WEST LINN OPERATIONS COMPLEX
WEST LINN, OREGON

Draft Stormwater Management Report

NOVEMBER 2025

PREPARED FOR:
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PRELIMINARY

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PROJECT OVERVIEW

The West Linn Public Works Department proposes to construct a new public works operations complex at 22500 Salamo Road in West Linn, Oregon. The proposed development includes a multi-story 28,200 square foot office and warehouse building, an 11,000 square foot warehouse and shop building, truck wash and decant buildings, fueling station, covered and open bulk storage areas, asphalt roadways for site access and parking, concrete hardscape and sidewalks, and landscaping. The total project footprint is approximately 5.7 acres. The project is situated on a vacant lot east of Salamo Road, north of Highway 205, west of an existing public works material laydown area, and south of existing private residences off of Barrington Drive. Stormwater BMPs (best management practices) outlined in this report will comply with the City of West Linn Stormwater Management Manual dated May 2025. See Table 1 below for design requirements per the City of West Linn.

Table 1. West Linn Stormwater Management Criteria

Design Requirement	West Linn Criteria
Project Classification	Centralized Subdivision and Large Development (Creates or replaces 10,000 SF or more of impervious surface area) • Use a downstream, centralized stormwater management facility to meet the infiltration, water quality, and flow control performance standard for all impervious surfaces on site.
Flow Control Performance	Match pre-developed discharge rates for the 2-year, 10-year and 25-year, 24-hour storm events using the 'Engineered Method' – Santa Barbara Urban Hydrograph (SBUH) Method using the Soil Conservation Service Type 1-A, 24-hour rainfall distribution.
Water Quality	Stormwater management facilities must treat 80% of the average annual runoff (1 inch per 24 hour period).
Conveyance	Storm pipes shall be sized using the 25-year, 24-hour storm event. Pipes shall have a minimum velocity of 2 feet per second when flowing full using a Manning's coefficient of no less than 0.013 and slope of no less than 0.55%.
Downstream Analysis	Review and physically inspect either 1,500 feet downstream of the proposed outlet or to the distance which the project contributes less than 15% of the total upstream basin area. Confirm nothing downstream of the end point will be adversely affected by the project's runoff.

BASIN CHARACTERISTICS

Existing Conditions

The existing conditions within the project footprint consist of a stabilized hill with a mix of trees and vegetated ground cover, as well as a large gravel pad. Slopes within the vegetated areas of the site vary beyond 33% while the gravel area is generally flat. Existing drainage flows north to south towards a natural ravine southwest of the site, ultimately flowing to the east along the toe of the fill slope of Highway 205.

The following technical criteria were determined for the existing site:

- **Hydrologic Soil Group D (Per USGS WebSoil Survey)**
  - **64D – Kinton Silt Loam: 13.5% of Site Area, Soil Group C**
  - **34C – Nekia Silty Clay Loam: 7.2% of Site Area, Soil Group C**
  - **89D – Witzel Very Stony Silt Loam: 79.2% of Site Area. Soil Gound D**
- **Basin 1 Time of Concentration: 15.3 minutes**
- **Basin 2 Time of Concentration: 16.5 minutes**
- **Curve Number:**
  - **70 (Existing ground per West Linn Stormwater Management Manual 2.3.2.1)**

The existing basin map is available in appendix A. Additional soil data is available in appendix B.

Infiltration as a method of stormwater management was not recommended by the geotechnical engineer (Columbia West) in the draft geotechnical report dated April 3, 2025 “due to the presence of steep slopes at the site and subsurface conditions”. Refer to appendix B for the Executive Summary of the geotechnical report.

Proposed Conditions

The proposed operations complex will include two new buildings, covered truck wash and decant structures, covered and open bulk storage areas, asphalt pavement for site access, parking, and material lay-down, concrete hardscape, and landscaping. The proposed site generally maintains the flow characteristics of the existing site, utilizing a network of underground storm pipes to convey stormwater north to south. At the south end of the site, a proprietary underground chamber system (R-Tank) is proposed for detention of runoff with a proprietary mechanical system (Contech StormFilter vault, manhole, and catch basin) providing pretreatment. The release rate of the stormwater within the R-Tank will be regulated by a flow control manhole to match the existing 2, 10, and 25-year, 24-hour storm events, meeting the City of West Linn criteria for large developments. Stormwater will outfall downslope at the south end of the site towards the existing natural ravine. The following technical criteria were determined for the proposed site:

- **Time of Concentration (all basins): 5 minutes**
- **Curve Number:**
  - **98 (Proposed Impervious Area)**
  - **80 (Proposed Landscaping)**

The proposed basin map is available in appendix A and storm plan sheets are available in appendix C.

STORMWATER MANAGEMENT

Water Quality

The City of West Linn water quality requirements will be met by treating runoff using a proprietary treatment vault, manhole, and catch basin (Contech StormFilter). According the City of West Linn Stormwater Management Manual, “manufactured stormwater treatment technology” is ranked third in the hierarchy of stormwater management facilities used to manage the water quality design storm,

behind full or partial infiltration, and vegetated filtration or other green infrastructure. Per the geotechnical report (see appendix B), infiltration is not recommended due to the site's steep slopes and subsurface conditions. Vegetated filtration is not feasible due the site's topography. The proposed development utilizes the flat areas of the existing site for its buildings and hardscape, leaving only very steep terrain as options for placing a vegetated swale or pond. Placing a pond or swale in the steep slopes of the site would not provide adequate residence time for stormwater treatment and would require very large walls to accommodate the cut section of a pond. Therefore, underground detention is proposed beneath the asphalt of the south parking lot with upstream treatment provided by a Contech StormFilter vault, manhole, and catch basin.

The following City of West Linn Water Quality Design Storm was used for water quality calculations:

- **1 inch per 24-hour period**

Table 2 below provides a summary of the water quality calculations.

Table 2. Water Quality Calculation Summary

Basin	Water Quality Flow (cfs)	Proposed Treatment Facility	Number of Cartridges*
WQ 1	0.247	Contech StormFilter 6' x 12' Peak Diversion Vault	9
WQ 2	0.053	Contech StormFilter 48" Water Quality Manhole	2
WQ 3	0.078	Contech StormFilter Steel 3 - Cartridge Catch Basin	3

*Calculations assume 18" PSROB cartridges with peak flow capacity of 0.028 cfs (12.53 gpm)

Refer to appendix A for water quality basin map. Refer to appendix D for hydrographs.

Hydromodification and Detention

The project proposes to add 4.12 acres (179,309 SF) of impervious area to the site; therefore, it is classified as a 'large development' by the City of West Linn Stormwater Management Manual. Peak-flow matching is required for the pre-developed 2, 10, and 25-year, 24-hour storm events. The site layout lends itself to a 'centralized' approach with all stormwater on site being piped to a single centralized underground detention facility. The Santa Barbara Urban Hydrograph (SBUH) was chosen to demonstrate the detention facility is adequately sized for flow control using the following parameters:

- **2-Year: 2.5 inches/hour**
- **5-Year: 3.1 inches/hour**
- **10-Year: 3.45 inches/hour**
- **25-Year: 4.9 inches/hour**
- **Type 1A Rainfall Distribution**

Site stormwater will be routed to a 17,475 CF R-Tank set at elevation 300.86 beneath the site's south parking lot. Flow out of the R-Tank is regulated by a flow control manhole with a single 4.1" diameter

orifice set at elevation 300.86. A 12" overflow is provided at elevation 304.46 which helps to convey the 10, 25, and 100 year storm events.

The proposed R-Tank is designed to capture and detain runoff from Basin 1 only. Basin 2 will shed stormwater offsite as topographical constraints do not allow for stormwater to be captured and routed back to the facility. Basin 2 includes just 1,232 SF of new impervious area with the rest of the basin being made up of pervious fill slope (0.49 Acres) to catch the existing grade downslope of the project. Basin 3 will be routed around the project site, bypassing the development. Refer to the Conveyance section of this report for more information on Basin 3 and refer to appendix A for the proposed basin map.

Table 3 below provides a summary of the flow control data for this project.

Table 3. Flow Control Data

Storm Event	Pre-Developed Flow (cfs)	Post-Developed Flow (cfs)	Detained Release Rate (cfs)
2-Year	0.630	2.512	0.624
10-Year	1.610	3.758	1.228
25-Year	2.139	4.347	2.127
100-Year*	3.155	5.387	3.485

*100 year storm event not required for peak flow matching. Shown for conveyance through the R-Tank system only.

Refer to appendix D for hydrographs.

Conveyance

The project site sits at the bottom of an existing 2:1 slope which will shed water toward the proposed development. The upper access road will require fill to construct, creating a low point north of road. Stormwater will drain to the toe of this fill slope and be conveyed to a proposed ditch inlet just west of the eastern asphalt yard and discharged through a 12" culvert to the existing wetland to the south, bypassing the project site. See 'basin 3' in the proposed basin map exhibit in appendix A for basin location.

The stormwater conveyance system will be sized using the Santa Barabara Urban Hydrograph Method (SBUH) to convey the 25-year storm event. Conveyance calculations will be provided with the final report.

Downstream Analysis

A downstream analysis will be provided in the final report.

Operations and Maintenance

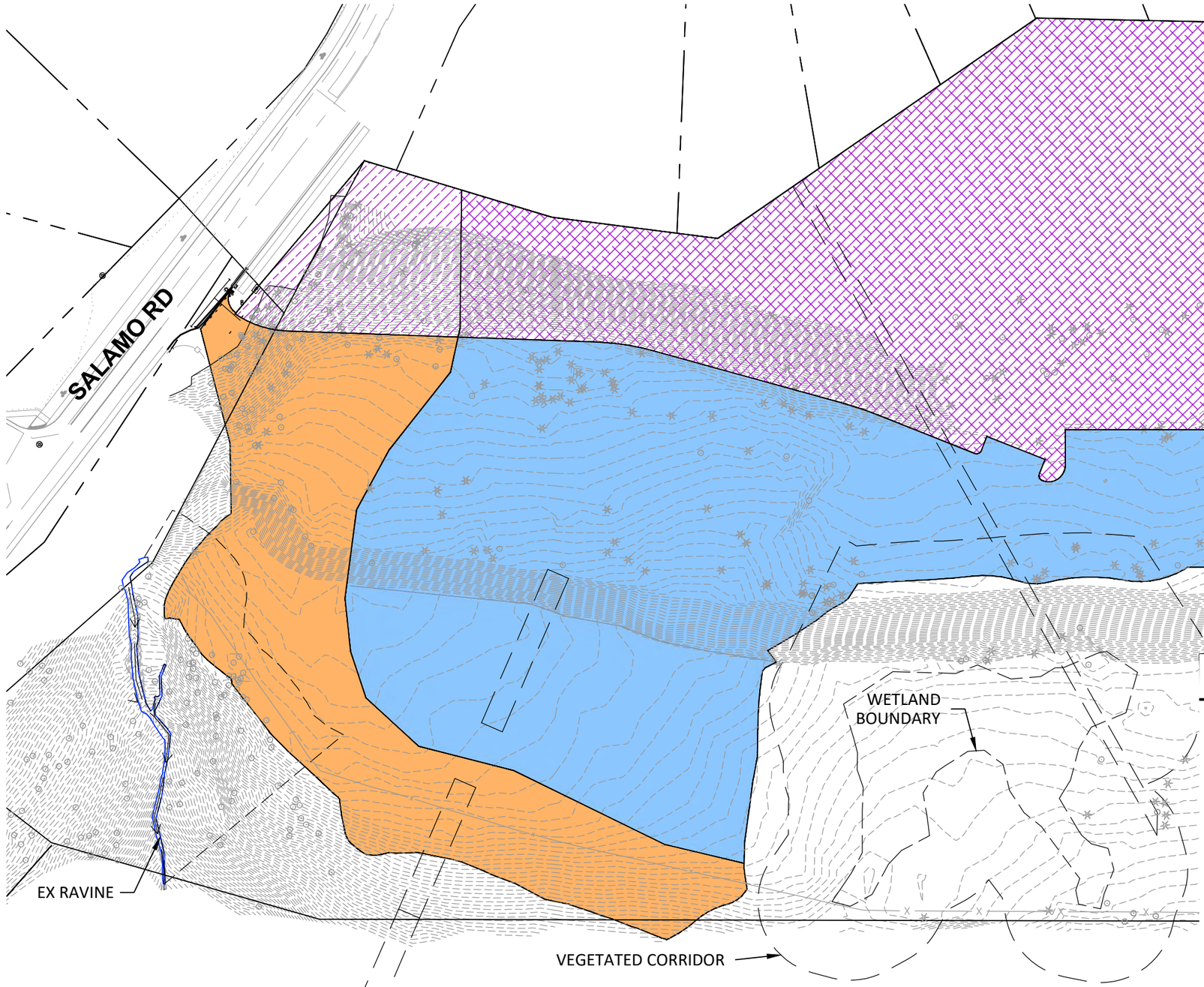
An operations and maintenance plan will be provided for the R-Tank and Contech StormFilter structures in the final report.

CONCLUSION

The proposed stormwater management plan will achieve stormwater quality and flow control to the standards of the City of West Linn Stormwater Management Manual dated May 2025.

Appendix A – Figures

P:\01-Portland\SEA (Scott Edwards Architecture)\SEA-158 (West Linn Public Works)\SEA158-DOCS\Reports\Stormwater\Exhibits\ SEA158-Existing Basin Map.dwg



LEGEND

- BASIN 1
  PERVIOUS: 85,620 SF (1.97)
- BASIN 1 - OFFSITE
  PERVIOUS: 21,159 SF (0.49 AC)
- BASIN 2
  PERVIOUS: 221,441 SF (5.08 AC)
- BASIN 2 - OFFSITE
  PERVIOUS: 256,078 SF (5.88 AC)

0 50 100 200
SCALE: 1" = 100'

DATE	NO.	DESCRIPTION

REVISIONS

DESIGNED: ---
DRAWN: ---
CHECKED: ---
DATE: -----

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EXISTING BASIN MAP

WEST LINN OPERATIONS COMPLEX

WEST LINN, OREGON

SHEET NO. EX

JOB NO. SEA-158

P:\01-Portland\SEA (Scott Edwards Architecture)\SEA-158 (West Linn Public Works)\SEA158-DOCS\Reports\Stormwater\Exhibits\ SEA158-Proposed Basin Map.dwg

SALAMO RD

BASIN 3 BYPASS
INLET AND CULVERT

FFE = 316.00

FFE = 311.00

EX RAVINE

PROPOSED R-TANK

IE OUT = 297.00

WETLAND
BOUNDARY

VEGETATED CORRIDOR

LEGEND

BASIN 1
IMPERVIOUS: 178,077 SF (4.09 AC)
PERVIOUS: 48,722 SF (1.12 AC)

BASIN 2
IMPERVIOUS: 1,232 SF (0.03 AC)
PERVIOUS: 21,560 SF (0.49 AC)

BASIN 3 - BYPASSED
IMPERVIOUS: 0 SF (0.00 AC)
PERVIOUS: 239,195 SF (5.50 AC)

0 25 50 100
SCALE: 1" = 100'

N

DATE	NO.	DESCRIPTION

REVISIONS

DESIGNED: LEM
DRAWN: LEM
CHECKED: AJS
DATE: NOVEMBER 2025

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PROPOSED BASIN MAP - DETENTION

WEST LINN OPERATIONS COMPLEX

WEST LINN, OREGON

SHEET NO.
DET

JOB NO.
SEA-158

P:\01-Portland\SEA (Scott Edwards Architecture)\SEA-158 (West Linn Public Works)\SEA158-DOCS\Reports\Stormwater\Exhibits\ SEA158-Water Quality Basin Map.dwg

SALAMO RD

FFE = 316.00

FFE = 311.00

EX RAVINE

IE OUT = 297.00

CONTECH STORMFILTER CATCH BASIN

PROPOSED R-TANK

VEGETATED CORRIDOR

WETLAND BOUNDARY

CONTECH STORMFILTER VAULT

72" CONTECH STORMFILTER MANHOLE

LEGEND

WQ BASIN 1
IMPERVIOUS: 149,601 SF (3.43 AC)

WQ BASIN 2
IMPERVIOUS: 11,288 SF (0.26 AC)

WQ BASIN 3
IMPERVIOUS: 18,421 SF (0.42 AC)

0 25 50 100
SCALE: 1" = 100'

N

DATE	NO.	DESCRIPTION

R E V I S I O N S

DESIGNED: LEM
DRAWN: LEM
CHECKED: AJS
DATE: NOVEMBER 2025

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PROPOSED BASIN MAP - WATER QUALITY

WEST LINN OPERATIONS COMPLEX

WEST LINN, OREGON

SHEET NO. WQ

JOB NO. SEA-158

Appendix B – Geotechnical Data

Custom Soil Resource Report
Soil Map

Map Scale: 1:1,320 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 15 30 60 90

Feet
0 50 100 200 300

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
48D	Kinton silt loam, 15 to 30 percent slopes	1.0	13.5%
64C	Nekia silty clay loam, 8 to 15 percent slopes	0.5	7.2%
89D	Witzel very stony silt loam, 3 to 40 percent slopes	5.7	79.2%
Totals for Area of Interest		**7.2**	**100.0%**

Clackamas County Area, Oregon

48D—Kinton silt loam, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: 2258
Elevation: 250 to 1,400 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Kinton and similar soils: 85 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kinton

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluve, base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stratified glaciolacustrine deposits

Typical profile

H1 - 0 to 15 inches: silt loam
H2 - 15 to 35 inches: silt loam
H3 - 35 to 60 inches: silt loam

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 30 to 40 inches to fragipan
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 27 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: F002XB005OR - Loess Hill Group
Forage suitability group: Moderately Well Drained >15% Slopes (G002XY003OR)
Other vegetative classification: Moderately Well Drained >15% Slopes (G002XY003OR)
Hydric soil rating: No

Minor Components

Delena

Percent of map unit: 2 percent
Landform: Hillslopes, terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Interfluve, riser
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
Hydric soil rating: Yes

64C—Nekia silty clay loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2269
Elevation: 250 to 1,200 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Nekia and similar soils: 80 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nekia

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, nose slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from basalt

Typical profile

H1 - 0 to 19 inches: silty clay loam
H2 - 19 to 39 inches: clay
H3 - 39 to 43 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Available water supply, 0 to 60 inches: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R002XC012OR - Red Hill Group
Forage suitability group: Well drained < 15% Slopes (G002XY002OR)
Other vegetative classification: Well drained < 15% Slopes (G002XY002OR)
Hydric soil rating: No

89D—Witzel very stony silt loam, 3 to 40 percent slopes

Map Unit Setting

National map unit symbol: 227s
Elevation: 300 to 1,000 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Not prime farmland

Map Unit Composition

Witzel and similar soils: 80 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Witzel

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, nose slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from basalt

Typical profile

H1 - 0 to 4 inches: very stony silt loam
H2 - 4 to 16 inches: very stony silty clay loam
H3 - 16 to 20 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 40 percent
Depth to restrictive feature: 12 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R002XC009OR - Bald Group
Forage suitability group: Well Drained > 15% Slopes (G002XY001OR)
Other vegetative classification: Well Drained > 15% Slopes (G002XY001OR)
Hydric soil rating: No

EXECUTIVE SUMMARY

This executive summary presents the primary geotechnical considerations associated with the proposed City of West Linn's Operations Center located in West Linn, Oregon. Our conclusions and recommendations are based on the subsurface information presented in the report and proposed development information provided by the design team. Detailed discussion of the geotechnical considerations summarized here is presented in respective sections of the report.

- Based on our understanding of the proposed development and the results of our explorations and engineering analyses, it is our opinion that the proposed development can be constructed at the site.

- Undocumented fill was encountered to depths between 1 foot and 31 feet BGS in 15 of our 18 explorations and to depths between 10.5 and 49.5 feet BGS in prior explorations by others. The composition and consistency of the fill are highly variable and generally include medium stiff to hard clay with varying proportions of sand and gravel or very loose to very dense gravel and sand with varying proportions of clay and silt. The fill also includes cobbles and boulders. Bark chip fill was encountered in seven of our explorations to depths between 6 and 24 inches. To prevent excessive differential settlement, foundations and floor slabs should not bear on the undocumented fill, unless it has been improved. This material should be evaluated during construction and removed from foundation and floor slab subgrade.

- Based on the assumed foundation loads, buildings in areas not underlain by undocumented fill or underlain by less than a few feet of undocumented fill can be supported on conventional spread footings, provided the undocumented fill is removed and replaced with structural fill and the buildings can safely withstand the predicted static foundation settlement.

- In lieu of removal of undocumented fill where the fill is more than a few feet thick, the buildings can be supported on deep foundation or ground improvement. Ground improvement is typically more economical than deep foundations. Therefore, this report focuses on ground improvement. If requested, our office can provide additional recommendations for deep foundations.

- The native, dense gravel, cobbles, and boulders encountered at shallow depths will result in difficult excavation with conventional equipment in both fill and decomposed/weathered basalt as well as the underlying intact basalt. In addition, because of the presence of cobbles and boulders in the near-surface fill and decomposed/weathered basalt, we expect difficult excavation at shallow depths. Utility trenches may result in slowed excavation and larger backfill volumes due to the presence of cobbles, boulders, and related caving.

- The project budget should include a contingency for removal of boulders.

- Static groundwater was measured at depths as shallow as 79.3 feet BGS in the VWPs installed at the site. Based on planned development grades, static groundwater is not a design consideration. Perched groundwater could be encountered at shallow depths following periods of heavy or prolonged rainfall.

- Based on soil and groundwater conditions at the site, liquefaction and lateral spreading are not design considerations at the site.

- Eleven of our 18 explorations encountered topsoil in the upper 6 to 12 inches, which includes an approximately 4- to 6-inch-thick root zone. In general, the topsoil is soft and contains organic material. This material exhibits low or highly variable strength and generally does not provide consistent subgrade support for foundations, floor slabs, or pavement. We recommend that the topsoil be removed, stabilized, or scarified and compacted as recommended for structural fill where it is present.

- Minor to severe caving was observed in 6 of our 13 test pits, starting at depths between 0 feet and 1 foot BGS. Caving was observed to occur within the fill.

- The on-site soil is suitable for use as structural fill, provided it is properly moisture conditioned and free of oversized materials. Moisture conditioning (drying) of the soil will likely be required depending on location and depth. It will be impossible to dry the soil during periods of extended wet weather.

- As an alternative to the use of thickened granular sections to support construction traffic, cement amendment can be used to obtain suitable support properties. However, depending on the grade and location, cobbles and boulders could be present in the subgrade. These oversized materials can damage cement tilling equipment when encountered and may require removal before cement amendment.

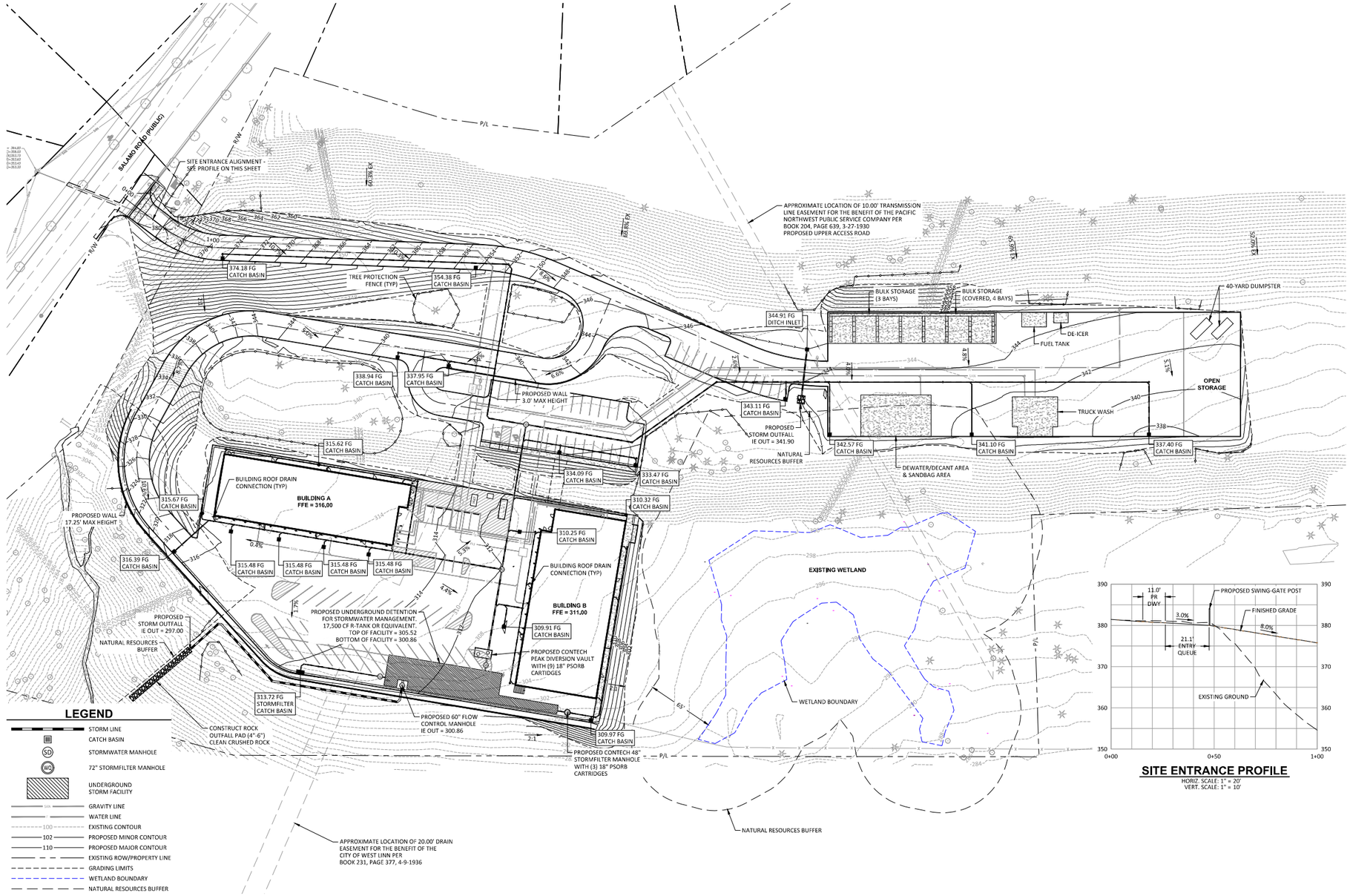
- Perimeter building foundation drains are recommended based on the preliminary grading plan and site surface and subsurface conditions. Columbia West should be contacted to review the final grading plans to verify our recommendations.

- The site is classified as Site Class C according to the 2022 SOSSC and ASCE 7-16 based on site-specific shear wave velocity measurements. Buildings founded directly on basalt can be designed using Site Class B.

- Due to the presence of steep slopes at the site and subsurface conditions, we do not recommend that stormwater drainage be infiltrated on the site. Stormwater should be routed to an appropriate stormwater system.

Appendix C – Plan Sheets

FILE PATH: C:\Revit_Local\23028_West Linn Public Works_tjorgensenZEPNR.rvt



PLAN VIEW
SCALE: 1" = 40'

SITE ENTRANCE PROFILE
HORIZ. SCALE: 1" = 20'
VERT. SCALE: 1" = 10'

0 20 40 80
SCALE: 1" = 40'

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REGISTERED PROFESSIONAL ENGINEER
OREGON
JANUARY 15, 2016
ALEXANDER J. SIMPSON
EXPIRES: 06/30/2024

CONSTRUCTION

WEST LINN PUBLIC WORKS FACILITY

Job Number: 23028

WEST LINN, OR

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ISSUE	DATE
100% DESIGN DEVELOPMENT SET	11/17/2025

Drawing:

STORMWATER & GRADING PLAN

Sheet No:

C2.0

Appendix D – Hydrographs

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No. 1

Basin 1 - Existing

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 240.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.40		0.00		0.00		
Land slope (%)	= 15.50		0.00		0.00		
Travel Time (min)	**= 14.63**	**+**	**0.00**	**+**	**0.00**	**=**	**14.63**
Shallow Concentrated Flow							
Flow length (ft)	= 318.00		0.00		0.00		
Watercourse slope (%)	= 15.10		0.00		0.00		
Surface description	= Paved		Paved		Paved		
Average velocity (ft/s)	=7.90		0.00		0.00		
Travel Time (min)	**= 0.67**	**+**	**0.00**	**+**	**0.00**	**=**	**0.67**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 15.30 min

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No. 3

Basin 2 - Existing

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 273.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.40		0.00		0.00		
Land slope (%)	= 16.60		0.00		0.00		
Travel Time (min)	**= 15.78**	**+**	**0.00**	**+**	**0.00**	**=**	**15.78**
Shallow Concentrated Flow							
Flow length (ft)	= 179.00		0.00		0.00		
Watercourse slope (%)	= 4.50		0.00		0.00		
Surface description	= Paved		Paved		Paved		
Average velocity (ft/s)	=4.31		0.00		0.00		
Travel Time (min)	**= 0.69**	**+**	**0.00**	**+**	**0.00**	**=**	**0.69**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 16.50 min

Hydrograph Report - WATER QAULITY

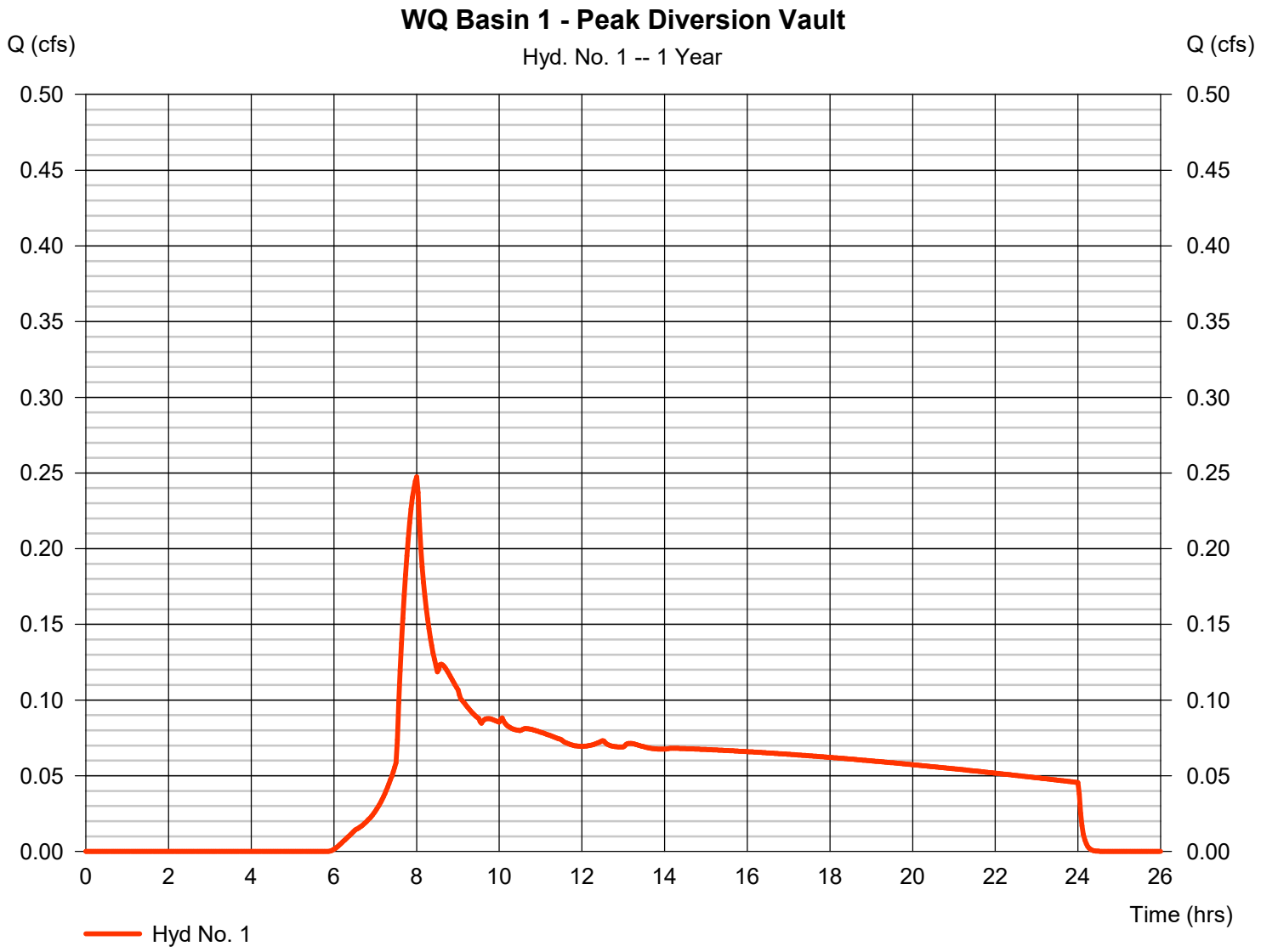
Hyd. No. 1

WQ Basin 1 - Peak Diversion Vault

1 in/hr

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.247 cfs
Storm frequency	= 1 yrs	Time to peak	= 8.00 hrs
Time interval	= 2 min	Hyd. volume	= 4,473 cuft
Drainage area	= 3.430 ac	Curve number	= 91*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 1.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a

* Composite (Area/CN) = [(2.300 x 80) + (3.960 x 98)] / 3.430



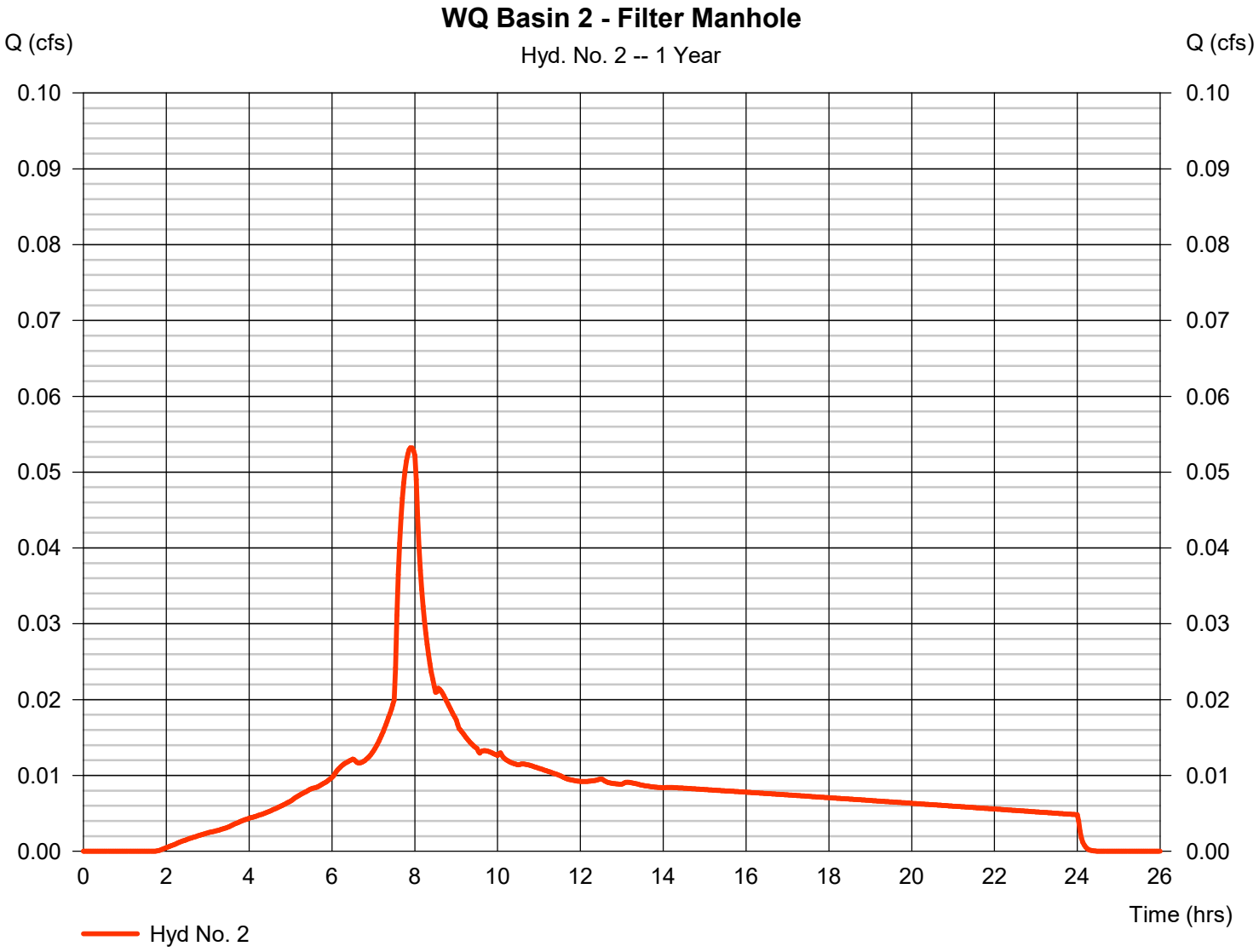
Hydrograph Report - WATER QAULITY

Hyd. No. 2

1 in/hr

WQ Basin 2 - Filter Manhole

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.053 cfs
Storm frequency	= 1 yrs	Time to peak	= 7.90 hrs
Time interval	= 2 min	Hyd. volume	= 746 cuft
Drainage area	= 0.260 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 1.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a



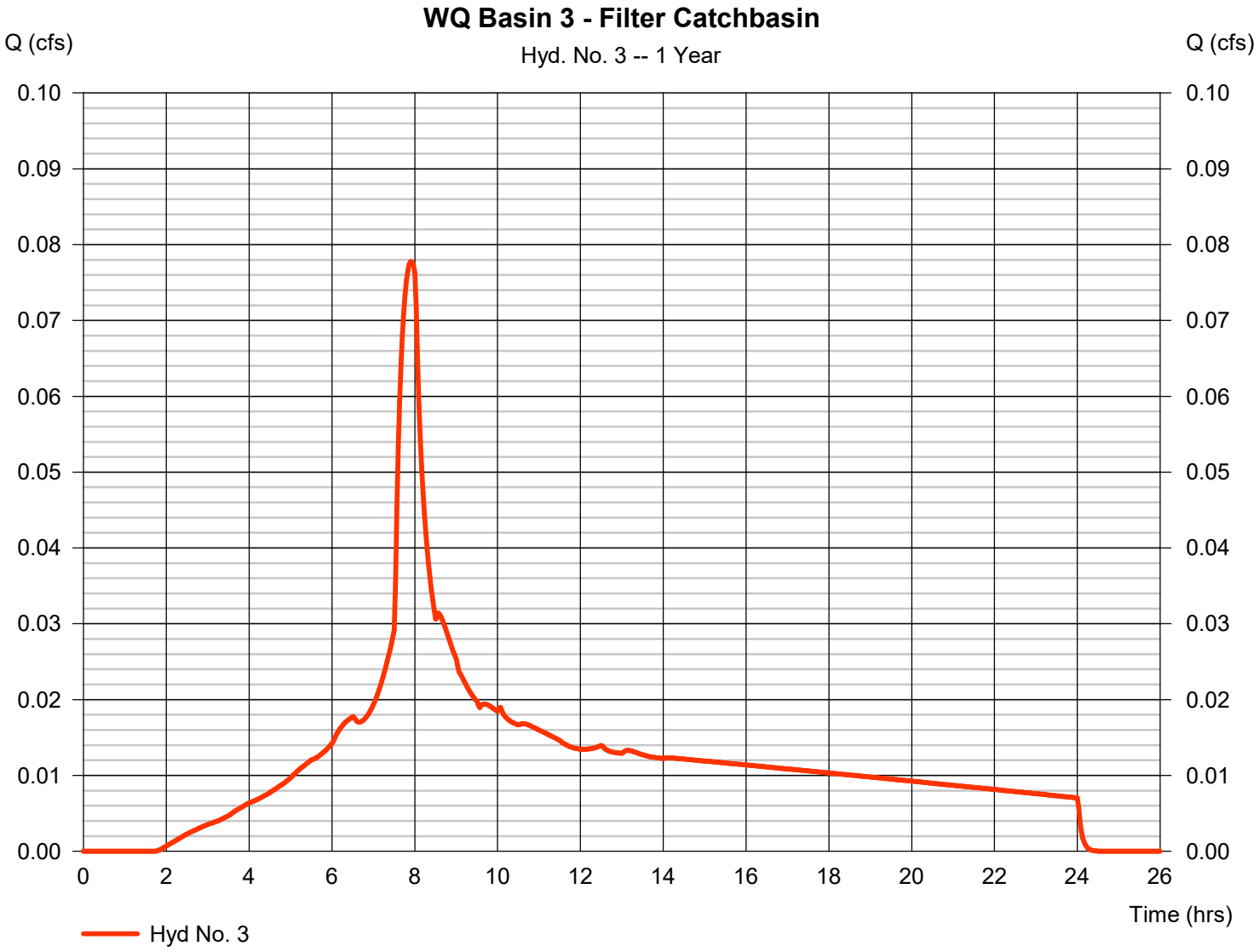
Hydrograph Report - WATER QAULITY

Hyd. No. 3

1 in/hr

WQ Basin 3 - Filter Catchbasin

Hydrograph type	=	SBUH Runoff	Peak discharge	=	0.078 cfs
Storm frequency	=	1 yrs	Time to peak	=	7.90 hrs
Time interval	=	2 min	Hyd. volume	=	1,091 cuft
Drainage area	=	0.380 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	1.00 in	Distribution	=	Type IA
Storm duration	=	24 hrs	Shape factor	=	n/a



Hydrograph Report

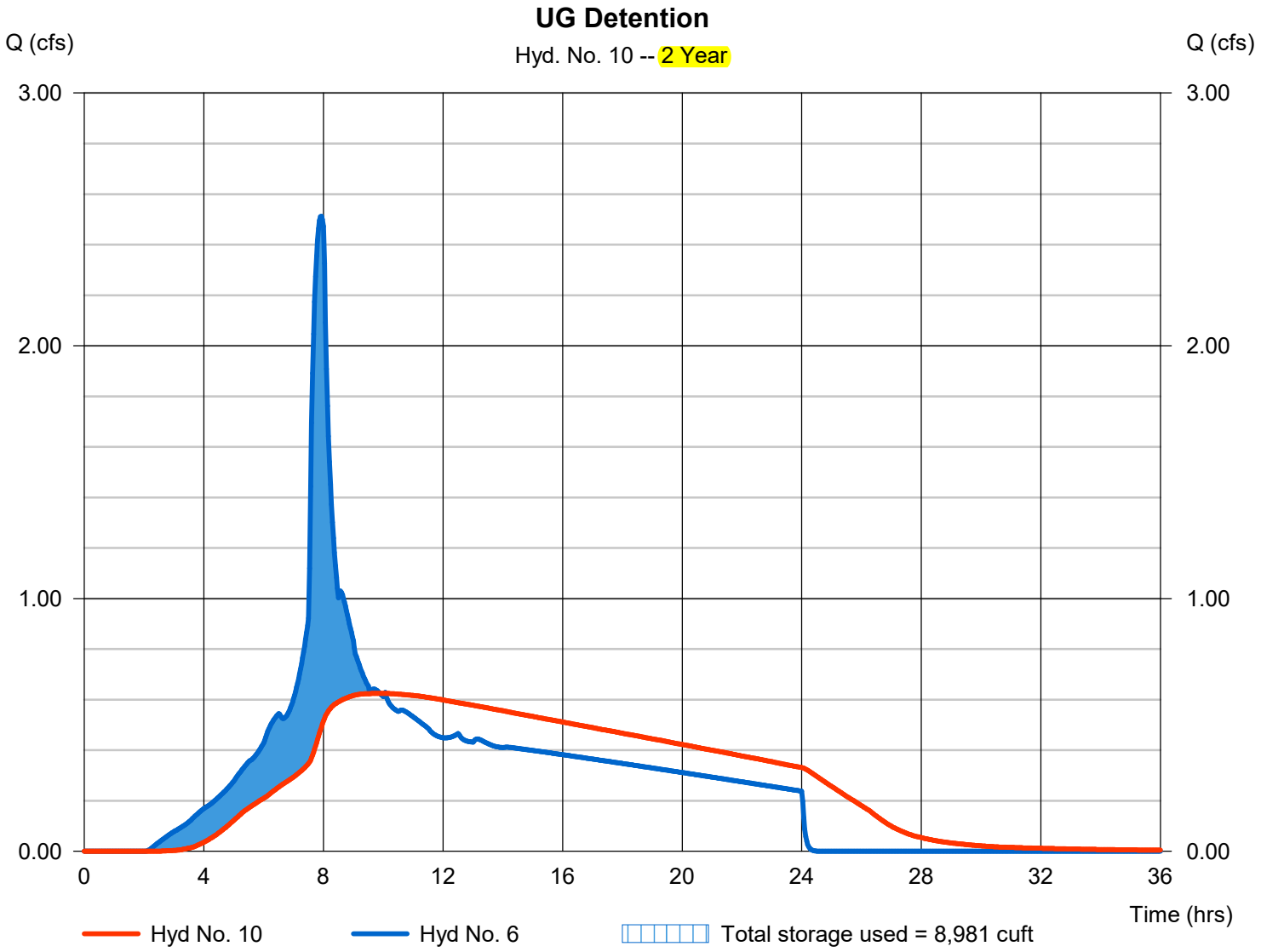
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Wednesday, 11 / 19 / 2025

Hyd. No. 10

UG Detention

Hydrograph type	=	Reservoir	Peak discharge	=	0.624 cfs
Storm frequency	=	2 yrs	Time to peak	=	9.90 hrs
Time interval	=	2 min	Hyd. volume	=	35,316 cuft
Inflow hyd. No.	=	6 - Basin 1 - Proposed	Max. Elevation	=	102.39 ft
Reservoir name	=	UG Detention	Max. Storage	=	8,981 cuft

Storage Indication method used.



Hydrograph Report

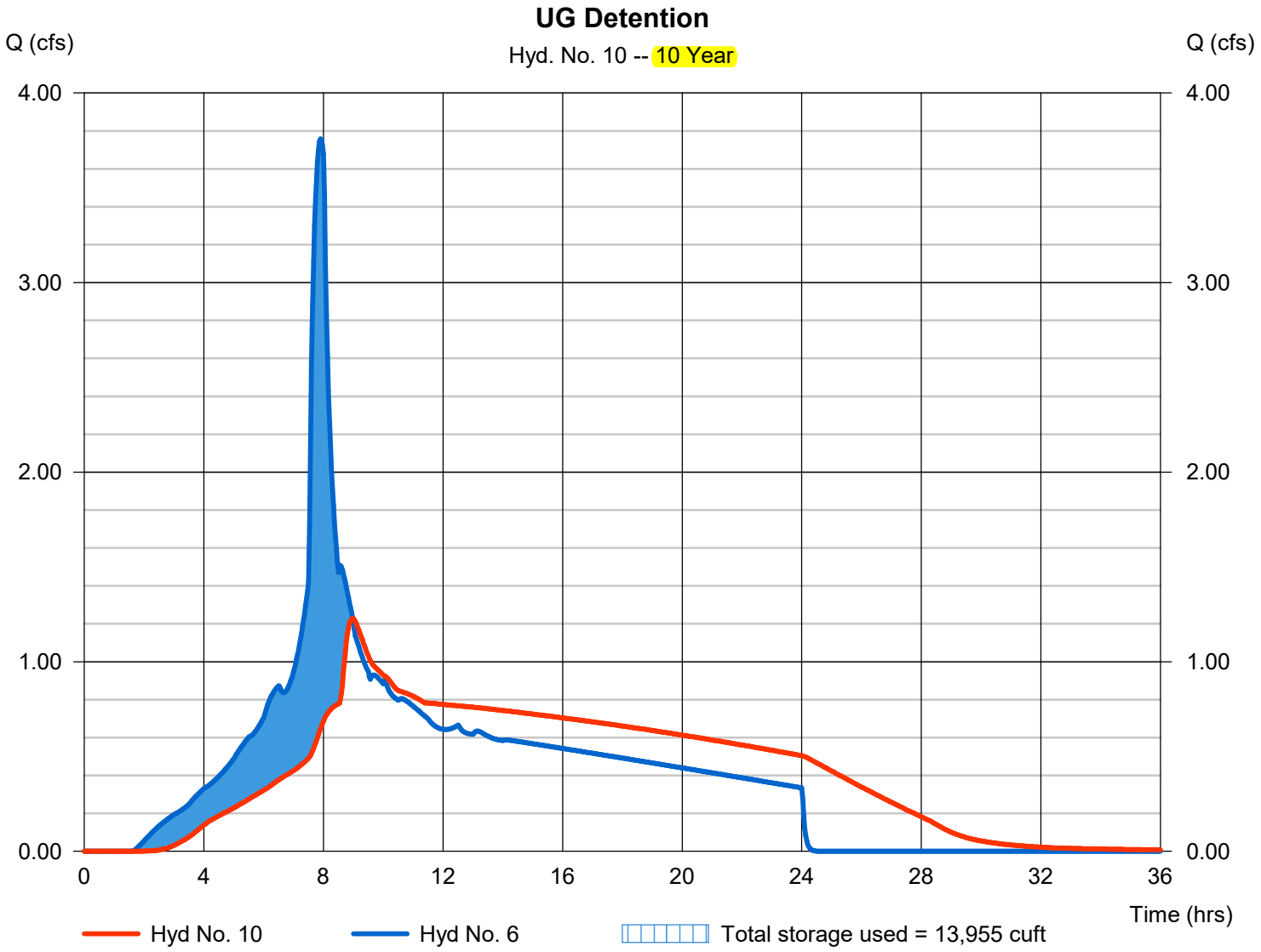
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Wednesday, 11 / 19 / 2025

Hyd. No. 10

UG Detention

Hydrograph type	=	Reservoir	Peak discharge	=	1.228 cfs
Storm frequency	=	10 yrs	Time to peak	=	8.97 hrs
Time interval	=	2 min	Hyd. volume	=	52,669 cuft
Inflow hyd. No.	=	6 - Basin 1 - Proposed	Max. Elevation	=	103.72 ft
Reservoir name	=	UG Detention	Max. Storage	=	13,955 cuft

Storage Indication method used.



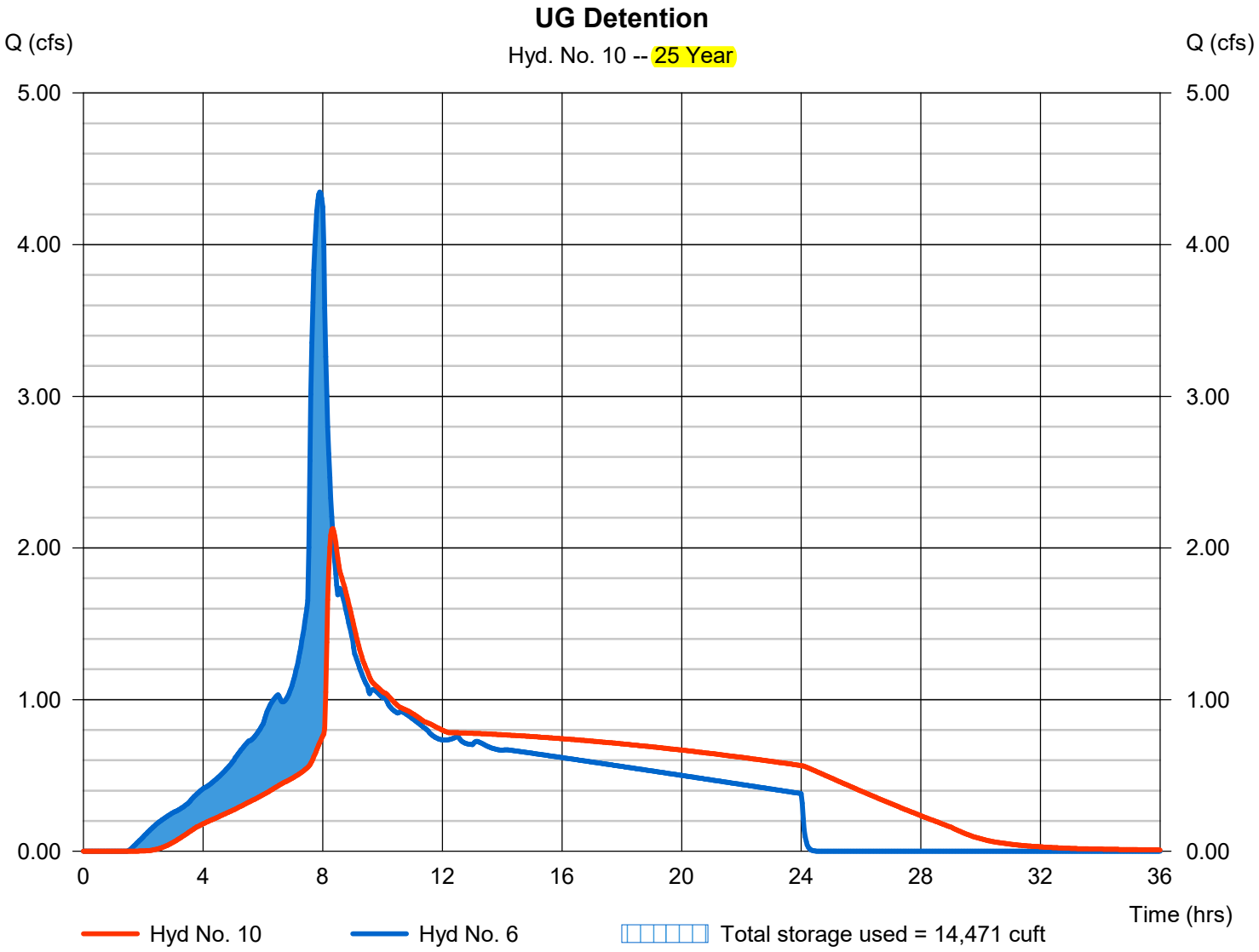
Hydrograph Report

Hyd. No. 10

UG Detention

Hydrograph type	=	Reservoir	Peak discharge	=	2.127 cfs
Storm frequency	=	25 yrs	Time to peak	=	8.33 hrs
Time interval	=	2 min	Hyd. volume	=	60,981 cuft
Inflow hyd. No.	=	6 - Basin 1 - Proposed	Max. Elevation	=	103.86 ft
Reservoir name	=	UG Detention	Max. Storage	=	14,471 cuft

Storage Indication method used.



Hydrograph Report

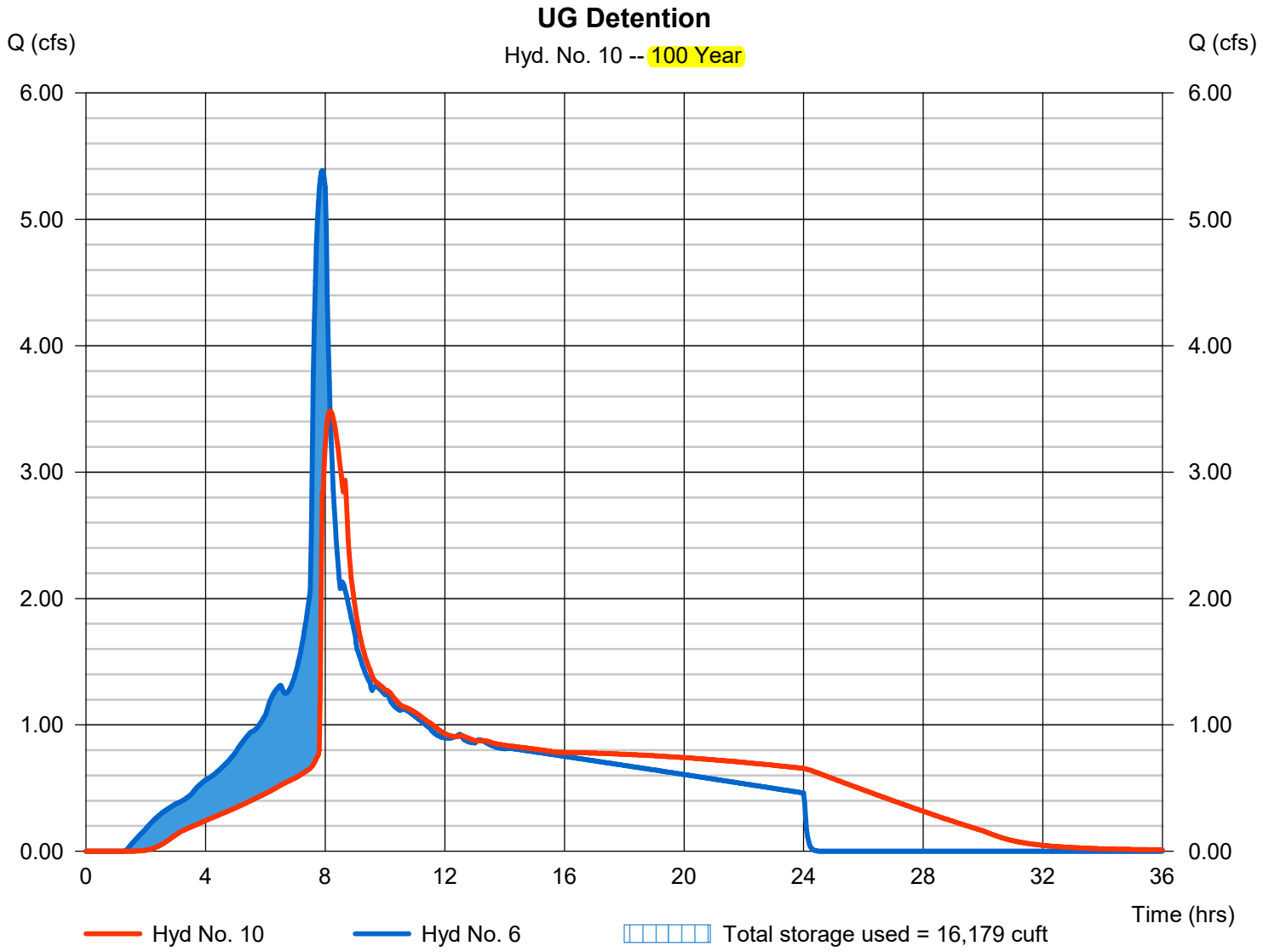
Hyd. No. 10

UG Detention

Shown for conveyance through underground detention only. Peak Flow Matching not required.

Hydrograph type	= Reservoir	Peak discharge	= 3.485 cfs
Storm frequency	= 100 yrs	Time to peak	= 8.17 hrs
Time interval	= 2 min	Hyd. volume	= 75,843 cuft
Inflow hyd. No.	= 6 - Basin 1 - Proposed	Max. Elevation	= 104.31 ft
Reservoir name	= UG Detention	Max. Storage	= 16,179 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - UG Detention

Pond Data

Trapezoid -Bottom L x W = 150.0 x 25.0 ft, Side slope = 0.00:1, Bottom elev. = 100.00 ft, Depth = 4.66 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	3,750	0	0
0.47	100.47	3,750	1,748	1,748
0.93	100.93	3,750	1,748	3,495
1.40	101.40	3,750	1,748	5,243
1.86	101.86	3,750	1,748	6,990
2.33	102.33	3,750	1,748	8,738
2.80	102.80	3,750	1,748	10,485
3.26	103.26	3,750	1,748	12,233
3.73	103.73	3,750	1,748	13,980
4.19	104.19	3,750	1,748	15,728
4.66	104.66	3,750	1,748	17,475

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	4.10	0.00	0.00
Span (in)	= 12.00	4.10	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 100.00	100.00	0.00	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 3.14	0.00	0.00	0.00
Crest El. (ft)	= 103.60	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).