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Job No.: MSC-221

Date: June 20, 2019

To: Vera Kolias, AICP
City of Milwaukie

From: Ken Valentine, PE

Project/Subject: **Elk Rock Estates – Site Civil Memorandum**

The Elk Rock Estates project is located adjacent to the Willamette River in Milwaukie, Oregon. The property consists of two tax lots, 3200 being 1.34 acres and 3300 being 2.32 aces in size. The project will create 10 new single family residences and preserve two existing single family residences. A large portion of the site falls within the 100-year floodplain as identified in the Flood Insurance Study (FIS) 41005CV001A. The FIS shows a cross section directly through the site labeled "E" also known as river mile 19.1. The base flood elevation (BFE) at this cross section is 36.4 feet above mean sea level based on the 1988 vertical datum. The grading goal for the project is achieve a balanced cut and fill or a not net fill within the 100-year flood plain.

The proposed grading plan was prepared by first grading an access from 19th Avenue sloping down into the site from the east creating a Tee intersection with access running north and south form the Tee. According to the City of Milwaukie Comprehensive Plan all streets are required to be one foot above the base flood elevation. The City of Milwaukie has stated that the access should be considered a street because it provides access to the majority of the proposed homes. Therefore, the roadway grading was established to meet the City's criteria to be one foot above the BFE. The access is proposed as twenty-four wide paved surface with crowned centerline and two percent cross slopes. The driveways for each home were then graded to match into the proposed access and sloped down at four to six percent into the proposed garages. The garages were then assumed to be level without regard to the BFE because they are not considered living spaces. The minimum finish floor grades for the houses were set at one foot above the BFE per code. The building foundations will be constructed on existing grade with concrete stem walls. The foundation walls will be constructed per FEMA Technical Bulletin FEMATB-11 for building constructed in Special Flood Hazard Areas. The foundations will be constructed with flood vents and the crawl spaces will not be constructed no more than feet below the lowest adjacent grade. Further foundation discussion is included in the flood plain fringe velocity section of this memorandum. A water quality swale was designed using the Portland PAC calculator. The swale is proposed west of the lower buildings above the floodway and ordinary high water line. Cuts and fills on various locations on the site were determined through a trial and error process with the goal of a balanced or net cut scenario.

A proposed grading plan was created using Autodesk Civil3d software and a finish surface was created. An existing grade surface was created by combining metro lidar data with field shot topographic information. The finish grade surface was then laid over the existing grade surface and an earthwork surface was created. The earthwork surface boundary is the BFE line. All earthwork at and below the BFE and below was calculated using the triangulation of each surface. The analysis determined the cut volume within the flood plain is 1,853.42 cubic yards and fill

volume is 1,763.06 cubic yards with a net cut of 90.36 cubic yards. Additional grading details will be developed during the construction document stage, but this analysis demonstrates that it is possible to develop the site and balance the earthwork within the flood plan.

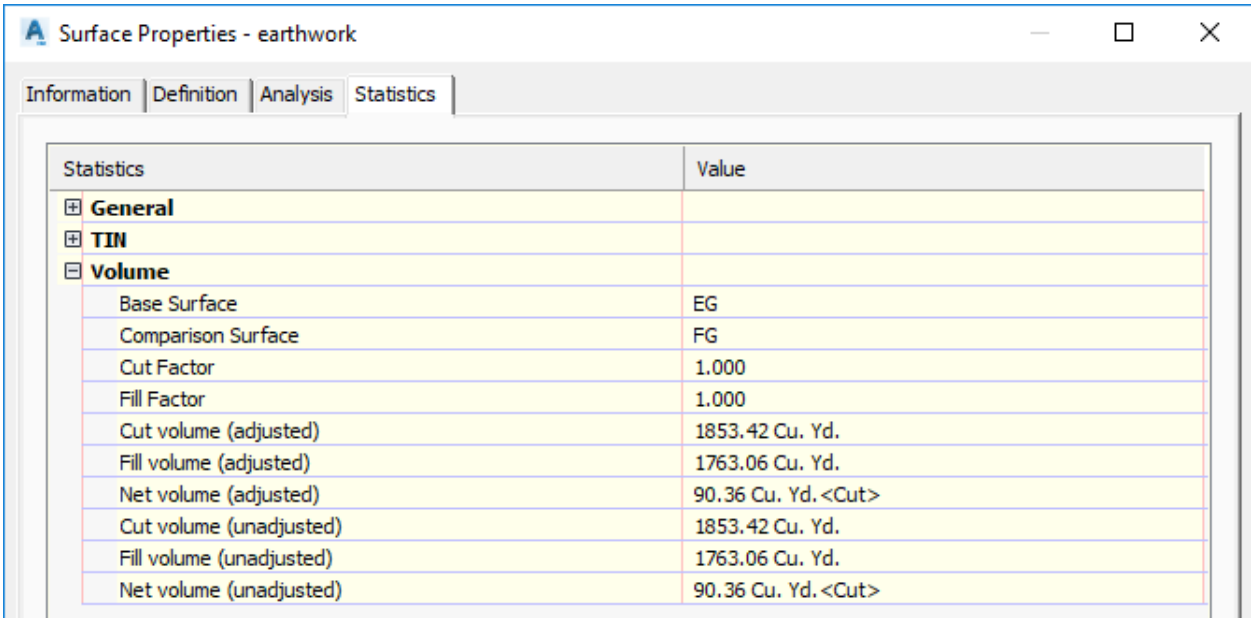

Figure 1 - Autodesk Civil3d Cut/Fill Results

Flood Plain Fringe Velocity

The staff report dated May 20, 2019 states that the area where the houses are proposed would be subject to velocities of 5.9 feet per section based on the mean velocity at cross section E of the flood insurance study. The staff report correctly states that the mean velocity is not a good measure of the fringe velocity. The mean velocity is a simple mathematic calculation dividing the flow in cubic feet per second by the cross sectional area measured in square feet to achieve a foot per second number. This calculation is never accurate for determining the fringe velocities due to changing roughness coefficients in the fringe. The center of the channel is generally where the highest velocities are measured because there is less friction and lower Manning's coefficient of roughness. The fringe which is covered in thick vegetation and rock outcroppings has a higher Manning's coefficient thereby reducing the fringe velocities. The best known ways to determine actual fringe velocity is by actual measurement during the event or by modeling the river using a FEMA approved software such as HECRAS developed by the US Army Corp of Engineers. Measuring during the actual event is unpractical, therefore the HECRAS results are the accepted practice by FEMA.

As stated above, the proposed project is located at river mile 19.1 and can be located in the Flood Insurance Study (FIS) 41005CV001A at cross section E. The FIS states that the peak discharges for the Willamette River were based on stage-frequency curves for gauges at the Willamette Falls Locks and Wilsonville. The model for the Willamette River is a backwater model adjusted by modeling the 1964 flood and matching the elevations obtained at three cross sections in the river. FEMA does not have official HECRAS models for the Willamette River, so the BFE data and velocities are based on very old hydraulic analysis and measurements. A HECRAS model was developed of Willamette River from the Oregon City Falls to the confluence with the Columbia

River as part of the Tilikum Crossing bridge project. The model was prepared by West Consultants and a Letter Map Revision was submitted to FEMA. The model is the best representation of the river conditions available today. A copy of the model was acquired to assist in the design of the Elk Rock Estates project.

The model results for cross section E of the FIS indicate that the fringe velocities are 0.95 fps for the left overbank and 1.33 fps for the right overbank (The proposed site). A copy of the analysis results are attached to this memo. These velocities are well below the mean velocity of 5.9 fps. The FEMA Technical Bulletin 1 "*Openings in Foundation Walls and Walls of Enclosures*" dated August 2008 identified for special treatment and design. The document also states that parking of vehicles, building access, storage and crawlspaces are allowed below the BFE and that using perimeter foundation walls that create enclosed areas so long as flow is allowed utilizing flood openings. City code MMC 18.04150G states that crawl spaces are should not be used when velocities exceed 5 fps. The model results indicate the velocities are much lower than 5 fps. See additional memo titled "Staff Report Response to Floodplain Impacts".

Cross Section Output

File Type Options Help

River: Willamette River Profile: 100-yr

Reach Upper Portland RS: 19.1 Plan: Proposed

Plan: Proposed Willamette River Upper Portland RS: 19.1 Profile: 100-yr

E.G. Elev (ft)	36.96	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.56	Wt. n-Val.	0.060	0.035	0.090
W.S. Elev (ft)	36.40	Reach Len. (ft)	2300.00	2480.00	2200.00
Crit W.S. (ft)	-28.48	Flow Area (sq ft)	163.85	59459.08	8567.44
E.G. Slope (ft/ft)	0.000137	Area (sq ft)	163.85	59459.08	9250.65
Q Total (cfs)	375000.00	Flow (cfs)	157.94	363471.50	11370.53
Top Width (ft)	1953.62	Top Width (ft)	14.31	1336.92	602.39
Vel Total (ft/s)	5.50	Avg. Vel. (ft/s)	0.96	6.11	1.33
Max Chl Dpth (ft)	104.90	Hydr. Depth (ft)	11.45	44.47	18.22
Conv. Total (cfs)	32052270.0	Conv. (cfs)	13499.8	31066900.0	971869.8
Length Wtd. (ft)	2475.66	Wetted Per. (ft)	27.00	1377.18	475.71
Min Ch El (ft)	-68.50	Shear (lb/sq ft)	0.05	0.37	0.15
Alpha	1.20	Stream Power (lb/ft s)	2225.00	0.00	0.00
Frctn Loss (ft)	0.18	Cum Volume (acre-ft)	748.51	50712.02	2908.42
C & E Loss (ft)	0.08	Cum SA (acres)	126.64	1036.09	163.13

Figure 2 HEC-RAS Cross Section Results

FEMA Technical bulletin 11 provides guidance for designing buildings in the floodplain with crawl spaces. The proposed buildings will incorporate design incompliance with FEMA guidelines. Compliant openings in the foundation walls will be incorporated into the designs and garage floors below the BFE are approved in the FEMA bulletin 1. Whether or not the garages are elevated should be a final design decision and will comply with applicable regulations and FEMA guidelines.

The staff report also discusses the elevation for the building access drive. Whether the access is required be one foot above the BFE or not the roadway and subsequent cut/fill ratio can be designed to provide for a "No-rise" situation. Typically the final analysis is completed after land use approval and after incorporating conditions of approval. I have completed many projects

within regulated floodplains that have either incorporated a balanced cut/fill ratio, demonstrated no negative impacts through a no-rise analysis or both. Preliminary analysis has demonstrated that a balanced cut/fill can be achieved based the proposed grading plan. The conditions of approval should include a requirement to meet MMC 18 and the final analysis will be completed once the conditions of approval have been issued and accepted.

Stormwater Management

The site is located at the intersection of 19th Avenue and Sparrow Street in Milwaukie, Oregon. The proposed development includes construction of a shared access way and 10 new single family dwellings developed as a cluster development. The site is made up of two tax lots that extend from 19th Avenue west across a slough on to Elk Island within the Willamette River.

This drainage report addresses the best practices (BMP) for the new impervious surfaces including roof runoff. Water quality treatment will be completed using a vegetated swale.

Existing Site Conditions

The existing site includes two existing homes fronting 19th Avenue. 19th Avenue is lighting improved with an asphalt roadway. The Sparrow Street right of way extends along the south of the property but is unimproved. The site slopes down from east to west to the Willamette River. There is an existing sanitary sewer that transects about the middle of the property north to south. The site is primarily covered in grasses with trees on the fringes. A portion of the site is within the AE flood hazard area as depicted on the FEMA Firm Map number 41005C0017D. The maps indicates that cross E is directly on the property. The FEMA flood insurance study 41005CV001A dated June 17, 2008 indicates the base flood elevation is 36.4 msl based on the NAVD 88 vertical datum.

The USDA Web Soil Survey shows the pre-developed conditions in this area as Newberg fine sandy loam, map unit 67, with hydrologic soil group A.

Soils curve numbers were based on the existing ground cover and hydrologic soil grouping.

Curve numbers: 98 for impervious Area
49 for fair conditions grass cover soil type A

Proposed Site Improvements

The improvements include construction of a shared access way constructed of asphalt paving and concrete curbs. The pavement will be 24' wide and approximately 348 linear feet. There will be 10 new single family homes of various sizes with driveways. The proposed access way and the houses on the east side of the proposed access way will be collected via pipes and catch basins. The runoff will be directed to a vegetated infiltration swale. The proposed buildings on the west side of the access way will be daylighted and flow to the vegetated swale. The vegetated swale will provide water quality before discharging to the Willamette River.

The City of Milwaukie has adopted the City of Portland Stormwater Management Manual (SWMM). The site's impervious surfaces must be managed per the SWMM. Per the SWMM, the Stormwater Infiltration and Discharge Hierarchy is to be used to determine the feasibility of the stormwater option to be used for the site. The following addresses each category in the Hierarchy;

Category 1: Requires total onsite infiltration with vegetated infiltration facilities.

The site will not use a total onsite infiltration basin.

Category 2: Requires total onsite infiltration with a vegetated facility that overflows to a subsurface infiltration facility.

The site will not overflow to a subsurface infiltration facility.

Category 3: Requires onsite detention with vegetated facilities that overflow to a drainage way, river, or storm-only pipe.

The site will overflow to the Willamette River.

Table 1 City of Portland Stormwater Management Requirements

Design Requirement	City of Portland
Treatment Area	All Area within Limits of Improvements
Treatment Storm	70% TSS removal from 90% avg. annual runoff
Detention	• 2-year post-developed to ½ 2 year pre-developed runoff • 5-year post-developed runoff to 5-year pre-developed runoff • 10-year post-developed runoff to 10-year pre-developed runoff • 25-year post-developed runoff to 25-year pre-developed runoff

Flow Control

Flow control is not required for discharges flowing to the Willamette River per the SWMM.

Water Quality

All impervious surfaces will be directed a vegetated swale designed using the SWMM presumptive approach calculator (PAC). The proposed development will create 29,834 new impervious surfaces. A vegetated swale will be located west of the developed area closest to the Willamette River. A slough is located west of the developed area and east of Elk Island. The swale will collect and provide treatment before discharging to the slough. The discharge will be located above the ordinary high water line estimated to be at or near the 20 foot contour line.

Conveyance

The onsite storm pipe system has been designed using the rational method. The pipes will be privately maintained and no portion of the system will be publicly owned or maintained by the City of Milwaukie. The maximum pipe size will be 10 inch with a minimum slope of 1%. There is no downstream analysis required because the system will discharge to the Willamette River.

Conclusion

The vegetated swale has been sized to treat all impervious surfaces associated with the development per the SWMM and PAC. The stormwater system will be maintained by the development. No detention is required because the system ultimately discharges to the

Willamette River. The design meets or exceeds the City of Milwaukie requirements for stromwater management. A formal drainage report will be submitted with construction permitting.

Exhibits

Existing Conditions Map
Proposed Conditions Map
PAC Report
Soil Survey Hydrologic Group Data

P:\MSC (Gillis Properties)\MSC-221 (Riverside Cluster Development)\MSC221-DOCS\REPORTS\STORM - (Storm Report)\MSC221 - 2 - Existing Condition.dwg

EXISTING CONDITION
RIVER CLUSTER DEVELOPMENT
MILWAUKIE, OREGON

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REGISTERED PROFESSIONAL ENGINEER 50,102 OREGON JULY 13, 1993 KENNETH K. VALENTINE
EXPIRES: 06/30/20

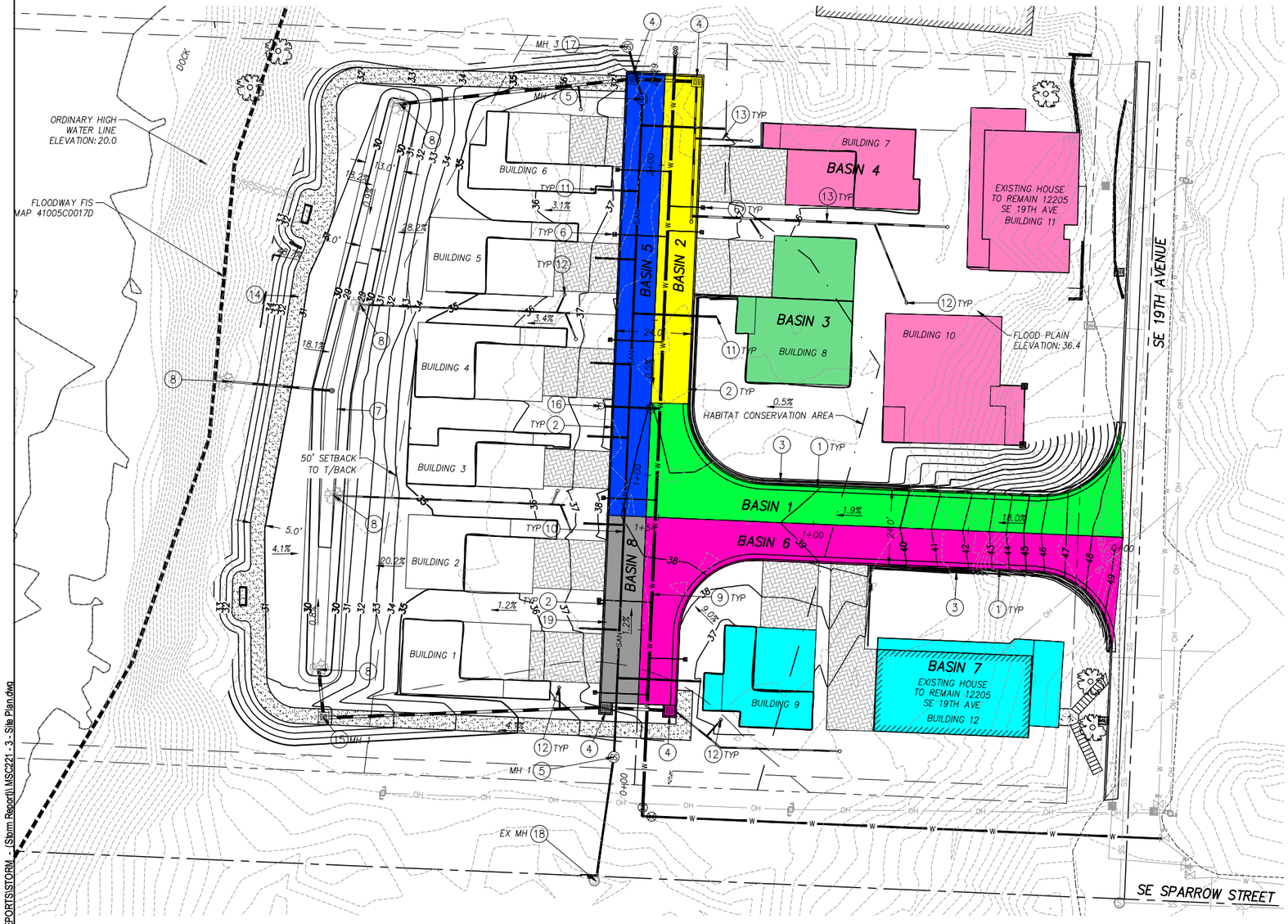
DESIGNED:	KKV
DRAWN:	HHPR TEAM
CHECKED:	KKV
DATE:	JUNE 2019

DATE	NO.	DESCRIPTION
APRIL 2019	1	REVISED GRADING

R E V I S I O N S

SHEET NO.
E

JOB NO.
MSC-221



CONSTRUCTION NOTES:

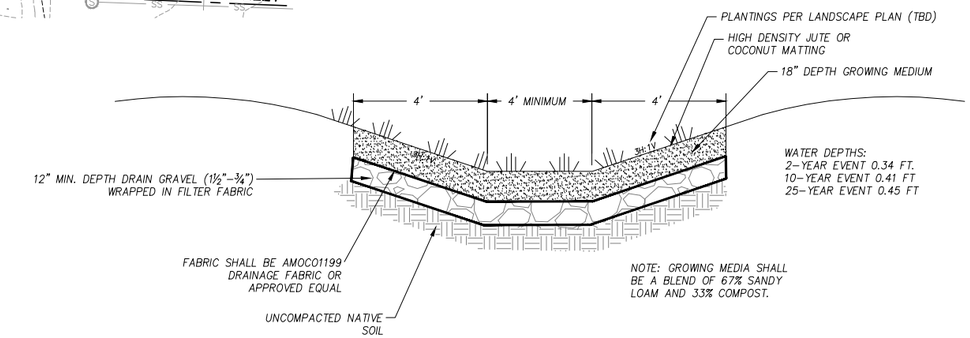
1. INSTALL STANDARD CURB AND GUTTER.
2. INSTALL MOUNTABLE CURB.
3. INSTALL MODULAR BLOCK RETAINING WALL.
4. INSTALL STANDARD CATCH BASIN.
5. INSTALL 48" STANDARD SANITARY MANHOLE
6. INSTALL WATER METER
7. CONSTRUCT WATER QUALITY SWALE. SEE BELOW.
8. CONSTRUCT STORM WATER OUTFALL WITH RIPRAP
9. INSTALL 8" WATER LINE
10. INSTALL 8" SANITARY SEWER LINE
11. INSTALL SANITARY SEWER LATERAL
12. INSTALL STORM CLEANOUT
13. INSTALL STORM SEWER LATERAL
14. CONSTRUCT PEDESTRIAN TRAIL
15. INSTALL 48" STANDARD STORM MANHOLE
16. INSTALL FIRE HYDRANT
17. INSTALL STANDARD 48" SANITARY MANHOLE OVER EXTG. 8" SANITARY LINE. PLUG AND ABANDON EXTG. SANITARY PIPE TO THE SOUTH. CONTRACTOR TO POTHOLE AND VERIFY LOCATION AND ELEVATION PRIOR TO CONSTRUCTION.
18. CONNECT TO EXTG. SANITARY MANHOLE. PLUG AND ABANDON EXTG. SANITARY PIPE TO THE NORTH.
19. ABANDON EXTG. SANITARY SEWER IN PLACE. REMOVE PORTIONS OF PIPE THAT ARE IN CONFLICT WITH PROPOSED FACILITIES.

PROPOSED LEGEND:

- SAN — SANITARY LINE
- W — WATER LINE
- STORM LINE
- CURB
- ATRIUM INLET
- PEDESTRIAN PATH
- MAJOR CONTOUR – 5' INTERVALS
- MINOR CONTOUR – 1' INTERVALS
- SD — STORM MANHOLE
- SS — SANITARY MANHOLE
- CLEANOUT
- CATCH BASIN
- FIRE HYDRANT
- 2% — FLOW ARROW AND SLOPE

IMPERVIOUS AREA BASIN DATA

- BASIN 1 – 2,502 SF 0.06 AC
- BASIN 2 – 1,326 SF 0.03 AC
- BASIN 3 – 4,870 SF 0.11 AC
- BASIN 4 – 1,150 SF 0.03 AC
- BASIN 5 – 2,937 SF 0.07 AC
- BASIN 6 – 5,756 SF 0.13 AC
- BASIN 7 – 2,775 SF 0.06 AC
- BASIN 8 – 771 SF 0.02 AC



STORM WATER QUALITY SWALE

N.T.S.

PROPOSED CONDITIONS AND BASINS MAP
RIVER CLUSTER DEVELOPMENT
MILWAUKIE, OREGON

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REGISTERED PROFESSIONAL ENGINEER — OREGON JULY 13, 2005 — KENNETH K. VALENTINE — EXPIRES: 06/30/20

DESIGNED:	KKV
DRAWN:	HHPR TEAM
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NO.	DESCRIPTION	DATE
1	REVISED GRADING	APRIL 2019

SHEET NO.
P

JOB NO.
MSC-221

P:\MSC (Gillis Properties)\MSC-221 (Riverside Cluster Development)\MSC221-DOCS\REPORTS\STORM - (Storm Report)\MSC221-3 - Site Plan.dwg

PAC Report

Project Name **Milwaukie Cluster Development**	Permit No.	Created **11/15/18 10:02 AM**
Project Address **12205 SE 19th Street Milwaukie, OR 97222**	Designer **Ken Valentine**	Last Modified **6/12/19 1:40 PM**
	Company **HHPR**	Report Generated **6/12/19 1:40 PM**

Project Summary

Riverside Cluster Development

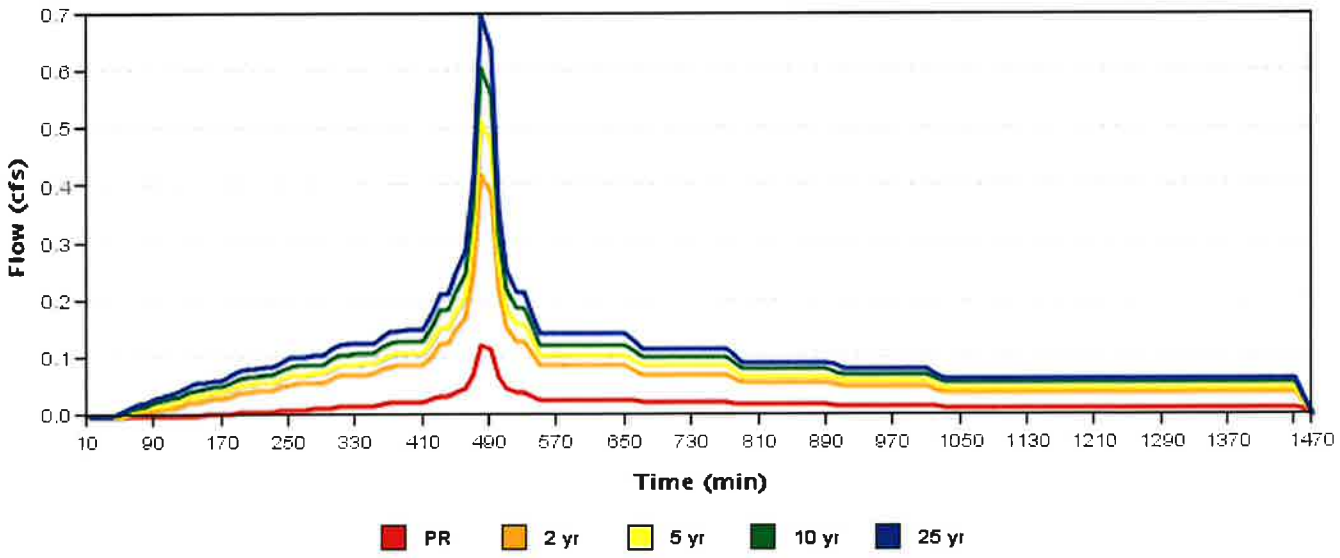
Catchment Name	Impervious Area (sq ft)	Native Soil Design Infiltration Rate	Hierarchy Category	Facility Type	Facility Config	Facility Size (sq ft)	Facility Sizing Ratio	PR Results	Flow Control Results
Combined	29834	0.10	3	Swale	C		2.7%	Pass	Not Used

Catchment Combined

Site Soils & Infiltration Testing Data	Infiltration Testing Procedure	**Open Pit Falling Head**
	Native Soil Infiltration Rate (I_{test})	**0.10**
Correction Factor	CF_{test}	**2**
Design Infiltration Rates	Native Soil (I_{dsgn})	**0.05 in/hr**
	Imported Growing Medium	**2.00 in/hr**
Catchment Information	Hierarchy Category	**3**
	Disposal Point	**A**
	Hierarchy Description	**Off-site flow to drainageway, river, or storm-only pipe system**
	Pollution Reduction Requirement	**Pass**
	10-year Storm Requirement	**N/A**
	Flow Control Requirement	**N/A**
	Impervious Area	**29834 sq ft** **0.685 acre**
	Time of Concentration (Tc)	**5**
	Pre-Development Curve Number (CN_{pre})	**72**
	Post-Development Curve Number (CN_{post})	**98**

Indicates value is outside of recommended range

SBUH Results



	Pre-Development Rate and Volume		Post-Development Rate and Volume	
	Peak Rate (cfs)	Volume (cf)	Peak Rate (cfs)	Volume (cf)
PR	0	1.72	0.123	1558.91
2 yr	0.037	1187.167	0.421	5398.339
5 yr	0.086	1862.761	0.514	6634.829
10 yr	0.142	2625.513	0.607	7873.169
25 yr	0.204	3456.774	0.7	9112.677

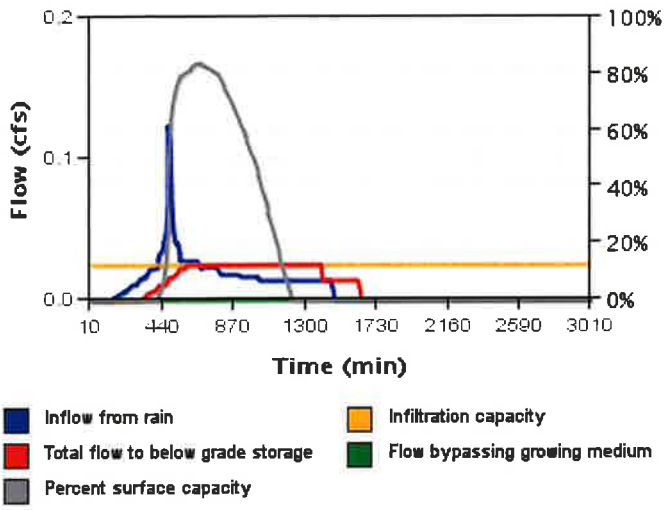
Facility Combined

Facility Details	Facility Type	**Swale**
	Facility Configuration	**C: Infl. with RS and underdrain (Ud)**
	Facility Shape	**Sloped**
	Above Grade Storage Data	
	Growing Medium Depth	**18 in**
	Surface Capacity at Depth 1	**305.4 cu ft**
	Design Infiltration Rate for Native Soil	**0.000 in/hr**
	Infiltration Capacity	**0.025 cfs**
	Below Grade Storage Data	
	Rock Storage Depth	**12 in**
	Rock Porosity	**0.30 in**
	Storage Depth 3	**12.0 in**
Facility Facts	Total Facility Area Including Freeboard	**800.00 sq ft**
	Sizing Ratio	**2.7%**
Pollution Reduction Results	Pollution Reduction Score	**Pass**
	Overflow Volume	**1437.734 cf**
	Surface Capacity Used	**84%**
	Rock Capacity Used	**100%**
Flow Control Results	Flow Control Score	**Not Used**
	Overflow Volume	**7748.830 cf**
	Surface Capacity Used	**100%**
	Rock Capacity Used	**100%**

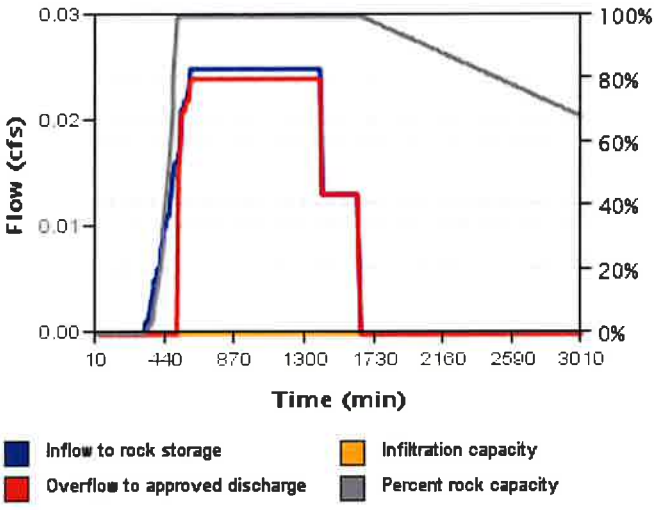
Sloped Facility Worksheet

#	Segment Length (ft)	Check Dam Length (ft)	Slope, v/h (ft/ft)	Bottom Width (ft)	Right Side Slope, h/v (ft/ft)	Left Side Slope, h/v (ft/ft)	Downstream Depth (in)	Landscape Width (ft)	Rock Storage Width (ft)
1	20.00	1.00	0.0100	4.00	3.0	3.0	9.0	10.00	4.00
2	20.00	1.00	0.0100	4.00	3.0	3.0	9.0	10.00	4.00
3	20.00	1.00	0.0100	4.00	3.0	3.0	9.0	10.00	4.00
4	20.00	1.00	0.0100	4.00	3.0	3.0	9.0	10.00	4.00

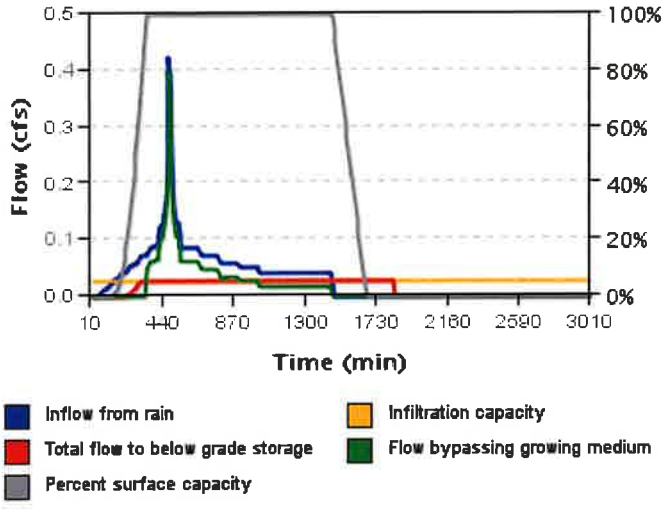
Pollution Reduction Event Surface Facility Modeling



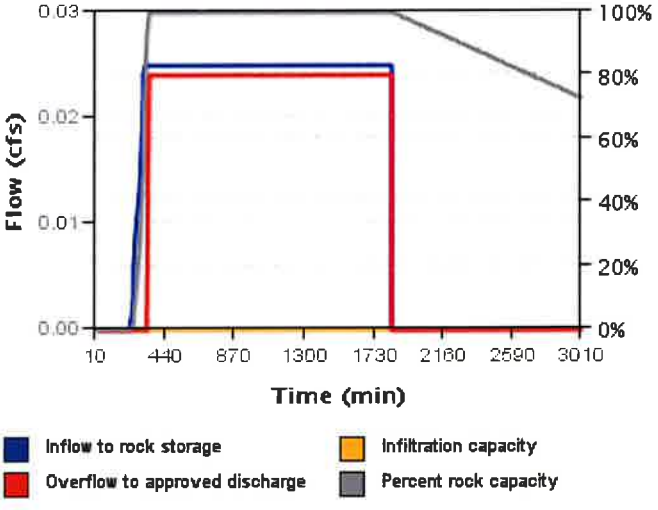
Pollution Reduction Event Below Grade Modeling



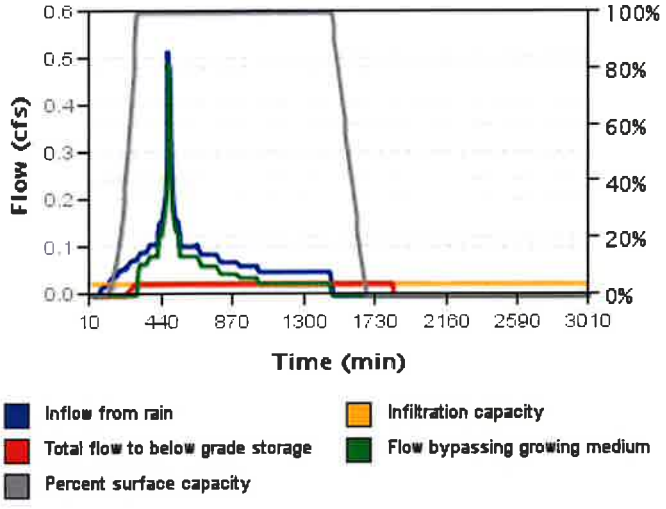
2 Year Event Surface Facility Modeling



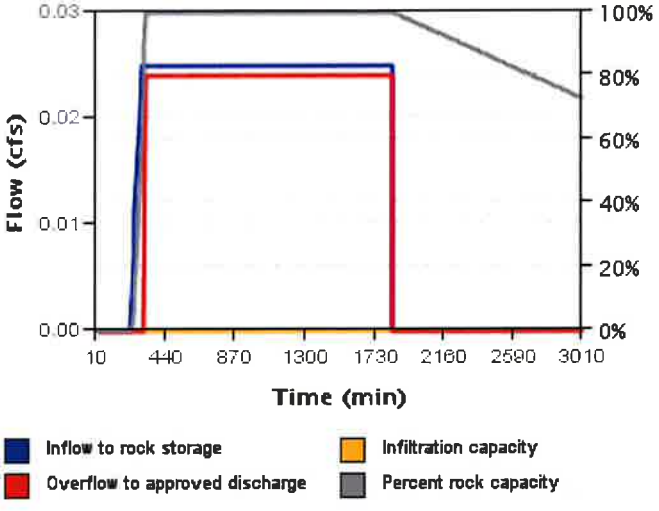
2 Year Event Below Grade Modeling



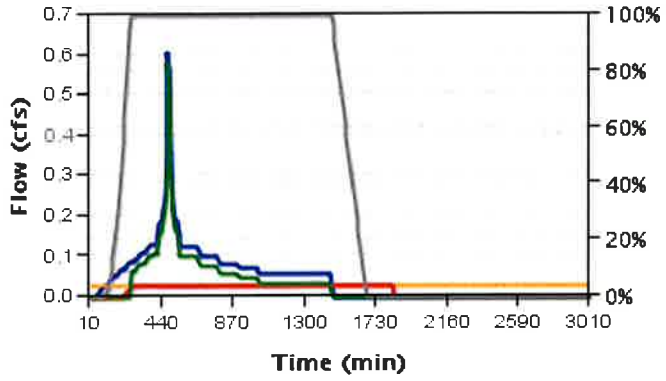
5 Year Event Surface Facility Modeling



5 Year Event Below Grade Modeling

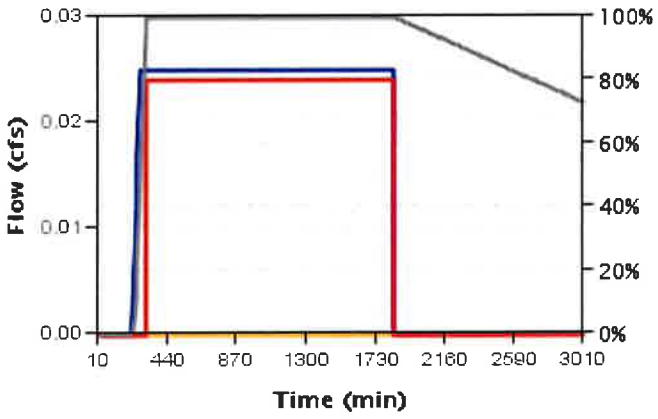


10 Year Event Surface Facility Modeling



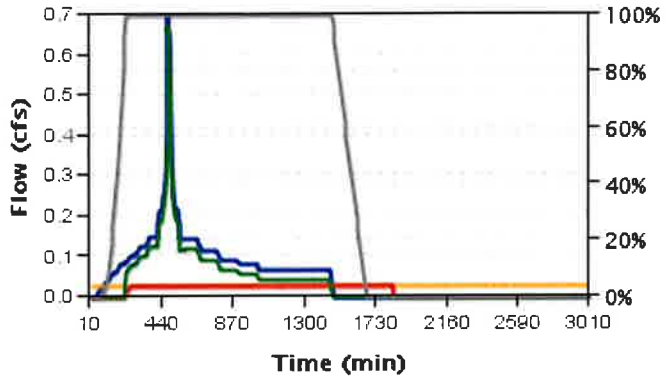
Inflow from rain
Infiltration capacity
Total flow to below grade storage
Flow bypassing growing medium
Percent surface capacity

10 Year Event Below Grade Modeling



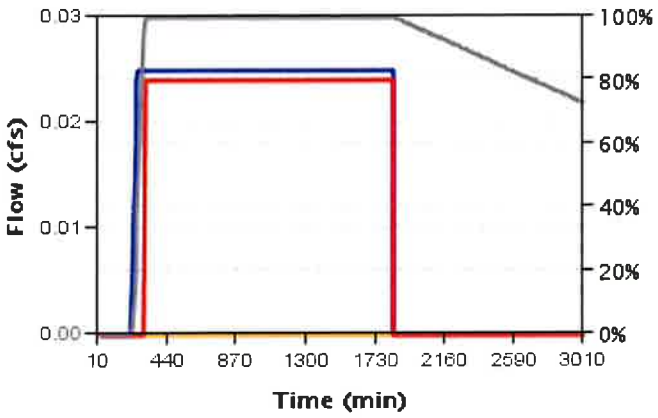
Inflow to rock storage
Infiltration capacity
Overflow to approved discharge
Percent rock capacity

25 Year Event Surface Facility Modeling



Inflow from rain
Infiltration capacity
Total flow to below grade storage
Flow bypassing growing medium
Percent surface capacity

25 Year Event Below Grade Modeling



Inflow to rock storage
Infiltration capacity
Overflow to approved discharge
Percent rock capacity

Milwaukie Cluster

2-year Flow Swale depth

Man-Made Channels

CIVIL TOOLS PRO
English Units
06-18-2019 09:30:28

Results

Flow Depth	=	0.34 ft
Flowrate	=	0.42 cfs
Bottom Width	=	4.00 ft
Side Slope (H:V)	=	3.0000 H:V
Channel Slope (V:H)	=	0.0100 V:H
Manning's N	=	0.250
Wetted Area	=	1.68 sq ft
Wetted Perimeter	=	6.12 ft
Velocity	=	0.25 fps
Froude No.	=	0.08
Flow Regime	=	Sub-Critical

Milwaukie Cluster

10-year Flow Swale depth

Man-Made Channels

CIVIL TOOLS PRO
English Units
06-18-2019 09:29:29

Results

Flow Depth	=	0.41 ft
Flowrate	=	0.60 cfs
Bottom Width	=	4.00 ft
Side Slope (H:V)	=	3.0000 H:V
Channel Slope (V:H)	=	0.0100 V:H
Manning's N	=	0.250
Wetted Area	=	2.13 sq ft
Wetted Perimeter	=	6.58 ft
Velocity	=	0.28 fps
Froude No.	=	0.09
Flow Regime	=	Sub-Critical

Milwaukie Cluster

25-year Flow Swale depth

Man-Made Channels

CIVIL TOOLS PRO
English Units
06-18-2019 09:30:00

Results

Flow Depth	=	0.45	ft
Flowrate	=	0.70	cfs
Bottom Width	=	4.00	ft
Side Slope (H:V)	=	3.0000	H:V
Channel Slope (V:H)	=	0.0100	V:H
Manning's N	=	0.250	
Wetted Area	=	2.38	sq ft
Wetted Perimeter	=	6.82	ft
Velocity	=	0.29	fps
Froude No.	=	0.09	
Flow Regime	=	Sub-Critical	

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 Clackamas County Area, Oregon

Milwaukie Cluster Development

June 19, 2019

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

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

Map Scale: 1:1,520 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 20 40 80 120

Feet
0 50 100 200 300

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 1:20,000.

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: Clackamas County Area, Oregon
Survey Area Data: Version 14, Sep 18, 2018

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

Date(s) aerial images were photographed: Jul 26, 2014—Sep 5, 2014

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
67	Newberg fine sandy loam	8.9	73.1%
91B	Woodburn silt loam, 3 to 8 percent slopes	2.1	17.4%
93E	Xerochrepts-Rock outcrop complex, moderately steep	0.2	1.4%
W	Water	1.0	8.1%
Totals for Area of Interest		**12.2**	**100.0%**

Map Unit Descriptions

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

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

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

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

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

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

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

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

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

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

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

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

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

Clackamas County Area, Oregon

67—Newberg fine sandy loam

Map Unit Setting

National map unit symbol: 226g
Elevation: 30 to 1,200 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Newberg and similar soils: 85 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Newberg

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 14 inches: fine sandy loam
H2 - 14 to 23 inches: fine sandy loam
H3 - 23 to 42 inches: fine sand
H4 - 42 to 60 inches: extremely gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Wapato

Percent of map unit: 2 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear

Across-slope shape: Linear
Hydric soil rating: Yes

Aquolls

Percent of map unit: 1 percent
Landform: Flood plains
Hydric soil rating: Yes

91B—Woodburn silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 227z
Elevation: 150 to 400 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Woodburn and similar soils: 90 percent
Minor components: 4 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodburn

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stratified glaciolacustrine deposits

Typical profile

H1 - 0 to 16 inches: silt loam
H2 - 16 to 38 inches: silty clay loam
H3 - 38 to 60 inches: silt loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 25 to 32 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e

Hydrologic Soil Group: C
Forage suitability group: Moderately Well Drained < 15% Slopes (G002XY004OR)
Hydric soil rating: No

Minor Components

Huberly
Percent of map unit: 2 percent
Landform: Swales on terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Dayton
Percent of map unit: 1 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Aquolls
Percent of map unit: 1 percent
Landform: Flood plains
Hydric soil rating: Yes

93E—Xerochrepts-Rock outcrop complex, moderately steep

Map Unit Setting
National map unit symbol: 2282
Elevation: 100 to 500 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Not prime farmland

Map Unit Composition
Xerochrepts and similar soils: 60 percent
Rock outcrop: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Xerochrepts

Setting
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from andesite and/or basalt

Typical profile

H1 - 0 to 26 inches: gravelly loam
H2 - 26 to 30 inches: unweathered bedrock

Properties and qualities

Slope: 0 to 30 percent
Depth to restrictive feature: 10 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Rock Outcrop

Typical profile

R - 0 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 0 to 30 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

W—Water

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Water

Interpretive groups

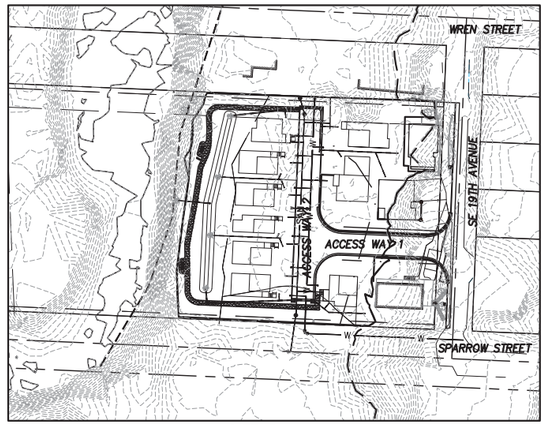
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Yes

RIVER CLUSTER DEVELOPMENT

MILWAUKIE, OREGON

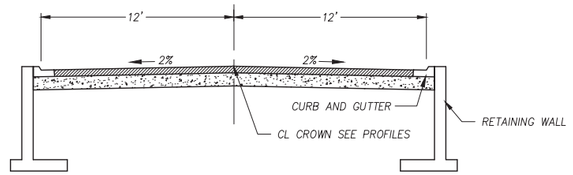
VICINITY MAP

NTS



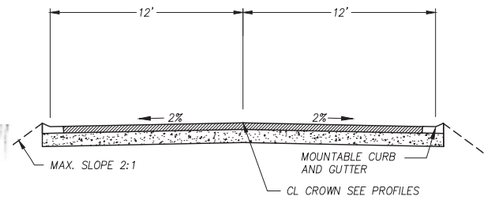
SITE PLAN

NTS



TYPICAL SECTION ACCESS WAY 1

N.T.S.



TYPICAL SECTION ACCESS WAY 2

GENERAL NOTES

WORK SHALL CONFORM WITH OREGON STANDARD SPECIFICATIONS FOR CONSTRUCTION (APWA), OREGON DEPARTMENT OF TRANSPORTATION (ODOT), CITY OF MILWAUKIE STANDARDS, APPLICABLE UTILITY PROVIDER STANDARDS, THE INTERNATIONAL BUILDING CODE (IBC), AND THE UNIFORM PLUMBING CODE (UPC).

EXISTING UTILITIES SHOWN ON THE PLANS ARE PER SURFACE LOCATIONS AND AS-BUILT DRAWINGS. THE CONTRACTOR SHALL VERIFY LOCATIONS OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL BE REQUIRED TO VERIFY ALL EXISTING INVERT ELEVATIONS PRIOR TO MAKING CONNECTIONS TO EXISTING STRUCTURES OR CONSTRUCTING NEW MANHOLES OVER EXISTING PIPES. ANY REQUIRED CHANGES TO THE PLAN MUST BE APPROVED THROUGH THE ENGINEER.

TRAFFIC CONTROL DEVICES, FLAG PERSONS, ETC., SHALL BE IN PLACE PRIOR TO INITIATION OF CONSTRUCTION WORK AND SHALL BE EFFECTIVELY MAINTAINED.

ALL TRAFFIC CONTROL DEVICES TO CONFORM WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), (CURRENT EDITION).

EXCAVATOR(S) MUST COMPLY WITH O.R.S. 757.541 THROUGH 757.571; EXCAVATOR(S) SHALL NOTIFY ALL UTILITY COMPANIES FOR LINE LOCATIONS 72 HOURS (MIN.) PRIOR TO START OF WORK. DAMAGE TO UTILITIES SHALL BE CORRECTED AT THE CONTRACTOR'S EXPENSE.

CONSTRUCTION NOISE AND PROJECT WORK TIMES SHALL COMPLY WITH CURRENT LOCAL AND STATE REGULATIONS.

ALL MANHOLES AND VALVE LIDS SHALL BE CONSTRUCTED LEVEL WITH THE FIRST LIFT OF PAVEMENT. WHEN THE SECOND LIFT OF PAVEMENT IS PLACED THE MANHOLE LIDS AND VALVE COVERS SHALL BE ADJUSTED TO FINISH GRADE. MANHOLES TO BE ADJUSTED WITH STEEL OR C.I. 1-1/2" RISER RING.

ALL WASTE MATERIALS INCLUDING STRIPING MUST BE DISPOSED IN A MANNER CONFORMING TO LOCAL, STATE AND FEDERAL REQUIREMENTS. STRIPING SHALL BE STOCKPILED OR DISPOSED OF ON LOTS. ANY EXCESS EXCAVATED MATERIAL DEEMED SUITABLE FOR CONSTRUCTION OF STRUCTURAL FILLS BY THE PROJECT GEOTECHNICAL ENGINEER SHALL BE COMPACTED TO SPECIFICATIONS BELOW. STOCKPILED MATERIALS SHALL BE COVERED WITH BLACK PLASTIC OR STRAW AND SURROUNDED BY STRAW BALES TO ELIMINATE SEDIMENT TRANSPORT.

ALL BURIED UTILITY MAINS AND LATERALS (EXCEPT AT WATER METERS & VALVE BOXES) LOCATED WITHIN THE RIGHT-OF-WAY SHALL HAVE A MINIMUM 30-INCH COVER TO FINISH GRADE AND BE PLACED PRIOR TO PAVING.

GRADING AND COMPACTION

ALL STRUCTURAL FILLS SHALL BE COMPACTED TO A DENSITY NOT LESS THAN 95% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D-1557 OR EQUIVALENT STANDARD (AASHTO T-180). SUBGRADE SHALL BE COMPACTED TO 92% RELATIVE DENSITY. ASPHALT CONCRETE SHALL BE COMPACTED TO 92% RELATIVE DENSITY. CRUSHED ROCK SHALL BE COMPACTED TO 95% RELATIVE DENSITY.

ALL FILL ON LOTS SHALL BE CONSIDERED STRUCTURAL FILL AND SHALL BE COMPACTED TO 95% RELATIVE DENSITY OF IN-PLACE DENSITY OF SURROUNDING SOIL.

CONTRACTOR TO PROOF ROLL SUBGRADE, WITH ENGINEER AND LOCAL JURISDICTION INSPECTOR, PRIOR TO CRUSHED ROCK PLACEMENT AND PRIOR TO PAVING AND CURB INSTALLATION.

PAVING

ASPHALTIC CONCRETE (A.C.) PAVEMENT SHALL BE LEVEL 2, 1/2" DENSE HMAC MIXTURE WITH 20% RECYCLED MATERIALS AS DEFINED IN SECTION 745, 2015 STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, (ODOT).

CRUSHED ROCK SHALL BE SIZED AS SHOWN ON PLAN AND SHALL BE CONSTRUCTED AS DEFINED IN SECTION 641, 2015 STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, (ODOT).

STORM SEWER

PIPE AND ALL ASSOCIATED MATERIALS AND FITTINGS SHALL CONFORM TO EITHER 1) ADS N-12 IB WT (WATER TIGHT) OR 2) SDR 35 PVC (ASTM D3034 AND ASTM F679 FOR LARGER PIPES) WITH GASKETED BELL END OR 3) OTHER APPROVED MATERIALS. CONSTRUCTION SHALL CONFORM TO MILAUKIE ENGINEERING STANDS SECTION 2.000.

SANITARY SEWER

PIPE AND ALL ASSOCIATED MATERIALS AND FITTINGS SHALL BE SDR 35 PVC ASTM D3034 WITH GASKETED BELL END AND BE INSTALLED PER CITY OF MILWAUKIE ENGINEERING STANDARDS SECTION 3.0000.

WATER

PIPE AND ALL ASSOCIATED MATERIALS AND FITTINGS SHALL BE DUCTILE IRON PIPE AND BE INSTALLED PER CITY OF MILWAUKIE ENGINEERING STANDARDS SECTION 4.0000.

RECEIVED
JUN 25 2019
CITY OF MILWAUKIE
PLANNING DEPARTMENT

RECEIVED
JUN 25 2019
CITY OF MILWAUKIE
PLANNING DEPARTMENT

'PERTIES LLC
MATT GILLIS
17TH AVE, STE. 210
EGON 97223
1-810-2344

ECT
HITECTS, PC
CONTACT: TODD ISELIN
1307 SEVENTH STREET
OREGON CITY, OREGON 97045
PHONE: 503-656-1942

ENGINEER

HARPER HOUF PETERSON RIGHELLIS INC.
CONTACT: KEN VALENTINE, PE
205 SE SPOKANE STREET #200
PORTLAND, OREGON 97202
PHONE: 503-221-1131
FAX: 503-221-1171

SURVEYOR

HARPER HOUF PETERSON RIGHELLIS INC.
CONTACT: THOM WALKER
205 SE SPOKANE STREET #200
PORTLAND, OREGON 97202
PHONE: 503-221-1131

PROJECT LOCATION

12205 SE 19TH STREET
MILWAUKIE, OREGON 97222
LATITUDE: 45° 26' 7"
LONGITUDE: -122° 38' 40"

PROJECT DESCRIPTION

2S, 11E, SECTION 35DD TAX LOT 3200 AND 3300
CLACKAMAS COUNTY, OREGON
R-5 ZONE

SHEET INDEX

ATTENTION EXCAVATORS:

OREGON LAW REQUIRES YOU TO FOLLOW RULES ADOPTED BY THE OREGON UTILITY NOTIFICATION CENTER. THOSE RULES ARE SET FORTH IN OAR 952-001-0010 THROUGH OAR 952-001-0090. YOU MAY OBTAIN COPIES OF THESE RULES FROM THE CENTER BY CALLING 503-232-1987. IF YOU HAVE ANY QUESTIONS ABOUT THE RULES, YOU MAY CONTACT THE CENTER. YOU MUST NOTIFY THE CENTER AT LEAST TWO BUSINESS DAYS, BEFORE COMMENCING AN EXCAVATION. CALL 503-246-6699.

COVER SHEET
RIVER CLUSTER DEVELOPMENT
MILWAUKIE, OREGON

Harper Houf Peterson Righellis Inc.
ENGINEERS • PLANNERS
LANDSCAPE ARCHITECTS • SURVEYORS
205 SE Spokane Street, Suite 200, Portland, OR 97202
phone: 503.221.1131 www.hhpr.com fax: 503.221.1171

REGISTERED PROFESSIONAL ENGINEER
OREGON JULY 13, 1989
KENNETH K. VALENTINE
EXPIRES: 06/30/20

DESIGNED:	KKV
DRAWN:	HHPR TEAM
CHECKED:	KKV
DATE:	JUNE 2019

REVISIONS

NO.	DESCRIPTION	DATE
1	REVISED GRADING	APRIL 2019

SHEET NO. 1

JOB NO. MSC-221

P:\MSC (Gillis Properties)\MSC-221 (Riverside Cluster Development)\MSC221-DWGS\SHEETS\ MSC221 - 1 - Cover.dwg

SCALE: 1" = 20'

JOB NO.	SHEET NO.
MSC-221	

DATE	NO.	DESCRIPTION
APRIL 2019	1	REVISED GRADING

REVISIONS

DESIGNED: KKV
DRAWN: HHPR TEAM
CHECKED: KKV
DATE: JUNE 2019

REGISTERED PROFESSIONAL ENGINEER
50,102
OREGON
JULY 13, 1989
KENNETH K. VALENTINE
EXPIRES: 06/30/20

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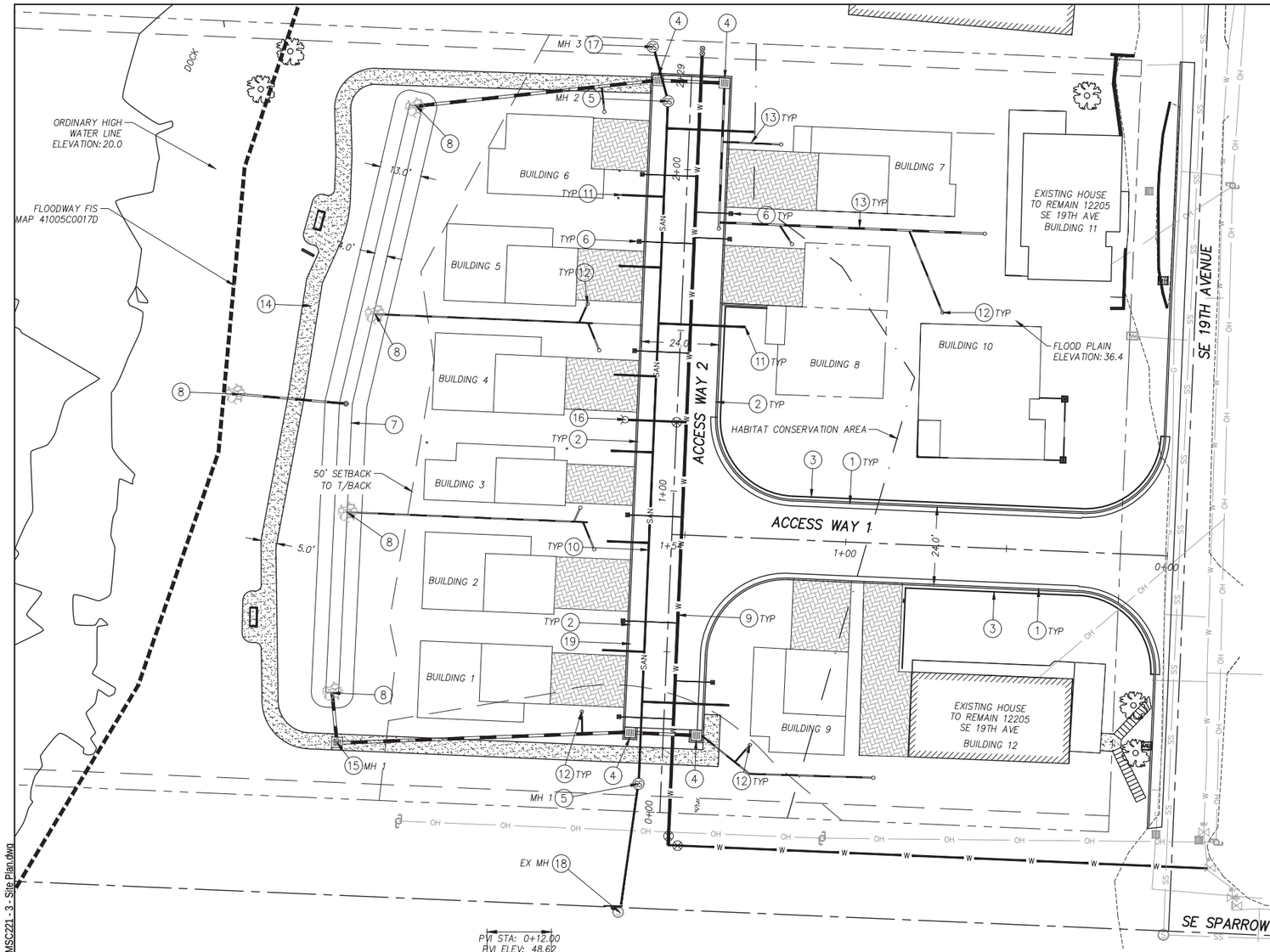
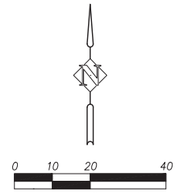
205 SE Spokane Street, Suite 200, Portland, OR 97202
phone: 503.221.1131 www.hhpr.com fax: 503.221.1171

EXISTING CONDITION

RIVER CLUSTER DEVELOPMENT

MILWAUKIE, OREGON



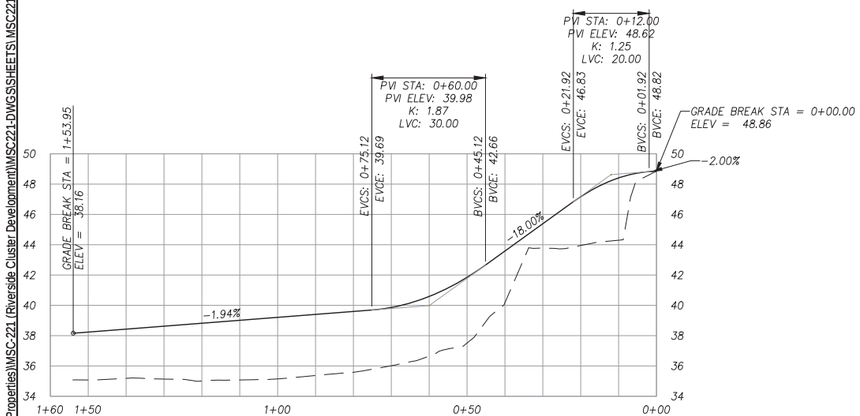


CONSTRUCTION NOTES:

1. INSTALL STANDARD CURB AND GUTTER.
2. INSTALL MOUNTABLE CURB.
3. INSTALL MODULAR BLOCK RETAINING WALL.
4. INSTALL STANDARD CATCH BASIN.
5. INSTALL 48" STANDARD SANITARY MANHOLE
6. INSTALL WATER METER
7. CONSTRUCT WATER QUALITY SWALE. SEE SHEET 6 FOR DETAIL.
8. CONSTRUCT STORM WATER OUTFALL WITH RIPRAP
9. INSTALL 8" WATER LINE
10. INSTALL 8" SANITARY SEWER LINE
11. INSTALL SANITARY SEWER LATERAL
12. INSTALL STORM CLEANOUT
13. INSTALL STORM SEWER LATERAL
14. CONSTRUCT PEDESTRIAN TRAIL
15. INSTALL 48" STANDARD STORM MANHOLE
16. INSTALL FIRE HYDRANT
17. INSTALL STANDARD 48" SANITARY MANHOLE OVER EXTG. 8" SANITARY LINE. PLUG AND ABANDON EXTG. SANITARY PIPE TO THE SOUTH. CONTRACTOR TO POTHOLE AND VERIFY LOCATION AND ELEVATION PRIOR TO CONSTRUCTION.
18. CONNECT TO EXTG. SANITARY MANHOLE. PLUG AND ABANDON EXTG. SANITARY PIPE TO THE NORTH.
19. ABANDON EXTG. SANITARY SEWER IN PLACE. REMOVE PORTIONS OF PIPE THAT ARE IN CONFLICT WITH PROPOSED FACILITIES.

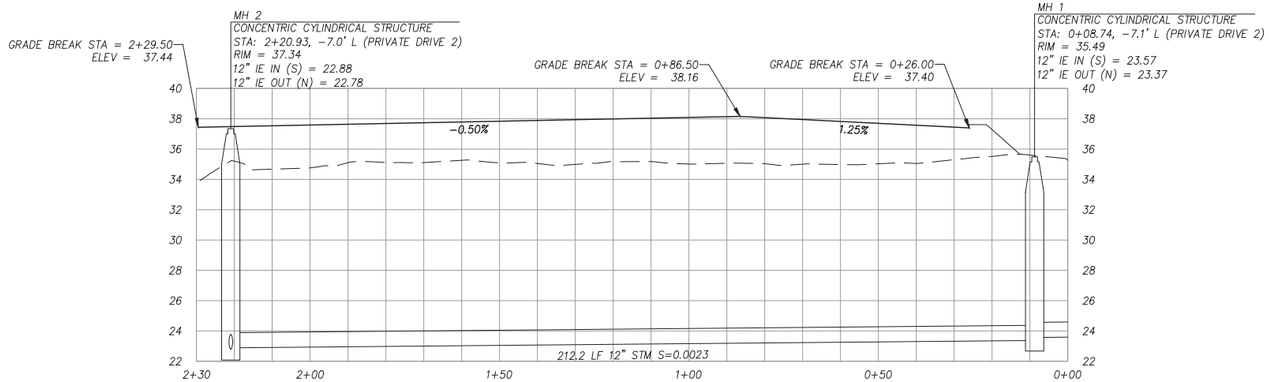
PROPOSED LEGEND:

- SAN — SANITARY LINE
- W — WATER LINE
- STORM LINE
- CURB
- ATRIUM INLET
- PEDESTRIAN PATH
- MAJOR CONTOUR – 5' INTERVALS
- MINOR CONTOUR – 1' INTERVALS
- SD — STORM MANHOLE
- SS — SANITARY MANHOLE
- CLEANOUT
- CATCH BASIN
- FIRE HYDRANT



ACCESS WAY 1

SCALE: 1" = 20' (HORIZ.)
1" = 5' (VERT.)



ACCESS WAY 2

SCALE: 1" = 20' (HORIZ.)
1" = 5' (VERT.)

SITE AND UTILITY PLAN
RIVER CLUSTER DEVELOPMENT
MILWAUKIE, OREGON

Harper Houf Peterson Righellis Inc.
ENGINEERS★PLANNERS
LANDSCAPE ARCHITECTS★SURVEYORS
205 SE Spokane Street, Suite 200, Portland, OR 97202
phone: 503.221.1131 www.hhpr.com fax: 503.221.1171

REGISTERED PROFESSIONAL ENGINEER 50,102 — OREGON JULY 13, 1982 KENNETH K. VALENTINE — EXPIRES: 06/30/20

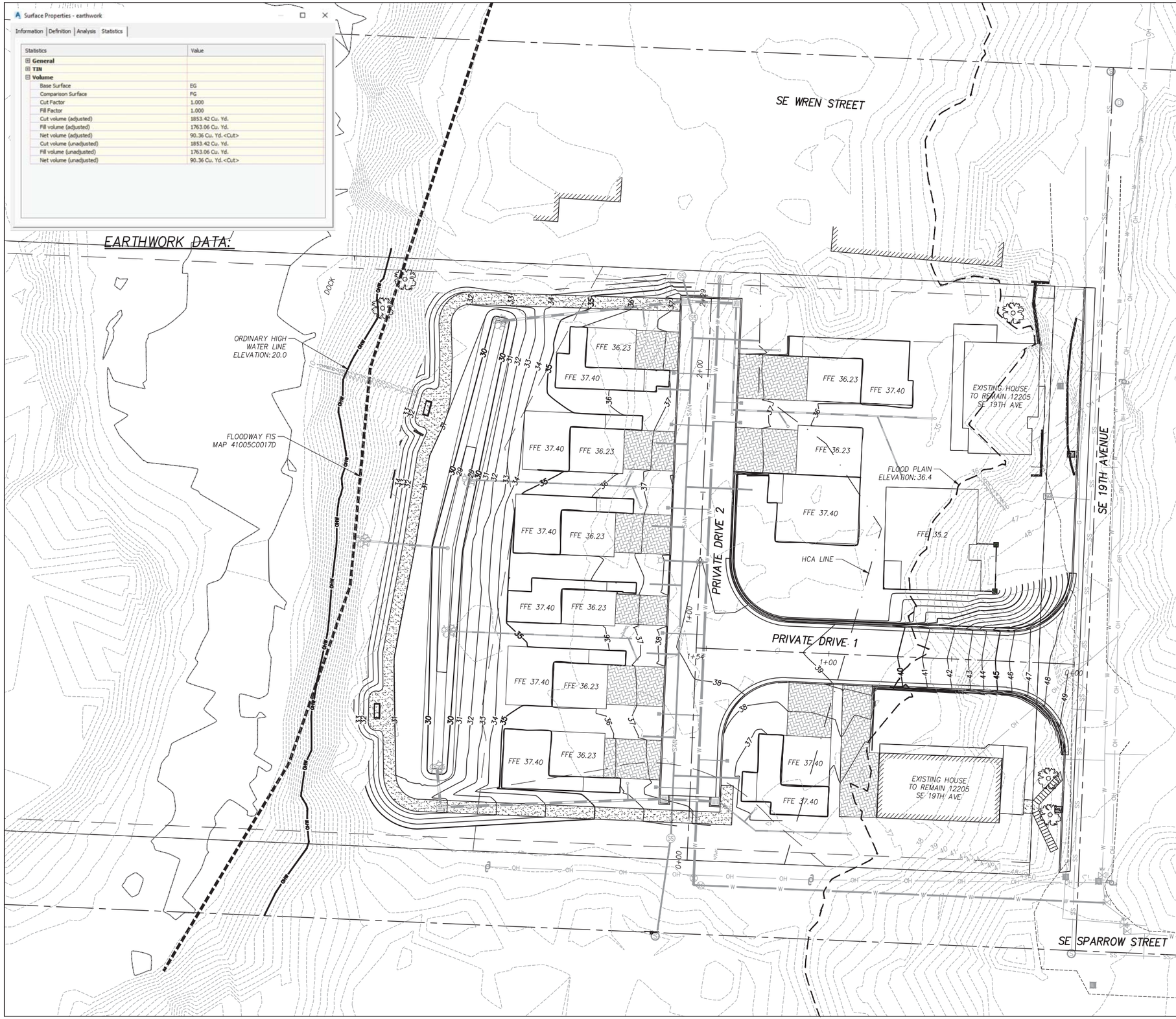
DESIGNED:	DRAWN:	CHECKED:	DATE:
KKV	HHPR TEAM	KKV	JUNE 2019

NO.	DESCRIPTION	DATE
1	REVISED GRADING	APRIL 2019

SHEET NO.
3

JOB NO.
MSC-221

P:\MSC (Gillis Properties)\MSC-221 (Riverside Cluster Development)\MSC221-DWGS\SHEETS\ MSC221 - 3 - Site Plan.dwg



GRADING PLAN

RIVER CLUSTER DEVELOPMENT

MILWAUKIE, OREGON

Harper Houf Peterson Righellis Inc.
ENGINEERS • PLANNERS
LANDSCAPE ARCHITECTS • SURVEYORS
205 SE Spokane Street, Suite 200, Portland, OR 97202
phone: 503.221.1131 www.hhpr.com fax: 503.221.1171

REGISTERED PROFESSIONAL ENGINEER — OREGON JULY 13, 1979 — KENNETH K. VALENTINE — 90,102 — EXPIRES: 06/30/20

DESIGNED:	KKV
DRAWN:	HHPR TEAM
CHECKED:	KKV
DATE:	JUNE 2019

REVISIONS

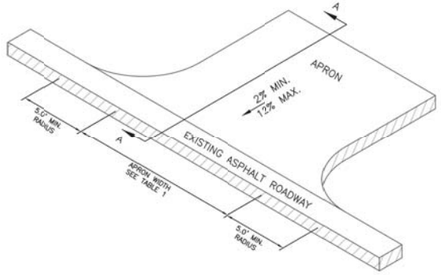
DATE	NO.	DESCRIPTION
APRIL 2019	1	REVISED GRADING

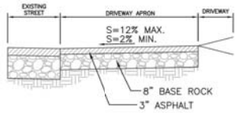
SHEET NO.

4

JOB NO.

MSC-221





CROSS SECTION A–A

TABLE 1 – DRIVEWAY APPROACH WIDTH		
CLASSIFICATION	MIN. WIDTH	MAX. WIDTH
1–2 RESIDENTIAL DWELLING UNITS	9.0'	20.0'
3 RESIDENTIAL DWELLING UNITS	16.0'	20.0'
4–7 RESIDENTIAL DWELLING UNITS	20.0'	24.0'
8 OR MORE RESIDENTIAL DWELLING UNITS	24.0'	36.0'

1. ALL PAVEMENT INSTALLATION SHALL BE HOT CLASS "C" MIX ASPHALT CONCRETE.
2. EXISTING ASPHALT CONCRETE IN FRONT OF THE DRIVEWAY APRON SHALL BE SAW CUT ALONG A LINE PARALLEL TO THE FRONTING PROPERTY LINE TO PROVIDE A CLEAN SURFACE FOR THE DRIVEWAY APPROACH TO TIE INTO.
3. SEAL ALL JOINTS WITH A HEAT APPLIED RUBBERIZED SEALANT. SEALANT SHALL CONFORM TO ASTM D6690 TYPE I, OR APPROVED EQUAL.

CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Asphalt Driveway Approach

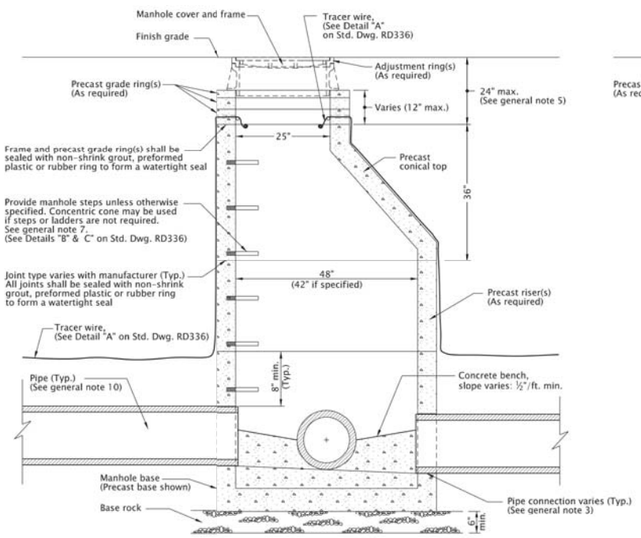
DRAWING NO. 502F

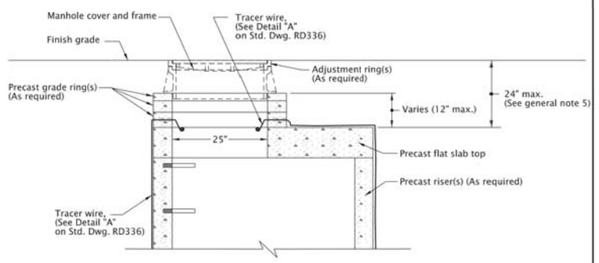
APPROVED _____ 12/14
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	UPDATED FOR CODE CHANGES	10/08	ZJW
2	GENERAL FORMATTING	12/10	MCP
3	CHANGED NOTE 3	12/14	AJR

RD318

rd318.dgn 25-JUL-2017





GENERAL NOTES FOR ALL DETAILS:

1. All precast products shall conform to requirements of ASTM C478.
2. Standard precast manhole section diameter shall be 48". Use 42" if specified by the Engineer.
3. See Std. Dwg. RD345 for pipe to manhole connections.
4. See Std. Dwg. RD344 for manhole base section.
5. Adjust 24" maximum.
6. All connecting pipes shall have a tracer wire, or approved alternate.
7. See Std. Dwg. RD336 for manhole steps.
8. See Std. Dwg. RD336 for details not shown.
9. See Std. Dwg. RD356 for manhole covers and frames, manhole adjustment rings, etc.
10. Max. pipe diameter varies with pipe material.
11. See Std. Dwg. RD342 for shallow manholes.
12. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.
13. This detail limited to interior drop of 24".
    See Std. Dwgs. RD350 or RD352 for drop manhole details for drops in excess of 24".

CALC. BOOK NO. N/A

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without consulting a Registered Professional Engineer.

BASELINE REPORT DATE 25-JUL-2017

NOTE: All material and workmanship shall be in accordance with the current Oregon Standard Specifications

OREGON STANDARD DRAWINGS

STANDARD SANITARY SEWER MANHOLE

2018

DATE	REVISION DESCRIPTION

RD338

Effective Date: December 1, 2018 – May 31, 2019

THE FOLLOWING LATEST VERSION OF THE OREGON STANDARD DRAWINGS PUBLISHED BY APWA/ODOT SHALL BE USED AS A CITY OF MILWAUKIE STANDARD WITH MILWAUKIE SPECIFIC REQUIREMENTS AS NOTED

OSSC STANDARD DRAWING NUMBER	OSSC STANDARD DRAWING NAME	MILWAUKIE EXCEPTION TO DRAWING
RD317	CULVERT EMBANKMENT AND RIPRAP PADS PROTECTION	NO EXCEPTION TAKEN
RD335	STANDARD STORM SEWER MANHOLE	NO MANHOLE STEPS
RD339	PIPE TO STRUCTURE CONNECTIONS	NO EXCEPTION TAKEN
RD340	STORM SEWER POLLUTION CONTROL MANHOLE	NO MANHOLE STEPS
RD344	STANDARD MANHOLE BASE SECTION	NO EXCEPTION TAKEN
RD345	PIPE TO MANHOLE CONNECTIONS	NO EXCEPTION TAKEN
RD360	MANHOLE FRAME ADJUSTMENT	NO EXCEPTION TAKEN
RD363	GUTTER TRANSITION AT INLET	NO EXCEPTION TAKEN
RD365	FRAMES & GRATES FOR CONCRETE INLETS	NO EXCEPTION TAKEN
RD370	DITCH INLET TYPE D	NO EXCEPTION TAKEN
RD372	CONCRETE INLET TOP, OPTION 1 TYPE CG-3	NO EXCEPTION TAKEN
DET1300	SEDIMENTATION MANHOLE	NO EXCEPTION TAKEN
DET1302	POLLUTION CONTROL MANHOLE	NO EXCEPTION TAKEN

NOTES:

1. STANDARD DRAWING PUBLISHED BY APWA/ODOT NOT LISTED SHALL NOT BE USED WITHOUT PRIOR APPROVAL BY THE PUBLIC WORKS DEPARTMENT

CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

OSSC ACCEPTABLE STORM STANDARD DRAWINGS

DRAWING NO. 600

APPROVED _____ 11/18
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	NEW DRAWING	11/18	TAP

THE FOLLOWING LATEST VERSION OF THE OREGON STANDARD DRAWINGS PUBLISHED BY APWA/ODOT SHALL BE USED AS A CITY OF MILWAUKIE STANDARD WITH MILWAUKIE SPECIFIC REQUIREMENTS AS NOTED

OSSC STANDARD DRAWING NUMBER	OSSC STANDARD DRAWING NAME	MILWAUKIE EXCEPTION TO DRAWING
RD317	CULVERT EMBANKMENT AND RIPRAP PADS PROTECTION	NO EXCEPTION TAKEN
RD335	STANDARD STORM SEWER MANHOLE	NO MANHOLE STEPS
RD339	PIPE TO STRUCTURE CONNECTIONS	NO EXCEPTION TAKEN
RD340	STORM SEWER POLLUTION CONTROL MANHOLE	NO MANHOLE STEPS
RD344	STANDARD MANHOLE BASE SECTION	NO EXCEPTION TAKEN
RD345	PIPE TO MANHOLE CONNECTIONS	NO EXCEPTION TAKEN
RD360	MANHOLE FRAME ADJUSTMENT	NO EXCEPTION TAKEN
RD363	GUTTER TRANSITION AT INLET	NO EXCEPTION TAKEN
RD365	FRAMES & GRATES FOR CONCRETE INLETS	NO EXCEPTION TAKEN
RD370	DITCH INLET TYPE D	NO EXCEPTION TAKEN
RD372	CONCRETE INLET TOP, OPTION 1 TYPE CG-3	NO EXCEPTION TAKEN
DET1300	SEDIMENTATION MANHOLE	NO EXCEPTION TAKEN
DET1302	POLLUTION CONTROL MANHOLE	NO EXCEPTION TAKEN

NOTES:

1. STANDARD DRAWING PUBLISHED BY APWA/ODOT NOT LISTED SHALL NOT BE USED WITHOUT PRIOR APPROVAL BY THE PUBLIC WORKS DEPARTMENT

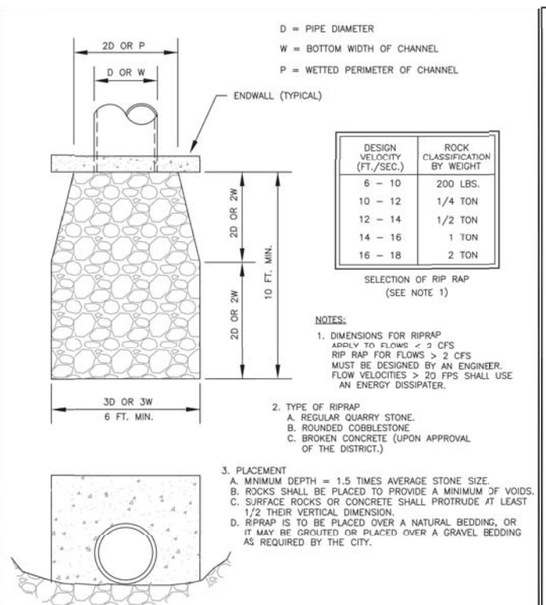
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

OSSC ACCEPTABLE STORM STANDARD DRAWINGS

DRAWING NO. 600

APPROVED _____ 11/18
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	NEW DRAWING	11/18	TAP



D = PIPE DIAMETER
W = BOTTOM WIDTH OF CHANNEL
P = WETTED PERIMETER OF CHANNEL

DESIGN VELOCITY (FT./SEC.)	ROCK CLASSIFICATION BY WEIGHT
6 – 10	200 LBS.
10 – 12	1/4 TON
12 – 14	1/2 TON
14 – 16	1 TON
16 – 18	2 TON

SELECTION OF RIP RAP (SEE NOTE 1)

NOTES:

1. DIMENSIONS FOR RIPRAP APPLY TO FLOWS < 2 CFS. RIP RAP FOR FLOWS > 2 CFS MUST BE DESIGNED BY AN ENGINEER. FLOW VELOCITIES > 20 FPS SHALL USE AN ENERGY DISSIPATER.
2. TYPE OF RIPRAP
   A. REGULAR QUARRY STONE.
   B. ROUNDED COBBLESTONE
   C. BROKEN CONCRETE (UPON APPROVAL OF THE DISTRICT.)
3. PLACEMENT
   A. MINIMUM DEPTH = 1.5 TIMES AVERAGE STONE SIZE.
   B. ROCKS SHALL BE PLACED TO PROVIDE A MINIMUM OF VOIDS.
   C. SURFACE ROCKS OR CONCRETE SHALL PROTRUDE AT LEAST 1/2 THEIR VERTICAL DIMENSION.
   D. RIPRAP IS TO BE PLACED OVER A NATURAL BEDDING, OR IT MAY BE GROUTED OR PLACED OVER A GRAVEL BEDDING AS REQUIRED BY THE CITY.

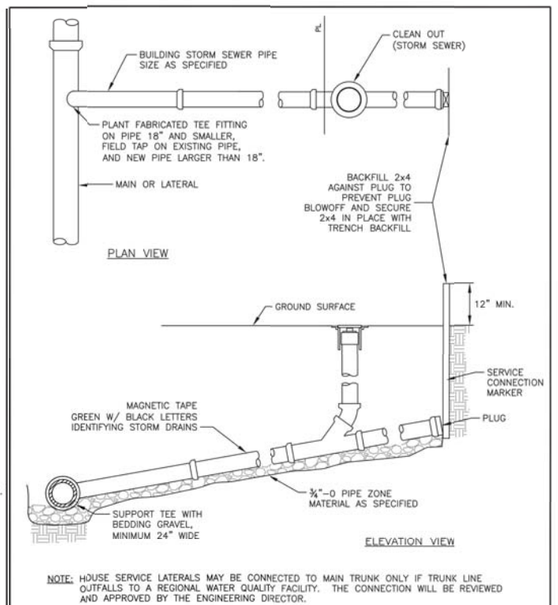
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Riprap

DRAWING NO. 623

APPROVED _____ 12/14
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	ADJUSTED DRAWING NOTES TEXT SIZE	12/13	MCP
2	CHANGED DRAWING NUMBER	12/13	MTC



NOTE: HOUSE SERVICE LATERALS MAY BE CONNECTED TO MAIN TRUNK ONLY IF TRUNK LINE OUTFALLS TO A REGIONAL WATER QUALITY FACILITY. THE CONNECTION WILL BE REVIEWED AND APPROVED BY THE ENGINEERING DIRECTOR.

CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Storm Lateral Connection

DRAWING NO. 621

APPROVED _____ 12/14
CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	ADDED HOUSE LATERAL NOTE	12/13	MCP
2	CHANGED DRAWING NUMBER	12/13	MTC

DETAILS

RIVER CLUSTER DEVELOPMENT

MILWAUKIE, OREGON

Harper Houf Peterson Righellis Inc.
ENGINEERS • PLANNERS • LANDSCAPE ARCHITECTS • SURVEYORS
205 SE Spokane Street, Suite 200, Portland, OR 97202
phone: 503.221.1131 www.hhpr.com fax: 503.221.1171

REGISTERED PROFESSIONAL ENGINEER — OREGON — JULY 17, 1998 — KENNETH K. VAN METER

EXPIRES: 06/30/20

DESIGNED:	KKV
DRAWN:	HHPR TEAM
CHECKED:	KKV
DATE:	JUNE 2019

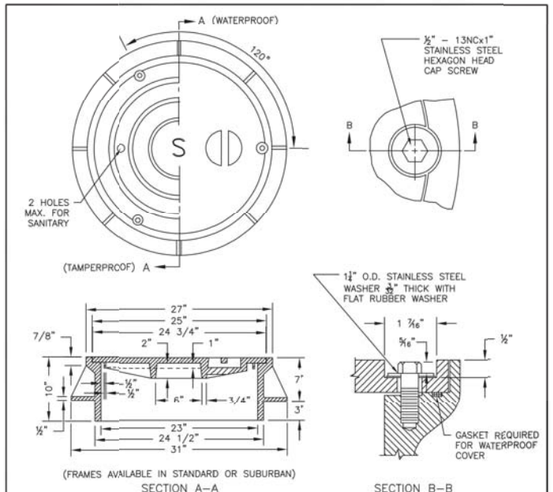
REVISIONS

NO.	DESCRIPTION	DATE
1	REVISED GRADING	APRIL 2019

SHEET NO. 5

JOB NO. MSC-221

P:\MSC (Gills Properties)\MSC-221 (Riverside Cluster Development)\MSC221-DWG\SSHEETS\ MSC221 - x - Details.dwg



(FRAMES AVAILABLE IN STANDARD OR SUBURBAN)

SECTION A–A

SECTION B–B

NOTES:

1. TAMPER PROOF COVERS REQUIRED ON SANITARY OR STORM MANHOLES LOCATED WITHIN UNIMPROVED EASEMENTS AND RIGHT–OF–WAY.
2. WATER TIGHT COVERS REQUIRED IF LOCATED WHERE COVER MAY BE SUBMERGED.
3. COVER AND FRAME TO BE MACHINED FOR TRUE BEARING.
4. MATERIAL SHALL BE GREY CAST IRON ASTM A–48 CLASS 30.

LIDS MAY BE PURCHASED FROM THE CITY OR THE MANUFACTURER

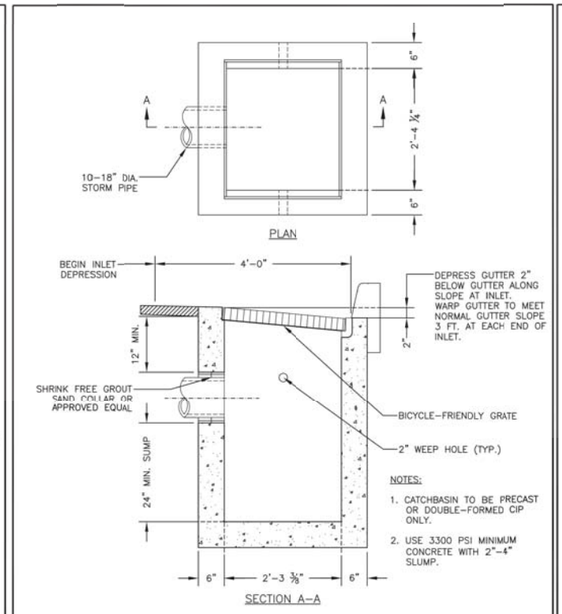
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Waterproof and Tamperproof Frame and Cover

DRAWING NO. 302

APPROVED _____ CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
2	GENERAL FORMATTING	12/10	MCP
3	DRAWING NO. CHANGE, PURCHASING NOTE	12/13	MCP
4	DRAWING NO. CHANGE	11/18	TAP



SECTION A–A

NOTES:

1. CATCHBASIN TO BE PRECAST OR DOUBLE–FORMED CIP ONLY.
2. USE 3300 PSI MINIMUM CONCRETE WITH 2"–4" SLUMP.

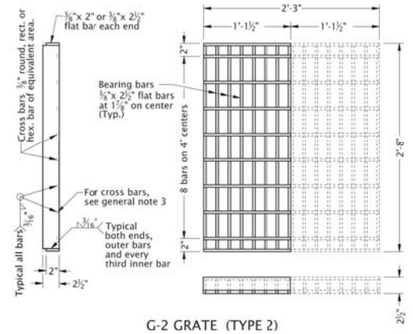
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

G–2 Catchbasin

DRAWING NO. 601

APPROVED _____ CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	ADJUST MIN. PIPE SIZE, FORMATTING	12/10	MCP
2	RENUMBERED DRAWING	11/18	TAP



G–2 GRATE (TYPE 2)

(Bicycle–safe)
(2 grates required per inlet, as shown)

NOTES:

1. FOR INLET DETAILS, SEE APPROPRIATE INLET STANDARD DRAWING (S).
2. ⅜" CROSS BARS SHALL BE FLUSH WITH THE TOP OF GRATE SURFACE AND MAY BE FILLET WELDED, RESISTANCE WELDED OR ELECTROFORGED TO BEARING BARS.
3. HOT DIP GALVANIZE AFTER FABRICATION.

CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

G–2 Catchbasin Grate

DRAWING NO. 604

APPROVED _____ CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	RECREATED DRAWING	12/10	MCP
2	DRAWING RENUMBERED	11/18	TAP

THE FOLLOWING LATEST VERSION OF THE OREGON STANDARD DRAWINGS PUBLISHED BY APWA/ODOT SHALL BE USED AS A CITY OF MILWAUKIE STANDARD WITH MILWAUKIE SPECIFIC REQUIREMENTS AS NOTED

OSSC STANDARD DRAWING NUMBER	OSSC STANDARD DRAWING NAME	MILWAUKIE EXCEPTION TO DRAWING
RD250	THRUST BLOCKING	NO EXCEPTION TAKEN
RD254	HYDRANT INSTALLATION	MEGALUG RESTRAINED JOINT
RD262	TYPICAL MAIN DEAD–END BLOWOFF ASSEMBLY	MEGALUG RESTRAINED JOINT
RD270	COMBINATION AIR RELEASE AIR VACUUM VALVE ASSEMBLY (2" AND SMALLER)	NO EXCEPTION TAKEN
RD282	WATER SAMPLING STATION	KUPFERLE ECLIPSE 88–SS WITH "CITY OF MILWAUKIE" LOGO CAST INTO ACCESS DOOR

NOTES:

1. STANDARD DRAWING PUBLISHED BY APWA/ODOT NOT LISTED SHALL NOT BE USED WITHOUT PRIOR APPROVAL BY THE PUBLIC WORKS DEPARTMENT

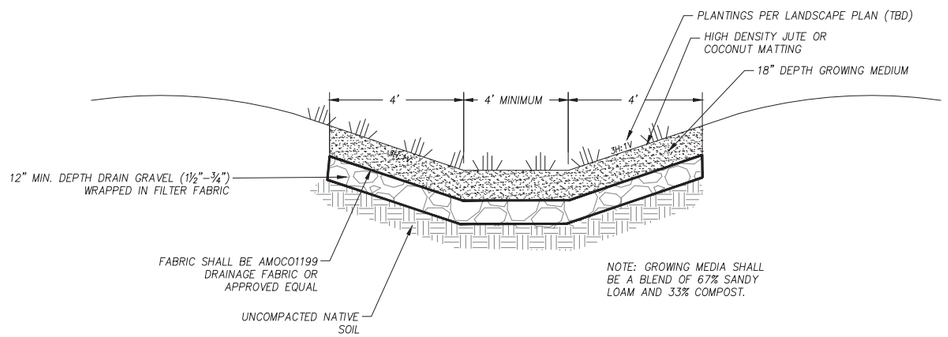
CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

OSSC ACCEPTABLE WATER STANDARD DRAWINGS

DRAWING NO. 400

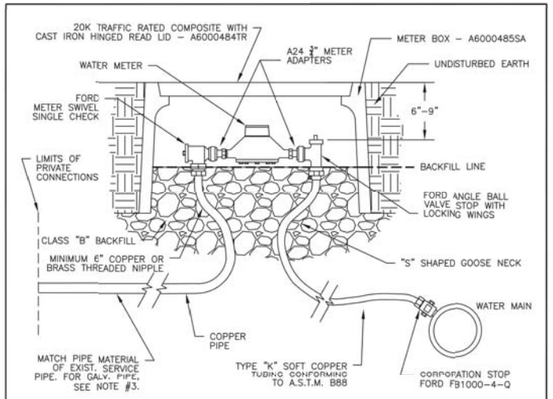
APPROVED _____ CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
1	NEW DRAWING	11/18	TAP

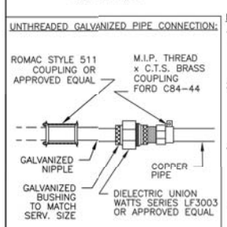


STORM WATER QUALITY SWALE

N.T.S.



UNTHREADED GALVANIZED PIPE CONNECTION:



NOTES:

1. IF COPPER TUBING CROSSES CATHODICALLY PROTECTED LINE, ENCASE COPPER IN POLYETHYLENE TUBING FOR 24" (CENTERED AT THE CROSSING LINE) AND FASTEN WITH 2" WIDE ADHESIVE TAPE THAT IS COMPATIBLE WITH POLYETHYLENE.
2. PLACE METER BOXES (1) LOCATED BEHIND THE SIDEWALK WHERE THERE IS SUFFICIENT RIGHT–OF–WAY, (2) WITHIN THE PLANTER STRIP, EXCLUDING WATER QUALITY FACILITIES, (3) WITHIN THE SIDEWALK WITH THE BACK OF THE METER BOX AT THE BACK EDGE OF THE SIDEWALK.
3. CONNECT GALVANIZED SERVICE PIPE; (1) AT EXISTING THREADED FITTING WITHIN 5 FEET OF WATER METER; (2) RETHREAD EXISTING GALVANIZED SERVICE PIPE, (3) IF EXISTING PIPE IS IN POOR CONDITION AND CANNOT BE RETHREADED, USE UNTHREADED GALVANIZED PIPE CONNECTION DETAIL.
4. IF METER BOX IS LOCATED IN THE SIDEWALK, DIELECTRIC UNION WILL BE INSTALLED (1) 6" FROM BACK OF METER INSIDE OF METER BOX, (2) BEHIND BACK OF SIDEWALK.

CITY OF MILWAUKIE, OREGON – PUBLIC WORKS DEPT.

Standard 3/4 to 1 Inch Water Service

DRAWING NO. 401

APPROVED _____ CITY ENGINEER DATE

NO.	REVISIONS	DATE	BY
4	REMOVED COPPERSETTER	11/13	AJR
5	ADDED DIELECTRIC UNION NOTE	12/14	AJR
6	ADDED 3/4" WATER SERVICE	11/18	TAP

DETAILS

RIVER CLUSTER DEVELOPMENT

MILWAUKIE, OREGON

Harper Houf Peterson Righellis Inc.
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phone: 503.221.1131 www.hhpr.com fax: 503.221.1171

REGISTERED PROFESSIONAL ENGINEER — OREGON — JULY 17, 1999 — KENNETH K. VAN ATTA — 90,102

EXPIRES: 06/30/20

DESIGNED:	KKV
DRAWN:	HHPR TEAM
CHECKED:	KKV
DATE:	JUNE 2019

REVISIONS

NO.	DESCRIPTION	DATE
1	REVISED GRADING	APRIL 2019

SHEET NO. 6

JOB NO. MSC-221

P:\MSC (Gillis Properties)\MSC-221 (Riverside Cluster Development)\MSC221-DWG\SHEETS\ MSC221 - x - Details.dwg