PLSA
ENGINEERING & SURVEYING

STORMWATER MANAGEMENT REPORT

WATER STREET DENTAL OFFICE

108 South Water Street
Ellensburg, WA 98926
Parcel No. 497133

December 16, 2025
PLSA Project No. 25022

Prepared for:
Igor Elperin
2906 W Nob Hill Boulevard
Yakima, WA 98902

PLSA Engineering & Surveying
521 North 20th Avenue, Suite #3
Yakima, WA 98902
www.plsaofyakima.com

CERTIFICATE OF ENGINEER

Design for the storm system was done in accordance with the current edition of the Department of Ecology's Stormwater Management Manual for Eastern Washington and the Ellenburg Municipal Code. The technical information and data contained in this report was prepared under the direction and supervision of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

Scott Garland, PE

PLSA Engineering & Surveying

ABBREVIATIONS

BMPs.....Best Management Practices

DS .....Dead Storage

DSL.....Distribution System Leakage

EPA.....Environmental Protection Agency

FS .....Factor of Safety

GPM.....Gallons Per Minute

IOC.....Inorganic Chemical

LAA .....Local Administrative Authority

LS.....Live Storage

MCL.....Maximum Contaminant Level

MCLG.....Maximum Contaminant Level Goal

NPDES.....National Pollutant Discharge Elimination System

PUD.....Planned Unit Development

RCW .....Revised Code of Washington

SSA .....Storm and Sanitary Analysis

SSP.....Stormwater Site Plan

SWMMEW .....Stormwater Management Manual for Eastern Washington

SWPPP.....Stormwater Pollution Prevention Plan

TESC.....Temporary Erosion and Sediment Control

TSS.....Total Suspended Solids

UGA.....Urban Growth Area

UIC.....Underground Injection Control

USDA.....United States Department of Agriculture

WAC .....Washington Administrative Code

WSDE .....Washington State Department of Ecology

TABLE OF CONTENTS

1.0 INTRODUCTION

The purpose of this stormwater report is to identify, analyze, and size the proposed stormwater management facilities to adequately support the post development sub-basin. Stormwater facilities are intended to protect receiving body water quality, the conveyance systems, minimize local flooding, and lessen or eliminate impacts to down-gradient properties as urban development occurs.

2.0 PROJECT DESCRIPTION

Dr. Igor Elperin proposes the construction of 3,696 square foot dental office on the site previously identified. See Attachment #1 for the Vicinity. The project will consist of a dental office, and a parking lot. Proposed impervious areas will total approximately 12,090 sf. Impervious areas consist of 3,696 sf for the new buildings and 8,394 sf of pavement for the parking lot. See Attachment #2 for civil Grading and Drainage plans.

3.0 EXISTING CONDITIONS

3.1 Land Use

The site was previously developed and is populated with several older wood frame structures and gravel drive. The existing structures have been demolished and removed from the site.

3.2 Topography

The site is generally flat with maximum grades that are less than 5%.

3.3 Drainage Patterns

The site is fronted and accessed on the west side by South Water Street. All runoff from the street is retained and managed by the City of Ellensburg. The surrounding property is fully developed. There are no significant drainage patterns observed on or adjacent to the site.

4.0 GEOTECHNICAL SITE CHARACTERISTICS

Online soil data published by the USDA indicates that the topsoil stratum on the site consists primarily of Nack-Opnish Complex and Opnish Ashy Loam. The soil profiles very from loam and clayey loam on the surface and transition to gravelly clay loam or gravelly sandy clay. Both soil profiles include a clay component, just a few inches below the surface, that minimizes surface water infiltration. These soils can be expected to infiltrate water at the practical minimum rate of 0.5-inches per hour.

A resource protection well located approximately 550-feet to the northwest of the site, reports a depth to groundwater of 6.88-feet in November. See Attachment #3 for Well Log and Location

Map. Groundwater may be as shallow as 6 feet below the ground surface (BGS) under the recharge influence of heavy spring runoff and /or regional irrigation.

The reported cation exchange capacity for this soil profile is above 20 milliequivalents per 100 grams and exceeds the minimum requirement of 5 milliequivalents. See Attachment # 4 for USDA Soil Report.

4.1 Online Soil Data

Site specific observations of the permeability of the surface topsoil revealed results consistent with the high range of the USDA Soil report. A long-term design infiltration rate of 0.5 in/hr has been estimated for the native soil observed at this site. The site is suitable for onsite infiltration of stormwater with no anticipated runoff for the 25-year, 24-hour event.

5.0 DESIGN AND PROJECT COMPLIANCE

The site is currently developed with a few trees and existing structures. The site will be cleared of existing construction and prepared for redevelopment. Proposed impervious areas will include approximately 8,394 sf of new pavement and 3,696 sf of new building footprint.

6.0 CORE ELEMENTS

The regulatory threshold is the "trigger" for requiring compliance with the Core Elements. The regulatory threshold is defined as "the disturbance of 1 acre or more or the addition or replacement of 5,000 square feet or more of impervious surfaces." All new development projects regardless of whether the project meets the regulatory threshold, shall comply with the following Core Elements if applicable:

- Core Element 1: Stormwater Site Plan
- Core Element 2: Construction of Stormwater Pollution Prevention
- Core Element 3: Source Control of Pollutants
- Core Element 4: Preservation of Natural Drainage Systems
- Core Element 8: Conveyance Systems

The applicability of Core Elements depends on many factors, including type, size, and location of the project. This project meets the regulatory threshold and will need to comply with Core Elements 1, 2, 3, 4, 5, 7, and 8 listed in the SWMMEW. Stormwater is contained and infiltrated onsite therefore Core Element 6, Flow Control, is not required. The applicable core elements are addressed herein.

6.1 Core Element 1: Preparation of a Stormwater Site Plan

The SSP includes the necessary qualitative and informational gathering steps required to address the impacts of the project. The SSP will be comprised of this report and the attached documents.

The disturbed area consists of approximately 0.46 acres and all construction stormwater shall be kept onsite. A SWPPP/CSWGP, if warranted, will be required and will be the responsibility of the contractor. There is no proposed construction stormwater discharge to waters of the State currently identified. An erosivity Waiver may also be approved in place of a CSWGP depending on the construction timeline.

6.2 Core Element 2: Construction Stormwater Pollution Prevention

The intent of this element is to ensure adequate measures are taken to address construction stormwater. TESC BMPs shall be installed and are referenced in the construction documents. The contractor, selected by the owner, will be appointed as the Erosion Control Lead for this project and will be responsible for preparation of the SWPPP. The SWPPP will outline the general requirements and responsibilities the contractor shall follow to eliminate sediment laden stormwater and dust from leaving the project area during construction. During construction, BMPs will be utilized to ensure water and air quality are preserved to the maximum extent possible.

6.3 Core Element 3: Source Control of Pollution

The intent of source control BMPs is to prevent pollutants from encountering stormwater. Following construction, projects shall apply all known, available, and reasonable source control BMPs. Source control BMPs shall be selected, designed, and maintained according to the WSDOE's SWMMEW. Applicable means of source control include but are not limited to preventative maintenance, spill prevention and cleanup, employee training, inspections, and good housekeeping.

6.4 Core Element 4: Preservation of Natural Drainage Systems

Preservation of natural drainage systems limits the impact created by new drainage patterns. Creating new drainage patterns results in more site disturbance and more potential for erosion and sedimentation during and after construction. Natural drainage patterns should be maintained and discharges from the project site should occur at the natural location to the maximum extent feasible. The project is not expected to have an impact on existing drainage.

6.5 Core Element 5: Runoff Treatment

The objective of this Core Element is to reduce pollutant loads and concentrations in stormwater. This can be achieved using physical, biological, and chemical removal. The type of land use at the project site will help determine the appropriate treatment methods. All proposed stormwater facilities must remove or reduce the specific target pollutants to levels that comply with state groundwater quality standards when the discharge reaches the water table or first encounters an aquifer.

All stormwater will be retained and infiltrated on-site using a shallow infiltration swale or PaveDrain paving systems an underlying 6-inch-thick treatment layer of compost amended sand. Infiltration facilities provide treatment for TSS, dissolved metals, pesticides/fungicides, and hydrocarbons (e.g., oil and grease).

6.6 Core Element 6: Flow Control

Flow control facilities are necessary to mitigate impacts due to increased storm runoff volumes and flows to downstream conveyance systems, and to downstream properties caused by land development. When site conditions allow, infiltration is the preferred method of flow control for urban runoff.

This project is not subject to this Core Element since the proposed management facilities retain and infiltrate all stormwater on-site.

6.7 Core Element 7: Operation and Maintenance

Upon project completion, all stormwater facilities on the property will be owned and maintained by the owner and will be subject to the current operations and maintenance programs compliant with the SWMMEW. Inspection of stormwater facilities is recommended annually and after major rainfall events. Maintenance criteria for the proposed facilities are included as an attachment at the end of this report.

6.8 Core Element 8: Conveyance Systems

The City of Ellensburg requires that the stormwater disposal methodologies be compliant with the SWMMEW and current City of Ellensburg Standard Plans and Specifications.

The roof area runoff will be conveyed using gutters, down spouts, and tightline pipe. The paved area runoff will sheet flow to PaveDrain infiltration systems.

7.0 STORMWATER SYSTEM DESIGN

Current civil design plans, including stormwater improvements, are included as an attachment. The hydrologic analysis for the system was performed in HydroCAD and the results are attached.

7.1 On-Site Stormwater Design

A detailed stormwater site plan has been developed showing planned stormwater facilities and is attached. The stormwater system was designed to infiltrate the entire long duration Eastern-WA R2, 24-hour, 25-Year, and the Eastern-WA Short 3-hour, 25-Year rainfall events using the design infiltration rate.

7.2 Stormwater Quantity Control

All stormwater will be retained and infiltrated on-site using bio-infiltration swales or PaveDrain paving systems. The facilities have been designed to contain the entire long duration Eastern-WA R2, 24-hour, 25-Year and the Eastern-WA Short 3-hour, 25-Year rainfall events. Stormwater calculations were prepared using HydroCAD in accordance with the WSDOE's SWMMEW. The Santa Barbara Urban Hydrograph hydrology method was used to analyze the 100 -year, 24-hour design storm. Treatment for TSS, dissolved metals, oil, and grease is provided with the use of infiltration facilities.

8.0 TEMPORARY EROSION AND SEDIMENT CONTROL

TESC BMPs will be provided during construction. All downstream boundaries should have silt fencing or straw wattles in place to prevent sediment laden runoff from leaving the site. Appropriate check dams, wattles, or silt fence should also be constructed to prevent sediment laden stormwater from entering low lying areas of the site where stormwater will infiltrate. Any disturbed soils should be stabilized and seeded or sodded as necessary once construction is completed. All constructed stormwater facilities shall be protected from sediment intrusion until disturbed soils are stabilized and the work is accepted by the engineer and City of Ellensburg.

To prevent wind-blown erosion, the contractor should use person operated watering devices, no unattended watering of the site should be allowed. A stabilized construction entrance should be used to eliminate any sediment from being transported onto City roadways. Any mud or debris that is tracked onto City roads should be removed before the end of each working day. This maintenance shall be the responsibility of the contractor during construction.

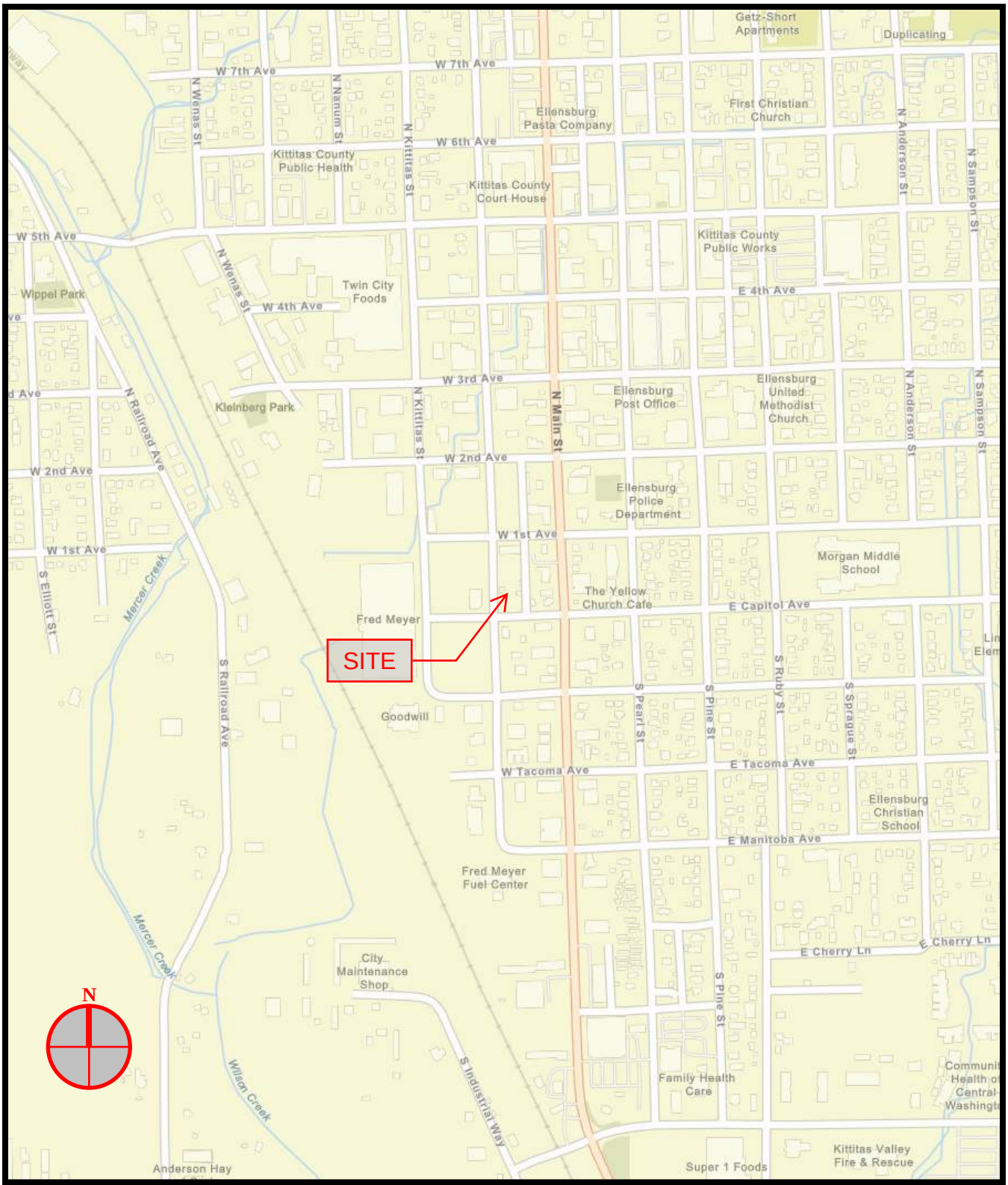
9.0 CONCLUSION

The stormwater system designed and described in this report is in general compliance with the City of Ellensburg and the WSDOE's SWMMEW, to the maximum extent possible. If problems should arise during the project or any changes occur that may alter the assumptions made in this report, we strongly recommend contacting PLSA Engineering at (509)575-6990 so appropriate action can be taken.

ATTACHMENTS

ATTACHMENT #1

Vicinity Map



PLSA

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521 North 20th AVENUE, YAKIMA, WA (509) 575-6990

VICINITY MAP

SOUTH WATER STREET DENTAL OFFICE
ELLENSBURG, WASHINGTON

PREPARED FOR
Dr. Igor Elperin

Date: 11-06-2025 | Kittitas County Parcel(s) 497133 | PLSA Project No. 25022

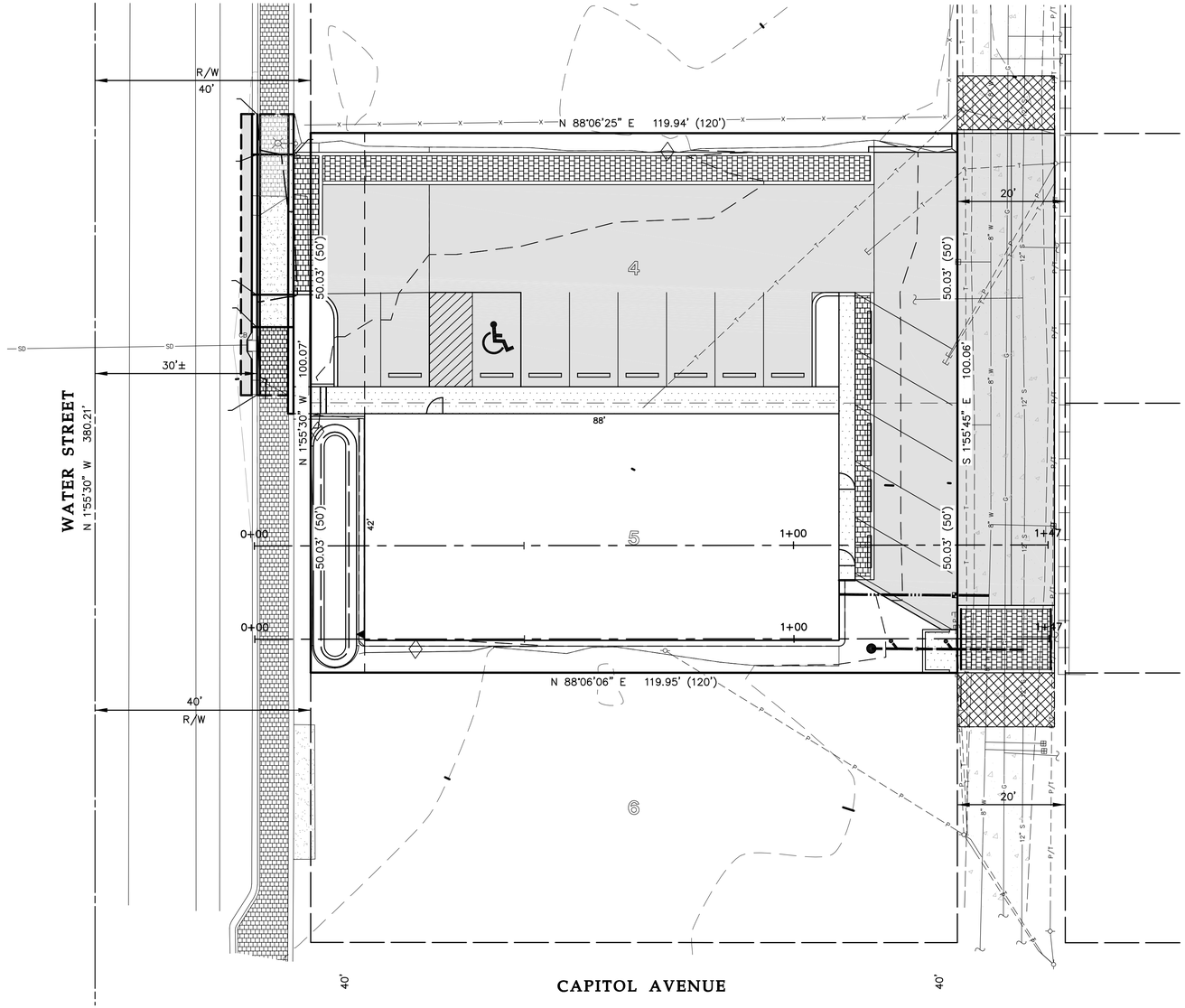
ATTACHMENT #2

Civil Site Plans

ELLENSBURG DENTAL

ELLENSBURG, WASHINGTON

SECTION 2, T-17 N, R-18 E, WM - TAX PARCEL NO. 497133



SITE MAP

NTS

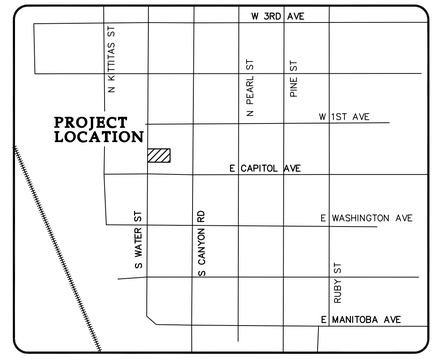
LEGEND

PROPOSED FEATURES

- NEW DUCTILE IRON WATERMAIN
- NEW SANITARY SEWER AS NOTED
- WATER METER
- TBM
- NEW PAVEMENT

EXISTING FEATURES

- SECTION LINE
- PROPERTY/RIGHT OF WAY LINE
- ADJOINING PROPERTY/RIGHT OF WAY
- CENTER LINE
- FENCE (TYPE AS NOTED)
- SANITARY SEWER (AS NOTED)
- DOMESTIC WATER (AS NOTED)
- OVERHEAD POWER
- UNDERGROUND POWER
- OVERHEAD TELEPHONE
- SEWER MANHOLE
- WATER VALVE
- FIRE HYDRANT
- POWER POLE
- TELEPHONE POLE
- TELEPHONE MANHOLE
- SIGN
- MAILBOX
- DECIDUOUS TREE
- CONIFEROUS TREE



VICINITY MAP

NO SCALE

SHEET INDEX

DATUM

ELEVATIONS FOR THIS PROJECT WERE DERIVED BY GPS OBSERVATION USING THE WASHINGTON STATE REFERENCE NETWORK. (NAVD 88)

PREPARED FOR

DR IGOR ELPERIN

DATE	REVISION

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ELLENSBURG, WASHINGTON
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DR. IGOR ELPERIN
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D. GARLAND 19838 STATE OF WASHINGTON REGISTERED PROFESSIONAL ENGINEER — PRELIMINARY — NOT FOR CONSTRUCTION

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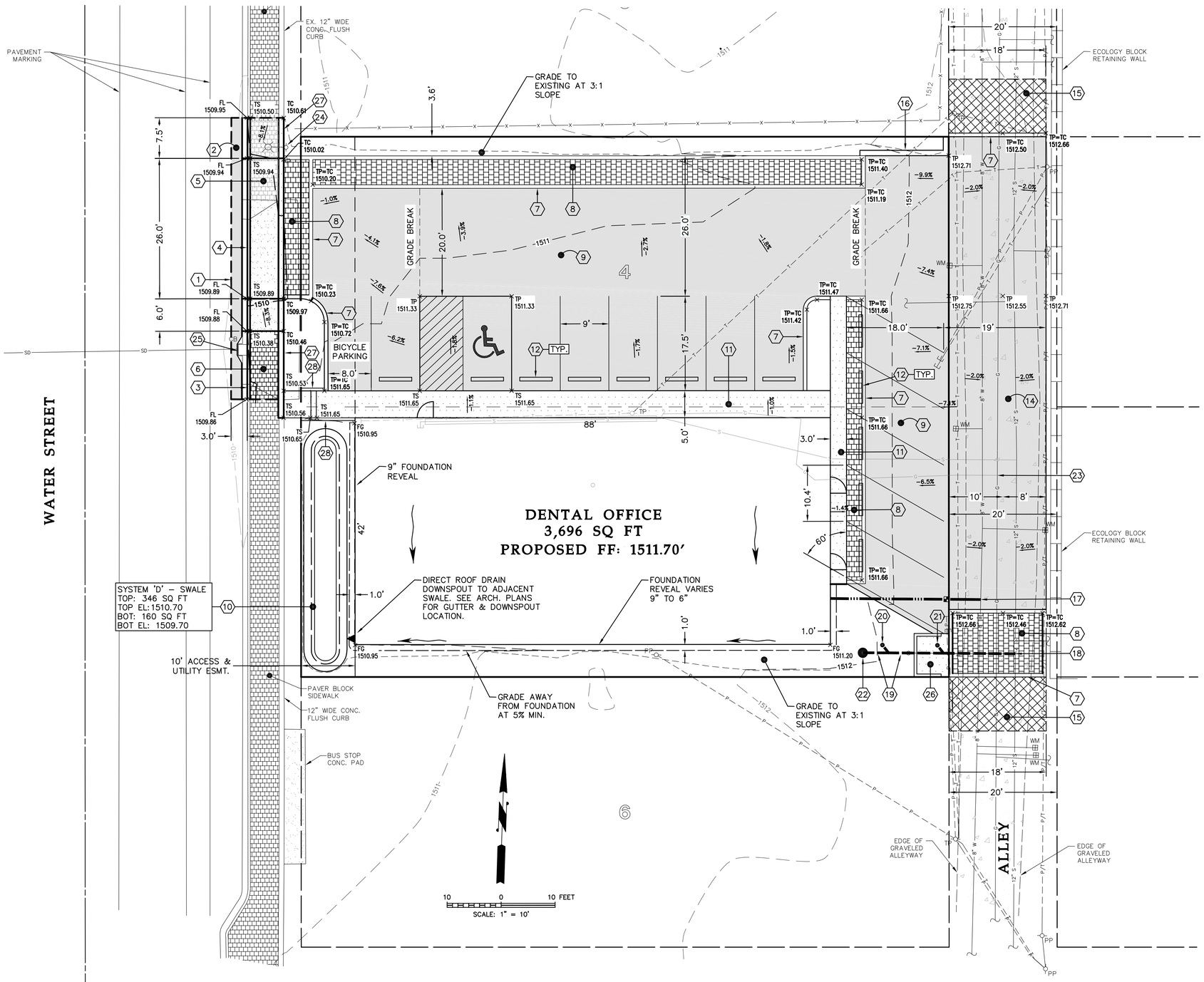
521 N. 20TH AVE. STE. 3 YAKIMA, WASHINGTON (509) 575-6990

DATE	12/23/2025
DRAWN BY	T.K.L.
CHECKED BY	S.D.G.
JOB NO.	25022
DWG NAME	

SHEET 1 of 4

CITY OF YAKIMA
PROJ. ENG-XX-XXXX



CONSTRUCTION NOTES:

1. MATCH EXISTING ELEVATION. EXISTING PAVEMENT SHALL BE SAWCUT TO PROVIDE A CLEAN EDGE FOR MATCHING.
2. PATCH ASPHALT ROADWAY PER CITY OF ELLENSBURG STANDARD DETAIL SC–30 ON SHEET 3.
3. REMOVE EXISTING DRIVEWAY CURB CUT TO NEAREST EXPANSION JOINT AND REPLACE WITH STANDARD CURB AND GUTTER PER CITY OF ELLENSBURG STANDARD DETAIL SW–51 ON SHEET 3.
4. REMOVE EXISTING CONCRETE DRIVEWAY AND CONSTRUCT NEW CEMENT CONCRETE DRIVEWAY APPROACH AS SHOWN ON PLANS PER CITY OF ELLENSBURG STANDARD DETAIL SW–20 ON SHEET 3.
5. DECONSTRUCT EXISTING CONCRETE PAVER STONE SIDEWALK. CONTRACTOR TO COORDINATE WITH CITY OF ELLENSBURG TO DETERMINE SUITABILITY OF PAVER STONES FOR REUSE AND RELOCATION IN NEW PAVERSTONE SIDEWALK LOCATED AT SOUTH SIDE OF NEW CONCRETE DRIVEWAY APPROACH.
6. CONSTRUCT NEW PAVER STONE SIDEWALK PER CITY OF ELLENSBURG STANDARD DETAILS SW–17 & SW–70 ON SHEET 3. SEE NOTE 5 FOR REUSE OF EXISTING PAVER STONES.
7. CONSTRUCT 8" WIDE CEMENT CONCRETE FLUSH CURB PER DETAIL ON SHEET 3.
8. INSTALL PERMEABLE PAVER BLOCKS (PaveDrain®), PER MANUFACTURE SPECIFICATIONS. SEE PAVEDRAIN SECTION DETAIL ON SHEET 4. CONTRACTOR/DEVELOPER TO COORDINATE WITH PAVEDRAIN FOR MATERIAL PURCHASE AND DELIVERY.
9. CONSTRUCT 2" PAVED PARKING AREA PER DETAIL ON SHEET 3.
10. GRASS BIO–INFILTRATION SWALE. 12" SAND AMENDED WITH 25% COMPOST. HYDROSEED AND IRRIGATE TO WELL ESTABLISHED GRASS STAND. SEE DETAIL ON SHEET 4.
11. CONSTRUCT CONCRETE SIDEWALK PER DETAIL ON SHEET 3. WIDTH AS SHOWN ON PLANS.
12. PLACE CURB STOP IN PARKING STALLS AS SHOWN ON PLANS.
13. CONTRACTOR TO CONSTRUCT TWO (2) 6" HEIGHT CONCRETE STAIRS PER ARCH PLAN DETAILS.
14. CONSTRUCT ASPHALT ALLEY SECTION PER CITY OF ELLENSBURG STANDARD DETAIL SC–16 ON SHEET 3.
15. CONSTRUCT 10' LONG GRAVEL SECTION ADJACENT TO FLUSH CURB PER DETAILS ON SHEET 3. TRANSITION GRAVEL FROM NEW ALLEYWAY SURFACING IMPROVEMENTS TO EXISTING GRADE.
16. CONSTRUCT 1' ASPHALT EDGE TREATMENT PER DETAIL ON SHEET 3.
17. CONTRACTOR TO CONSTRUCT 1" WATER SERVICE AND METER BOX PER CITY OF ELLENSBURG STANDARD DETAIL W–7 ON SHEET 4. CITY OF ELLENSBURG TO INSTALL 1" METER AT OWNER'S EXPENSE.
18. REMOVE EXISTING SEWER SERVICE AND CONSTRUCT 6" SCH. 40 ASTM D–1788 ABS SIDE SEWER PIPE PER CITY OF ELLENSBURG STANDARD DETAIL SS–30 ON SHEET 4.
19. CONSTRUCT 2" SCH 40 PVC FORCE SEWER SERVICE PER CITY OF ELLENSBURG STANDARD DETAIL SS–61 ON SHEET 4.
20. CONSTRUCT FORCE MAIN SEWER CLEAN–OUT PER DETAILS ON SHEET 4.
21. CONSTRUCT 6" CLEAN OUT PER DETAIL ON SHEET 4.
22. CONTRACTOR TO INSTALL GRINDER PUMP STATION. GRINDER PUMP STATION, SYSTEM CAPACITY SHALL BE COORDINATED WITH MECHANICAL. GRINDER PUMP SHALL MAINTAIN A MINIMUM 2' CLEARANCE FROM BUILDING FOUNDATION.
23. EXISTING NATURAL GAS LINE SHALL BE REMOVED AND ABANDONED PRIOR TO BEGINNING THE DEMOLITION OF EXISTING SITE FEATURES AND BUILDINGS.
24. EXISTING LIGHT POLE SHALL BE RELOCATED BY THE CITY OF ELLENSBURG LIGHT DEPARTMENT. CONTRACTOR TO COORDINATE THE RELOCATION WITH THE LIGHT DEPARTMENT PRIOR TO THE CONSTRUCTION ENTRANCE BEING INSTALLED.
25. ADJUST RIM TO GRADE.
26. TRASH ENCLOSURE BY OTHERS.
27. CONSTRUCT 4" THICK CONCRETE SECTION TO MATCH EXISTING. 6" THICK AT DRIVEWAYS
28. CONTRACTOR TO CONSTRUCT PEDESTRIAN CURB MINIMUM OF 6" ABOVE TOP OF SIDEWALK/STEP.

REVISION	DATE

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NOT FOR CONSTRUCTION
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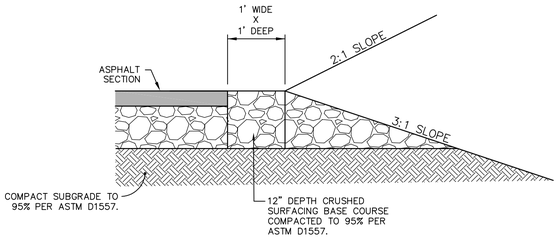
DATE	DRAWN BY	CHECKED BY	JOB NO.	DWG NAME
12/23/2025	T.K.L.	S.D.G.	25022	

SHEET 2 of 4
OF
CITY OF YAKIMA
PROJ. ENG-XX-XXXX



ASPHALT EDGE TREATMENT
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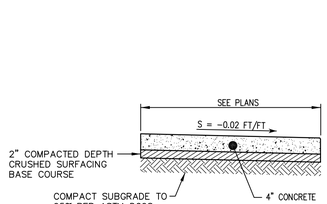

4" CONCRETE SIDEWALK
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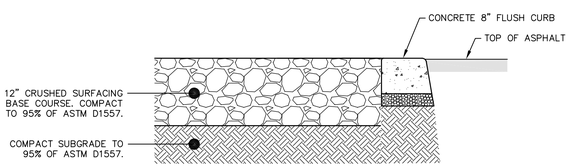

12" DEPTH GRAVEL SECTION
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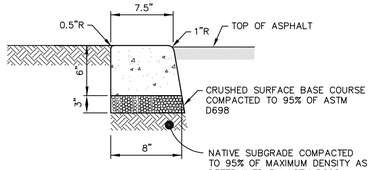
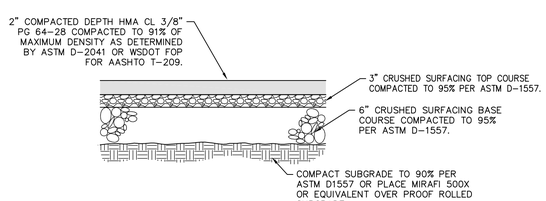


CONCRETE 8" FLUSH CURB
NO SCALE



ASPHALT PAVEMENT SECTION
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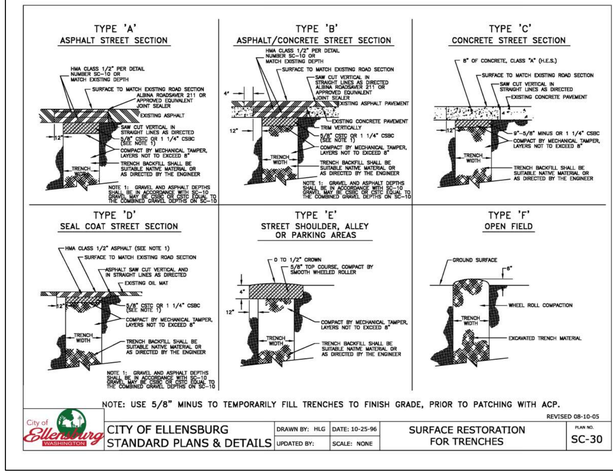
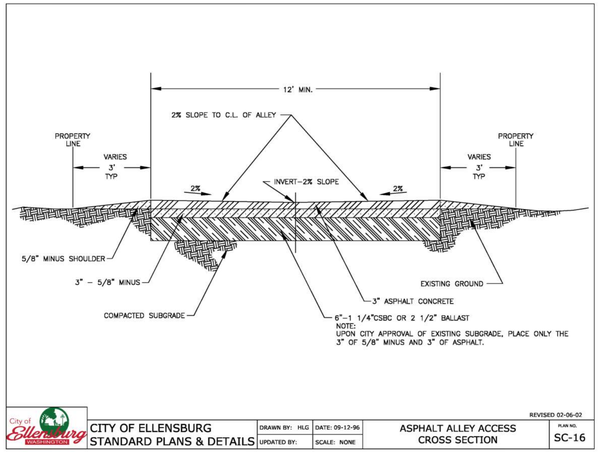


NOTE: USE 5/8" MINUS TO TEMPORARILY FILL TRENCHES TO FINISH GRADE, PRIOR TO PATCHING WITH ACP.

REVISED 08-10-05

City of Ellensburg WASHINGTON

CITY OF ELLENSBURG STANDARD PLANS & DETAILS	DRAWN BY: HLG	DATE: 10-25-96	SURFACE RESTORATION FOR TRENCHES	PLAN NO. SC-30
	UPDATED BY:	SCALE: NONE		



REVISED 03-06-02

City of Ellensburg WASHINGTON

CITY OF ELLENSBURG STANDARD PLANS & DETAILS	DRAWN BY: HLG	DATE: 09-12-96	ASPHALT ALLEY ACCESS CROSS SECTION	PLAN NO. SC-16
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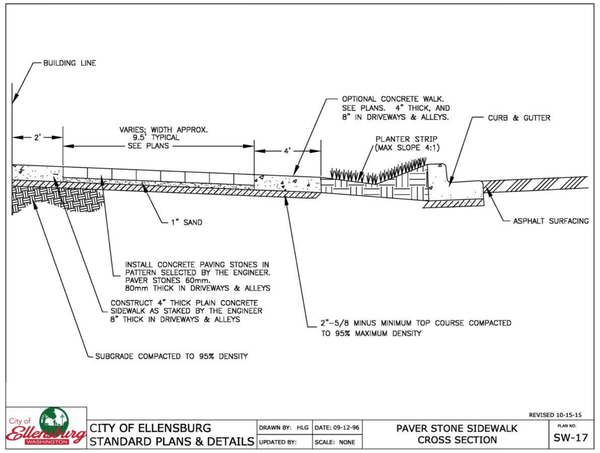
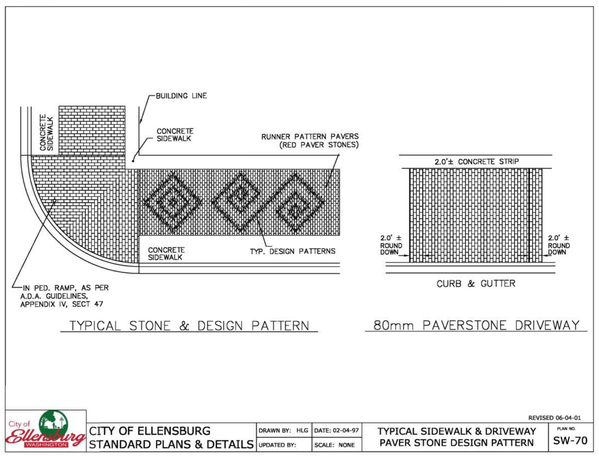


REVISED 10-15-15

City of Ellensburg WASHINGTON

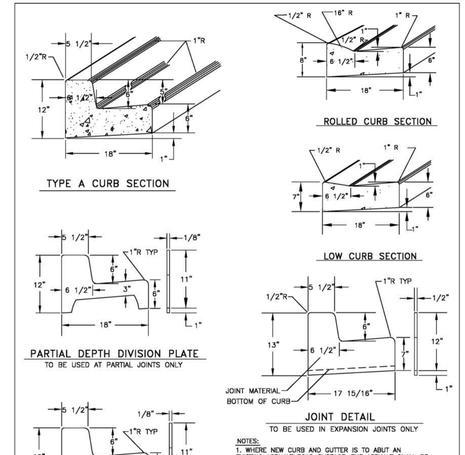
CITY OF ELLENSBURG STANDARD PLANS & DETAILS	DRAWN BY: HLG	DATE: 09-12-96	PAVER STONE SIDEWALK CROSS SECTION	PLAN NO. SW-17
	UPDATED BY:	SCALE: NONE		



REVISED 06-04-01

City of Ellensburg WASHINGTON

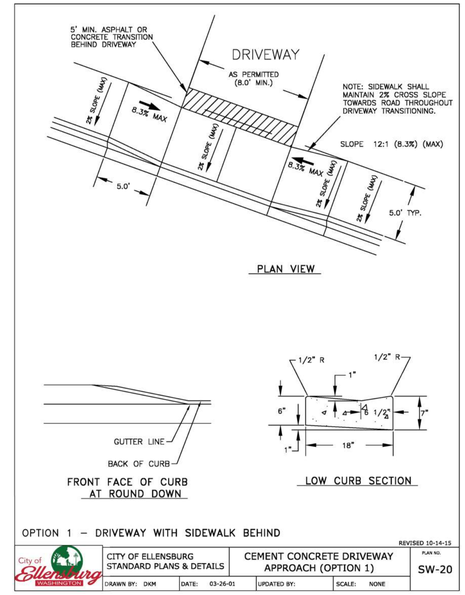
CITY OF ELLENSBURG STANDARD PLANS & DETAILS	DRAWN BY: HLG	DATE: 02-04-97	TYPICAL SIDEWALK & DRIVEWAY PAVER STONE DESIGN PATTERN	PLAN NO. SW-70
	UPDATED BY:	SCALE: NONE		



REVISED 03-15-10

City of Ellensburg WASHINGTON

CITY OF ELLENSBURG STANDARD PLANS & DETAILS	DRAWN BY: HLG	DATE: 09-12-96	CEMENT CONCRETE CURB & GUTTER FORM DETAILS	PLAN NO. SW-51
	UPDATED BY:	SCALE: NONE		



REVISED 10-14-15

City of Ellensburg WASHINGTON

CITY OF ELLENSBURG STANDARD PLANS & DETAILS	DRAWN BY: DKM	DATE: 03-26-01	CEMENT CONCRETE DRIVEWAY APPROACH (OPTION 1)	PLAN NO. SW-20
	UPDATED BY:	SCALE: NONE		

DATE	REVISION

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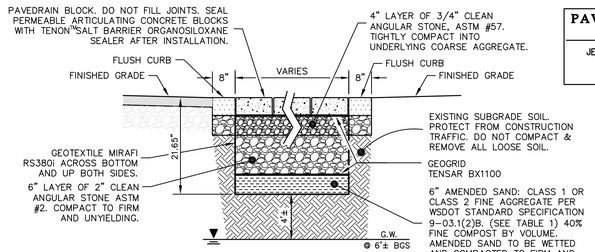
DATE	XX/XX/2025
DRAWN BY	T.K.L.
CHECKED BY	S.D.G.
JOB NO.	25022
DWG NAME	

OF

CITY OF YAKIMA
PROJ. ENG-XX-XXXX



TYPICAL PAVEDRAIN SECTION (X)
NO SCALE

PAVEDRAIN CONTACT INFORMATION
JEFF BUCH, PAVEDRAIN, LLC
JBUCH@PAVEDRAIN.COM
MOB (763) 292-0754

PAVEDRAIN SYSTEM A
(3 ROWS X 53 CHAMBERS PER ROW)

INTERLOCKING BLOCK SECTION (5.65" HEIGHT x 2.83' WIDE x 53.5' LONG)
#57 ROCK SECTION – (4" DEPTH x 2.83' WIDE x 53.5' LONG)
#2 ROCK SECTION – (6" DEPTH x 2.83' WIDE x 53.5' LONG)
AMENDED SAND SECTION – (6" DEPTH x 2.83' WIDE x 53.5' LONG)

PAVEDRAIN SYSTEM B
(5 ROWS X 101 CHAMBERS PER ROW)

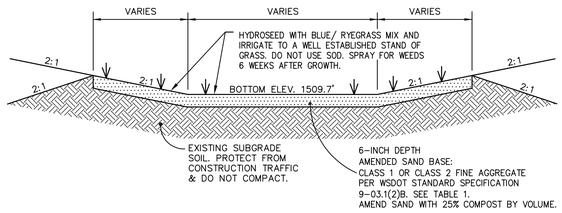
INTERLOCKING BLOCK SECTION (5.65" HEIGHT x 4.67' WIDE x 101.5' LONG)
#57 ROCK SECTION – (4" DEPTH x 4.67' WIDE x 101.5' LONG)
#2 ROCK SECTION – (6" DEPTH x 4.67' WIDE x 101.5' LONG)
AMENDED SAND SECTION – (6" DEPTH x 4.67' WIDE x 101.5' LONG)

PAVEDRAIN SYSTEM C
(5 ROWS X 25 CHAMBERS PER ROW)

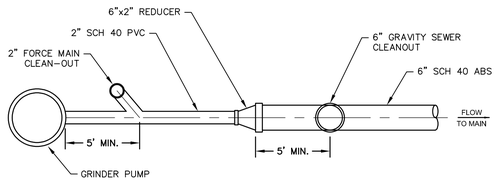
INTERLOCKING BLOCK SECTION (5.65" HEIGHT x 4.67' WIDE x 25.5' LONG)
#57 ROCK SECTION – (4" DEPTH x 4.67' WIDE x 25.5' LONG)
#2 ROCK SECTION – (6" DEPTH x 4.67' WIDE x 25.5' LONG)
AMENDED SAND SECTION – (6" DEPTH x 4.67' WIDE x 25.5' LONG)

PAVEDRAIN SYSTEM E
(12 ROWS X 16 CHAMBERS PER ROW)

INTERLOCKING BLOCK SECTION (5.65" HEIGHT x 11.08' WIDE x 16.5' LONG)
#57 ROCK SECTION – (4" DEPTH x 11.08' WIDE x 16.5' LONG)
#2 ROCK SECTION – (6" DEPTH x 11.08' WIDE x 16.5' LONG)
AMENDED SAND SECTION – (6" DEPTH x 11.08' WIDE x 16.5' LONG)



BIO-INFILTRATION SWALE 'D' (#)
NO SCALE



FORCE SEWER SCHEMATIC LAYOUT
NO SCALE

GENERAL NOTES:

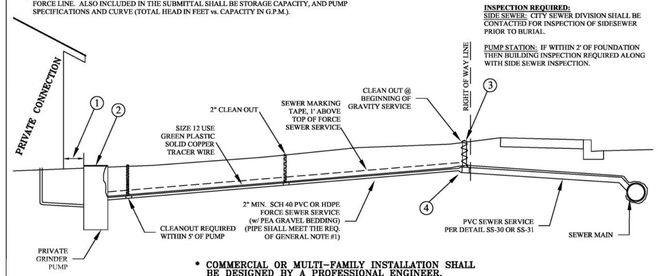
1. ALL FORCE SEWER SERVICE LINES SHALL BE HYDROSTATICALLY TESTED AT A MINIMUM PRESSURE OF AT LEAST 50% ABOVE THE DESIGN WORKING PRESSURE, AND SHALL BE IN ACCORDANCE WITH THE MOST CURRENT REQUIREMENTS OF THE DEPT. OF ECOLOGY.
2. ALL FORCE SEWER LINES SHALL HAVE WATERTIGHT CLEANOUTS INSTALLED AT MAX. SPACINGS OF 100' AND AT AGGREGATE HORIZONTAL DIRECTION CHANGES OF 135°.
3. EACH CLEANOUT SHALL BE INSTALLED SO THAT IT OPENS TO ALLOW FOR CLEANING IN THE DIRECTION OF FLOW, AND SHALL BE INSTALLED VERTICALLY ABOVE THE FLOW LINE OF THE PIPE.
4. CLEANOUTS SHALL BE INSTALLED TO ABOVE GRADE, AND SHALL HAVE A MINIMUM OF 12" OF CLEARANCE IN FRONT OF CLEANOUT.
5. ALL FORCE AND GRAVITY SERVICE LINES SHALL HAVE PEA GRAVEL BEDDING (4" ABOVE AND 4" BELOW PIPE).
6. ALL FORCE AND GRAVITY SERVICE LINES, CLEANOUTS, PUMPS, WET WELL, ECT., SHALL REMAIN THE OWNERSHIP OF THE PROPERTY OWNER WHO SHALL BE RESPONSIBLE FOR THEIR OPERATION AND MAINTENANCE.
7. PERMITTEE SHALL SUBMIT DRAWING SHOWING LOCATIONS OF PUMP, CLEANOUT(S), AND FORCE LINE. ALSO INCLUDED IN THE SUBMITTAL SHALL BE STORAGE CAPACITY, AND PUMP SPECIFICATIONS AND CURVE (TOTAL HEAD IN FEET vs. CAPACITY IN G.P.M.).

NOTES:

① IF PUMP IS LOCATED WITHIN 2' OF THE FOUNDATION, THEN THE SEWER PUMP SHALL BE INCLUDED IN THE CITY OF ELLENSBURG BUILDING PERMIT, AND SHALL MEET THE REQUIREMENTS OF THE UNIFORM PLUMBING CODE AS WELL AS THESE REQUIREMENTS. IF OUTSIDE OF 2' FROM FOUNDATION THAN THESE DETAILS SHALL APPLY. A PUBLIC WORKS PERMIT SHALL BE REQUIRED FOR ALL SEWER SERVICES.
② SEE STANDARD DETAIL SS-62 FOR SPECIFICATIONS ON THE GRINDER PUMP.
③ A PVC GRAVITY SEWER SERVICE SHALL BE INSTALLED FROM THE MAIN TO THE EDGE OF RIGHT OF WAY. A SEWER CLEANOUT SHALL BE INSTALLED WITHIN 5' OF THE REDUCER.
④ THE 2" PVC FORCE SERVICE LINE SHALL BE INSTALLED FROM GRINDER PUMP TO THE 4" GRAVITY SERVICE LINE. AN APPROPRIATE 2" FITTING (BEND), IF REQUIRED, SHALL BE USED TO GO FROM THE FORCE LINE TO THE GRAVITY LINE. A 2"x4" REDUCER SHALL BE USED WITHIN 6" OF THE FITTING (BEND).

INSPECTION REQUIRED:
SIDE SEWER: CITY SEWER DIVISION SHALL BE CONTACTED FOR INSPECTION OF SIDESEWER PRIOR TO BURIAL.

PUMP STATION: IF WITHIN 2' OF FOUNDATION THEN BUILDING INSPECTION REQUIRED ALONG WITH SIDE SEWER INSPECTION.

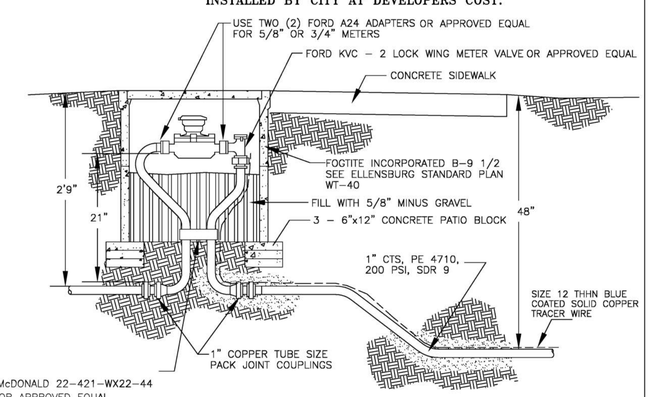


* COMMERCIAL OR MULTI-FAMILY INSTALLATION SHALL BE DESIGNED BY A PROFESSIONAL ENGINEER.

REVISED 06-01-11

City of Ellensburg WASHINGTON	CITY OF ELLENSBURG STANDARD PLANS & DETAILS	DRAWN BY: DKM	DATE: 10-25-04	PRIVATE FORCE SEWER SERVICE	PLAN NO. SS-61
		UPDATED BY:	SCALE: NONE		

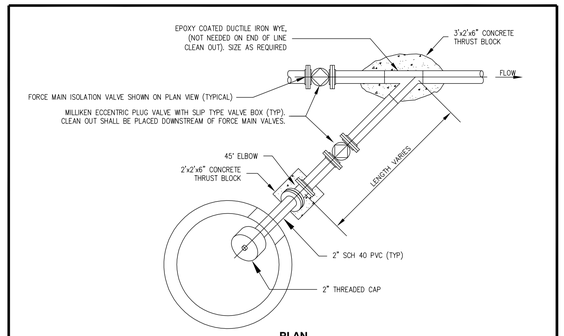
NOTE: COPPERSETTER, METER, & SERVICE BOX INSTALLED BY CITY AT DEVELOPERS COST.



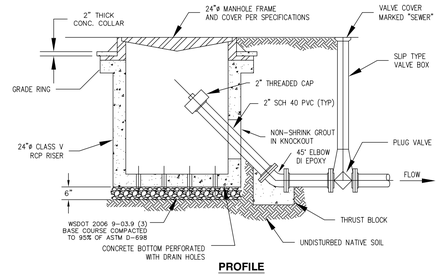
McDONALD 22-421-WX22-44 OR APPROVED EQUAL

REVISED 3-11-19

City of Ellensburg WASHINGTON	CITY OF ELLENSBURG STANDARD PLANS & DETAILS	DRAWN BY: HLG	DATE: 09-23-96	5/8" OR 1" WATER SERVICE INSTALLATION	PLAN NO. WT-25
		UPDATED BY: DY	SCALE: NONE		



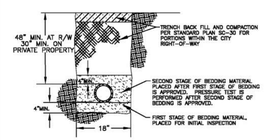
PLAN



PROFILE

Force Main Cleanout Detail
REVISED:

PIPE BEDDING & TRENCH BACK FILL



ACCEPTABLE BEDDING MATERIALS
Section 7-17.3(1)B of Standard Specifications
1. Pea Gravel

ACCEPTABLE SIDE SEWER PIPE MATERIAL
Section 7-17.2 of Standard Specifications
1. Ductile Iron Pipe (AWWA C151)
2. ABS Pipe (Schedule 40, ASTM D-1788)
3. PVC Pipe (SDR 35, ASTM D3034)

CLEAN OUTS
1. Not less than one per side sewer and/or each total change of 90° of grade or alignment and/or each 100 feet in straight runs.
2. Metal frame and cover, with concrete collar is required in gravel or asphalt areas.

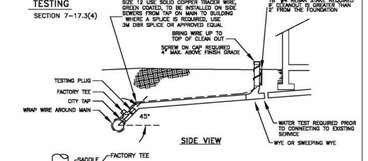
GRADE & ALIGNMENT
1. Minimum grade of 2% for 4" pipe, and 1% for 6" pipe, unless approved by City Public Works Department.
2. Line and grade to be straight between factory bends.

Ground water is strictly prohibited from entering a sanitary sewer. Sediment must be removed from ground water before it is allowed to enter a storm drain. Obtain City approval prior to discharge into a storm drain.

A PERMIT IS REQUIRED for ANY REPAIR OR MODIFICATION of a side sewer whether on public or private property. CALL 962-7277 FOR TAP OR INSPECTION.

State law requires 48 hours notice prior to excavation. Call 1-800-424-5555 for underground utility locates.

TESTING
SECTION 7-17.3(4)



INSPECTION:
All work on side sewers must be inspected by the City prior to back filling. If back filling has occurred before the inspection, the City will request that the piping be exposed for inspection purposes. Any person performing work under permit pursuant to the provisions of this chapter must give 48 hours notice, plus Saturdays, Sundays, and holidays, for an inspection. Notice shall include the inspection location address. The permit must be paid prior to the inspection. Call Public Works for surface restoration inspection of asphalt, curb & gutter, sidewalk, etc.

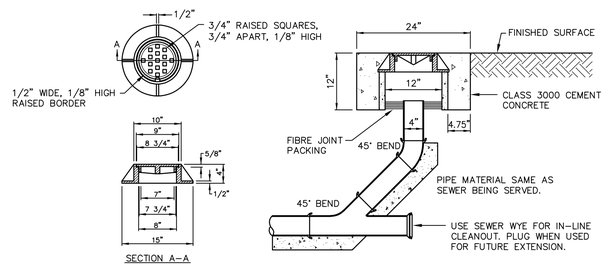
TAP:
The contractor shall give 48 hours notice of request for the tap. The contractor shall completely expose the sewer main at the point of connection for the City crews to make such connection. The trench is to be free of water and conform to W.I.S.H.A. safety standards for construction work, Part N.

6" side sewers required for multi-family residential and commercial buildings.
4" minimum side sewers required for single family buildings.

* SERVICE CLEAN-OUTS SHALL BE IN LINE WITH SERVICE LINE.
* BENDS IN PIPE NOT TO EXCEED 45° BENDS (90° BENDS SHALL BE CONSTRUCTED WITH 2 - 45° BENDS)

REVISED 06-01-11

City of Ellensburg WASHINGTON	CITY OF ELLENSBURG STANDARD PLANS & DETAILS	DRAWN BY: HLG	DATE: 10-24-96	SIDE SEWER CONSTRUCTION WITH TAP ON EXISTING MAIN	PLAN NO. SS-30
		UPDATED BY:	SCALE: NONE		



CAST IRON RING & COVER

4" CLEAN OUT
NO SCALE

REVISION	DATE

NEW DENTAL OFFICE DETAILS
108 S. WATER STEET
ELLENSBURG, WASHINGTON
PREPARED FOR
DR. IGOR ELPERIN
2906 W NOB HILL BLVD, YAKIMA, WA 98902 (917) 549-7026

D. GARLAND WASHINGTON 19055 PROFESSIONAL ENGINEER PRELIMINARY NOT FOR CONSTRUCTION

PLSA
ENGINEERING-SURVEYING-PLANNING (509) 575-6990
521 N. 20TH AVE. STE. 3 YAKIMA, WASHINGTON

DATE	DRAWN BY	CHECKED BY	JOB NO.	DWG NAME
12/23/2025	T.K.L.	S.D.G.	25022	

SHEET 4 of 4
OF
CITY OF YAKIMA
PROJ. ENG-XX-XXXX

ATTACHMENT #3

Well Log

Please print, sign and return to the Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. RE09321

SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *("x" in box)*

☒ Construction
☐ Decommission

ORIGINAL INSTALLATION Notice of Intent Number:

Type of Well *("x in box)*

☒ Resource Protection
☐ Geotech Soil Boring

Consulting Firm

Unique Ecology Well IDTag No. BHR-302

Property Owner CITY OF ELLENSBURG

Site Address 109 NORTH WATER ST

City ELLENSBURG County KITTITAS

Location SW1/4-1/4 NE1/4 Sec 2 Twn 17N R 18E

EWM ☒ or WWM ☐

Lat/Long (s, t, r still REQUIRED) Lat Deg ____ Min ____ Sec ____

Long Deg ____ Min. ____ Sec ____

Tax Parcel No.

Cased or Uncased Diameter 2" Static Level 6.88'

Work/Decommission Start Date 11-21-2013

Work/Decommission Completed Date 11-21-2013

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

☐ Driller ☐ Engineer ☐ Trainee

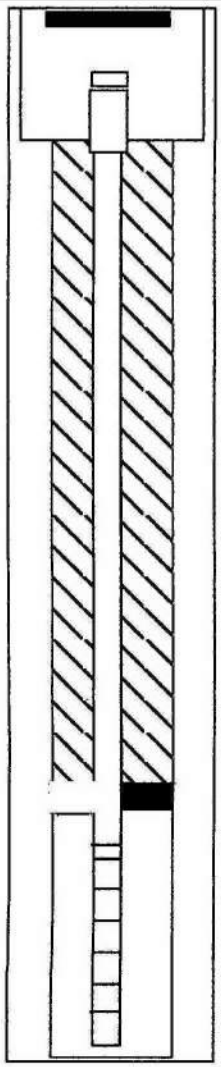
Name (Print Last, First Name) JOHNSON, MARCUS

Driller/Engineer /Trainee Signature

Driller or Trainee License No. 3040

If trainee, licensed driller's Signature and License Number:

Construction Design MW-5



Well Data

2" WELL SET USING 3 ¾" DIRECT PUSH METHOD FROM 0' TO 15'

FLUSH MONUMENT

2" BLANK CASING: 0'-5'
BENTONITE SEAL: 0'-4'

2" PREPACK SCREEN: 5'-15'
10/20 SILICA SAND FILTER: 4'-15'

Formation Description	
LOOSE GRAVELS	0'-3'
DARK BROWN SILTS	3'-5'
BROWN SILTY SANDS	5'-8'
SILTY GRAVELS	8'-10'
BROWN GRAVELLY SANDS	10'-15'

DEPT OF ECOLOGY Received SEP 2 8 2015 CENTRAL REGION OFFICE

SCALE: 1"= ____ PAGE ____ OF ____

CY 050-12 (Rev. 7/06)

Ecology is an Equal Opportunity Employer

PLSA

ENGINEERING-SURVEYING-PLANNING
521 North 20th AVENUE, YAKIMA, WA (509) 575-6990

WELL LOG LOCATION MAP

SOUTH WATER STREET DENTAL OFFICE
ELLENSBURG, WASHINGTON
PREPARED FOR
Dr. Igor Elperin

Date: 11-06-2025 | Kittitas County Parcel(s) 497133 | PLSA Project No. 25022

ATTACHMENT #4

USDA Soil Report

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Kittitas County Area, Washington

Elperin - Dental Clinic

April 8, 2025

Preface

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

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

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

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

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

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

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

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

Contents

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 (Elperin - Dental Clinic)

Map Scale: 1:519 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 5 10 20 30

Feet
0 25 50 100 150

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Kittitas County Area, Washington
Survey Area Data: Version 17, Aug 27, 2024

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

Date(s) aerial images were photographed: Jun 26, 2022—Aug 5, 2022

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

Map Unit Legend (Elperin - Dental Clinic)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
590	Brickmill-Nanum complex, 0 to 5 percent slopes	0.0	1.4%
635	Opnish ashy loam, 0 to 2 percent slopes	0.7	57.1%
795	Nack-Opnish complex, 0 to 2 percent slopes	0.5	41.5%
Totals for Area of Interest		**1.1**	**100.0%**

Map Unit Descriptions (Elperin - Dental Clinic)

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

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

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

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

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

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

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

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

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

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

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

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

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

Kittitas County Area, Washington

590—Brickmill-Nanum complex, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2l4c
Elevation: 1,500 to 3,300 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 150 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Brickmill and similar soils: 45 percent
Nanum and similar soils: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brickmill

Setting

Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium with an influence of volcanic ash in the surface

Typical profile

H1 - 0 to 12 inches: gravelly ashy loam
H2 - 12 to 28 inches: very gravelly ashy sandy loam
H3 - 28 to 38 inches: extremely gravelly sandy loam
H4 - 38 to 49 inches: extremely gravelly sandy loam
H5 - 49 to 60 inches: extremely gravelly loamy coarse sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: 40 to 60 inches to strongly contrasting textural stratification
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 28 to 38 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C
Ecological site: R008XY930WA - Loamy Bottom
Hydric soil rating: No

Description of Nanum

Setting

Landform: Terraces, alluvial fans
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Alluvium with an influence of volcanic ash in th upper part

Typical profile

H1 - 0 to 8 inches: ashy loam
H2 - 8 to 15 inches: ashy loam
H3 - 15 to 28 inches: ashy clay loam
H4 - 28 to 35 inches: very gravelly clay loam
H5 - 35 to 60 inches: extremely gravelly sandy clay loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 21 to 28 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: Moderate (about 8.1 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Ecological site: R008XY930WA - Loamy Bottom
Hydric soil rating: No

Minor Components

Nack

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

Opnish

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

635—Opnish ashy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2l5w

Elevation: 1,400 to 2,100 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 150 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Opnish

Setting

Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium with an influence of volcanic ash in the upper part

Typical profile

H1 - 0 to 8 inches: ashy loam
H2 - 8 to 13 inches: ashy clay loam
H3 - 13 to 26 inches: clay loam
H4 - 26 to 60 inches: extremely gravelly clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 24 to 40 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 13.0
Available water supply, 0 to 60 inches: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C
Ecological site: R008XY970WA - Alkali Terrace
Hydric soil rating: No

Minor Components

Nack

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

Brickmill

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

795—Nack-Opnish complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2l95
Elevation: 1,400 to 2,400 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 150 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Nack and similar soils: 55 percent
Opnish and similar soils: 40 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nack

Setting

Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium with a mantle of volcanic ash

Typical profile

H1 - 0 to 6 inches: gravelly ashy loam
H2 - 6 to 15 inches: clay loam
H3 - 15 to 60 inches: extremely gravelly sandy clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 15 to 39 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C/D
Ecological site: R008XY970WA - Alkali Terrace
Hydric soil rating: No

Description of Opnish

Setting

Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium with an influence of volcanic ash in the upper part

Typical profile

H1 - 0 to 8 inches: ashy loam
H2 - 8 to 13 inches: ashy clay loam
H3 - 13 to 26 inches: clay loam
H4 - 26 to 60 inches: extremely gravelly clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 24 to 40 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 13.0
Available water supply, 0 to 60 inches: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C
Ecological site: R008XY970WA - Alkali Terrace
Hydric soil rating: No

Minor Components

Brickmill

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

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Chemical Properties

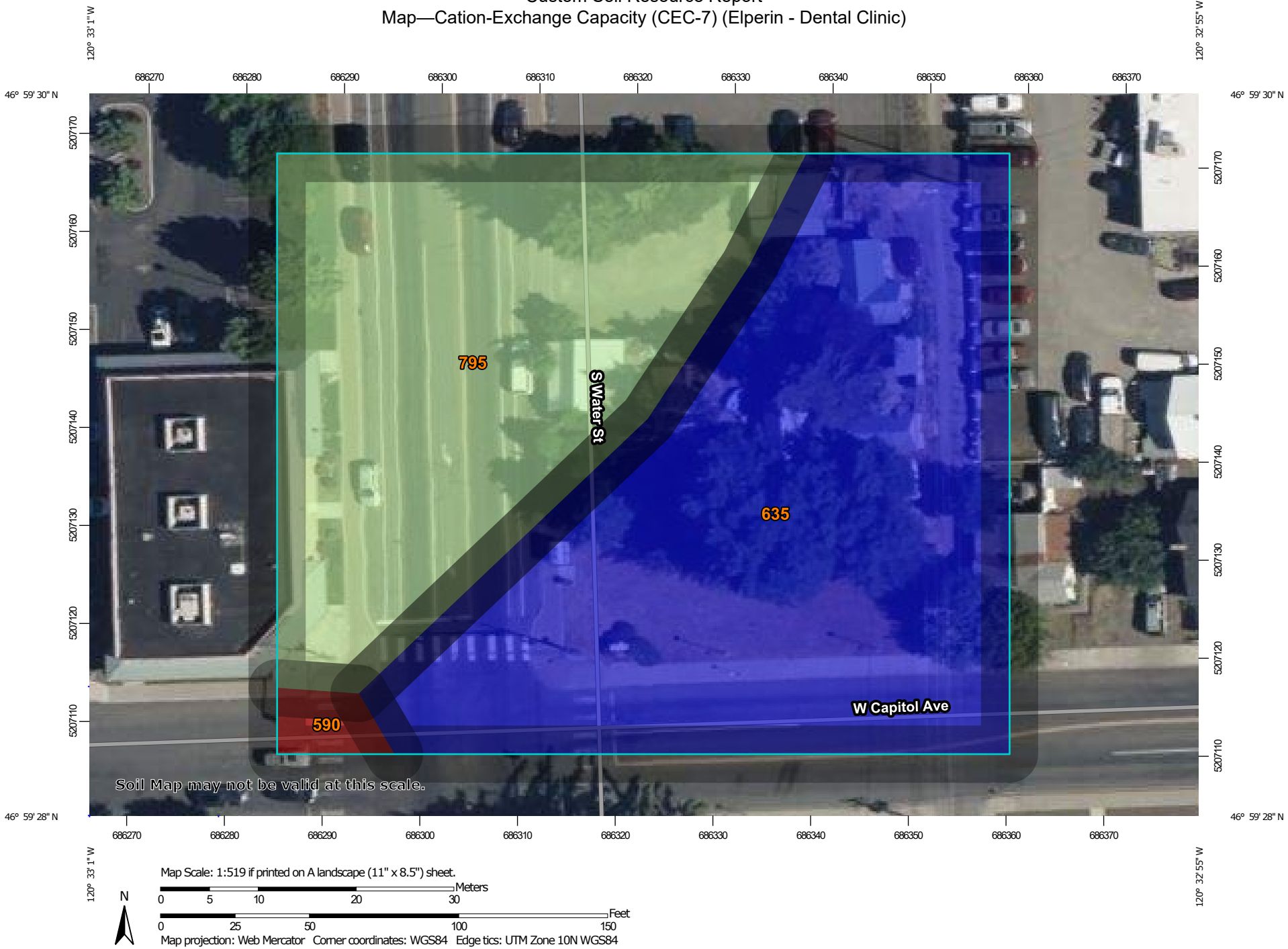
Soil Chemical Properties are measured or inferred from direct observations in the field or laboratory. Examples of soil chemical properties include pH, cation exchange capacity, calcium carbonate, gypsum, and electrical conductivity.

Cation-Exchange Capacity (CEC-7) (Elperin - Dental Clinic)

Cation-exchange capacity (CEC-7) is the total amount of extractable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Map—Cation-Exchange Capacity (CEC-7) (Elperin - Dental Clinic)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

<= 13.3

> 13.3 and <= 22.3

> 22.3 and <= 24.9

Not rated or not available

Soil Rating Lines

<= 13.3

> 13.3 and <= 22.3

> 22.3 and <= 24.9

Not rated or not available

Soil Rating Points

<= 13.3

> 13.3 and <= 22.3

> 22.3 and <= 24.9

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Kittitas County Area, Washington
Survey Area Data: Version 17, Aug 27, 2024

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

Date(s) aerial images were photographed: Jun 26, 2022—Aug 5, 2022

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

Table—Cation-Exchange Capacity (CEC-7) (Elperin - Dental Clinic)

Map unit symbol	Map unit name	Rating (milliequivalents per 100 grams)	Acres in AOI	Percent of AOI
590	Brickmill-Nanum complex, 0 to 5 percent slopes	13.3	0.0	1.4%
635	Opnish ashy loam, 0 to 2 percent slopes	24.9	0.7	57.1%
795	Nack-Opnish complex, 0 to 2 percent slopes	22.3	0.5	41.5%
Totals for Area of Interest			**1.1**	**100.0%**

Rating Options—Cation-Exchange Capacity (CEC-7) (Elperin - Dental Clinic)

Units of Measure: milliequivalents per 100 grams

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Interpret Nulls as Zero: No

Layer Options (Horizon Aggregation Method): Depth Range (Weighted Average)

Top Depth: 12

Bottom Depth: 60

Units of Measure: Inches

Water Features

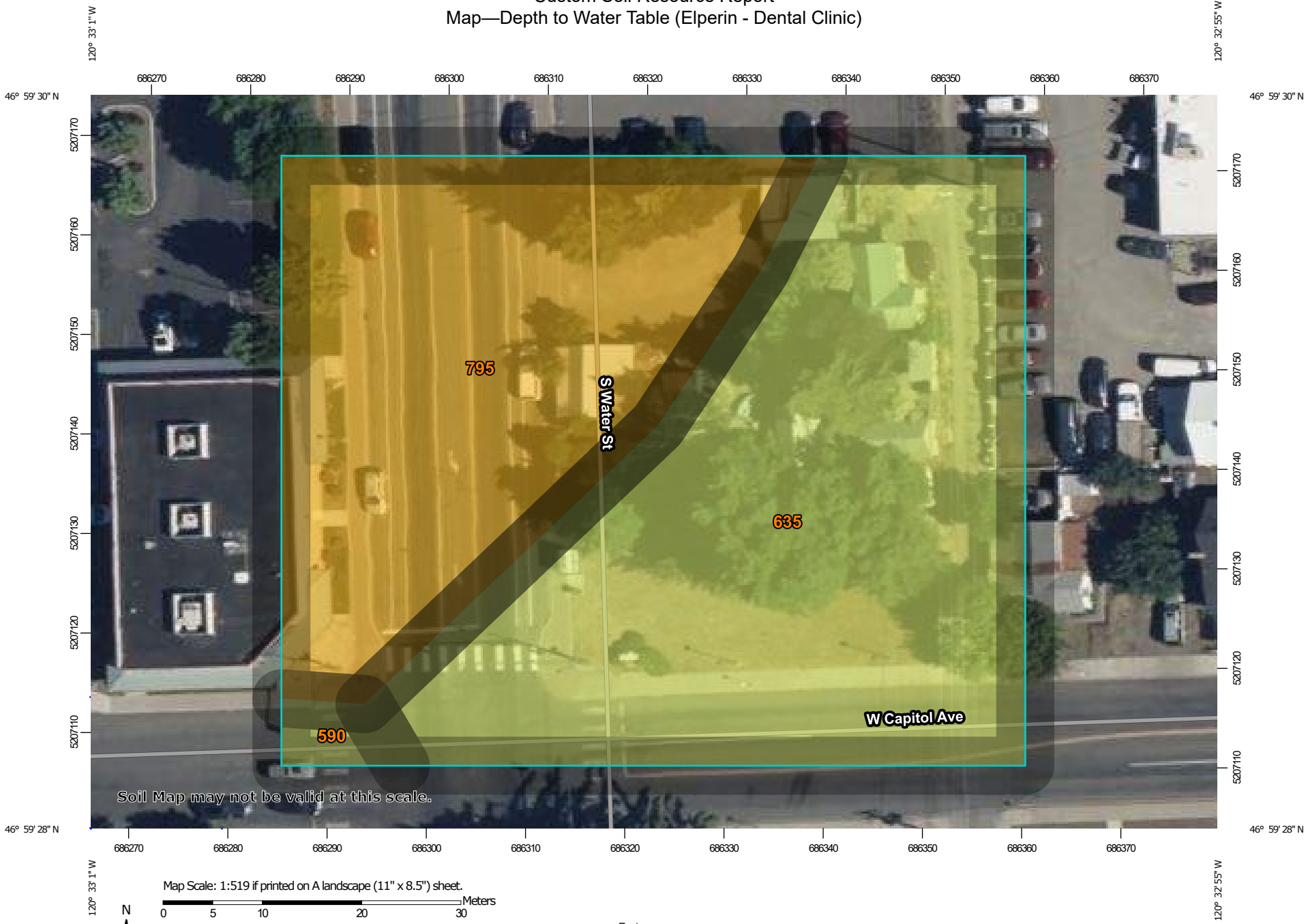
Water Features include ponding frequency, flooding frequency, and depth to water table.

Depth to Water Table (Elperin - Dental Clinic)

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Custom Soil Resource Report
Map—Depth to Water Table (Elperin - Dental Clinic)



Map Scale: 1:519 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 5 10 20 30

Feet
0 25 50 100 150

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Lines

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Points

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Kittitas County Area, Washington
Survey Area Data: Version 17, Aug 27, 2024

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

Date(s) aerial images were photographed: Jun 26, 2022—Aug 5, 2022

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

Table—Depth to Water Table (Elperin - Dental Clinic)

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
590	Brickmill-Nanum complex, 0 to 5 percent slopes	71	0.0	1.4%
635	Opnish ashy loam, 0 to 2 percent slopes	84	0.7	57.1%
795	Nack-Opnish complex, 0 to 2 percent slopes	38	0.5	41.5%
Totals for Area of Interest			**1.1**	**100.0%**

Rating Options—Depth to Water Table (Elperin - Dental Clinic)

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No

Beginning Month: January

Ending Month: December

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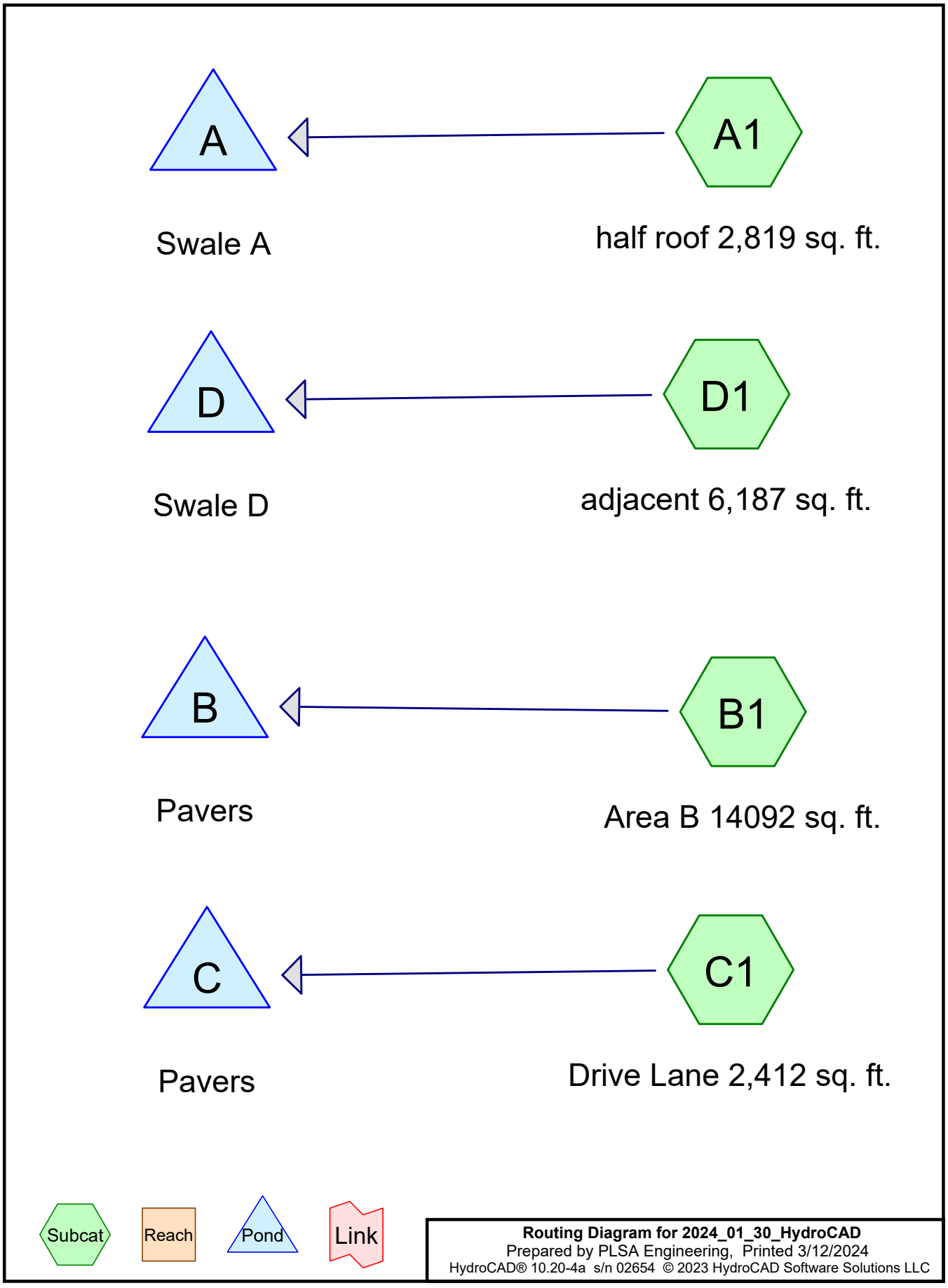
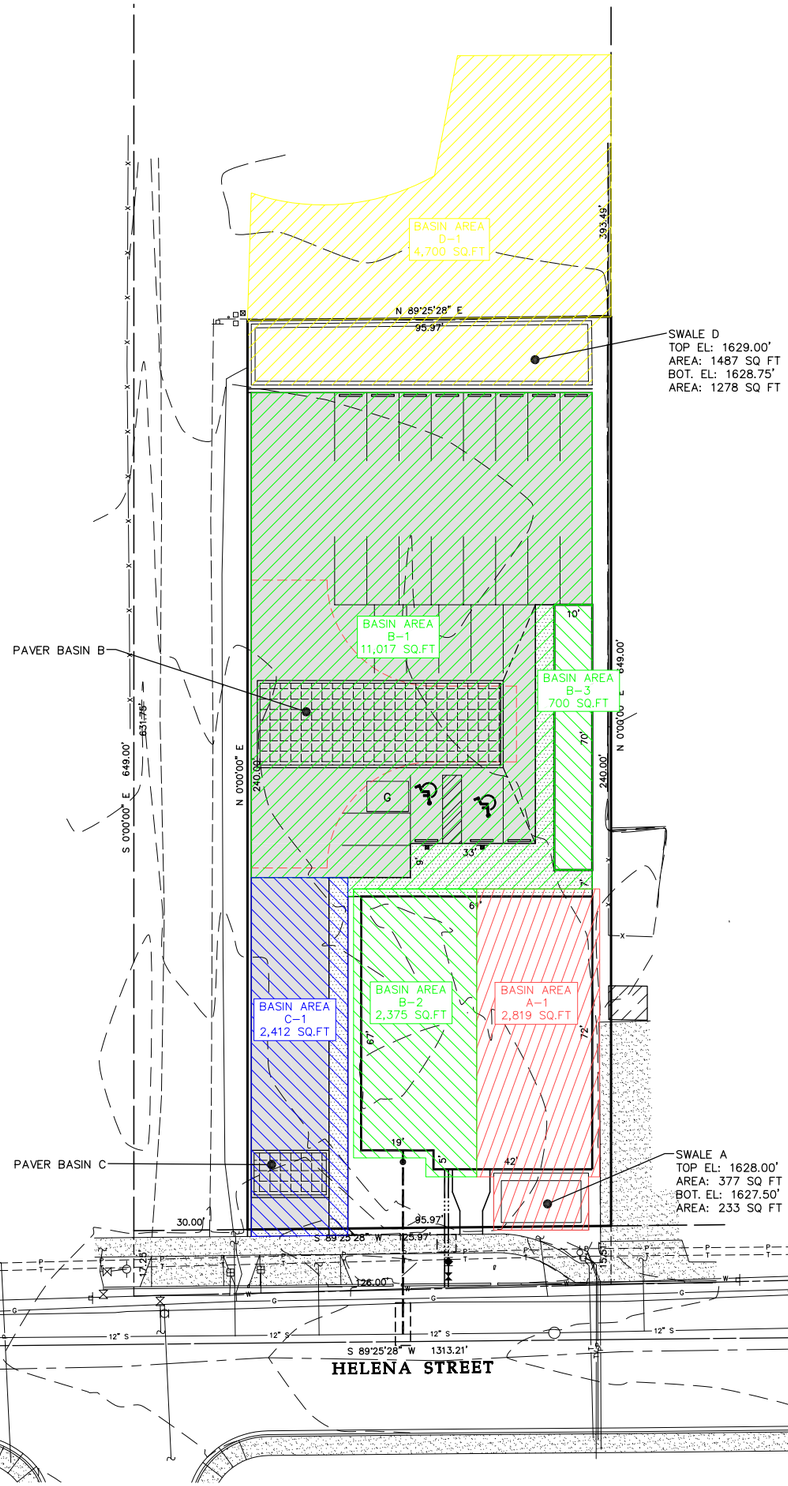
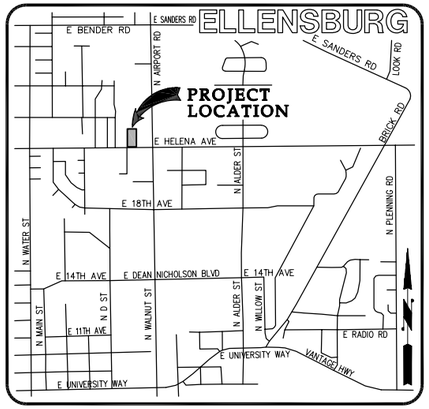
ATTACHMENT #5

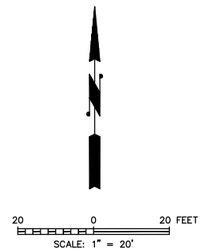
HydroCAD Report


A
A1
Swale A
half roof 2,819 sq. ft.
D
D1
Swale D
adjacent 6,187 sq. ft.
B
B1
Pavers
Area B 14092 sq. ft.
C
C1
Pavers
Drive Lane 2,412 sq. ft.
Subcat
Reach
Pond
Link
Routing Diagram for 2024_01_30_HydroCAD
Prepared by PLSA Engineering, Printed 3/12/2024
HydroCAD® 10.20-4a s/n 02654 © 2023 HydroCAD Software Solutions LLC





VICINITY MAP
NO SCALE



REVISION	DATE
SEWER RELOCATION	XX-XX-XXXX

APARTMENT COMPLEX
BASIN MAP - 4
503 EAST HELENA STREET
ELLENSBURG, WASHINGTON
— PREPARED FOR —
MATTHEW STALDER
210 STRANDE ROAD ELLENSBURG WA, 98926 (206) 458-9419

PLSA
ENGINEERING-SURVEYING-PLANNING
521 N 20TH AVE., SUITE 3 YAKIMA, WASHINGTON (509) 575-6990

DATE	DRAWN BY	CHECKED BY	JOB NO.	DWG NAME
01-30-2024	T.K.L.		22212	XXXXXplt1.dwg

C1.0
OF
CITY OF ELLENSBURG

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	25 YR - 24 HR	E-WA Long R2 24-hr		Default	24.00	1	1.80	2
2	25 YR - 3 HR	E-WA Short 3-hr		Default	3.00	1	1.00	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
2,819	98	A-1 (A1)
11,017	98	B1 (B1)
2,375	98	B2 (B1)
700	98	B3 (B1)
4,700	98	D1 (D1)
1,487	98	SWALE D (D1)
2,412	98	drive lane (C1)
25,510	**98**	**TOTAL AREA**

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A1: half roof 2,819 sq. ft. Runoff Area=2,819 sf 100.00% Impervious Runoff Depth=1.58"
Tc=5.0 min CN=0/98 Runoff=0.02 cfs 370 cf

Subcatchment B1: Area B 14092 sq. ft. Runoff Area=14,092 sf 100.00% Impervious Runoff Depth=1.58"
Tc=5.0 min CN=0/98 Runoff=0.10 cfs 1,851 cf

Subcatchment C1: Drive Lane 2,412 sq. ft. Runoff Area=2,412 sf 100.00% Impervious Runoff Depth=1.58"
Tc=5.0 min CN=0/98 Runoff=0.02 cfs 317 cf

Subcatchment D1: adjacent 6,187 sq. ft. Runoff Area=6,187 sf 100.00% Impervious Runoff Depth=1.58"
Tc=5.0 min CN=0/98 Runoff=0.04 cfs 813 cf

Pond A: Swale A Peak Elev=1,627.98' Storage=147 cf Inflow=0.02 cfs 370 cf
Outflow=0.00 cfs 370 cf

Pond B: Pavers Peak Elev=101.34' Storage=780 cf Inflow=0.10 cfs 1,851 cf
Outflow=0.02 cfs 1,851 cf

Pond C: Pavers Peak Elev=101.67' Storage=147 cf Inflow=0.02 cfs 317 cf
Outflow=0.00 cfs 317 cf

Pond D: Swale D Peak Elev=1,628.86' Storage=141 cf Inflow=0.04 cfs 813 cf
Outflow=0.02 cfs 813 cf

Total Runoff Area = 25,510 sf Runoff Volume = 3,351 cf Average Runoff Depth = 1.58"
0.00% Pervious = 0 sf 100.00% Impervious = 25,510 sf

Summary for Subcatchment A1: half roof 2,819 sq. ft.

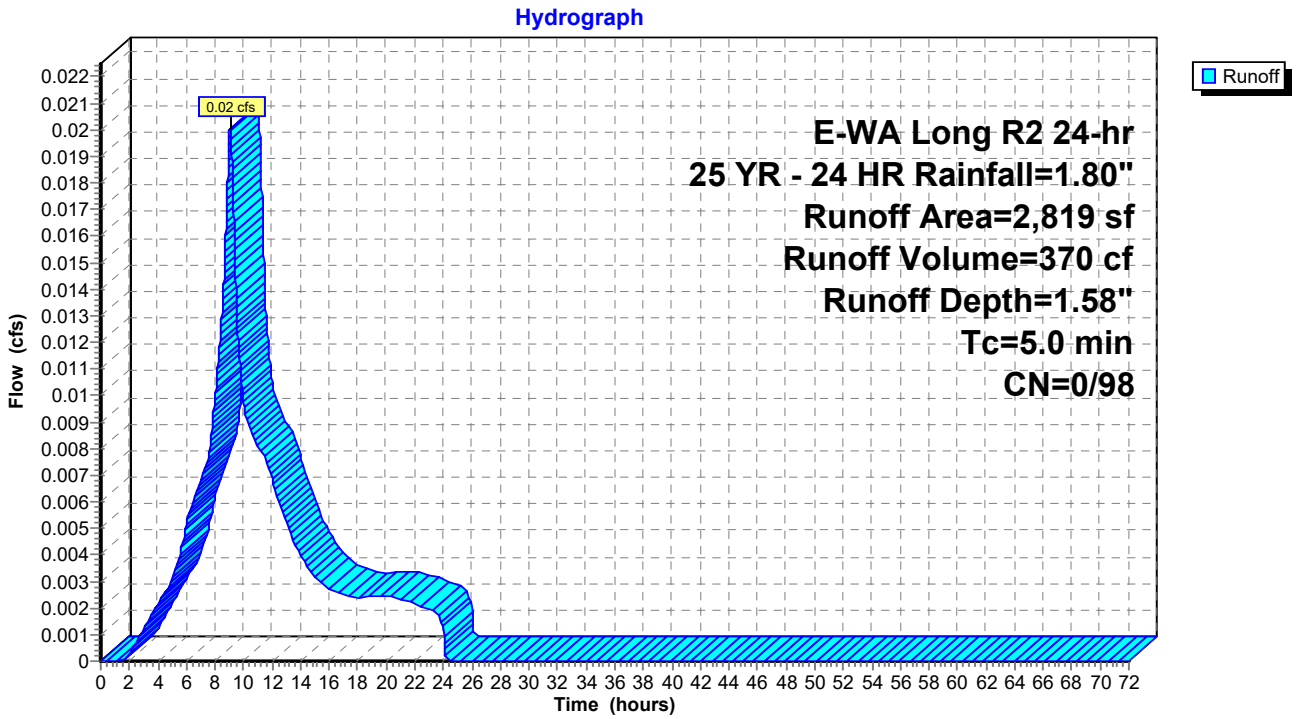
Runoff = 0.02 cfs @ 9.06 hrs, Volume= 370 cf, Depth= 1.58"
Routed to Pond A : Swale A

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
E-WA Long R2 24-hr 25 YR - 24 HR Rainfall=1.80"

	Area (sf)	CN	Description
*	2,819	98	A-1
	2,819		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, Minimum Value**

Subcatchment A1: half roof 2,819 sq. ft.



Summary for Subcatchment B1: Area B 14092 sq. ft.

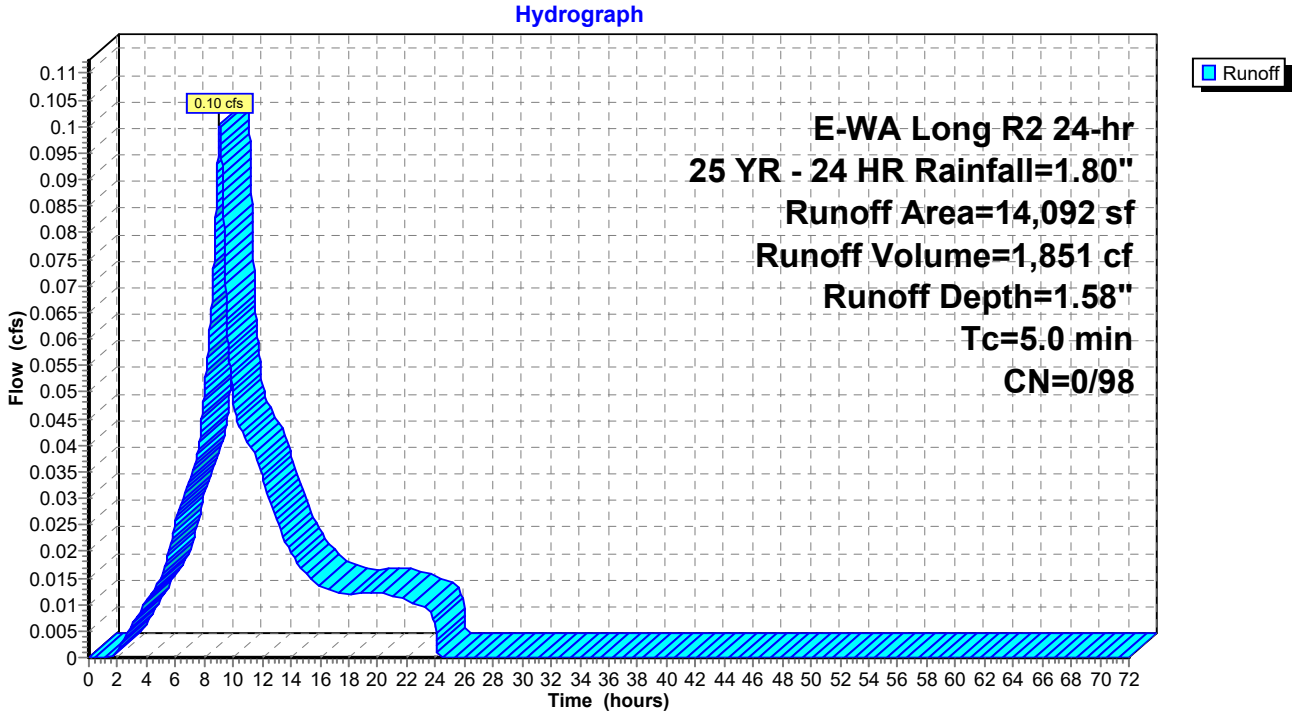
Runoff = 0.10 cfs @ 9.06 hrs, Volume= 1,851 cf, Depth= 1.58"
Routed to Pond B : Pavers

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
E-WA Long R2 24-hr 25 YR - 24 HR Rainfall=1.80"

	Area (sf)	CN	Description
*	11,017	98	B1
*	2,375	98	B2
*	700	98	B3
	14,092	98	Weighted Average
	14,092		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, Minimum Value**

Subcatchment B1: Area B 14092 sq. ft.



Summary for Subcatchment C1: Drive Lane 2,412 sq. ft.

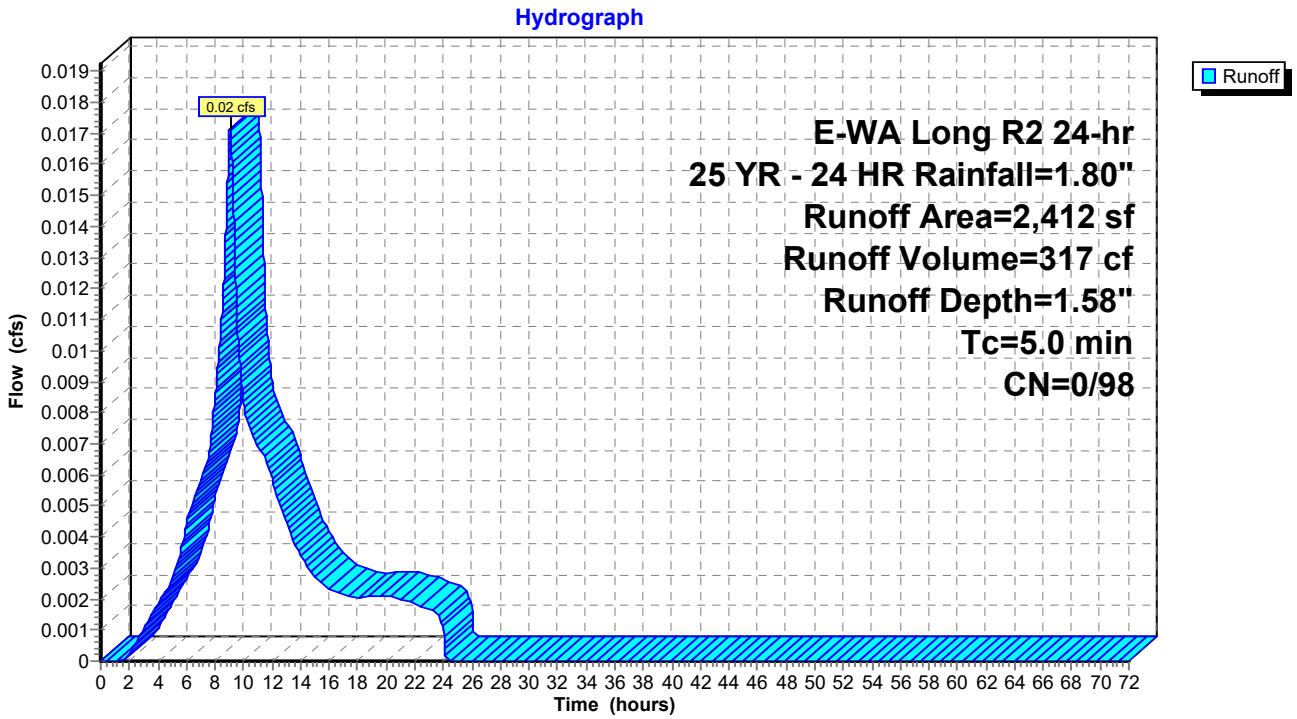
Runoff = 0.02 cfs @ 9.06 hrs, Volume= 317 cf, Depth= 1.58"
Routed to Pond C : Pavers

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
E-WA Long R2 24-hr 25 YR - 24 HR Rainfall=1.80"

	Area (sf)	CN	Description
*	2,412	98	drive lane
	2,412		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, Minimum Value**

Subcatchment C1: Drive Lane 2,412 sq. ft.



Summary for Subcatchment D1: adjacent 6,187 sq. ft.

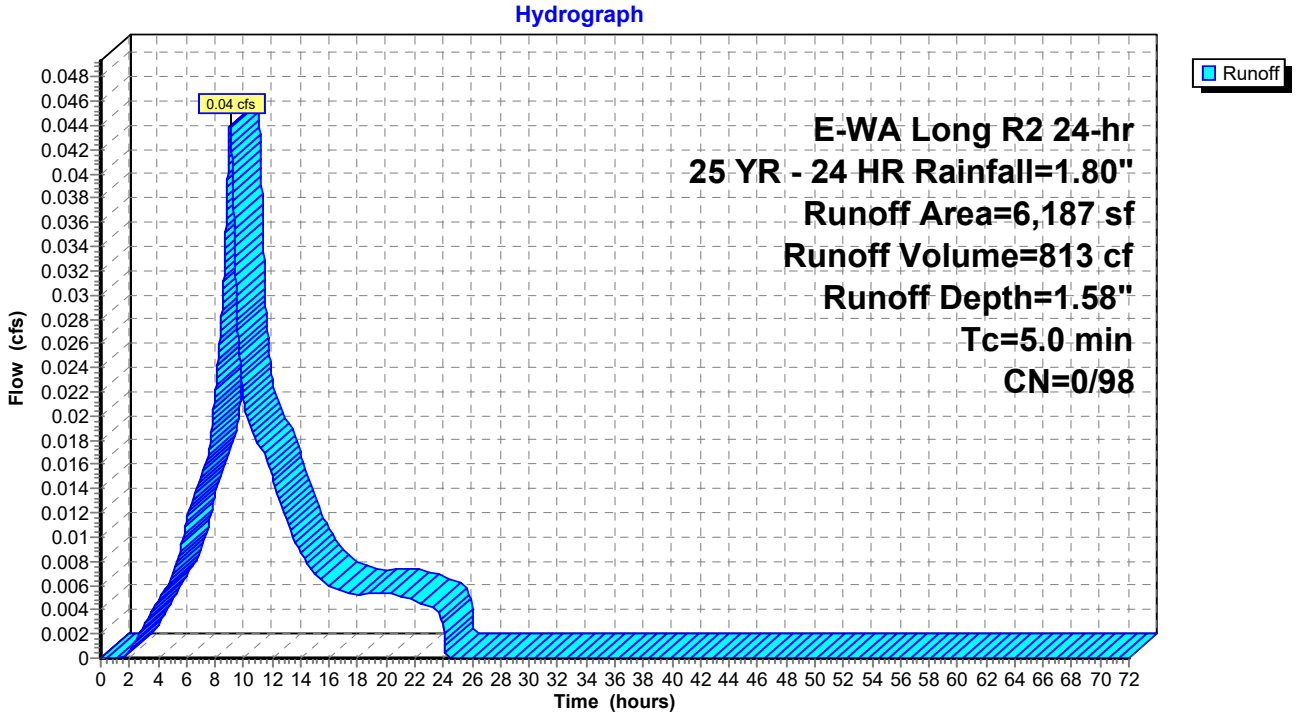
Runoff = 0.04 cfs @ 9.06 hrs, Volume= 813 cf, Depth= 1.58"
Routed to Pond D : Swale D

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
E-WA Long R2 24-hr 25 YR - 24 HR Rainfall=1.80"

	Area (sf)	CN	Description
*	4,700	98	D1
*	1,487	98	SWALE D
	6,187	98	Weighted Average
	6,187		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, Minimum Value**

Subcatchment D1: adjacent 6,187 sq. ft.



Summary for Pond A: Swale A

Inflow Area = 2,819 sf,100.00% Impervious, Inflow Depth = 1.58" for 25 YR - 24 HR event
Inflow = 0.02 cfs @ 9.06 hrs, Volume= 370 cf
Outflow = 0.00 cfs @ 13.67 hrs, Volume= 370 cf, Atten= 79%, Lag= 277.0 min
Discarded = 0.00 cfs @ 13.67 hrs, Volume= 370 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,627.98' @ 13.67 hrs Surf.Area= 373 sf Storage= 147 cf

Plug-Flow detention time= 366.2 min calculated for 370 cf (100% of inflow)
Center-of-Mass det. time= 366.2 min (1,048.5 - 682.3)

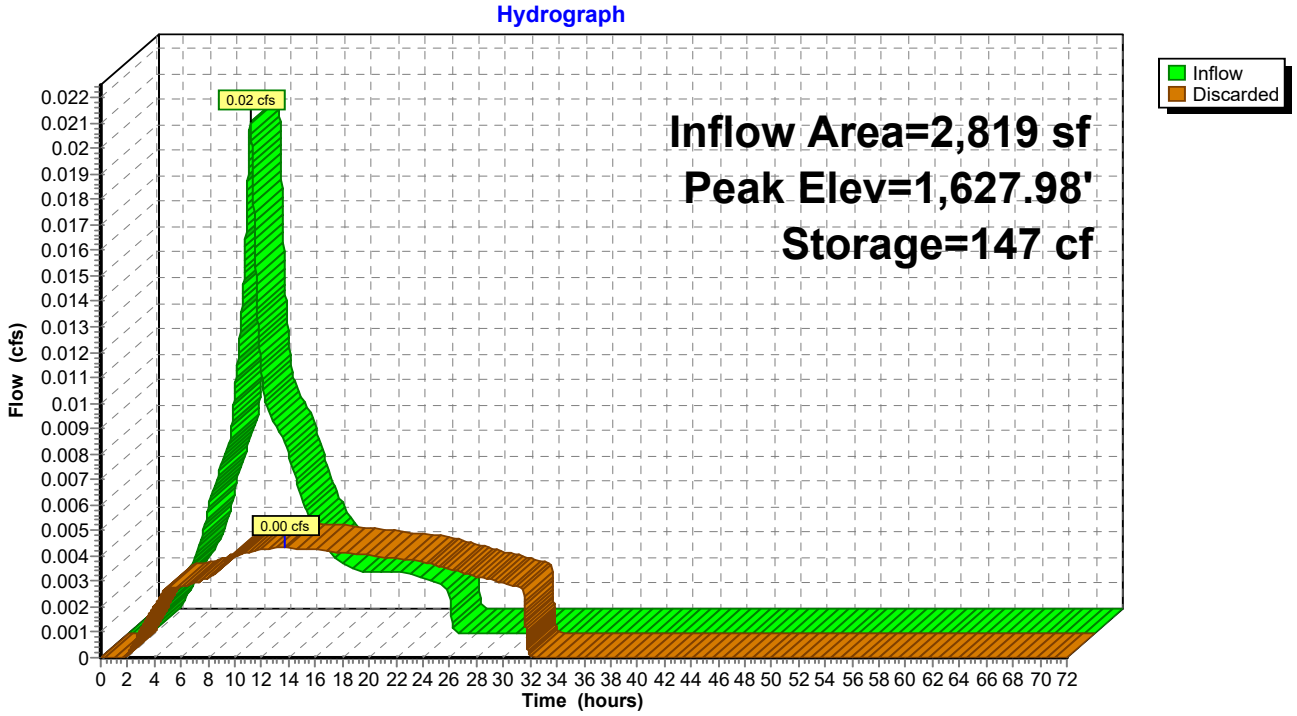
Volume	Invert	Avail.Storage	Storage Description
#1	1,627.50'	153 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,627.50	233	0	0
1,628.00	377	153	153

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,627.50'	**0.500 in/hr Exfiltration 0.5 In/Hr over Surface area**

Discarded OutFlow Max=0.00 cfs @ 13.67 hrs HW=1,627.98' (Free Discharge)
1=Exfiltration 0.5 In/Hr (Exfiltration Controls 0.00 cfs)

Pond A: Swale A



Summary for Pond B: Pavers

Inflow Area = 14,092 sf,100.00% Impervious, Inflow Depth = 1.58" for 25 YR - 24 HR event
Inflow = 0.10 cfs @ 9.06 hrs, Volume= 1,851 cf
Outflow = 0.02 cfs @ 5.39 hrs, Volume= 1,851 cf, Atten= 83%, Lag= 0.0 min
Discarded = 0.02 cfs @ 5.39 hrs, Volume= 1,851 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 101.34' @ 14.67 hrs Surf.Area= 1,461 sf Storage= 780 cf

Plug-Flow detention time= 450.9 min calculated for 1,851 cf (100% of inflow)
Center-of-Mass det. time= 450.9 min (1,133.2 - 682.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	100.00'	879 cf	**23.00'W x 63.50'L x 1.97'H Field A** 2,872 cf Overall - 674 cf Embedded = 2,199 cf x 40.0% Voids
#2A	101.50'	150 cf	**PaveDrain S6-45** x 1575 Inside #1 Inside= 7.1"W x 5.6"H => 0.10 sf x 1.00'L = 0.1 cf Outside= 12.0"W x 5.6"H => 0.43 sf x 1.00'L = 0.4 cf 1575 Chambers in 25 Rows
		1,030 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	100.00'	**0.500 in/hr Exfiltration 0.5 in/hr over Surface area**

Discarded OutFlow Max=0.02 cfs @ 5.39 hrs HW=100.02' (Free Discharge)
↑**1=Exfiltration 0.5 in/hr** (Exfiltration Controls 0.02 cfs)

Pond B: Pavers - Chamber Wizard Field A

Chamber Model = PaveDrain S6-45 (PaveDrain 12x12 Block with gap storage)
Inside= 7.1"W x 5.6"H => 0.10 sf x 1.00'L = 0.1 cf
Outside= 12.0"W x 5.6"H => 0.43 sf x 1.00'L = 0.4 cf

12.0" Wide - 1.0" Nesting = 11.0" C-C Row Spacing

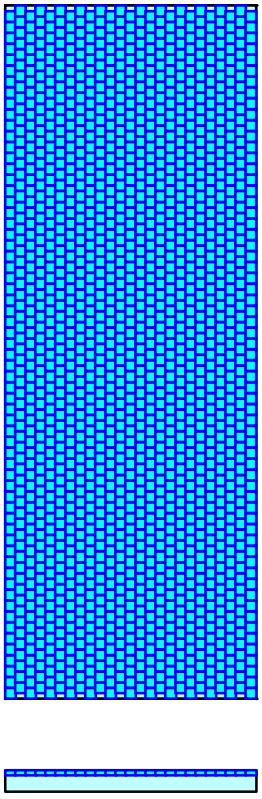
63 Chambers/Row x 1.00' Long = 63.00' Row Length +0.50' Row Offset = 63.50' Base Length
25 Rows x 12.0" Wide - 1.0" Nesting x 24 = 23.00' Base Width
18.0" Stone Base + 5.6" Chamber Height = 1.97' Field Height

1,575 Chambers x 0.1 cf = 150.4 cf Chamber Storage
1,575 Chambers x 0.4 cf = 673.8 cf Displacement

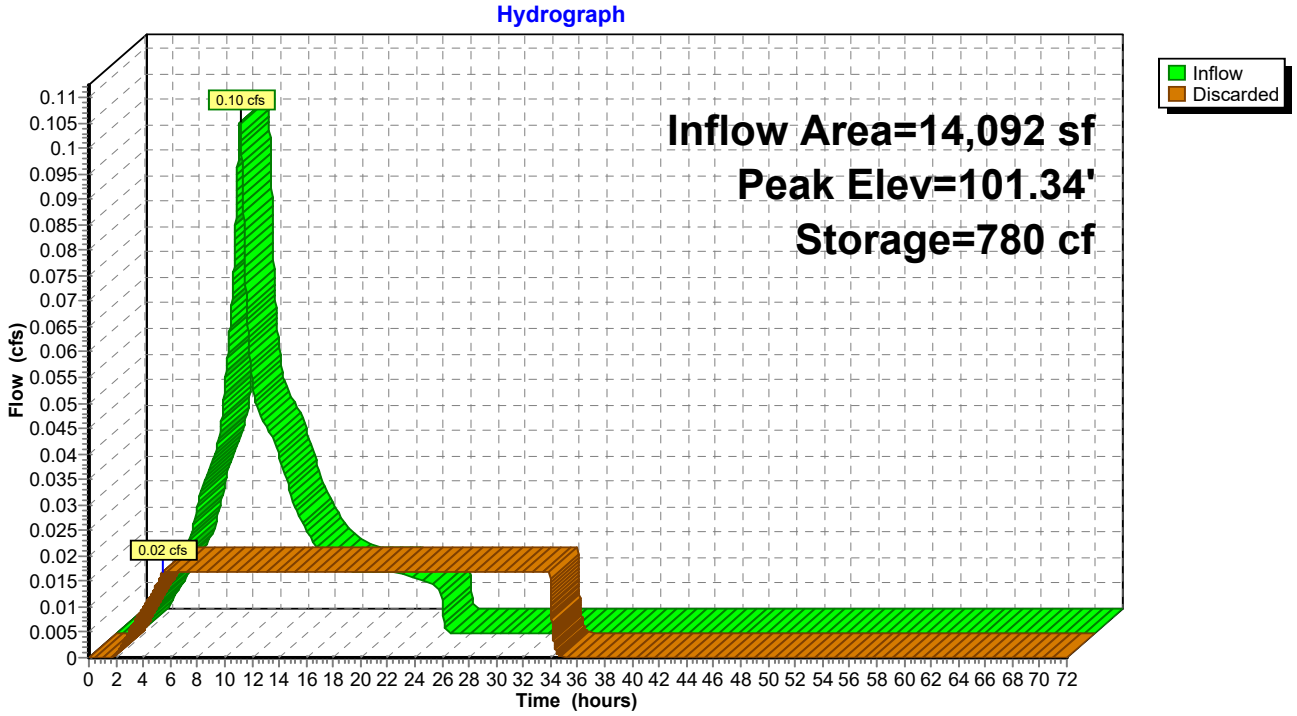
2,872.3 cf Field - 673.8 cf Chambers = 2,198.6 cf Stone x 40.0% Voids = 879.4 cf Stone Storage

Chamber Storage + Stone Storage = 1,029.8 cf = 0.024 af
Overall Storage Efficiency = 35.9%
Overall System Size = 63.50' x 23.00' x 1.97'

1,575 Chambers
106.4 cy Field
81.4 cy Stone



Pond B: Pavers



Summary for Pond C: Pavers

Inflow Area = 2,412 sf,100.00% Impervious, Inflow Depth = 1.58" for 25 YR - 24 HR event
Inflow = 0.02 cfs @ 9.06 hrs, Volume= 317 cf
Outflow = 0.00 cfs @ 5.07 hrs, Volume= 317 cf, Atten= 85%, Lag= 0.0 min
Discarded = 0.00 cfs @ 5.07 hrs, Volume= 317 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 101.67' @ 15.45 hrs Surf.Area= 216 sf Storage= 147 cf

Plug-Flow detention time= 579.6 min calculated for 317 cf (100% of inflow)
Center-of-Mass det. time= 579.7 min (1,262.0 - 682.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	100.00'	131 cf	**11.08'W x 19.50'L x 1.97'H Field A** 425 cf Overall - 98 cf Embedded = 328 cf x 40.0% Voids
#2A	101.50'	22 cf	**PaveDrain S6-45** x 228 Inside #1 Inside= 7.1"W x 5.6"H => 0.10 sf x 1.00'L = 0.1 cf Outside= 12.0"W x 5.6"H => 0.43 sf x 1.00'L = 0.4 cf 228 Chambers in 12 Rows
		153 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	100.00'	**0.500 in/hr Exfiltration 0.5 in/hr over Surface area**

Discarded OutFlow Max=0.00 cfs @ 5.07 hrs HW=100.02' (Free Discharge)
↑**1=Exfiltration 0.5 in/hr** (Exfiltration Controls 0.00 cfs)

Pond C: Pavers - Chamber Wizard Field A

Chamber Model = PaveDrain S6-45 (PaveDrain 12x12 Block with gap storage)
Inside= 7.1"W x 5.6"H => 0.10 sf x 1.00'L = 0.1 cf
Outside= 12.0"W x 5.6"H => 0.43 sf x 1.00'L = 0.4 cf

12.0" Wide - 1.0" Nesting = 11.0" C-C Row Spacing

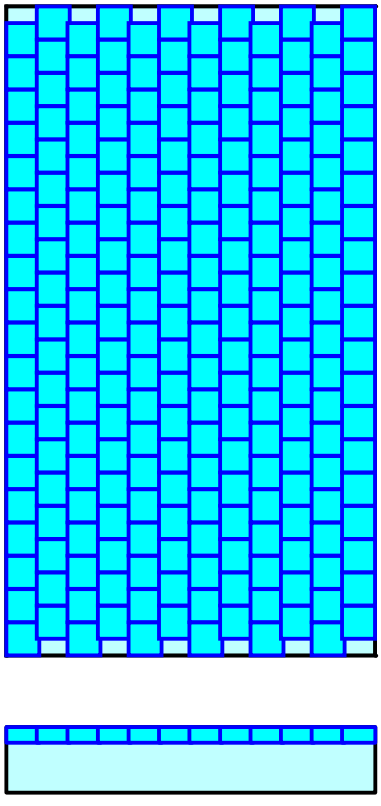
19 Chambers/Row x 1.00' Long = 19.00' Row Length +0.50' Row Offset = 19.50' Base Length
12 Rows x 12.0" Wide - 1.0" Nesting x 11 = 11.08' Base Width
18.0" Stone Base + 5.6" Chamber Height = 1.97' Field Height

228 Chambers x 0.1 cf = 21.8 cf Chamber Storage
228 Chambers x 0.4 cf = 97.5 cf Displacement

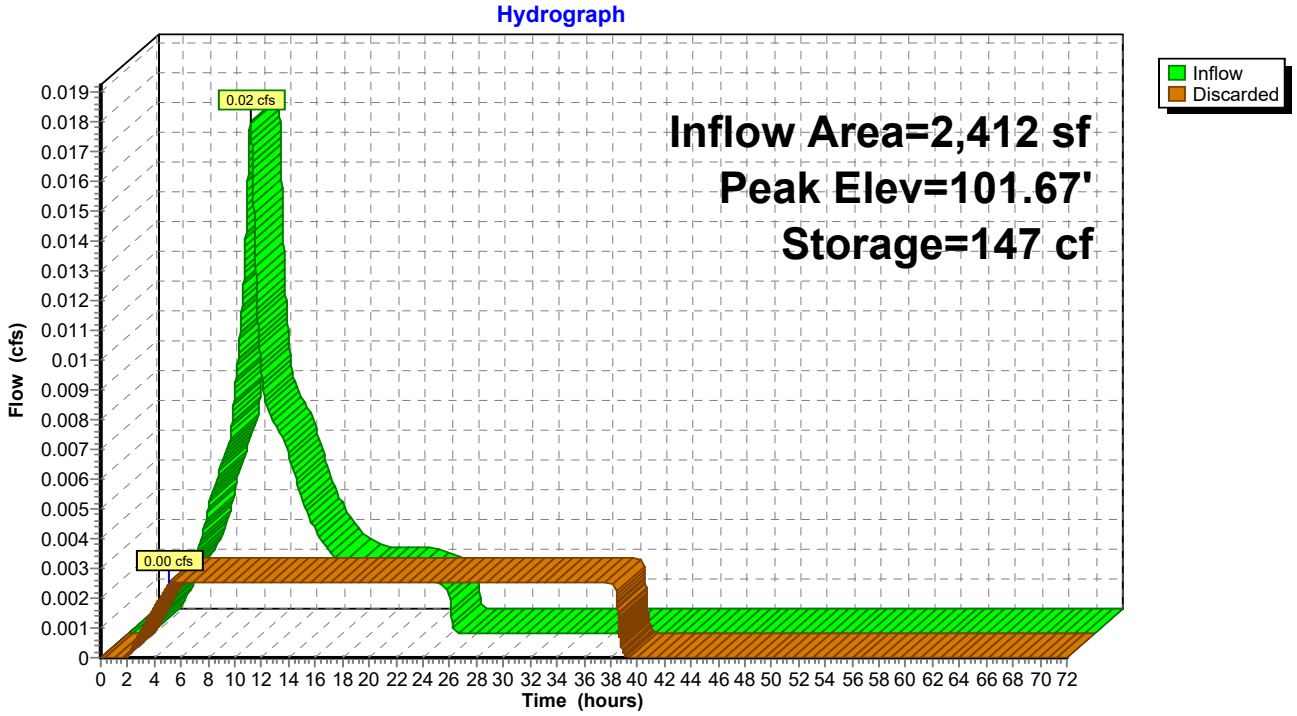
425.0 cf Field - 97.5 cf Chambers = 327.5 cf Stone x 40.0% Voids = 131.0 cf Stone Storage

Chamber Storage + Stone Storage = 152.8 cf = 0.004 af
Overall Storage Efficiency = 35.9%
Overall System Size = 19.50' x 11.08' x 1.97'

228 Chambers
15.7 cy Field
12.1 cy Stone



Pond C: Pavers



Summary for Pond D: Swale D

Inflow Area = 6,187 sf,100.00% Impervious, Inflow Depth = 1.58" for 25 YR - 24 HR event
Inflow = 0.04 cfs @ 9.06 hrs, Volume= 813 cf
Outflow = 0.02 cfs @ 11.80 hrs, Volume= 813 cf, Atten= 64%, Lag= 164.8 min
Discarded = 0.02 cfs @ 11.80 hrs, Volume= 813 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,628.86' @ 11.80 hrs Surf.Area= 1,367 sf Storage= 141 cf

Plug-Flow detention time= 65.7 min calculated for 813 cf (100% of inflow)
Center-of-Mass det. time= 65.7 min (748.1 - 682.3)

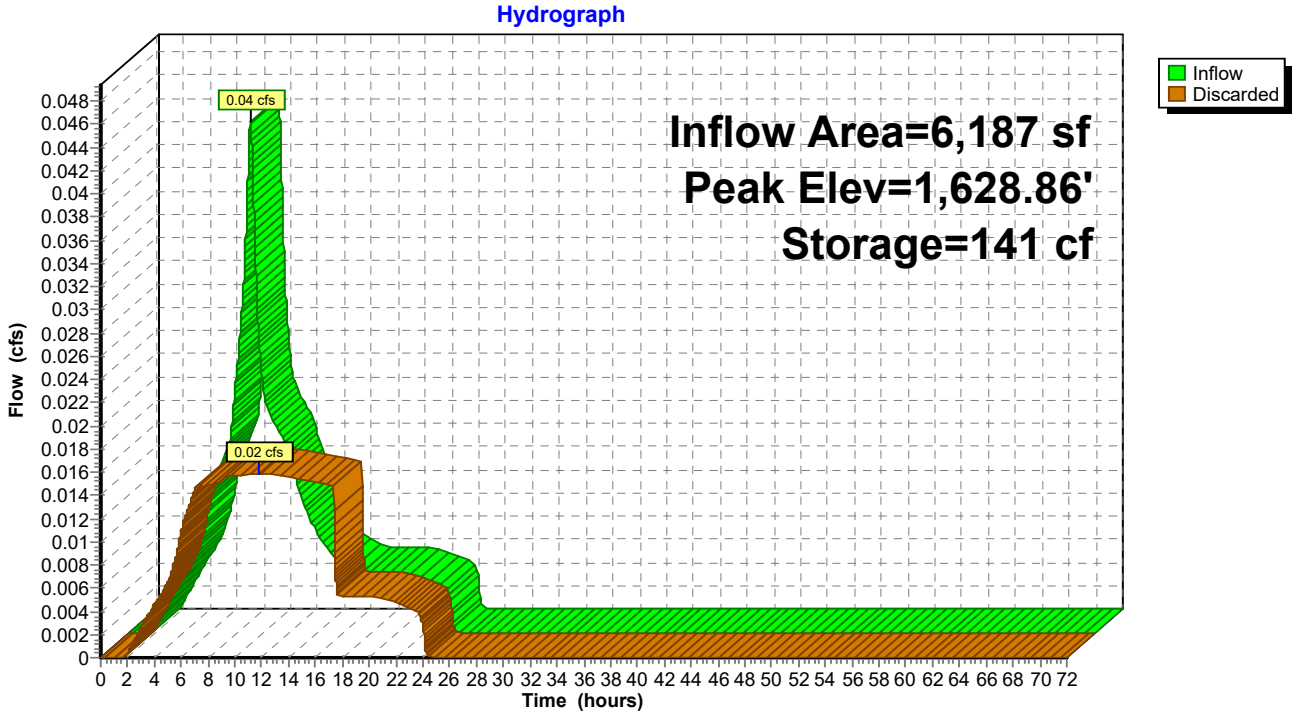
Volume	Invert	Avail.Storage	Storage Description
#1	1,628.75'	346 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,628.75	1,278	0	0
1,629.00	1,487	346	346

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,628.75'	**0.500 in/hr Exfiltration 0.5 In/Hr over Surface area**

Discarded OutFlow Max=0.02 cfs @ 11.80 hrs HW=1,628.86' (Free Discharge)
1=Exfiltration 0.5 In/Hr (Exfiltration Controls 0.02 cfs)

Pond D: Swale D



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentA1: half roof 2,819 sq. ft. Runoff Area=2,819 sf 100.00% Impervious Runoff Depth=0.79"
Tc=5.0 min CN=0/98 Runoff=0.13 cfs 186 cf

SubcatchmentB1: Area B 14092 sq. ft. Runoff Area=14,092 sf 100.00% Impervious Runoff Depth=0.79"
Tc=5.0 min CN=0/98 Runoff=0.64 cfs 929 cf

SubcatchmentC1: Drive Lane 2,412 sq. ft. Runoff Area=2,412 sf 100.00% Impervious Runoff Depth=0.79"
Tc=5.0 min CN=0/98 Runoff=0.11 cfs 159 cf

SubcatchmentD1: adjacent 6,187 sq. ft. Runoff Area=6,187 sf 100.00% Impervious Runoff Depth=0.79"
Tc=5.0 min CN=0/98 Runoff=0.28 cfs 408 cf

Pond A: Swale A Peak Elev=1,628.00' Storage=152 cf Inflow=0.13 cfs 186 cf
Outflow=0.00 cfs 186 cf

Pond B: Pavers Peak Elev=101.33' Storage=779 cf Inflow=0.64 cfs 929 cf
Outflow=0.02 cfs 929 cf

Pond C: Pavers Peak Elev=101.56' Storage=137 cf Inflow=0.11 cfs 159 cf
Outflow=0.00 cfs 159 cf

Pond D: Swale D Peak Elev=1,628.97' Storage=303 cf Inflow=0.28 cfs 408 cf
Outflow=0.02 cfs 408 cf

Total Runoff Area = 25,510 sf Runoff Volume = 1,681 cf Average Runoff Depth = 0.79"
0.00% Pervious = 0 sf 100.00% Impervious = 25,510 sf

Summary for Subcatchment A1: half roof 2,819 sq. ft.

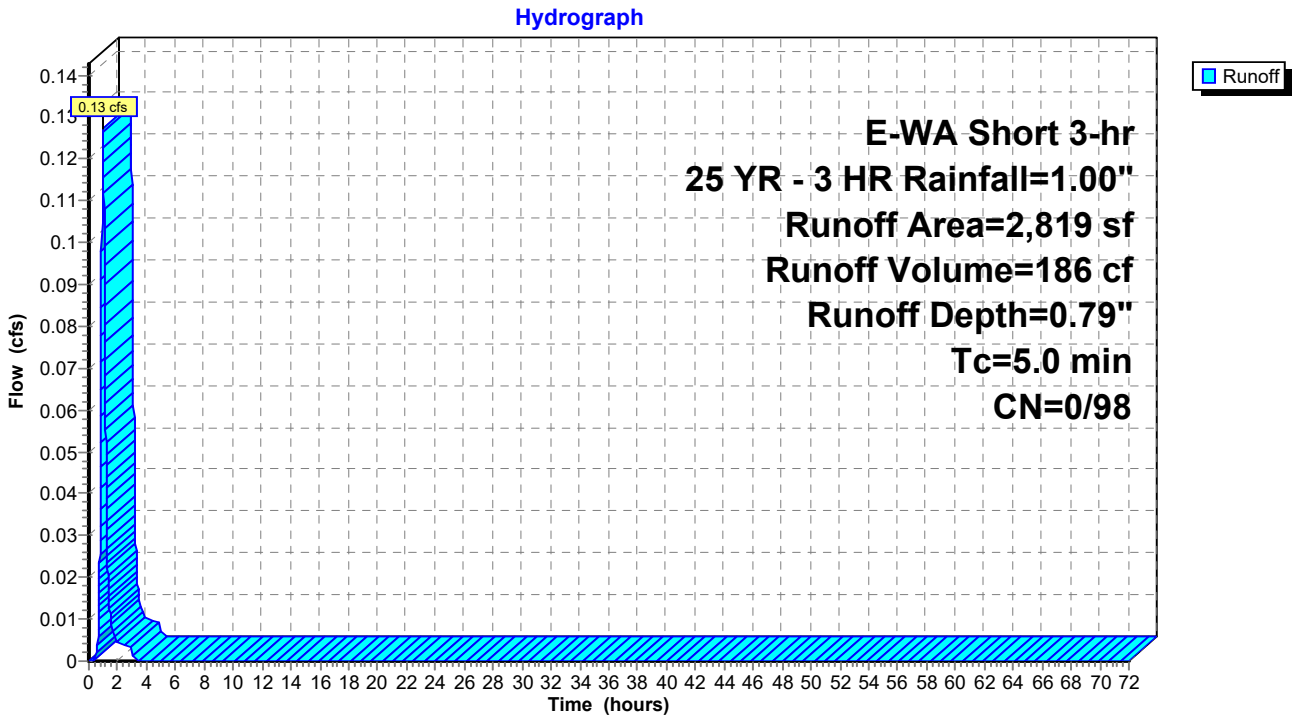
Runoff = 0.13 cfs @ 0.97 hrs, Volume= 186 cf, Depth= 0.79"
Routed to Pond A : Swale A

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
E-WA Short 3-hr 25 YR - 3 HR Rainfall=1.00"

	Area (sf)	CN	Description
*	2,819	98	A-1
	2,819		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, Minimum Value**

Subcatchment A1: half roof 2,819 sq. ft.



Summary for Subcatchment B1: Area B 14092 sq. ft.

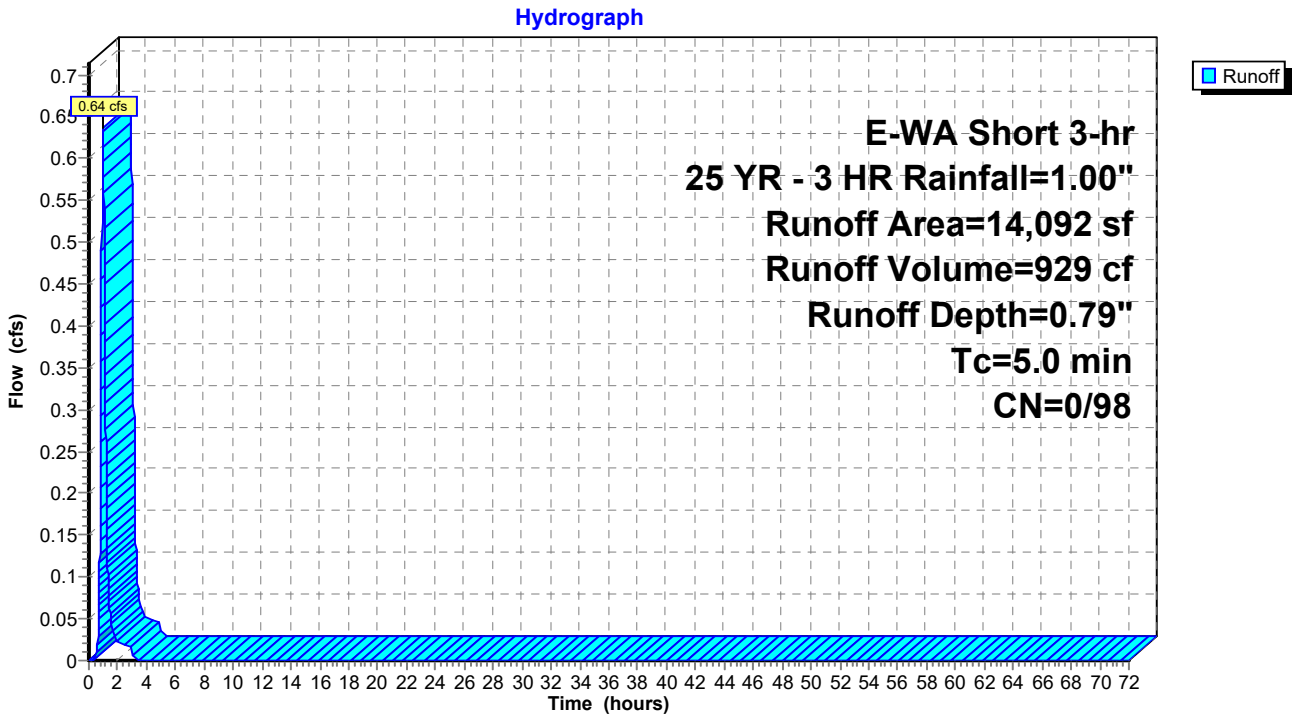
Runoff = 0.64 cfs @ 0.97 hrs, Volume= 929 cf, Depth= 0.79"
Routed to Pond B : Pavers

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
E-WA Short 3-hr 25 YR - 3 HR Rainfall=1.00"

	Area (sf)	CN	Description
*	11,017	98	B1
*	2,375	98	B2
*	700	98	B3
	14,092	98	Weighted Average
	14,092		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, Minimum Value**

Subcatchment B1: Area B 14092 sq. ft.



Summary for Subcatchment C1: Drive Lane 2,412 sq. ft.

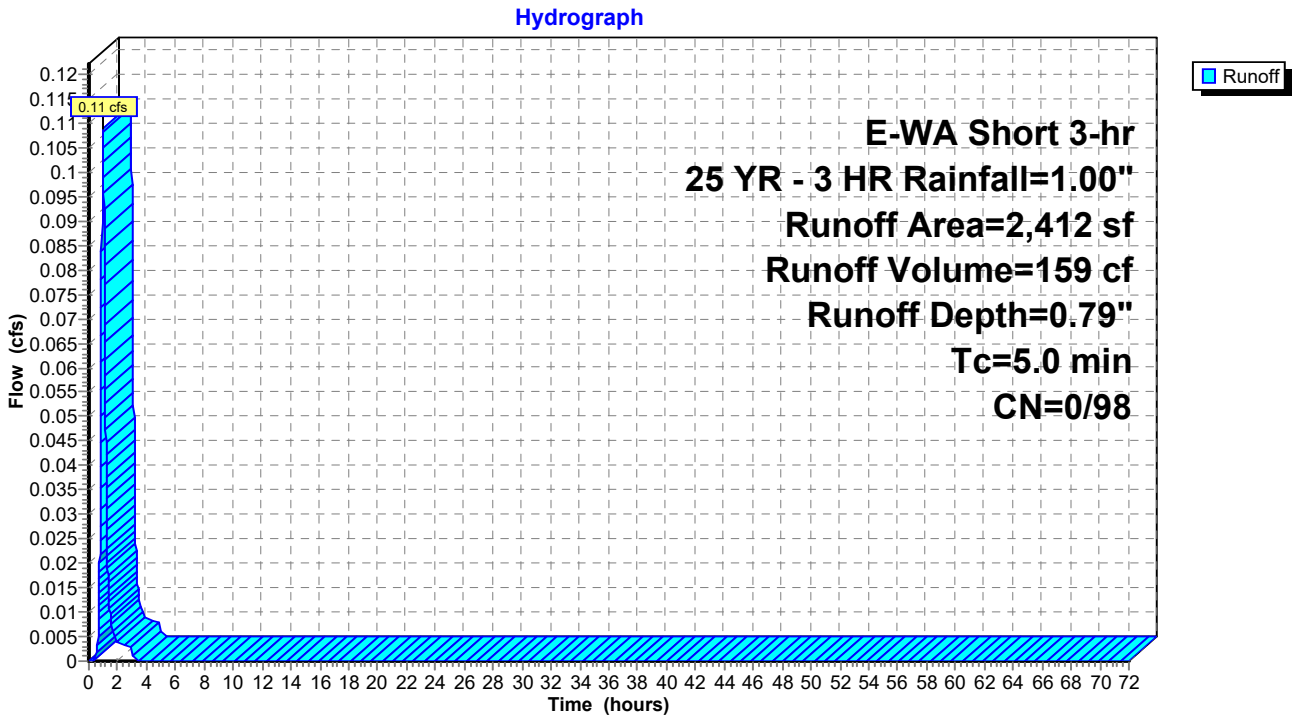
Runoff = 0.11 cfs @ 0.97 hrs, Volume= 159 cf, Depth= 0.79"
Routed to Pond C : Pavers

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
E-WA Short 3-hr 25 YR - 3 HR Rainfall=1.00"

	Area (sf)	CN	Description
*	2,412	98	drive lane
	2,412		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, Minimum Value**

Subcatchment C1: Drive Lane 2,412 sq. ft.



Summary for Subcatchment D1: adjacent 6,187 sq. ft.

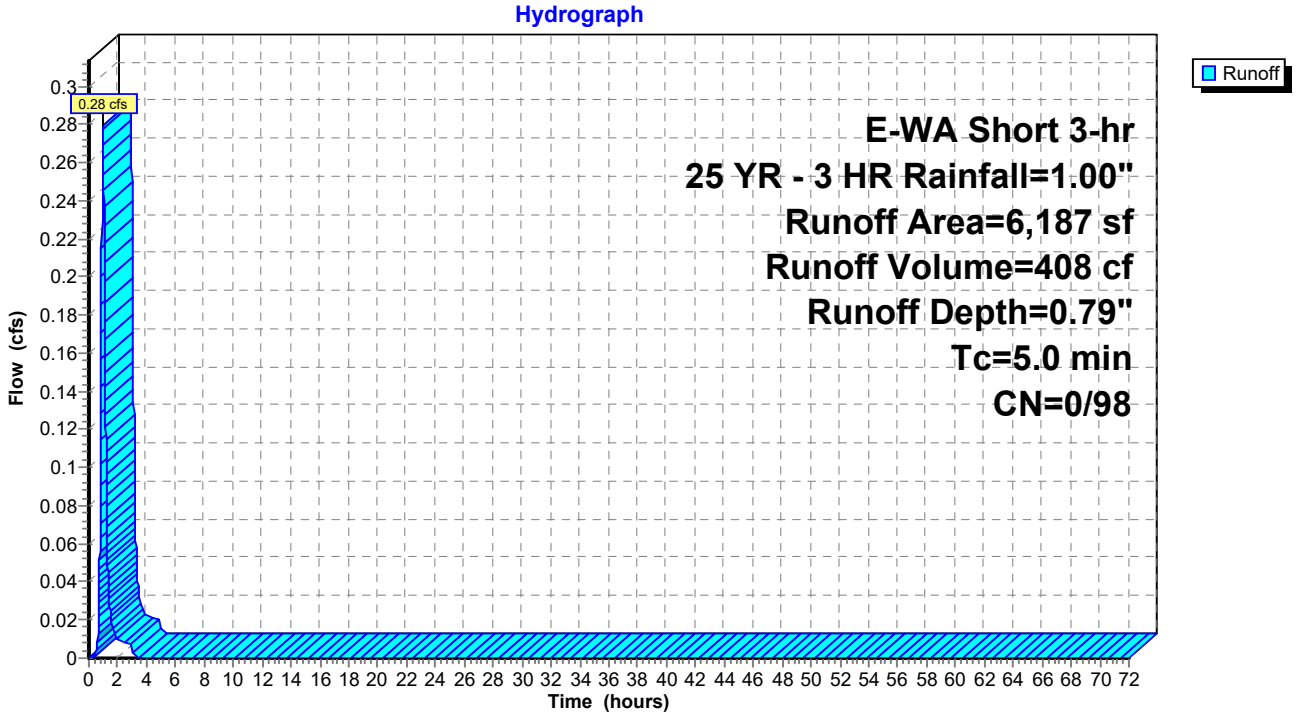
Runoff = 0.28 cfs @ 0.97 hrs, Volume= 408 cf, Depth= 0.79"
Routed to Pond D : Swale D

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
E-WA Short 3-hr 25 YR - 3 HR Rainfall=1.00"

	Area (sf)	CN	Description
*	4,700	98	D1
*	1,487	98	SWALE D
	6,187	98	Weighted Average
	6,187		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, Minimum Value**

Subcatchment D1: adjacent 6,187 sq. ft.



Summary for Pond A: Swale A

Inflow Area = 2,819 sf,100.00% Impervious, Inflow Depth = 0.79" for 25 YR - 3 HR event
Inflow = 0.13 cfs @ 0.97 hrs, Volume= 186 cf
Outflow = 0.00 cfs @ 2.02 hrs, Volume= 186 cf, Atten= 97%, Lag= 63.0 min
Discarded = 0.00 cfs @ 2.02 hrs, Volume= 186 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,628.00' @ 2.02 hrs Surf.Area= 377 sf Storage= 152 cf

Plug-Flow detention time= 363.0 min calculated for 186 cf (100% of inflow)
Center-of-Mass det. time= 363.0 min (433.8 - 70.8)

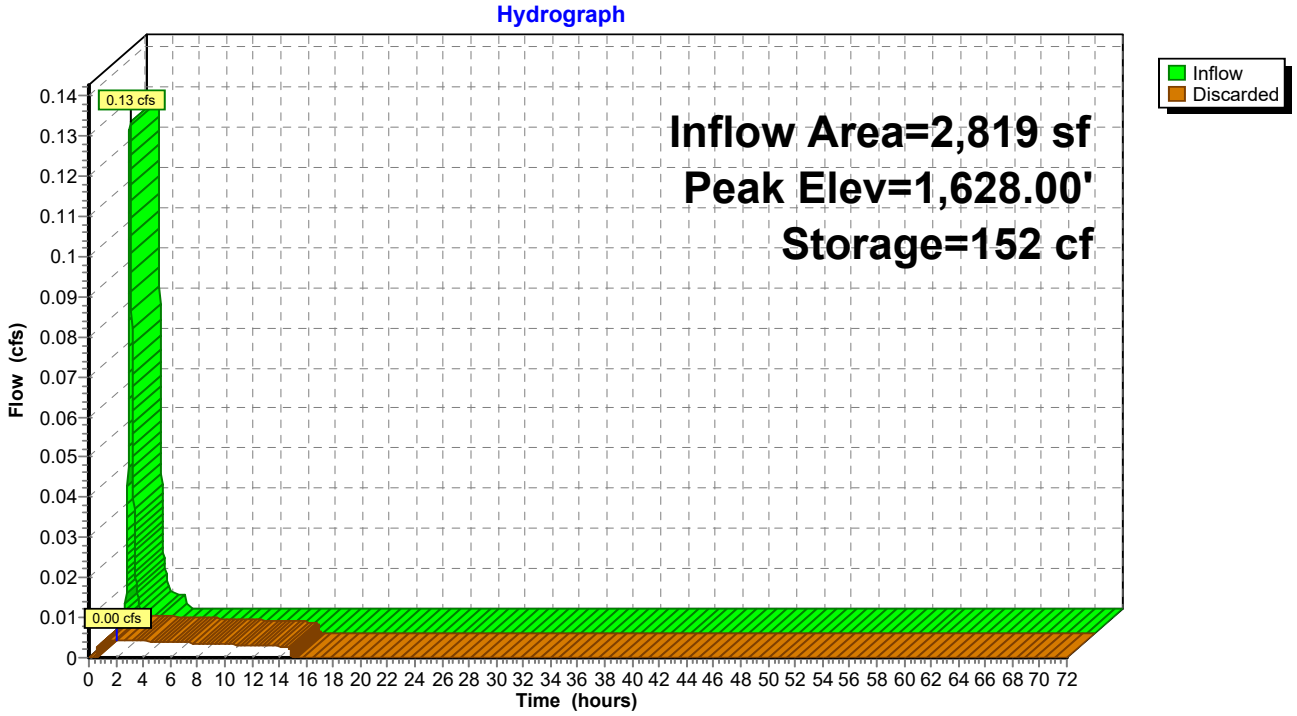
Volume	Invert	Avail.Storage	Storage Description
#1	1,627.50'	153 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,627.50	233	0	0
1,628.00	377	153	153

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,627.50'	**0.500 in/hr Exfiltration 0.5 In/Hr over Surface area**

Discarded OutFlow Max=0.00 cfs @ 2.02 hrs HW=1,628.00' (Free Discharge)
1=Exfiltration 0.5 In/Hr (Exfiltration Controls 0.00 cfs)

Pond A: Swale A



Summary for Pond B: Pavers

Inflow Area = 14,092 sf,100.00% Impervious, Inflow Depth = 0.79" for 25 YR - 3 HR event
Inflow = 0.64 cfs @ 0.97 hrs, Volume= 929 cf
Outflow = 0.02 cfs @ 0.70 hrs, Volume= 929 cf, Atten= 97%, Lag= 0.0 min
Discarded = 0.02 cfs @ 0.70 hrs, Volume= 929 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 101.33' @ 3.01 hrs Surf.Area= 1,461 sf Storage= 779 cf

Plug-Flow detention time= 425.5 min calculated for 929 cf (100% of inflow)
Center-of-Mass det. time= 425.5 min (496.3 - 70.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	100.00'	879 cf	**23.00'W x 63.50'L x 1.97'H Field A** 2,872 cf Overall - 674 cf Embedded = 2,199 cf x 40.0% Voids
#2A	101.50'	150 cf	**PaveDrain S6-45** x 1575 Inside #1 Inside= 7.1"W x 5.6"H => 0.10 sf x 1.00'L = 0.1 cf Outside= 12.0"W x 5.6"H => 0.43 sf x 1.00'L = 0.4 cf 1575 Chambers in 25 Rows
		1,030 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	100.00'	**0.500 in/hr Exfiltration 0.5 in/hr over Surface area**

Discarded OutFlow Max=0.02 cfs @ 0.70 hrs HW=100.02' (Free Discharge)
↑**1=Exfiltration 0.5 in/hr** (Exfiltration Controls 0.02 cfs)

Pond B: Pavers - Chamber Wizard Field A

Chamber Model = PaveDrain S6-45 (PaveDrain 12x12 Block with gap storage)
Inside= 7.1"W x 5.6"H => 0.10 sf x 1.00'L = 0.1 cf
Outside= 12.0"W x 5.6"H => 0.43 sf x 1.00'L = 0.4 cf

12.0" Wide - 1.0" Nesting = 11.0" C-C Row Spacing

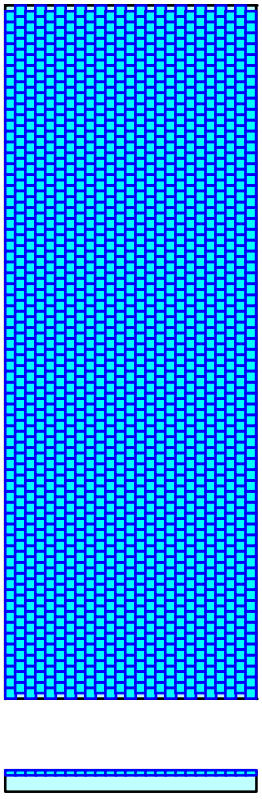
63 Chambers/Row x 1.00' Long = 63.00' Row Length +0.50' Row Offset = 63.50' Base Length
25 Rows x 12.0" Wide - 1.0" Nesting x 24 = 23.00' Base Width
18.0" Stone Base + 5.6" Chamber Height = 1.97' Field Height

1,575 Chambers x 0.1 cf = 150.4 cf Chamber Storage
1,575 Chambers x 0.4 cf = 673.8 cf Displacement

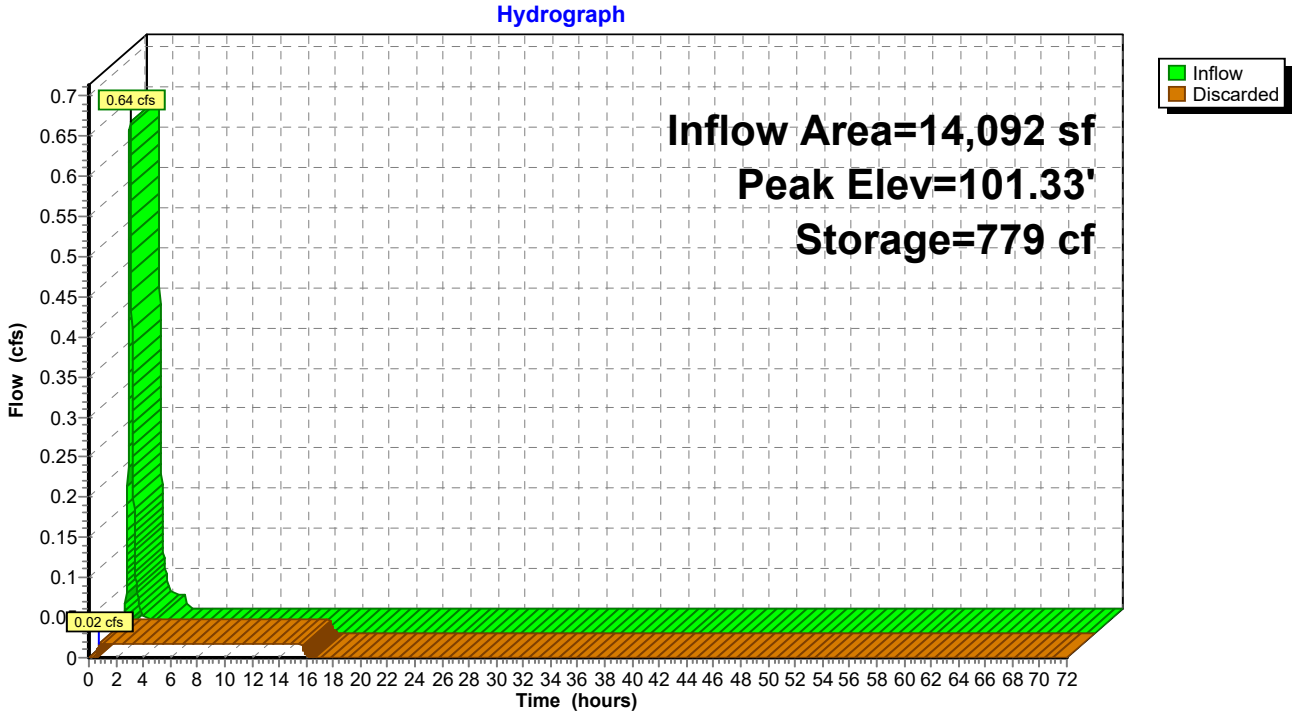
2,872.3 cf Field - 673.8 cf Chambers = 2,198.6 cf Stone x 40.0% Voids = 879.4 cf Stone Storage

Chamber Storage + Stone Storage = 1,029.8 cf = 0.024 af
Overall Storage Efficiency = 35.9%
Overall System Size = 63.50' x 23.00' x 1.97'

1,575 Chambers
106.4 cy Field
81.4 cy Stone



Pond B: Pavers



Summary for Pond C: Pavers

Inflow Area = 2,412 sf,100.00% Impervious, Inflow Depth = 0.79" for 25 YR - 3 HR event
Inflow = 0.11 cfs @ 0.97 hrs, Volume= 159 cf
Outflow = 0.00 cfs @ 0.69 hrs, Volume= 159 cf, Atten= 98%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.69 hrs, Volume= 159 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 101.56' @ 3.02 hrs Surf.Area= 216 sf Storage= 137 cf

Plug-Flow detention time= 496.6 min calculated for 159 cf (100% of inflow)
Center-of-Mass det. time= 496.7 min (567.5 - 70.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	100.00'	131 cf	**11.08'W x 19.50'L x 1.97'H Field A** 425 cf Overall - 98 cf Embedded = 328 cf x 40.0% Voids
#2A	101.50'	22 cf	**PaveDrain S6-45** x 228 Inside #1 Inside= 7.1"W x 5.6"H => 0.10 sf x 1.00'L = 0.1 cf Outside= 12.0"W x 5.6"H => 0.43 sf x 1.00'L = 0.4 cf 228 Chambers in 12 Rows
		153 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	100.00'	**0.500 in/hr Exfiltration 0.5 in/hr over Surface area**

Discarded OutFlow Max=0.00 cfs @ 0.69 hrs HW=100.02' (Free Discharge)
↑**1=Exfiltration 0.5 in/hr** (Exfiltration Controls 0.00 cfs)

Pond C: Pavers - Chamber Wizard Field A

Chamber Model = PaveDrain S6-45 (PaveDrain 12x12 Block with gap storage)
Inside= 7.1"W x 5.6"H => 0.10 sf x 1.00'L = 0.1 cf
Outside= 12.0"W x 5.6"H => 0.43 sf x 1.00'L = 0.4 cf

12.0" Wide - 1.0" Nesting = 11.0" C-C Row Spacing

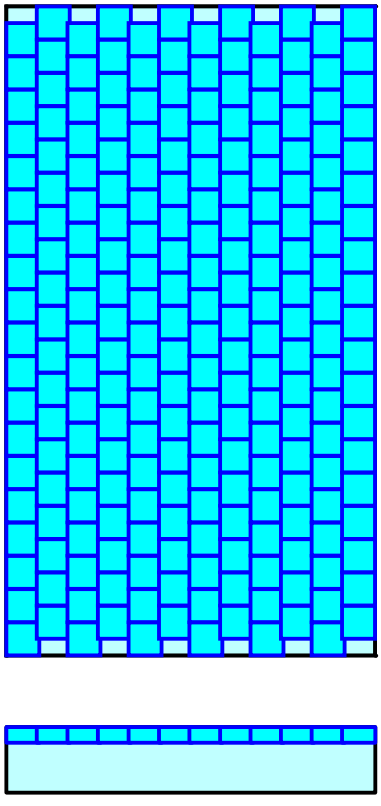
19 Chambers/Row x 1.00' Long = 19.00' Row Length +0.50' Row Offset = 19.50' Base Length
12 Rows x 12.0" Wide - 1.0" Nesting x 11 = 11.08' Base Width
18.0" Stone Base + 5.6" Chamber Height = 1.97' Field Height

228 Chambers x 0.1 cf = 21.8 cf Chamber Storage
228 Chambers x 0.4 cf = 97.5 cf Displacement

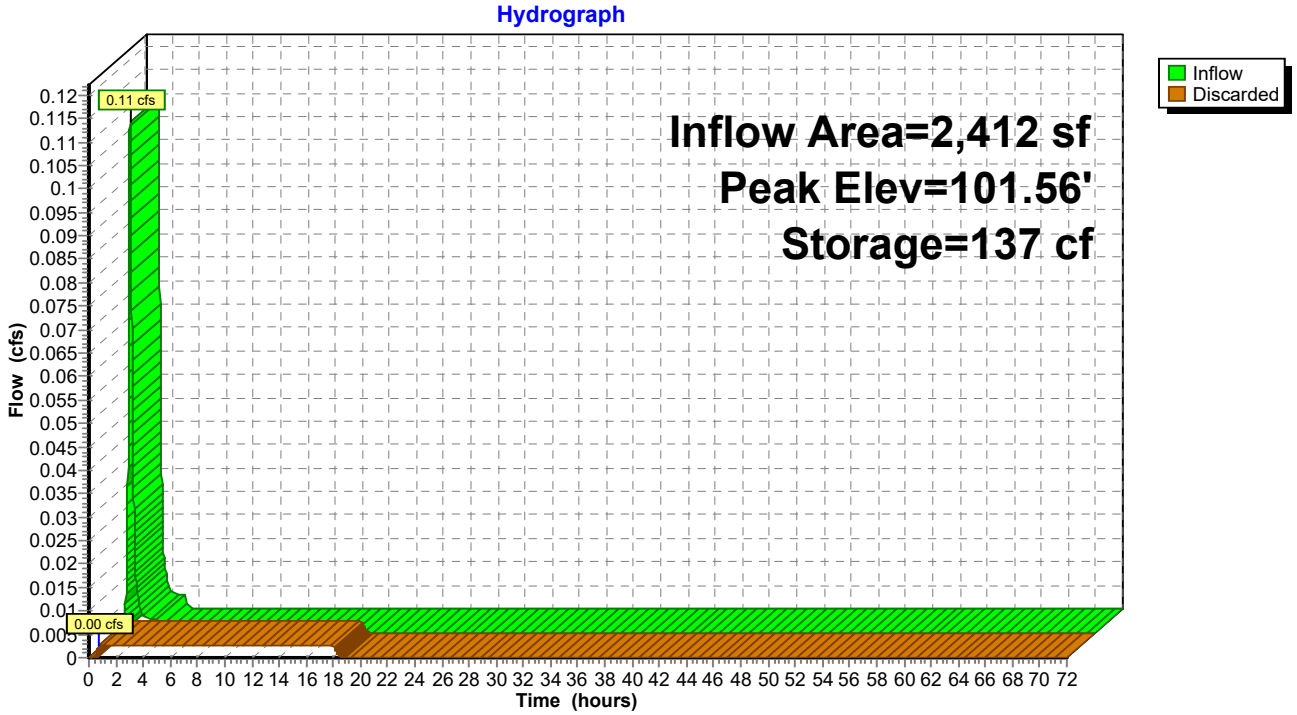
425.0 cf Field - 97.5 cf Chambers = 327.5 cf Stone x 40.0% Voids = 131.0 cf Stone Storage

Chamber Storage + Stone Storage = 152.8 cf = 0.004 af
Overall Storage Efficiency = 35.9%
Overall System Size = 19.50' x 11.08' x 1.97'

228 Chambers
15.7 cy Field
12.1 cy Stone



Pond C: Pavers



Summary for Pond D: Swale D

Inflow Area = 6,187 sf,100.00% Impervious, Inflow Depth = 0.79" for 25 YR - 3 HR event
Inflow = 0.28 cfs @ 0.97 hrs, Volume= 408 cf
Outflow = 0.02 cfs @ 1.61 hrs, Volume= 408 cf, Atten= 94%, Lag= 38.2 min
Discarded = 0.02 cfs @ 1.61 hrs, Volume= 408 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,628.97' @ 1.61 hrs Surf.Area= 1,463 sf Storage= 303 cf

Plug-Flow detention time= 175.7 min calculated for 408 cf (100% of inflow)
Center-of-Mass det. time= 175.7 min (246.6 - 70.8)

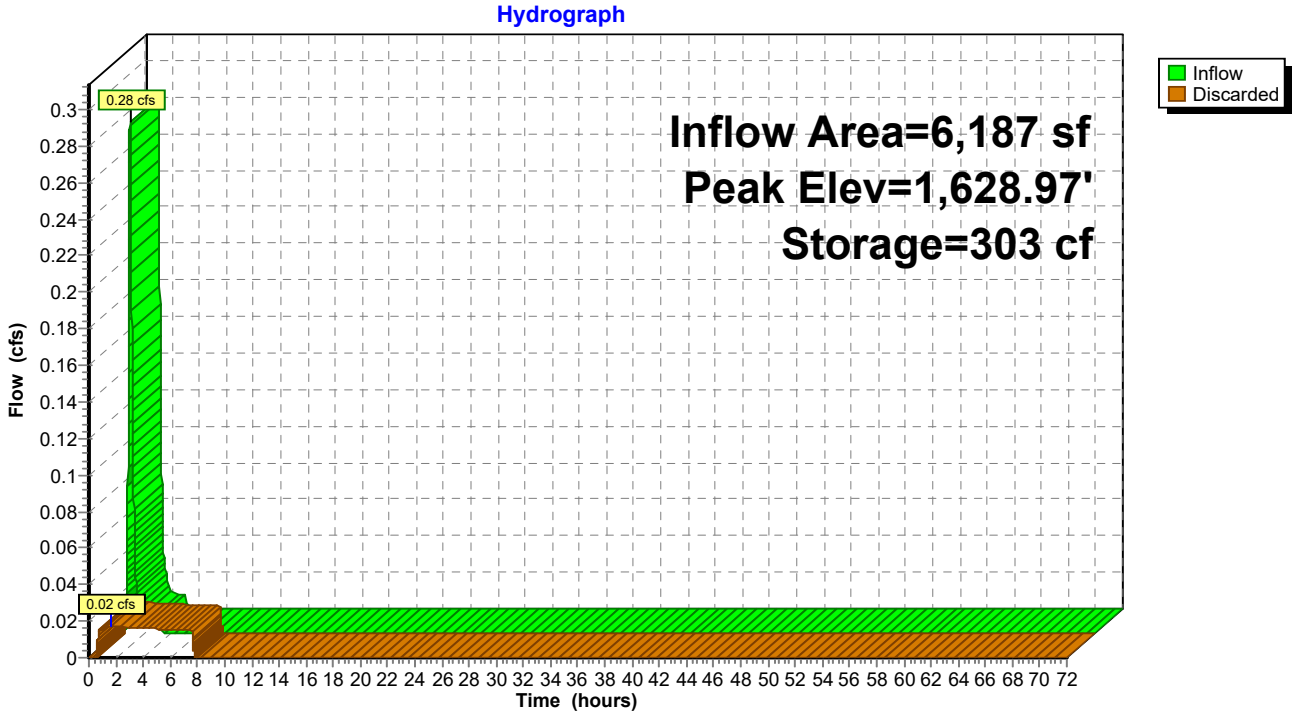
Volume	Invert	Avail.Storage	Storage Description
#1	1,628.75'	346 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,628.75	1,278	0	0
1,629.00	1,487	346	346

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,628.75'	**0.500 in/hr Exfiltration 0.5 In/Hr over Surface area**

Discarded OutFlow Max=0.02 cfs @ 1.61 hrs HW=1,628.97' (Free Discharge)
1=Exfiltration 0.5 In/Hr (Exfiltration Controls 0.02 cfs)

Pond D: Swale D



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ATTACHMENT #6

Maintenance Criteria

MAINTENANCE MANUAL

The PaveDrain® System is a heavy-duty, low maintenance permeable pavement. It is a next-generation system that began life as an erosion control system, before being adapted for sidewalks, parking lots, and roadways.

Clean when clogged. Skip the preventative maintenance.

PaveDrain is a Permeable Articulating Concrete Block System. It relies on OPEN JOINTS and geometrically interlocked units. Never fill the joints with sand or stone—it pre-clogs the system.

Updated January 2023

MAINTENANCE QUESTIONS & ANSWERS

Cleaning

- How often should the PaveDrain System be cleaned?
- What is the best way to clean the PaveDrain System?
    - PaveDrain Vac Head
    - True Vacuum Trucks
- How do I know when to clean the PaveDrain System?

Winter Weather

- Should the PaveDrain System by sealed?
- Should the PaveDrain System be salted or sanded?
- What is the recommended method for snow plowing PaveDrain?
- Can the PaveDrain System be snow plowed with a steel snow plow blade?

Repairs

- Can a single PaveDrain Block be replaced?
    - **Minimal labor, minimal equipment**
    - **Spot repairs, not area repairs.**

If in doubt, give us a shout:
info@pavedrain.com or 888-575-5339

Stormwater Performance Warranty

All PaveDrain installed after January 1, 2023 includes the following manufacturer's warranty

➢ 3-Year Manufacturer Performance Warranty: Surface infiltration ≥500 in/hr

If the PaveDrain surface infiltration is <500 in/hr we will clean to perform above this benchmark.

- Anytime within 3 years your installed PaveDrain system will infiltrate according to ASTM C1701/C1701M-09, or C1781 test at or above 500 in/hr.
    - *Result is the average of 3 representative test sites: One chosen by manufacturer, one chosen by owner, and one chosen jointly.*
- *Maintenance:* Recommended maintenance process should be followed as per most recent relevant manufacturer guidance at the time of installation (i.e., Sealing and vacuuming or sweeping excessive debris areas such as leaves or lawn clippings)
    - Failure to follow these maintenance guidelines will nullify this warranty.
- Run-on Ratios in excess of 15:1 on municipal streets ONLY. (NOTE: permeable interlocking concrete pavers (PICP), pervious concrete, and porous asphalt recommends a 1:1, 3:1 or 5:1 ratio depending on the application.)
- Additional conditions as below

➢ Extended 6-Year Manufacturer Performance Warranty: >8 in/hr

- Anytime within 6 years your installed PaveDrain system will infiltrate according to the ASTM C1701/C1701M-09, or C1781 test at or above 8 in/hr. *(Why 8 in/hr…SEE BELOW)*
    - *Result is the average of 3 representative test sites: One chosen by manufacturer, one chosen by owner, and one chosen jointly.*
- *Maintenance:* Recommended maintenance process should be followed as per most recent relevant manufacturer guidance at the time of installation (i.e., Sealing and vacuuming or sweeping excessive debris areas such as leaves or lawn clippings)
    - Failure to follow these maintenance guidelines will nullify this warranty.
- Run-on Ratios in excess of 15:1 on municipal streets ONLY. (NOTE: PICP, pervious concrete and porous asphalt recommends a 1:1, 3:1 or 5:1 ratio depending on the application.)
- Additional conditions as below.

Fine Print for both

- Proper Installation: Installation must follow manufacturer's guidance (https://www.pavedrain.com/installation)
    - Base compaction in 6"-8" lifts
    - Proper use of geotextiles and geofabrics
    - Open joints
- Use
    - Warranty is voided if pavement surface is used to store loose aggregate (sand, stone, mulch, soil, etc.)
    - Plowing should be done with a rubber tipped blade / raised blade
- Limitations
    - Warranty does not cover blocks that are chipped, damaged, cracked or suffer some other cosmetic issue that do not impact stormwater performance.
        - If heavy vehicle traffic is expected, use PaveDrain HD blocks
    - Warranty is only available for block purchased directly from PaveDrain, LLC , Licensed Manufacturers, or its Distribution Partners beginning January 1, 2023
    - Applies only to contiguous areas larger than 300 SF

Manufacturer's Warranty

All PaveDrain also includes a 1-year manufacturer's warranty that covers issues with block manufacturing.

To make a warranty claim please contact: PaveDrain, LLC. info@pavedrian.com (888) 575-5339

Questions & Answers

Q: How often should the PaveDrain System be cleaned?

A: The system need only be clean when clogged. The frequency will depend on the project. Factors that necessitate more frequent cleanings include high run-on ratios, lots of organic debris (leaves), etc.

Following the initial installation, the PaveDrain System should be checked annually to assess the amount of infiltration still occurring, the results of which determines the ideal frequency. Some systems have never been cleaned in over 10 years of use and continue to perform well. An urban site with large amounts of organic may need more frequent attention.

Ideally, the visual inspection to determine the need to clean should occur during a rain event. Else a ring infiltration (ASTM C1701/C1781) test can be used. If the average of three infiltration tests <100 in/hr, it is time for a cleaning.

It is also possible to use an in-situ sensor to determine clogging. As the PaveDrain surface clogs, the time-delayed and reduced volumes of rainwater uptake will be observed. When they reach a critical threshold, you will know it’s time to clean.

Q: What is the best way to clean a PaveDrain System?

A: The TWO BEST maintenance options to clean the PaveDrain System are:

1. PaveDrain VAC Head: best for small areas
2. A true vacuum truck (e.g, Elgin Whirlwind, Bucher V65, etc.): best for large areas

Unlike other permeable systems, there is **no preventative maintenance**. Cleaning with a vacuum will restore >90% of its original infiltration rate of 1,600 in/hr.

Combination Sewer Truck with 1,500 gallon water tank

Two years of stormwater runoff from adjacent asphalt, mulched flower beds, flowering trees, and residential lawns. Before and after cleaning with PaveDrain VAC Head.

PAVE DRAIN
STORMWATER'S ARCH ENEMY

Vac Head Attachment

1. 36” diameter circular deck (maximum 2,500 cfm).
2. Green Carrying Handles.
3. Cotter Pins for attaching removable handle.
4. 30” Angled suction port located on underside of circular deck (maximum 2,500 cfm).
5. 6” diameter hose attachment (maximum 2,500 cfm).
6. Water hose connection manifold (maximum 2,000 psi).
7. (2) - Rigid solid rubber wheels.
8. Hard Rubber debris guard.
9. (4) - wands with 3 nozzles located on underside of circular deck (maximum 2,000 psi).
10. (2) - 360° Swivel solid rubber wheels.

- 36” diameter deck with (4) 15” wands
- (4) 15” wands with (3) nozzles
- Continuous suction up to 2,500 CFM
- Up to 2,000 psi water displacement
- 30” angled suction port
- VAC Head weight is under 50 lbs
- Swivel handle for ease of moving
- (2) Swivels wheels on front of head
- (2) Rigid wheels on rear of head
- Hard rubber debris guard around deck

A video of the PaveDrain VAC Head in action is available online.
http://www.youtube.com/watch?v=I2U-4xsy3wo

The PaveDrain VAC Heads are available from local distributors.
info@pavedrain.com or (888) 575-5339

True Vacuum Truck

Figure: Bucher V-65 (top left), Elgin Whirlwind (bottom left), post cleaning (right). Any true vacuum, NOT regenerative vacuum would work.

Just one pass of a Vacuum Truck over the PaveDrain System filled with mulch and road debris. PRE- WETTING OF THE DEBRIS WILL HELP IN THE VACUUMING PROCESS.

Q: How do I know when to clean the PaveDrain System?

A: The PaveDrain® system is unlike any other permeable system. The PaveDrain system can "tell" you when it needs maintenance even when it is NOT raining. A simple visual inspection can be accomplished by walking on it and determining if the joints are filled with debris.

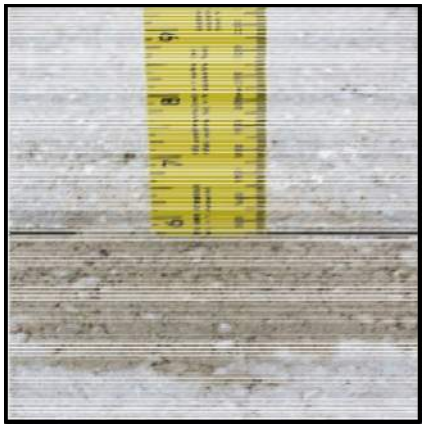
Visual Inspection to see if the joints between the PaveDrain Blocks are filled with debris (see photo 1 & 2 below).
Example: If you have a 5,000 square foot installation and if 50% (approx. 2,500 SF) of the joints between the PaveDrain blocks are filled with debris. It is time to schedule a cleaning.

Photo 1 – PaveDrain in need of cleaning

Photo 2 – PaveDrain following cleaning

Ruler Inspection Insert a ruler between the joints of the PaveDrain to determine the depth of debris between the PaveDrain blocks.

Example:
If the ruler only goes down <2" in 50% of the area covered with the PaveDrain System. It is time for a cleaning. A PaveDrain block is 5.65" thick.



Sensor Notification an in-situ sensor can also provide information regarding clogging and

performance, alerting you automatically to the need to clean (Form more information: www.pavedrain.com/infil-tracker-by-p4-infrastructure)

Checking various spots within a PaveDrain installation is always recommended.

Q: Should the PaveDrain System by sealed?

A: Yes, especially in these situations

- YOUR TOWN, CITY OR STATE USES SALT.
- Your PaveDrain install involves colored blocks.
- If you want to do less maintenance and keep your site looking as good as the day it was installed.

Sealing is maintenance and an economical way to assist the PaveDrain system to resist the damages caused by salt to concrete. Sealing of the PaveDrain system will increase its longevity. Contact your local hardscapes dealer or block manufacturer for a recommended concrete sealer that complies with local rules and regulations. (EXAMPLE – Tenon Salt Barrier by Blue Stone Products OR EQUAL)

The PaveDrain system should be sealed AFTER it has been installed. Due to its open joint design, the PaveDrain system will remain permeable. AFTER the sealer has been applied if the joints are open and free of debris. (Excess sealer will simply run down the sides of the PaveDrain Blocks). The PaveDrain system can be sealed with a boom sprayer, rolled on, or any other suitable application method for ease of installation.

Sealant being applied on PaveDrain via Sprayer

Close up immediately following sealant

Water beading on the surface, indicates the sealer has sealed up the concrete pores in the PaveDrain. A penetrating sealer will further improve the longevity of sealer and the surface of the PaveDrain block

NOTE:

- It is strongly recommended to vacuum/clean the PaveDrain system prior to applying a sealant.
- Sealer should be reapplied at the frequency recommended by its manufacturer.

Q: Should the PaveDrain System be salted or sanded?

A: NO. If it must be done sanding is preferred over salt. Covering the PaveDrain surface with a heavy dose of salt (as granules or brine) is NOT recommended. Salt is hard on virtually everything! Sanding will help with traction but also has the adverse effect of washing the sand between the open joints and into the base material. Which may lead to increased maintenance costs (i.e. vacuuming out the joints). Over time, this may decrease the infiltration performance of the entire system.

Q: What is the recommended method for snow plowing PaveDrain?

A: In order to minimize surface damage to the PaveDrain system, the recommended snow plowing method would be with a rubber tipped or polyethylene snow plow blade. Rubber edges easily adjust to irregular road surfaces & pavement markers without gouging. Rubber edges save you costly repairs to submerged lighting and surfaces such as cobblestone and brick.

NOTE: NO MATTER HOW MUCH CARE IS TAKEN…ICE AND SLIPPING IS ALWAYS A POSSIBILITY! (SEE HEATED PaveDrain…!) PaveDrain, LLC and it's manufacturing, distribution and licensed partners can NOT be held liable in a slip or fall situation.

Q: Can the PaveDrain System be snow plowed with a steel blade?

A: Accidents do happen. Once or twice…yes. However, it should be noted that the edges and tops of the blocks may be scored or damaged by a steel snowplow blade (SEE BELOW). An individual PaveDrain block will not be "flipped" or "kicked out" from being struck by a snow plow blade.

To prevent damage during the winter snow plowing operations from standard steel snow plow blades, it is recommended to float the steel blade ¼"-½" above the PaveDrain system to avoid damaging the edges of the PaveDrain blocks that MAY be sticking up due to the variances in subgrade preparation. (A rubber edge blade for plowing fixes this!) Many municipalities already float the blades on their traditional concrete and asphalt streets to protect their steel blades and roadway infrastructure. Winter care, if done improperly, typically has the greatest impact to the life of the system.

Steel Snow Plow Damage

Rust marks from steel snow blades

Q: Can a single PaveDrain Block be replaced?

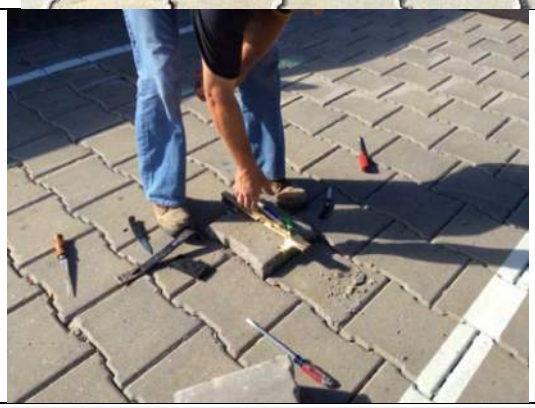
A: **Yes!** If a PaveDrain block breaks it is easy to replace the single block without having to pull out any of the adjacent blocks or the entire mattress (if your installation method was mats). Follow this method to repair a single block.

Extraction starts with the right tool: it is recommended that you have a SlabGrabber (Probst), PaverPuller (Probst), or similar tool. A snug fit on the block works best. The Probst SlabGrabber may need to be modified so that the steel edges that slide between the PaveDrain blocks need to be cut to fit. Best size setting is four holes from the end

NOTE: New units may slip a few times before they get "roughed up" and catch the block firmly.

Please go to www.pavedrain.com and review the Maintenance Information located under the "Installation and Maintenance" section of the site.

There are also many informative PaveDrain videos at https://www.youtube.com/results?search_query=pavedrain

You may have to clean the joints between the PaveDrain block for removal. Even the smallest rock can make removal more difficult than expected.	
Adjust the PaveDrain Extractor so that it will pick from the two flat sides of a PaveDrain block. Pull and move handle of extractor back and forth to remove damaged block	
Once the target block is removed, debris should be cleaned out of area. Use the PaveDrain extractor to install the new block. If you need to remove more blocks, continue the process.	
Slide the new block down into place. You may use a rubber mallet to tamp it down securely at the edges. Be sure not to damage the new block by using 5 lb dead blow hammer!	

5.A.2 Maintenance Criteria for Wetponds

Table 5.36: Maintenance Criteria for Wetponds

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash and Debris	Any trash and debris > 5 cubic feet (cf) per 1,000 square feet (sf). (This is about equal to the amount of trash it would take to fill up one standard size garbage can). In general, there should be no visual evidence of dumping. If less than threshold, all trash and debris will be removed as part of next scheduled maintenance.	Trash and debris cleared from site.
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation that may constitute a hazard to maintenance personnel or the public. Any evidence of noxious weeds as defined by state or local regulations. (Apply requirements of adopted integrated pest management policies for the use of herbicides).	No danger of poisonous vegetation where maintenance personnel or the public might normally be. (Coordinate with local health department). Complete eradication of noxious weeds may not be possible. Compliance with state or local eradication policies required.
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants (Coordinate removal/cleanup with local water quality response agency).	No contaminants or pollutants present.
	Rodent Holes	Any evidence of rodent holes if wetpond is acting as a dam or berm, or any evidence of water piping through dam or berm via rodent holes.	Rodents destroyed and dam or berm repaired. (Coordinate with local health department; coordinate with the Washington State Department of Ecology Dam Safety Office if pond ≥ 10 acre-feet.)
	Beaver Dams	Dam results in change or function of the wetpond.	Wetpond is returned to design function. (Coordinate trapping of beavers and removal of dams with appropriate permitting agencies.)
	Insects	When insects such as wasps and hornets interfere with maintenance activities.	Insects destroyed or removed from site. Apply insecticides in compliance with adopted integrated pest management policies.
	Tree Growth and Hazard Trees	Tree growth does not allow maintenance access or interferes with maintenance activity (i.e., slope mowing, silt removal, Vactoring, or equipment movements). If trees are not interfering with access or maintenance, do not remove. If dead, diseased, or dying trees are identified. (Use a certified arborist to determine health of tree or removal requirements.)	Trees do not hinder maintenance activities. Harvested trees should be recycled into mulch or other beneficial uses (e.g., alders for firewood). Remove hazard trees.
Side Slopes of Pond	Erosion	Eroded damage > 2 inches deep where cause of damage is still present or where there is potential for continued erosion. Any erosion observed on a compacted berm embankment.	Slopes should be stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction. If erosion is occurring on compacted berms, a licensed engineer in the state of Washington should be consulted to resolve source of erosion.
Storage Area	Sediment	Accumulated sediment > 10% of the designed pond depth unless otherwise specified or affects inletting or outletting condition of the wetpond.	Sediment cleaned out to designed pond shape and depth; pond reseeded if necessary to control erosion.
	Liner (if applicable)	Liner is visible and has > three 0.25-inch holes in it.	Liner repaired or replaced. Liner is fully covered.
Pond Berms (Dikes)	Settlements	Any part of berm that has settled 4 inches lower than the design elevation. If settlement is apparent, measure berm to determine amount of settlement.	Dike is built back to the design elevation.

Table 5.36: Maintenance Criteria for Wetponds (continued)

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
		Settling can be an indication of more severe problems with the berm or outlet works. A licensed engineer in the state of Washington should be consulted to determine the source of the settlement.	
	Piping	Discernible water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a licensed engineer in the state of Washington with geotechnical expertise be called in to inspect and evaluate condition and recommend repair of condition.)	Piping eliminated. Erosion potential resolved.
Emergency Overflow/ Spillway and Berms Over 4 Feet in Height	Tree Growth	Tree growth on emergency spillways creates blockage problems and may cause failure of the berm due to uncontrolled overtopping. Tree growth on berms > 4 feet in height may lead to piping through the berm, which could lead to failure of the berm.	Trees should be removed. If root system is small (base < 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. A licensed engineer in the state of Washington should be consulted for proper berm/spillway restoration.
	Piping	Discernible water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a licensed engineer in the state of Washington with geotechnical expertise be called in to inspect and evaluate condition and recommend repair of condition.)	Piping eliminated. Erosion potential resolved.
Emergency Overflow/ Spillway	Emergency Overflow/ Spillway	Only one layer of rock exists above native soil in area ≥ 5 sf, or any exposure of native soil at the top of outflow path of spillway. (Riprap on inside slopes need not be replaced.)	Rocks and pad depth are restored to design standards.
General	Water Level	First cell is empty, doesn't hold water.	Line the first cell to maintain ≥ 4 feet of water. Although the second cell may drain, the first cell must remain full to control turbulence of the incoming flow and reduce sediment resuspension.
	Trash and Debris	Accumulation > 1 cf per 1,000 sf of pond area.	Trash and debris removed from pond.
	Inlet/Outlet Pipe	Inlet/outlet pipe clogged with sediment and/or debris material.	No clogging or blockage in the inlet and outlet piping.
	Sediment Accumulation in Pond Bottom	Sediment accumulations in pond bottom that exceeds the depth of sediment zone plus 6 inches, usually in the first cell.	Sediment removed from pond bottom.
	Oil Sheen on Water	Prevalent and visible oil sheen.	Oil removed from water using oil-absorbent pads or Vactor truck. Source of oil located and corrected. If chronic low levels of oil persist, plant wetland plants such as *Juncus effusus* (soft rush) which can uptake small concentrations of oil.
	Erosion	Erosion of the pond's side slopes and/or scouring of the pond bottom > 6 inches, or where continued erosion is prevalent.	Slopes stabilized using proper erosion control measures and repair methods.
	Settlement of Pond Dike/Berm	Any part of these components that has settled 4 inches or lower than the design elevation, or inspector determines dike/berm is unsound.	Dike/berm is repaired to specifications.
	Internal Berm	Berm dividing cells should be level.	Berm surface is leveled so that water flows evenly over entire length of berm.
	Overflow Spillway	Rock is missing and soil is exposed at top of spillway or outside slope.	Rocks replaced to specifications.

5.A.3 Maintenance Criteria for Bioinfiltration/Infiltration Trenches/Basins

Table 5.37: Maintenance Criteria for Bioinfiltration/Infiltration Trenches/Basins

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash and Debris	See Table 5.36: Maintenance Criteria for Wetponds	See Table 5.36: Maintenance Criteria for Wetponds
	Poisonous/ Noxious Vegetation	See Table 5.36: Maintenance Criteria for Wetponds	See Table 5.36: Maintenance Criteria for Wetponds
	Contaminants and Pollution	See Table 5.36: Maintenance Criteria for Wetponds	See Table 5.36: Maintenance Criteria for Wetponds
	Rodent Holes	See Table 5.36: Maintenance Criteria for Wetponds	See Table 5.36: Maintenance Criteria for Wetponds
Storage Area	Sediment	Water ponding in infiltration pond after rainfall ceases and appropriate time allowed for infiltration. (A percolation test pit or test of BMP indicates BMP is only working at 90% of its designed capabilities. If ≥ 2 inches of sediment is present, remove).	Sediment is removed and/or BMP is cleaned so that infiltration system works according to design.
Rock Filters	Sediment and Debris	By visual inspection, little or no water flows through filter during heavy rain storms.	Gravel in rock filter is replaced.
Side Slopes of Pond	Erosion	See Table 5.36: Maintenance Criteria for Wetponds	See Table 5.36: Maintenance Criteria for Wetponds
Emergency Overflow Spillway and Berms Over 4 Feet in Height	Tree Growth	See Table 5.36: Maintenance Criteria for Wetponds	See Table 5.36: Maintenance Criteria for Wetponds
	Piping	See Table 5.36: Maintenance Criteria for Wetponds	See Table 5.36: Maintenance Criteria for Wetponds
Emergency Overflow Spillway	Rock Missing	See Table 5.36: Maintenance Criteria for Wetponds	See Table 5.36: Maintenance Criteria for Wetponds
	Erosion	See Table 5.36: Maintenance Criteria for Wetponds	See Table 5.36: Maintenance Criteria for Wetponds
Presettling Ponds and Vaults	BMP or Sump Filled With Sediment and/or Debris	6 inches or designed sediment trap depth of sediment.	Sediment is removed.

5.A.4 Maintenance Criteria for Closed Treatment Systems (Tanks/Vaults)

Table 5.38: Maintenance Criteria for Closed Treatment Systems (Tanks/Vaults)

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Storage Area	Plugged Air Vents	One-half the cross section of a vent is blocked at any point or the vent is damaged.	Vents open and functioning.
	Debris and Sediment	Accumulated sediment depth > 10% of the diameter of the storage area for one-half the length of storage vault or any point depth > 15% of diameter. (Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for > one-half the length of tank.)	All sediment and debris removed from storage area.
	Joints Between Tank/Pipe Section	Any openings or voids allowing material to be transported into the tanks/vault. (Will require engineering analysis to determine structural stability).	All joint between tank/pipe sections are sealed.
	Tank Pipe Bent out of Shape	Any part of tank/pipe is bent out of shape > 10% of its design shape. (Review required by licensed engineer in the state of Washington to determine structural stability).	Tank/pipe repaired or replaced to design.
	Vault Structure Includes Cracks in Wall, Cracks in Bottom, or Damage to Frame and/or Top Slab	Cracks > 0.5 inches and any evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determines that the vault is not structurally sound.	Vault replaced or repaired to design specifications and is structurally sound.
		Cracks > 0.5 inches at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls.	No cracks > 0.25 inches wide at the joint of the inlet/outlet pipe.
Manhole	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.	Manhole is closed.
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have < 0.5 inches of thread (may not apply to self-locking lids).	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person.
	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, misalignment, not securely attached to structure wall, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.
Catch Basins	See criteria in Table 5.40: Maintenance Criteria for Catch Basins.		

5.A.5 Maintenance Criteria for Control Structure/Flow Restrictor for Wetponds

Table 5.39: Maintenance Criteria for Control Structure/Flow Restrictor for Wetponds

Maintenance Component	Defect	Condition When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash and Debris (Includes Sediment)	Material > 25% of sump depth or 1 foot below orifice plate.	Control structure orifice is not blocked. All trash and debris removed.
	Structural Damage	Structure is not securely attached to manhole wall.	Structure securely attached to wall and outlet pipe.
		Structure is not in upright position (allow up to 10% from plumb).	Structure in correct position.
		Connections to outlet pipe are not watertight and show signs of rust.	Connections to outlet pipe are water tight; structure repaired or replaced and works as designed.
		Any holes—other than designed holes—in the structure.	Structure has no holes other than designed holes.
Clean-Out Gate	Damaged or Missing	Clean-out gate is not watertight or is missing.	Gate is watertight and works as designed.
		Gate cannot be moved up and down by one maintenance person.	Gate moves up and down easily and is watertight.
		Chain/rod leading to gate is missing or damaged.	Chain is in place and works as designed.
		Gate is rusted > 50% of its surface area.	Gate is repaired or replaced to meet design standards.
Orifice Plate	Damaged or Missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
Manhole	See criteria for vaults/tanks in Table 5.38: Maintenance Criteria for Closed Treatment Systems (Tanks/Vaults).		
Catch Basin	See criteria in Table 5.40: Maintenance Criteria for Catch Basins.		

5.A.6 Maintenance Criteria for Catch Basins

Table 5.40: Maintenance Criteria for Catch Basins

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash and Debris	Trash or debris that is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by > 10%.	No trash or debris located immediately in front of catch basin or on grate opening.
		Trash or debris (in the basin) > 60% of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case < 6 inches clearance from the debris surface to the invert of the lowest pipe.	No trash or debris in the catch basin.
		Trash or debris in any inlet or outlet pipe blocking > one-third of its height.	Inlet and outlet pipes free of trash or debris.
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) > 60% of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case < 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure Damage to	Top slab has holes > 2 square inches or cracks > 0.25 inches	Top slab is free of holes and cracks.

Table 5.40: Maintenance Criteria for Catch Basins (continued)

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
	Frame and/or Top Slab	(Intent is to make sure no material is running into basin).	
		Frame not sitting flush on top slab, i.e., separation of > 0.75 inches of the frame from the top slab. Frame not securely attached	Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/Bottom	Maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.
	Fractures or Cracks in Basin Walls/ Bottom (cont'd)	Grout fillet has separated or cracked > 0.5 inches and > 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking > 10% of the basin opening.	No vegetation blocking opening to basin.
		Vegetation growing in inlet/outlet pipe joints that is > 6 inches tall and < 6 inches apart.	No vegetation or root growth present.
	Contamination and Pollution	See "Wetponds" (Table 5.36: Maintenance Criteria for Wetponds).	No pollution present.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Catch basin cover is closed
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have < 0.5 inches of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	Grate opening Unsafe	Grate with opening > 0.875 inches.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking > 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.

5.A.7 Maintenance Criteria for Debris Barriers (e.g., Trash Racks)

Table 5.41: Maintenance Criteria for Debris Barriers (e.g., Trash Racks)

Maintenance Components	Defect	Condition When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash and Debris	Trash or debris that is plugging > 20% of the openings in the barrier.	Barrier cleared to design flow capacity.
Metal	Damaged/ Missing Bars	Bars are bent out of shape > 3 inches.	Bars in place with no bends > 0.75 inches.
		Bars are missing or entire barrier missing.	Bars in place according to design.
		Bars are loose and rust is causing 50% deterioration to any part of barrier.	Barrier replaced or repaired to design standards.
	Inlet/Outlet Pipe	Debris barrier missing or not attached to pipe	Barrier firmly attached to pipe

5.A.8 Maintenance Criteria for Energy Dissipaters

Table 5.42: Maintenance Criteria for Energy Dissipaters

Maintenance Components	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
External			
Rock Pad	Missing or Moved Rock	Only one layer of rock exists above native soil in area ≥ 5 square feet (sf), or any exposure of native soil.	Rock pad replaced to design standards.
	Erosion	Soil erosion in or adjacent to rock pad.	Rock pad replaced to design standards.
Dispersion Trench	Pipe Plugged With Sediment	Accumulated sediment > 20% of the design depth.	Pipe cleaned/flushed so that it matches design.
	Not Discharging Water Properly	Visual evidence of water discharging at concentrated points along trench (normal condition is a "sheet flow" of water along trench). Intent is to prevent erosion damage.	Trench redesigned or rebuilt to standards.
	Perforations Plugged	> 50% of the perforations in pipe are plugged with debris and sediment.	Perforated pipe cleaned or replaced.
	Water Flowing out Top of "Distributor" Catch Basin	Maintenance person observes or receives credible report of water flowing out during any storm less than the design storm or is causing or appears likely to cause damage.	Energy dissipater rebuilt or redesigned to standards.
	Receiving Area Oversaturated	Water in receiving area is causing or has potential of causing landslide problems.	No danger of landslides.
Internal			
Manhole/ Chamber	Worn or Damaged Post, Baffles, or Side of Chamber	Structure dissipating flow deteriorates to one-half the original size or any concentrated worn spot > 1 sf, which would make structure unsound.	Structure replaced to design standards.
	Other Defects	See criteria in Table 5.40: Maintenance Criteria for Catch Basins.	See criteria in Table 5.40: Maintenance Criteria for Catch Basins.

5.A.9 Maintenance Criteria for Biofiltration Swales

Table 5.43: Maintenance Criteria for Biofiltration Swales

Maintenance Component	Defect or Problem	Condition When Maintenance Is Needed	Recommended Maintenance to Correct Problem
General	Sediment Accumulation on Grass	Sediment depth > 2 inches.	Remove sediment deposits on grass treatment area of the biofiltration swale. When finished, swale should be level from side to side and drain freely toward outlet. There should be no areas of standing water once inflow has ceased.
	Standing Water	When water stands in the swale between storms and does not drain freely.	Any of the following may apply: remove sediment or trash blockages, improve grade from head to foot of swale, remove clogged check dams, add underdrains or convert to a wet biofiltration swale.
	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire swale width.	Level the spreader and clean so that flows are spread evenly over entire swale width.
	Constant Base Flow	When small quantities of water continually flow through the swale, even when it has been dry for weeks, and an eroded, muddy channel has formed in the swale bottom.	Add a low-flow pea-gravel drain the length of the swale or by-pass the base flow around the swale.
	Poor Vegetation Coverage	When grass is sparse or bare or eroded patches occur in > 10% of the swale bottom.	Determine why grass growth is poor and correct that condition. Replant with plugs of grass from the upper slope: plant in the swale bottom at 8-inch intervals. Or reseed into loosened, fertile soil.

Table 5.43: Maintenance Criteria for Biofiltration Swales (continued)

Maintenance Component	Defect or Problem	Condition When Maintenance Is Needed	Recommended Maintenance to Correct Problem
	Vegetation	When the grass becomes excessively tall (> 10 inches); when nuisance weeds and other vegetation start to take over.	Mow vegetation or remove nuisance vegetation so that flow not impeded. Grass should be mowed to a height of 3 to 4 inches. Remove grass clippings.
	Excessive Shading	Grass growth is poor because sunlight does not reach swale.	If possible, trim back overhanging limbs and remove brushy vegetation on adjacent slopes.
	Inlet/Outlet	Inlet/outlet areas clogged with sediment and/or debris.	Remove material so that there is no clogging or blockage in the inlet and outlet area.
	Trash and Debris Accumulation	Trash and debris accumulated in the biofiltration swale.	Remove trash and debris from biofiltration swale.
	Erosion/ Scouring	Eroded or scoured swale bottom due to flow channelization, or higher flows.	For ruts or bare areas < 12 inches wide, repair the damaged area by filling with crushed gravel. If bare areas are large, generally > 12 inches wide, the swale should be regraded and reseeded. For smaller bare areas, overseed when bare spots are evident, or take plugs of grass from the upper slope and plant in the swale bottom at 8-inch intervals.

5.A.10 Maintenance Criteria for Vegetated Filter Strips

Table 5.44: Maintenance Criteria for Vegetated Filter Strips

Maintenance Component	Defect or Problem	Condition When Maintenance Is Needed	Recommended Maintenance to Correct Problem
General	Sediment Accumulation on Grass	Sediment depth > 2 inches.	Remove sediment deposits, relevel so slope is even and flows pass evenly through strip.
	Vegetation	When the grass becomes excessively tall (> 10 inches); when nuisance weeds and other vegetation starts to take over.	Mow grass, control nuisance vegetation, such that flow not impeded. Grass should be mowed to a height between 3 to 4 inches.
	Trash and Debris Accumu-lation	Trash and debris accumulated on the filter strip.	Remove trash and debris from filter.
	Erosion/ Scouring	Eroded or scoured areas due to flow channelization, or higher flows.	For ruts or bare areas < 12 inches wide, repair the damaged area by filling with crushed gravel. The grass will creep in over the rock in time. If bare areas are large, generally > 12 inches wide, the filter strip should be regraded and reseeded. For smaller bare areas, overseed when bare spots are evident.
	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire filter width.	Level the spreader and clean so that flows are spread evenly over entire filter width.