pervious			
Landscape	34,202	0.78	
Total Site Pervious	34,202	0.78	78.0%

0 20 40 FEET
1" = 20'

ARCHITECT

studio MENG STRAZZARA

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CONSULTANT

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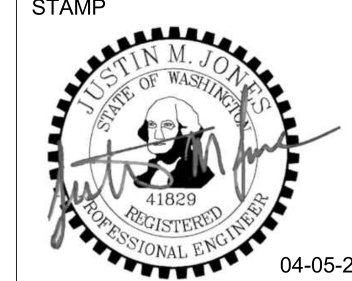
CLIENT/OWNER

PUYALLUP SCHOOL DISTRICT
A Tradition of Excellence

TITLE

PUYALLUP HS NEW PORTABLES 2023

STAMP



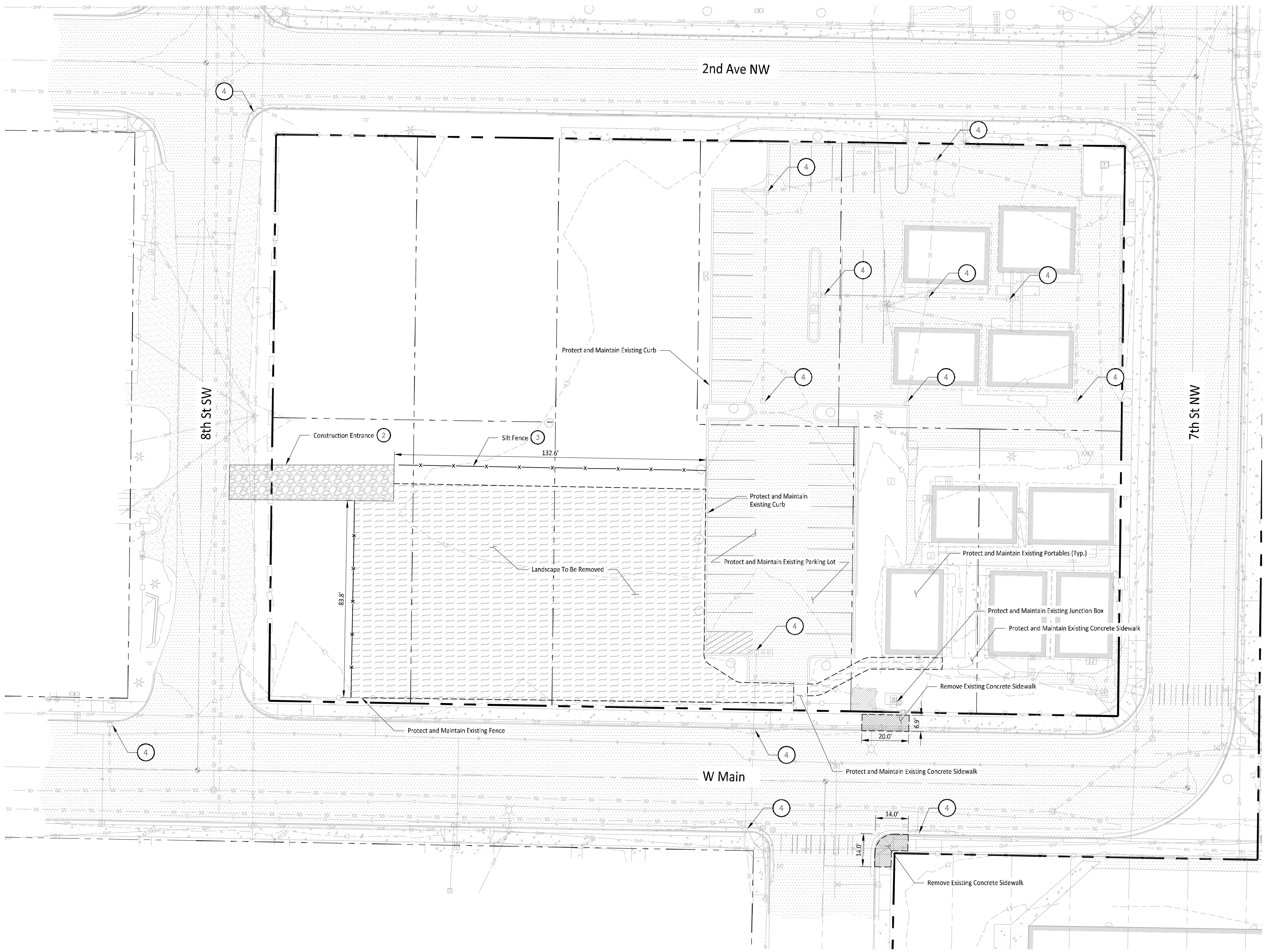
04-05-24

ISSUED:	DATE:
CONDITIONAL USE PERMIT	OCT, 11 2023
CUP CC#1 RESPONSE	APR, 5 2024

EXISTING SITE PLAN

Building Permit #:	-
CUP #:	PLCUP20230109
Owner's Project #:	-
Architect's Project #:	2023106
Drawn By	MO
Checked By	JJ

C.01



LEGEND

- Construction Entrance
- Landscape To Be Removed
- Concrete To Be Removed
- Existing Asphalt Pavement
- Existing Gravel Pavement
- Existing Concrete Pavement
- Property Line
- Parcel Line
- Silt Fence
- Existing Overhed Power Line
- Existing Sewer Line
- Existing Storm Line
- Existing Water Line
- Existing Gas Line
- Existing Building Line
- Existing Chainlink Fence Line
- Existing Tree
- Existing Type II Storm Manhole
- Existing Type I Storm Catch Basin
- Existing Sewer Manhole
- Existing Light Pole
- Existing Power Pole

TESC NOTES

1. Contractor to install TESC measures as necessary to ensure stormwater leaving the site is free of settleable solids.
2. Install and maintain construction entrance per City of Puyallup Standard Detail 05.01.01 and install wheel wash as needed per Washington DOE BMP C106.
3. Install silt fence per City of Puyallup Standard Detail 02.03.02. Silt Fence to mark clearing limits in the field.
4. Maintain and Install storm drain inlet protection in all existing catch basins within the project vicinity per WSDOT Standard Plan I-40.20-00 and storm drain barriers per City of Puyallup Standard Details 02.03.05 and 02.03.06.
5. Roads shall be cleared thoroughly as needed to protect stormwater infrastructure and downstream water resources. Sediment shall be removed from roads by shoveling or pickup sweeping and be transported to a controlled sediment disposal area.
6. Exposed soils shall be watered as necessary to prevent dust from leaving the site.
7. Concrete handling and equipment washing in accordance with DOE BMP C151.
8. Disturbed soils to be amended per DOE BMP T5.13
9. If necessary, alternative sediment control methods shall be submitted by the contractor for review and approval prior to construction.
10. A CESCL shall be present on-site or on-call for the duration of construction operations.

DEMOLITION NOTES

- Landscaping to be Cleared & Grubbed: 14,165 SF
- Concrete to be Removed: 275 SF
- Disturbed Area On-site: 14,165 SF

0 20 40 FEET
1" = 20'

ARCHITECT

studio MENG STRAZZARA

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STAMP

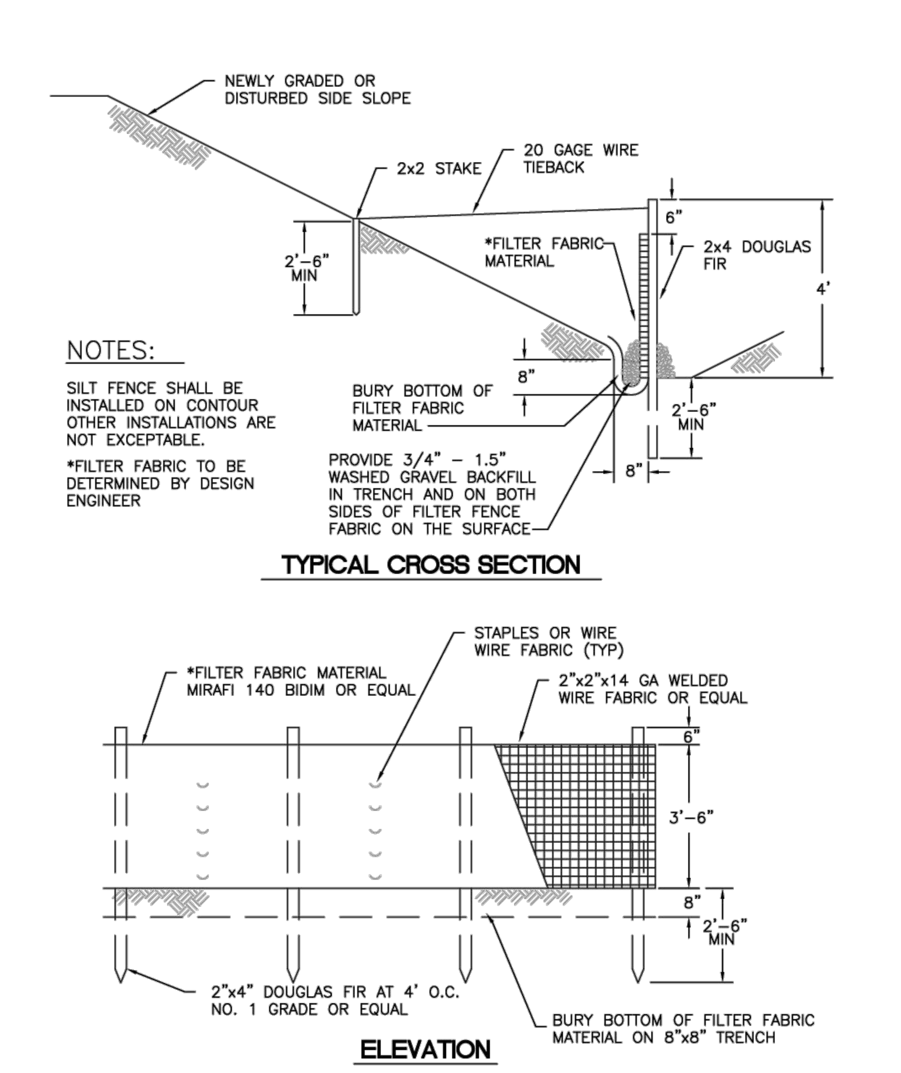
JUSTIN M. JONES
STATE OF WASHINGTON
41829
REGISTERED PROFESSIONAL ENGINEER
04-05-24

ISSUED:	DATE:
CONDITIONAL USE PERMIT	OCT, 11 2023
CUP CC#1 RESPONSE	APR, 5 2024

TESC & DEMOLITION PLAN

Building Permit #:	-
CUP #:	PLCUP20230109
Owner's Project #:	-
Architect's Project #:	2023106
Drawn By	MO
Checked By	JJ

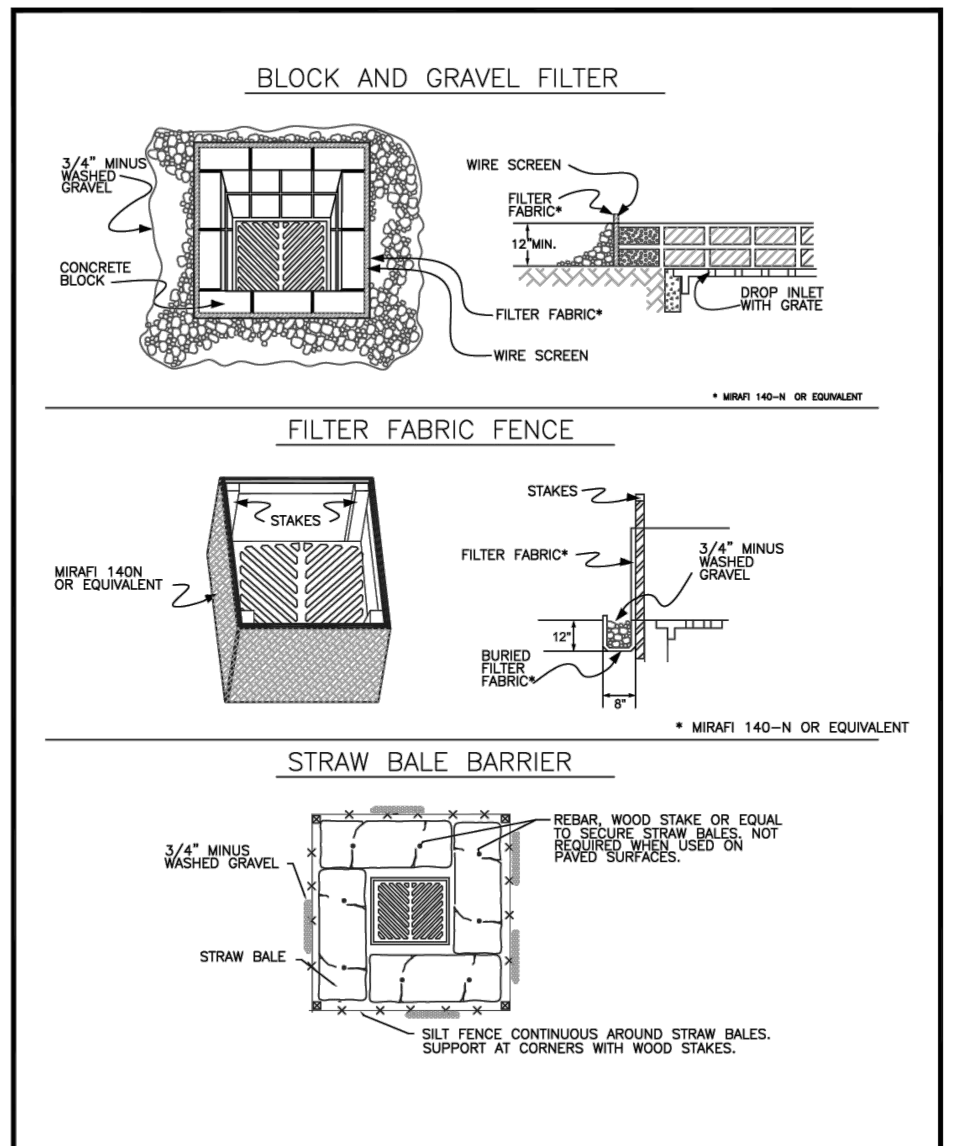
C.02



CITY OF PUYALLUP
DEVELOPMENT ENGINEERING and PUBLIC WORKS DEPARTMENTS

SILTATION FENCE

CITY STANDARD 02.03.02



CITY OF PUYALLUP
DEVELOPMENT ENGINEERING and PUBLIC WORKS DEPARTMENTS

STORM DRAIN BARRIERS

CITY STANDARD 02.03.05

CONDITIONS WHERE PRACTICE APPLIES

1. BLOCK AND GRAVEL FILTER – APPLICABLE FOR AREAS GREATER THAN 5% SLOPE.
2. FILTER FABRIC FENCE – APPLICABLE WHERE THE INLET DRAINS A RELATIVELY SMALL (ONE ACRE OR LESS) AND FLAT AREA (LESS THAN 5% SLOPE).
3. STRAW BALE BARRIER – APPLICABLE WHERE INLET DRAINS A RELATIVELY FLAT DISTURBED AREA (LESS THAN 5% SLOPE) IN WHICH SHEET FLOW (NOT EXCEEDING 0.5 FT/SEC.) OCCURES. BARRIERS OF THIS TYPE SHOULD NOT BE PLACED AROUND INLETS RECEIVING CONCENTRATED FLOWS SUCH AS THOSE ALONG MAJOR STREETS AND HIGHWAYS.

1. BLOCK AND GRAVEL FILTER – INSTALLATION PROCEDURE

A: PLACE WIRE MESH OVER THE DROP INLET SO THAT THE WIRE EXTENDS A MINIMUM OF ONE FOOT BEYOND EACH SIDE OF THE INLET STRUCTURE. USE WIRE SCREEN WITH 1/2-INCH OPENINGS. IF MORE THAN ONE STRIP OF MESH IS NECESSARY, OVERLAP THE STRIPS. PLACE FILTER FABRIC* OVER WIRE MESH.

B: PLACE CONCRETE BLOCKS LENGTHWISE ON THEIR SIDES IN A SINGLE ROW AROUND THE PERIMETER OF THE INLET, SO THAT THE OPEN ENDS FACE OUTWARD, NOT UPWARD. THE ENDS OF ADJACENT BLOCKS SHOULD ABUT. THE HIEGHT OF THE BARRIER CAN BE VARIED, DEPENDING ON DESIGN NEEDS, BY STACKING COMBINATIONS OF BLOCKS THAT ARE 4-INCH, 8-INCH AND 12-INCH WIDE. THE ROW OF BLOCKS SHOULD BE AT LEAST 12-INCHES BUT NO GREATER THAN 24-INCHES HIGH.

C: PLACE WIRE SCREEN OVER THE OVERSIDE VERTICAL FACE (OPEN END) OF THE CONCRETE BLOCKS TO PREVENT STONES FROM BEING WASHED THROUGH THE BLOCKS. USE WIRE SCREEN WITH 1/2-INCH OPENINGS.

D: PILE STONES AGAINST THE WIRE MESH TO THE TOP OF THE BLOCKS. USE 3/4" MINUS WASHED GRAVEL.

2. FILTER FABRIC FENCE – INSTALLATION PROCEDURE

A: PLACE 2-INCH BY 2-INCH WOODEN STAKES AROUND THE PERIMETER OF THE INLET A MAXIMUM OF 3 FEET APART AND DRIVE THEM AT LEAST 8-INCHES INTO THE GROUND. THE STAKES MUST BE AT LEAST 3 FEET LONG.

B: EXCAVATE A TRENCH APPROXIMATELY 8-INCHES WIDE AND 12-INCHES DEEP AROUND THE OUTSIDE PERIMETER OF THE STAKES.

C: STAPLE THE FILTER FABRIC* TO THE WOODEN STAKES SO THAT 32-INCHES OF THE FABRIC EXTENDS AND CAN BE FORMED INTO THE TRENCH, AND USE HEAVY-DUTY WIRE STAPLES AT LEAST 1/2-INCHES LONG.

D: BACKFILL THE TRENCH WITH 3/4-INCH MINUS WASHED GRAVEL ALL THE WAY AROUND.

3. STRAW BALE BARRIER – INSTALLATION PROCEDURE

A: EXCAVATE A 4-INCH DEEP TRENCH AROUND THE INLET. MAKE THE TRENCH AS WIDE AS A STRAW BALE.

B: ORIENT STRAW BALES WITH THE BINDINGS AROUND THE SIDES OF THE BALES RATHER THAN OVER AND UNDER THE BALES.

C: PLACE BALES LENGTHWISE AROUND THE INLET AND PRESS THE ENDS OF ADJACENT BALES SECURELY IN PLACE.

D: DRIVE TWO 2-INCH BY 2-INCH STAKES THROUGH EACH BALE TO ANCHOR THE BALE SECURELY IN PLACE.

E: BACKFILL THE EXCAVATED SOIL AND COMPACT IT AGAINST THE BALE.

F: WEDGE LOOSE STRAW BETWEEN BALES TO PREVENT WATER FROM FLOWING BETWEEN BALES.

* MIRAFI 140-N OR EQUIVALENT

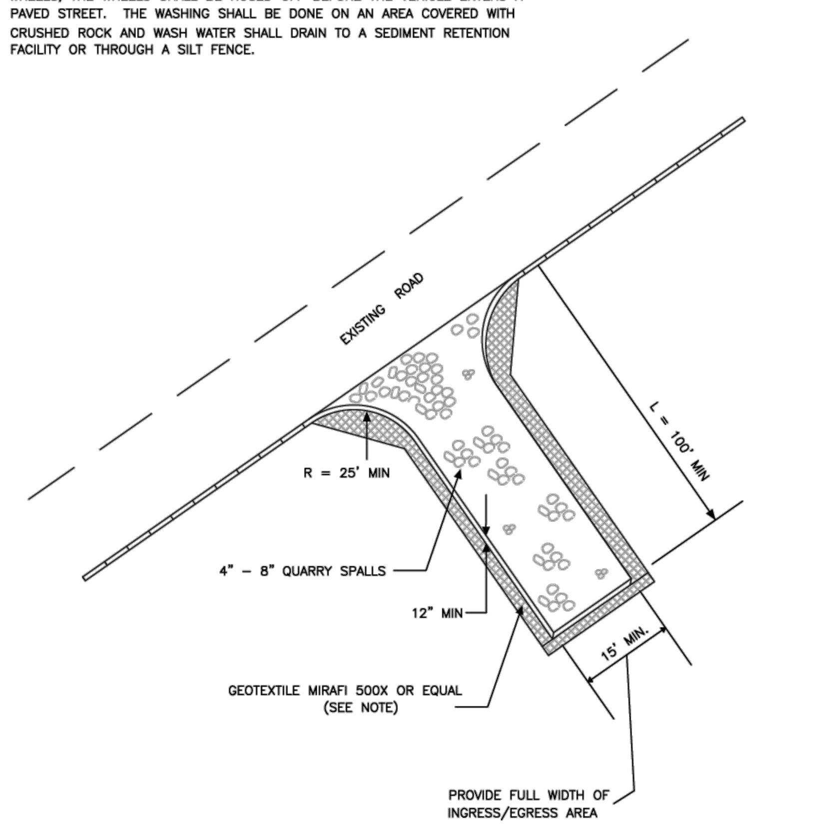
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING and PUBLIC WORKS DEPARTMENTS

STORM DRAIN BARRIERS NOTES

DRAWN BY	CHECKED BY	APPROVED BY	REVISED BY	CITY STANDARD
LINDA LANSING	LINDA LIAN	COLLEEN HARRIS	XXXX	
FILE NAME: F:\DWG\COMMON\STDS\CITY\2009\02_SD\02.03.06		DATE APPROVED 09/01/1992	DATE REVISED 06/01/2003	SCALE NTS — 02.03.06

NOTE:

1. GEOTEXTILE MIRAFI 500 X OR APPROVED EQUAL SHALL BE PLACED UNDER THE ENTIRETY OF THE TEMPORARY ENTRANCE.
2. ADDITIONAL ROCK SHALL BE ADDED PERIODICALLY TO MAINTAIN PROPER FUNCTION OF THE PAD.
3. IF THE PAD DOES NOT ADEQUATELY REMOVE THE MUD FROM THE VEHICLE'S WHEELS, THE WHEELS SHALL BE HOSED OFF BEFORE THE VEHICLE ENTERS A PAVED STREET. THE WASHING SHALL BE DONE ON AN AREA COVERED WITH CRUSHED ROCK AND WASH WATER SHALL DRAIN TO A SEDIMENT RETENTION FACILITY OR THROUGH A SILT FENCE.



CITY OF PUYALLUP
DEVELOPMENT ENGINEERING and PUBLIC WORKS DEPARTMENTS

TEMPORARY CONSTRUCTION ENTRANCE

CITY STANDARD 05.01.01

1. ALL LIMITS OF CLEARING AND AREAS OF VEGETATION PRESERVATION AS PRESCRIBED ON THE PLANS SHALL BE CLEARLY FLAGGED IN THE FIELD AND OBSERVED DURING CONSTRUCTION.

2. ALL REQUIRED SEDIMENTATION AND EROSION CONTROL FACILITIES MUST BE CONSTRUCTED AND IN OPERATION PRIOR TO ANY LAND CLEARING AND/OR OTHER CONSTRUCTION TO ENSURE THAT SEDIMENT LADEN WATER DOES NOT ENTER THE NATURAL DRAINAGE SYSTEM. THE CONTRACTOR SHALL SCHEDULE AN INSPECTION OF THE EROSION CONTROL FACILITIES PRIOR TO ANY LAND CLEARING AND/OR CONSTRUCTION. ALL EROSION AND SEDIMENT FACILITIES SHALL BE MAINTAINED IN A SATISFACTIRY CONDITION AS DETERMINED BY THE CITY, UNTIL SUCH TIME THAT CLEARING AND/OR CONSTRUCTION IS COMPLETED AND THE POTENTIAL FOR ON-SITE EROSION HAS PASSED. THE IMPLEMENTATION, MAINTENANCE, REPLACEMENT, AND ADDITIONS TO THE EROSION AND SEDIMENTATION CONTROL SYSTEMS SHALL BE THE RESPONSIBILITY OF THE PERMITEE.

3. THE EROSION AND SEDIMENTATION CONTROL SYSTEM FACILITIES DEPICTED ON THESE PLANS ARE INTENDED TO BE MINIMUM REQUIREMENTS TO MEET ANTICIPATED SITE CONDITIONS. AS CONSTRUCTION PROGRESSES AND UNEXPECTED OR SEASONAL CONDITIONS DICTATE, FACILITIES WILL BE NECESSARY TO ENSURE COMPLETE SILTATION CONTROL ON THE SITE. DURING THE COURSE OF CONSTRUCTION, IT SHALL BE THE OBLIGATION AND RESPONSIBILITY OF THE PERMITEE TO ADDRESS ANY NEW CONDITIONS THAT MAY BE CREATED BY HIS ACTIVITIES AND TO PROVIDE ADDITIONAL FACILITIES, OVER AND ABOVE THE MINIMUM REQUIREMENTS, AS MAY BE NEEDED TO PROTECT ADJACENT PROPERTIES, SENSITIVE AREAS, NATURAL WATER COURSES, AND/OR STORM DRAINAGE SYSTEMS.

4. APPROVAL OF THESE PLANS IS FOR GRADING, TEMPORARY DRAINAGE, EROSION AND SEDIMENTATION CONTROL ONLY. IT DOES NOT CONSTITUTE AN APPROVAL OF PERMANENT STORM DRAINAGE DESIGN, SIZE OR LOCATION OF PIPES, RESTRICTORS, CHANNELS, OR RETENTION FACILITIES.

5. ANY DISTURBED AREA WHICH HAS BEEN STRIPPED OF VEGETATION AND WHERE NO FURTHER WORK IS ANTICIPATED FOR A PERIOD OF 30 DAYS OR MORE, MUST BE IMMEDIATELY STABILIZED WITH MULCHING, GRASS PLANTING, OR OTHER APPROVED EROSION CONTROL TREATMENT APPLICABLE TO THE TIME OF YEAR IN QUESTION. GRASS SEEDING ALONE WILL BE ACCEPTABLE ONLY DURING THE MONTHS OF APRIL THROUGH SEPTEMBER INCLUSVE. SEEDING MAY PROCEED OUTSIDE THE SPECIFIED TIME PERIOD WHENEVER IT IS IN THE INTEREST OF THE PERMITEE BUT MUST BE AUGMENTED WITH MULCHING, NETTING, OR OTHER TREATMENT APPROVED BY THE CITY.

6. IN CASE EROSION OR SEDIMENTATION OCCURS TO ADJACENT PROPERTIES, ALL CONSTRUCTION WORK WITHIN THE DEVELOPMENT THAT WILL FURTHER AGGRAVATE THE SITUATION MUST CEASE, AND THE OWNER/CONTRACTOR WILL IMMEDIATELY COMMENCE RESTORATION METHODS. RESTORATION ACTIVITY WILL CONTINUE UNTIL SUCH TIME AS THE AFFECTED PROPERTY OWNER IS SATISFIED.

7. NO TEMPORARY OR PERMANENT STOCKPILING OF MATERIALS OR EQUIPMENT SHALL OCCUR WITHIN CRITICAL AREAS OR ASSOCIATED BUFFERS, OR THE CRITICAL ROOT ZONE FOR VEGETATION PROPOSED FOR RETENTION.

CITY OF PUYALLUP
DEVELOPMENT ENGINEERING and PUBLIC WORKS DEPARTMENTS

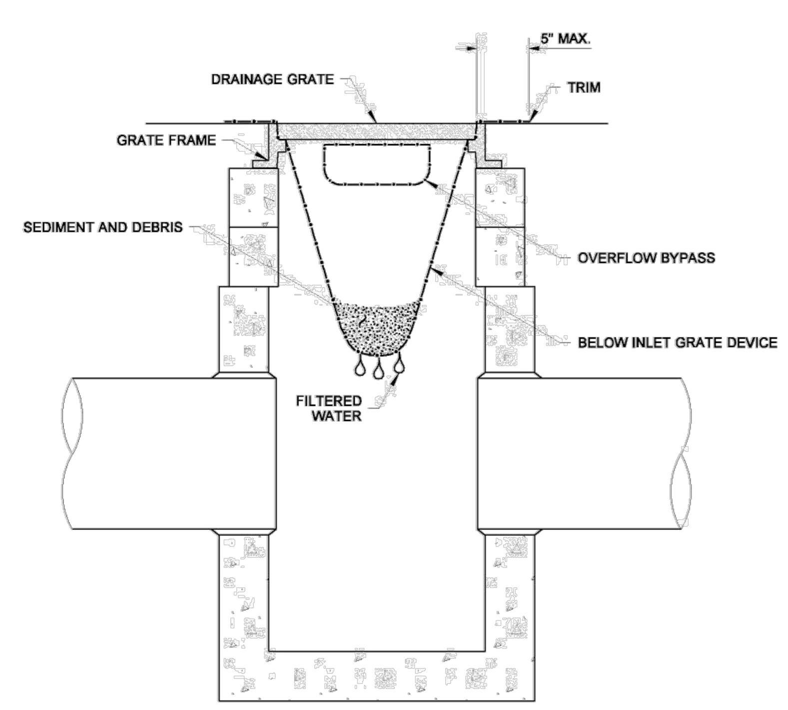
GRADING, EROSION, AND SEDIMENTATION CONTROL NOTES

CITY STANDARD 05.02.01

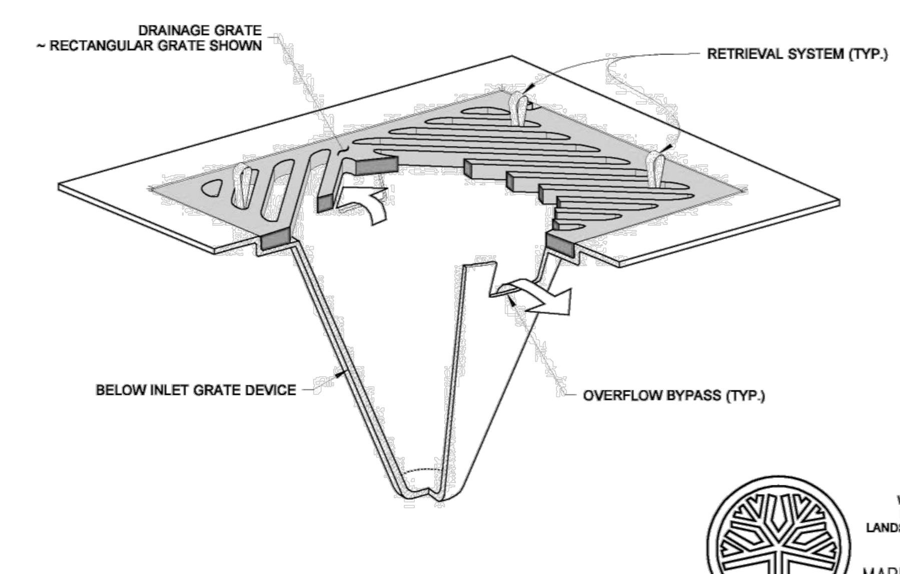
DRAWN BY: LISA CYFORD

NOTES

1. Size the Below Inlet Grate Device (BIGD) for the storm water structure it will service.
2. The BIGD shall have a built-in high-flow relief system (overflow bypass).
3. The retrieval system must allow removal of the BIGD without spilling the collected material.
4. Perform maintenance in accordance with Standard Specification 8-01.3(15).



SECTION VIEW
NOT TO SCALE



ISOMETRIC VIEW

STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT
MARK W. MAURER
CERTIFICATE NO. 000598

STORM DRAIN INLET PROTECTION
STANDARD PLAN I-40.20-00
SHEET 1 OF 1 SHEET
APPROVED FOR PUBLICATION
Pasco Bakotich III 09-20-07
STATE DESIGN ENGINEER DATE
Washington State Department of Transportation

ARCHITECT

studio MENG STRAZZARA

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Sumner, WA 98390
(206) 596-2020

CLIENT/OWNER

PUYALLUP SCHOOL DISTRICT
A Tradition of Excellence

TITLE

PUYALLUP HS NEW PORTABLES 2023

STAMP

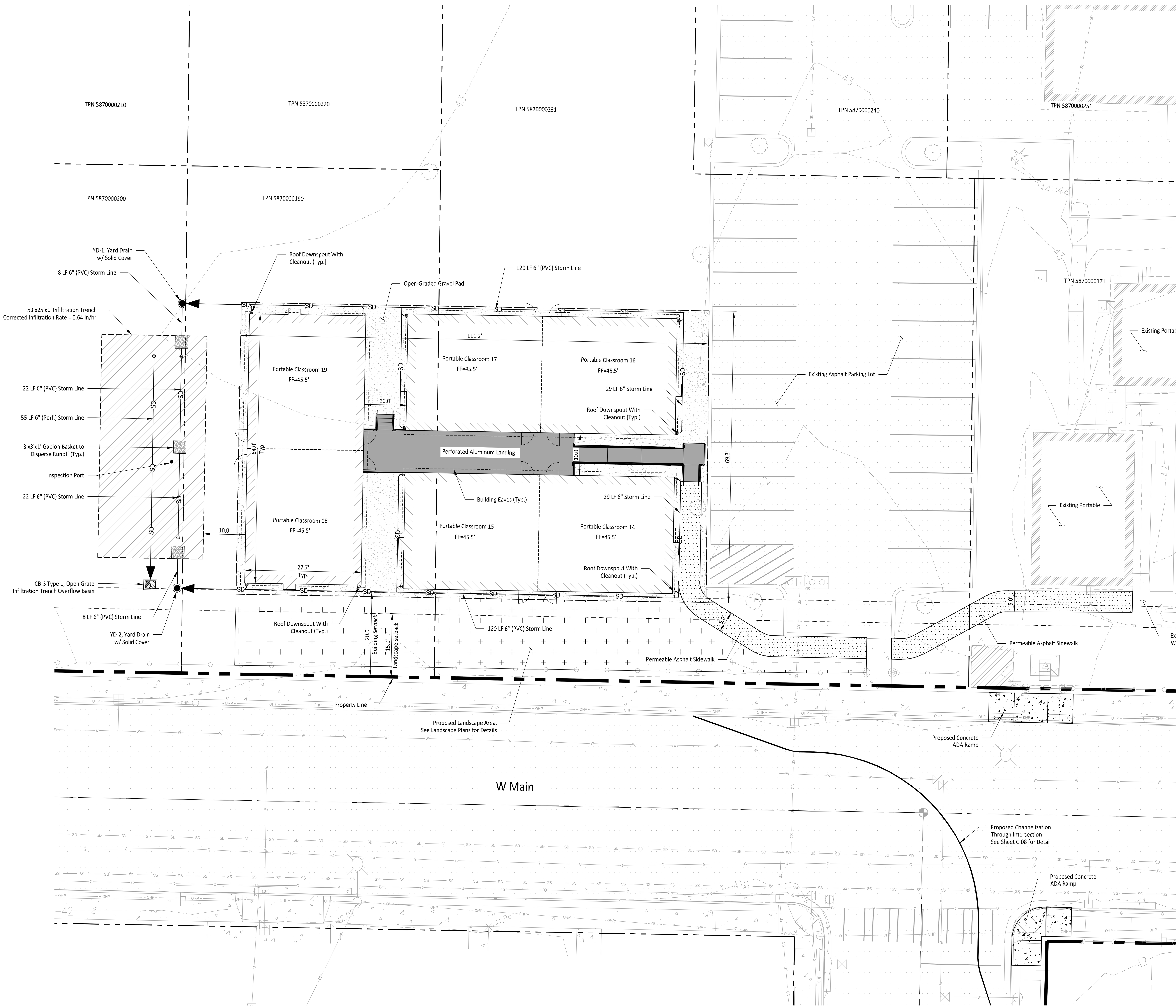
JUSTIN M. JONES
STATE OF WASHINGTON
41829
REGISTERED PROFESSIONAL ENGINEER
04-05-24

ISSUED:	DATE:
CONDITIONAL USE PERMIT	OCT, 11 2023
CUP CC#1 RESPONSE	APR, 5 2024

TESC DETAILS

Building Permit #:	-
CUP #:	PLCUP20230109
Owner's Project #:	-
Architect's Project #:	2023106
Drawn By	MO
Checked By	JJ

C.03



LEGEND

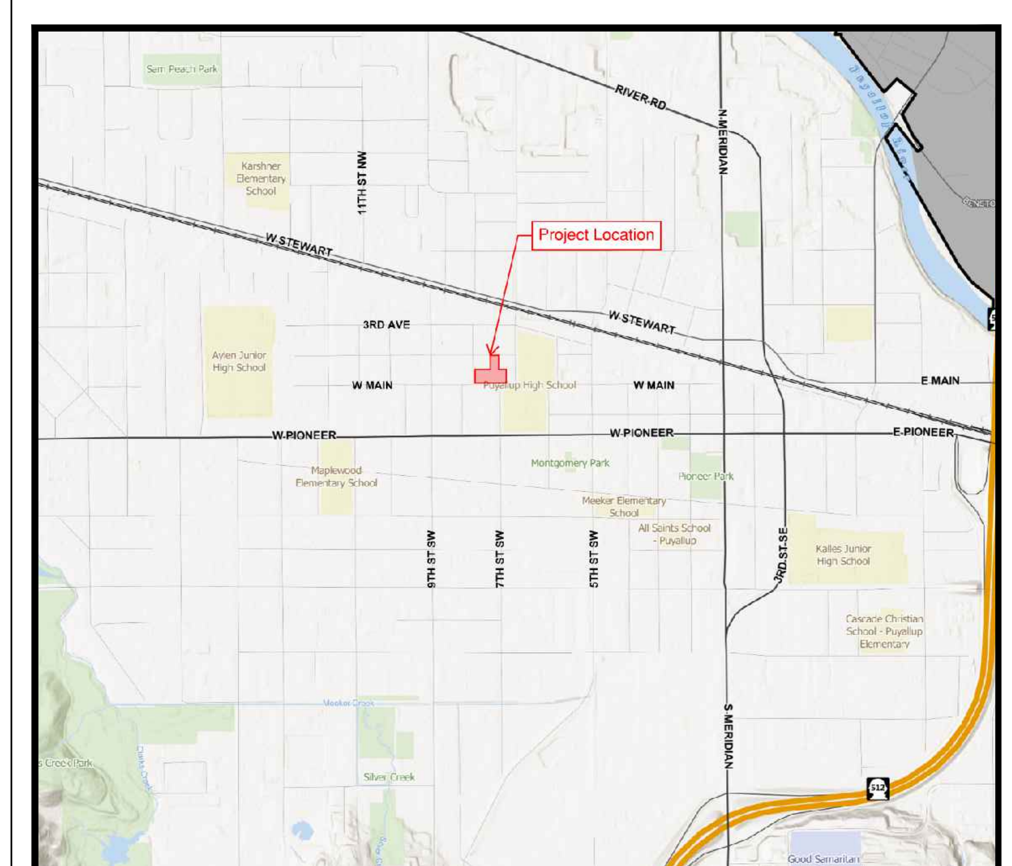
- Existing Asphalt
- Existing Concrete
- Proposed Permeable Asphalt
- Proposed Open-Graded Gravel
- Proposed Perforated Aluminum Landing
- Proposed Landscape Area
- Proposed Infiltration Trench
- Proposed Catch Basin Type 1, Open Grate
- Proposed Yard Drain
- Proposed Cleanout
- Existing Catch Basin
- SD Proposed Storm Drain Line
- SD Existing Storm Drain Line

SITE DATA

- Total Lot Area: 43,574 SF (1.00 AC)
- Total Project Site Area: 16,587 SF (0.38 AC)
- Tax Parcel Numbers: 5870000171, 5870000190, 5870000200, 5870000231
- Zoning: PF- Public Facilities

PROPOSED LOT COVERAGE

Total Lot Area	43,574 SF (1.00 AC)		
Coverage	Area (SF)	Area (AC)	% of Site
Impervious			
Ex. Roof	1,722	0.04	
Ex. Concrete Sidewalk	964	0.03	
Ex. Asphalt Parking Lot	6,686	0.15	
New Roof	5,785	0.12	
New Permeable Asphalt Sidewalk	663	0.02	
New Open-Graded Gravel Pad	1,570	0.04	
New Perforated Aluminum Landing	660	0.02	
Total New Impervious	8,678	0.20	20.0%
Total Site Impervious	18,050	0.42	42.0%
Pervious			
Landscape	25,524	0.58	
Total Site Pervious	25,524	0.58	58.0%



VICINITY MAP

0 10 20 FEET
1" = 10'

ARCHITECT

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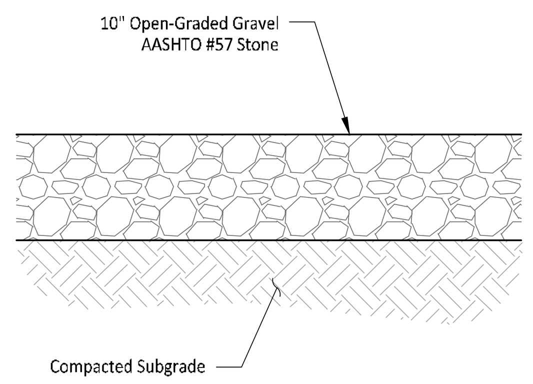
CONDITIONAL USE PERMIT	OCT, 11 2023
CUP CC#1 RESPONSE	APR, 5 2024

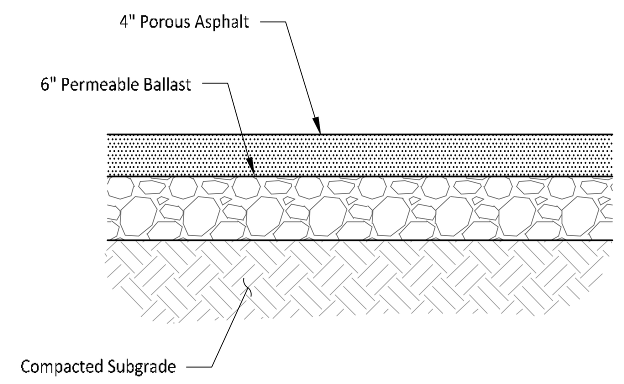
PROPOSED SITE & STORM PLAN

Building Permit #:	-
CUP #:	PLCUP20230109
Owner's Project #:	-
Architect's Project #:	2023106
Drawn By	MO
Checked By	JJ

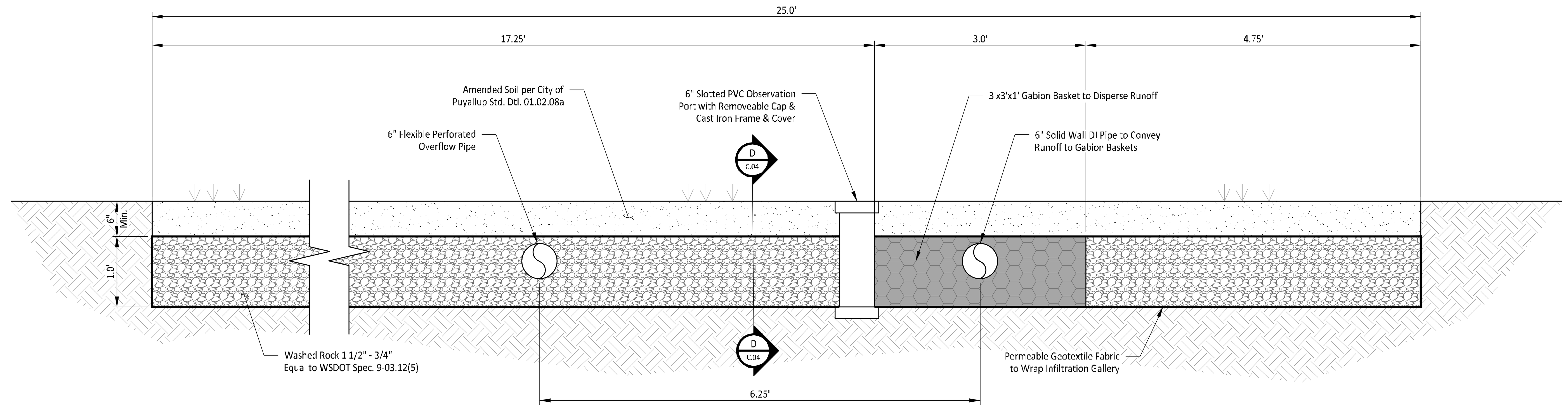
C.04



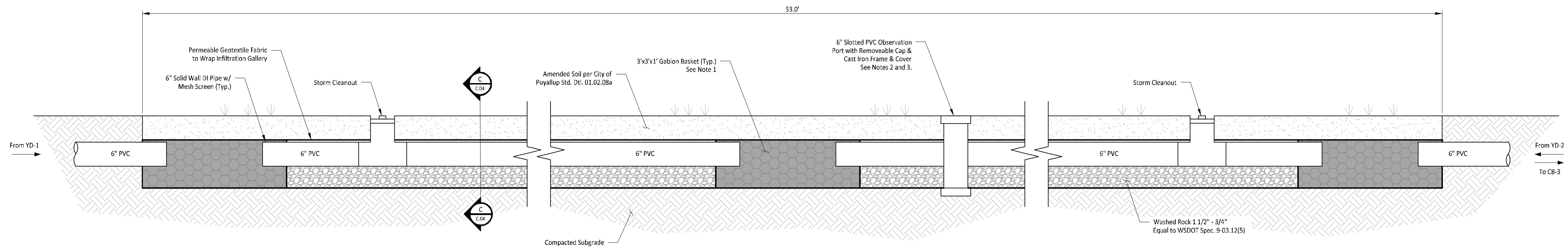
OPEN-GRADED GRAVEL
SECTION A
1" = 1'



PERMEABLE ASPHALT
SECTION B
1" = 1'



TYPICAL INFILTRATION GALLERY
SECTION C
1" = 1'



Notes:
1. Gabion Baskets to be wrapped with permeable geotextile fabric.
2. Install Observation Port per City of Puyallup Std. Dtl. 02.01.10.
3. Observation Port to be installed to the bottom of permeable ballast layer.

TYPICAL INFILTRATION GALLERY
SECTION D
1" = 1'

ARCHITECT

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ISSUED:	DATE:
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CUP CC#1 RESPONSE	APR, 5 2024

NOTES & DETAILS

Building Permit #:	-
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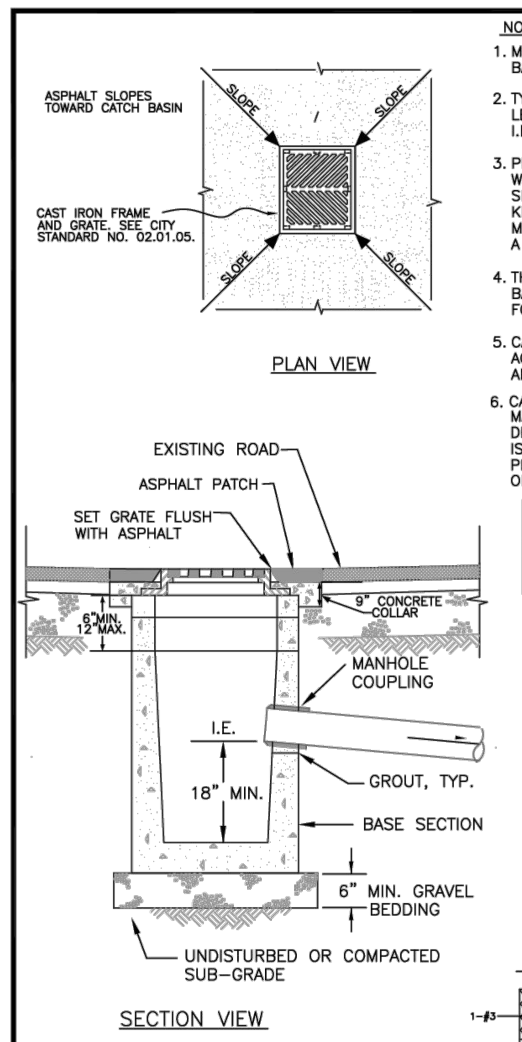
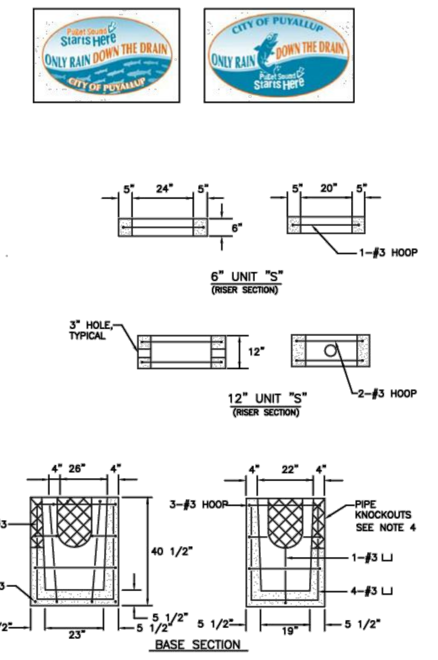
Architect's Project #:	2023106
Drawn By	MO
Checked By	JJ

C.05



NOTES:

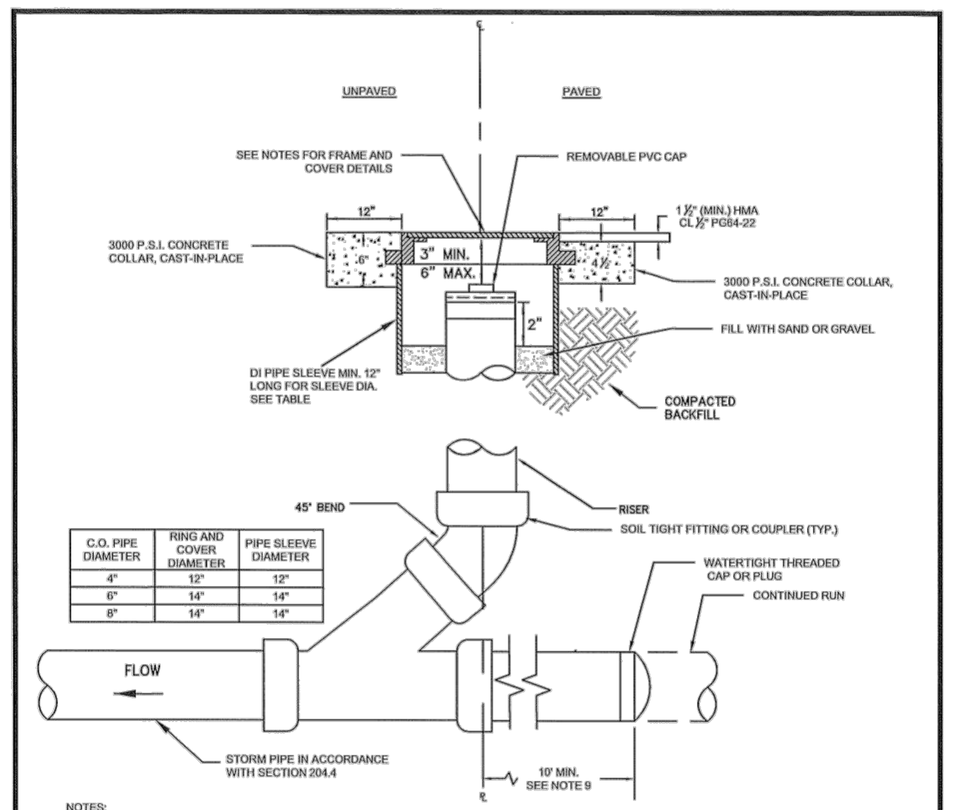
1. MAXIMUM LENGTH OF PIPE BETWEEN CATCH BASINS SHALL BE 400'.
2. TYPE I CATCH BASIN IS USED FOR DEPTHS LESS THAN 5'-0" FROM TOP OF GRATE TO I.E.(PIPE INVERT).
3. PRECAST BASE SECTION SHALL BE FURNISHED WITH CUTOUTS OR KNOCKOUTS. KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" MIN. KNOCKOUTS SHALL BE ON 4 SIDES WITH A MAXIMUM DIAMETER OF 20" TO PROVIDE FOR A MINIMUM SUMP DEPTH OF 18".
4. THE TAPER ON THE SIDES OF THE PRECAST BASE SECTION SHALL NOT EXCEEED 1/2" PER FOOT.
5. CATCH BASIN SHALL BE CONSTRUCTED IN ACCORDANCE WITH ASTM C 478 (AASHTO M 199) AND ASTM C 890 UNLESS OTHERWISE NOTED.
6. CATCH BASIN MARKER WILL BE AFFIXED WITH MANUFACTURER'S EPOXY IN DRY WEATHER, 40 DEGREES OR WARMER. IF CURB EXISTS MARKER IS PLACED ON TOP OF CURB, IF A RAISED EDGE PLACE MARKER ON THE WEDGE, IF NO CURB PLACE ON PAVEMENT ON SIDE LEAST EXPOSED TO TRAFFIC



CITY OF PUYALLUP
DEVELOPMENT ENGINEERING and PUBLIC WORKS DEPARTMENTS

CATCH BASIN TYPE 1 (AREA DRAIN)

DRAWN BY	CHECKED BY	APPROVED BY	REVISED BY	CITY STANDARD
LINDA LANSING	LINDA LIAN	COLLEEN HARRIS	XXXX	
FILE NAME F:\DWG\COMMON\STDS\CITY\2009\02_SD\02.01.02		DATE APPROVED 09/01/1992	DATE REVISED 06/01/2003 SCALE NTS	02.01.02



C.O. PIPE DIAMETER	RING AND COVER DIAMETER	PIPE SLEEVE DIAMETER
4"	10"	12"
6"	14"	14"
8"	14"	14"

NOTES:
1. CAST IRON COVER MARKED "FDCO" FOR FOOTING DRAINS OR "SDCO" FOR STORM LINES.
2. CAST IRON FRAME AND COVER SHALL BE DRILLED AND TAPPED WITH ⅝"-11 NC STAINLESS STEEL TYPE 304 ALLEN HEAD BOLTS, 2" LONG.
3. BOLT-LOCKING CAST IRON FRAME AND COVER SHALL BE HS-20 RATED IF USED IN RIGHT-OF-WAY OR EASEMENTS.
4. 14" BOLT-LOCKING CAST IRON FRAME AND COVER SHALL BE EQUAL TO OLYMPIC FOUNDRY PART # M1060.
5. CAST IRON FRAME AND COVER SHALL BE FLUSH WITH FINISHED GRADE.
6. CLEANOUTS REQUIRED FOR EACH PIPE LENGTH GREATER THAN 100' AND FOR EACH 90 DEGREE BEND.
7. STORM PIPE BEDDING AND BACKFILL SHALL CONFORM TO STD DETAIL 06.01.01.
8. FINAL JOINTS SHALL BE SAW CUT, FACE OF CUT TACKED AND ALL JOINTS SEALED WITH SEALANT (AR4000W).
9. STORM DRAIN STUB SHALL EXTEND 10' BEYOND THE PROPERTY LINE OR EASEMENT LINE TO PREVENT DAMAGE AND MINIMIZE CONFLICT WITH FUTURE UTILITIES.
10. EACH CLEANOUT ASSEMBLY SHALL CONSIST OF: ONE CLEANOUT ADAPTOR, (HUB x FEMALE INSIDE PIPE THREAD, PVC SLIP IN), AND ONE CLEANOUT PLUG (MALE OUTSIDE THREAD WITH RAISED NUT, PVC).
11. FOR LANDSCAPED AREAS (OUTSIDE OF CITY ROW, EASEMENTS AND FACILITIES) A GREEN "CARSON" MODEL 910 YARD BOX MAY BE USED FOR C.O. PIPE DIA. LESS THAN OR EQUAL TO 6". YARD BOX SHALL BE FASTENED WITH ⅜" HEX BOLTS, THE COVER MARKED "STORM" AND FLUSH WITH FINISHED GRADE.

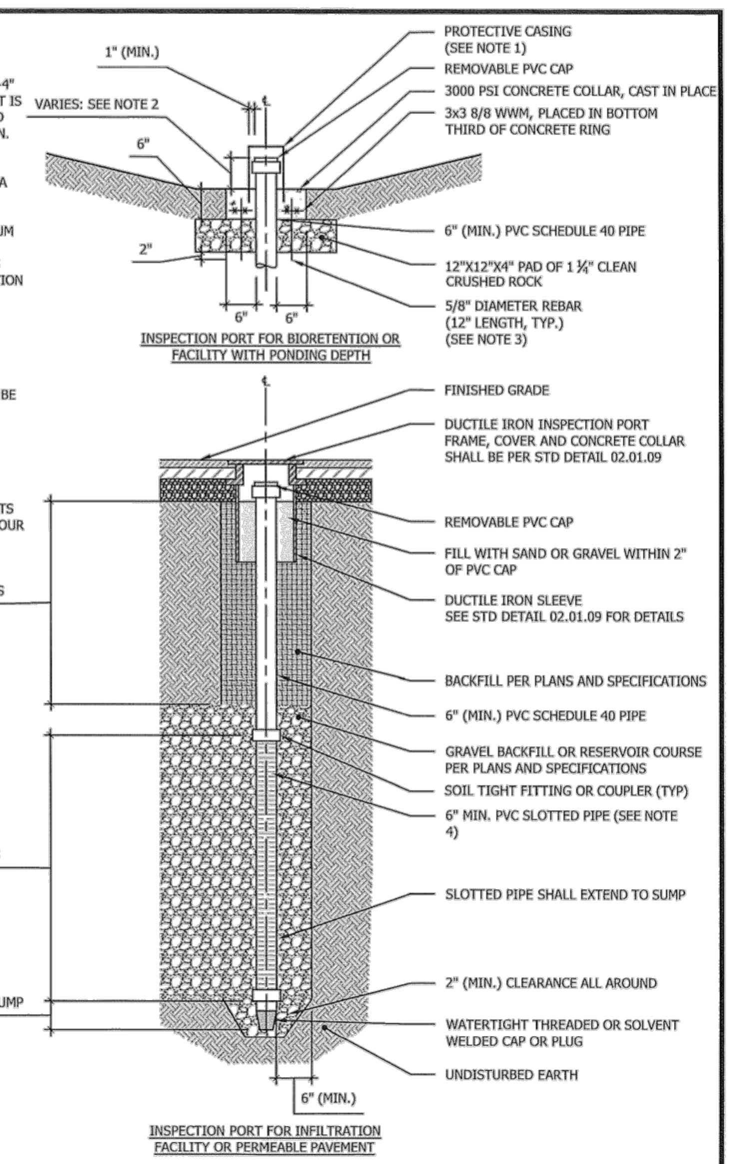
CITY OF PUYALLUP
PUBLIC WORKS AND DEVELOPMENT ENGINEERING

APPROVED FOR PUBLICATION
HANS P. HUNGER STATE OF WASHINGTON 33750 REGISTERED PROFESSIONAL ENGINEER
DATE SEALED: 2/28/23

STORM DRAIN CLEANOUT

SCALE: NTS
DATE REVISED: 01/06/2023
FILE NAME: Y:\Shared\Drawings\City Standards\2018\02 - PART 2 - STANDARD DETAILS\CAD\200\02.01.09
CITY STANDARD 02.01.09

NOTES:
1. INSPECTION PORT COVER SHALL BE SECURED IN CONCRETE SURROUND (1'-4" TOTAL DIAMETER) IF PORT IS NOT OTHERWISE SECURED BY SURFACE RESTORATION.
2. FOR INSPECTION PORTS LOCATED WITHIN BIORETENTION CELLS OR A FACILITY WITH PONDING DEPTH, PVC CAP SHALL EXTEND 2" ABOVE MAXIMUM PONDING DEPTH.
3. FOR OBSERVATION PORTS LOCATED IN A BIORETENTION CELL OR A FACILITY WITH PONDING DEPTH, PLACE THREE (3) LENGTHS OF REBAR EVENLY SPACED AROUND COLLAR, AND 3" FROM OUTER EDGE.
4. SLOTTED PVC PIPE SHALL BE PER ASTM D1785 SCH 40 WITH SLOTS CUT PERPENDICULAR TO THE LONG AXIS OF THE PIPE. SLOTS SHALL BE 0.04" TO 0.069" BY 1" LONG AND SPACED 0.25" APART. SLOTS SHALL BE ARRANGED IN FOUR (4) ROWS SPACED ON 45-DEGREE CENTERS.

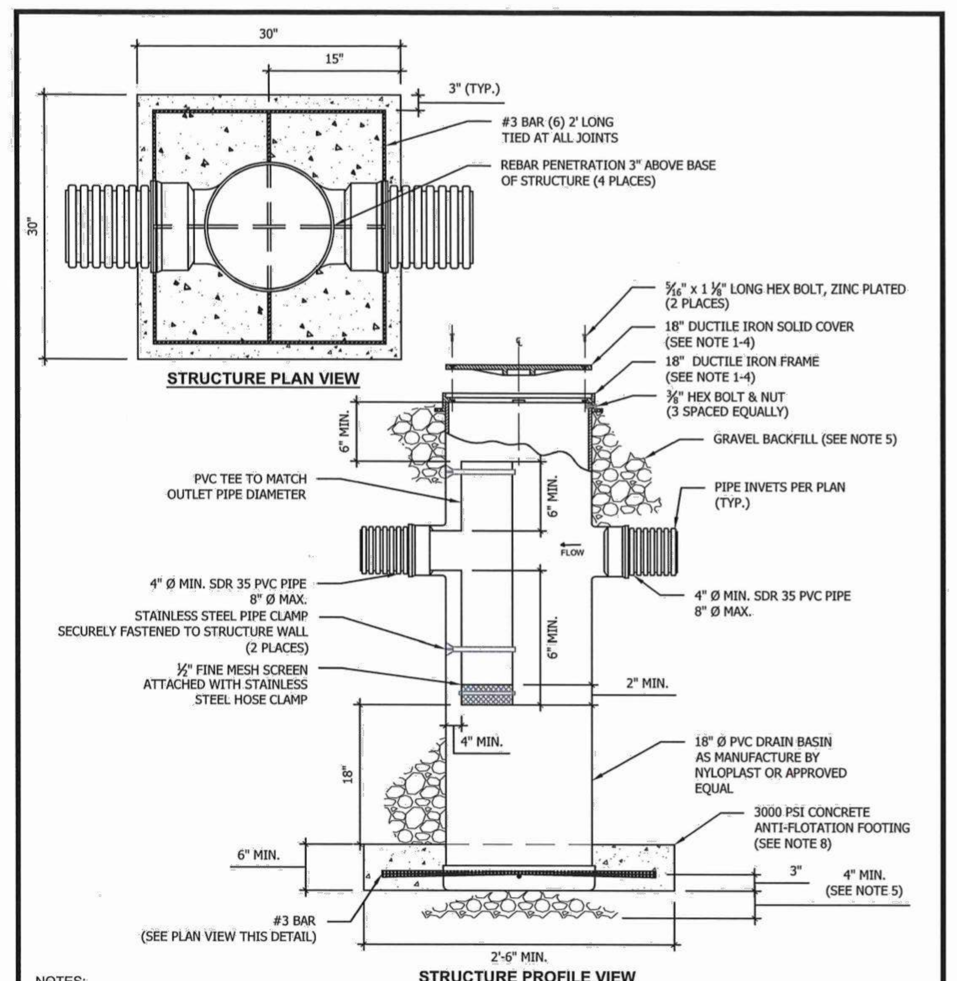


CITY OF PUYALLUP
PUBLIC WORKS AND DEVELOPMENT ENGINEERING

APPROVED FOR PUBLICATION
HANS P. HUNGER STATE OF WASHINGTON 33750 REGISTERED PROFESSIONAL ENGINEER
DATE SEALED: 2/28/23

STORM DRAIN INSPECTION PORT

SCALE: NTS
DATE REVISED: 01/06/2023
FILE NAME: Y:\Shared\Drawings\City Standards\2018\02 - PART 2 - STANDARD DETAILS\CAD\200\02.01.10
CITY STANDARD 02.01.10



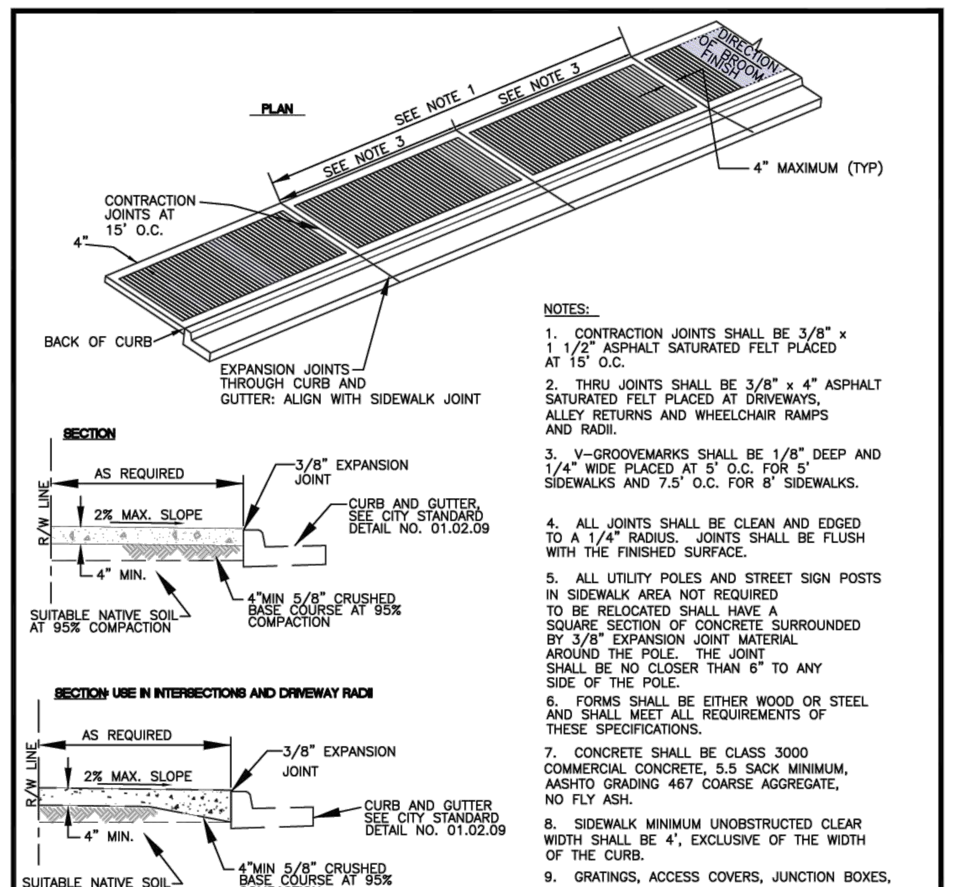
NOTES:
1. TRAFFIC APPLICATIONS SHALL BE HS-20 RATED, NOT FOR USE IN PUBLIC RIGHT-OF-WAY, PUBLIC EASEMENTS, OR TRACTS.
2. 18" SOLID LOCKING DUCTILE IRON FRAME AND COVER BY NYLOPLAST - TYPE C OR APPROVED EQUAL.
3. DUCTILE IRON FRAME AND COVER SHALL BE DRILLED AND TAPPED WITH 5⁄16"- 8 ZINC-PLATED HEX BOLT 1 ⅛" LONG.
4. DUCTILE IRON FRAME AND COVER SHALL BE FLUSH WITH FINISHED GRADE.
5. STORM PIPE AND STRUCTURE BEDDING AND BACKFILL SHALL CONFORM TO STD DETAIL 06.01.01.
6. ALL BOLT HOLES DRILLED IN THE STRUCTURE SHALL BE WATERTIGHT WITH RUBBER SEALING WASHERS OR APPROVED EQUAL.
7. ALL PIPE JOINTS SHALL BE WATERTIGHT.
8. A CONCRETE FOOTING SHALL BE PROVIDED AT THE BASE OF THE STRUCTURE WHEN THE BOTTOM ELEVATION OF THE STRUCTURE IS WITHIN 6" OF HIGH GROUNDWATER.
9. THE MAXIMUM DEPTH FROM FINISHED GRADE TO THE PIPE INVERT IS 5'-0".

CITY OF PUYALLUP
PUBLIC WORKS AND DEVELOPMENT ENGINEERING

APPROVED FOR PUBLICATION
HANS P. HUNGER STATE OF WASHINGTON 33750 REGISTERED PROFESSIONAL ENGINEER
DATE SEALED: 1/6/23

YARD DRAIN

SCALE: NTS
DATE REVISED: 12/05/2022
FILE NAME: Y:\Shared\Drawings\City Standards\2018\02 - PART 2 - STANDARD DETAILS\CAD\200\02.05.02
CITY STANDARD 02.05.02



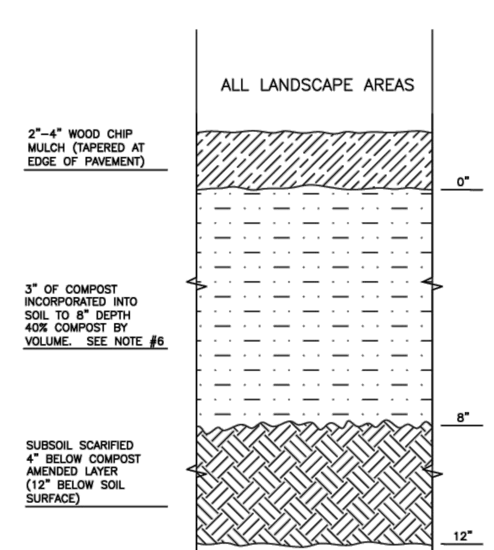
MINIMUM SIDEWALK WIDTHS
5'(RS ZONES) SINGLE FAMILY RESIDENTIAL AREAS (DETACHED DWELLINGS)
8'(RS ZONES) COMMERCIAL USES, WHEN REQUIRED BY DEVELOPMENT SERVICES MANAGER
8'(RM ZONES) MEDIUM AND HIGH DENSITY MULTI-FAMILY RESIDENTIAL AREAS
8'(ML ZONES) INDUSTRIAL AREAS
8'(CG, CBD ZONES) COMMERCIAL AREAS
8'(PF ZONES) PUBLIC FACILITIES AREAS
8'(F ZONES) FAIR AREAS
* MATCH GREATEST WIDTH FOR ANY ADJACENT ZONE

NOTES:
1. CONTRACTION JOINTS SHALL BE 3/8" x 1 1/2" ASPHALT SATURATED FELT PLACED AT 15' O.C.
2. THRU JOINTS SHALL BE 3/8" x 4" ASPHALT SATURATED FELT PLACED AT DRIVEWAYS, ALLEY RETURNS AND WHEELCHAIR RAMPS AND RADII.
3. V-GROOVEMARKS SHALL BE 1/8" DEEP AND 1/4" WIDE PLACED AT 5' O.C. FOR 5' SIDEWALKS AND 7.5' O.C. FOR 8' SIDEWALKS.
4. ALL JOINTS SHALL BE CLEAN AND EDGED TO A 1/4" RADIUS. JOINTS SHALL BE FLUSH WITH THE FINISHED SURFACE.
5. ALL UTILITY POLES AND STREET SIGN POSTS IN SIDEWALK AREA NOT REQUIRED TO BE RELOCATED SHALL HAVE A SQUARE SECTION OF CONCRETE SURROUNDED BY 3/8" EXPANSION JOINT MATERIAL AROUND THE POLE. THE JOINT SHALL BE NO CLOSER THAN 6" TO ANY SIDE OF THE POLE.
6. FORMS SHALL BE EITHER WOOD OR STEEL AND SHALL MEET ALL REQUIREMENTS OF THESE SPECIFICATIONS.
7. CONCRETE SHALL BE CLASS 3000 COMMERCIAL CONCRETE, 5.5 SACK MINIMUM, AASHTO GRADING 467 COARSE AGGREGATE, NO FLY ASH.
8. SIDEWALK MINIMUM UNOBSTRUCTED CLEAR WIDTH SHALL BE 4', EXCLUSIVE OF THE WIDTH OF THE CURB.
9. GRATINGS, ACCESS COVERS, JUNCTION BOXES, CABLE VAULTS, PULL BOXES AND OTHER APPURTENANCES WITHIN THE SIDEWALK (RIGHT-OF-WAY) MUST HAVE SLIP RESISTANT SURFACE AND MATCH THE GRADE OF THE SIDEWALK.
10. CURB RAMPS SHALL BE CONSTRUCTED AT INTERSECTIONS USING A DESIGN PREPARED BY A LICENSED PROFESSIONAL ENGINEER. WHEN A RAMP DESIGN FAILS TO MEET ALL APPLICABLE DESIGN STANDARDS, THE ENGINEER SHALL DOCUMENT WHY THE PROPOSED RAMP ACHIEVES DESIGN STANDARDS TO THE MAXIMUM EXTENT FEASIBLE.

CITY OF PUYALLUP
DEVELOPMENT ENGINEERING and PUBLIC WORKS DEPARTMENTS

SIDEWALK WITHOUT PLANTING STRIP

DRAWN BY	CHECKED BY	APPROVED BY	REVISED BY	CITY STANDARD
JIM ERWIN-SVOBODA	LINDA LIAN	COLLEEN HARRIS	LINDA LIAN	
FILE NAME F:\DWG\COMMON\STDS\CITY\2009\01_STR\01.02\01.02.01		DATE APPROVED	DATE REVISED SCALE	01.02.01



NOTES:
1. ALL SOIL AREAS DISTURBED OR COMPACTED DURING CONSTRUCTION, AND NOT COVERED BY BUILDINGS OR PAVEMENT, SHALL BE AMENDED WITH COMPOST AS DESCRIBED BELOW.
2. SUBSOIL SHOULD BE SCARIFIED (LOOSENED) 4 INCHES BELOW AMENDED LAYER, TO PRODUCE 12-INCH DEPTH OF UN-COMPACTED SOIL, EXCEPT WHERE SCARIFICATION WOULD DAMAGE TREE ROOTS OR AS DETERMINED BY THE ENGINEER. SEE NOTE BELOW REGARDING PLANTING STEPS FOR STREET TREES.
3. COMPOST SHALL BE TILLED IN TO 8 INCH DEPTH INTO EXISTING SOIL, OR PLACE 8 INCHES OF COMPOST-AMENDED SOIL, PER SOIL SPECIFICATION.
4. PLANTING BEDS SHALL RECEIVE 3 INCHES OF COMPOST TILLED IN TO 8-INCH DEPTH, OR MAY SUBSTITUTE 8" OF IMPORTED SOIL CONTAINING 35-40% COMPOST BY VOLUME. MULCH AFTER PLANTING, WITH 4 INCHES OF ARBORIST WOOD CHIP MULCH OR APPROVED EQUAL (6" OF LOOSE WOOD CHIPS AT THE TIME OF PLANTING TO ALLOW SETTLING TO 4").
5. SETBACKS: TO PREVENT UNEVEN SETTLING, DO NOT COMPOST-AMEND SOILS WITHIN 3 FEET OF UTILITY INFRASTRUCTURES (POLES, VAULTS, METERS ETC.). WITHIN ONE FOOT OF PAVEMENT EDGE, CURBS AND SIDEWALKS SOIL SHOULD BE COMPACTED TO APPROXIMATELY 95% PROCTOR TO ENSURE A FIRM SURFACE.
6. SEE SECTION 8.2(B) OF THE VMS FOR SOIL AMENDMENT AND INSTRUCTION PROCEDURES FOR STREET TREE PLANTER STRIPS. ALL STREET TREE PLANTER STRIPS SHALL RECEIVE 40% COMPOST AMENDED SOIL TO THE FULL DEPTH OF THE STREET TREE ROOTBALL.

CITY OF PUYALLUP
DEVELOPMENT ENGINEERING and PUBLIC WORKS DEPARTMENTS

SOIL AMENDMENT AND DEPTH

DRAWN BY	CHECKED BY	APPROVED BY	REVISED BY	CITY STANDARD
LINDA LIAN	CHRIS BEALE	COLLEEN HARRIS	XXXX	
FILE NAME F:\DWG\COMMON\STDS\CITYSTDS\STR\01.02.08		DATE APPROVED 08/01/2015	DATE REVISED XX/XX/XX SCALE 1:1	01.02.08a

ARCHITECT

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04-05-24

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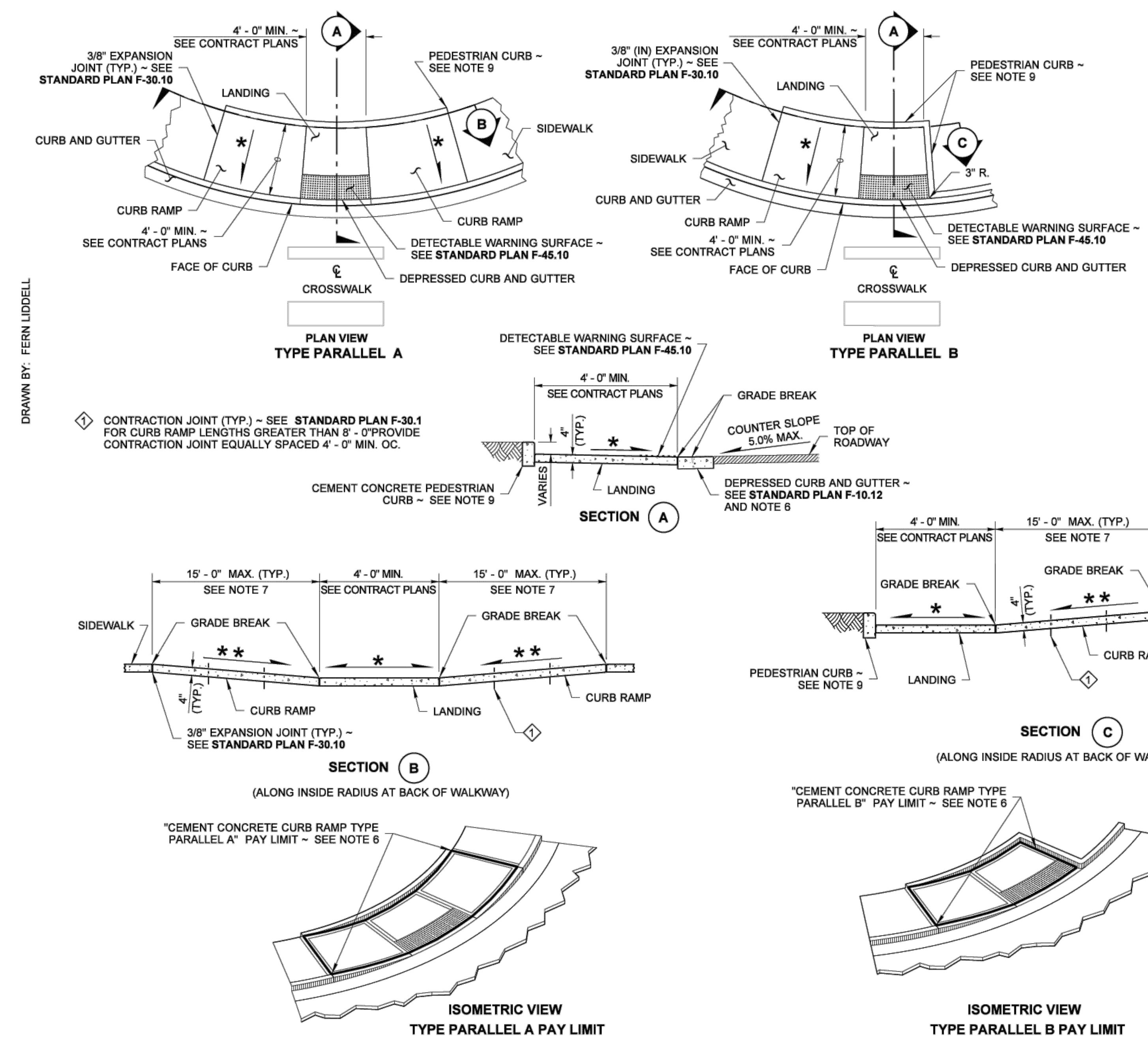
Architect's Project #:	2023106
Drawn By	MO
Checked By	JJ

C.06



NOTES

1. At marked crosswalks, the connection between the landing and the roadway must be contained within the width of the crosswalk markings.
2. Where "GRADE BREAK" is called out, the entire length of the grade break between the two adjacent surface planes shall be flush.
3. Do not place Gratings, Junction Boxes, Access Covers, or other appurtenances on any part of the Curb Ramp or Landing, or in the Depressed Curb and Gutter where the Landing connects to the roadway.
4. See Contract Plans for the curb design specified. See **Standard Plan F-10.12** for Curb, Curb and Gutter, Depressed Curb and Gutter, and Pedestrian Curb details.
5. See **Standard Plan F-30.10** for Cement Concrete Sidewalk Details. See Contract Plans for width and placement of sidewalk.
6. The Bid Item "Cement Concrete Curb Ramp Type __" does not include the adjacent Curb, Curb and Gutter, Depressed Curb and Gutter, Pedestrian Curb, or Sidewalks.
7. The Curb Ramp length is not required to exceed 15 feet (unless otherwise shown in the Contract Plans). When applying the 15-foot max. length, the running slope of the curb ramp is allowed to exceed 8.3%. Use a single constant slope from bottom of ramp to top of ramp to match into the sidewalk over a horizontal distance of 15 feet. Do not include abutting landing(s) in the15-foot max. measurement. When a ramp is constructed on a radius, the 15-foot max. length is measured on the inside radius along the back of the walkway.
8. Curb Ramps and Landings shall receive a broom finish. See **Standard Specifications 8-14.**
9. Pedestrian Curb may be omitted if the ground surface at the back of the Curb Ramp and/or Landing will be at the same elevation as the Curb Ramp or Landing and there will be no material to retain.

LEGEND

⟷	SLOPE IN EITHER DIRECTION
*	1.5% OR FLATTER RECOMMENDED FOR DESIGN/FORMWORK (2% MAX.)
* *	7.5% OR FLATTER RECOMMENDED FOR DESIGN/FORMWORK (8.3% MAX.) ~ SEE NOTE 7

R. SCOTT ZELLER STATE OF WASHINGTON 28680 REGISTERED PROFESSIONAL ENGINEER

Zeller, Scott
Jun 24 2016 7:19 AM

PARALLEL CURB RAMP

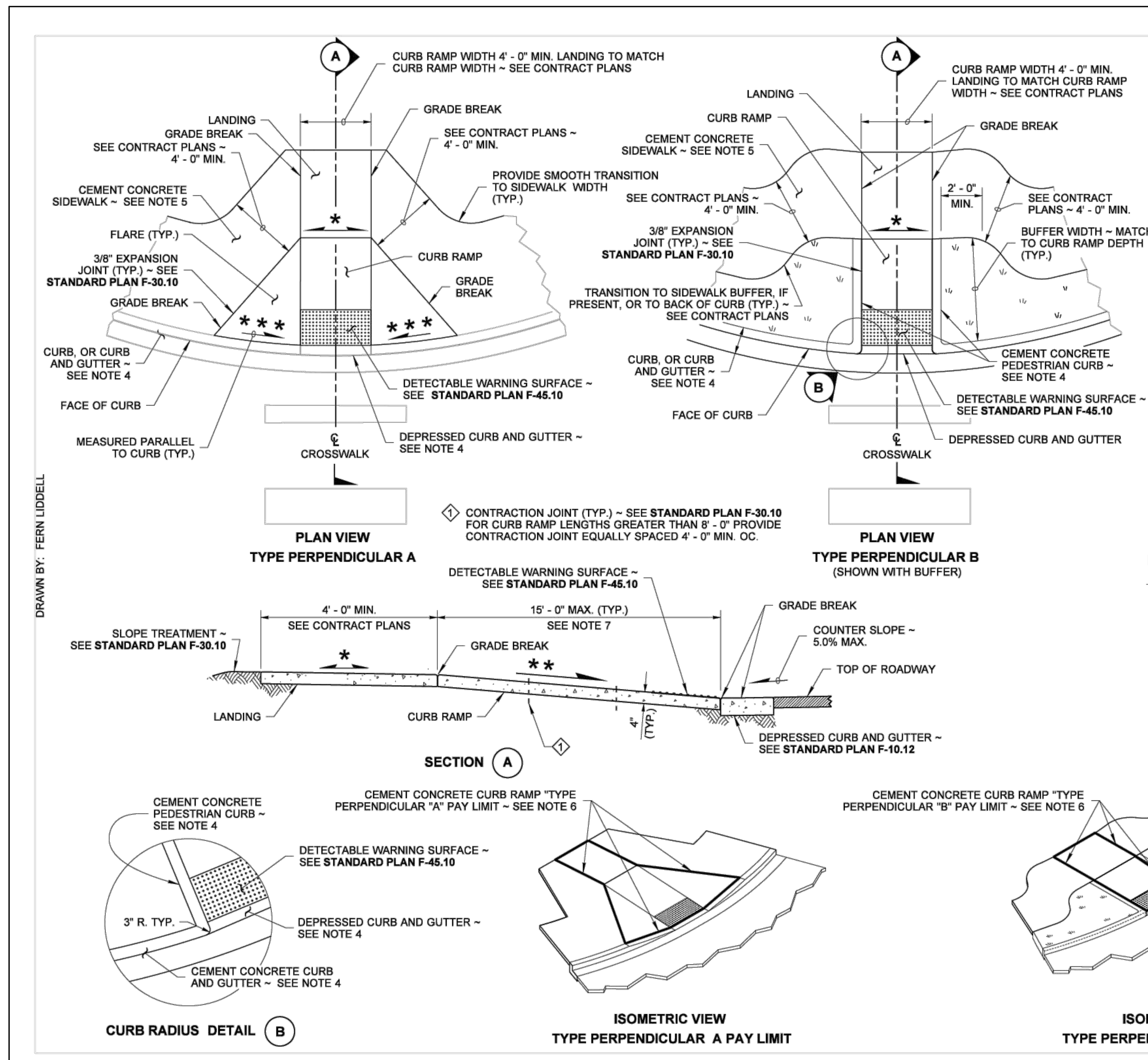
STANDARD PLAN F-40.12-03

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jun 29 2016 2:27 PM

STATE DESIGN ENGINEER

Washington State Department of Transportation



NOTES

1. At marked crosswalks, the connection between the curb ramp and the roadway must be contained within the width of the crosswalk markings.
2. Where "GRADE BREAK" is called out, the entire length of the grade break between the two adjacent surface planes shall be flush.
3. Do not place Gratings, Junction Boxes, Access Covers, or other appurtenances on any part of the Curb Ramp or Landing, or in front of the Curb Ramp where it connects to the roadway.
4. See Contract Plans for the curb design specified. See **Standard Plan F-10.12** for Curb, Curb and Gutter, Depressed Curb and Gutter, and Pedestrian Curb details.
5. See **Standard Plan F-30.10** for Cement Concrete Sidewalk Details. See Contract Plans for width and placement of sidewalk.
6. The Bid Item "Cement Concrete Curb Ramp Type __" does not include the adjacent Curb, Curb and Gutter, Depressed Curb and Gutter, Pedestrian Curb, or Sidewalks.
7. The Curb Ramp length is not required to exceed 15 feet (unless shown otherwise in the Contract Plans). When applying the 15-foot max. length, the running slope of the Curb Ramp is allowed to exceed 8.3%. Use a single constant slope from bottom of ramp to top of ramp to match into the landing over a horizontal distance of 15 feet. Do not include the abutting landing in the 15-foot max. measurement.
8. Curb Ramps and Landings shall receive a broom finish. See **Standard Specifications 8-14.**
9. Pedestrian Curb may be omitted if the ground surface at the back of the Curb Ramp and/or Landing will be at the same elevation as the Curb Ramp or Landing and there will not be material to retain.

LEGEND

⟷	SLOPE IN EITHER DIRECTION
*	1.5% OR FLATTER RECOMMENDED FOR DESIGN/FORMWORK (2% MAX.)
* *	7.5% OR FLATTER RECOMMENDED FOR DESIGN/FORMWORK (8.3% MAX.)
* * *	9.5% OR FLATTER RECOMMENDED FOR DESIGN/FORMWORK (10% MAX.)

R. SCOTT ZELLER STATE OF WASHINGTON 28680 REGISTERED PROFESSIONAL ENGINEER

Digitally signed by R. Scott Zeller
Date: 2020.09.22 13:23:53 -07'00'

PERPENDICULAR CURB RAMP

STANDARD PLAN F-40.15-04

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Date: 2020.09.25
14:44:37 -07'00'

STATE DESIGN ENGINEER

Washington State Department of Transportation

ARCHITECT

studio MENG STRAZZARA

2001 WESTERN AVE, STE# 200, SEATTLE, WA 98121
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CONSULTANT

JMJ TEAM

JMJ Team
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Sumner, WA 98390
(206) 596-2020

CLIENT/OWNER

PUYALLUP SCHOOL DISTRICT
A Tradition of Excellence

TITLE

PUYALLUP HS NEW PORTABLES 2023

STAMP

JUSTIN M. JONES STATE OF WASHINGTON 41829 REGISTERED PROFESSIONAL ENGINEER

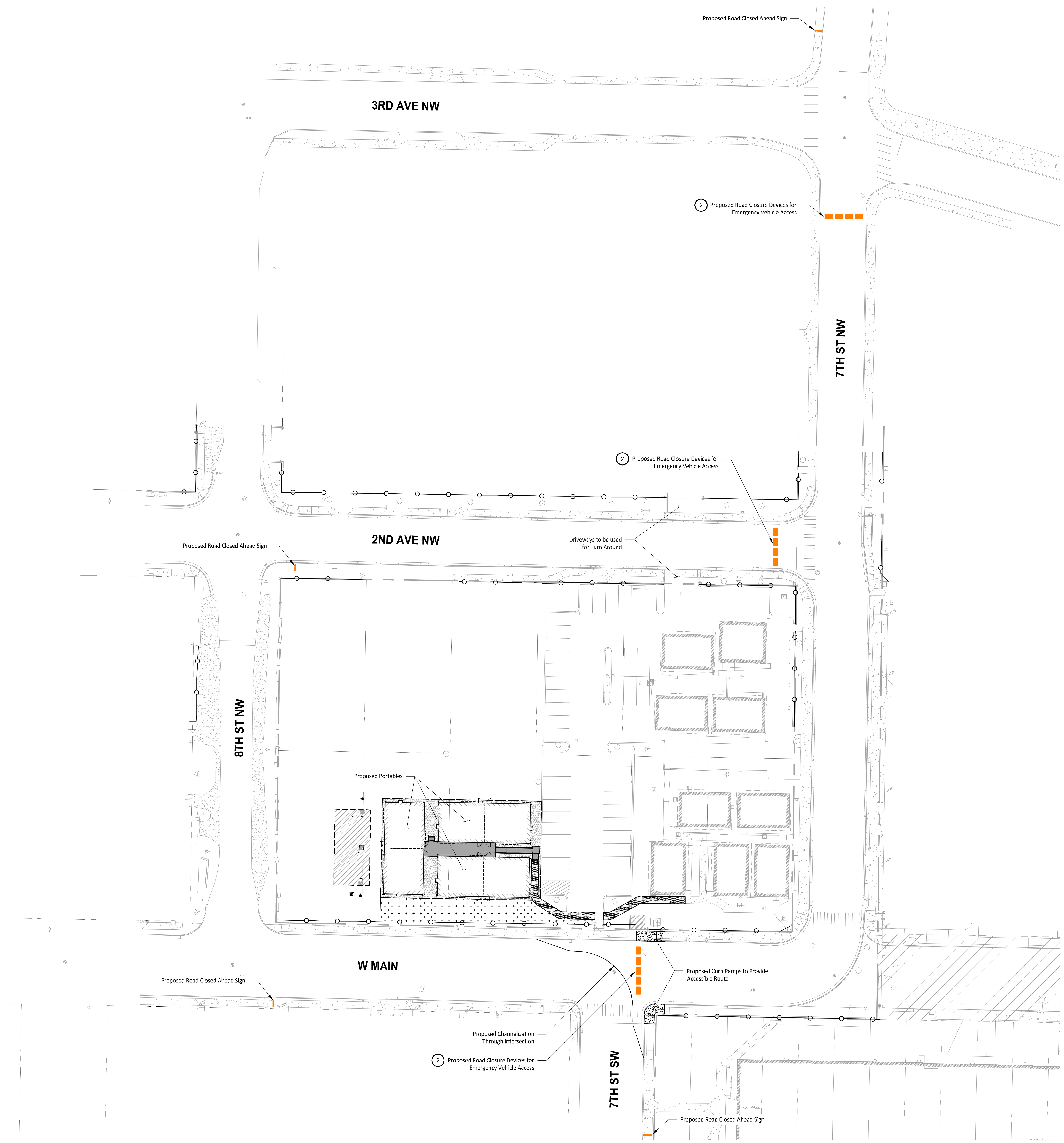
04-05-24

ISSUED:	DATE:
CONDITIONAL USE PERMIT	OCT, 11 2023
CUP CC#1 RESPONSE	APR, 5 2024

NOTES & DETAILS

Building Permit #:	-
CUP #:	PLCUP20230109
Owner's Project #:	-
Architect's Project #:	2023106
Drawn By	MO
Checked By	JJ

C.07



GENERAL NOTE

1. Intersection and Advanced Signage for road closure to meet Manual on Uniform Traffic Control Devices (MUTCD) and City of Puyallup Standards as part of future ROW and Civil Plans.
2. Road Closure Device to be Reflective Water Filled Barrier(s) or another MUTCD compliant feature as requested by the City of Puyallup.

PLASTIC WATER FILLED BARRIER
EXAMPLE A
NOT TO SCALE

ARCHITECT
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JMJTEAM
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A Tradition of Excellence

TITLE
PUYALLUP HS NEW PORTABLES 2023

STAMP
JUSTIN M. JONES
STATE OF WASHINGTON
41829
REGISTERED PROFESSIONAL ENGINEER
04-05-24

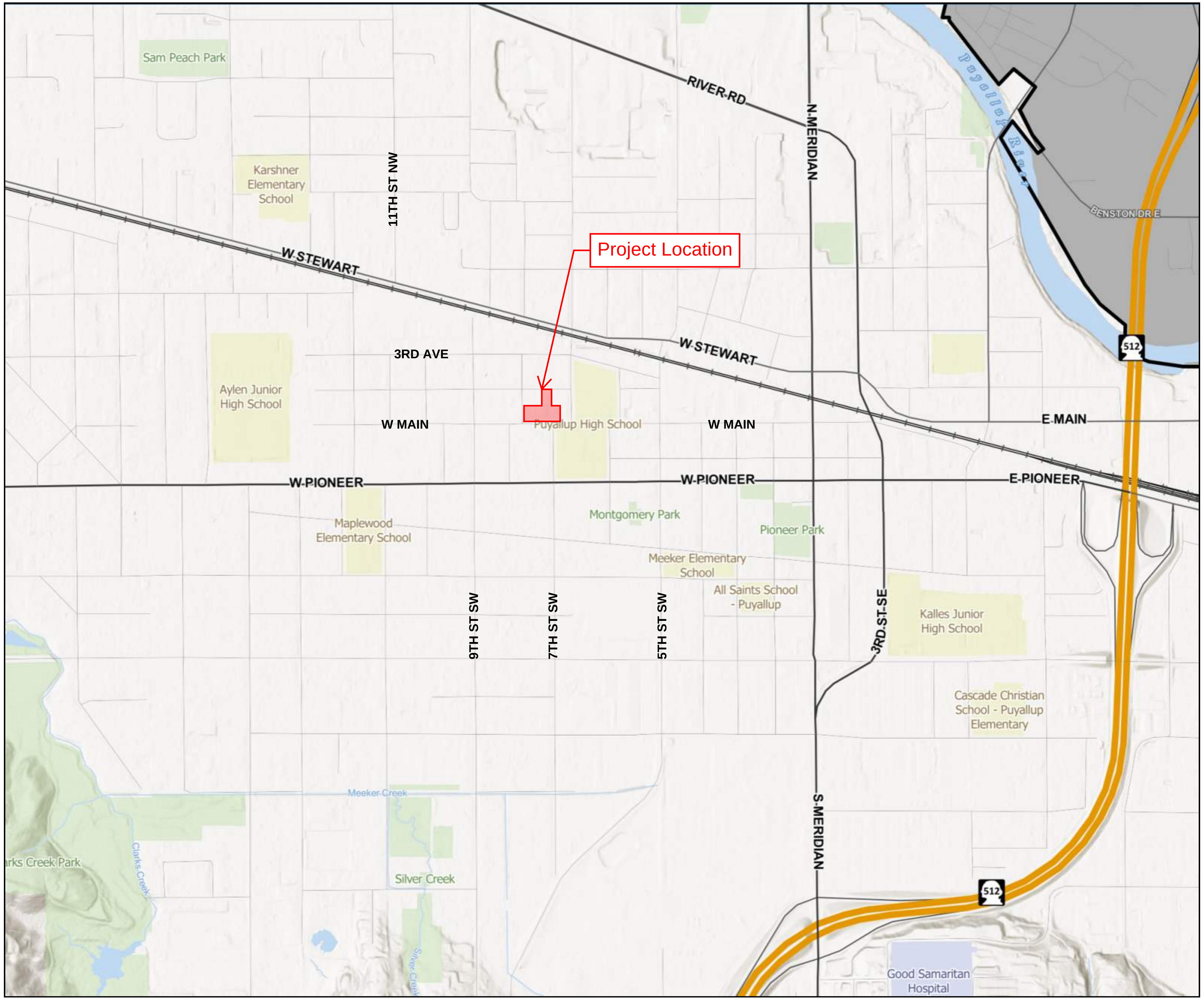
ISSUED:	DATE:
CONDITIONAL USE PERMIT	OCT, 11 2023
CUP CC#1 RESPONSE	APR, 5 2024

7TH STREET SW ROAD CLOSURE PLAN

Building Permit #:	-
CUP #:	PLCUP20230109
Owner's Project #:	-
Architect's Project #:	2023106
Drawn By	MO
Checked By	JJ

C.08

APPENDIX B



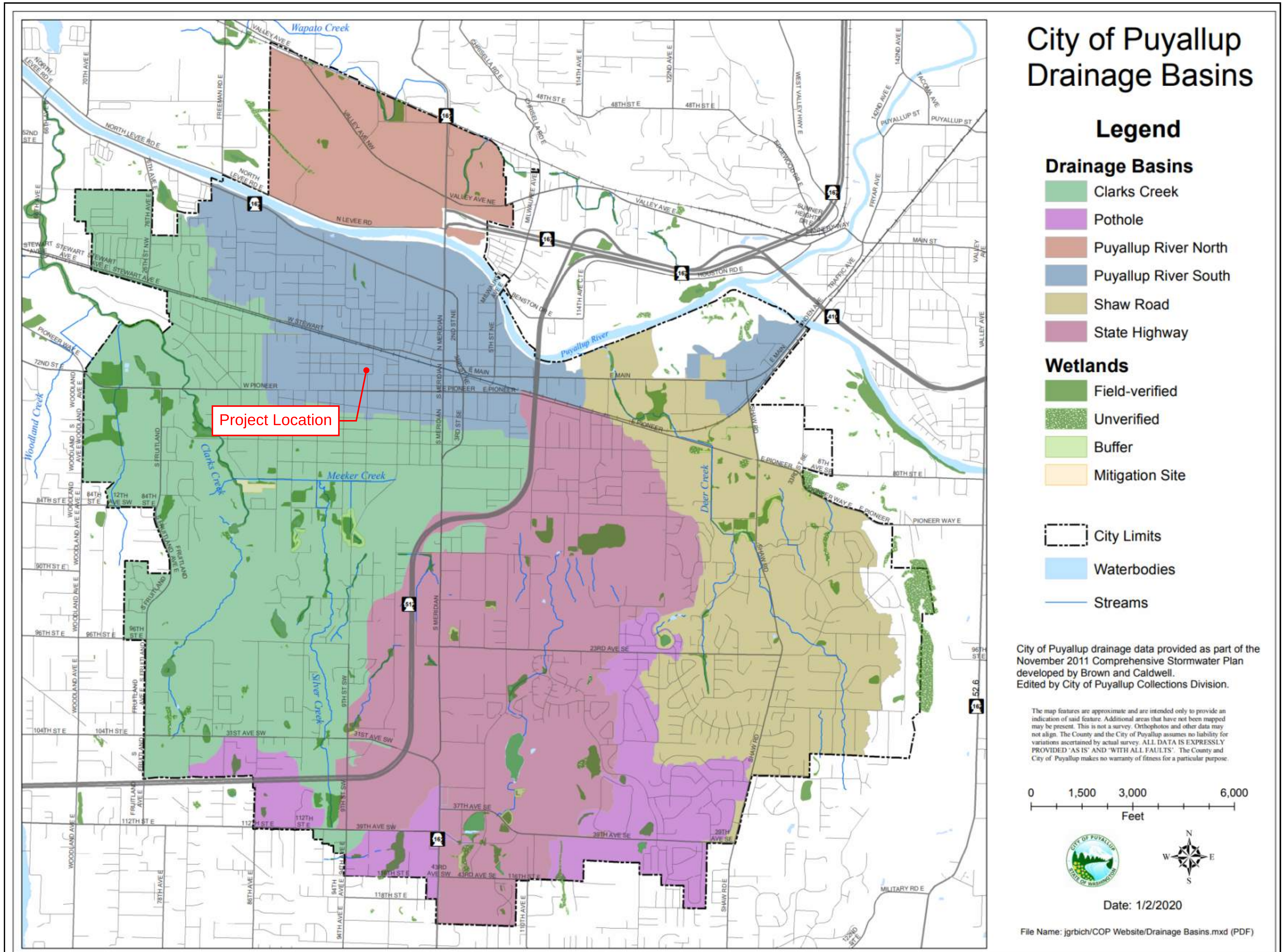
NOT TO SCALE

JMJTEAM

PHS Portables

Vicinity Map

Figure 1

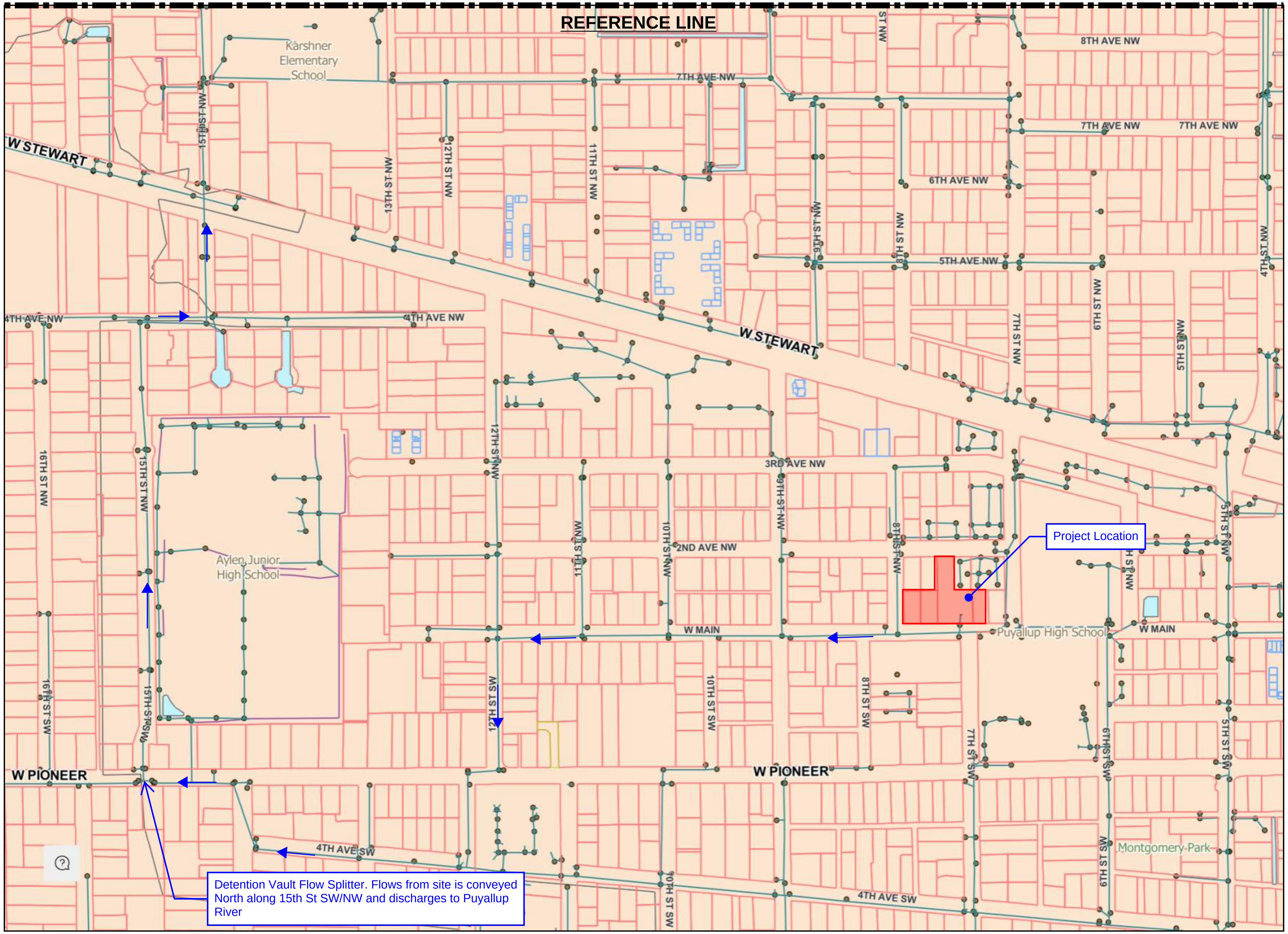


NOT TO SCALE

PHS Portables

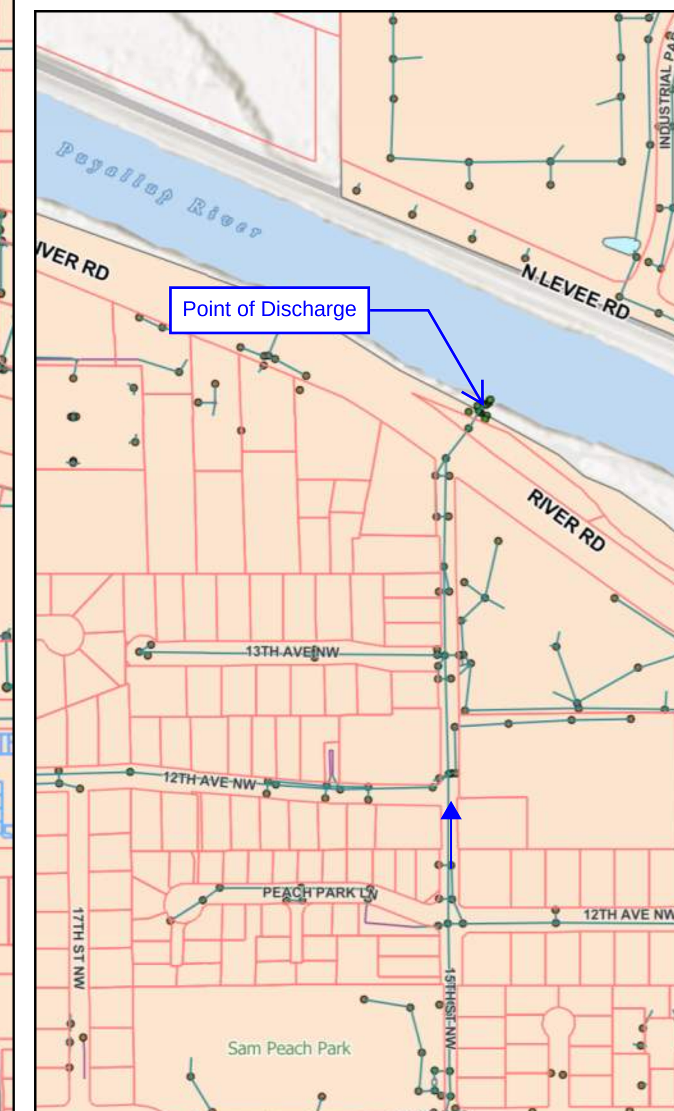
Drainage Basin Map

Figure 2



GENERAL NOTE

Map taken from City of Puyallup Public Data Viewer.



REFERENCE LINE

NOT TO SCALE

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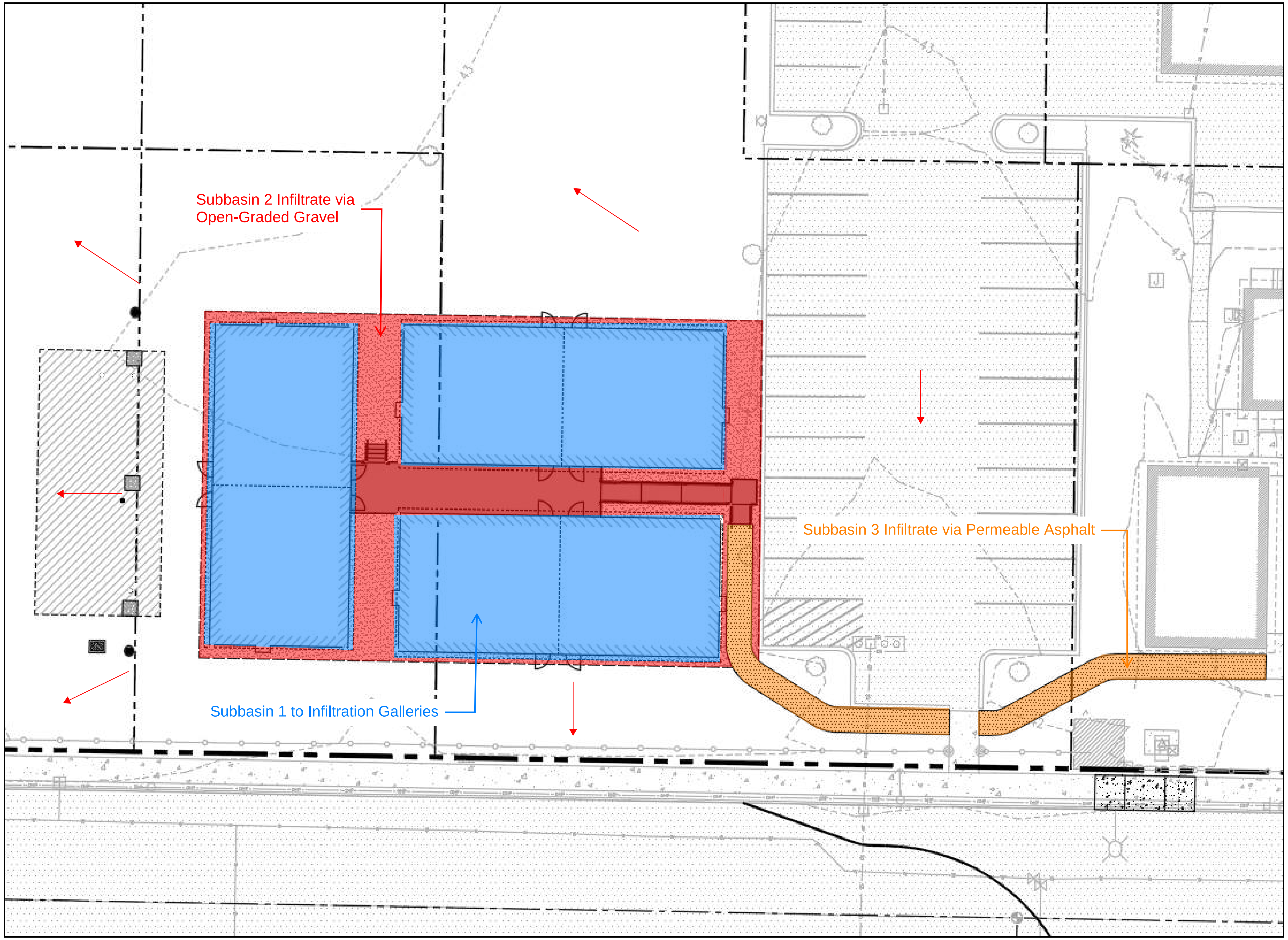
PHS Portables

Downstream Drainage Map

Figure 3



LEGEND

- Subbasin 1
- Subbasin 2
- Subbasin 3
- Flow Path

PROPOSED BASINS

Subbasin 1:
Impervious:

Roof:	5,785 SF	
Total:	5,785 SF	(0.12 AC)

Subbasin 2:
Impervious:

Perm. Gravel:	1,570 SF	
Landing:	660 SF	
Total:	2,230 SF	(0.05 AC)

Subbasin 3:
Impervious:

Perm. Asphalt:	663 SF	
Total:	663 SF	(0.02 AC)

NOT TO SCALE

JMJTEAM

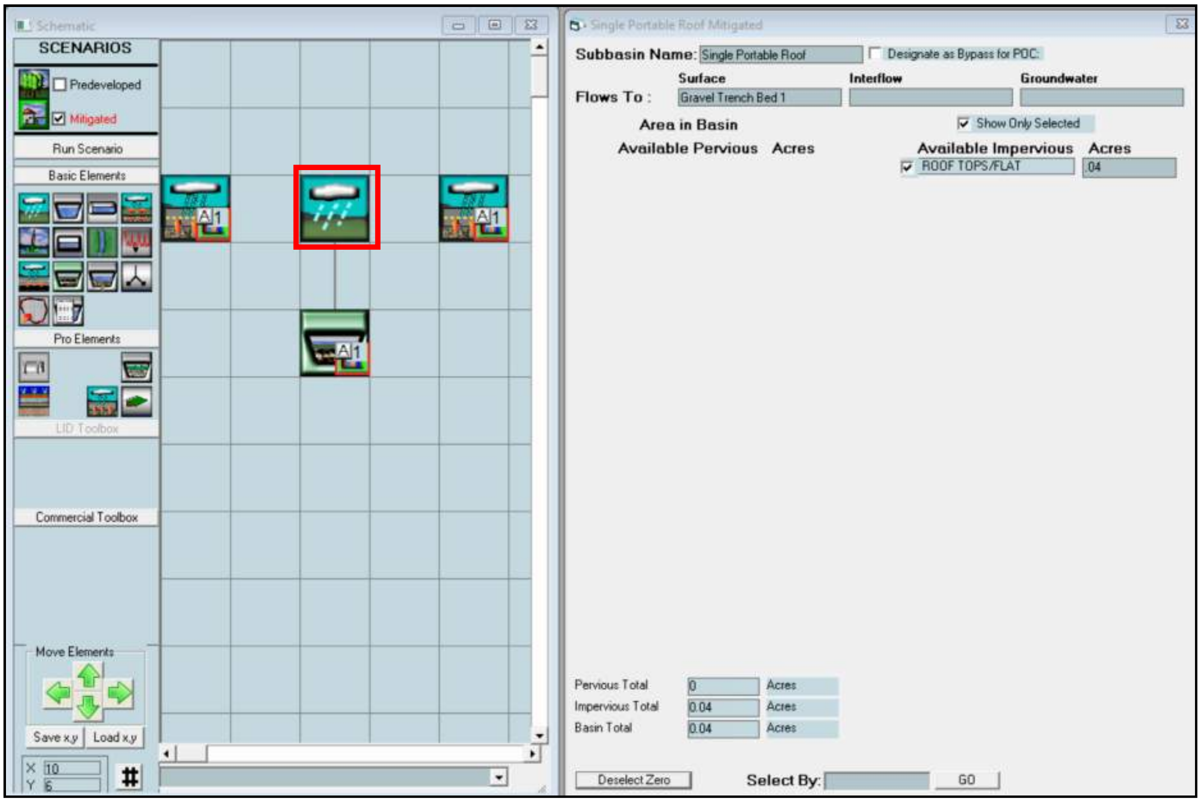
PHS Portables
Proposed Basin Map
Figure 4

APPENDIX C

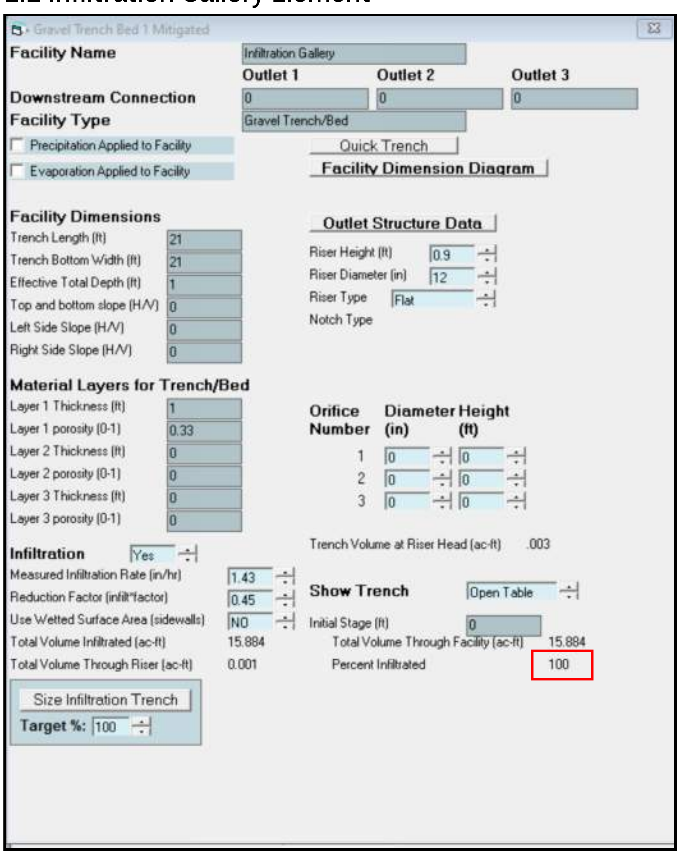
WWHM MODELING

1.0 DOWNSPOUT INFILTRATION:

1.1 Schematic and Basin Areas

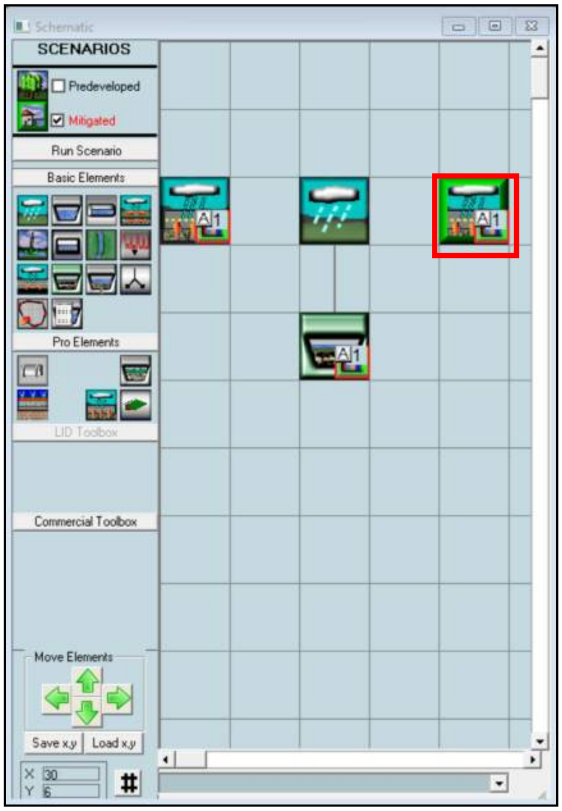


1.2 Infiltration Gallery Element

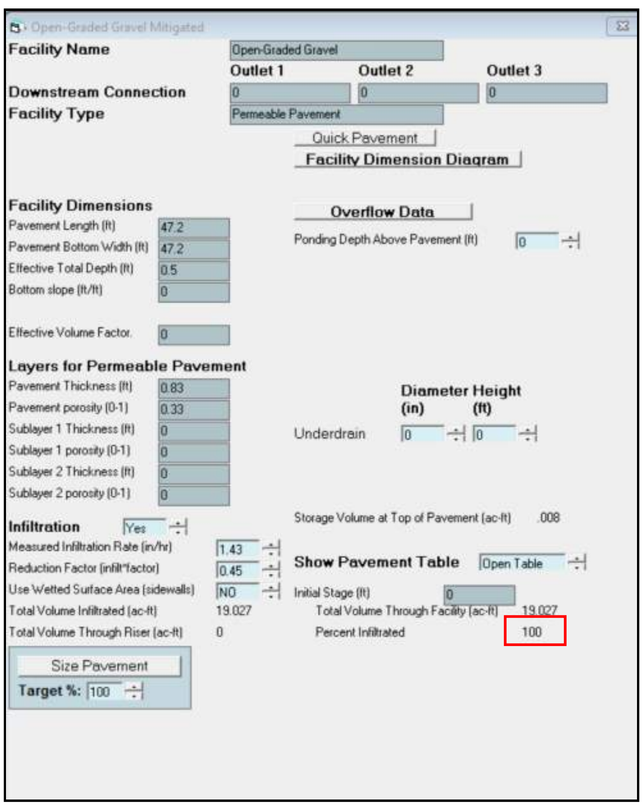


2.0 OPEN-GRADED GRAVEL:

2.1 Schematic



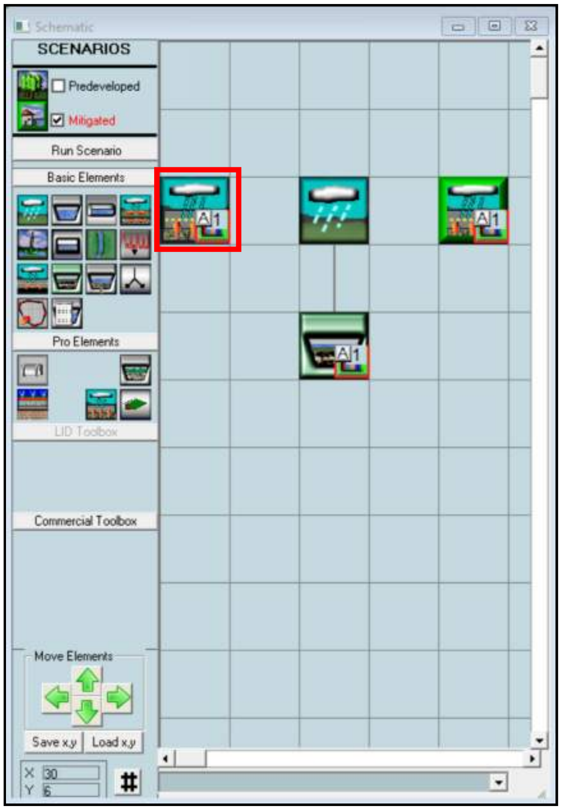
2.2 Open-Graded Gravel Element



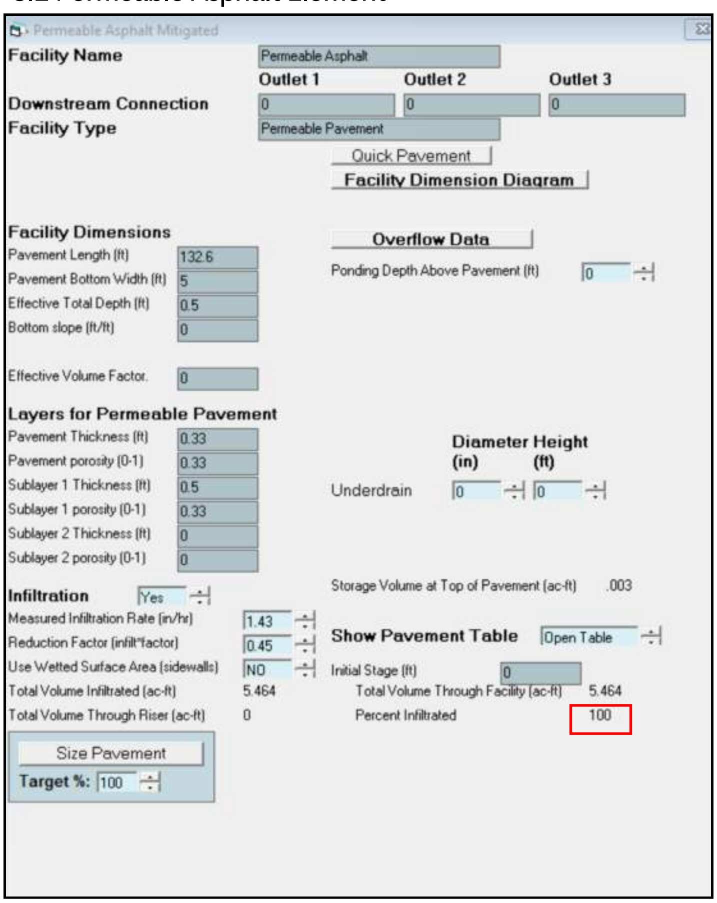
Element area includes gravel pad and landing as runoff from perforated landing will drain through slots and infiltrate into open-graded gravel pad.

3.0 PERMEABLE ASPHALT WALKWAY:

3.1 Schematic



3.2 Permeable Asphalt Element



APPENDIX D

Infiltration Testing Report

Puyallup High School Portables

711, 721 & 701 West Main
Puyallup, WA

Prepared for
Puyallup School District
c/o Studio Meng Strazzara
2001 Western Ave, Suite 200
Seattle, WA 98121
206.587.3797

Prepared by
JMJ TEAM
905 Main St, Suite 200
Sumner, WA 98390
206.596.2020
Justin Jones, PE

April 5, 2024

PROJECT ENGINEER'S CERTIFICATION

I hereby certify that this Infiltration Testing Report for Puyallup High School Portables has been prepared by me or under my supervision and meets minimum standards of the Department of Ecology Stormwater Management Manual for Western Washington.

JUSTIN M. JONES
STATE OF WASHINGTON
41829
REGISTERED
PROFESSIONAL ENGINEER

04-05-24

____

Justin Jones, PE

TABLE OF CONTENTS

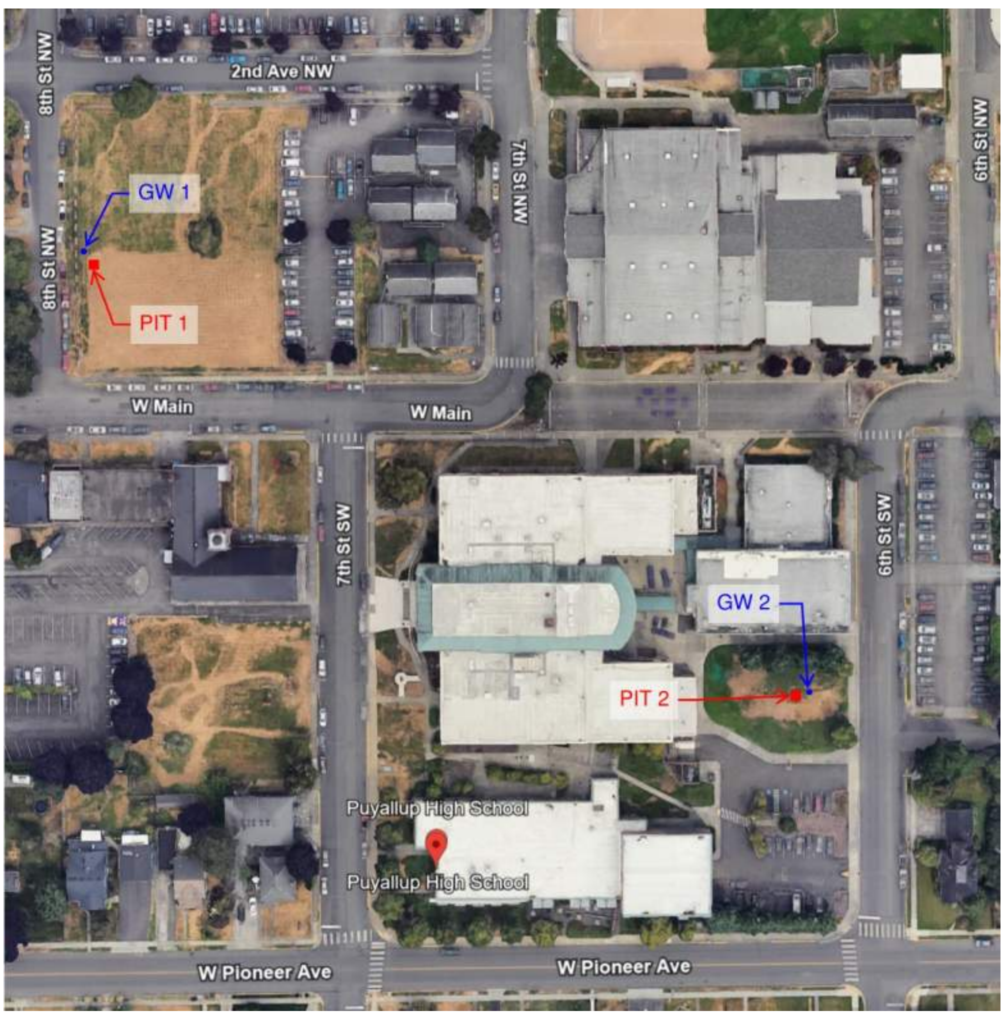
SUMMARY

This report details the results of infiltration testing for use in the stormwater system design of Puyallup High School Portables located within Puyallup, WA. Two (2) Small-Scale Pilot Infiltration Tests (PIT) were conducted on site to determine the onsite stormwater infiltration rate. The test holes were excavated and backfilled by a licensed contractor and the PIT was completed in accordance with the Department of Ecology (ECY) Stormwater Management Manual for Western Washington (Stormwater Manual).

The PIT process evaluates the infiltration within a 12 SF area by first measuring the rate of water required to maintain a constant water elevation of approximately 12-inches in the test pit, and second by measuring the drawdown rate of the water within the test pit. The drawdown is done using a data logger.

The field data is then analyzed, and a factor of safety is applied to determine the stormwater design infiltration rate. Below is a summary of the results.

Test Pit and Ground Water Monitoring Location



Summary of Results

Per the PIT, the site soil is suitable for stormwater infiltration. Soil evaluations were not taken as the designed stormwater BMP is not intended to treat pollution generating surfaces.

Testing	**Test PIT**	**Results**	**ECY Threshold**
Ground Water	Pit Depth	4.0-feet	N/A
	Test Hole 1 Groundwater Level	Ground Water Observed at 4.0’	N/A
	Test Hole 2 Groundwater Level	Ground Water Observed at 3.5’ Depth	N/A
Infiltration Rate	Infiltration Rate Factor of Safety	0.45	N/A
	Test Hole 1 Infiltration Rates	Uncorrected: 1.43 inches per hour	≥ 0.3 inches per hour
		Design: 0.64 Inches per hour	
	Test Hole 2 Infiltration Rates	Uncorrected: 4.42 inches per hour	≥ 0.3 inches per hour
		Design: 1.99 inches per hour	
Water Quality	Test Hole 1 Lab Analysis	CEC Value: N/A	≥ 5.0 milliequivalents CEC/100g
		Organic Content: N/A	≥ 1.0%
	Test Hole 2 Lab Analysis	CEC Value: N/A	≥ 5.0 milliequivalents CEC/100g
		Organic Content: N/A	≥ 1.0%

INFILTRATION TEST PROCEDURES

Below is the process taken for the Small-Scale PIT:

- ◻ Identify PIT locations based on the site survey of existing buildings and utilities as well as the potential locations of infiltration facilities based on the preliminary site plan.
- ◻ Obtain public and private utility locates. Prior to the PIT utility locates will be called to ensure there are no utilities present in the PIT locations.
- ◻ Excavation of PIT holes (approximately 3-feet x 4-feet x 2-feet deep). A 3-feet x 4-feet x 2-feet tall wood box is inserted into the test hole to ensure that the bottom surface area is exactly 12 SF. The box is backfilled to the top edge to ensure stability and infiltration only through the bottom of the test hole for the duration of the PIT.
- ◻ A soil sample is collected from the bottom of the hole to test treatment capability. A lab tests the cation exchange rate and organic matter content of soils. Lab results confirm if the soil is suitable for treatment based on Stormwater Manual criteria.
- ◻ A float system with a water hose connection is set into the center of the test hole. The float system is equipped with a leveling plate, a measuring ruler for visual inspection of water levels and a perforated pipe housing for the data collector.
- ◻ Using water transfer tanks or hose spigot as available, the test hole is filled to a 12-inch water depth that is maintained. The presoak period ensures that the soil has been fully saturated before conducting the PIT. A 1-hour stabilization test is performed after the presoak period to confirm soil stabilization. If the test yields 4 constant gallon per minute (GPM) readings that are conducted every 15-minutes, the stabilization of the soil is confirmed.
- ◻ A 1-hour GPM test is conducted per the Stormwater Manual. Using a water meter accurate to the nearest tenth of a gallon, a GPM flow rate is recorded every 15-minutes while the water level is maintained at a 12-inch depth. An infiltration rate (in/hr) can be determined using the GPM flow rate and the 12 SF bottom surface area of the hole.
- ◻ A drawdown test is performed per Stormwater Manual to determine the drawdown infiltration capability of the soil. A CRS451V (Pressure Transducer) is placed into the test hole and set to take pressure (PSI) readings every 10-minutes. The water source is shut off, and the pressure transducer will measure water drawdown for a 2-hour period. At the end of the period the sensors are removed from the test hole, the data is collected using a PC interface module and the HydroSci program to communicate with the sensor to retrieve the data.
- ◻ The wood box and the float system are removed from the test hole.
- ◻ The test hole is then over excavated to confirm there is no ground water mounding.
- ◻ The test pit then gets backfilled and restored to prior state of excavation.

FINDINGS AND RECOMMENDATIONS

Groundwater Conditions

The Stormwater Manual specifies minimum separations between the seasonal high groundwater elevation and the bottom of the infiltration facility based on different best management practices (BMP):

- **Downspout Infiltration:** 1-foot
- **Permeable Pavement:** 1-foot
- **Infiltration Gallery:** 1-foot
- **Bioretention:** 3-foot

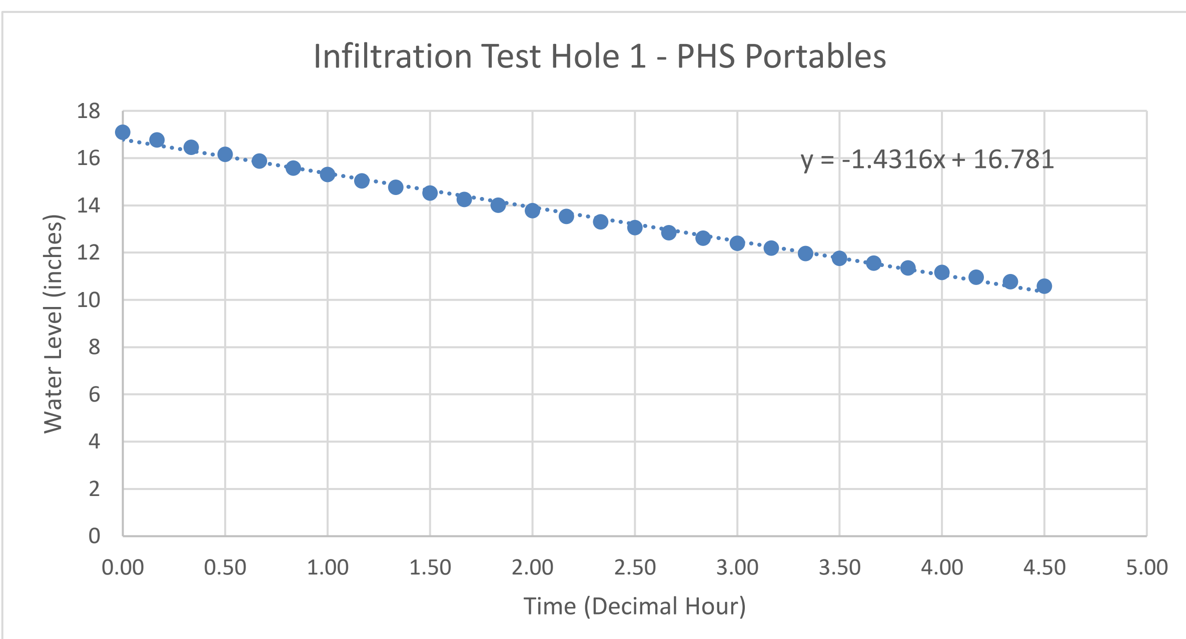
Groundwater was monitored throughout the wet season. The average groundwater depth for Test Hole-1 was determined to be 4.0’ below existing grade. The average groundwater depth for Test Hole-2 was determined to be 3.55’ below existing grade. With known groundwater conditions for each test hole, there is adequate spacing between groundwater and BMPs. An overflow should be installed with BMP in case of large storm events.

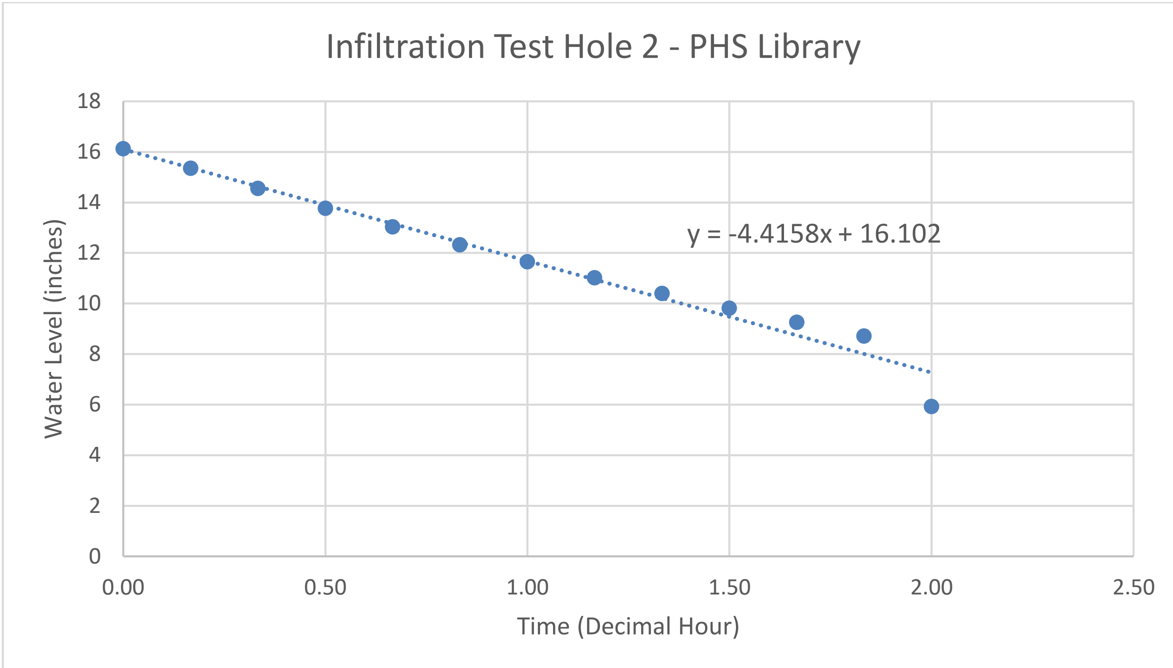
Field Measured Infiltration Rate

The infiltration rate was collected using two methods during the PIT. The first method is to measure the gallons per minute flow rate required to maintain a constant water level in the test pit. The average of the flow rate measurements taken over an hour timeframe.

The second method is to measure the drawdown rate of the test pit. Measurements were taken both visually and with a data logger. The average of the drawdown measurements resulted in the following infiltration rates:

- Test Hole 1: 1.43 inches per hour
- Test Hole 2: 4.42 inches per hour





Design Infiltration Rate

Per the Stormwater Manual a minimum design infiltration rate of 0.3 inches per hour is required for onsite infiltration. The design infiltration rate takes the field measured infiltration rate and applies a factor of safety based on three correction factors. The three corrections are based on site variability, test method, and degree of influent control (See Appendix D).

Issue	Partial Correction Factor
Site variability and number of locations tested	CF_v = 0.33 to 1.0
Test Method	
• Large-scale PIT • Small-scale PIT • Other small-scale (e.g. Double ring, falling head) • Grain Size Method	CF_t = 0.75 = 0.50 = 0.40 = 0.40
Degree of influent control to prevent siltation and bio-buildup	CF_m = 0.9

Total Correction Factor, $CF_T = CF_v \times CF_t \times CF_m$

Per the Stormwater Manual, a site variability correction of 1 is used. A correction of 0.5 for the small-scale PIT and 0.9 for the degree of influent are also used. A total correction factor of 0.45 is applied to the measured infiltration rate yielding a recommended design infiltration rates as follows:

- Test Hole 1: 0.64 inches per hour
- Test Hole 2: 1.99 inches per hour

Treatment Suitability

Per the Stormwater Manual the soils that stormwater is infiltrated into may be used for treatment of pollution generating surfaces if the soil meets specific requirements. Otherwise, a treatment layer is required to treat pollution generating surfaces. The treatment threshold of the infiltrated soil per the Stormwater Manual is a Cation Exchange Capacity greater than or equal to 5 milliequivalents CEC/100g and a minimum of 1.0% organic content.

This project does not propose to manage pollution generating hard surfaces runoff through an infiltration facility; therefore, soil treatment suitability was not evaluated.

TEST PIT PHOTO DOCUMENTATION – TEST HOLE 1

3-feet x 4-feet x 2-feet PIT

Pre-Soak PIT

1-Hour GPM Test

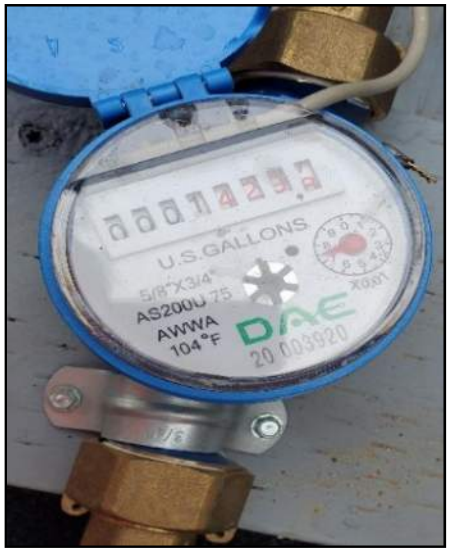
Completed Drawdown

Overexcavate to Verify
Groundwater Mounding

Backfill and Install
Groundwater Monitoring

TEST PIT PHOTO DOCUMENTATION – TEST HOLE 2

3-feet x 4-feet x 2-feet PIT
and Pre-Soak



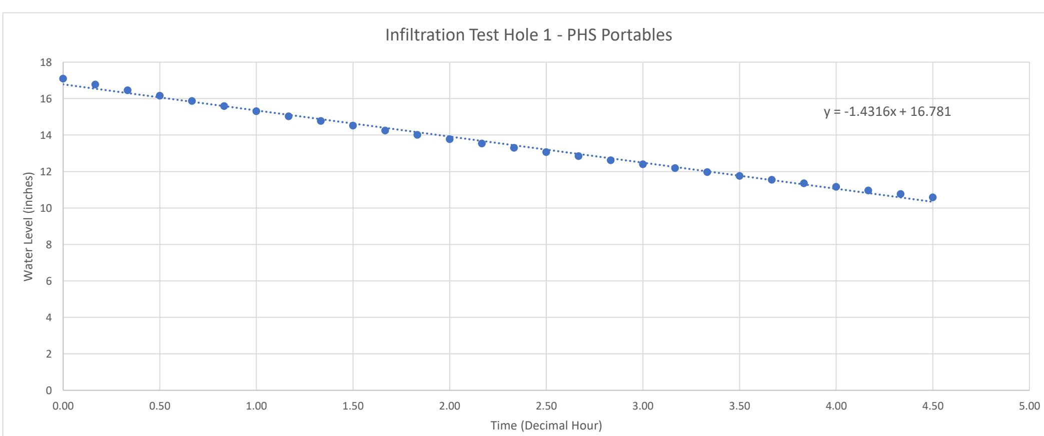
1-Hour GPM Test

Overexcavate to Verify
Groundwater Mounding

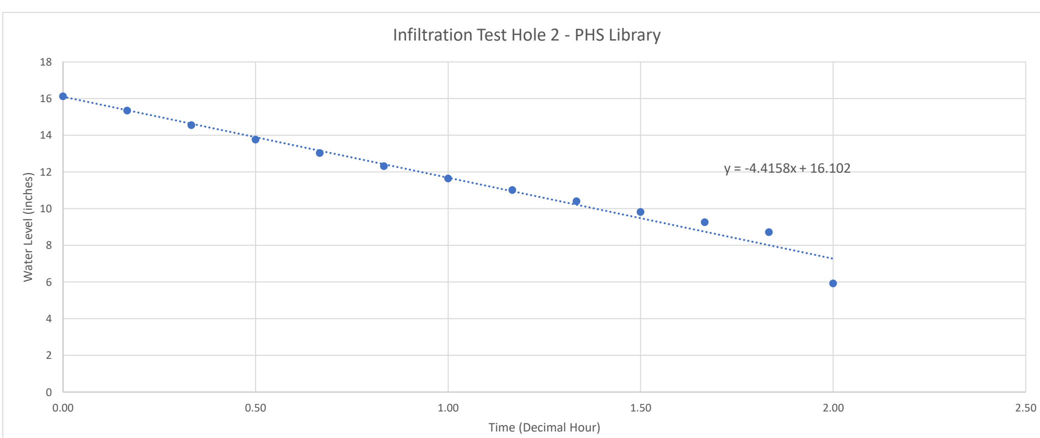
Backfill and Install
Groundwater Monitoring

APPENDIX A

Project Location:	PHS Portables			3506 Initial Meter Reading				
Date of Test:		2/10/2024	Test start					
Test Pit Dimensions:		Width (feet)	3	Length (feet)	4	Depth (inches)	24	
Presoak:	12:00PM Start Pre soak	4hrs at 12-inch water column						
Weather Conditions:	Clear	50° F						
Infiltration Test:								
		Water Column Maintained (inches):	12					
		Gallons Per Inch:	7.48					
		Time(Minutes)	**Volume (gallons)**	**Flow Rate (GPM)**			**Flow (Gallons)**	**Infiltration Rate (in/hr)**
				Meter Start	Meter End	Flow (Gallons)		
4:05 PM Start		0		3581.9	3582.1	0.2	0.2	
		15		3584.7	3584.9	0.3	3.1	
		30		3587.9	3588.2	0.3	6.3	
		45		3591.0	3591.3	0.3	9.4	
		60		3594.2	3594.8	0.6	12.9	**1.7**
Drawdown Test (Sensor):								
Sensor Name:		JMJ 01 (**CRS451V Sensors from Campbell Scientic**)						
Time (Decimal Hours)	**Record Measurement Interval**	**Time Stamp**	**Record #**	**Reading (PSI)**	**Level (in)**			
0.0000	0	4:05 PM	0	0.61668	17.0943696			
0.1667	10	4:15 PM	1	0.605066	16.77242952			
0.3333	20	4:25 PM	2	0.593788	16.45980336			
0.5000	30	4:35 PM	3	0.582971	16.15995612			
0.6667	40	4:45 PM	4	0.572547	15.87100284			
0.8333	50	4:55 PM	5	0.562265	15.5859858			
1.0000	60	5:05 PM	6	0.552374	15.31180728			
1.1667	70	5:15 PM	7	0.542279	15.03197388			
1.3333	80	5:25 PM	8	0.532924	14.77265328			
1.5000	90	5:35 PM	9	0.52373	14.5177956			
1.6667	100	5:45 PM	10	0.514174	14.25290328			
1.8333	110	5:55 PM	11	0.505343	14.00810796			
2.0000	120	6:05 PM	12	0.497038	13.77789336			
2.1667	130	6:15 PM	13	0.488469	13.54036068			
2.3333	140	6:25 PM	14	0.479748	13.29861456			
2.5000	150	6:35 PM	15	0.471365	13.0662378			
2.6667	160	6:45 PM	16	0.463378	12.84483816			
2.8333	170	6:55 PM	17	0.455239	12.61922508			
3.0000	180	7:05 PM	18	0.447283	12.39868476			
3.1667	190	7:15 PM	19	0.439696	12.18837312			
3.3333	200	7:25 PM	20	0.431804	11.96960688			
3.5000	210	7:35 PM	21	0.424222	11.75943384			
3.6667	220	7:45 PM	22	0.416743	11.55211596			
3.8333	230	7:55 PM	23	0.409753	11.35835316			
4.0000	240	8:05 PM	24	0.4027	11.162844			
4.1667	250	8:15 PM	25	0.395456	10.96204032			
4.3333	260	8:25 PM	26	0.388569	10.77113268			
4.5000	270	8:35 PM	27	0.381685	10.5803082			
						Average Infiltration Rate:	**1.43**	
						Factor of Safety:	**0.45**	
						Design Infiltration Rate:	**0.64**	



Project Location:	PHS Library			4502 Initial Meter Reading				
Date of Test:		2/10/2024	Test start					
Test Pit Dimensions:		Width (feet)	3	Length (feet)	4	Depth (inches)	24	
Presoak:	12:00PM Start Pre soak	4hrs at 12-inch water column						
Weather Conditions:	Clear	50° F						
Infiltration Test:								
		Water Column Maintained (inches):	12					
		Gallons Per Inch:	7.48					
		Time(Minutes)	**Volume (gallons)**	**Flow Rate (GPM)**			**Flow (Gallons)**	**Infiltration Rate (in/hr)**
				Meter Start	Meter End	Flow (Gallons)		
4:15 PM Start		0		4702.0	4702.8	0.8	0.8	
		15		4711.5	4712.2	0.7	10.2	
		30		4721.7	4722.4	0.7	20.4	
		45		4732.2	4732.9	0.7	30.9	
		60		4742.9	4743.7	0.8	41.6	**5.6**
Drawdown Test (Sensor):								
Sensor Name:		JMJ 02 (**CRS451V Sensors from Campbell Scientic**)						
Time (Decimal Hours)	**Record Measurement Interval**	**Time Stamp**	**Record #**	**Reading (PSI)**	**Level (in)**			
0.0000	0	4:05 PM	0	0.5816216	16.12255075			
0.1667	10	4:15 PM	1	0.5537774	15.35070953			
0.3333	20	4:25 PM	2	0.5248642	14.54923562			
0.5000	30	4:35 PM	3	0.4966844	13.76809157			
0.6667	40	4:45 PM	4	0.4701035	13.03126902			
0.8333	50	4:55 PM	5	0.4443737	12.31803896			
1.0000	60	5:05 PM	6	0.4201141	11.64556285			
1.1667	70	5:15 PM	7	0.3973055	11.01330846			
1.3333	80	5:25 PM	8	0.3752191	10.40107345			
1.5000	90	5:35 PM	9	0.3541772	9.817791984			
1.6667	100	5:45 PM	10	0.334096	9.26114112			
1.8333	110	5:55 PM	11	0.3144749	8.717244228			
2.0000	120	6:05 PM	12	0.2135902	5.920720344			
						Average Infiltration Rate:	**4.42**	
						Factor of Safety:	**0.45**	
						Design Infiltration Rate:	**1.99**	



APPENDIX B

PRODUCT

CAMPBELL SCIENTIFIC
WHEN MEASUREMENTS MATTER

CRS451V

Stainless-Steel Vented Stand-Alone Pressure Transducer

Pressure Transducer Combined with a Recorder

High resolution and accuracy

Overview

The CRS451V consists of a submersible water-level and water-temperature sensor with its own time clock and memory to store the collected data—in a compact stainless-steel case. This data logging capability frees users to place the sensor in remote sites and let it collect data for long periods. HydroSci software is included and elegantly supports test setup, data retrieval, and data display. Long battery life and rugged construction mean you can trust the CRS451V to collect important data. Low cost and ease of use make it a good choice in a variety of applications. The CRS456V is the same as this, but with a titanium case.

Benefits and Features

- Sensors and data-collection features in one instrument case
- Rugged stainless-steel case protects piezoresistive sensor
- Quality construction ensures product reliability
- Fully temperature-compensated
- Fast scan rate
- Large data-storage capacity
- Long battery life
- Easy-to-use software

Detailed Description

The CRS451V has several pressure range options.

HydroSci software is available for download. This software simplifies the process of configuring the CRS451V. Users can configure the CRS451V to monitor surface water, ground water, or a standard pump test.

HydroSci software will display the data in tabular or graphical formats.

Specifications

Venting	Vented	Measurement Time	< 1.0 s

APPENDIX C

INFILTRATION TEST

The Washington State Department of Ecology Stormwater Manual provides testing procedures and best practices, which are described below.

- Testing should occur between December 1 and April 1.
- The horizontal and vertical locations of the PIT shall be surveyed by a licensed land surveyor and accurately shown on the design drawings.
- Excavate the test pit to the estimated elevation of the proposed infiltration into the native soil. Note that for some proposed BMPs, such as and BMP T5.15: Per- meable Pavements, this will be below the proposed finished grade. If the native soils will have to meet a minimum subgrade compaction requirement (for example, the road subgrade if using BMP T5.15: Permeable Pavements), compact the native soil to that requirement prior to testing. Lay back the slopes sufficiently to avoid caving and erosion during the test. Altern- atively, consider shoring the sides of the test pit.
- The horizontal surface area of the bottom of the test pit should be approximately 100 square feet. Document the size and geometry of the test pit.
- Install a vertical measuring rod (long enough to measure the ponded water depth, minimum 5- ft. long) marked in half-inch increments in the center of the pit bottom.
- Use a rigid 6-inch diameter pipe with a splash plate on the bottom to convey water to the test pit and reduce side-wall erosion or excessive disturbance of the test pit bottom. Excessive erosion and bottom disturbance will result in clogging of the infiltration receptor and yield lower than actual infiltration rates.
- Add water to the pit at a rate that will maintain a water level between 6 and 12 inches above the bottom of the pit. A rotameter can be used to measure the flow rate into the pit.

The depth should not exceed the proposed maximum depth of water expected in the completed BMP. For infiltration BMPs serving large drainage areas, designs with multiple feet of standing water can have infiltration tests with greater than 1 foot of standing water.

- Every 15-30 min, record the cumulative volume and instantaneous flow rate in gallons per minute necessary to maintain the water level at the same point on the measuring rod.
- Keep adding water to the pit until one hour after the flow rate into the pit has stabilized (constant flow rate; a goal of 5% or less variation in the total flow) while maintaining the same pond water level. The total of the pre-soak time plus one hour after the flow rate has stabilized should be no less than 6 hours.
- After the flow rate has stabilized for at least one hour, turn off the water and record the rate of infiltration (the drop rate of the standing water) in inches per hour from the measuring rod data, until the pit is empty. Consider running this falling head phase of the test several times to estimate the dependency of the infiltration rate with head.
- At the conclusion of testing, over-excavate the pit to see if the test water is mounded on shallow restrictive layers or if it has continued to flow deep into the subsurface. The depth of excavation varies depending on soil type and depth to the hydraulic restricting layer, and is determined by the

engineer or certified soils professional. Mounding is an indication that a mounding analysis is necessary.

DATA ANALYSIS

Calculate and record the initial K_{sat} rate in inches per hour in 30 minutes or one-hour increments until one hour after the flow has stabilized.

Use statistical/trend analysis to obtain the hourly flow rate when the flow stabilizes. This would be the lowest hourly flow rate. *Example:*

The area of the bottom of the test pit is 8.5-ft. by 11.5-ft. (97.75 sq. ft.).

Water flow rate was measured and recorded at intervals ranging from 15 to 30 minutes throughout the test. Between 400 minutes and 1,000 minutes the flow rate stabilized between 10 and 12.5 gal- lons per minute or 600 to 750 gallons per hour, or 80.2 to 100 ft^3 per hour. Dividing this rate by the surface area gives an initial K_{sat} of 9.8 to 12.3 inches per hour.

K_{sat} Determination Option 2: Small Scale Pilot Infiltration Test (PIT)

A small-scale PIT can be substituted for Ksat Determination Option 1: Large Scale Pilot Infiltration Test (PIT) in any of the following instances:

- The drainage area to the infiltration BMP is less than 1 acre.
- The testing is for BMP T7.30: Bioretention or BMP T5.15: Permeable Pavements that either serve small drainage areas and/or are widely dispersed throughout a project site.
- The site has a high infiltration rate (>4 in/hr), making a large scale PIT difficult, and the site geo- technical investigation suggests uniform subsurface characteristics.

INFILTRATION TEST

Use the same procedures described above in Ksat Determination Option 1: Large Scale Pilot Infiltra-tion Test (PIT), with the following changes:

- The horizontal surface area of the bottom of the test pit should be 12 to 32 square feet. It may be circular or rectangular. Document the size and geometry of the test pit.
- The rigid pipe with a splash plate used to convey water to the pit may be a 3-inch diameter pipe for pits on the smaller end of the recommended surface area, or a 4-inch pipe for pits on the larger end of the recommended surface area.
- Pre-soak period: Add water to the pit so that there is standing water for at least 6 hours. Maintain the pre-soak water level at least 12 inches above the bottom of the pit.
- At the end of the pre-soak period, add water to the pit at a rate that will maintain a 6-12 inch water level above the bottom of the pit over a full hour. The depth should not exceed the pro- posed

maximum depth of water expected in the completed facility.

- Every 15 minutes, record the cumulative volume and instantaneous flow rate in gallons per minute necessary to maintain the water level at the same point (between 6 inches and 1 foot) on the measuring rod. The specific depth should be the same as the maximum designed pond- ing depth (usually 6 – 12 inches).

After one hour, turn off the water and record the rate of infiltration (the drop rate of the standing water) in inches per hour from the measuring rod data, until the pit is empty.

- A self-logging pressure sensor may also be used to determine water depth and drain-down.
- At the conclusion of testing, over-excavate the pit to see if the test water is mounded on shallow restrictive layers or if it has continued to flow deep into the subsurface. The depth of excavation varies depending on soil type and depth to the hydraulic restricting layer, and is determined by the engineer or certified soils professional. The soils professional should judge whether a mounding analysis is necessary.

APPENDIX D

CALCULATED DESIGN INFILTRATION RATE:

Site variability and number of locations tested (CF_v) - The number of locations tested must be capable of producing a picture of the subsurface conditions that fully rep- resents the conditions throughout the proposed location of the infiltration BMP. The partial correction factor used for this issue depends on the level of uncertainty that adverse subsurface conditions may occur. If the range of uncertainty is low - for example, conditions are known to be uniform through previous exploration and site geological factors

- one pilot infiltration test (or grain size analysis location) may be adequate to justify a partial correction factor at the high end of the range.

If the level of uncertainty is high, a partial correction factor near the low end of the range may be appropriate. This might be the case where the site conditions are highly variable due to conditions such as a deposit of ancient landslide debris, or buried stream channels. In these cases, even with many explorations and several pilot infiltration tests (or several grain size test locations), the level of uncertainty may still be high.

A partial correction factor near the low end of the range could be assigned where conditions have a more typical variability, but few explorations and only one pilot infiltration test (or one grain size analysis location) is conducted. That is, the number of explorations and tests conducted do not match the degree of site variability anticipated.

- **Uncertainty of test method (CF_t)** accounts for uncertainties in the testing methods. For the full scale PIT method, $CF_t = 0.75$; for the small-scale PIT method, $CF_t = 0.50$; for smaller-scale infiltration tests such as the double-ring infiltrometer test, $CF_t = 0.40$; for grain size analysis, $CF_t = 0.40$. These values are intended to represent the difference in each test's ability to estimate the actual saturated hydraulic conductivity. The assumption is the larger the scale of the test, the more reliable the result.
- **Degree of influent control to prevent siltation and bio-buildup (CF_m)** Even with a pre-settling basin or a basic treatment BMP for pre-treatment, the soil's initial infiltration rate will gradually decline as more and more stormwater, with some amount of suspended material, passes through the soil profile. The maintenance schedule calls for removing sediment when the BMP is infiltrating at only 90% of its design capacity. Therefore, a correction factor, CF_m, of 0.9 is called for.

Table V-5.1: Correction Factors to be Used With In-Situ Saturated Hydraulic Conductivity Measurements to Estimate Design Rates

Issue	Partial Correction Factor
Site variability and number of locations tested	CF_v = 0.33 to 1.0
Test Method	
• Large-scale PIT • Small-scale PIT • Other small-scale (e.g. Double ring, falling head) • Grain Size Method	CF_t = 0.75 = 0.50 = 0.40 = 0.40
Degree of influent control to prevent siltation and bio-buildup	CF_m = 0.9

Total Correction Factor, $CF_T = CF_v \times CF_t \times CF_m$

Total Correction Factor, $CF_T = 1.0 \times 0.5 \times 0.9$

$$CF_T = 0.45$$