H.A. McCOY
ENGINEERING & SURVEYING, LLC

PO Box 533 Redmond, OR 97756 · 541-923-7554 · www.ham-engr.com

Silas Heights Storm Water Report

11159 SE Maplehurst Road

Milwaukie, OR 97222-2852

7/26/17

REGISTERED PROFESSIONAL ENGINEER
65686PE
OREGON
July 12, 2005
HAYES A. McCOY
RENEWAL DATE: 12/31/18

Prepared By,
H.A. McCoy Engineering & Surveying
1180 SW Lake Road Suite 201
Redmond, Oregon 97756
Ph:541-923-7554
Hayes@Ham-ENGR.com

Designer's Certification and Statement

I hereby certify that this Stormwater Management Report for the Silas Heights Subdivision has been prepared by me or under my supervision and meets minimum standards of the City of Milwaukie and normal standards of engineering practice. I hereby acknowledge and agree that the jurisdiction does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities designed by me.

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Project Summary

H.A. McCoy Engineering and Surveying has designed a stormwater drainage plan for the proposed 11 lot subdivision in accordance with the City of Milwaukie Public Works Standards and the current City of Portland Stormwater Management Manual (SWMM). The current manual is dated August 2016.

The subject property is located on the edge of the Milwaukie city limits and has rolling topography with a high point near the center of the site. There are two existing accesses to the property, one being the street stub of SE 66th Ave. and the other an access to SE Maplehurst Road.

As part of this project the applicant will construct street improvements which will include, asphalt roadway, curb, and sidewalk. The addition of this impervious area creates the need for a stormwater disposal system as no existing storm drainage infrastructure exists onsite. The streets will also have trees installed along the frontage which are used to reduce the total amount of impervious area managed. Broad leaf trees were used for calculations, but the exact tree species will be determined at the time of construction plan approval. See the attached Tree Credit Worksheets.

The applicant proposes to use two drywells, with sedimentation manholes for pollution control, and a basin for stormwater detention and infiltration. See the attached basin map for details. Drywells have been designed using the SWMM hierarchy 2 standards and contain the full 25-year storm event. The detention basin has also been designed to the SWMM hierarchy 2 standards and fully contains the 10-year event as required for surface drainage infrastructure.

The proposed drainage infrastructure was sized using HydroCAD software and the Portland Stormwater Presumptive Approach Calculator (PAC). The attached calculations analyze the peak flow from the drainage basin and size the facilities in accordance with the Portland Stormwater Management Manual. Future homes on the new lots will manage their stormwater with drywells or soakage trenches onsite.

Methodology and Analysis

Infiltration Rates were tested onsite using an Open Pit Falling Head procedure, see the attached infiltration test results. A correction factor of 2 was applied to the test infiltration rates leading to a design infiltration rate of 2.82 in/hr. This rate is conservative as drywells are likely to have significantly higher infiltration rates when constructed.

A time of concentration of 5 minutes was assumed for post-developed conditions for each basin. A post-development curve number of 98 was used for runoff calculations as specified in the SWMM.

Drywells are required to dispose of runoff from the 25-year storm and surface detention basins are required to dispose of the runoff from the 10-year storm event. The 24-hour storm event rainfall depth was determined from the Isopluvials map detailed in figure 28 of the NOAA Atlas 2, see attached map. A design rainfall depth of 4" for a 25-year storm event was determined for the site.

Runoff volumes for basins 1 and 3 were calculated using the Santa Barbara Urban Hydrograph method, Type I storm for a 25-year event. Runoff coefficients were used from the SWMM. HydroCAD software was used to calculate the runoff volumes and infiltration rates - these calculations are attached.

The PAC was used for the sizing of the detention pond in Basin 2. The impervious curve number, rain intensity, and infiltration rates remained constant.

The enclosed HydroCAD and PAC calculations demonstrate that in all cases stormwater was fully contained and infiltrated by the proposed storm drainage infrastructure.

Exhibit A

Tree Credit Worksheets

TREE CREDIT WORKSHEET

CITY OF PORTLAND
Stormwater Management Manual

Trees may be able to reduce the size of required stormwater facilities. Small projects, such as residential additions or new detached structures (garages, sheds, accessory dwelling units), may be able to eliminate stormwater requirements through use of tree credit. Trees used for tree credit must be clearly labeled on the site plan and included on the Stormwater Operations & Maintenance Plan.

Tree Credit Applicability:

- For sites with more than 1,000 square feet of new or redeveloped impervious surface to manage, no more than 10% of the impervious area can be mitigated with through tree credit.
- Nuisance trees cannot receive stormwater tree credit.
- BES may require a certified arborists' report to verify suitable tree selection and preservation.
- Trees planted in stormwater facilities or used towards environmental zone mitigation cannot also receive tree credit.
- Trees (new or existing) must be located within 10 feet of impervious surfaces to qualify for tree credit.

CALCULATE TREE CREDIT

NEW TREES

New trees must be at least 1.5 caliper inches at the time of planting; new coniferous trees must be at least 5 feet tall.

TYPE OF TREE	NUMBER OF TREES	CREDIT PER TREE	TREE CREDIT (SF)
New coniferous trees	0	Multiply by 200 square feet	0
New broadleaf trees	14	Multiply by 100 square feet	1400

EXISTING TREES

SMALL TREES *(Existing trees with caliper of 1.5 to 6 inches)*

	NUMBER OF TREES	CREDIT PER TREE	TREE CREDIT (SF)
Existing trees with caliper of 1.5 to 6 inches	0	Multiply by 200 square feet	0

LARGE TREES *(Larger than 6 caliper inches)*

TYPE OF TREE	CALIPER SIZE *(in inches)*	DETERMINE CREDIT UNITS	CREDIT UNITS PER TREE *(Do not round up)*	CREDIT PER 6 CALIPER INCHES	TREE CREDIT (SF)
		Divide by 6		Multiply by 400 square feet	
		Divide by 6		Multiply by 400 square feet	
		Divide by 6		Multiply by 400 square feet	
		Divide by 6		Multiply by 400 square feet	
		Divide by 6		Multiply by 400 square feet	
		Divide by 6		Multiply by 400 square feet	
		Divide by 6		Multiply by 400 square feet	
		Divide by 6		Multiply by 400 square feet	
TOTAL TREE CREDIT					

Continue on back

TREE CREDIT WORKSHEET

ALLOWABLE TREE CREDIT

For sites with less than 1,000 square feet of new or redeveloped impervious area, the Total Tree Credit is allowed. Stormwater runoff may go to the existing disposal location.

Allowable Tree Credit = Total Tree Credit

For sites with over 1,000 square feet of new or redeveloped impervious area, a maximum of 10% of the new or redeveloped impervious area can be mitigated through tree credit.

TOTAL NEW OR REDEVELOPMENT IMPERVIOUS AREA (SF)	MAXIMUM TREE CREDIT	TOTAL ALLOWABLE TREE CREDIT (SF)
14634	Multiply by 0.10	1463

Allowable Tree Credit is the lesser of the Total Tree Credit or the Total Allowable Tree Credit

Allowable Tree Credit = 1400

TREE CREDIT WORKSHEET

CITY OF PORTLAND
Stormwater Management Manual

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CALCULATE TREE CREDIT

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New trees must be at least 1.5 caliper inches at the time of planting; new coniferous trees must be at least 5 feet tall.

TYPE OF TREE	NUMBER OF TREES	CREDIT PER TREE	TREE CREDIT (SF)
New coniferous trees	0	Multiply by 200 square feet	0
New broadleaf trees	9	Multiply by 100 square feet	900

EXISTING TREES

SMALL TREES *(Existing trees with caliper of 1.5 to 6 inches)*

	NUMBER OF TREES	CREDIT PER TREE	TREE CREDIT (SF)
Existing trees with caliper of 1.5 to 6 inches	0	Multiply by 200 square feet	0

LARGE TREES *(Larger than 6 caliper inches)*

TYPE OF TREE	CALIPER SIZE *(in inches)*	DETERMINE CREDIT UNITS	CREDIT UNITS PER TREE *(Do not round up)*	CREDIT PER 6 CALIPER INCHES	TREE CREDIT (SF)
		Divide by 6		Multiply by 400 square feet	
		Divide by 6		Multiply by 400 square feet	
		Divide by 6		Multiply by 400 square feet	
		Divide by 6		Multiply by 400 square feet	
		Divide by 6		Multiply by 400 square feet	
		Divide by 6		Multiply by 400 square feet	
		Divide by 6		Multiply by 400 square feet	
		Divide by 6		Multiply by 400 square feet	
TOTAL TREE CREDIT					

Continue on back

TREE CREDIT WORKSHEET

ALLOWABLE TREE CREDIT

For sites with less than 1,000 square feet of new or redeveloped impervious area, the Total Tree Credit is allowed. Stormwater runoff may go to the existing disposal location.

Allowable Tree Credit = Total Tree Credit [ ]

For sites with over 1,000 square feet of new or redeveloped impervious area, a maximum of 10% of the new or redeveloped impervious area can be mitigated through tree credit.

TOTAL NEW OR REDEVELOPMENT IMPERVIOUS AREA (SF)	MAXIMUM TREE CREDIT	TOTAL ALLOWABLE TREE CREDIT (SF)
8029	Multiply by 0.10	803

Allowable Tree Credit is the lesser of the Total Tree Credit or the Total Allowable Tree Credit

Allowable Tree Credit = 803

TREE CREDIT WORKSHEET

CITY OF PORTLAND
Stormwater Management Manual

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- Trees (new or existing) must be located within 10 feet of impervious surfaces to qualify for tree credit.

CALCULATE TREE CREDIT

NEW TREES

New trees must be at least 1.5 caliper inches at the time of planting; new coniferous trees must be at least 5 feet tall.

TYPE OF TREE	NUMBER OF TREES	CREDIT PER TREE	TREE CREDIT (SF)
New coniferous trees	0	Multiply by 200 square feet	0
New broadleaf trees	3	Multiply by 100 square feet	300

EXISTING TREES

SMALL TREES *(Existing trees with caliper of 1.5 to 6 inches)*

	NUMBER OF TREES	CREDIT PER TREE	TREE CREDIT (SF)
Existing trees with caliper of 1.5 to 6 inches	0	Multiply by 200 square feet	0

LARGE TREES *(Larger than 6 caliper inches)*

TYPE OF TREE	CALIPER SIZE *(in inches)*	DETERMINE CREDIT UNITS	CREDIT UNITS PER TREE *(Do not round up)*	CREDIT PER 6 CALIPER INCHES	TREE CREDIT (SF)
		Divide by 6		Multiply by 400 square feet	
		Divide by 6		Multiply by 400 square feet	
		Divide by 6		Multiply by 400 square feet	
		Divide by 6		Multiply by 400 square feet	
		Divide by 6		Multiply by 400 square feet	
		Divide by 6		Multiply by 400 square feet	
		Divide by 6		Multiply by 400 square feet	
		Divide by 6		Multiply by 400 square feet	
				TOTAL TREE CREDIT	

Continue on back

TREE CREDIT WORKSHEET

ALLOWABLE TREE CREDIT

For sites with less than 1,000 square feet of new or redeveloped impervious area, the Total Tree Credit is allowed. Stormwater runoff may go to the existing disposal location.

Allowable Tree Credit = Total Tree Credit [ ]

For sites with over 1,000 square feet of new or redeveloped impervious area, a maximum of 10% of the new or redeveloped impervious area can be mitigated through tree credit.

TOTAL NEW OR REDEVELOPMENT IMPERVIOUS AREA (SF)	MAXIMUM TREE CREDIT	TOTAL ALLOWABLE TREE CREDIT (SF)
6069	Multiply by 0.10	607

Allowable Tree Credit is the lesser of the Total Tree Credit or the Total Allowable Tree Credit

Allowable Tree Credit = 300

Exhibit B

Annotated Isopluvial Map for 25-Year 24-Hr Storm Event

OREGON

10 0 10 20 30 40 MILES

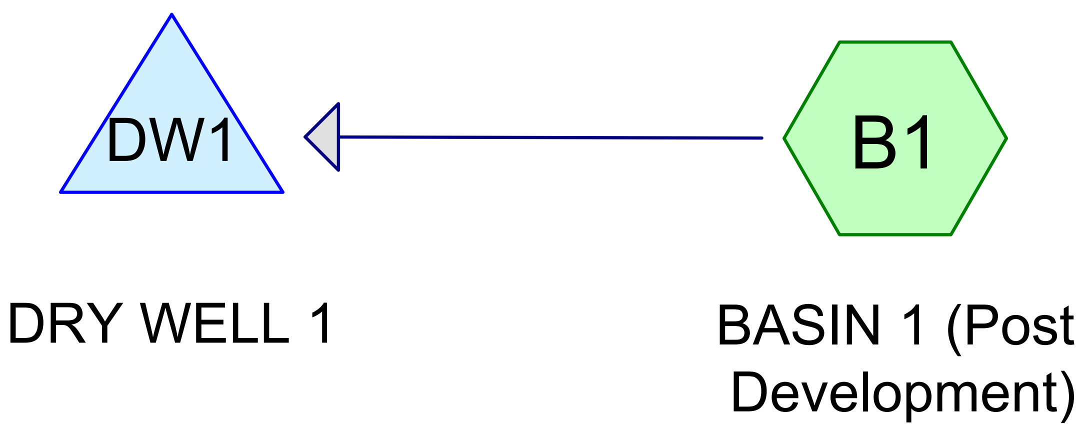
NOAA ATLAS 2, Volume X
Prepared by U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service, Office of Hydrology
Prepared for U.S. Department of Agriculture,
Soil Conservation Service, Engineering Division

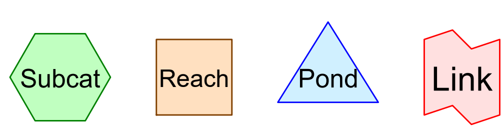
Figure 28

ISOPLUVIALS OF 25-YR 24-HR PRECIPITATION IN TENTHS OF AN INCH

Exhibit C

Basin 1 Stormwater Report





Routing Diagram for 170726-17031-StormDrain-Basin 1-DW 1
Prepared by H.A. McCoy Engineering and Surveying, LLC, Printed 7/26/2017

Summary for Subcatchment B1: BASIN 1 (Post Development)

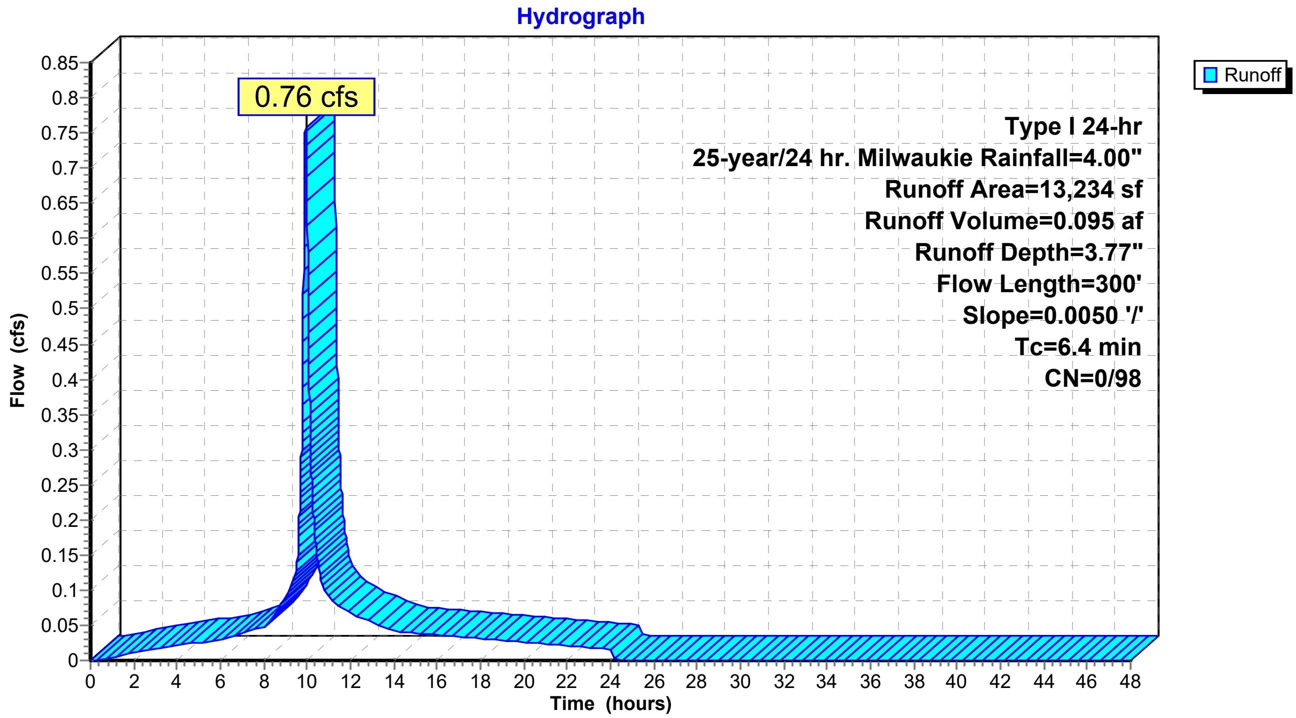
Runoff = 0.76 cfs @ 9.94 hrs, Volume= 0.095 af, Depth= 3.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type I 24-hr 25-year/24 hr. Milwaukie Rainfall=4.00"

	Area (sf)	CN	Description
*	13,234	98	PUBLIC IMPERVIOUS
	13,234		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	300	0.0050	0.78		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.00"

Subcatchment B1: BASIN 1 (Post Development)



Summary for Pond DW1: DRY WELL 1

Inflow Area = 0.304 ac,100.00% Impervious, Inflow Depth = 3.77" for 25-year/24 hr. Milwaukie event
Inflow = 0.76 cfs @ 9.94 hrs, Volume= 0.095 af
Outflow = 0.05 cfs @ 13.15 hrs, Volume= 0.095 af, Atten= 93%, Lag= 192.5 min
Discarded = 0.05 cfs @ 13.15 hrs, Volume= 0.095 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 6.94' @ 13.15 hrs Surf.Area= 797 sf Storage= 1,602 cf

Plug-Flow detention time= 320.1 min calculated for 0.095 af (100% of inflow)
Center-of-Mass det. time= 320.1 min (1,019.6 - 699.5)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	1,684 cf	**160 YD DW (Conic)** Listed below (Recalc) 4,638 cf Overall x 36.3% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
0.00	488	0	0	488
7.00	800	4,463	4,463	1,187
7.07	33	23	4,486	1,954
11.67	33	152	4,638	2,047

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**2.820 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.05 cfs @ 13.15 hrs HW=6.94' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Pond DW1: DRY WELL 1

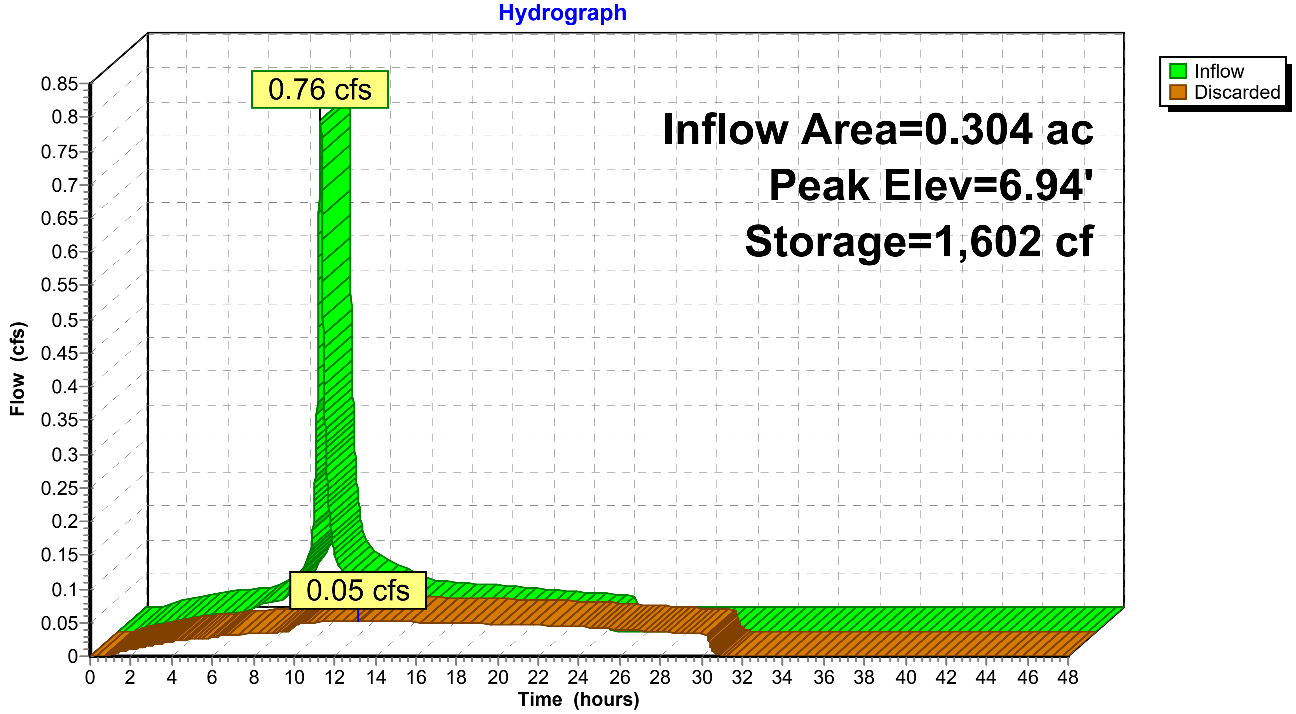


Exhibit D

Basin 2 PAC Report

PAC Report

Project Name	Permit No.	Created
Riggins Subdivision	TBD	7/25/17 2:34 PM
Project Address	Designer	Last Modified
Milwaukie Milwaukie, OR 97222	AMS	7/26/17 11:53 AM
	Company	Report Generated
	H.A. McCoy Engineering and Surveying	7/26/17 11:53 AM

Project Summary

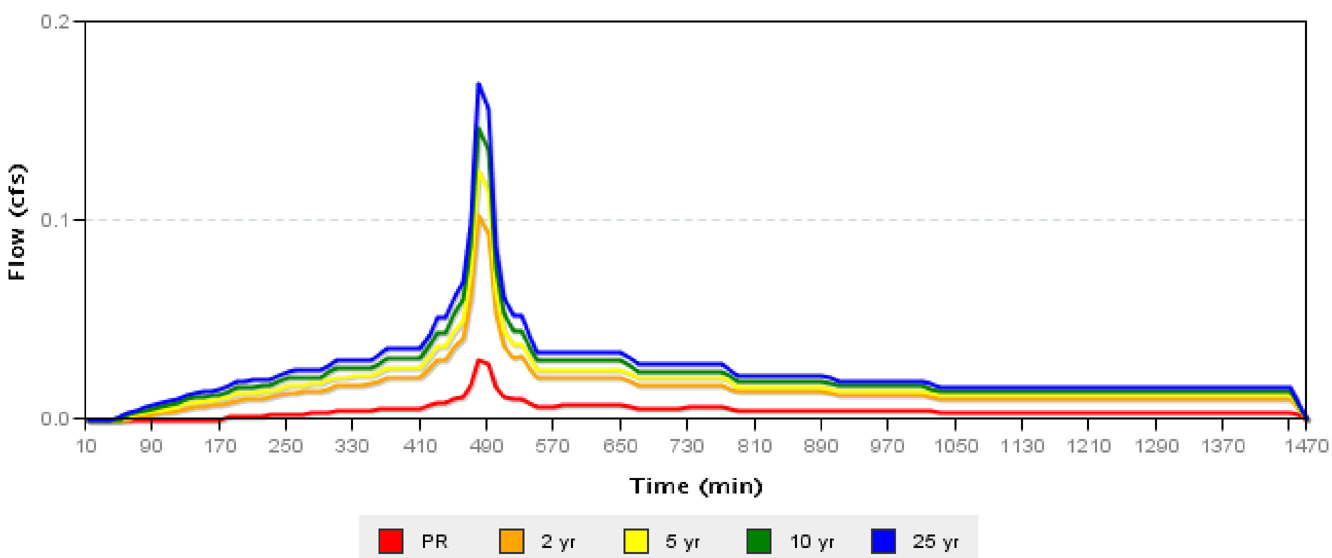
Proposed Subdivision

Catchment Name	Impervious Area (sq ft)	Native Soil Design Infiltration Rate	Hierarchy Category	Facility Type	Facility Config	Facility Size (sq ft)	Facility Sizing Ratio	PR Results	Flow Control Results
Basin 2	7226	5.64	2	Basin	A	250	9.3%	Pass	Not Used

Catchment Basin 2

Site Soils & Infiltration Testing Data	Infiltration Testing Procedure	**Open Pit Falling Head**
	Native Soil Infiltration Rate (I_{test})	**5.64**
Correction Factor	CF_{test}	**2**
Design Infiltration Rates	Native Soil (I_{dsgn})	**2.82 in/hr**
	Imported Growing Medium	**2.00 in/hr**
Catchment Information	Hierarchy Category	**2**
	Hierarchy Description	**On-site infiltration through use of approved UIC facility**
	Pollution Reduction Requirement	**Pass**
	10-year Storm Requirement	**Pass or if Fail, disposal through separate approved UIC**
	Flow Control Requirement	**Pass or if Fail, disposal through separate approved UIC**
	Impervious Area	**7226 sq ft** **0.166 acre**
	Time of Concentration (Tc)	**5**
	Post-Development Curve Number (CN_{post})	**98**

SBUH Results



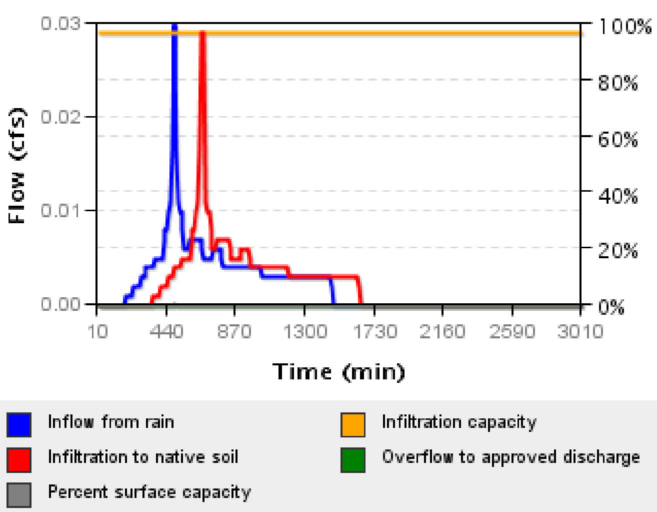
	Peak Rate (cfs)	Volume (cf)
PR	0.03	377.579
2 yr	0.102	1307.515

5 yr	0.125	1607.001
10 yr	0.147	1906.936
25 yr	0.169	2207.153

Facility Basin 2

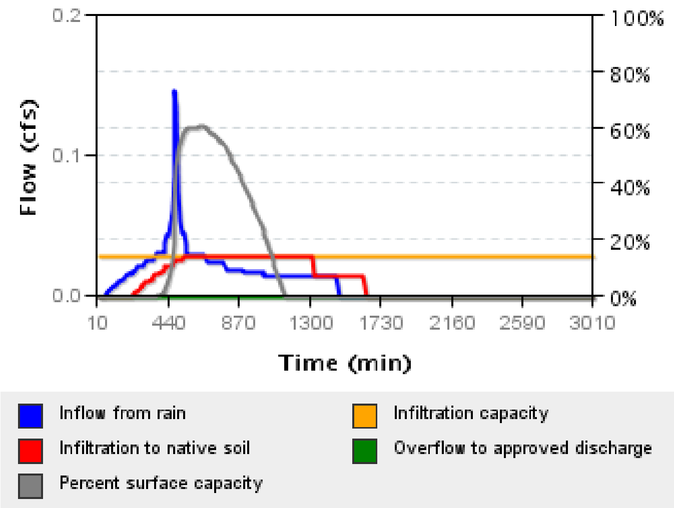
Facility Details	Facility Type	**Basin**
	Facility Configuration	**A: Infiltration (Infl.)**
	Facility Shape	**User Defined**
	Above Grade Storage Data	
	Bottom Area	**250 sq ft**
	Surface Area at Storage Depth 1	**750 ft**
	Storage Depth 1	**12.0 in**
	Growing Medium Depth	**18 in**
	Surface Capacity at Depth 1	**500.0 cu ft**
	Design Infiltration Rate for Native Soil	**0.041 in/hr**
	Infiltration Capacity	**0.029 cfs**
Facility Facts	Total Facility Area Including Freeboard	**750.00 sq ft**
	Sizing Ratio	**9.3%**
Pollution Reduction Results	Pollution Reduction Score	**Pass**
	Overflow Volume	**0.000 cf**
	Surface Capacity Used	**1%**
10 Year Results	10 Year Score	**Pass**
	Overflow Volume	**0.000 cf**
	Surface Capacity Used	**79%**

Pollution Reduction Event Surface Facility Modeling



Pollution Reduction Event Below Grade Modeling

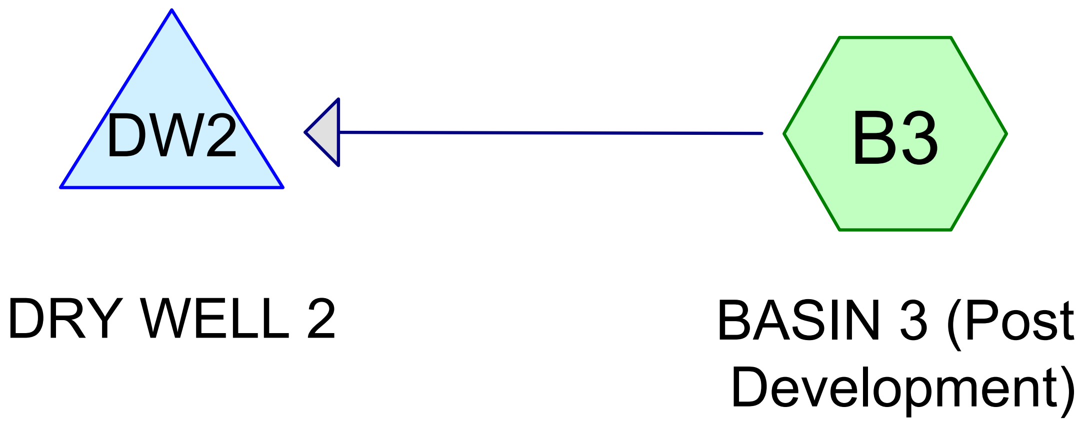
10 Year Event Surface Facility Modeling

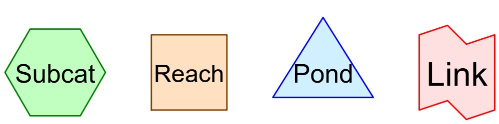


10 Year Event Below Grade Modeling

Exhibit E

Basin 3 Drainage Report





Routing Diagram for 170726-17031-StormDrain-Basin 3-DW 2
Prepared by H.A. McCoy Engineering and Surveying, LLC, Printed 7/26/2017
HydroCAD® 10.00-14 s/n 08866 © 2015 HydroCAD Software Solutions LLC

Summary for Subcatchment B3: BASIN 3 (Post Development)

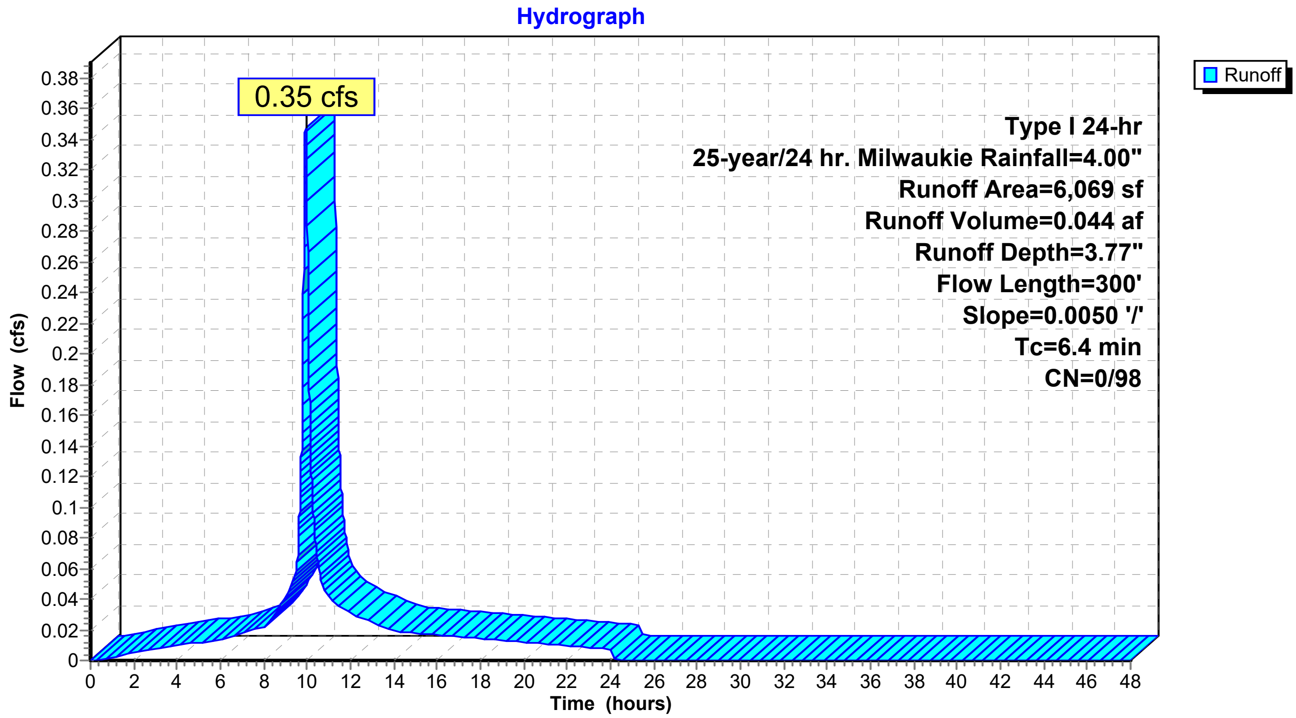
Runoff = 0.35 cfs @ 9.94 hrs, Volume= 0.044 af, Depth= 3.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type I 24-hr 25-year/24 hr. Milwaukie Rainfall=4.00"

	Area (sf)	CN	Description
*	6,069	98	PUBLIC IMPERVIOUS
	6,069		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	300	0.0050	0.78		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.00"

Subcatchment B3: BASIN 3 (Post Development)



Summary for Pond DW2: DRY WELL 2

Inflow Area = 0.139 ac,100.00% Impervious, Inflow Depth = 3.77" for 25-year/24 hr. Milwaukie event
Inflow = 0.35 cfs @ 9.94 hrs, Volume= 0.044 af
Outflow = 0.03 cfs @ 12.81 hrs, Volume= 0.044 af, Atten= 93%, Lag= 172.0 min
Discarded = 0.03 cfs @ 12.81 hrs, Volume= 0.044 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 5.75' @ 12.81 hrs Surf.Area= 395 sf Storage= 691 cf

Plug-Flow detention time= 271.4 min calculated for 0.044 af (100% of inflow)
Center-of-Mass det. time= 271.4 min (970.9 - 699.5)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	945 cf	**90 YD DW (Conic)** Listed below (Recalc) 2,533 cf Overall x 37.3% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
0.00	255	0	0	255
7.00	429	2,368	2,368	742
7.07	33	14	2,381	1,138
11.67	33	152	2,533	1,232

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**2.820 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.03 cfs @ 12.81 hrs HW=5.75' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Pond DW2: DRY WELL 2

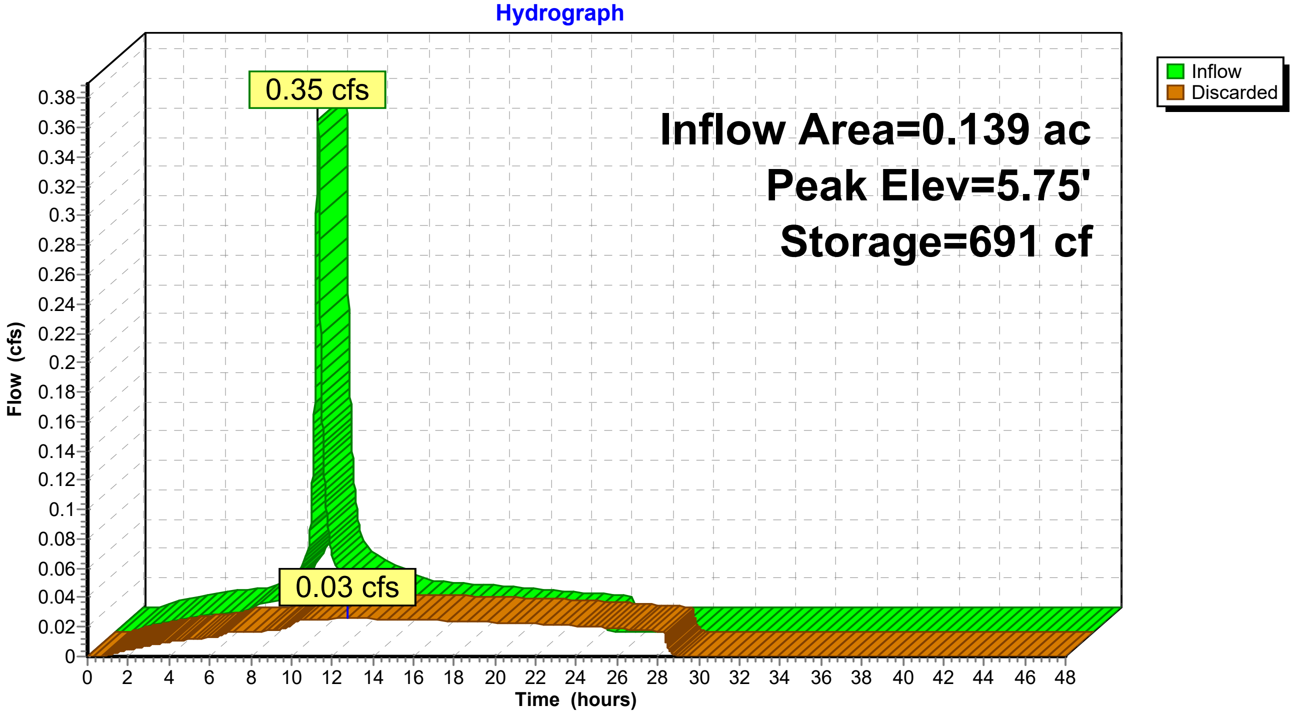


Exhibit F

Infiltration Testing Results

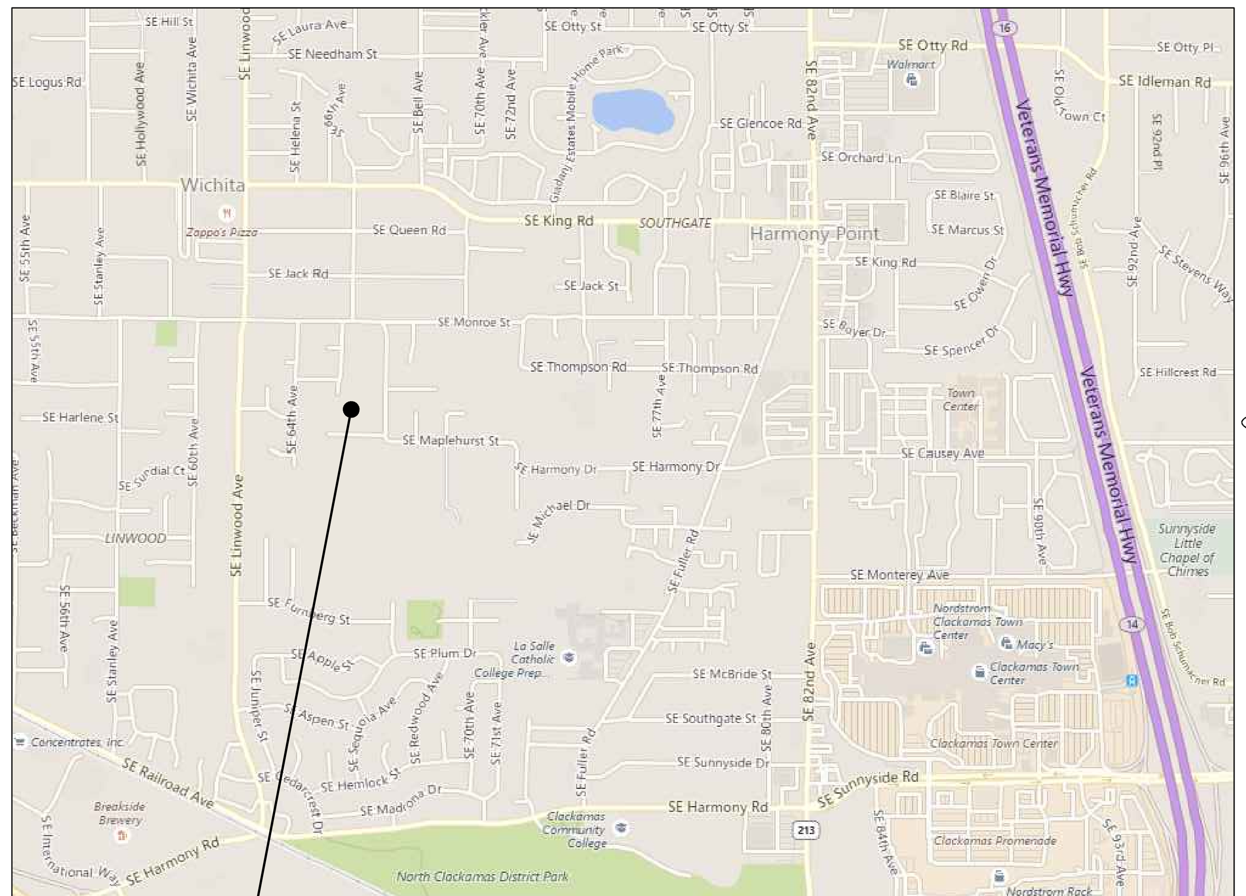
RIGGINS SUBDIVISION

PRE-DEVELOPMENT SITE PLAN

11159 SE MAPLEHURST ROAD, MILWAUKIE, OR 97222-2852

TAX LOT 100, MAP 12E32BC

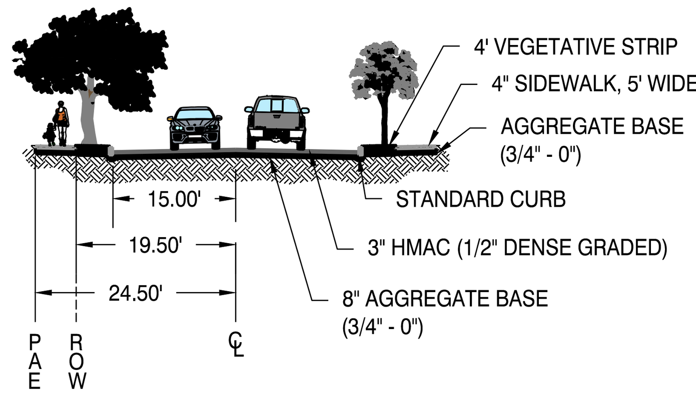
JUNE, 2017



PROJECT SITE

VICINITY MAP

NTS



LOCAL STREET SECTION

SITE INFORMATION

ADDRESS: 11159 SE MAPLEHURST ROAD, MILWAUKIE, OR 97222-2852

TAX ASSESSORS MAP: TAX LOT 100, MAP 12E32BC

PROPERTY SIZE: 2.50 ACRES

ZONING: R-7

PROPOSED USE

11 LOT SUBDIVISION

SHEET INDEX

P1.0 COVER SHEET AND PRELIMINARY SUBDIVISION

OWNER

DAVID RIGGINS
13605 SE HIGHWAY 212
MILWAUKIE, OR 97015

CIVIL ENGINEER

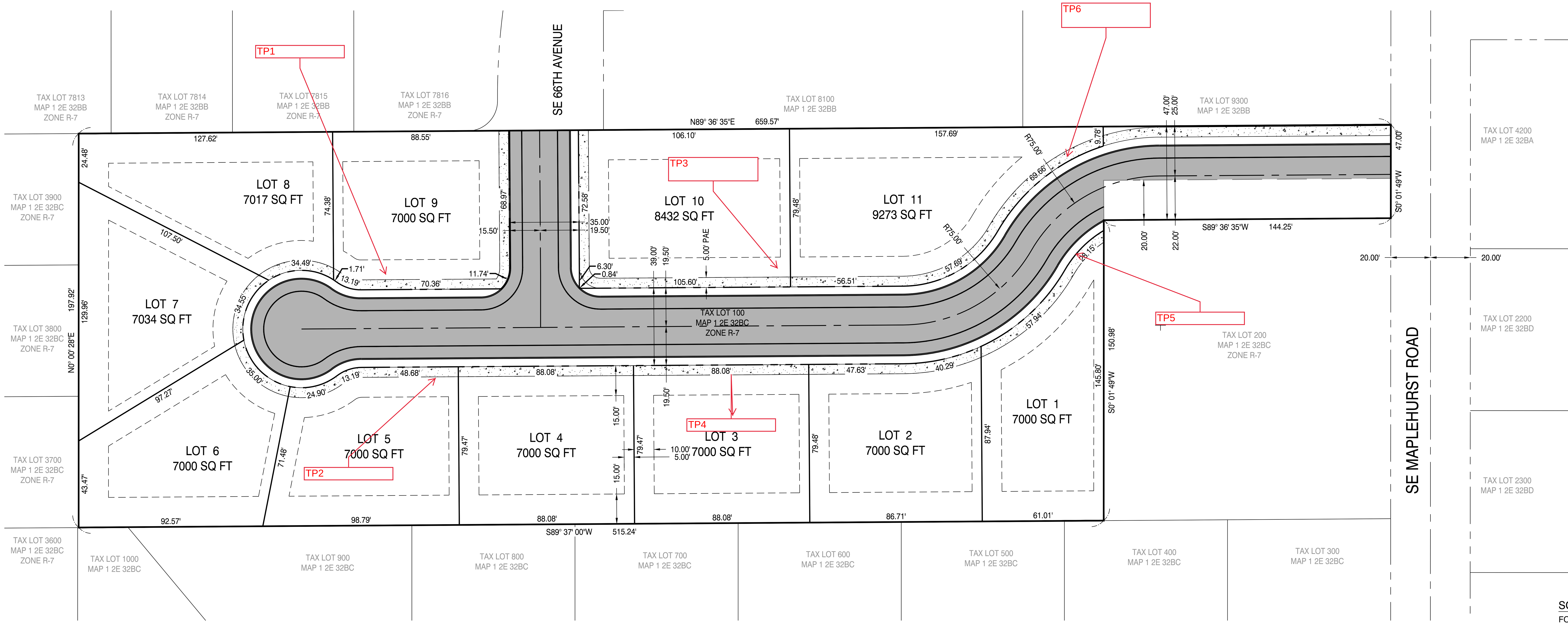
H.A. McCOY ENGINEERING & SURVEYING
CONTACT: HAYES McCOY
1180 SW LAKE ROAD
SUITE 201
REDMOND, OR 97756
PH: 541-923-7554

LEGEND

		EXISTING / PROPOSED	
ECABL	EXISTING CABLE		SANITARY SEWER MANHOLE
EGAS	EXISTING GAS		STORM DRAIN MANHOLE, DRYWELL
EIRRG	EXISTING IRRIGATION		WATER VALVE, GAS VALVE
OHW	EXISTING OVERHEAD LINES		AIR RELEASE VALVE
EPOWR	EXISTING POWER		BACKFLOW PREVENTER
EX SS	EXISTING SANITARY SEWER		WATER METER, GAS METER
EX SD	EXISTING STORM DRAIN		FIRE HYDRANT
ECOMM	EXISTING TELECOMMUNICATIONS		CATCH BASIN/CURB INLET
EWAT	EXISTING WATER		CLEAN OUT
CABL	NEW CABLE		RAIN DRAIN
GAS	NEW GAS		STREET LIGHT, PARKING LOT LIGHT
IRRG	NEW IRRIGATION		UTILITY POLE, GUY ANCHOR
POWR	NEW POWER		UTILITY VAULT
SSWR	NEW SANITARY SEWER		ELECTRICAL PEDESTAL
SD	NEW STORM DRAIN		CABLE PEDESTAL
COMM	NEW TELECOMMUNICATIONS		TELECOMMUNICATIONS PEDESTAL
WAT	NEW WATER		IRON ROD, IRON PIPE
	FENCE		TREES
	EXISTING RIGHT-OF-WAY		SIGN
	EXISTING EDGE OF GRAVEL		MAILBOX
	EXISTING EDGE OF PAVEMENT		
	EXISTING CURB		
	NEW RIGHT-OF-WAY		
	NEW EDGE OF GRAVEL		
	NEW EDGE OF PAVEMENT		
	NEW CURB		

R-7 STANDARDS

MIN. LOT SIZE:	7,000 SF
MIN. STREET FRONTAGE:	35 FEET (STANDARD LOT)
MIN. WIDTH:	60 FEET
MIN. DEPTH:	80 FEET (FLAG LOT)
SETBACKS:	20 FEET (FRONT)
	5/10 FEET (SIDE)
	20 FEET (STREET SIDE)
	20 FEET (REAR)



SCALE: 1" = 30'
FOR 34"x22" SHEETS

PRELIMINARY SITE PLAN

REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY
HAYES A. McCOY
RENEWAL DATE: 12/31/18

DRAWING STATUS:	DATE:	No.	REVISION:	DATE:
PRELIM. PLAN	04/17/17			
PLAN REV.	06/06/17			

H.A. McCOY ENGINEERING & SURVEYING, LLC
1180 SW Lake Road, Suite 201, Redmond, OR 97756
Hayes McCoy PE, PLS, CWRE
541-923-7554
hayes@ham-engr.com

PROJECT: RIGGINS SUBDIVISION

PROJECT LOCATION: MILWAUKIE, OREGON

CLIENT: DAVID RIGGINS

SHEET TITLE: COVER SHEET AND PRELIMINARY SITE PLAN

JOB NO. 17-031

DRAWN BY: CPF

DRAWING: P1.0

FILE: Z:\HAM Engr\17-031 Riggins Subdivision Milwaukie\Planning\170606-17031-PLAN-B.dwg 6/7/2017 3:49 PM -- Owner

Infiltration Testing Name: N WILLIAMS Date: 06/07/2017 Project: RIGGINS SUBDIVISION

Use post-hole diggers to dig a hole in a test pit to fit "test cylinder" (pipe) in ground so that top of the pipe is at the bottom of the test pit. Put some gravel in the test pit.

Fill the test cylinder with water and then open the spigot as needed to maintain the water level in the test cylinder at the top and note the time.

After draining 5 gallons of water or 2 hours (whichever comes first), fill the cylinder with water. This is the end of the "Pre-Soak" period.

Note the time when the water level has drained 1" total and 2" total. Note the time when the test pit has emptied (or estimate if its really slow).

You may want an extra bucket of water just in case some spills or to fill the cylinders after the "pre-soak".

If you hit hard rock, you may want to backfill in the test pit a little to make sure the cylinder is at ground level.

Its not necessary to start every test cylinder at the same time. I usually start one, then start the other while checking on the first one, etc.

	Test Pit #1 WEST AREA OF PROP	**Test Pit #2** WEST AREA OF PROP	**Test Pit #3** CENTRAL AREA PROP
Start Pre Soak	9:53	10:10	10:37
End Pre-Soak	12:00	12:22	12:40
Cylinder Full	12:00	12:22	12:40
1" in Cylinder	12:05	12:23	1:01:00 PM
2" in Cylinder	12:10	12:25	1:20
	5.2" 12:35	4.2" 12:36	3.3" 2:00
	7.7" 1:09	6.3" 1:09	4.5" 2:48

Start Pre Soak	**Test Pit #4**	**Test Pit #5**	**Test Pit #6**
End Pre-Soak	CENTRAL AREA PROP	EAST AREA OF PROP	EAST AREA OF PROP
Cylinder Full	1:25	2:00	2:07
1" in Cylinder	3:30	4:02	4:10
2" in Cylinder	3:30	4:02	4:10
	3:45	4:15	5:23:00 AM
	4:01	4:33	6:11
	2.2" 5:20	3.2" 4:52	2.6" 7:00
	3.0" 6:45	4.5" 5:15	3.1" 8:00

Test Pit #	Measured Infiltration Rate (in/hr)	Factor of Safety	Design Infiltraion Rate (in/hr)
1	6.76	2	3.4
2	8.04	2	4.0
3	2.11	2	1.1
4	0.80	2	0.4
5	3.70	2	1.8
6	0.64	2	0.3
Average	**5.64**	**2**	**2.8**

Exhibit G

Drywell Geometry Assumptions

Drywell 1 Geometry Assumptions

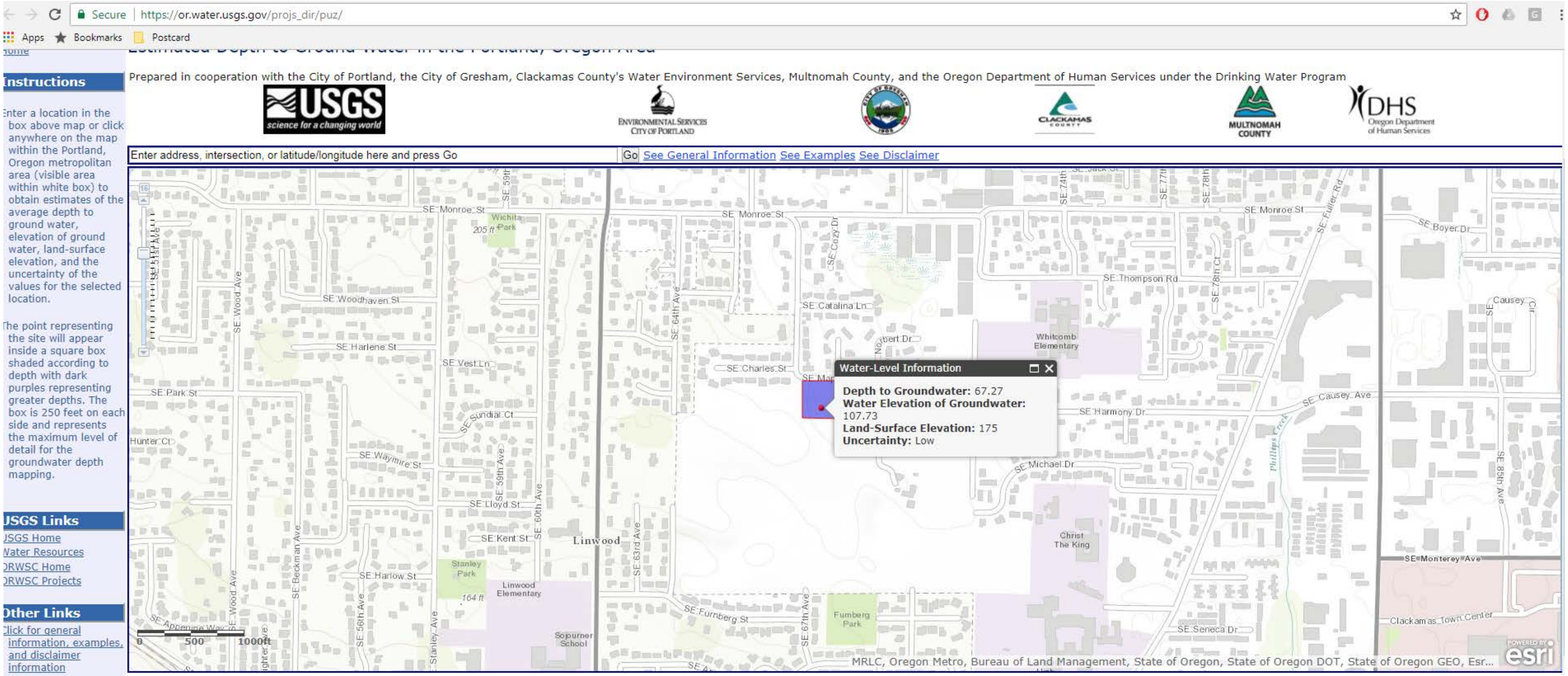
Drywell Rock Volume		160	cy
Drywell Depth		7	ft
Drywell Diameter		4	ft
Drywell Vol. (Internal)		87.96	cf
Drywell Vol. (Total)		1599.96	cf
Void Ratio		35%	
Vol. of Drain Rock		4320.00	cf
Ave. X-Sectional Area		617.14	sf
Ave. Radius		14.21	ft
Assumed Slope		0.50	
Base Radius		12.46	ft
Base Area		**487.60**	sf
Top Radius		15.96	ft
Top Area		**800.05**	sf
		36.3%	
Cone 1		2589.03	sf
Cone 2		1577.90	sf
Base Area		487.60	sf
Infiltration Surface Area		1498.72	sf

Drywell 2 Geometry Assumptions

Drywell Rock Volume		90	cy
Drywell Depth		7	ft
Drywell Diameter		4	ft
Drywell Vol. (Internal)		87.96	cf
Drywell Vol. (Total)		938.46	cf
Void Ratio		35%	
Vol. of Drain Rock		2430.00	cf
Ave. X-Sectional Area		347.14	sf
Ave. Radius		10.77	ft
Assumed Slope		0.50	
Base Radius		9.02	ft
Base Area		**255.43**	sf
Top Radius		12.52	ft
Top Area		**492.21**	sf
		37.3%	
Cone 1		1592.83	sf
Cone 2		826.60	sf
Base Area		255.43	sf
Infiltration Surface Area		1021.67	sf

Exhibit H

Depth to Groundwater



USGS Portland Area Depth to Groundwater for Subject Site