I-5 PEDESTRIAN BRIDGE: BARBER STREET TO WILSONVILLE TOWN CENTER

Draft Stormwater Management Report

City of Wilsonville Project #4202

Prepared for:

Zach Weigel, PE City of Wilsonville 29799 SW Town Center Loop East Wilsonville, OR 97070





4275 Commercial St SE Suite 100 Salem, OR 97302

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DOWL Project #0256-0042



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DISCLOSURES



Prepared by

Reviewed by

Nicholas Giles, El

Ben Wewerka, PE



1.0 OVERVIEW

1.1 Introduction

This stormwater management report addresses the stormwater management design for the I-5 Pedestrian Bridge from SW Barber Street to the Wilsonville Town Center in Clackamas County, Oregon. The project includes the construction of a new pedestrian bridge that crosses I-5, providing pedestrians and bicyclists a route from SW Barber Street to the Wilsonville Town Center. In addition, a plaza will be constructed where the east side of the bridge connects to the Town Center, and the sidewalk between SW Barber Street and SW Peyton Lane will be improved. Stormwater management facilities are proposed to treat and detain stormwater runoff resulting from the proposed construction. The project is located in Section 14, Township 3 South of Range 1 West in Clackamas County, Oregon. A vicinity map showing the project location is provided as Figure 1.

1.2 Regulatory Requirements

The project in located within the City of Wilsonville (City) in Clackamas County, Oregon. It falls under jurisdiction of the City and follows design requirements presented in Section 3 of the City of Wilsonville Public Works Standards, *Stormwater & Surface Water Design & Construction Standards (2015).* The City's design standards state that stormwater management facilities are required when the proposed development increases the impervious area by more than 5,000 square feet. A summary of the controlling stormwater management design standards are presented in Table 1.

Design Criteria	Requirement				
Water Quality	Capture and treat 80% of the average annual runoff volume to the maximum extent possible with the goal of removing 70% Total Suspended Solids (TSS). The treatment volume equates to a design storm of 1.0 inch over 24 hours.				
Water Quantity	Post-construction peak flows less than or equal to pre-development conditions for all peak flows between 42% of the 2-year storm and the 10-year storm. Peak flow rates will be determined by performing a continuous simulation of flows.				
Conveyance	Pass the 25-year design storm flowing full with no pressure flow.				
¹ Pre-development conditions are defined as the natural conditions prior to any development.					

The proposed stormwater facilities will outfall to existing City storm sewers.

1.3 Site Investigation & Sources of Data

Information regarding the project site was gathered from several sources, including DOWL field surveys of existing features and terrain. All elevations provided in this report are in feet and



reference to the North American Vertical Datum of 1988 (NAVD88). Additional site information was gathered from US Department of Agriculture (USDA) National Resource Conservation Service's (NRCS) Soil Surveys of Clackamas County, and supplemental existing storm sewer data was obtained using the Wilsonville Geographic Information Systems (GIS) data tool. Conflicts with existing storm sewers and utilities have been minimized.

According to NRCS soil data, the soils within the project area consist of silty loams. The majority of the soils within the site are classified as being in Hydrologic Soil Group C. An excerpt from the NRCS soil survey is included in Appendix 1 of this report.

2.0 WATERSHED CHARACTERISTICS

2.1 Existing Conditions

Rainfall that falls on I-5 in the footprint of the proposed pedestrian bridge is conveyed through ditches on both sides of the interstate to an existing ODOT stormwater facility. The existing sidewalk between SW Peyton Lane and SW Barber Street is five feet wide and parallels a wide vegetated strip west of the sidewalk. Runoff is collected by inlets along Wilsonville Frontage Road and is then conveyed south to an existing facility. The proposed location of the plaza is a parking lot and adjacent grass field in its existing state. Existing City storm sewers collect and convey the runoff in the location of the proposed plaza.

2.2 Proposed Conditions

The proposed pedestrian bridge covers mainly impervious area as it crosses I-5; however, this adds impervious surface runoff to both sides of the project site, and therefore, is considered additional contributing impervious area (CIA). The stormwater runoff east of station "BT" 18+25 on the proposed bridge will flow east and is collected by a trench drain, which outfalls to the plaza rain garden. Basins 4, 5, 15, and 16 will be collected in area drains and conveyed to the plaza rain garden. Basin 14 will sheet flow into the plaza rain garden. The plaza rain garden outfalls to an existing storm sewer. The remaining plaza basins will be treated by a combination of sheet flow over landscaped areas and rock trenches before being discharged to existing storm sewers. Stormwater runoff west of station "BT" 18+25 will be conveyed via gutter flow and captured by the proposed storm sewer system west of the pedestrian bridge. Due to right-ofway constraints, the runoff from the proposed sidewalk improvements between SW Peyton Lane and SW Barber Street will be offset with treatment closer to the pedestrian bridge. The offsetting treatment will treat and detain runoff from a section of Wilsonville Frontage Road immediately adjacent to the proposed pedestrian bridge. Two detention ponds will treat and detain the runoff from the west section of bridge, as well as the offsetting areas. The complete proposed stormwater conditions and subbasins are shown in Figure 2.

A hydrologic parameter summary and supporting calculations for all proposed subbasins are provided in Appendix 2. Due to the small areas of the subbasins, the time of concentrations were all set to a minimum of five minutes during the conveyance analysis. Table 2 presents the existing and proposed CIA for the project, as well as the offsetting treatment area.



Subbasin	Total Area (acres)	Pre-Dev. Impervious Area (acres)	Proposed Impervious Area (acres)	Treated Impervious Area (acres)
1	0.37	0.00	0.18	0.00
Offsite-1	0.04	0.00	0.00	0.04
Offsite-2	0.08	0.00	0.00	0.08
Offsite-3	0.07	0.00	0.00	0.07
2	0.14	0.00	0.14	0.14
3	0.25	0.00	0.25	0.25
4	0.18	0.00	0.16	0.16
5	0.23	0.00	0.18	0.18
6	0.05	0.00	0.02	0.02
7	0.05	0.00	0.01	0.01
8	0.08	0.00	0.01	0.01
9	0.08	0.00	0.03	0.03
10	0.06	0.00	0.02	0.02
11	0.09	0.00	0.03	0.03
12	0.10	0.00	0.01	0.01
13	0.05	0.00	0.02	0.02
14	0.08	0.00	0.03	0.03
15	0.06	0.00	0.01	0.01
16	0.04	0.00	0.01	0.01
17	0.11	0.00	0.04	0.04
18	0.05	0.00	0.01	0.01
Total	2.26	0.00	1.16	1.17

 Table 2: Pre-Development and Proposed Contributing Impervious Area

3.0 STORMWATER MANAGEMENT DESIGN

3.1 Analysis Methods

As recommended by the City, the Clackamas County Water Environment Services (WES) Best Management Practice (BMP) Sizing Tool was used to size all three stormwater facilities for stormwater quality and detention. The BMP Sizing Tool was developed with local rainfall data and local stormwater design requirements; thus, the only inputs required are the drainage areas, soil classifications, and pre/post-development land cover.

The inlet and pipe capacity calculations were performed using the Storm and Sanitary Analysis (SSA) software package developed by Autodesk, using the Rational Method, and the hydraulic routing was calculated with the Kinematic Wave method using the Hazen-Williams equation. The SCS TR-55 method was used to determine time of concentration values. The full results of the BMP Sizing Tool and the SSA models are included in this report as Appendix 2.



3.2 Storm Sewers

Storm sewer inlets and pipes were sized using the 25-year, 24-hour storm. Stormwater runoff from the proposed plaza will be captured and conveyed though a new storm sewer system to either the plaza rain garden or one of the rock trenches. Stormwater runoff on the pedestrian bridge east of station "BT" 18+25 on the proposed bridge will flow east and will be captured by a trench drain and conveyed to the plaza rain garden. Stormwater runoff west of station "BT" 18+25 will be conveyed via gutter flow and captured by the proposed storm sewer system west of the pedestrian bridge. The stormwater running off the improved sidewalk from station "BF" 40+00 to station "BF" 44+89 will be collected by the existing storm sewer system. The improved sidewalk runoff will be offset by collecting runoff from existing impervious area near the locations of the treatment facilities Pond-1 and Pond-2. The designs for the trench drain, rock trenches, and plaza rain garden were provided by MIG.

3.3 Stormwater Facility Design

Stormwater runoff resulting from the proposed construction will be treated for water quality and quantity in one of three on-site treatment facilities. Pond-1 and Pond-2 are detention ponds while the third facility is a rain garden. Pond-1 treats the bridge runoff from station "BT" 13+45 to station "BT" 18+25 (basin 3) and the offsetting basins between stations "BT" 12+35 and "BT" 14+58 (Offsite-2 and Offsite-3). Pond-1 has a top surface area of 1,250 square feet and a total depth of 4.71 feet. Pond-2 treats the bridge runoff from station "BT" 10+74 to station "BT" 13+45 and the offsetting basin between stations "BT" 10+74 and "BT" 11+48. Pond-2 has a top surface area of 1,200 square feet and a total depth of 4.81 feet. The plaza rain garden treats bridge runoff from station "BT" 18+25 to station "BT" 21+50. Due to Pond-2's proximity to the west bridge abutment, Pond-2 will be lined with a waterproof membrane. The rain garden has a top surface area of 550 square feet and a total depth of 3.25 feet.

4.0 FACILITY MAINTENANCE

Maintenance of the stormwater facilities will be performed regularly as recommended by section 301.13.00 of City of Wilsonville Public Works Standards (2015). The City will be responsible for inspecting and maintaining all proposed facilities. Annual inspection of the facilities should occur to confirm their proper function. Operation and Maintenance Manuals will be submitted under separate cover with the Final Stormwater Management Report.

5.0 CONCLUSION

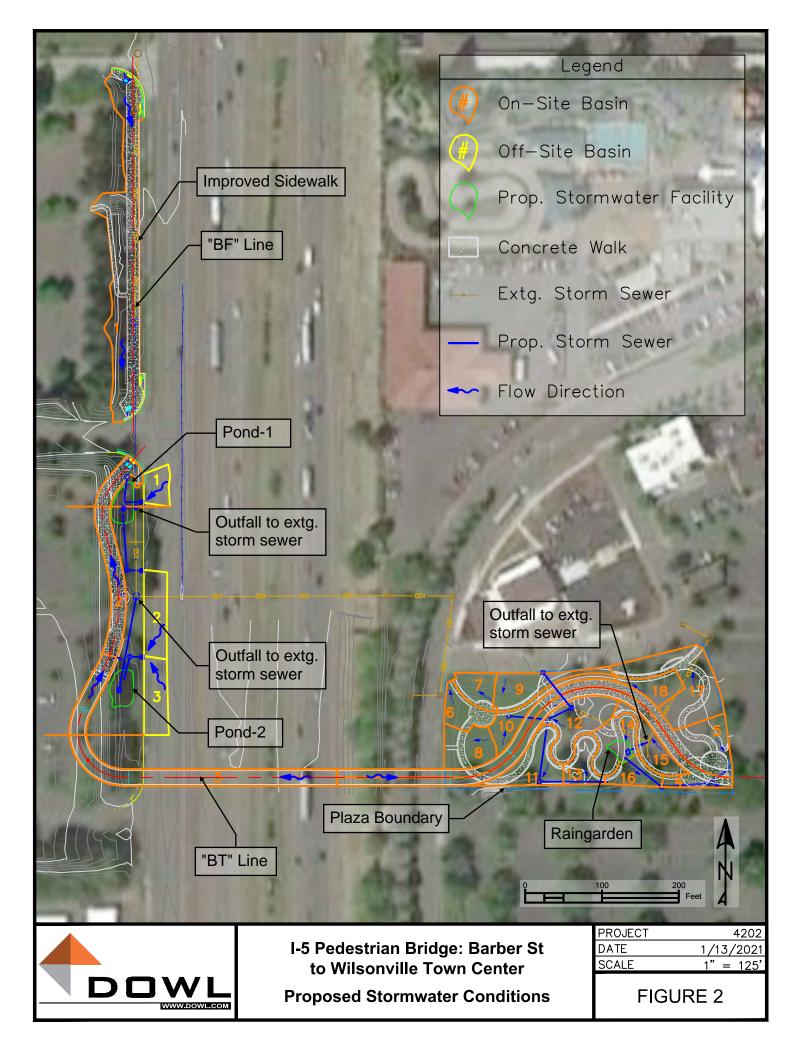
The proposed facilities provide stormwater management for site runoff, as required by the City of Wilsonville, to the maximum extent practicable. The proposed facilities provide treatment of reasonably expected pollutants and contaminants from the project site runoff. Therefore, it is demonstrated that the stormwater management provided for the project meets the regulatory requirements.



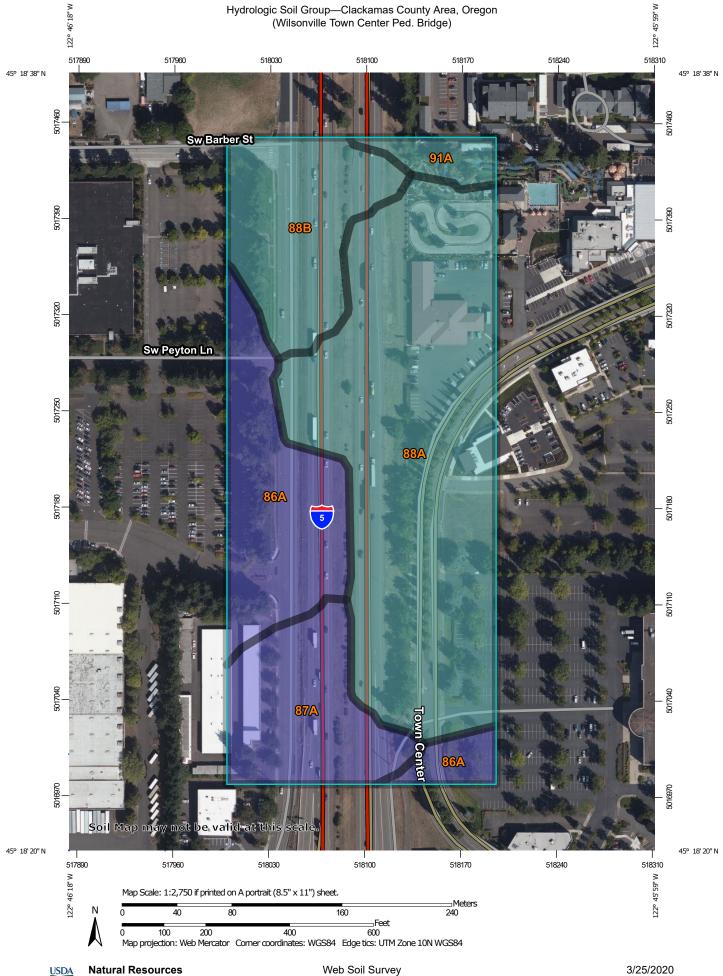
6.0 FIGURES





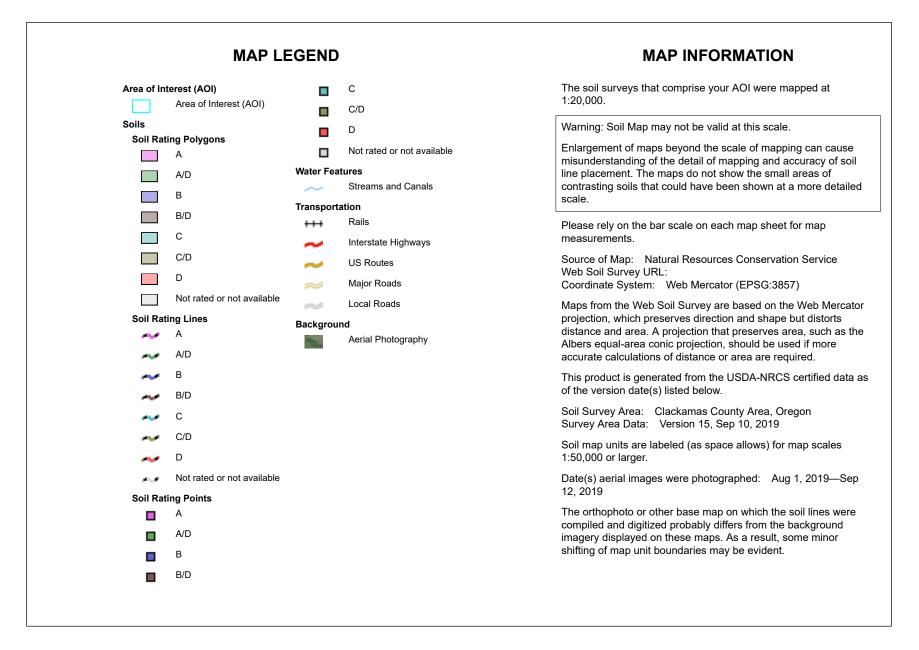


APPENDIX 1: NRCS SOIL DATA



Conservation Service

Web Soil Survey National Cooperative Soil Survey



Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
86A	Willamette silt loam, 0 to 3 percent slopes	В	4.3	18.9%
87A	Willamette silt loam, gravelly substratum, 0 to 3 percent slopes	В	3.1	13.6%
88A	Willamette silt loam, wet, 0 to 3 percent slopes	С	11.4	49.7%
88B	Willamette silt loam, wet, 3 to 7 percent slopes	С	3.4	15.0%
91A	Woodburn silt loam, 0 to 3 percent slopes	С	0.7	2.8%
Totals for Area of Inter	rest	22.9	100.0%	

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition Component Percent Cutoff: None Specified Tie-break Rule: Higher **APPENDIX 2: STORMWATER MODEL OUTPUTS**

WES BMP Sizing Software Version 1.6.0.2, May 2018

WES BMP Sizing Report

Project Information

Project Name	I-5 Ped Bridge (West)
Project Type	PublicFacilities
Location	29722 SW Boones Ferry Rd, Wilsonville, OR 97070
Stormwater Management Area	5675
Project Applicant	Nick Giles
Jurisdiction	OutofDistrict

Drainage Management Area

Name	Area (sq-ft)	Pre-Project Cover	Post-Project Cover	DMA Soil Type	BMP
Ped-Br-West-1	11,009	Grass	ConventionalCo ncrete	С	Pond-1
Ped-Br-West-2	6,290	Grass	ConventionalCo ncrete	С	Pond-2
Ped-Br-West-Of fsite-1	3,103	Grass	ConventionalCo ncrete	В	Pond-1
Ped-Br-West-Of fsite-2	3,380	Grass	ConventionalCo ncrete	С	Pond-2
Ped-Br-West-Of fsite-3	1,560	Grass	ConventionalCo ncrete	С	Pond-2

LID Facility Sizing Details

Pond Sizing Details

Pond ID	Design Criteria(1)	Facility Soil Type	Max Depth (ft)(2)	Top Area (sq-ft)	Side Slope (1:H)	Vol.	Water Storage Vol. (cu-ft)(4)	Adequate Size?
Pond-1	FCWQT	B1	4.71	1,250.0	3	2,433.5	1,919.5	Yes
Pond-2	FCWQT	B3	4.81	1,200.0	3	2,296.0	1,855.3	Yes

1. FCWQT = Flow control and water quality treatment, WQT = Water quality treatment only

2. Depth is measured from the bottom of the facility and includes the three feet of media (drain rock, separation layer and growing media).

3. Maximum volume of the facility. Includes the volume occupied by the media at the bottom of the facility.

4. Maximum water storage volume of the facility. Includes water storage in the three feet of soil media assuming a 40 percent porosity.

Simple Pond Geometry Configuration

Pond ID: Pond-1

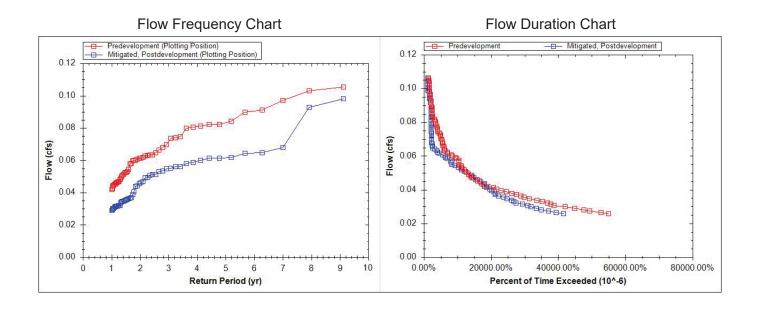
Design: FlowControlAndTreatment

Shape Curve

Depth (ft)	Area (sq ft)
4.7	1,250.0

Outlet Structure Details

Lower Orifice Invert (ft)	0.0
Lower Orifice Dia (in)	0.7
Upper Orifice Invert(ft)	3.2
Upper Orifice Dia (in)	1.6
Overflow Weir Invert(ft)	3.7
Overflow Weir Length (ft)	6.3



Simple Pond Geometry Configuration

Pond ID: Pond-2

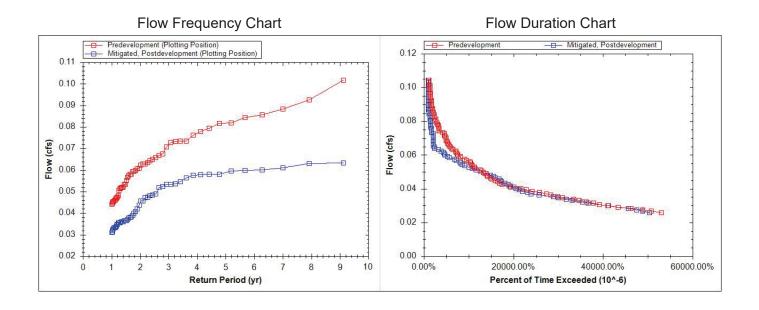
Design: FlowControlAndTreatment

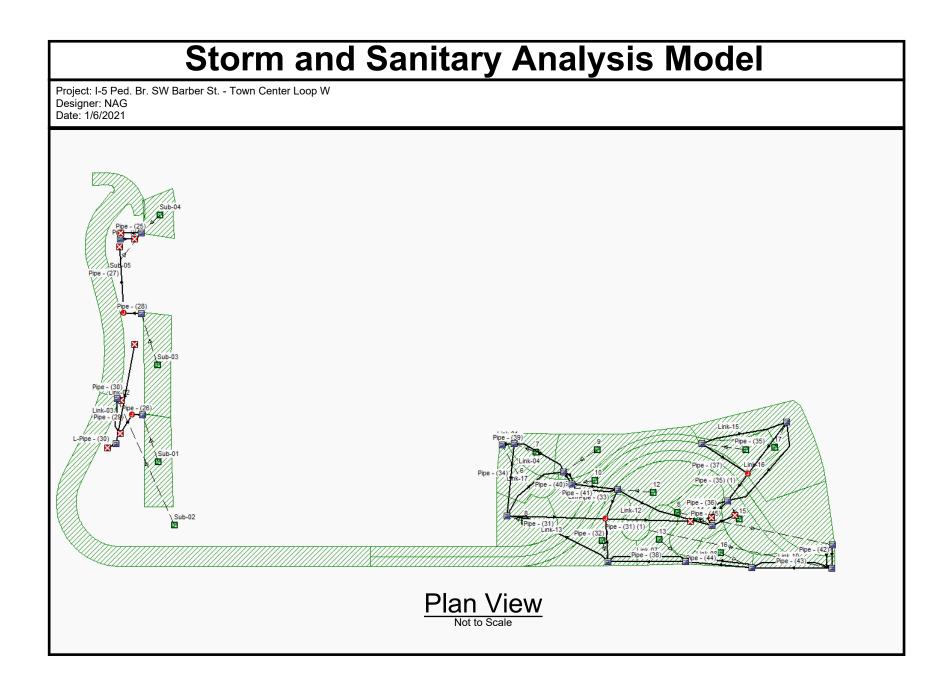
Shape Curve

Depth (ft)	Area (sq ft)				
4.8	1,200.0				

Outlet Structure Details

Lower Orifice Invert (ft)	0.0
Lower Orifice Dia (in)	0.7
Upper Orifice Invert(ft)	3.2
Upper Orifice Dia (in)	1.5
Overflow Weir Invert(ft)	3.8
Overflow Weir Length (ft)	6.3





Storm and Sanitary Analysis Output - Storm Sewer Conveyence

Project: I-5 I	Pedestrian Bridge	: Barber Street 1	To Wilsonville	Town Center
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Date: 1/4/2021 Event: 25-year

SN	Element ID	From (Inlet)	To (Outlet)	Pipe Shape	Pipe Dia.	Manning's	Entrance	Exit/Bend	Addl.	Peak	Time of Peak	Max Flow	Design Flow
		. ,			(in)	Roughness	Losess	Losses	Losses	Flow	Flow Occur.	Vel. (fps)	Capacity (cfs)
						-				(cfs)	(days hh:mm)		
18	Pipe - (24)	Structure - (35)	Out-1Pipe - (24)	CIRCULAR	12.000	0.0130	0.5000	0.5000	0.0000	0.00	0 00:00	0.00	3.56
19	Pipe - (25)	Structure - (36)	Out-1Pipe - (25)	CIRCULAR	12.000	0.0130	0.5000	0.5000	0.0000	0.55	0 00:05	7.15	10.66
20	Pipe - (26)	Structure - (32)	Structure - (39)	CIRCULAR	12.000	0.0130	0.5000	0.5000	0.0000	0.22	0 00:05	2.51	3.56
21	Pipe - (27)	Structure - (38)	Out-1Pipe - (27)	CIRCULAR	12.000	0.0130	0.5000	0.5000	0.0000	0.23	0 00:05	3.08	4.54
22	Pipe - (28)	Structure - (37)	Structure - (38)	CIRCULAR	12.000	0.0130	0.5000	0.5000	0.0000	0.24	0 00:05	2.96	3.61
23	Pipe - (29)	Structure - (39)	Out-1Pipe - (29)	CIRCULAR	12.000	0.0130	0.5000	0.5000	0.0000	0.22	0 00:05	4.55	8.14
24	Pipe - (30)	Structure - (40)	Out-1Pipe - (30)	CIRCULAR	12.000	0.0130	0.5000	0.5000	0.0000	0.00	0 00:00	0.00	3.56
25	Pipe - (31)	Structure - (44)	Structure - (52)	CIRCULAR	12.000	0.0130	0.5000	0.5000	0.0000	0.19	0 00:06	1.97	2.52
26	Pipe - (31) (1)	Structure - (52)	Out-1Pipe - (31) (1)	CIRCULAR	12.000	0.0130	0.5000	0.5000	0.0000	1.62	0 00:06	3.47	2.52
27	Pipe - (32)	Structure - (50)	Structure - (52)	CIRCULAR	12.000	0.0130	0.5000	0.5000	0.0000	1.17	0 00:06	3.17	2.52
28	Pipe - (33)	Structure - (46)	Structure - (52)	CIRCULAR	12.000	0.0130	0.5000	0.5000	0.0000	0.30	0 00:05	2.17	2.52
29	Pipe - (34)	Structure - (48)	Structure - (44)	CIRCULAR	12.000	0.0130	0.5000	0.5000	0.0000	0.10	0 00:05	1.85	2.52
30	Pipe - (35)	Structure - (47)	Structure - (54)	CIRCULAR	12.000	0.0130	0.5000	0.5000	0.0000	0.21	0 00:05	3.23	2.52
31	Pipe - (35) (1)	Structure - (54)	Structure - (53)	CIRCULAR	12.000	0.0130	0.5000	0.5000	0.0000	0.24	0 00:05	2.05	2.52
32	Pipe - (36)	Structure - (53)	Out-1Pipe - (36)	CIRCULAR	12.000	0.0130	0.5000	0.5000	0.0000	0.43	0 00:05	2.40	2.52
33	Pipe - (37)	Null Structure	Structure - (54)	CIRCULAR	12.000	0.0130	0.5000	0.5000	0.0000	0.03	0 00:05	2.00	2.52
34	Pipe - (38)	Structure - (49)	Structure - (50)	CIRCULAR	12.000	0.0130	0.5000	0.5000	0.0000	1.08	0 00:06	3.14	2.52
35	Pipe - (39)	Structure - (55)	Structure - (48)	CIRCULAR	12.000	0.0130	0.5000	0.5000	0.0000	0.04	0 00:05	1.43	2.52
36	Pipe - (40)	Structure - (56)	Structure - (51)	CIRCULAR	12.000	0.0130	0.5000	0.5000	0.0000	0.12	0 00:05	2.03	2.48
37	Pipe - (41)	Structure - (51)	Structure - (46)	CIRCULAR	12.000	0.0130	0.5000	0.5000	0.0000	0.22	0 00:05	2.00	2.52
38	Pipe - (42)	Structure - (59)	Structure - (58)	CIRCULAR	12.000	0.0130	0.5000	0.5000	0.0000	0.29	0 00:05	2.75	2.52
39	Pipe - (43)	Structure - (58)	Structure - (57)	CIRCULAR	12.000	0.0130	0.5000	0.5000	0.0000	0.80	0 00:05	2.90	2.52
40	Pipe - (44)	Structure - (57)	Structure - (49)	CIRCULAR	12.000	0.0130	0.5000	0.5000	0.0000	1.04	0 00:05	3.09	2.52
41	Pipe - (45)	Structure - (61)	Out-1Pipe - (45)	CIRCULAR	12.000	0.0130	0.5000	0.5000	0.0000	0.20	0 00:05	3.70	4.75

Storm and Sanitary Analysis Output - Subbasin Summary

Project: I-5 Pedestrian Bridge: Barber Street To Wilsonville Town Center Date: 1/4/2021

Date: 1/4/2021 Event: 25-year

SN	Element	Area	rea Weighted Acc. Total F		Peak	Rainfall	TC		
	ID	(ac)	Runoff	Precip. (in)	Runoff Runoff		Intensity	(days	
			Coefficient		(in)	(cfs)	(in/hr)	hh:mm:ss)	
20	2	0.14	0.9000	0.28	0.26	0.43	3.400	0 00:05:00	
17	3	0.25	0.9000	0.28	0.26	0.77	3.400	0 00:05:00	
1	4	0.18	0.8200	0.28	0.23	0.49	3.400	0 00:05:00	
2	5	0.23	0.7400	0.28	0.21	0.58	3.400	0 00:05:00	
3	6	0.05	0.4700	0.28	0.13	0.08	3.400	0 00:05:00	
4	7	0.05	0.3200	0.28	0.09	0.05	3.400	0 00:05:00	
5	8	0.08	0.2700	0.28	0.08	0.07	3.400	0 00:05:00	
6	9	0.08	0.4500	0.28	0.13	0.12	3.400	0 00:05:00	
7	10	0.06	0.4200	0.28	0.12	0.09	3.400	0 00:05:00	
8	11	0.09	0.4200	0.28	0.12	0.13	3.400	0 00:05:00	
9	12	0.10	0.2500	0.28	0.07	0.09	3.400	0 00:05:00	
10	13	0.05	0.4700	0.28	0.13	0.08	3.400	0 00:05:00	
11	14	0.08	0.4500	0.28	0.13	0.12	3.400	0 00:05:00	
12	15	0.06	0.3000	0.28	0.09	0.07	3.400	0 00:05:00	
13	16	0.04	0.3600	0.28	0.10	0.05	3.400	0 00:05:00	
14	17	0.17	0.6400	0.28	0.18	0.37	3.400	0 00:05:00	
15	18	0.05	0.3200	0.28	0.09	0.05	3.400	0 00:05:00	