7789

DRAINAGE REPORT
FOR

Kestrel Street Partition
Keizer, Oregon

Prepared For:
CHEMAWA CROSSING LLC
P.O. BOX 1094
Salem, Oregon 97304

June 16, 2025

Renew date: 6.30.2027

MULTI/TECH
ENGINEERING SERVICES, INC.

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Contents

PROJECT DESCRIPTION

The applicant is proposing to partition the site into three Parcels and develop each parcel with Middle Housing four-plex units. The location of the site is 307 Kestrel Street N. The parcels of land to be developed are Tax Lots 100 and 1300 of Marion County Assessor's Map 07 3W 02BB. The subject property is zoned Residential Single Family. Supporting maps for the site are located in Appendix A of this report.

Project Site

The development will consist of 4 apartment units or "Quads" within each of the 3 separate buildings and each with its own tax lot. The proposed development will be connected to public water and public sewer. Stormwater conveyance and detention will be designed per the current City of Keizer's Public Works Design Standards. This project is meeting City of Keizer design standards by utilizing GSI to the MEF. This project will provide infiltration into existing soils to the MEF, in compliance with the UICMP and State UIC guidelines. All developments are required to provide retention of stormwater runoff,

without release into the existing stormwater conveyance system(s). For projects such as this one, with infiltration rate greater than 2 inches per hour, the facility shall retain and treat the entire water quality event. The project facility shall retain all stormwater runoff up to, and including, the 100-year design storm event with no release allowed.

EXISTING CONDITIONS

The 31,337 square foot site is irregular in shape. Surface vegetation consists of grass along with 12 cedar trees (12" to 27"), and 29 fir trees (12" to 20"), both of which are planted in a line to border the east property lines. No residential structures exist on the property. There are no identified wetlands, sensitive areas or waterways located on the property. The topography of the parcel is flat with a low point along the northerly property line. The relief is approximately three feet, and the property does appear to be hydrologically isolated. The time of concentration of 15 minutes is not utilized in the pre-developed condition since this project is fully infiltrating the runoff including the 100-year rainfall storm event. The predeveloped Tc calculation is still included in Appendix A.

The adjacent properties to the west and south are older and fully developed single family residences that do not include storm water conveyance systems. Property to the east is fully developed commercial businesses. Adjacent lots are flat and assumed not to contribute any additional runoff to this site. Appendix A contains a map of existing and proposed conditions.

The Soil Conservation Service Soil Survey of Marion County identifies two main soil types on the site as Cloquato silt loam (map unit Cm) at 37% and Newberg fine sandy loam (map unit Nu) at 63% as shown in Table 1 below. Cm is in the hydrologic soil group B, while Nu is in the hydrologic soil group A. Both soil groups are well drained soils and allow for higher infiltration rates. Appendix B contains the NRCS soil survey for the site. **The detention facility design will be conservative and use only the HSG-B soil type with a CN value of 61.**

Table 1. Existing Conditions from Soil Report

Surface Type	Soil type	Area (Sq-ft)	CN Value
Landscaping > 75% Grass Cover	Cloquato Silt Loam (37%)	11,595	61 (HSG-B)
Landscaping > 75% Grass Cover	Newberg Fine Sandy Loam (63%)	19,742	39 (HSG-A)
Total Site		31,337	52

Infiltration testing was conducted on the site using the open pit falling head procedure. Two test pits were dug on opposite ends of the site and two infiltration tests were conducted for each test pit. The north test pit experienced an average infiltration rate of 19.2 and 19.8 inches per hour. The south test pit experienced an average infiltration rate of 110 and 120 inches per hour. A factor of safety of 2 is recommended to be used for design purposes. Applying the factor of safety results in a design infiltration rate of 10 inches per hour for the north test pit and a design infiltration rate of 57.5 inches per hour for the south test pit. **As a more conservative approach to infiltration on the site, a design infiltration rate of 10 inches per hour will be used.**

An existing 10" storm drainage system runs through this property and includes a 17-foot-wide storm pipeline easement. A storm drain manhole is also located on the property and creates a directional change from water exiting the cul-de-sac at an existing type-1 catch basin and then turning south at the manhole connection into an existing French drain system. This manhole which has a 10" pipe entering and exiting, will be used as the stormwater retention facility's overflow connection point into the existing French drain system, explained later in this report.

DEVELOPED CONDITIONS

Stormwater runoff for the site will be conveyed and disposed of via Green Stormwater Infrastructure through incorporation of a combination retention and infiltration facility. This facility will provide water quality treatment by allowing for the removal of pollutants through sedimentation, adsorption onto surrounding vegetation, filtration, and biological uptake. The facility will also be used to retain and infiltrate rainfall intensities including the 100-year rainfall event. A single retention pond will be constructed on Parcel 1 to collect runoff from all three Parcels.

Roof drains will be used to convey stormwater runoff from the building roofs to the onsite stormwater facility while a type-1 catch basin located in the center of the parking lot will drain impervious surface runoff and be piped to the stormwater facility through a 10" PVC pipe.

Table 2 below shows the rainfall intensity for a Type-1A rainfall distribution for various design storms in the City of Keizer and is used in this analysis to size the retention pond.

Table 2. Rainfall Distribution Type-1A

Design Storm	Intensity (in / 24-hr)
Water Quality	1.38
5-yr	2.70
10-yr	3.20
25-yr	3.60
50-yr	4.10
100-yr	4.40

Post developed flows were calculated using HydroCAD 10.20-7a. For the post-developed condition, a time of concentration of 5 minutes is used. Post-developed areas classified as "Impervious Surface", have a curve number (CN) of 98. The landscaped area that is ">75% grass covered" uses a CN value of 61. Overall, this creates a combined CN value of 83. The Santa Barbara Unit Hydrograph method was used to generate the hydrographs. For the 31,337 total square footage of the site, Table 3 shows the surface conditions and associated runoff curve number for the developed condition.

Table 3. Developed Conditions

Surface Type	Area (Sq-ft)	CN Value	
Building, Parking Lot, Sidewalks	18,763	98 (HSG-B)	59.8 % Impervious
Landscaping > 75% Grass Cover (37%)	12,574	61 (HSG-B)	40.2 % Pervious
Total Site	31,337	83	

Stormwater runoff from these new surface areas will be conveyed to an on-site infiltration pond. A copy of the site plan is shown in Appendix A of this report.

The infiltration pond sits at the NW corner of Parcel 1 and is designed to accept runoff from all impervious areas. The facility is 664 square feet, is triangular in shape and is offset 10 feet from the building and 5 feet from the property line. The top layer of the pond consists of 18 inches of growing media and sits directly on top of native soil. The facility is sized to accept, retain and infiltrate runoff up to and include the 100-year rainfall event without releasing any water. The sides of the pond are

designed with vertical walls surrounding the perimeter because a 3 to 1 interior slope would not provide sufficient storage capacity to retain the 100-year rainfall event. The top of the pond wall is flush with the adjacent ground, is 2.5 feet above the level of the growing media and is at an elevation of 129.00 feet. For events above the 100-year storm, there is a 24" round beehive inlet within the facility used as an emergency overflow with a rim elevation set at 2 inches below the top of wall. The beehive inlet will convey overflow runoff through a proposed 10" storm drain leading to an existing storm manhole located in the parking lot.

In the unlikely event that water would overtop the stormwater facility, water would flow into adjacent grassy areas where it would further infiltrate, or it would run into the paved surface where there exists an additional storage capacity of about 6 inches deep to the top of curb. At 3 inches deep, water will enter the grated manhole adjacent to the catch basin and flow south into the French drain. A plan view and cross section of the pond is shown in Figures 1 and 2 below and a larger view is shown in the plans in Appendix A.

Figure 1. Plan View

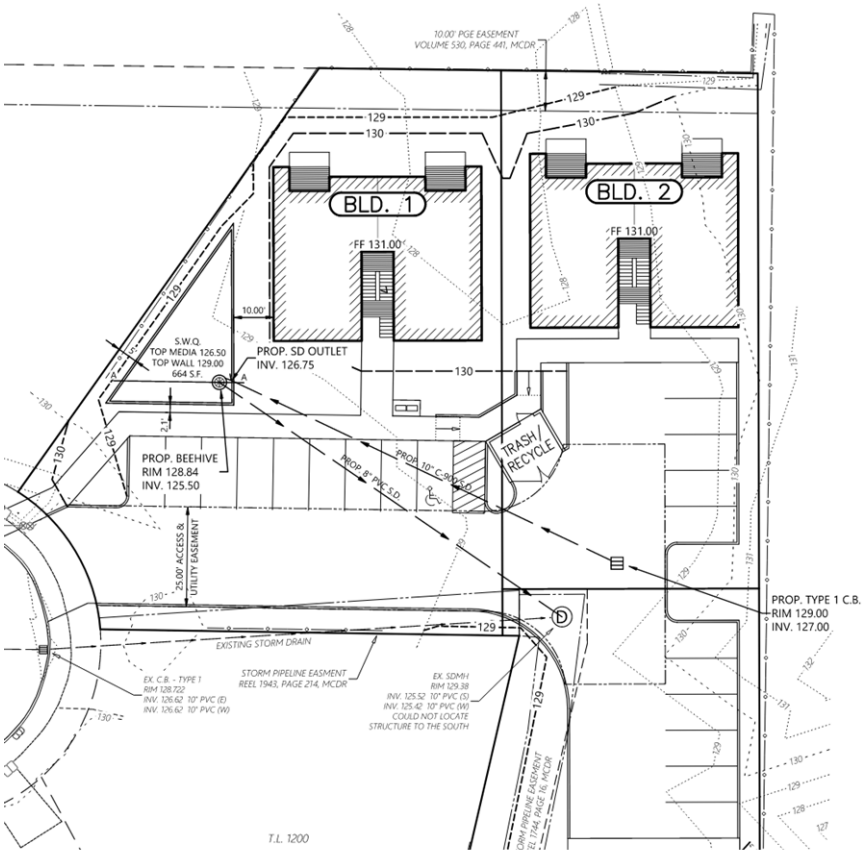


Figure 2. Pond Cross Section View

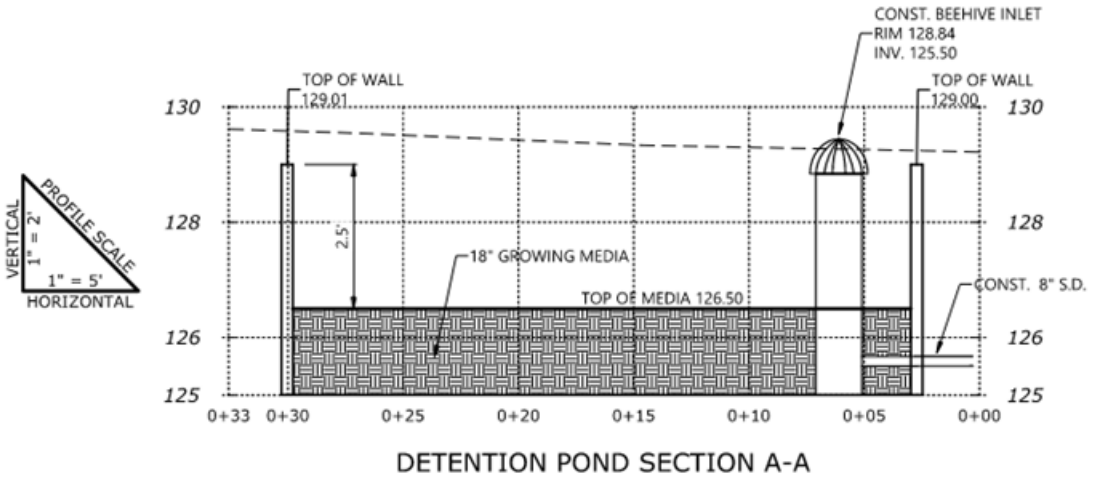


Figure 2 above shows a cross section of the pond with surrounding walls and a 24" beehive inlet set at 2 inches below the top of wall. The rim is set just above the peak water elevation of the 100-year rainfall event. The outfall which serves as an overflow device runs southeast to the existing storm drain manhole and French drain.

The existing outfall from the manhole is a 10" pipe and is stubbed out in the southerly direction into what is believed to be an infiltration trench or French drain. The design proposal is to use this manhole as an overflow structure and drain overflow stormwater into the French drain. The manhole lid would be adjusted to approximately 129.25 to match the paved surface which is 3 inches above the type-1 catch basin rim. The solid manhole cover would be replaced with a grated cover that will allow the capture of overflow runoff if the paved surface were to pond up with water above 3 inches. This also ensures all storm events at or below the 100-year storm are treated by the stormwater quality facility.

HYDROLOGIC ANALYSIS

The height of the beehive inlet above the growing media is set at an elevation of **128.84** which will allow complete storage and treatment of all storm events up to and including the 100-year storm event within the growing media space. Volumes and elevations of the design storm events are listed in Table 4 below.

Table 4. Peak Elevations and Capacity

Design Storm	Growing Media Elevation (ft)	Peak Elevation (ft)	Storage (cf)	% of Capacity (1660 cf Full)
WQ Event	126.50	126.61	72	4.3%
2-yr	126.50	126.89	259	15.6%
5-yr	126.50	127.12	409	24.6%
10-yr	126.50	127.43	621	37.4%
25-yr	126.50	127.77	841	50.7%
50-yr	126.50	128.35	1231	74.2%
100-yr	126.50	128.77	1510	91.0%

The retention facility stores, treats and infiltrates stormwater runoff for all rainfall events up to and include the 100-year design storm event. A design infiltration rate of 6 inches per hour is used for the growing media and is in accordance with the City of Portland 2020 Stormwater Management Manual. As mentioned earlier from the infiltration test, the native soil has a higher design infiltration rate of 10 inches per hour so the growing media is the limiting rate and there is no need for a rock storage gallery since the native soil can infiltrate all collected runoff.

Figure 3 below shows the peak water elevation of 128.77 feet within the facility during the 100-year rainfall event. The HydroCAD reports for all existing and developed stormwater events are included in Appendix C.

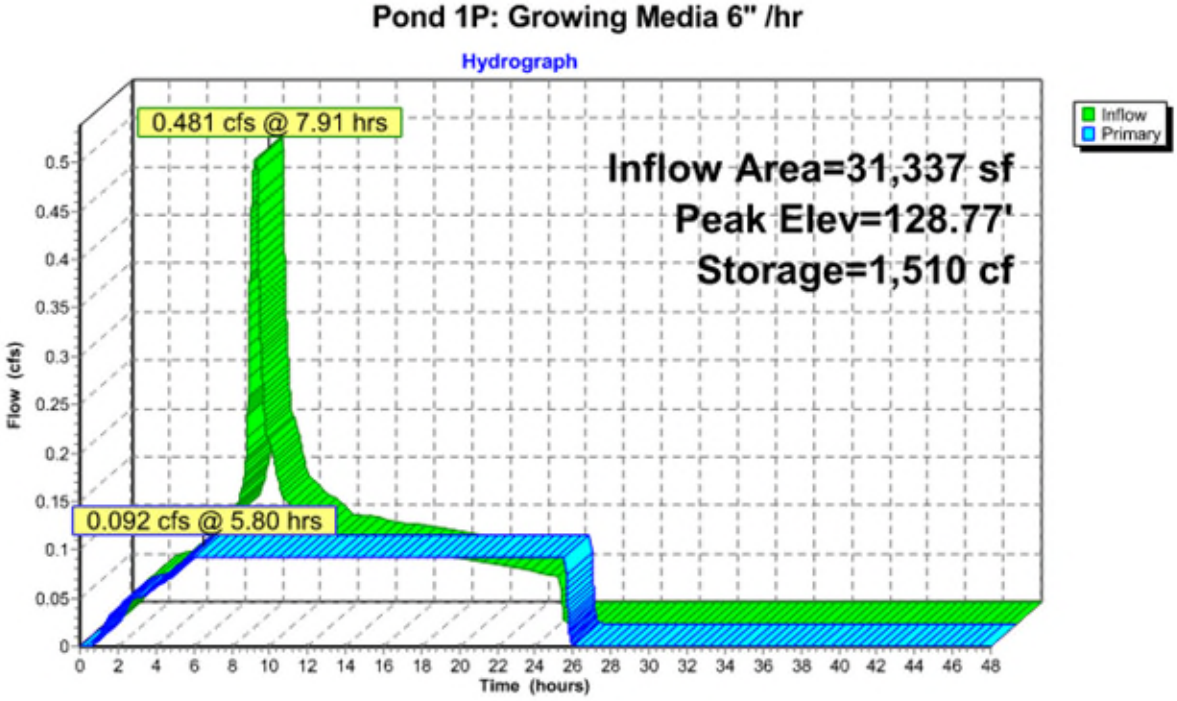


Figure 3. Pond Hydrograph at the 100-year Storm Event

In summary, the infiltration pond as designed will retain, treat and infiltrate all runoff from the project and meet the City of Keizer design standards.

Operation & Maintenance

All stormwater runoff is stored and treated entirely by the private facility on site, and it is therefore the property owner's responsibility to maintain the facility.

The stormwater facility is designed to infiltrate all runoff into the existing ground. It is important to maintain the preconstruction in-situ condition of the soil so that it maintains the designed infiltration rate used in calculations. During construction, it is important to keep construction equipment and vehicles from tracking over the infiltration area to prevent compaction of the existing soils which will

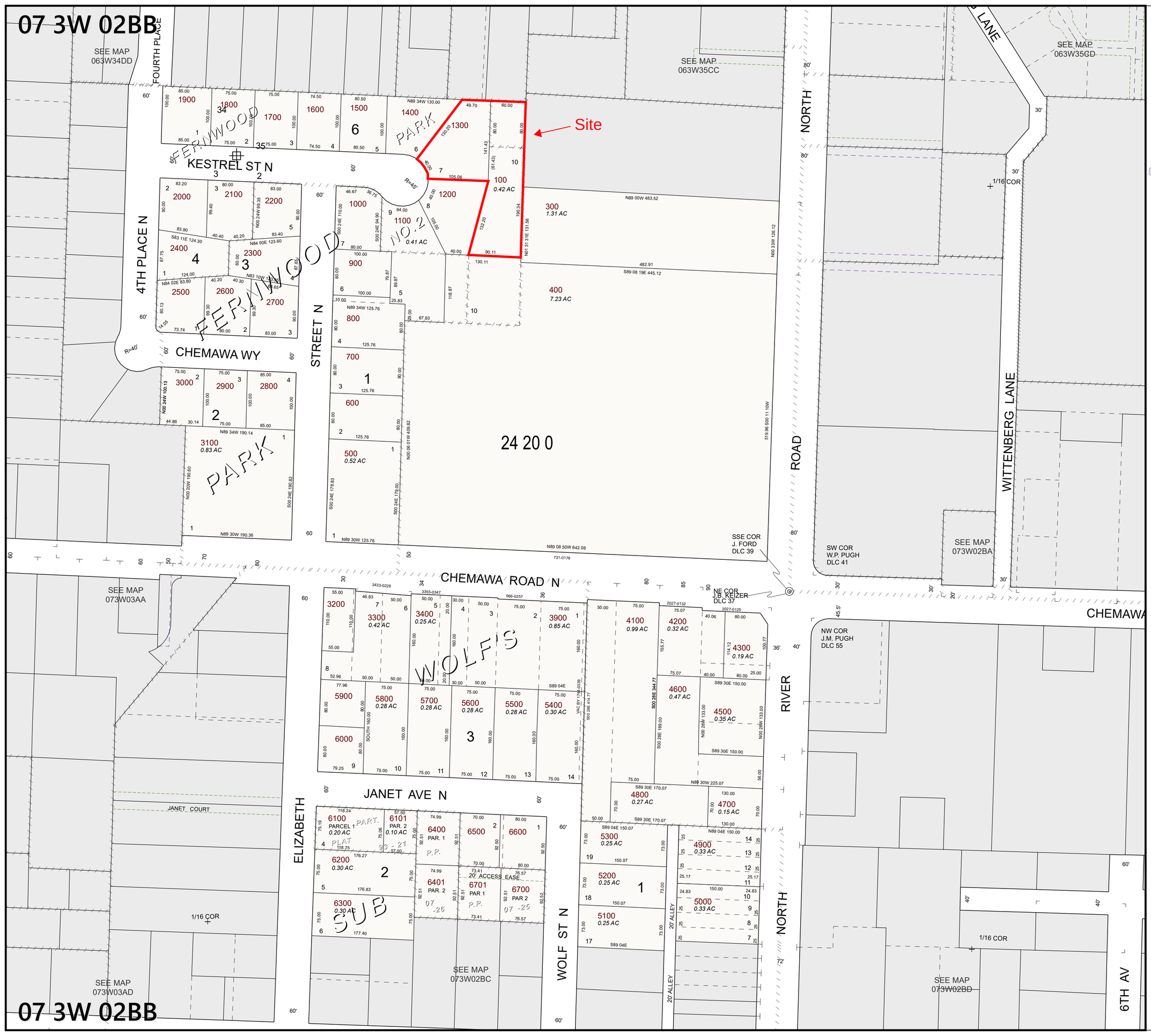
reduce the infiltration rate and could potentially result in flooding. Operations and Maintenance forms for rain gardens are included in Appendix D.

CONCLUSION

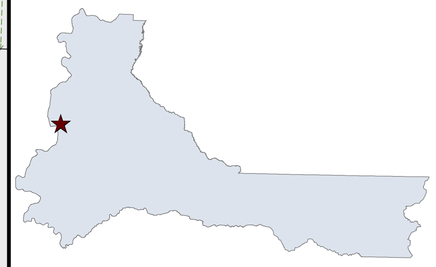
Based on the presented information, the proposed design meets the water quantity standards for the City of Keizer. If there are any questions regarding this analysis or the design, please contact Todd Liles at TLiles@mtengineering.net or Natalie Janney at NJanney@mtengineering.net.

Appendix A: Maps & Plans

07 3W 02BB



07 3W 02BB
KEIZER



MARION COUNTY, OREGON

NW1/4 NW1/4 SEC2 T7S R3W W.M.

SCALE 1" = 100'

LEGEND

LINE TYPES

- Taxlot Boundary
- Historical Boundary
- Road Right-of-Way
- Easement
- Railroad Right-of-Way
- Railroad Centerline
- Private Road ROW
- Taxcode Line
- Subdivision/Plat Bndry
- Map Boundary
- Waterline - Taxlot Bndry
- Waterline - Non Bndry

CORNER TYPES

- + 1/16TH Section Cor.
- 1/4 Section Cor.
- DLC Corner
- 16 15 / 21 22 Section Corner

NUMBERS

Tax Code Number

00 00 0

Acreage *0.25 AC*

All acres listed are Net Acres, excluding any portions of the taxlot within public ROWs

NOTES

Tick Marks: A tick mark in the road indicates that the labeled dimension extends into the public ROW

200.00
175.00

CANCELLED NUMBERS

200
201
401
3400B1
3500
3600
3601
3700
3701
3800
3801
3901
4000
4301
4400
4900A1

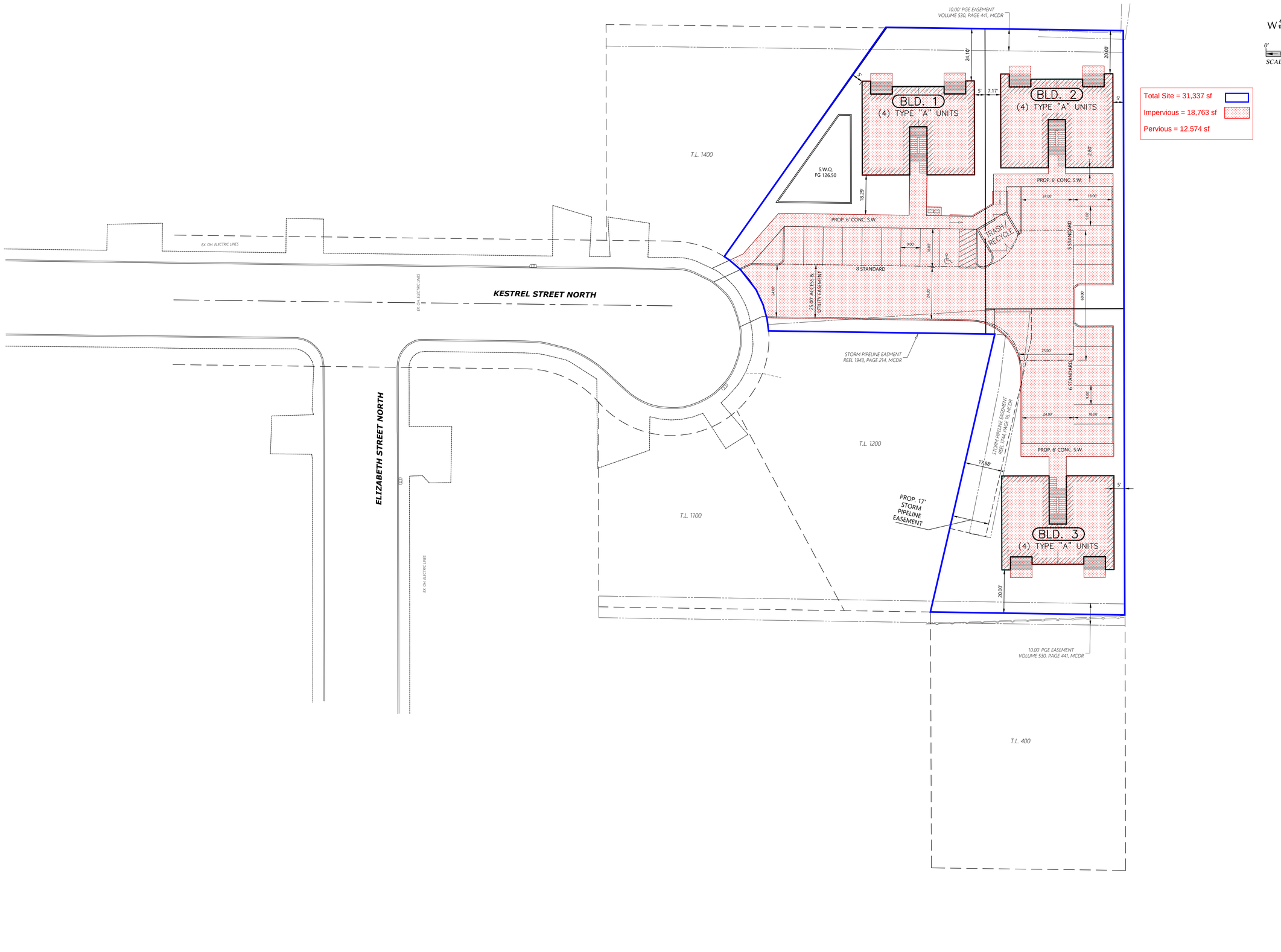
DISCLAIMER: THIS MAP WAS PREPARED FOR ASSESSMENT PURPOSES ONLY

Marion County OREGON — Assessors Office Cartography Dept

FOR ADDITIONAL MAPS VISIT OUR WEBSITE AT www.co.marion.or.us

PLOT DATE: 10/16/2020

KEIZER
07 3W 02BB



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SITE PLAN

KESTREL STREET PARTITION

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DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.

7789p 701-SITE

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Scale: AS SHOWN

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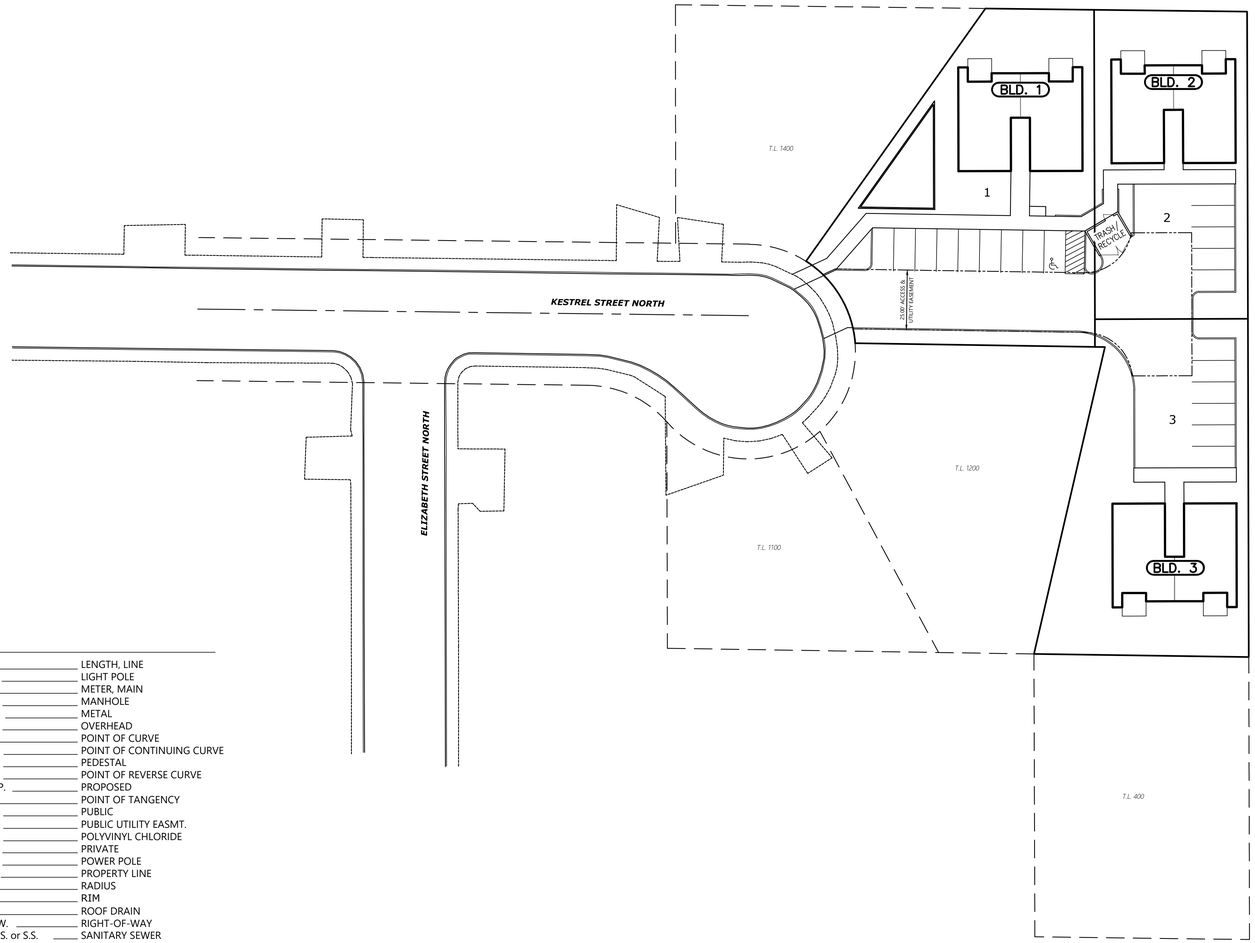
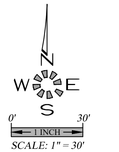
OREGON
JULY 14, 1978
MARK D. GRENZ

EXPIRES: 06-30-2025

JOB # 7789

701





VICINITY MAP

KESTREL STREET PARTITION

SE 1/4 SEC. 35, T. 6 S., & NW 1/4 SEC. 2,
T. 7 S., R. 3 W., W.M.
CITY OF KEIZER
MARION COUNTY, OREGON

Owner / Developer:

CHEMAWA CROSSING LLC

P.O. BOX 1094
SALEM, OREGON 97304

ABBREVIATIONS

A.C.	ASPHALTIC CONCRETE	L	LENGTH, LINE
ACMP	ALUMINIZED CMP	L.P.	LIGHT POLE
ASSY.	ASSEMBLY	M	METER, MAIN
B.O.	BLOW OFF	M.H.	MANHOLE
B.F.V.	BUTTERFLY VALVE	MTL.	METAL
C & G	CURB & GUTTER	O.H.	OVERHEAD
CATV	CABLE TELEVISION	PC	POINT OF CURVE
C.B.	CATCH BASIN	PCC	POINT OF CONTINUING CURVE
C.B.C.O.	CATCH BASIN CLEANOUT	PED.	PEDESTAL
C.B.I.	CATCH BASIN INLET	PRC	POINT OF REVERSE CURVE
CCR	COMPACTED CRUSHED ROCK	PROP.	PROPOSED
C.L.	CENTERLINE	PT	POINT OF TANGENCY
CMP	CORRUGATED METAL PIPE	PUB.	PUBLIC
C.O.	CLEANOUT	PUE	PUBLIC UTILITY EASMT.
CONC.	CONCRETE	PVC	POLYVINYL CHLORIDE
CONST.	CONSTRUCT	PVT.	PRIVATE
D.I.	DUCTILE IRON	P.P.	POWER POLE
DIA.	DIAMETER	P.L.	PROPERTY LINE
DWG	DRAWING	R	RADIUS
EASMT.	EASEMENT	R-	RIM
E.G.	EXIST. GRADE / GROUND	RD	ROOF DRAIN
EOP, E.P.	EDGE OF PAVEMENT	R.O.W.	RIGHT-OF-WAY
ELEC.	ELECTRIC	SAN.S. or S.S.	SANITARY SEWER
ELEV. or EL.	ELEVATION	S	SLOPE
EX. or EXIST.	EXISTING	S.Q.F.	STORMWATER QUALITY FACILITY
F.D.C.	FIRE DEPT. CONNECTION	STA.	STATION
FT.	FEET	STD.	STANDARD
F.F.	FINISH FLOOR	STL.	STEEL
F.G.	FINISH GRADE	STM.DRN. or S.D.	STORM DRAIN
F.H.	FIRE HYDRANT	SVC.	SERVICE
F.M.	FORCE MAIN	SW	SIDEWALK
GUT. or GTR.	GUTTER	T.C.	TOP OF CURB
G.V.	GATE VALVE	TEL.	TELEPHONE
IMP.	IMPROVEMENT	TYP.	TYPICAL
INST.	INSERT	U.G.	UNDERGROUND
INV. or I-	INVERT	VLT.	VAULT
		W.M.	WATER MAIN

SYMBOLS

EX.	PROP.		EX.	PROP.	
⊖	◓	BLOW OFF ASSY.	Ⓢ	Ⓢ	MANHOLE SAN. SEWER
▥	▥	CATCH BASIN	Ⓓ	Ⓓ	MANHOLE STORM DRAIN
▣	■	CATCH BASIN CLEANOUT	②	②	2' DIA. C.O. / M.H.
▣	◙	CATCH BASIN CURB INLET	Ⓣ	Ⓣ	MANHOLE TELEPHONE
△	▲	CATV PED. / BOX	Ⓦ	Ⓦ	MANHOLE WATER
○	●	CLEANOUT	▷	▶	REDUCER / INCREASER
◪	◪	ELEC. PED. / BOX	▣	▣	TEL. PED. / BOX
⊰◯⊱	◓	FIRE HYDRANT	▭	▭	TRAFFIC PED. / BOX
◍	◭	GAS LOCATION MARKER	⊰◯⊱	⊰◯⊱	UTILITY / POWER POLE
⋈	⋈	GAS VALVE	▢	■	WATER METER
◫	◧	MAIL BOX	⊗	◓	WATER VALVE

CABLE TELEVISION	SANITARY SEWER EXIST.
CENTERLINE	SANITARY SEWER CONST.
DITCH C.L.	STORM DRAIN EXIST.
ELECTRICAL LINE	STORM DRAIN CONST.
GAS MAIN	WATER MAIN EXIST.
TELEPHONE LINE	WATER MAIN CONST.

SHEET INDEX

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COVER SHEET

KESTREL STREET PARTITION

7789p 101-COV

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Issue Date: 6/16/25
Scale: AS SHOWN

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OREGON
JULY 14, 1978
MARK D. GRENZ
EXPIRES: 06-30-2027

JOB # 7789

101

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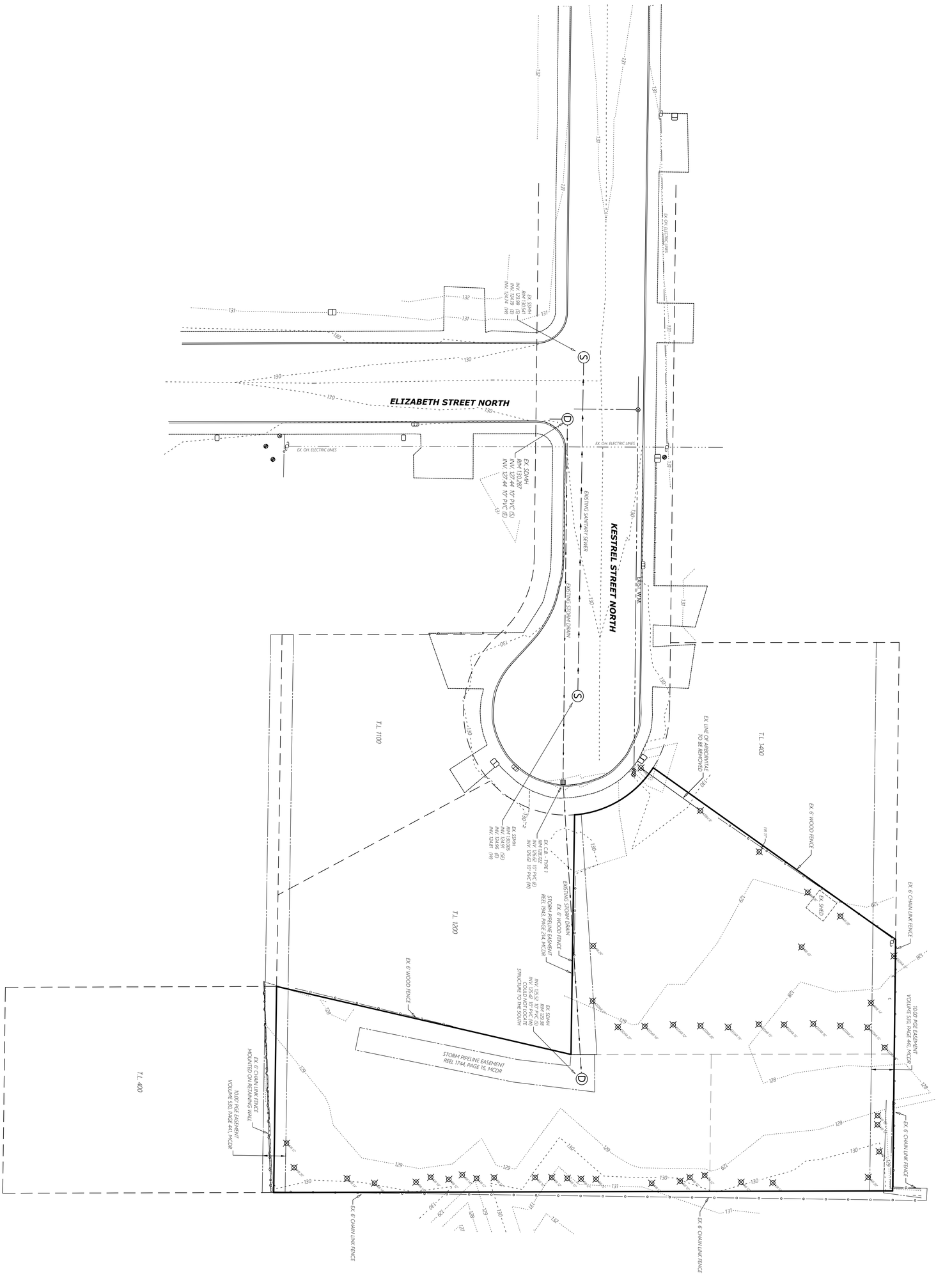

SCALE: 1" = 30'

102	JOB # 7789	7789p 102-X Design: M.D.G. Drawn: C.F.G. & M.K.D. Checked: J.J.G. Issue Date: 6/16/25 Scale: AS SHOWN	NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER. DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.	**KESTREL STREET PARTITION**	**EXISTING CONDITIONS PLAN**

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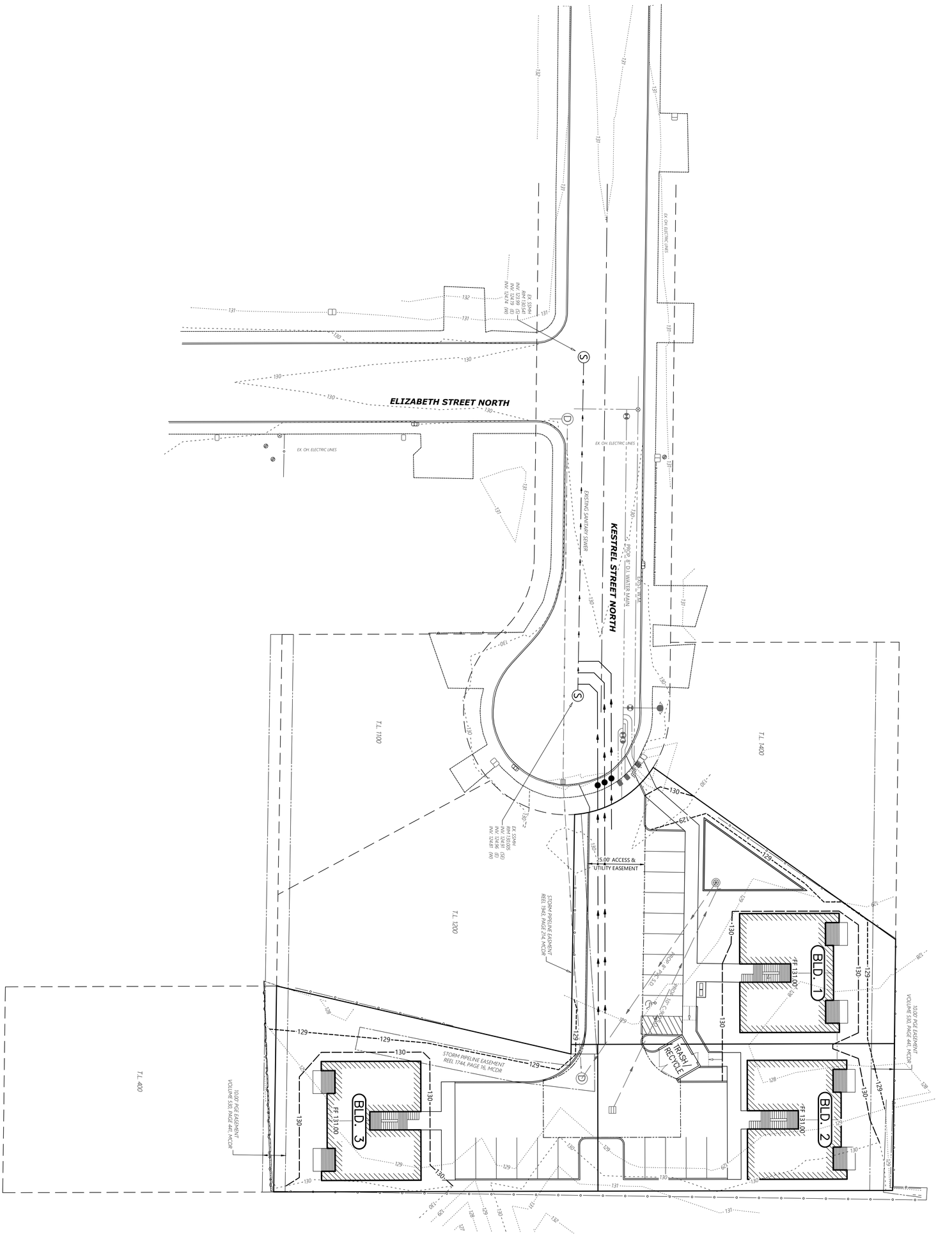

201

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7789p 201-SAN

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KESTREL STREET PARTITION

SANITARY SEWER PLAN

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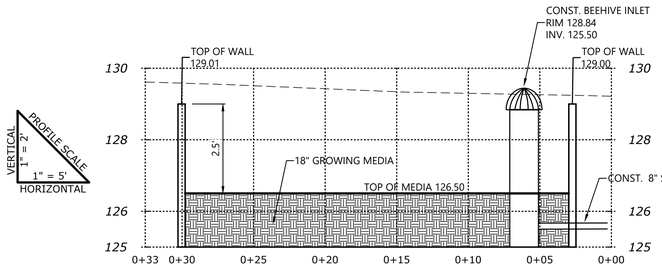

DETENTION POND SECTION A-A

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STORM DRAIN PLAN

KESTREL STREET PARTITION

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7789p 301-STORM

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OREGON
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MARK D. GRENZ

EXPIRES: 06-30-2027

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301

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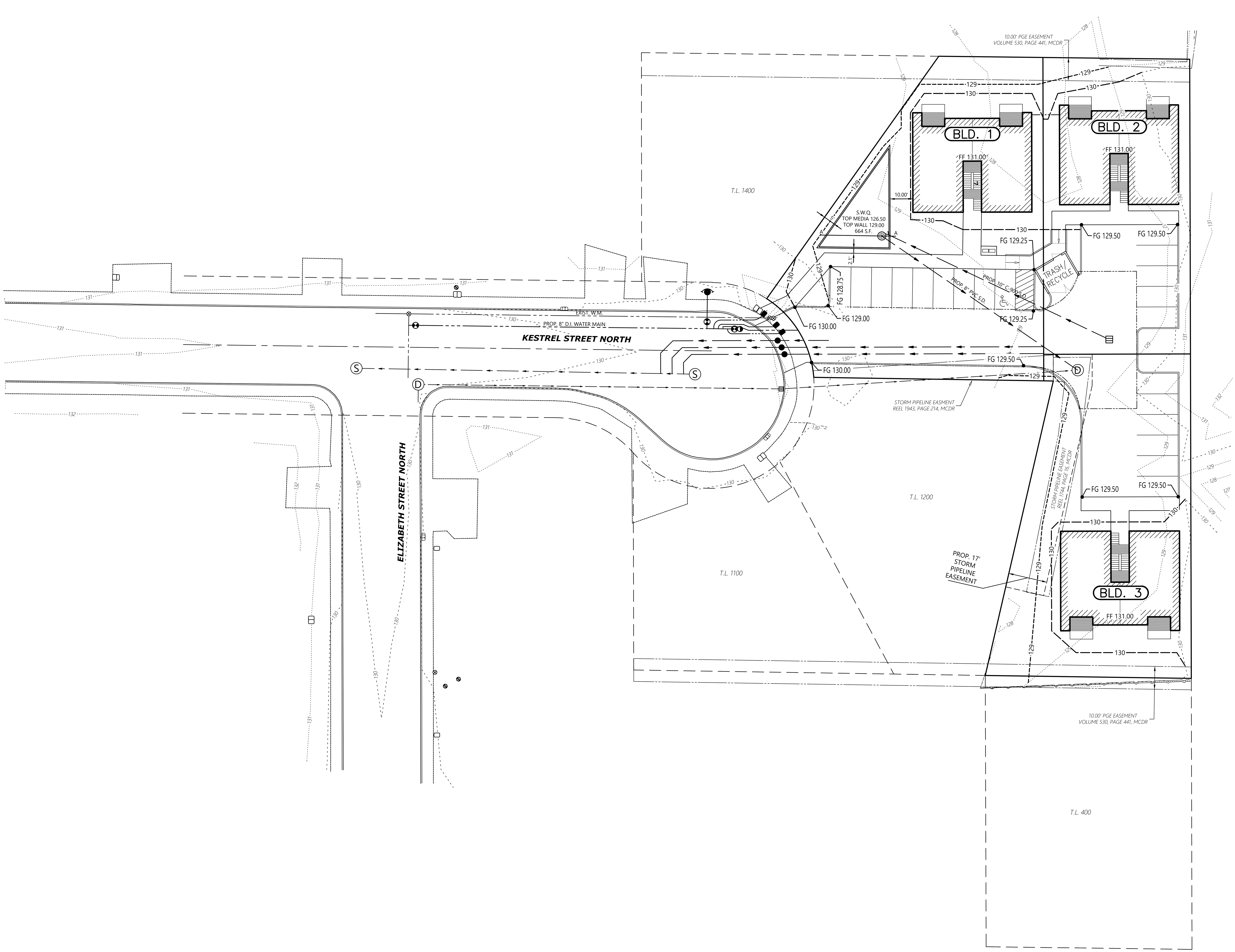

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GRADING PLAN

KESTREL STREET PARTITION

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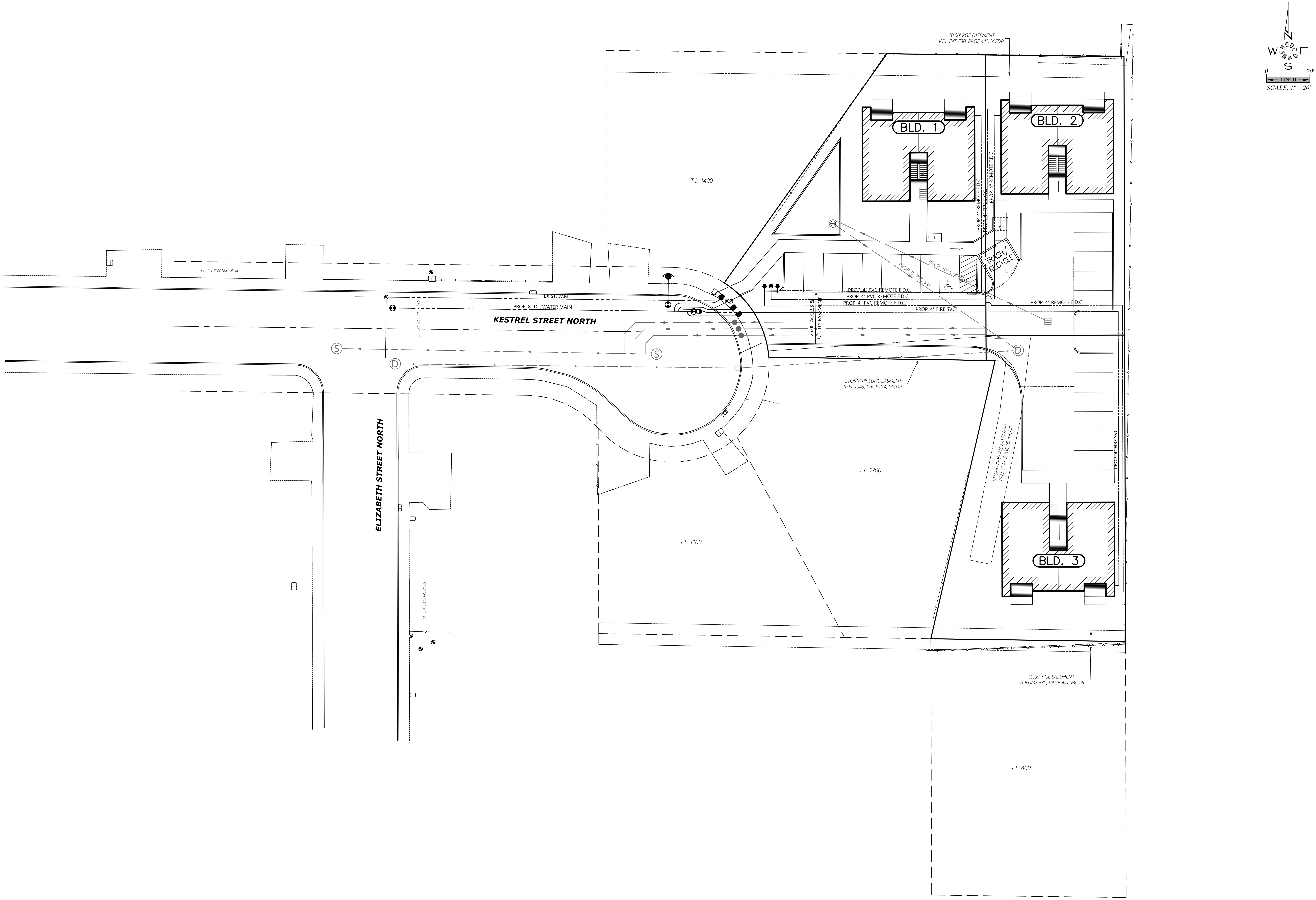
JOB # 7789

401



W N E S

0' 20'

1 INCH

SCALE: 1" = 20'

MULTI/TECH

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DOMESTIC WATER PLAN

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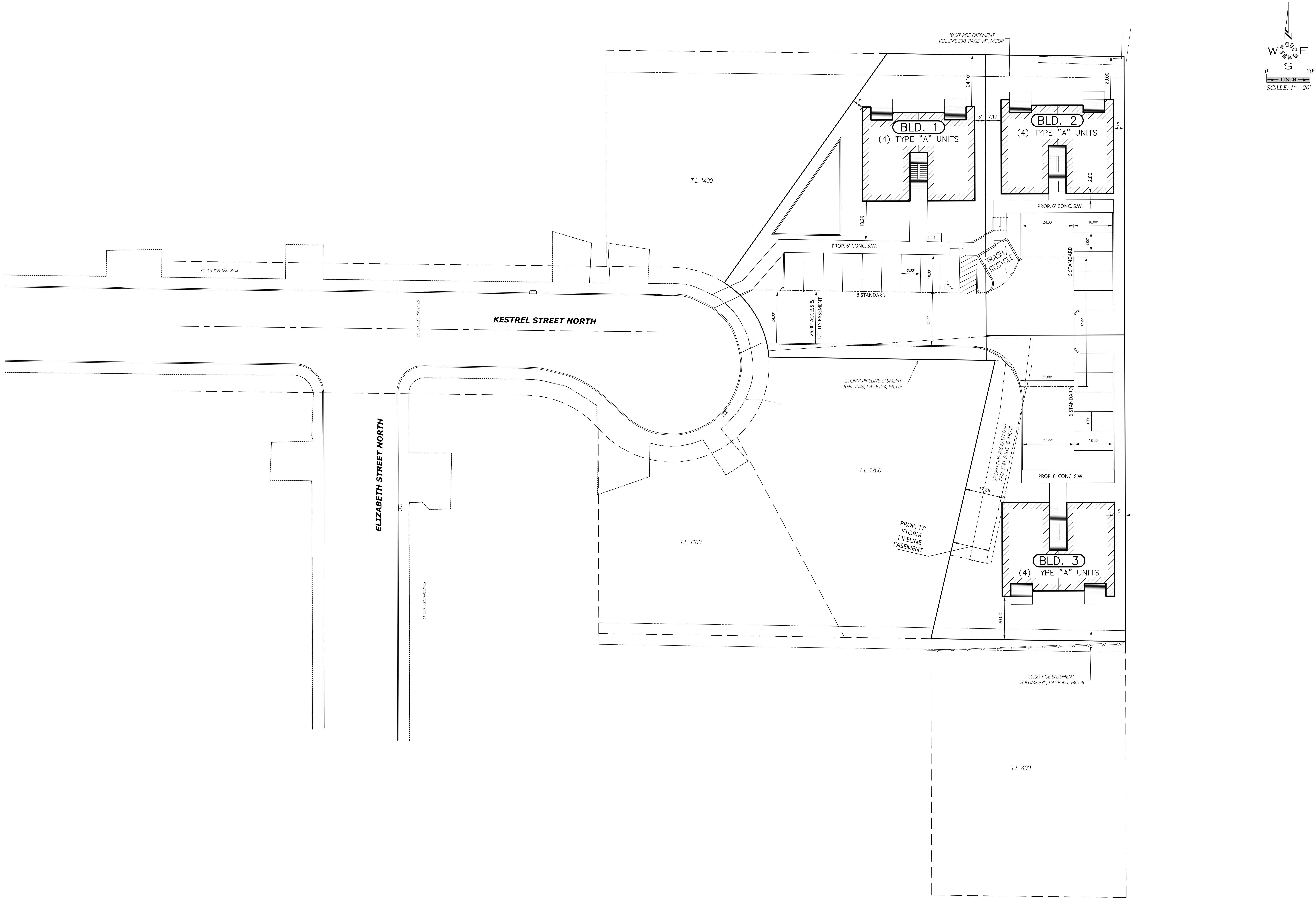
OREGON
JULY 14, 1978
MARK D. GRENZ
EXPIRES: 06-30-2027

JOB # 7789

501



SITE PLAN

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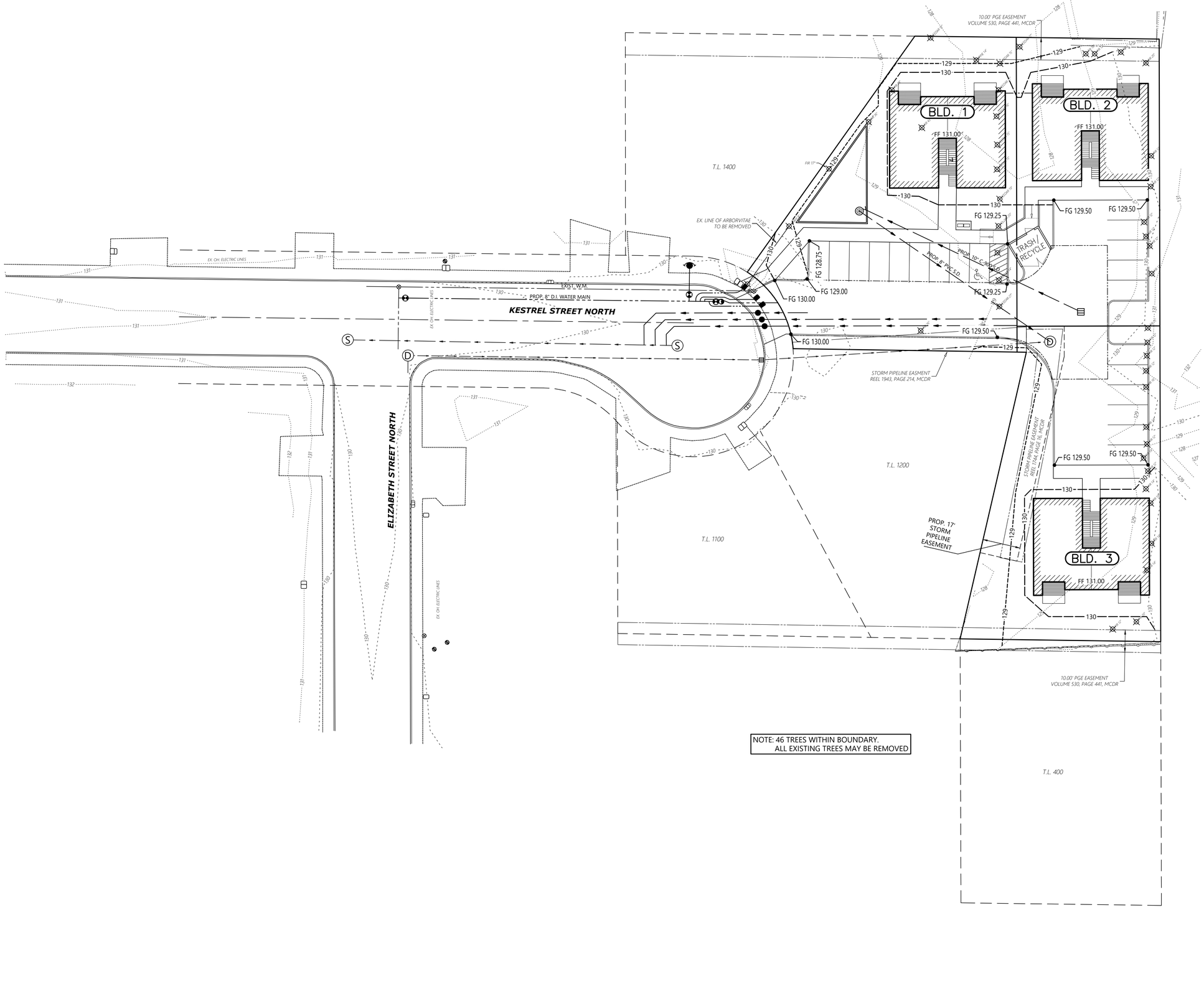

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SCALE: 1" = 20'

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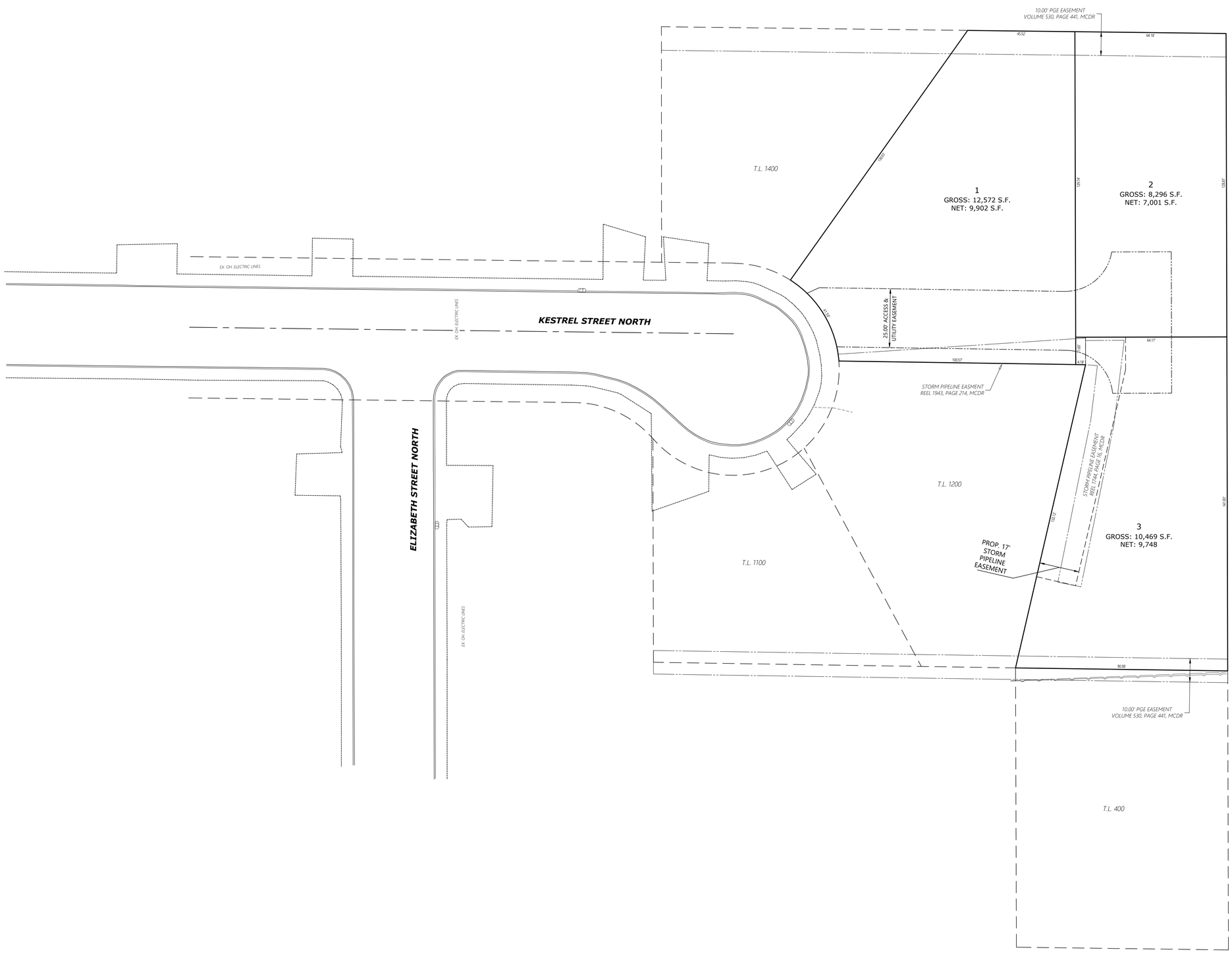
JOB # 7789

702



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EXPIRES: 06-30-2027

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Appendix B:

Soil Report

Infiltration Tests

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 Marion County Area, Oregon

May 21, 2025

Preface

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

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

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

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

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

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

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:496 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 5 10 20 30

Feet
0 20 40 80 120

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: Marion County Area, Oregon
Survey Area Data: Version 22, Aug 30, 2024

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

Date(s) aerial images were photographed: May 17, 2023—Jun 3, 2023

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
Cm	Cloquato silt loam	0.3	37.4%
Nu	Newberg fine sandy loam	0.5	62.6%
Totals for Area of Interest		**0.8**	**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.

Marion County Area, Oregon

Cm—Cloquato silt loam

Map Unit Setting

National map unit symbol: 24p1
Elevation: 100 to 650 feet
Mean annual precipitation: 40 to 45 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 200 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Cloquato and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cloquato

Setting

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

Typical profile

H1 - 0 to 9 inches: silt loam
H2 - 9 to 41 inches: silt loam
H3 - 41 to 83 inches: silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 10.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Ecological site: F002XC003OR - Low Flood Plain Group
Forage suitability group: Well drained < 15% Slopes (G002XY002OR)
Other vegetative classification: Well drained < 15% Slopes (G002XY002OR)
Hydric soil rating: No

Nu—Newberg fine sandy loam

Map Unit Setting

National map unit symbol: 24r2
Elevation: 100 to 650 feet
Mean annual precipitation: 40 to 45 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 200 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Newberg and similar soils: 85 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 over sandy or gravelly material

Typical profile

H1 - 0 to 10 inches: fine sandy loam
H2 - 10 to 60 inches: sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
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 supply, 0 to 60 inches: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A
Ecological site: F002XC001OR - Riparian Group
Hydric soil rating: No

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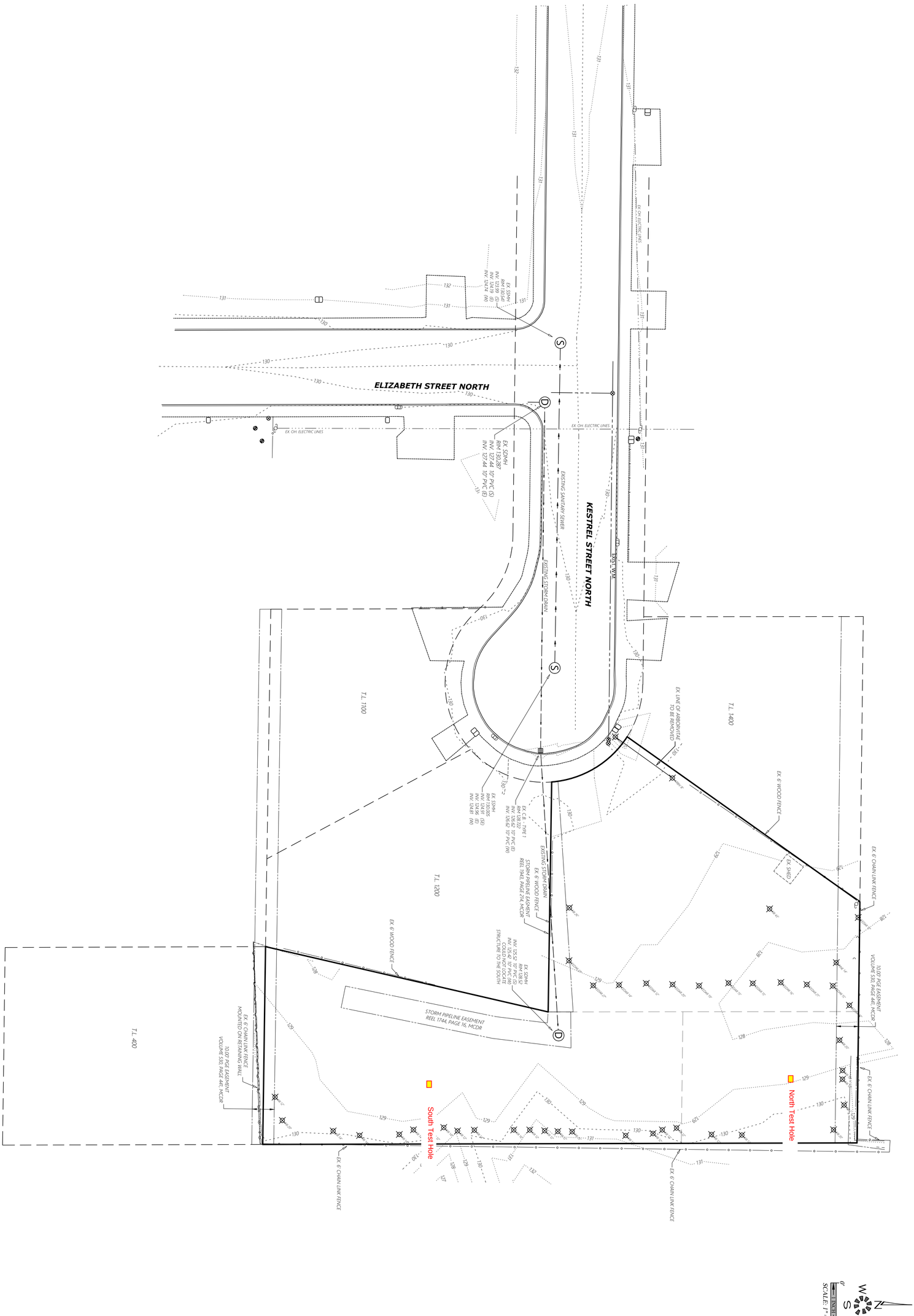

102	JOB # 7789	06-30-2025	7789p 102-X Design: M.D.G. Drawn: C.F.G. & M.K.D. Checked: J.J.G. Issue Date: 4/15/25 Scale: AS SHOWN	NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER. DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.	**KESTREL STREET PARTITION**	**EXISTING CONDITIONS PLAN**

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Kestral St Project

North Hole

Infiltration Test

1st, test Run

April 19th, 2025

Time *(min)*	Time Difference *(min)*	Water Level *(feet)*	Infiltration *(feet)*	Infiltration *(inches)*	Infiltration Rate *In/Min*	Infiltration Rate *In/hr*	Cumilative Infiltration *(inches)*
0		1.4					
	4		0.15	1.8	0.45	27	1.8
4		1.55					
	4		0.15	1.8	0.45	27	3.6
8		1.7					
	4		0.12	1.44	0.36	21.6	5.04
12		1.82					
	4		0.12	1.44	0.36	21.6	6.48
16		1.94					
	4		0.11	1.32	0.33	19.8	7.8
20		2.05					
	10		0.25	3	0.3	18	10.8
30		2.3					
	10		0.25	3	0.3	18	13.8
40		2.55					
	10		0.25	3	0.3	18	16.8
50		2.8					
	10		0.2	2.4	0.24	14.4	19.2
60		3					
	10						
70							
	10		0	0	0	0	0
80							
	10		0	0	0	0	0
90							
	10		0	0	0	0	0
100							
	20		0	0	0	0	0
120							

Average Rate 19.2

Design Rate 10 *in/hr*

24 Hour Design Rate ***240 in***

Kestral St Project

North Hole

Infiltration Test

2nd, test Run

April 19th, 2025

Time *(min)*	Time Difference *(min)*	Water Level *(feet)*	Infiltration *(feet)*	Infiltration *(inches)*	Infiltration Rate *In/Min*	Infiltration Rate *In/hr*	Cumilative Infiltration *(inches)*
0		1.2					
	4		0.14	1.68	0.42	25.2	1.68
4		1.34					
	4		0.16	1.92	0.48	28.8	3.6
8		1.5					
	4		0.14	1.68	0.42	25.2	5.28
12		1.64					
	4		0.11	1.32	0.33	19.8	6.6
16		1.75					
	4		0.11	1.32	0.33	19.8	7.92
20		1.86					
	10		0.24	2.88	0.288	17.28	10.8
30		2.1					
	10		0.25	3	0.3	18	13.8
40		2.35					
	10		0.25	3	0.3	18	16.8
50		2.6					
	10		0.25	3	0.3	18	19.8
60		2.85					
	10						
70							
	10		0	0	0	0	0
80							
	10		0	0	0	0	0
90							
	10		0	0	0	0	0
100							
	20		0	0	0	0	0
120							

Average Rate 19.8

Design Rate 10 *in/hr*

24 Hour Design Rate ***240 in***

Kestral St Project South Hole

Infiltration Test

1st, test Run

April 19th, 2025

Time *(min)*	Time Difference *(min)*	Water Level *(feet)*	Infiltration *(feet)*	Infiltration *(inches)*	Infiltration Rate *In/Min*	Infiltration Rate *In/hr*	Cumilative Infiltration *(inches)*
0		0.8					
	4		0.6	7.2	1.8	108	7.2
4		1.4					
	4		0.6	7.2	1.8	108	14.4
8		2					
	4		0.5	6	1.5	90	20.4
12		2.5					
	4			0	0	0	20.4
16							
	4		0	0	0	0	20.4
20							
	10		0	0	0	0	20.4
30							
	10		0	0	0	0	20.4
40							
	10		0	0	0	0	20.4
50							
	10		0	0	0	0	20.4
60							
	10						
70							
	10		0	0	0	0	0
80							
	10		0	0	0	0	0
90							
	10		0	0	0	0	0
100							
	20		0	0	0	0	0
120							

Average Rate 110

Hole drained in 12 min.

Design Rate 55 *in/hr*

24 Hour Design Rate ***1320 in***

Kestral St Project South Hole

Infiltration Test

2nd, test Run

April 19th, 2025

Time *(min)*	Time Difference *(min)*	Water Level *(feet)*	Infiltration *(feet)*	Infiltration *(inches)*	Infiltration Rate *In/Min*	Infiltration Rate *In/hr*	Cumilative Infiltration *(inches)*
0		1					
	4		0.6	7.2	1.8	108	7.2
4		1.6					
	4		0.6	7.2	1.8	108	14.4
8		2.2					
	4		0.3	3.6	0.9	54	18
12		2.5					
	4		-2.5	-30	-7.5	-450	-12
16							
	4		0	0	0	0	-12
20							
	10		0	0	0	0	-12
30							
	10		0	0	0	0	-12
40							
	10		0	0	0	0	-12
50							
	10		0	0	0	0	-12
60							
	10						
70							
	10		0	0	0	0	0
80							
	10		0	0	0	0	0
90							
	10		0	0	0	0	0
100							
	20		0	0	0	0	0
120							

Average Rate 120

Hole drained in 12 min.

Design Rate 60 *in/hr*

24 Hour Design Rate ***1440 in***

Appendix C: Hydrologic Analysis

Time of Concentration Calculation

Project: Kestrel Partition

Date: 5/22/2025

By: T. Liles

Sheet Flow: (Division 4, Appendix D) Up to 100 Feet

Time of Concentration = $0.93(L^{0.6})(n^{0.6}) / (i^{0.4})(S^{0.3})$

Tc = flow time in minutes

L = Overland Flow Length of 100 feet or less: L=100 ft

n = Mannings' Roughness Coeff. (Table 4D-4) = "Predeveloped Mixed" = 0.30

I = Rainfall Intensity (Inches/Hour) (Figure 4D-1) 2yr = 2.2 in/hr.

S = Average Slope of Overland Area (foot/foot) =.032 ft/ft

Tc = 14.6 min

Shallow Concentrated Flow: (Division 4, Appendix D)

Time of Concentration = $L / 60 (k_s)(S_0)^{.5}$

Tc = flow time in minutes

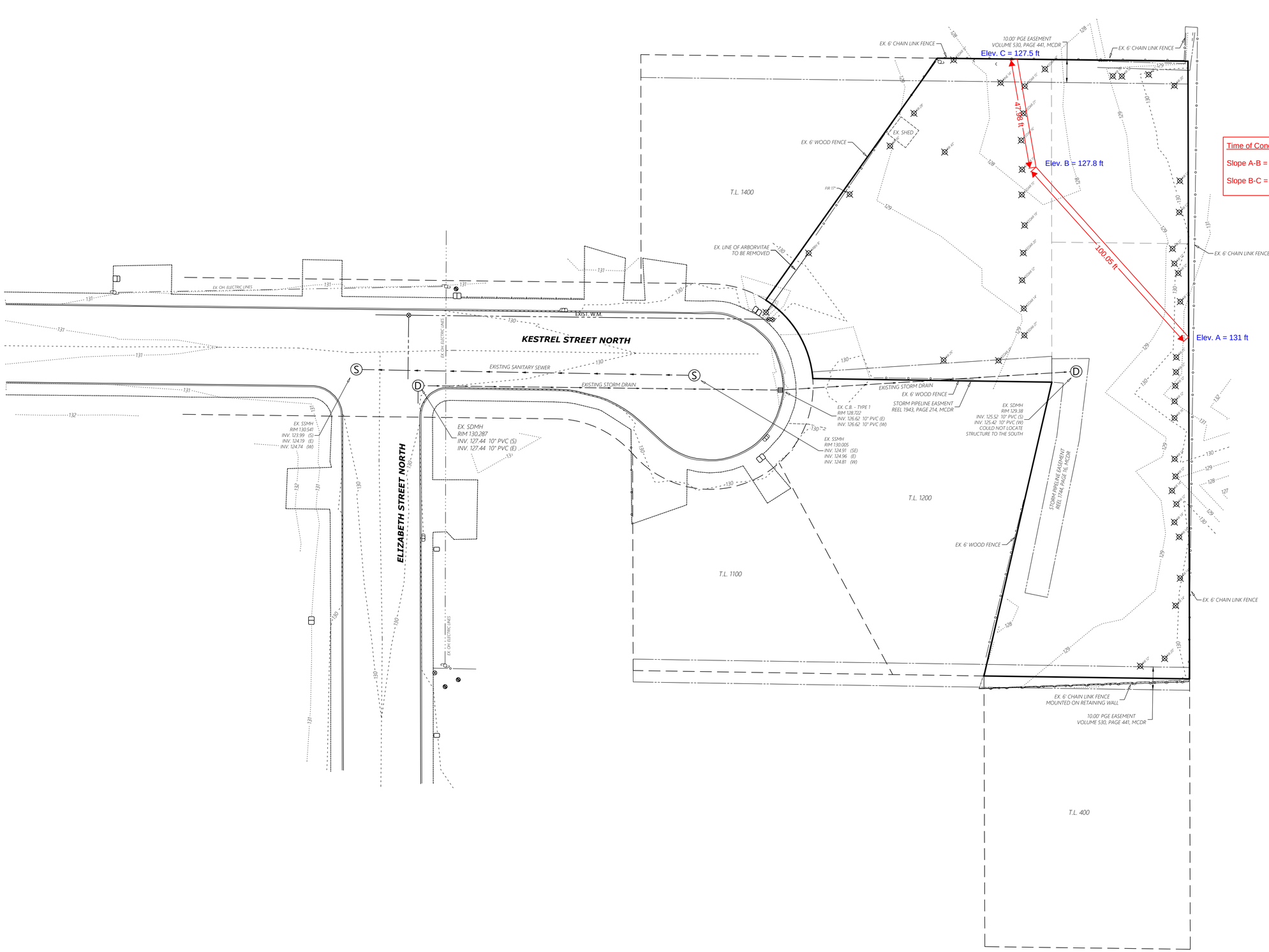
Length L = 48 feet

Velocity Factor Coefficient: $K_s = 11$ (short grass, Table 4D-5)

S_0 = land slope = .00625 feet/feet = .625%

Tc = 1 min

Total Tc = 15.6 minutes



MULTI/TECH
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www.mtengineering.net office@mtengineering.net

EXISTING CONDITIONS PLAN

KESTREL STREET PARTITION

NO CHANGES, MODIFICATIONS OR CONSTRUCTION TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER.

DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.

7789b 102-X
Design: M.D.G.
Drawn: C.F.G. & M.K.D.
Checked: J.J.G.
Issue Date: 5/15/25
Scale: AS SHOWN

REGISTERED PROFESSIONAL ENGINEER
OREGON
JULY 14, 1978
MARK D. GRENZ
EXPIRES: 06-30-2025

JOB # 7789

102

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	Water Quality	Type IA 24-hr		Default	24.00	1	1.38	2
2	2 Yr	Type IA 24-hr		Default	24.00	1	2.20	2
3	5 Yr	Type IA 24-hr		Default	24.00	1	2.70	2
4	10 Yr	Type IA 24-hr		Default	24.00	1	3.20	2
5	25 Yr	Type IA 24-hr		Default	24.00	1	3.60	2
6	50-Yr	Type IA 24-hr		Default	24.00	1	4.10	2
7	100 Yr	Type IA 24-hr		Default	24.00	1	4.40	2

Summary for Subcatchment Exist: Existing

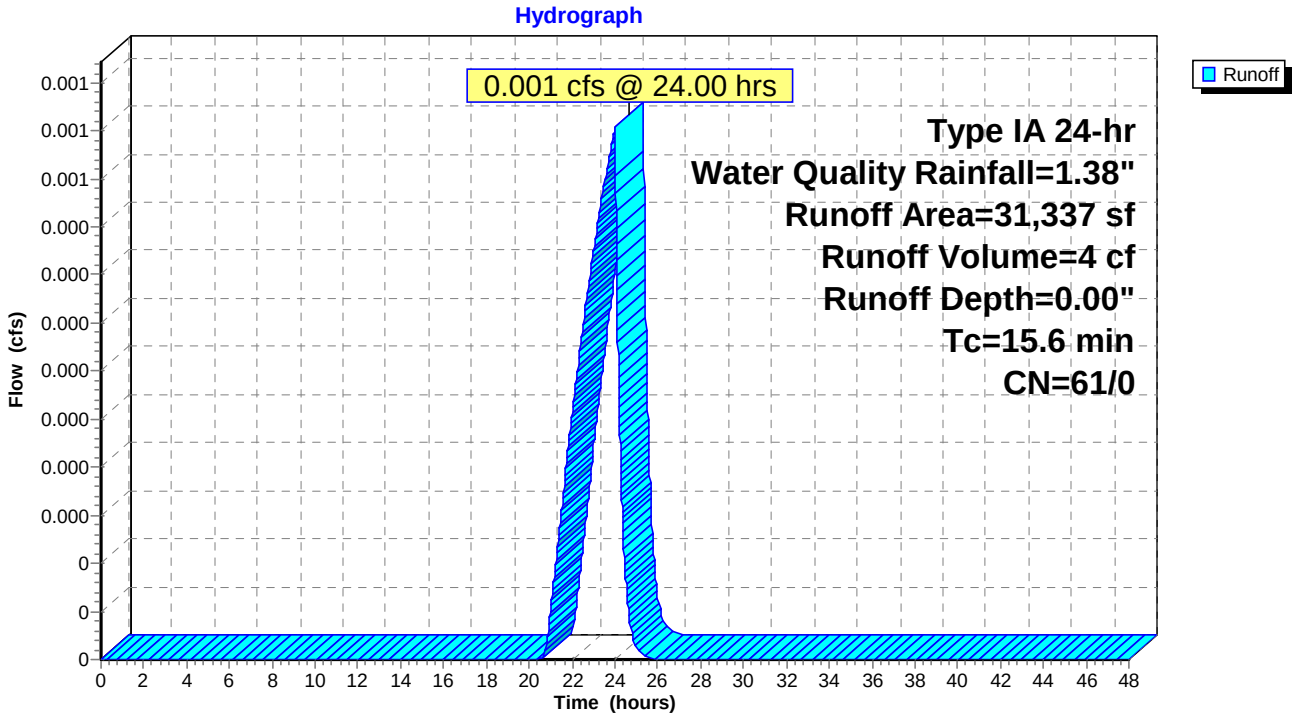
Runoff = 0.001 cfs @ 24.00 hrs, Volume= 4 cf, Depth= 0.00"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr Water Quality Rainfall=1.38"

Area (sf)	CN	Description
31,337	61	>75% Grass cover, Good, HSG B
31,337	61	100.00% Pervious Area

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

Subcatchment Exist: Existing



Summary for Subcatchment Exist: Existing

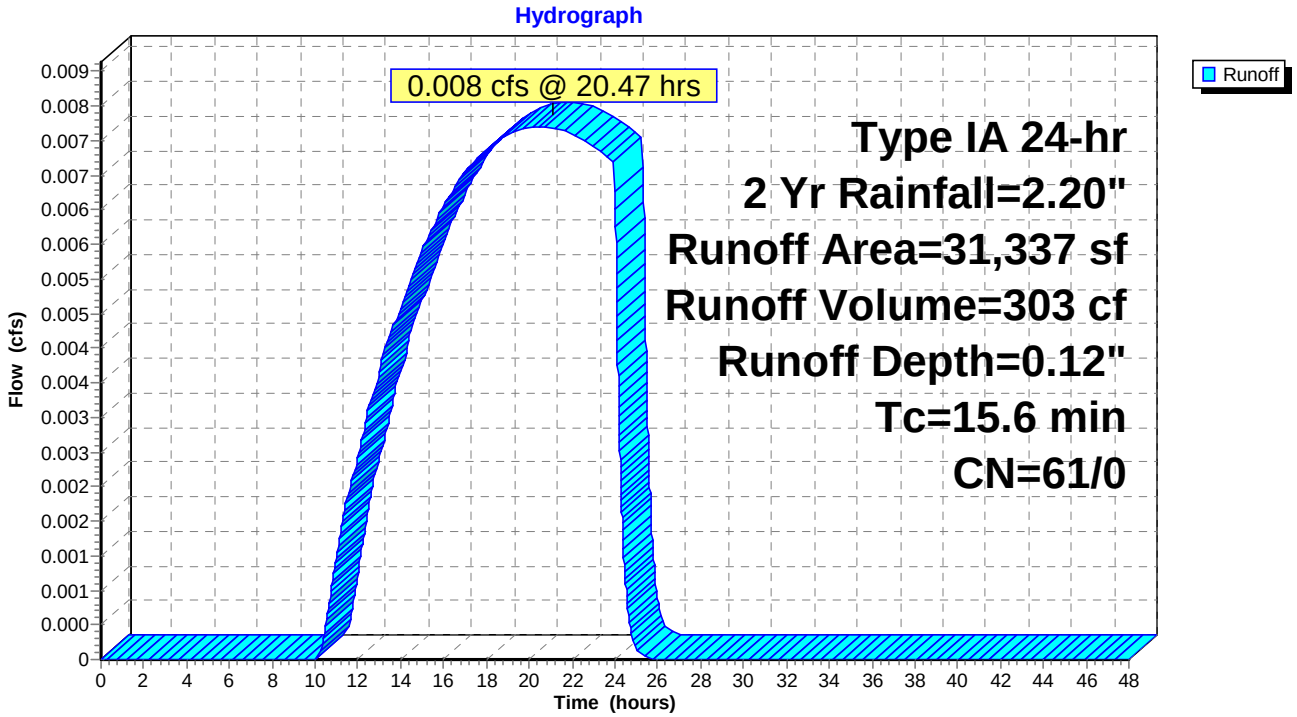
Runoff = 0.008 cfs @ 20.47 hrs, Volume= 303 cf, Depth= 0.12"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 Yr Rainfall=2.20"

Area (sf)	CN	Description
31,337	61	>75% Grass cover, Good, HSG B
31,337	61	100.00% Pervious Area

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

Subcatchment Exist: Existing



Summary for Subcatchment Exist: Existing

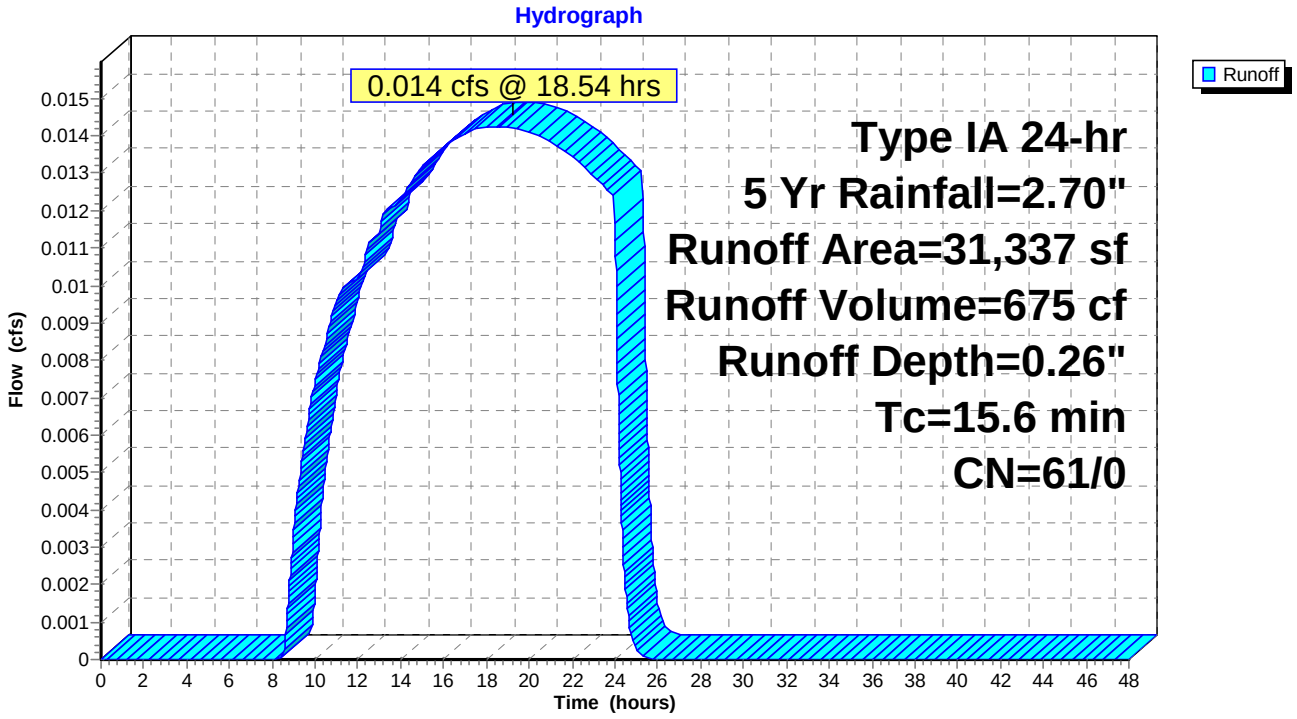
Runoff = 0.014 cfs @ 18.54 hrs, Volume= 675 cf, Depth= 0.26"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 5 Yr Rainfall=2.70"

Area (sf)	CN	Description
31,337	61	>75% Grass cover, Good, HSG B
31,337	61	100.00% Pervious Area

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

Subcatchment Exist: Existing



Summary for Subcatchment Exist: Existing

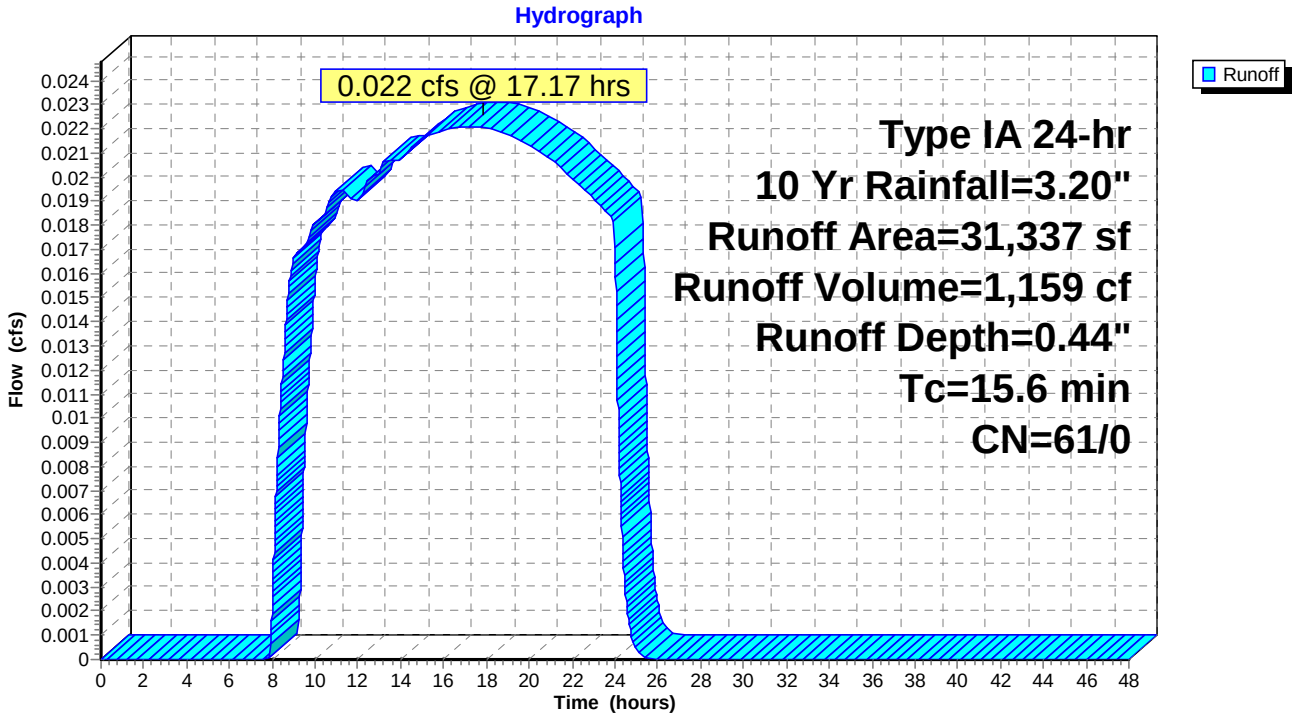
Runoff = 0.022 cfs @ 17.17 hrs, Volume= 1,159 cf, Depth= 0.44"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 Yr Rainfall=3.20"

Area (sf)	CN	Description
31,337	61	>75% Grass cover, Good, HSG B
31,337	61	100.00% Pervious Area

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

Subcatchment Exist: Existing



Summary for Subcatchment Exist: Existing

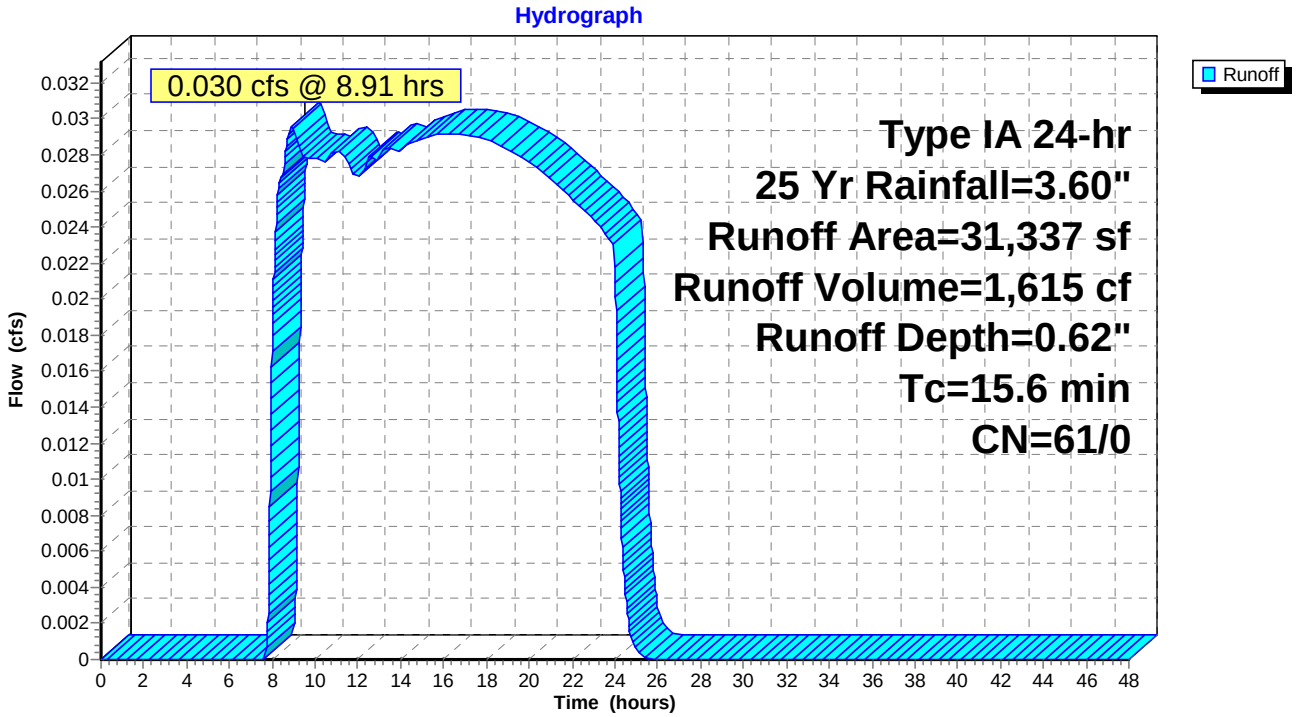
Runoff = 0.030 cfs @ 8.91 hrs, Volume= 1,615 cf, Depth= 0.62"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Yr Rainfall=3.60"

Area (sf)	CN	Description
31,337	61	>75% Grass cover, Good, HSG B
31,337	61	100.00% Pervious Area

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

Subcatchment Exist: Existing



Summary for Subcatchment Exist: Existing

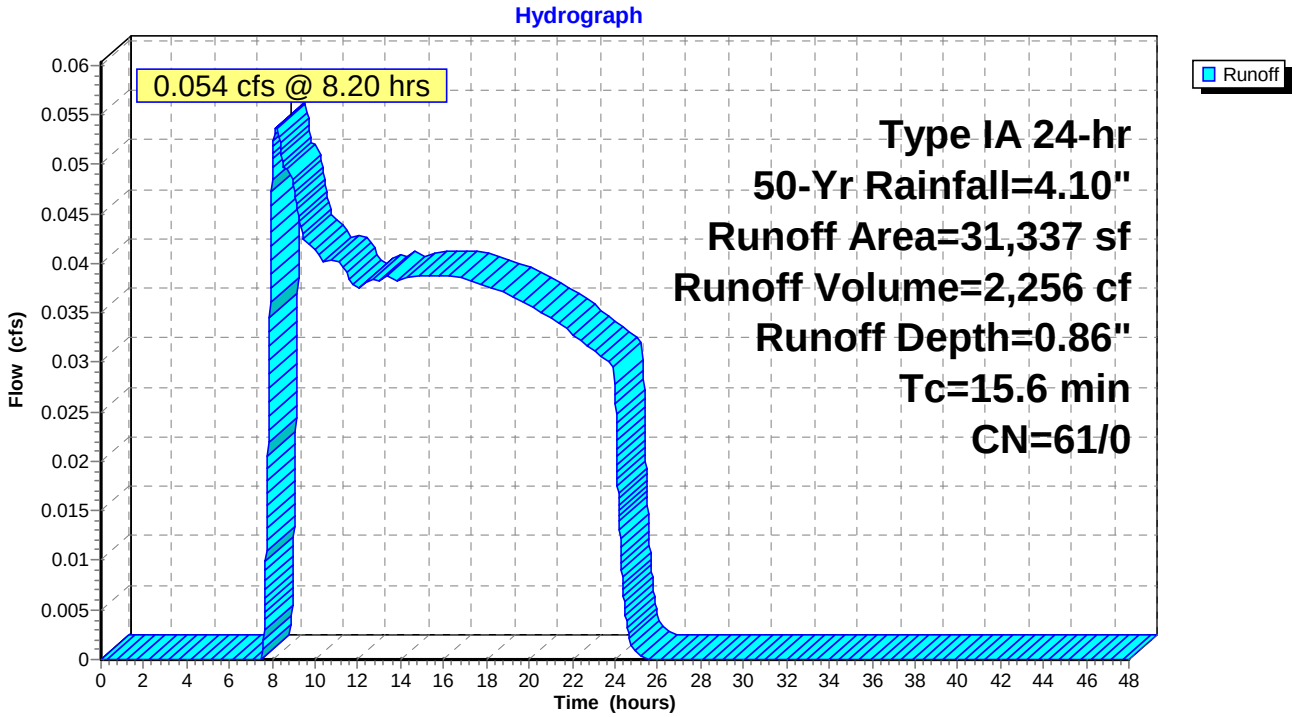
Runoff = 0.054 cfs @ 8.20 hrs, Volume= 2,256 cf, Depth= 0.86"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=4.10"

Area (sf)	CN	Description
31,337	61	>75% Grass cover, Good, HSG B
31,337	61	100.00% Pervious Area

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

Subcatchment Exist: Existing



Summary for Subcatchment Exist: Existing

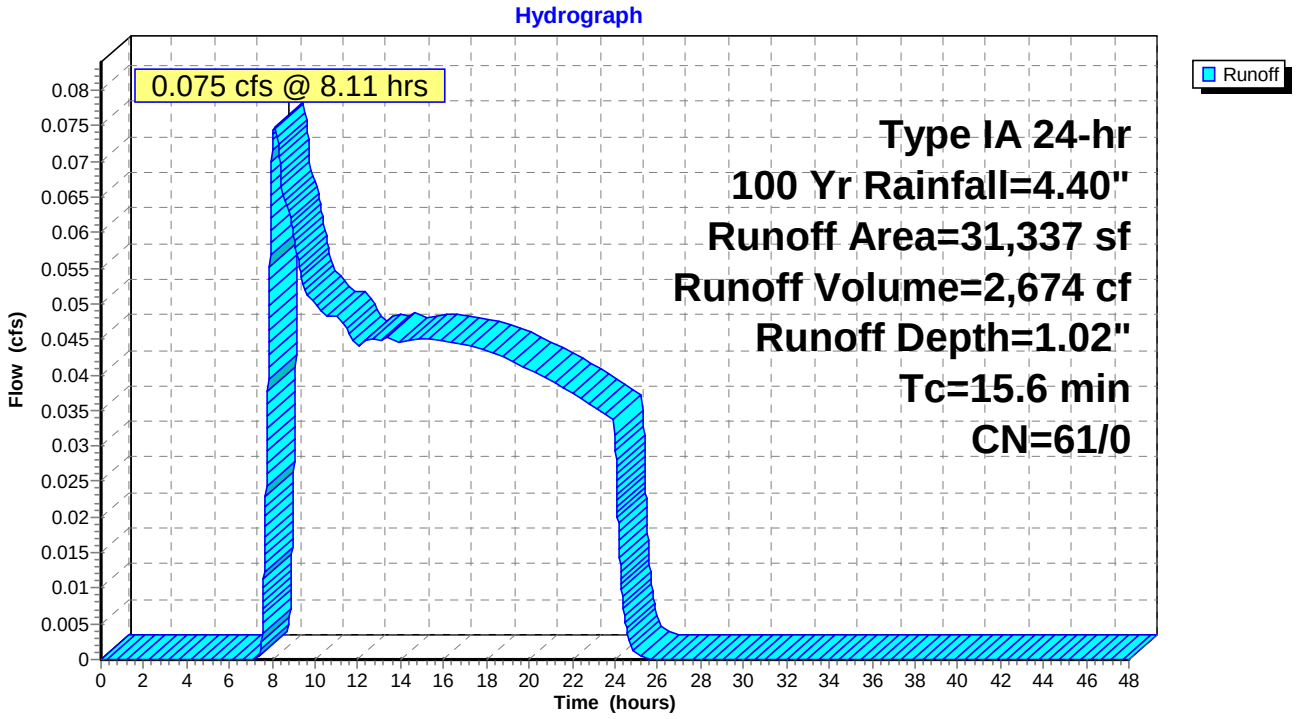
Runoff = 0.075 cfs @ 8.11 hrs, Volume= 2,674 cf, Depth= 1.02"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100 Yr Rainfall=4.40"

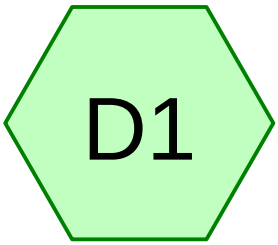
Area (sf)	CN	Description
31,337	61	>75% Grass cover, Good, HSG B
31,337	61	100.00% Pervious Area

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

Subcatchment Exist: Existing

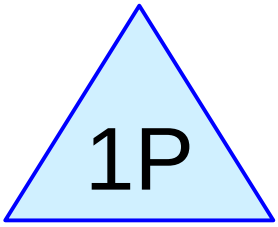


7789 - Kestrel Street Partition



Developed Site

100% Infiltration



Growing Media 6" /hr

Subcat Reach Pond Link

Routing Diagram for 7789- Kestrel Street Partition
Prepared by Multi/Tech Engineering Service, Printed 6/16/2025

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	Water Quality	Type IA 24-hr		Default	24.00	1	1.38	2
2	2 Yr	Type IA 24-hr		Default	24.00	1	2.20	2
3	5 Yr	Type IA 24-hr		Default	24.00	1	2.70	2
4	10 Yr	Type IA 24-hr		Default	24.00	1	3.20	2
5	25 Yr	Type IA 24-hr		Default	24.00	1	3.60	2
6	50-Yr	Type IA 24-hr		Default	24.00	1	4.10	2
7	100 Yr	Type IA 24-hr		Default	24.00	1	4.40	2

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
12,574	61	>75% Grass cover, Good, HSG B (D1)
18,763	98	Impervious surface, HSG B (D1)
31,337	**83**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
31,337	HSG B	D1
0	HSG C	
0	HSG D	
0	Other	
31,337		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
0	12,574	0	0	0	12,574	>75% Grass cover, Good	
0	18,763	0	0	0	18,763	Impervious surface	
0	**31,337**	**0**	**0**	**0**	**31,337**	**TOTAL AREA**	

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment D1: Developed Site Runoff Area=31,337 sf 59.87% Impervious Runoff Depth=0.70"
Tc=5.0 min CN=61/98 Runoff=0.129 cfs 1,819 cf

Pond 1P: Growing Media 6" /hr Peak Elev=126.61' Storage=72 cf Inflow=0.129 cfs 1,819 cf
Outflow=0.092 cfs 1,819 cf

Total Runoff Area = 31,337 sf Runoff Volume = 1,819 cf Average Runoff Depth = 0.70"
40.13% Pervious = 12,574 sf 59.87% Impervious = 18,763 sf

Summary for Subcatchment D1: Developed Site

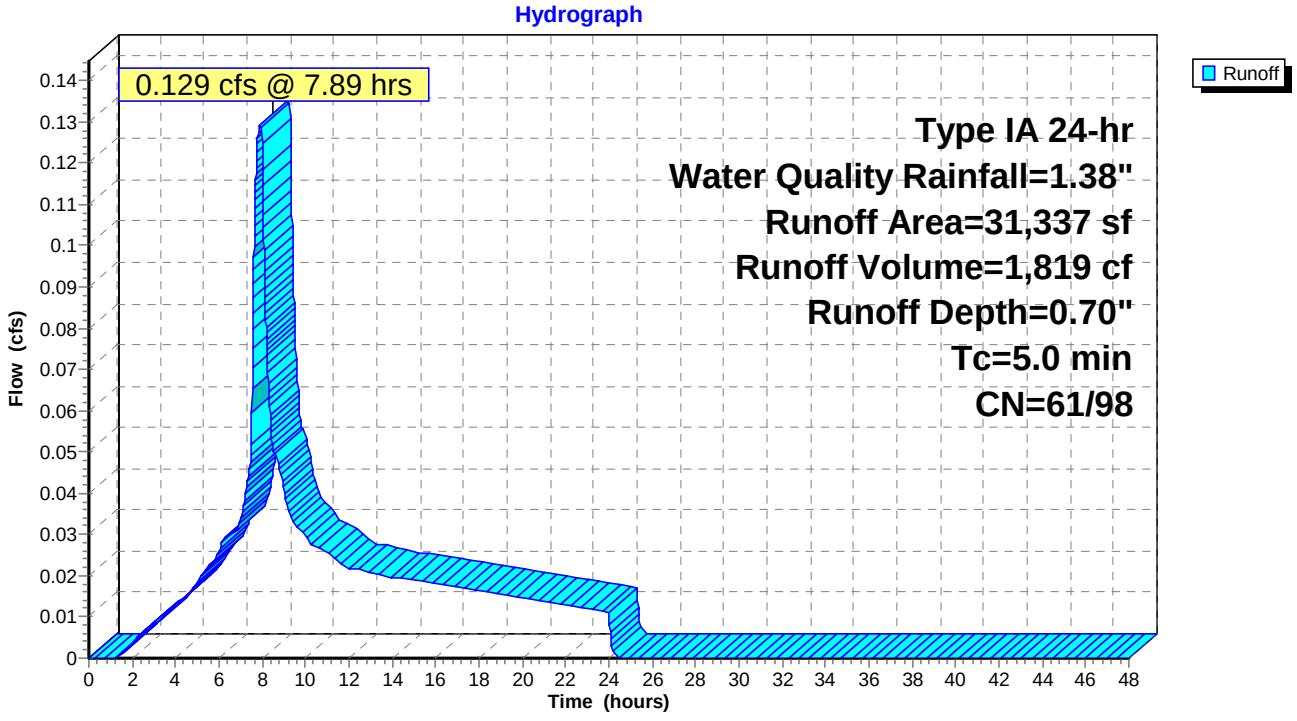
Runoff = 0.129 cfs @ 7.89 hrs, Volume= 1,819 cf, Depth= 0.70"
Routed to Pond 1P : Growing Media 6" /hr

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr Water Quality Rainfall=1.38"

	Area (sf)	CN	Description
*	18,763	98	Impervious surface, HSG B
	12,574	61	>75% Grass cover, Good, HSG B
	31,337	83	Weighted Average
	12,574	61	40.13% Pervious Area
	18,763	98	59.87% Impervious Area

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

Subcatchment D1: Developed Site



Summary for Pond 1P: Growing Media 6" /hr

Inflow Area = 31,337 sf, 59.87% Impervious, Inflow Depth = 0.70" for Water Quality event
Inflow = 0.129 cfs @ 7.89 hrs, Volume= 1,819 cf
Outflow = 0.092 cfs @ 7.69 hrs, Volume= 1,819 cf, Atten= 29%, Lag= 0.0 min
Primary = 0.092 cfs @ 7.69 hrs, Volume= 1,819 cf
Routed to nonexistent node Rock

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 126.61' @ 8.11 hrs Surf.Area= 664 sf Storage= 72 cf

Plug-Flow detention time= 5.9 min calculated for 1,818 cf (100% of inflow)
Center-of-Mass det. time= 5.9 min (702.6 - 696.7)

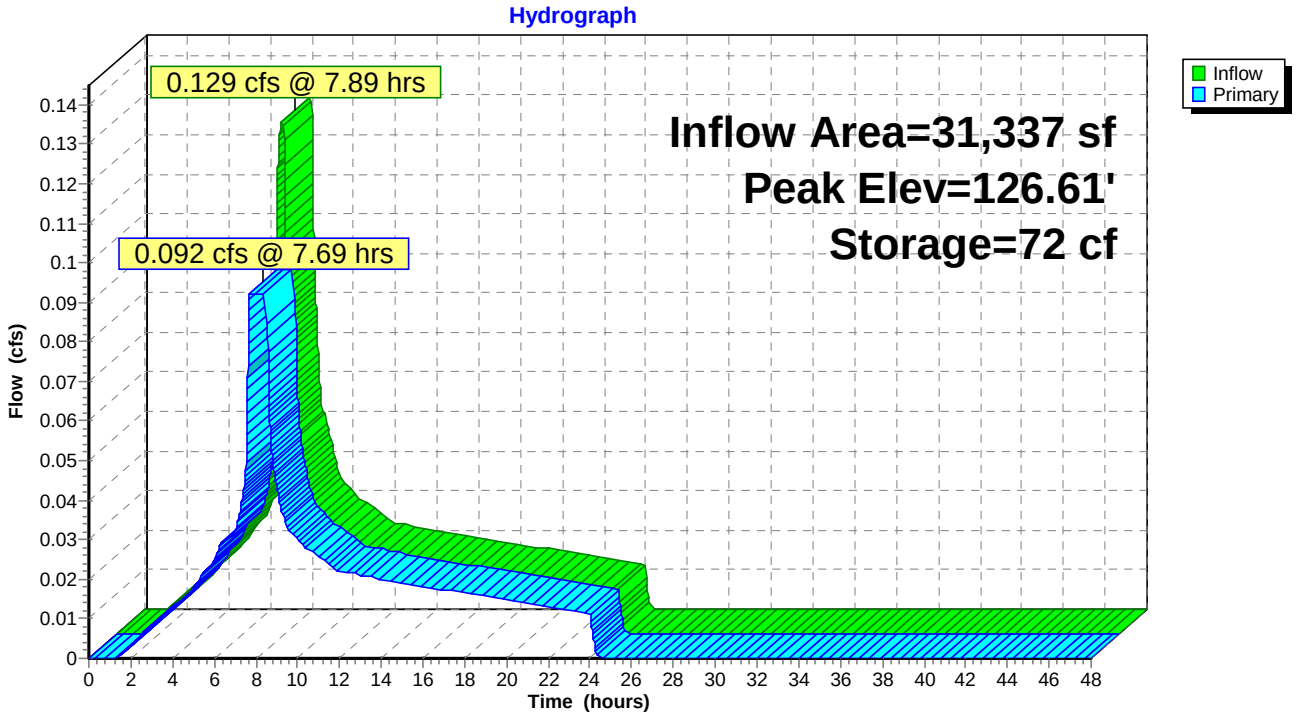
Volume	Invert	Avail.Storage	Storage Description
#1	126.50'	1,660 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
126.50	664	0	0
129.00	664	1,660	1,660

Device	Routing	Invert	Outlet Devices
#1	Primary	126.50'	**6.000 in/hr Growing Media Exfiltration over Horizontal area**
#2	Primary	128.84'	**24.0" Vert. 24" Beehive Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.092 cfs @ 7.69 hrs HW=126.54' (Free Discharge)
└─**1=Growing Media Exfiltration** (Exfiltration Controls 0.092 cfs)
└─**2=24" Beehive Overflow** (Controls 0.000 cfs)

Pond 1P: Growing Media 6" /hr



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment D1: Developed Site Runoff Area=31,337 sf 59.87% Impervious Runoff Depth=1.23"
Tc=5.0 min CN=61/98 Runoff=0.217 cfs 3,206 cf

Pond 1P: Growing Media 6" /hr Peak Elev=126.89' Storage=259 cf Inflow=0.217 cfs 3,206 cf
Outflow=0.092 cfs 3,206 cf

Total Runoff Area = 31,337 sf Runoff Volume = 3,206 cf Average Runoff Depth = 1.23"
40.13% Pervious = 12,574 sf 59.87% Impervious = 18,763 sf

Summary for Subcatchment D1: Developed Site

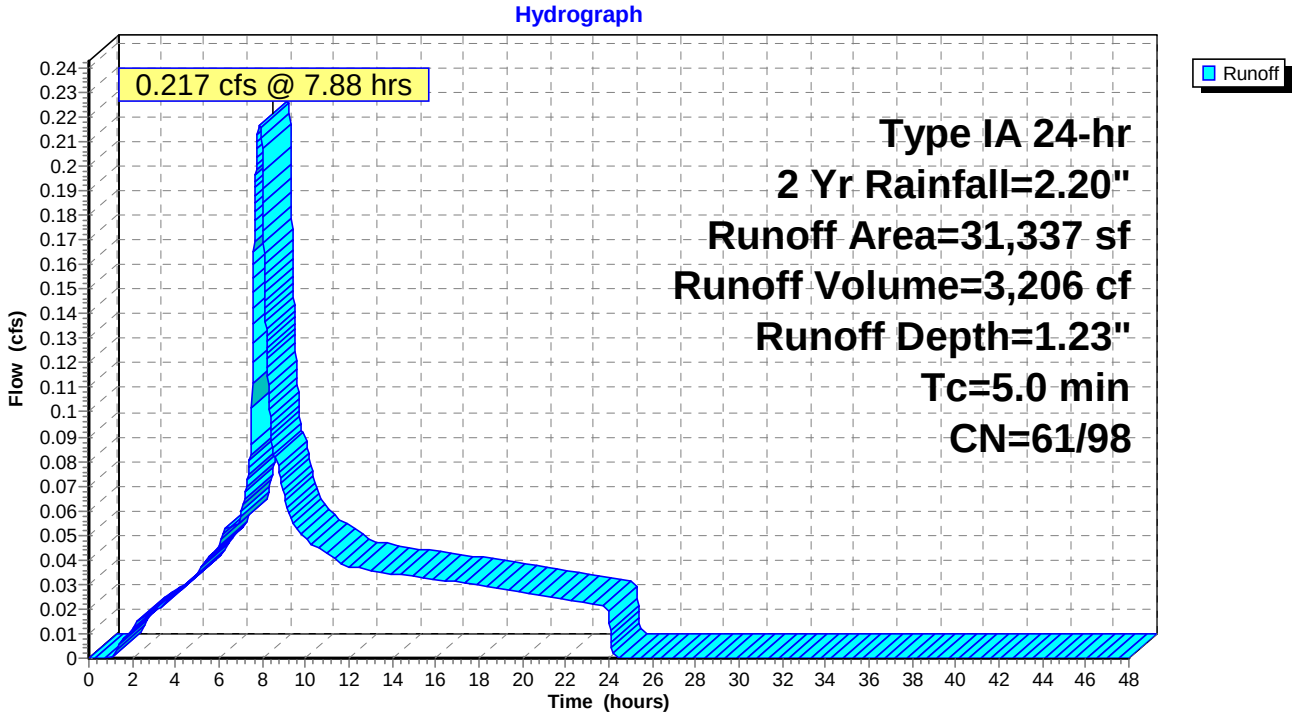
Runoff = 0.217 cfs @ 7.88 hrs, Volume= 3,206 cf, Depth= 1.23"
Routed to Pond 1P : Growing Media 6" /hr

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 Yr Rainfall=2.20"

	Area (sf)	CN	Description
*	18,763	98	Impervious surface, HSG B
	12,574	61	>75% Grass cover, Good, HSG B
	31,337	83	Weighted Average
	12,574	61	40.13% Pervious Area
	18,763	98	59.87% Impervious Area

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

Subcatchment D1: Developed Site



Summary for Pond 1P: Growing Media 6" /hr

Inflow Area = 31,337 sf, 59.87% Impervious, Inflow Depth = 1.23" for 2 Yr event
Inflow = 0.217 cfs @ 7.88 hrs, Volume= 3,206 cf
Outflow = 0.092 cfs @ 7.56 hrs, Volume= 3,206 cf, Atten= 57%, Lag= 0.0 min
Primary = 0.092 cfs @ 7.56 hrs, Volume= 3,206 cf
Routed to nonexistent node Rock

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 126.89' @ 8.40 hrs Surf.Area= 664 sf Storage= 259 cf

Plug-Flow detention time= 12.7 min calculated for 3,205 cf (100% of inflow)
Center-of-Mass det. time= 12.7 min (705.6 - 692.9)

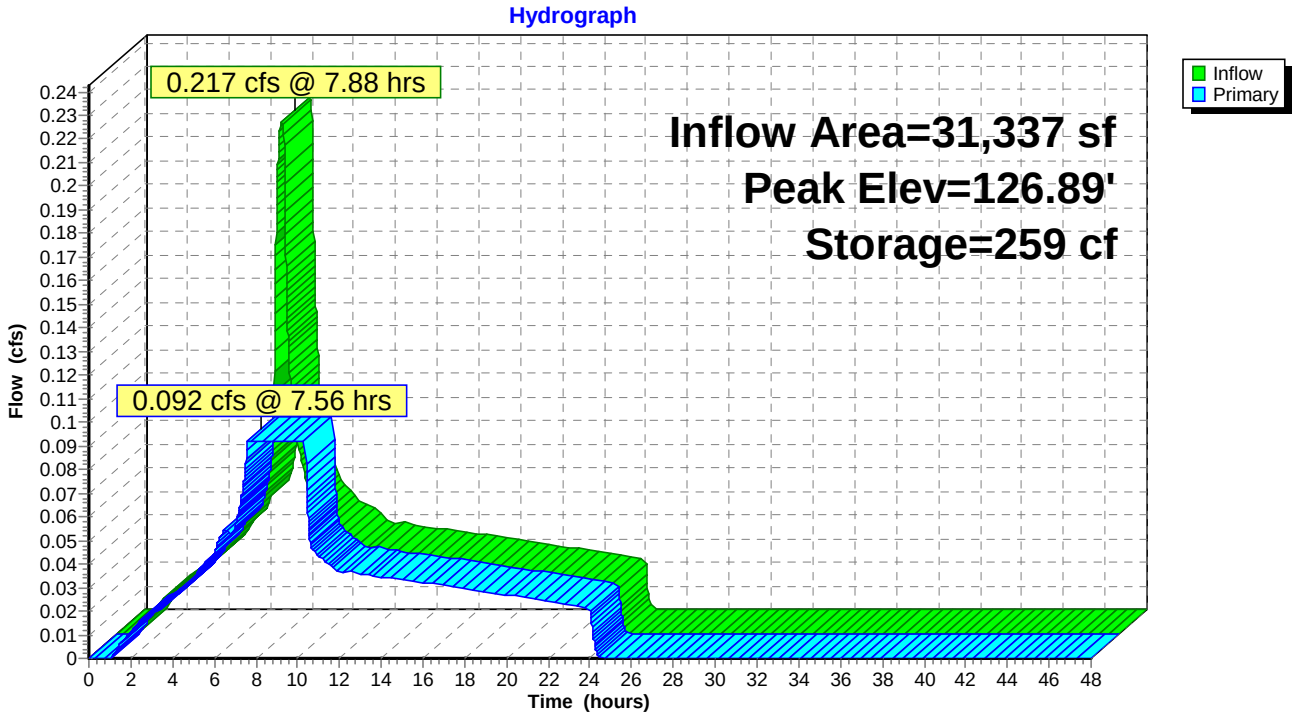
Volume	Invert	Avail.Storage	Storage Description
#1	126.50'	1,660 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
126.50	664	0	0
129.00	664	1,660	1,660

Device	Routing	Invert	Outlet Devices
#1	Primary	126.50'	**6.000 in/hr Growing Media Exfiltration over Horizontal area**
#2	Primary	128.84'	**24.0" Vert. 24" Beehive Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.092 cfs @ 7.56 hrs HW=126.55' (Free Discharge)
└─**1=Growing Media Exfiltration** (Exfiltration Controls 0.092 cfs)
└─**2=24" Beehive Overflow** (Controls 0.000 cfs)

Pond 1P: Growing Media 6" /hr



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment D1: Developed Site Runoff Area=31,337 sf 59.87% Impervious Runoff Depth=1.58"
Tc=5.0 min CN=61/98 Runoff=0.269 cfs 4,132 cf

Pond 1P: Growing Media 6" /hr Peak Elev=127.12' Storage=409 cf Inflow=0.269 cfs 4,132 cf
Outflow=0.092 cfs 4,132 cf

Total Runoff Area = 31,337 sf Runoff Volume = 4,132 cf Average Runoff Depth = 1.58"
40.13% Pervious = 12,574 sf 59.87% Impervious = 18,763 sf

Summary for Subcatchment D1: Developed Site

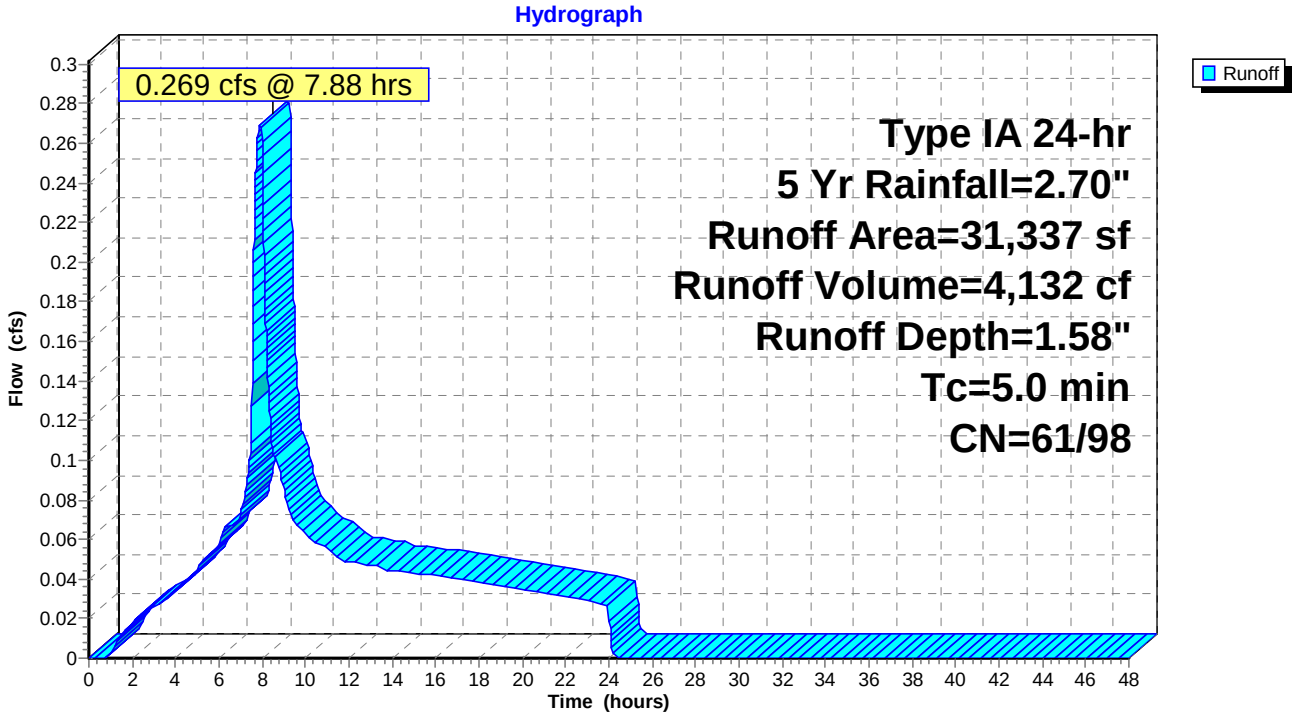
Runoff = 0.269 cfs @ 7.88 hrs, Volume= 4,132 cf, Depth= 1.58"
Routed to Pond 1P : Growing Media 6" /hr

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 5 Yr Rainfall=2.70"

	Area (sf)	CN	Description
*	18,763	98	Impervious surface, HSG B
	12,574	61	>75% Grass cover, Good, HSG B
	31,337	83	Weighted Average
	12,574	61	40.13% Pervious Area
	18,763	98	59.87% Impervious Area

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

Subcatchment D1: Developed Site



Summary for Pond 1P: Growing Media 6" /hr

Inflow Area = 31,337 sf, 59.87% Impervious, Inflow Depth = 1.58" for 5 Yr event
Inflow = 0.269 cfs @ 7.88 hrs, Volume= 4,132 cf
Outflow = 0.092 cfs @ 7.41 hrs, Volume= 4,132 cf, Atten= 66%, Lag= 0.0 min
Primary = 0.092 cfs @ 7.41 hrs, Volume= 4,132 cf
Routed to nonexistent node Rock

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 127.12' @ 8.85 hrs Surf.Area= 664 sf Storage= 409 cf

Plug-Flow detention time= 21.3 min calculated for 4,132 cf (100% of inflow)
Center-of-Mass det. time= 21.3 min (714.6 - 693.3)

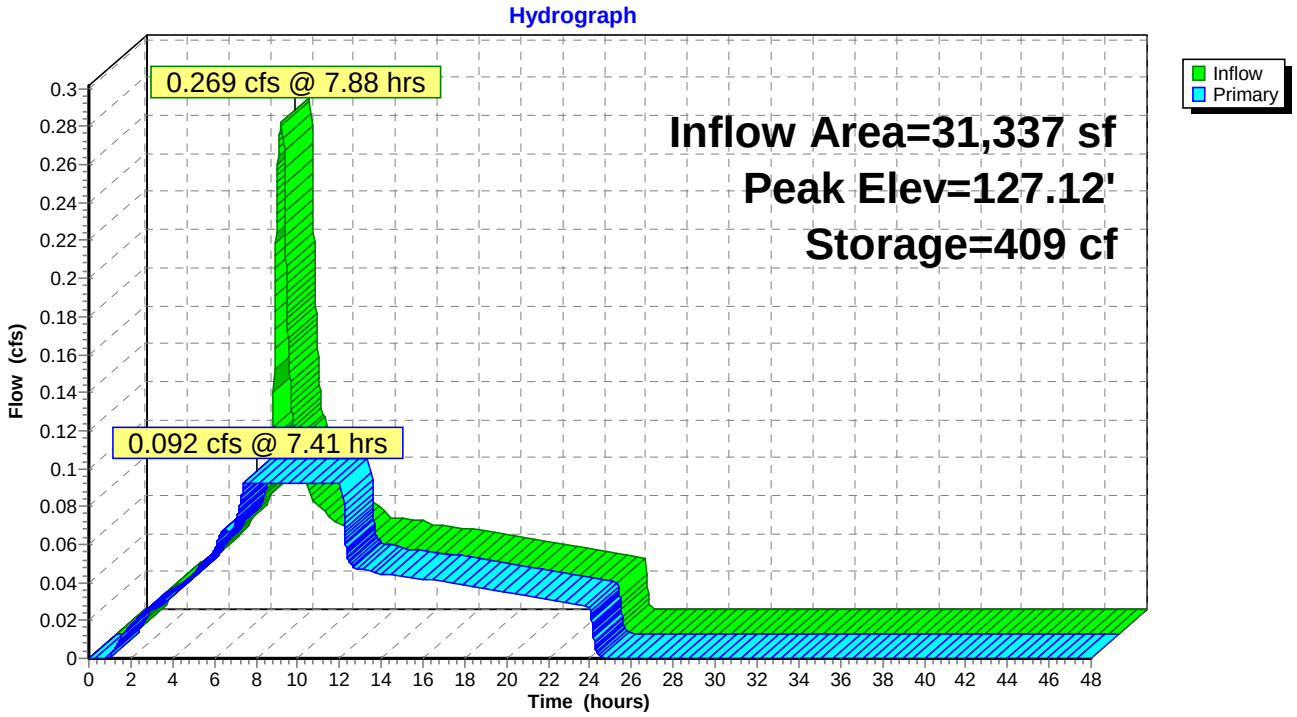
Volume	Invert	Avail.Storage	Storage Description
#1	126.50'	1,660 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
126.50	664	0	0
129.00	664	1,660	1,660

Device	Routing	Invert	Outlet Devices
#1	Primary	126.50'	**6.000 in/hr Growing Media Exfiltration over Horizontal area**
#2	Primary	128.84'	**24.0" Vert. 24" Beehive Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.092 cfs @ 7.41 hrs HW=126.54' (Free Discharge)
1=Growing Media Exfiltration (Exfiltration Controls 0.092 cfs)
2=24" Beehive Overflow (Controls 0.000 cfs)

Pond 1P: Growing Media 6" /hr



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment D1: Developed Site Runoff Area=31,337 sf 59.87% Impervious Runoff Depth=1.95"
Tc=5.0 min CN=61/98 Runoff=0.322 cfs 5,105 cf

Pond 1P: Growing Media 6" /hr Peak Elev=127.43' Storage=621 cf Inflow=0.322 cfs 5,105 cf
Outflow=0.092 cfs 5,105 cf

Total Runoff Area = 31,337 sf Runoff Volume = 5,105 cf Average Runoff Depth = 1.95"
40.13% Pervious = 12,574 sf 59.87% Impervious = 18,763 sf

Summary for Subcatchment D1: Developed Site

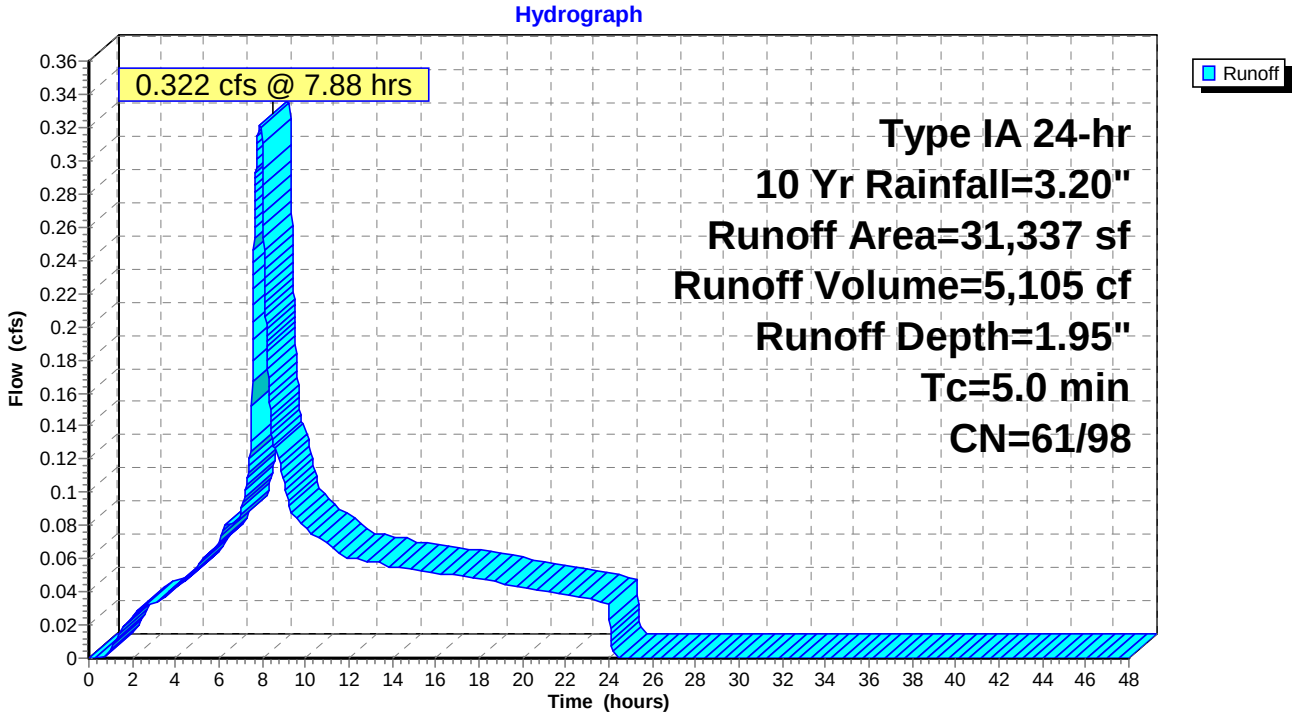
Runoff = 0.322 cfs @ 7.88 hrs, Volume= 5,105 cf, Depth= 1.95"
Routed to Pond 1P : Growing Media 6" /hr

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 Yr Rainfall=3.20"

	Area (sf)	CN	Description
*	18,763	98	Impervious surface, HSG B
	12,574	61	>75% Grass cover, Good, HSG B
	31,337	83	Weighted Average
	12,574	61	40.13% Pervious Area
	18,763	98	59.87% Impervious Area

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

Subcatchment D1: Developed Site



Summary for Pond 1P: Growing Media 6" /hr

Inflow Area = 31,337 sf, 59.87% Impervious, Inflow Depth = 1.95" for 10 Yr event
Inflow = 0.322 cfs @ 7.88 hrs, Volume= 5,105 cf
Outflow = 0.092 cfs @ 7.16 hrs, Volume= 5,105 cf, Atten= 71%, Lag= 0.0 min
Primary = 0.092 cfs @ 7.16 hrs, Volume= 5,105 cf
Routed to nonexistent node Rock

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 127.43' @ 9.25 hrs Surf.Area= 664 sf Storage= 621 cf

Plug-Flow detention time= 38.4 min calculated for 5,105 cf (100% of inflow)
Center-of-Mass det. time= 38.4 min (731.9 - 693.5)

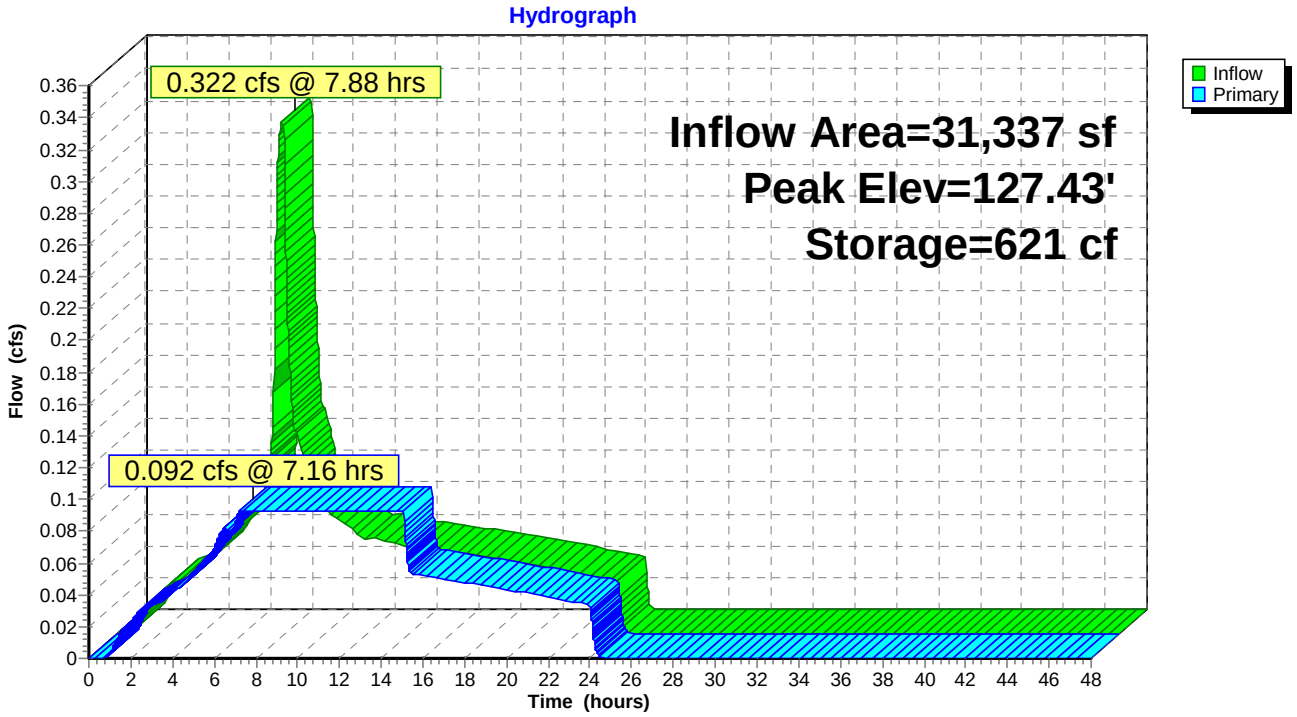
Volume	Invert	Avail.Storage	Storage Description
#1	126.50'	1,660 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
126.50	664	0	0
129.00	664	1,660	1,660

Device	Routing	Invert	Outlet Devices
#1	Primary	126.50'	**6.000 in/hr Growing Media Exfiltration over Horizontal area**
#2	Primary	128.84'	**24.0" Vert. 24" Beehive Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.092 cfs @ 7.16 hrs HW=126.54' (Free Discharge)
└─**1=Growing Media Exfiltration** (Exfiltration Controls 0.092 cfs)
└─**2=24" Beehive Overflow** (Controls 0.000 cfs)

Pond 1P: Growing Media 6" /hr



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment D1: Developed Site Runoff Area=31,337 sf 59.87% Impervious Runoff Depth=2.26"
Tc=5.0 min CN=61/98 Runoff=0.371 cfs 5,911 cf

Pond 1P: Growing Media 6" /hr Peak Elev=127.77' Storage=841 cf Inflow=0.371 cfs 5,911 cf
Outflow=0.092 cfs 5,911 cf

Total Runoff Area = 31,337 sf Runoff Volume = 5,911 cf Average Runoff Depth = 2.26"
40.13% Pervious = 12,574 sf 59.87% Impervious = 18,763 sf

Summary for Subcatchment D1: Developed Site

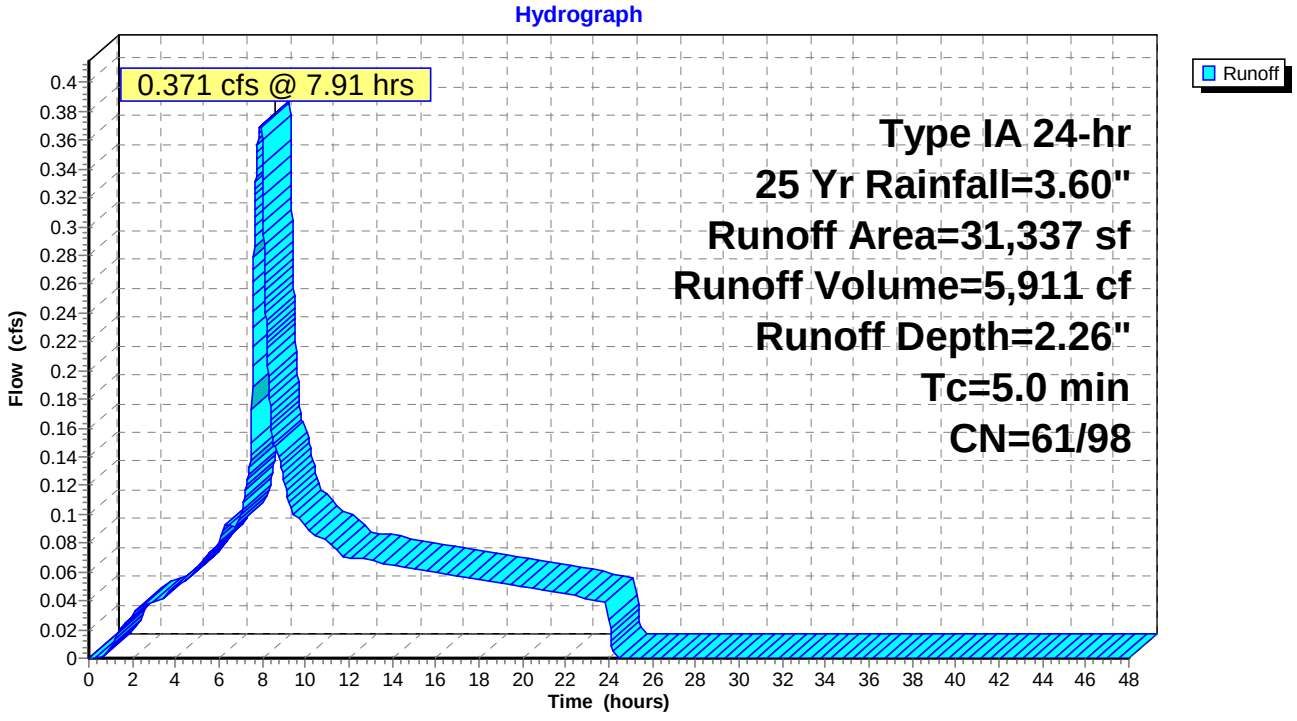
Runoff = 0.371 cfs @ 7.91 hrs, Volume= 5,911 cf, Depth= 2.26"
Routed to Pond 1P : Growing Media 6" /hr

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Yr Rainfall=3.60"

	Area (sf)	CN	Description
*	18,763	98	Impervious surface, HSG B
	12,574	61	>75% Grass cover, Good, HSG B
	31,337	83	Weighted Average
	12,574	61	40.13% Pervious Area
	18,763	98	59.87% Impervious Area

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

Subcatchment D1: Developed Site



Summary for Pond 1P: Growing Media 6" /hr

Inflow Area = 31,337 sf, 59.87% Impervious, Inflow Depth = 2.26" for 25 Yr event
Inflow = 0.371 cfs @ 7.91 hrs, Volume= 5,911 cf
Outflow = 0.092 cfs @ 6.41 hrs, Volume= 5,911 cf, Atten= 75%, Lag= 0.0 min
Primary = 0.092 cfs @ 6.41 hrs, Volume= 5,911 cf
Routed to nonexistent node Rock

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 127.77' @ 9.99 hrs Surf.Area= 664 sf Storage= 841 cf

Plug-Flow detention time= 63.5 min calculated for 5,911 cf (100% of inflow)
Center-of-Mass det. time= 63.5 min (756.8 - 693.3)

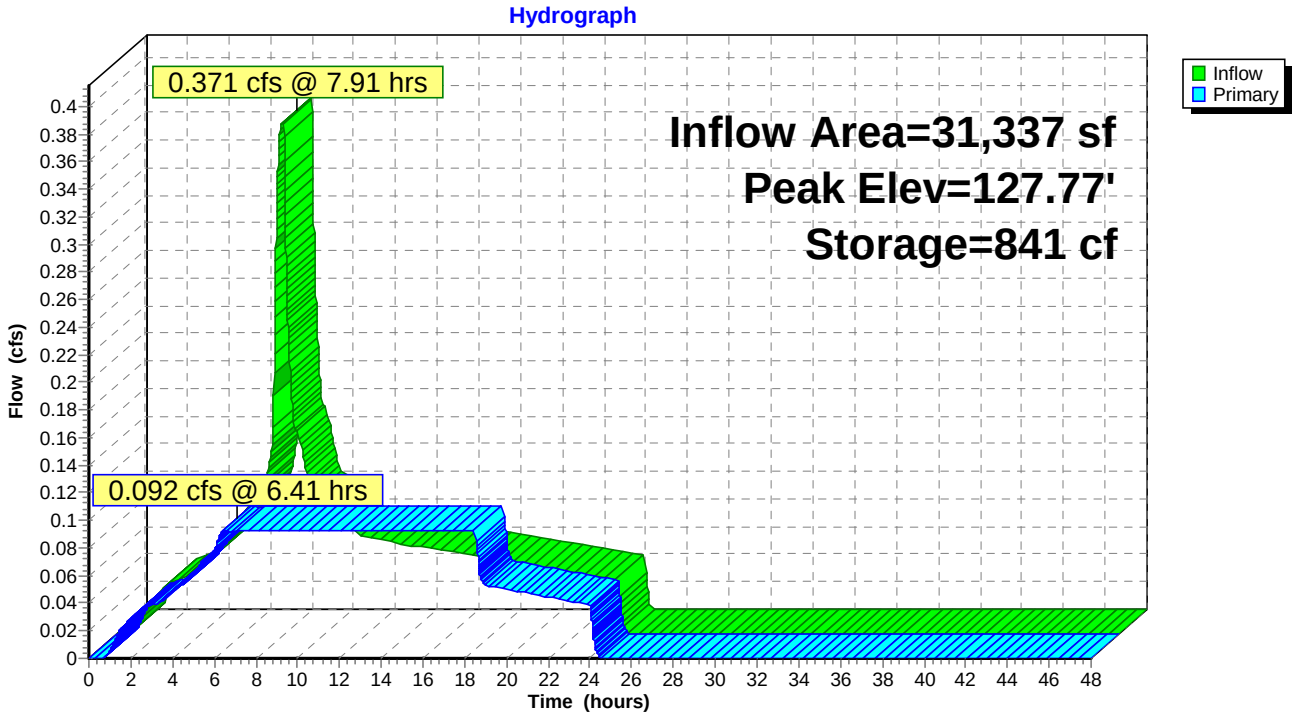
Volume	Invert	Avail.Storage	Storage Description
#1	126.50'	1,660 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
126.50	664	0	0
129.00	664	1,660	1,660

Device	Routing	Invert	Outlet Devices
#1	Primary	126.50'	**6.000 in/hr Growing Media Exfiltration over Horizontal area**
#2	Primary	128.84'	**24.0" Vert. 24" Beehive Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.092 cfs @ 6.41 hrs HW=126.54' (Free Discharge)
└**1=Growing Media Exfiltration** (Exfiltration Controls 0.092 cfs)
└**2=24" Beehive Overflow** (Controls 0.000 cfs)

Pond 1P: Growing Media 6" /hr



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment D1: Developed Site Runoff Area=31,337 sf 59.87% Impervious Runoff Depth=2.66"
Tc=5.0 min CN=61/98 Runoff=0.439 cfs 6,948 cf

Pond 1P: Growing Media 6" /hr Peak Elev=128.35' Storage=1,231 cf Inflow=0.439 cfs 6,948 cf
Outflow=0.092 cfs 6,948 cf

Total Runoff Area = 31,337 sf Runoff Volume = 6,948 cf Average Runoff Depth = 2.66"
40.13% Pervious = 12,574 sf 59.87% Impervious = 18,763 sf

Summary for Subcatchment D1: Developed Site

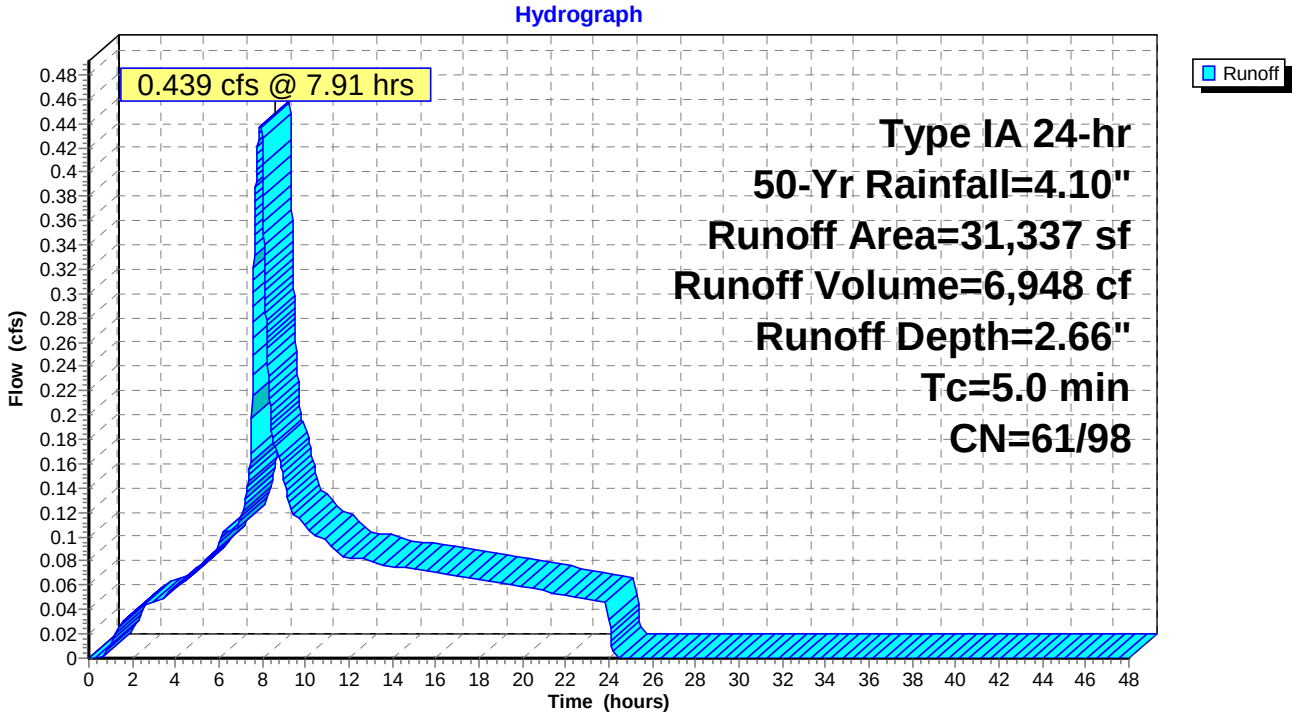
Runoff = 0.439 cfs @ 7.91 hrs, Volume= 6,948 cf, Depth= 2.66"
Routed to Pond 1P : Growing Media 6" /hr

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-Yr Rainfall=4.10"

	Area (sf)	CN	Description
*	18,763	98	Impervious surface, HSG B
	12,574	61	>75% Grass cover, Good, HSG B
	31,337	83	Weighted Average
	12,574	61	40.13% Pervious Area
	18,763	98	59.87% Impervious Area

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

Subcatchment D1: Developed Site



Summary for Pond 1P: Growing Media 6" /hr

Inflow Area = 31,337 sf, 59.87% Impervious, Inflow Depth = 2.66" for 50-Yr event
Inflow = 0.439 cfs @ 7.91 hrs, Volume= 6,948 cf
Outflow = 0.092 cfs @ 6.06 hrs, Volume= 6,948 cf, Atten= 79%, Lag= 0.0 min
Primary = 0.092 cfs @ 6.06 hrs, Volume= 6,948 cf
Routed to nonexistent node Rock

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 128.35' @ 11.20 hrs Surf.Area= 664 sf Storage= 1,231 cf

Plug-Flow detention time= 119.7 min calculated for 6,947 cf (100% of inflow)
Center-of-Mass det. time= 119.7 min (812.7 - 693.0)

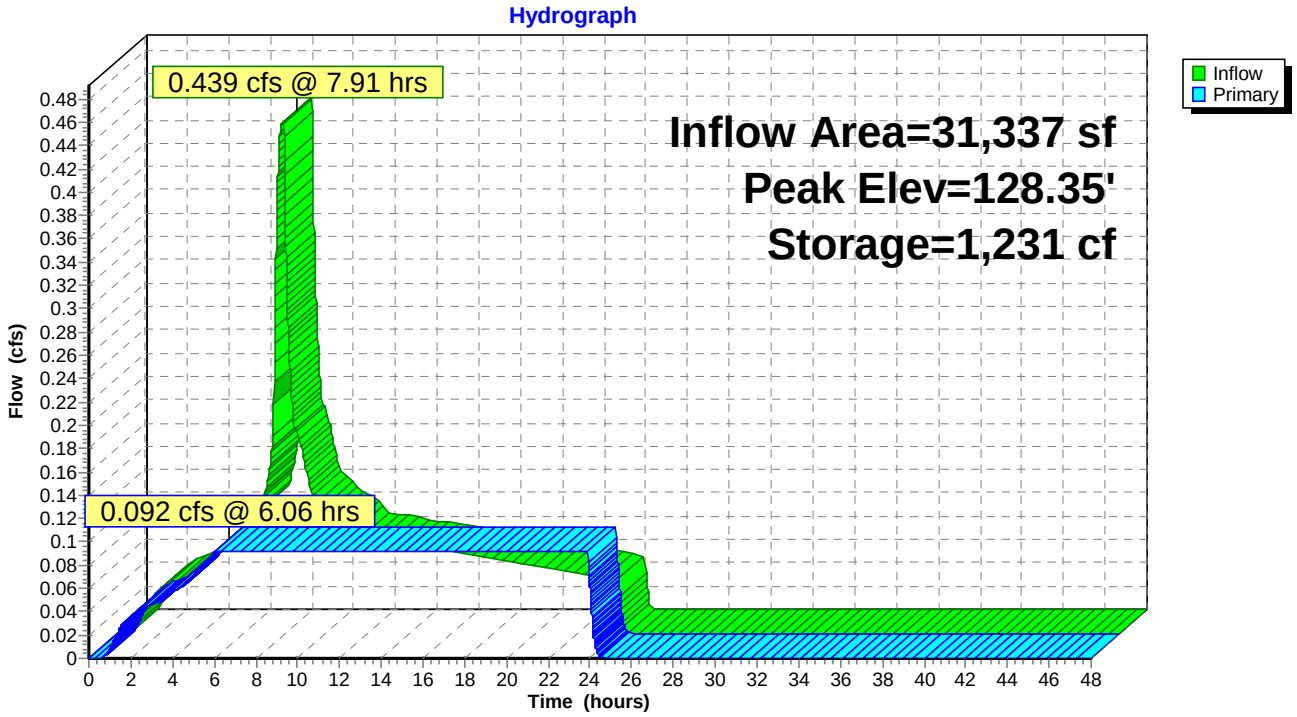
Volume	Invert	Avail.Storage	Storage Description
#1	126.50'	1,660 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
126.50	664	0	0
129.00	664	1,660	1,660

Device	Routing	Invert	Outlet Devices
#1	Primary	126.50'	**6.000 in/hr Growing Media Exfiltration over Horizontal area**
#2	Primary	128.84'	**24.0" Vert. 24" Beehive Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.092 cfs @ 6.06 hrs HW=126.54' (Free Discharge)
1=Growing Media Exfiltration (Exfiltration Controls 0.092 cfs)
2=24" Beehive Overflow (Controls 0.000 cfs)

Pond 1P: Growing Media 6" /hr



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment D1: Developed Site Runoff Area=31,337 sf 59.87% Impervious Runoff Depth=2.90"
Tc=5.0 min CN=61/98 Runoff=0.481 cfs 7,584 cf

Pond 1P: Growing Media 6" /hr Peak Elev=128.77' Storage=1,510 cf Inflow=0.481 cfs 7,584 cf
Outflow=0.092 cfs 7,584 cf

Total Runoff Area = 31,337 sf Runoff Volume = 7,584 cf Average Runoff Depth = 2.90"
40.13% Pervious = 12,574 sf 59.87% Impervious = 18,763 sf

Summary for Subcatchment D1: Developed Site

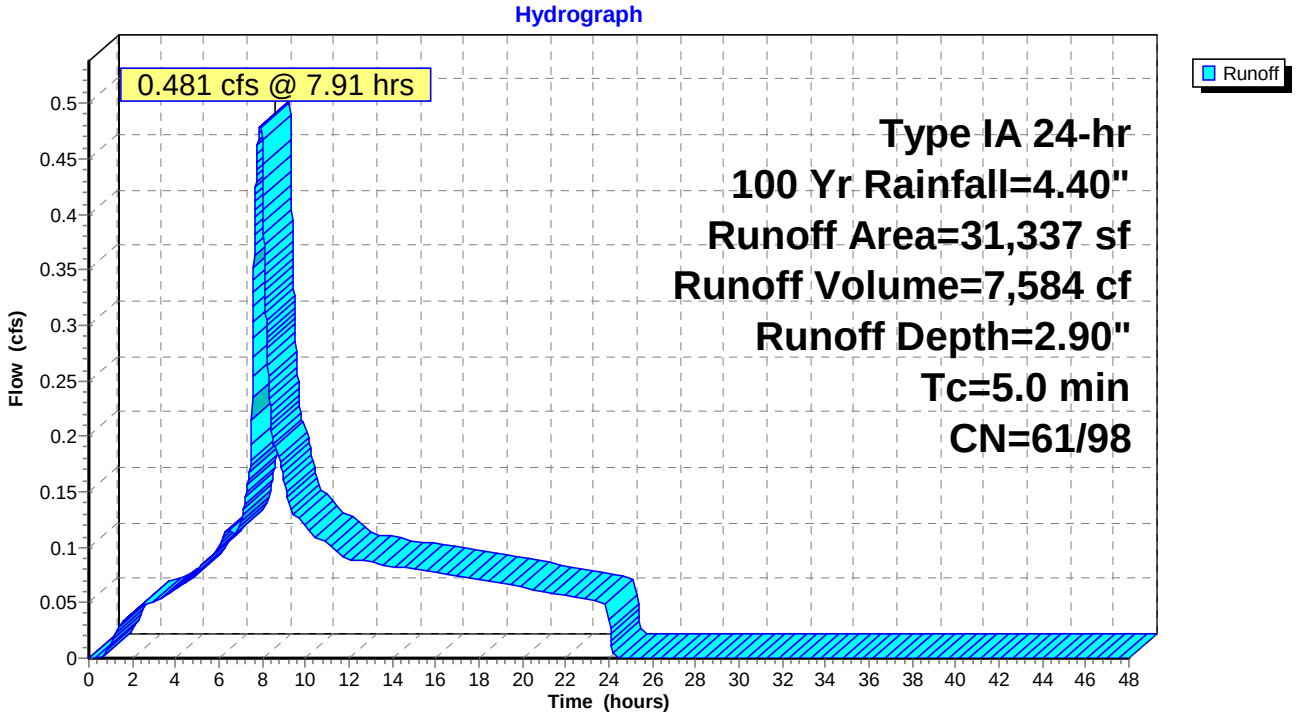
Runoff = 0.481 cfs @ 7.91 hrs, Volume= 7,584 cf, Depth= 2.90"
Routed to Pond 1P : Growing Media 6" /hr

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100 Yr Rainfall=4.40"

	Area (sf)	CN	Description
*	18,763	98	Impervious surface, HSG B
	12,574	61	>75% Grass cover, Good, HSG B
	31,337	83	Weighted Average
	12,574	61	40.13% Pervious Area
	18,763	98	59.87% Impervious Area

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

Subcatchment D1: Developed Site



Summary for Pond 1P: Growing Media 6" /hr

Inflow Area = 31,337 sf, 59.87% Impervious, Inflow Depth = 2.90" for 100 Yr event
Inflow = 0.481 cfs @ 7.91 hrs, Volume= 7,584 cf
Outflow = 0.092 cfs @ 5.80 hrs, Volume= 7,584 cf, Atten= 81%, Lag= 0.0 min
Primary = 0.092 cfs @ 5.80 hrs, Volume= 7,584 cf
Routed to nonexistent node Rock

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 128.77' @ 11.64 hrs Surf.Area= 664 sf Storage= 1,510 cf

Plug-Flow detention time= 162.6 min calculated for 7,582 cf (100% of inflow)
Center-of-Mass det. time= 162.6 min (855.3 - 692.7)

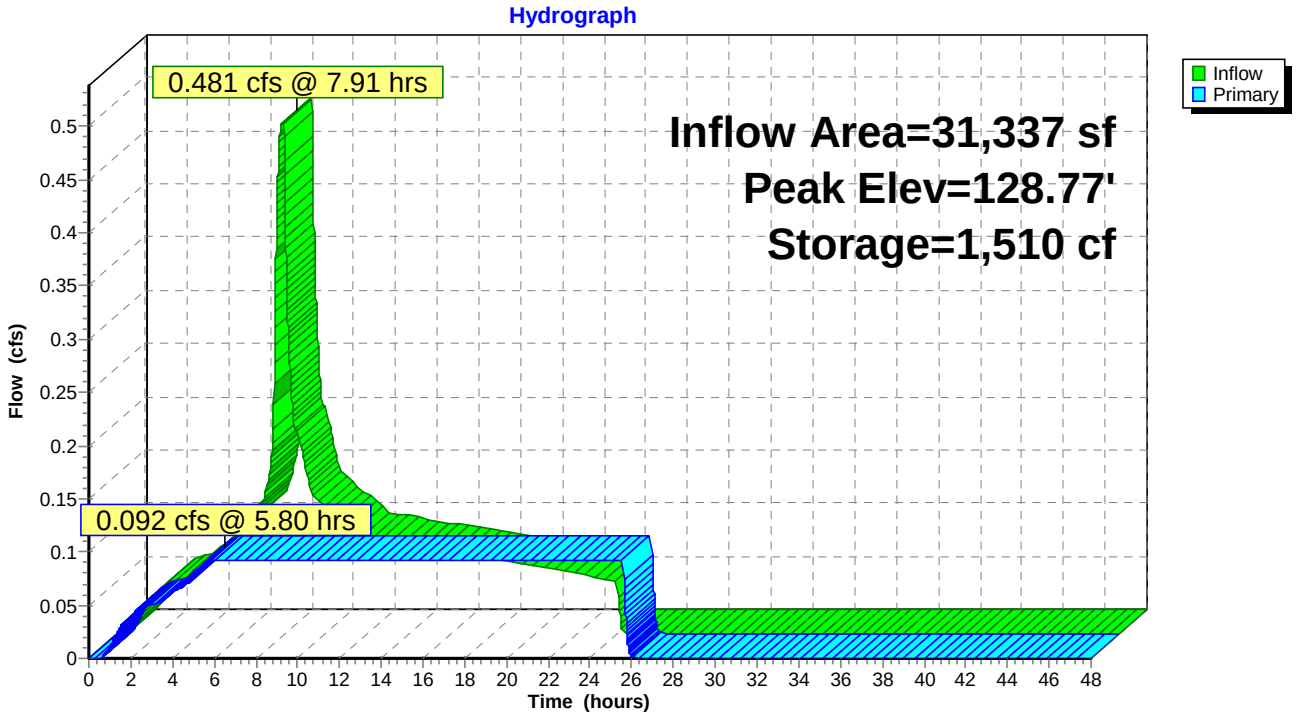
Volume	Invert	Avail.Storage	Storage Description
#1	126.50'	1,660 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
126.50	664	0	0
129.00	664	1,660	1,660

Device	Routing	Invert	Outlet Devices
#1	Primary	126.50'	**6.000 in/hr Growing Media Exfiltration over Horizontal area**
#2	Primary	128.84'	**24.0" Vert. 24" Beehive Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.092 cfs @ 5.80 hrs HW=126.54' (Free Discharge)
1=Growing Media Exfiltration (Exfiltration Controls 0.092 cfs)
2=24" Beehive Overflow (Controls 0.000 cfs)

Pond 1P: Growing Media 6" /hr



Appendix D: Maintenance Forms

Appendix A to 109-011 – Private Stormwater Facilities Agreement

This Agreement is made and entered into this _____ day of _____ 20___, by and between the City of Salem (City) and _____ (Owner) whose address is _____.

RECITALS

A. Owner has developed or will develop property with the stormwater facilities listed below. (List the type of private stormwater facilities on site and the quantity of each type).

Facility type (list each)	Quantity

B. The Facilities enable development of property while mitigating the adverse impacts of stormwater runoff and pollutants associated with stormwater runoff prior to discharge from the property directly or indirectly to the public stormwater system, another private stormwater system, or to receiving waters.

C. The property benefited by the stormwater facilities and subject to the obligation of this Agreement is described below or in Exhibit A (Property) attached hereto and incorporated by reference, with the location of each stormwater facility as indicated.

D. The stormwater facilities are designed by a registered professional engineer in accordance with the requirements of Salem Revised Code Chapter 71 (Stormwater) and the *Public Works Design Standards*.

E. Failure to properly inspect and maintain the stormwater facilities can result in unacceptable impacts to the public stormwater system, receiving waters, the environment, and downstream properties.

Appendix A to 109-011 – Private Stormwater Facilities Agreement

NOW, THEREFORE, it is agreed by and between the parties as follows:

1. MAINTENANCE

Owner agrees to maintain each stormwater facility in accordance with requirements provided by, or approved by, the City so that it is in proper working condition for effective pollutant removal, infiltration, and/or flow control.

2. INSPECTION

Owner agrees to inspect each stormwater facility in accordance with requirements provided by, or approved by, the City.

3. RECORDKEEPING

Owner agrees to maintain a record of the construction of, and all inspections, maintenance, and repair activities to, each stormwater facility and to make plans, records, procedures, and schedules of maintenance available to the Public Works Director during inspection of each stormwater facility, and at other reasonable times upon request of the Public Works Director.

4. REPAIR

Owner agrees to make any repairs as necessary to keep each stormwater facility in continuous working order. All deficiencies shall be corrected at Owner's expense within 30 days after the deficiency has been identified a deficiency, unless more than 30 days is reasonably needed to correct a deficiency. Owner shall have a reasonable period to correct the deficiency so long as the correction is commenced within the 30-day period and is diligently prosecuted to completion.

5. CITY CORRECTIONS

If correction of all Owner- or City-identified deficiencies is not completed within 30 days after Owner's inspection or City notice, City shall have the right to have any deficiencies corrected. In such instances, City:

(i) Shall have access to the stormwater facilities for the purpose of correcting such deficiencies; and

(ii) Shall bill Owner for all costs reasonably incurred by City for work performed to correct the deficiencies following Owner's failure to correct any deficiencies in the Facilities.

Owner shall pay the City within 30 days of the date of the invoice. Owner understands and agrees that upon non-payment, City may place a lien on the property for the amount plus interest and penalties.

6. ACCESS

Owner grants City the right to inspect the stormwater facilities. City will endeavor to give at least 10 days prior notice to Owner, except that no notice shall be required in case of an emergency. City shall determine whether deficiencies need to be corrected. Owner will be notified in writing of the deficiencies.

Appendix A to 109-011 – Private Stormwater Facilities Agreement

7. CHANGE OF OWNERSHIP

If a change of ownership occurs, owner agrees to transfer all records of installation, repair, and maintenance of each stormwater facility to the new property owner. Owner will inform future purchasers and other successors and assignees of the existence of the stormwater facility and of the requirements for continued inspection and maintenance of the stormwater facility.

8. EMERGENCY MEASURES

If, at any time, City reasonably determines that a stormwater facility is creating an imminent threat to public health, safety, or welfare, City may immediately and without prior notice to Owner take measures reasonably designed to remedy the threat. City shall provide notice of the threat and the measures taken to Owner as soon as reasonably practicable. City may charge Owner for the cost of these corrective measures.

9. HOLD HARMLESS

Owner shall indemnify and hold City harmless from any and all claims for damages to persons or property arising from the construction, operation, inspection, maintenance, or use of each stormwater facility.

10. FORCE AND EFFECT

This Agreement has the same force and effect as any deed covenant running with the land and shall benefit and bind all owners of the property present and future, and their heirs, successors and assigns.

11. AMENDMENTS

The terms of this Agreement may be amended only by mutual agreement of the parties. Any amendments shall be in writing, shall refer specifically to this Agreement, and shall be valid only when executed by the owners of the property and the City and recorded in the Official Records of the county where the Property is located.

12. PREVAILING PARTY

In any action brought by either party to enforce the terms of this Agreement, the prevailing party shall be entitled to recover all costs, including reasonable attorney's fees as may be determined by the court having jurisdiction, including any appeal.

13. SEVERABILITY

The invalidity of any section, clause, sentence, or provision of this Agreement shall not affect the validity of any other part of this Agreement, which can be given effect without such invalid part or parts.

After recording, return to:
City of Salem Public Works Department
555 Liberty Street SE, Room 325
Salem OR 97301-3513

Appendix A to 109-011 – Private Stormwater Facilities Agreement

IN WITNESS WHEREOF, the parties hereto have signed this Agreement as of the date below.

By: _____
Owner

_____
Title

STATE OF OREGON)
) ss.
County of _____)

This instrument was acknowledged before me on _____, 20____, by _____.

_____
Notary Public—State of Oregon
My commission expires: _____

Approved:

By: _____
Public Works Director

City of Salem, Oregon

By: _____
City Manager

STATE OF OREGON)
) ss.
County of _____)

This instrument was acknowledged before me on _____, 20____, by _____, as City Manager of the City of Salem, Oregon.

_____
Notary Public—State of Oregon
My commission expires: _____

Appendix B to 109-011 – Facility Maintenance Forms

This appendix contains Facility Maintenance Forms that provide minimum requirements for inspection, maintenance, and repair activities for the following types of stormwater facilities:

1. Stormwater Planters
2. Rain Gardens
3. Vegetated Filter Strips
4. Swales (Vegetated, Grassy, and Street)
5. Detention Basins
6. Subsurface Gravel Treatment Wetland
7. Constructed Treatment Wetlands
8. Manufactured Treatment Technology
9. Green Roofs
10. Sand Filters
11. Pervious Pavement
12. Underground Detention Tanks, Vaults, and Pipes
13. Conveyance: Piped
14. Conveyance: Open Channel
15. Soakage Trenches
16. Drywells

Appendix B to 109-011 – Facility Maintenance Forms

2. Rain Garden

A rain garden is a **vegetated infiltration basin** or depression created by excavation, berms, or small dams to provide for short-term ponding of surface water until it percolates into the soil. The basin should infiltrate stormwater within 24 hours.

Inspections

All facility components and vegetation shall be inspected for proper operations and structural stability. *These inspections shall occur, at a minimum, quarterly for the first two years from the date of installation, and two times per year thereafter.* It is recommended that a visual inspection be made within 48 hours after each major storm event to ensure proper function. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:

Date: ____/____/_____ Inspector's Name: _____

Basin inlet shall ensure unrestricted stormwater flow to the vegetated basin.

- □ Sources of erosion shall be identified and controlled when native soil is exposed or erosion channels are present.
- □ Inlet shall be kept clear at all times.
- □ Rock splash pads shall be replenished to prevent erosion.

Inspection Comments: _____

Embankment, dikes, berms, and side slopes retain water in the infiltration basin.

- □ Structural deficiencies shall be corrected upon discovery.
- □ Slopes shall be stabilized using appropriate erosion control measures when soil is exposed/flow channels are forming.
- □ Sources of erosion damage shall be identified and controlled.

Inspection Comments: _____

Overflow or emergency spillway conveys flow exceeding reservoir capacity to an approved stormwater receiving system.

- □ Overflow shall be kept clear at all times.
- □ Sources of erosion damage shall be identified and controlled when soil is exposed.
- □ Rocks or other armament shall be replaced when only one layer of rock exists.

Inspection Comments: _____

Amended soils shall allow stormwater to percolate uniformly through the infiltration basin. If water remains 36 hours after a storm, sources of possible clogging shall be identified and corrected.

- □ Basin shall be raked and, if necessary, soil shall be excavated and cleaned or replaced.

Inspection Comments: _____

Appendix B to 109-011 – Facility Maintenance Forms

2. Rain Garden (continued)

Sediment/Basin debris management shall prevent loss of infiltration basin volume caused by sedimentation.

- □ Sediment exceeding 3 inches in depth, or so thick as to damage or kill vegetation, shall be removed.
- □ Sediment accumulation shall be hand-removed with minimum damage to vegetation using proper erosion control measures.

Inspection Comments: _____

Debris and litter shall be removed to ensure stormwater infiltration and to prevent clogging of overflow drains and interference with plant growth.

- □ Restricted sources of sediment and debris, such as discarded lawn clippings, shall be identified and prevented.

Inspection Comments: _____

Vegetation shall be healthy and dense enough to provide filtering while protecting underlying soils from erosion. Proper horticultural practices shall be employed to ensure that plants are vigorous and healthy.

- □ Mulch shall be replenished as needed, but not inhibiting water flow.
- □ Vegetation, large shrubs, or trees that interfere with rain garden operation shall be pruned.
- □ Fallen leaves and debris from deciduous plant foliage shall be raked and removed.
- □ Nuisance or prohibited vegetation from the City of Salem Non-Native Invasive Plant list shall be removed when discovered. Invasive vegetation shall be removed immediately upon discovery.
- □ Dead vegetation shall be removed upon discovery.
- □ Vegetation shall be replaced as soon as possible to maintain cover density and control erosion where soils are exposed.

Inspection Comments: _____

Spill prevention measures shall be exercised when handling substances that contaminate stormwater.

- □ Releases of pollutants shall be corrected as soon as identified.

Inspection Comments: _____

Training and/or written guidance information for operating and maintaining vegetated infiltration basins shall be provided to all property owners and tenants. This Facility Maintenance Form can be used to meet this requirement.

Inspection Comments: _____

Access to the infiltration basin shall be safe and efficient. Egress and ingress routes shall be maintained to design standards. Roadways shall be maintained to accommodate size and weight of vehicles, if applicable.

- □ Obstacles preventing maintenance personnel and/or equipment access to the infiltration basin shall be removed.
- □ Gravel or ground cover shall be added if erosion has occurred.

Inspection Comments: _____

2. Rain Garden (continued)

Nuisance insects and rodents shall not be harbored in the infiltration basin. Pest control measures shall be taken when nuisance insects/rodents are found to be present.

- □ Holes in the ground located in and around the infiltration basin shall be filled.

Inspection Comments: _____

_____

If used at this site, the following will be applicable:

Fences shall be maintained to preserve their functionality and appearance.

- □ Collapsed fences shall be restored to an upright position.
- □ Jagged edges and damaged fences shall be repaired or replaced.

Inspection Comments: _____

_____

Appendix B to 109-011 – Facility Maintenance Forms

13. Conveyance: Piped

Conveyance (pipes) system shall be routinely inspected and cleaned on a scheduled cycle.

Inspection should consist of cleaning main line followed by TV inspection. Manholes and catch basins should be visually inspected annually and cleaned when sediment has reached 12 inches in depth or 50 percent of capacity has been taken.

- □ Structural deficiencies shall be corrected upon discovery:
- □ If cracks exist, repair or replace structure.

Date: ____/____/_____ Inspector's Name: _____

Access to the conveyance system shall be safe and efficient. Egress and ingress routes shall be maintained to design standards. Roadways shall be maintained to accommodate size and weight of vehicles, if applicable.

- □ Obstacles preventing maintenance personnel and/or equipment access to the conveyance system shall be removed.
- □ Gravel or ground cover shall be added if erosion has occurred.

Inspection Comments: _____

_____

Spill prevention measures shall be exercised when handling substances that contaminate stormwater.

- □ Releases of pollutants shall be corrected as soon as identified.

Inspection Comments: _____

Debris and litter shall be removed to prevent clogging.

Inspection Comments: _____

_____

Training and/or written guidance information for operating and maintaining closed channel conveyance systems shall be provided to all property owners and tenants. This Facility Maintenance Form can be used to meet this requirement.

Inspection Comments: _____

APPENDIX 400.B – GSI FACILITY PLANTING REQUIREMENTS

A. Purpose: The purpose of this guidance document is to outline the planting requirements for establishing plant material in GSI facilities required in the Standards.

B. Applicability: This guidance document is applicable GSI facilities installed in all projects that are subject to the stormwater treatment requirements defined in the Standards.

C. Soils / Growing Medium Requirements: The soil and growing medium installed in the stormwater facility shall meet the following requirements:

1. The minimum depth of the growing medium or amended soil shall be per design – minimum depth is 12 inches.
2. The growing medium or amended soil should be a mix of loamy soil, sand, and compost (30-40 percent compost, by volume), and shall be loose, friable, well-mixed, homogenous, free of wood pieces, plastic, and other foreign matter, and have no visible free water when placed in the facility. The pH of the mix shall be between 5 and 8.
3. The final infiltration rate of the bottom of the facility must be tested and confirmed to be equal to or greater than the Design Infiltration Rate for the facility.
4. After planting, the remaining areas of the facility shall be surfaced with 2 to 3 inches of either 1-1/2”-3/4” clean round rock (allowed throughout the facility) and/or hardwood chips (allowed only above the high-water level in the facility).
5. Weed-free certification is required for all imported growing medium, soil, surface material, and seed mixes.

D. Facility Planting Calendar: To ensure the best chances of successful plant establishment, all planting should take place between October 15th and May 15th; unless regular watering is provided to ensure the plantings are viable in drier months. In addition, air temperatures during planting must be between 32- and 90-degrees Fahrenheit.

E. Irrigation Requirements: In-ground automated irrigation systems are required for all GSI facilities and must be designed and installed to meet these requirements:

1. Water the entire plant area of the facility with 1 inch of water per week through from the beginning of July through the end of October, throughout the warranty period, to establish the facility plantings.
2. Water infrequently but deeply to help the plants become as drought tolerant as possible.
3. Continued irrigation after the establishment period is at the discretion of the owner.

It is not required that the irrigation system be designed by the Engineer – the system may be provided as “design-build” by the installer.

F. <u>Planting Ratio Requirements:</u> Plantings shall be placed per the quantities listed in the Figures below.

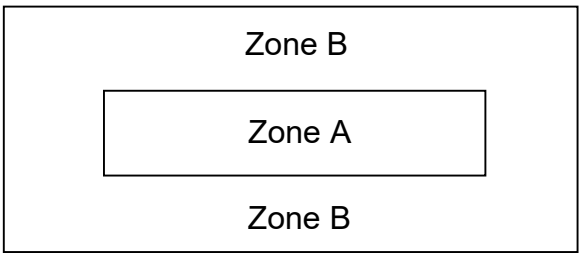


Diagram 1: Swale Planting Zones

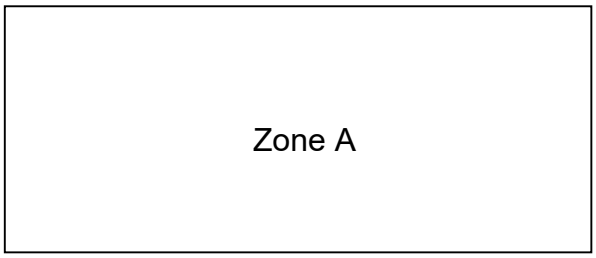


Diagram 2: Planter Planting Zones

Figure 400.B1. Facility Planting Zone Diagrams

Vegetation Group	Number of Plants	Per square Feet	Size/Spacing*
Zone A- Bottom of facility**			
Grass / Sedge / Rush	27	100	1 Gallon
And			
Perennial	15	100	1 Gallon
And			
Shrubs	3	100	1 Gallon
Zone B- Slopes of facility			
Groundcover / Perennial	20	100	1 Gallon
And			
Shrubs	5	100	1 Gallon

* Plants must meet ANSI Z-60.1 size specifications and standards. Visit https://www.americanhort.org/education/american-nursery-stock-standards/ for details. Spacing should be per current nursery industry standards, while achieving the required density of plans in each Zone.
** Since stormwater planters do not have sloped sides, Zone A spacing may need to be adjusted in planters to allow proper layout for growth and sustainability. Modifications to be approved by the Director.

Figure 400.B-2. Facility Planting Zone Ratios

G. "Sight Restriction" Areas: Some plants are unsuitable in street-side facilities within the sight-restricted zone, as they conflict with the vision clearance requirements per City of Keizer Development Code: Vision Clearance (Section 2.312.09). Applicant is required to evaluate the proposed plantings to ensure the vision clearance requirements are met.

H. Warranty Maintenance Period: All new public GSI stormwater facilities will be subject to a warranty period including a performance security. These facilities must be maintained to ensure the facility is functioning properly. To successfully complete the warranty period the facility must meet the following conditions:

1. At least 80% of the plants (percentage of cover for grasses, sedges, groundcover and perennials; percentage of trees and shrubs by count) must be alive and in good health.
2. The facility must be free of weeds and invasive plants (as defined by Marion County Soil and Water Conservation District).
3. The facility must be free of trash, debris, and excess dead foliage or clippings.
4. All inlets and outlets shall be clear and operational, without erosion or channelization throughout or downstream of the facility.

Any conditions not met will be required to be remediated prior to release of the performance security.

I. Approved Plant List: The GSI facility design is required to utilize at least two different species from each group (per Zone), in the Figures below, to create a more diverse plant mix throughout the facility. Species other than those listed may be allowed, subject to approval by the Director.

Grass / Sedge / Rush Common Name	Latin Name	Maximum Height	Planting Zone	Allowed in "Sight Restriction" Areas
California Brome Grass	*Bromus carinatus*	4'	B	No
New Zealand Hair Sedge	*Carex comans*	2'	A	Yes
Dense Sedge	*Carex densa*	28"	A	Yes
Dewey Sedge	*Carex dewayana*	3'	A	Yes
Blue Sedge	*Carex flacca*	10"	B	Yes
Martens' Sedge	*Carex mertensii*	3'	A	No
Japanese Sedge	*Carex morowii*	18"	A	Yes
Slough Sedge*	*Carex obnupta*	1'	A	No
Orange New Zealand Sedge	*Carex testacea*	2'	A	Yes
Foothill Sedge	*Carex tumulicola*	18"	A	Yes

Fox Sedge	*Carex vulpinodea*	3’	A	No
Tufted Hairgrass	*Deschampsia ceaspitosa*	3’	B	Yes
Blue Wild Rye	*Elymus glaucus*	5’	A	No
Slender Wheatgrass	*Elymus trachycaulus*	5’	B	No
Purple Love Grass	*Eragrostis spectabilis*	2’	B	Yes
Blue Fescue	*Festuca glauca*	1’	B	Yes
Idaho Fescue	*Festuca idahoensis*	14”	B	Yes
Chewings fescue	*Festuca rubra var. Commutata*	25”	B	No
Blue Oat grass	*Helictotrichon sempervirens*	3’	B	Yes
Common Rush	*Junctus effusus*	2’	A	Yes
Sword Leaf Rush	*Junctus ensifolius*	2’	A	Yes
Spreading Rush	*Junctus patens*	2’	A	No
Path Rush	*Junctus tenuis*	2’	A	Yes
Soft Rush	*Juncus effuses*	4’	A	No
Mondo Grass	*Ophiopogon* sp.	15”	B	Yes
Fountain Grass	*Pennisetum alopecuroides*	5’	B	Yes
Blue Eyed Grass	*Sisyrinchium angustifolium*	8”	A	Yes
Yellow Eyed Grass	*Sisyrinchium californicum*	8”	A	Yes
Prairie Dropseed	*Sporobolus heterolopus*	4’	B	Yes

* Slough sedge is not allowed in stormwater facilities located in the public right-of-way.

Figure 400.B-3. Approved Grasses and Sedges

Groundcover / Perennial Common Name	**Latin Name**	**Maximum Height**	**Planting Zone**	**Allowed in “Sight Restriction” Areas**
Common Yarrow	*Achillea millefollium*	3’	B	No
Nodding Onion	*Allium cernuum*	18”	A	Yes
Kinnikinnick	*Arctostaphylos uva-ursi*	8”	B	Yes
Purple Bergenia	*Bergenia purpurascens*	18”	A	Yes
Giant Camas	*Camassia leichtlinii*	3’	A/B	No
Common Camas	*Camassia quamash*	28”	A/B	Yes
Pacific Aster	*Chilensis symphyotrichum*	3’	B	No
Bearberry Cotoneaster	*Contoneaster dameri*	1’	A/B	Yes
Pacific Bleeding Heart	*Dicentra formosa*	18”	B	Yes

Narrow Leaf Purple Coneflower	*Echinacea angustifolia*	2’	B	No
Pale Purple Coneflower	*Echinacea pallada*	3’	B	No
Purple Coneflower	*Echinacea purpurea*	2’	B	No
Seaside Daisy	*Erigeron glaucus*	1’	B	Yes
Oregon Sunshine	*Eriophyllum lanatum*	10”	B	Yes
Coastal Strawberry	*Fragaria chiloensis*	6”	A	Yes
Wild Strawberry	*Fragaria vesca*	9”	A	Yes
Creeping Broom	*Genista pillosa*	18”	B	No
Daylilies	*Hemerocallis*	2’	A	Yes
Coral Bells	*Heuchera micrantha var. Micranthra*	16”	B	No
Japanese Iris	*Iris ensata*	2’	A/B	No
Iris Pacific Coast Hybrids	*Iris* Pacific Coast Hybrids	2’	A/B	Yes
Siberian Iris	*Iris sibirica*	3’	A/B	No
Oregon Iris	*Iris tenax*	1’	A/B	Yes
English Lavender	*Lavendula angustifolia*	3’	B	Yes
Riverbank Lupine	*Lupinus rivularis*	5’	A	No
Scarlet Monkeyflower	*Mimulus cardinalis*	3’	B	Yes
Yellow Monkeyflower	*Mimulus guttatus*	2’	A	Yes
Purple Monkeyflower	*Mimulus lewisii*	3’	A	Yes
Western Sword Fern	*Polystichum munitum*	6’	B	No
Cardwells Penstemon	*Penstemon cardwelli*	12”	A/B	Yes
Dwarf Primrose	*Primula* Dwarf	2”	A	Yes
Fairy Primrose	*Primula malicoides*	4”	A	No
Orange Cornflower	*Rudbeckia fulgida*	4’	B	No
Oregon Stonecrop	*Sedum oreganum*	18”	B	Yes
Broadleaf Stonecrop	*Sedum spathulifolium*	8”	B	Yes
Checkermallow	*Sidalcea campestris*	3’	A	No
Spiked Speedwell	*Veronica spicata*	3’	B	No

Figure 400.B-4. Approved Groundcover and Perennials

Shrub Common Name	Latin Name	Maximum Height	Planting Zone	Allowed in "Sight Restriction" Areas
Hairy Manzanita	*Arctostaphyllos columbiana*	15'	B	No
Common Manzanita	*Arctostaphyllos manzanitas*	20'	B	No
Black Chokeberry	*Aronia melanocarpa*	6'	B	No
California Lilacs	*Ceanothus* sp.	6'	B	No
Sweet Pepperbush	*Clethra alnifolia*	8'	B	No
Red Twig Dogwood	*Cornus sericea*	6'	A	No
Yellow Twig Dogwood	*Cornus sericea 'Flaviramea'*	6'	A	No
Kelsey Dogwood	*Cornus sericea 'Kelseyi'*	30"	A	Yes
Box Honeysuckle	*Lonicera nitida*	5'	B	No
Compact Oregon Grape	*Mahonia aquifolium 'compacta'*	3'	A	No
Cascade Barberry	*Mahonia nervosa*	2'	A	No
Creeping Oregon Grape	*Mahonia repens*	2'	B	Yes
Indian Plum	*Oemleria cerasiformis*	20'	B	No
Mock Orange	*Philadelphus lewisii*	6'	B	No
Pacific Ninebark	*Physocarpus capitatus*	15'	A	No
Yellow Flowering Currant	*Ribes aureum*	8'	A	No
Red-Flowering Currant	*Ribes sanguineum*	9'	A	No
Blue Elderberry	*Sambucus nigra L.* ssp. *caerulea*	12'	A/B	No
Sweet Box	*Sarcoccoca confusa*	5'	B	No
Birch Leaf Spirea	*Spirea betulifolia*	3'	A/B	No
Rose Meadowsweet	*Spirea desnsiflora*	3'	A/B	Yes
Shiny Leaf Spirea	*Spirea lucida*	3'	A/B	Yes

Figure 400.B-5. Approved Shrubs

Tree Common Name	Latin Name	Maximum Height	Planting Zone	Allowed in "Sight Restriction" Areas
Bigleaf Maple	*Acer macrophyllum*	100'	A/B	No
Vine Maple	*Acer circinatum*	25'	A/B	No
White Alder	*Alnus rhombifolia*	75'	B	No
Red Alder	*Alnus rubra*	120'	B	No
Pacific Madrone	*Arbutus menziesii*	125'	B	No
River Birch	*Betula nigra*	70'	A/B	No
Paper Birch	*Betula papyrifera*	70'	B	No
Incense Cedar	*Calocedrus decurrens*	100'	B	No
Eastern Redbud	*Cercis canadensis*	30'	B	No
Pacific Dogwood	*Cornus nuttallii*	66'	A/B	No
Common Dogwood	*Cornus sanguinea*	15'	A	No
Red Osier Dogwood	*Cornus stolonifera*	20'	A/B	No
Willamette Valley Ponderosa Pine	*Pinus ponderosa var. Willamettensis*	230'	B	No
Quaking Aspen	*Populus tremuloides*	50'	A/B	No
Swamp White Oak	*Quercus bicolor*	60"	A/B	No
Oregon White Oak	*Quercus garryana*	90'	A/B	No
Bald Cypress	*Taxodium distichum*	70'	A/B	No
Western Red Cedar	*Thuja plicata*	175'	A/B	No
Western Hemlock	*Tsuga heterophylla*	100'	B	No
Oregon Myrtle	*Umbellularia californica*	70'	B	No

NOTE: Trees are not allowed in stormwater facilities located in the public right-of-way, unless otherwise approved by the Director.

Figure 400.B-5. Approved Trees