

Memorandum

Date: August 11, 2016

To: West Linn Planning Commission

- From: Peter Spir, Associate Planner Khoi Le, Development Engineer
- Subject: Late submittal by applicant with revised storm water facilities for Self-Storage Facility (CUP-16-01)

At the request of the City of West Linn Engineering Department, and to be consistent with the Construction Code, the applicant has revised their plans to provide only above ground storm water treatment and detention facilities. This will replace the mix of underground and at grade facilities, as proposed in the initial submittal. These revisions were undertaken after the staff report was prepared and distributed. These revisions are discussed and shown in the attached exhibits and are also available for review online.

Comparison of the initial and revised designs show that they will impact similar sized areas (see drawings below). The landscape plan has been revised by the wetland consultant (Schott and Associates). The grading plan is also modified to accommodate this design.

These changes do not modify the building placement, driveways or the applicant's conformance with the approval criteria of the application. Please refer to the attached "Addendum to Staff Finding 97".





SUPPLEMENTAL STAFF REPORT

FOR THE PLANNING COMMISSION

(ADDENDUM TO STAFF FINDING 97)

FILE NUMBER:	CUP-16-01, DR-16-02, VAR-16-02/03, WAP-16-06, WRG-16-02
HEARING DATE:	August 17, 2016
REQUEST:	A Conditional Use Permit to construct a four story self-storage facility (106,487 square feet) at 2400-2450 Willamette Falls Drive, also requiring two variances (including a Special Waiver), Class II Design Review, Water Resource Area (WRA) permit and a Willamette and Tualatin River Protection Area permit.

The revised storm water detention and treatment design, received August 11, 2016, triggers an addendum to Staff Finding 97 to respond to the approval criteria of CDC Chapter 32.060(B) <u>Storm water and storm water facilities:</u>

1. Proposed developments shall be designed to maintain the existing WRAs and utilize them as the primary method of storm water conveyance through the project site unless:

a. The surface water management plan calls for alternate configurations (culverts, piping, etc.); or

b. Under CDC <u>32.070</u>, the applicant demonstrates that the relocation of the water resource will not adversely impact the function of the WRA including, but not limited to, circumstances where the WRA is poorly defined or not clearly channelized. Re-vegetation, enhancement and/or mitigation of the re-aligned water resource shall be required as applicable.

Public and private storm water detention, storm water treatment facilities and storm water outfall or energy dissipaters (e.g., rip rap) may encroach into the WRA if:
 a. Accepted engineering practice requires it;

b. Encroachment on significant trees shall be avoided when possible, and any tree loss shall be consistent with the City's Tree Technical Manual and mitigated per CDC <u>32.090</u>;

c. There shall be no direct outfall into the water resource, and any resulting outfall shall not have an erosive effect on the WRA or diminish the stability of slopes; and

d. There are no reasonable alternatives available.

A geotechnical report may be required to make the determination regarding slope stability.

Staff Finding 97: Staff incorporates the applicant findings (page 29 of applicant's submittal) as amended (italics) below:

The project will utilize the WRA for stormwater conveyance and includes stormwater treatment and detention facilities located within the Riparian Corridor area of the subject property. This is allowed if "there are no reasonable alternatives available." In the case of the subject property, approximately 77% of the site is covered by designated WRA, and reasonable development cannot be achieved without an encroachment into the WRA. All areas between the proposed building and its access/circulation are within the WRA and no reasonable alternatives exist. The proposed facilities will be constructed in a manner consistent with the above requirements.

ADDENDUM: The revised storm water detention and treatment pond in the east half of the site replaces a smaller pond. The revised design was at the request of the Engineering Department so as to be in conformance with City of West Linn Construction Code. Those standards require above ground facilities. The initial design was a mix of buried and above ground facilities and, therefore, did not comply with the Construction Code. According to the Schott and Associates August 9, 2016, letter: the "Proposed impact within the WRA has increased from 15,214 sf to 15,805 sf due to the expansion of the water quality facilities. Proposed mitigation shall consist of enhancement of the entire remaining Riparian Area. This area has decreased from 16,454 sf to 15,863 sf and continues to exceed the required 1:1 ratio for replacement. The additional area of impact is for stormwater quality ponds which will be planted per City of Portland Stormwater Management Manual and shall not be impervious surface but rather shall contribute to the overall function of the resource."

Areas disturbed to accommodate grading for these facilities will be similarly landscaped and are comprised within the 15,863 sf mitigation.

No outfall will be located directly into the water resource as the outfalls will be located upslope of Bernert Creek with appropriate energy dissipation utilized to ensure the proposed facilities will not result in an erosive effect on the WRA. The roadside culvert under the driveway east of the site is proposed to be extended westerly within the right-of-way to accommodate the new on-site east driveway. Stormwater facilities are not proposed to have permanent perimeter fencing and will be landscaped with native vegetation. No public stormwater facilities are proposed on-site. No significant trees will be affected by the development. The criteria is met.



August 9, 2016

City of West Linn Attention: Peter Spir 22500 Salamo Road West Linn, OR 97068

Re: Northwest Self Storage Facility at 2400-2450 Willamette Falls Drive Revised Materials for CUP-16-01 et al Project Number 2150120.01

Dear Mr. Spir:

On behalf of the Applicant, Northwest Self Storage, we are submitting revised plans that respond to guidance from West Linn's Civil Engineering staff. Importantly, fundamental aspects of the site plan (building location, circulation, parking, and so on) have not changed. The revisions reflect the use of surface facilities to achieve all stormwater quality treatment and detention functions, with corresponding changes in site grading and other features. Additionally, we are providing a revised stormwater report with storm facility calculations that support the revised plan set. Finally, we are enclosing a memo from Schott & Associates that updates the calculations for Water Resource Area (WRA) mitigation requirements. The calculations continue to support the finding that on-site mitigation planting areas are of sufficient size to meet applicable impact mitigation requirements. Schott's revised mitigation planting plan has been used as the basis for the updated site landscaping plan (Sheet C1.3).

AFFECTED PORTIONS OF NARRATIVE

Several sections of the narrative now contain information which does not reflect the revised stormwater management design requested by the City. To ensure consistency with the updated design, the narrative responses in the following sections should also refer to the August 9, 2016, memo from Schott & Associates, which contains updated Tables 3 and 4 and updated Appendix C from the Natural Resources Assessment Report (originally attached as Exhibit C):

- CDC Section 28.160 Mitigation Plan
- CDC Section 32.070 Alternate Review Process
- CDC Section 32.080 Approval Criteria (Alternate Review Process)
- CDC Section 32.090 Mitigation Plan
- CDC Section 32.100 Re-Vegetation Plan Requirements
- CDC Section 32.110 Hardship Provisions
- CDC Section 54.020 Approval Criteria

Additionally, the findings in Sections 32.090 and 32.110 refer to the areas of WRA impact and WRA mitigation. The references in these sections to WRA impact of 15,214 SF should be replaced with 15,805 SF and the references to mitigation area of 16,454 SF should be replaced with 15,863 SF. As noted above, the calculations continue to support the finding that on-site mitigation planting areas are of sufficient size to meet applicable impact mitigation requirements.



City of West Linn Northwest Self Storage Facility at 2400-2450 Willamette Falls Drive Project Number 2150120.01 August 9, 2016 Page 2

CONCLUSION

This letter and the revised materials address the issues raised by City Engineering staff and appropriately describe the affected portions of the land use narrative. As suggested by the brevity of the list, the storm revisions have resulted in only minor changes to the overall project and have not changed the overall project approach or the conclusion that the project complies with applicable standards of the Community Development Code.

We would like to thank staff for the guidance we have received in the review of this application, and we look forward to the Planning Commission's review. If you have any questions or need anything prior to the hearing please do not hesitate to call me.

Sincerely,

Lee D. Leighton, AICP Project Manager I

- Enclosure(s): Memorandum from Schott & Associates, dated August 9, 2016 Civil & landscaping plans, revised August 8, 2016 (Full-size & 11"x17") Final Stormwater Report, revised August 8, 2016 Electronic copy of revised materials
- c: Tom Jones, Kevin Howard Northwest Self Storage West Linn Vipul Patel - VK Northwest, Inc.



SCHOTT & ASSOCIATES Ecologists & Wetlands Specialists

21018 NE Hwy 99E • P.O. Box 589 • Aurora, OR 97002 • (503) 678-6007 • FAX: (503) 678-6011

MEMO

RE: Revisions to Northwest Self Storage Natural Resource Assessment and Mitigation Plan

August 9, 2016

Due to the proposed changes to two Willamette Falls stormwater quality facilities the applicant provides this memo outlining the changes in proposed mitigation planting area to account for unavoidable impacts to the Water Resource Area.

Proposed impact within the WRA has increased from 15,214sf to 15,805sf due to the expansion of the water quality facilities. Proposed mitigation shall consist of enhancement of the entire remaining Riparian Area. This area has decreased from 16,454sf to 15,863sf and continues to exceed the required 1:1 ratio for replacement. The additional area of impact is for stormwater quality ponds which will be planted per City of Portland Stormwater Management Manual and shall not be impervious surface but rather shall contribute to the overall function of the resource. Native trees and shrubs shall be planted to meet the required planting rate and total number has been increased to reflect the additional 591sf of impact (See revised Tables 3 and 4).

The proposed mitigation area consists of enhancement of the entire remaining 15,863sf of WRA within the subject property. This area was determined based on the large area of onsite resource, limiting the possible development area outside the resource. As described under the alternatives the proposed mitigation area shall provide higher functions than what would be provided by the existing resource, even though reduced in size.

The goal of the mitigation is protecting the ecological benefit and water quality benefit to the higher quality sensitive areas while maximizing developable area. Mitigation shall consist of removal of reed canary grass, Himalayan blackberry and other non-native species throughout the remaining WRA. An approved herbicide shall be used prior to grubbing out root material. Follow up spot applications will be provided as necessary.

The remaining onsite WRA will be planted with native trees, shrubs and groundcover consistent with CDC 32.100, meeting or exceeding the standards of CDC 32.090(C) to provide a diverse native forested/scrub-shrub community adjacent to the onsite water resource. Tree and shrub species will provide shade, large woody debris, habitat and food sources. In addition it will increase filtration and replace non-native vegetation with a greater diversity of native species. Species will be selected from the Portland Plant list and will include species such as Douglas fir, red alder, big leaf maple, Oregon grape, snowberry, and sword fern.

	Plant Type	Water	Light	Min.	Min.	Spacing	Qty
		Require-me	Require-me	Size	Height		
Douglas fir	Tree	Dry	Sun	2 gal/	3'	Single	47
(Pseudotsuga				1/2" calip			
menziesii)							
Big leaf maple	Tree	Dry	Sun	2 gal/	3'	Single	43
(Acer				1/2" calip			
macrophyllum)							
Red alder	Tree	Moist	Sun	2 gal/	3'	Single	45
(Alnus rubra)				1/2" calip			
Oregon ash*	Tree	Moist	Part	2 gal/	3'	Single	30
(Fraxinus latifolia)				1/2" calip			
Red flowering currant	Shrub	Dry	Sun	1 gal.	1.5'	Cluster	105
(Ribes sanguineum)							
Tall Oregon grape	Shrub	Dry	Sun	1 gal.	12"	Single	155
(Mahonia							
aquifolium)							
Snowberry	Shrub	Dry	Part	1 gal.	1.5'	Cluster	155
(Symphoricarpos							
albus)							
Serviceberry	Shrub	Dry	Part	1 gal.	1.5'	Single	77
(Amelanchier alnifolia)							
Sword fern	Forb	Moist	Shade	2 gal.	n/a	Cluster	100
(Polystichum munitum)							
Native California	Grass	Dry	Part	Seed	n/a	10lbs. pls	
brome							
(Bromus carinatus)							
Blue Wildrye	Grass	Dry	Part	Seed	n/a	10lbs. pls	
(Elymus glaucus)							

TABLE 3. FORESTED WRA ENHANCEMENT PLANTING PLAN (11.187sf)

*To be planted at toe of slope adjacent to wetlands only.

	Plant Type	Water Require-me	Light Require-me	Min. Size	Min. Height	Spacing	Qty
Red flowering currant (<i>Ribes sanguineum</i>)	Shrub	Dry	Sun	1 gal.	1.5'	Cluster	65
Tall Oregon grape (<i>Mahonia</i> <i>aquifolium</i>)	Shrub	Dry	Sun	1 gal.	12"	Single	65
Snowberry (Symphoricarpos albus)	Shrub	Dry	Part	1 gal.	1.5'	Cluster	65
Sword fern (Polystichum munitum)	Forb	Moist	Shade	2 gal.	n/a	Cluster	35
Native California brome (Bromus carinatus)	Grass	Dry	Part	Seed	n/a	10lbs. pls	
Blue Wildrye (Elymus glaucus)	Grass	Dry	Part	Seed	n/a	10lbs. pls	

 TABLE 4.
 SCRUB-SHRUB WRA ENHANCEMENT PLANTING PLAN (4,676sf)





DESIGN DRIVEN I CLIENT FOCUSED

FINAL STORMWATER REPORT

То

City of West Linn Department of Engineering

For Willamette Falls Self Storage

Prepared 4/11/2016 *Revised 8/08/16*

Project Number 2150120.00





Μ.

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ATTACHMENTS

- 1. STORM PLAN
- 2. PAC OUTPUT
- 3. HYDRAFLOW REPORT
- 4. ODOT CHANNEL SIZING
- 5. PIPE SIZING CALCULATION

SUMMARY

As required by the City of West Linn under CDC 55.130(B), this report *clearly shows that there will be no adverse impacts from increased intensity of runoff off site.*

Our plan and report have determined no off-site impacts from the 10-year storm. From our report:

- The City of West Linn requires stormwater detention facilities to provide enough storage to reduce peak flows up to the 25-year storm event with safe overflow conveyance up to the 100-year storm event. Post development discharge rates for the 2, 5, 10 and 25-year storm events are not to exceed that of the pre-developed rates. West Linn also requires that stormwater is treated to reduce the discharge of pollutants.
- Water Quality basins have been sized using the PAC provided by the City of Portland. The PAC was used to confirm that water quality requirements were being met.
- Hydraflow was used to size the detention pond. Water is released from the detention pond via orifices in flow control structures such that post-development flow rates do not exceed predeveloped conditions.
- The rational method was used to determine the conveyance capacity of the system. The 25year, 24-hour storm will be conveyed.
- The Oregon Department of Transportation requires that channels for ADT less than 750 be designed for a recurrence interval of 25 years (ODOT Manual, Table 3-1).



I. SITE AND SYSTEM DESCRIPTION

The proposed development is a self-storage facility on an existing 1.58-AC property. Two access driveways, three water quality facilities, and one detention facility will be created in addition to the building. The proposed development is located at 2400 and 2450 Willamette Falls Drive in West Linn, Oregon.

The City of West Linn Follows the City of Portland Stormwater Management Manual (SWMM) for water quality requirements. Since the project has more than 10,000-SF of new impervious area, the presumptive approached was used in designing the water quality basins.

The City of West Linn requires stormwater detention facilities to provide enough storage to reduce peak flows up to the 25-year storm event with safe overflow conveyance of up to the 100-year storm event. Post development discharge rates for the 2, 5, 10 and 25-year storm events are not to exceed that of the pre-developed rates. West Linn also requires that stormwater is treated to reduce the discharge of pollutants.

Water quality and detention requirements for the roof are met by collecting and conveying stormwater from new impervious areas through one of two water quality basins at the northwest and southeast sides of the site. Treated water is then detained in a detention pond and released at pre-developed rates to Bernert Creek, which flows to the Willamette River. Hydraflow Hydrographs Extension was used for detention calculations and the results have been included with this report.

All new onsite roadways will be constructed from pervious pavement, with the onsite porous sidewalk sloped towards the pervious asphalt. Runoff from these pervious areas (all non-building areas) will be detained within the pavement section, then piped to an adjacent water quality facility for treatment and released to the adjacent storm pipe.



II. FACILITY DESIGN

As a basis of design, existing times of concentration (T_c) are calculated within Hydraflow software using the TR55 methods. In summary, it utilized:

- \circ T_c = 21.5 minutes
- Manning's n=0.4
- o 200-foot length
- 2-year, 24-hour storm event = 2.3 inches
- Slope = 12%.

Water Quality

Stormwater roof runoff is treated onsite through two water quality basin and the detention pond located in on the northwest and southeast corners of the site. Basin 1 collects 12,175-sf of the north roof runoff. Basin 2 collects 12,100-sf of the south roof runoff. Basins 1 and 2 are routed to the detention pond after treatment.

The Water Quality basins have been sized using the Presumptive Approach Calculator (PAC) provided by the City of Portland. The PAC was used to confirm that water quality requirements were being met. The basins will have 18-in of growing medium, 9-in of storage, and 2-in minimum freeboard.

Runoff from site roadways (6,863-sf) will be routed via the pervious pavement section to adjacent water quality facilities for treatment.

The PAC calculations for these basins are included in the attachments.

Detention

Hydraflow was used to size the detention volumes. Water is released from the detention pond via orifices in a flow control structures such that post-development flow rates do not exceed predeveloped conditions. Runoff is ultimately discharged to Bernert Creek. An emergency spillway is also provided to convey the 100-yr event.

Detention facilities are subject to testing prior to final acceptance per the City's Standard Construction specifications, Subsection 604.01 and 604.02.

Stormwater detention via above ground storage was determined to be the City's preferred solution given their standard hierarchy.

For the building roof area, per the SCS method used in Hydrocad, the detention pond will have a bottom area of 134-sf, side slopes of 3:1, and a storage depth of 1.75-ft. The bottom of pond will be set at elevation 133.67. The top of detention storage is at elevation 135.42 and the top of freeboard is at elevation 136.42. The pond will store 1,173-cf during the 25-yr event. Flow control structures will be provided with orifices set such that the proposed release rates meet the existing 2-yr, 5-yr, 10-yr, and 25-yr rates with an emergency spillway provided for the 100-yr event.

Due to low infiltration rates onsite, runoff from the pervious asphalt and sidewalk must be detained in the rock section in accordance with the City of Portland Stormwater Management Manual.



The west driveway has a basin of 0.107-ac, Tc=5.0-min, and requires 145-CF of storage at the 25-yr event. A perforated underdrain installed at the low point of the 12-in rock section with an orifice of 1.28-in should be sufficient for detention, as determined with the SCS method in Hydraflow. The perforated underdrain will connect to a catchbasin where the orifice and overflow will be located. Flows will then be routed to a water quality facility. Treated water and overflow will be conveyed to Bernet Creek.

The east driveway will have 3 basins (Basin 1 is street adjacent, Basin 2 is the middle, and Basin 3 is building adjacent). Runoff from this driveway must be collected in 3 rectangular storage trenches under the rock section. Each trench will have an underdrain with orifice that carries flow out of the storage section. Using the SCS method in Hydraflow, the 25-yr storage for each basin was calculated. Assuming a 3-ft x 20-ft (the width of the driveway) trench and 30% voids, the minimum height from top of each detention trench to the IE of the underdrain was calculated:

BASIN	AREA ac	25-yr Storage cf	Flow Length ft	Slope %	Tc min	Orifice in	Minimum Height* ft
1	0.164	38	12.0	69	5.0	0.36	1.9
2	0.230	54	54.0	14.6	7.0	0.90	2.7
3	0.026	50	51.4	10.7	7.6	0.48	2.5

Table 1: Summary of east driveway storage calculations.

* Minimum Height = 3x [storage / (3ft x 20ft)]

Each perforated underdrain for the east driveway will connect to a catchbasin where the orifice and overflow will be located. Flows from the 3 catchbasins will be collected and routed to a water quality facility. Treated water and overflow will be conveyed to Bernert Creek.

ODOT Drainage

The existing site has an Oregon Department of Transportation (ODOT) drainage path flowing through the proposed building footprint. The proposed development will be downhill from the ODOT drainage path so it does not contribute additional runoff to the ODOT drainage path. A proposed channel will be provided to direct the existing runoff away from the building footprint. The existing channel has an average slope of 4.9%. The proposed channel will have an average slope of 5.0% and will be designed / rerouted in accordance with the ODOT Hydraulics Manual (ODOT Manual). The existing basin has 0.42-ac of impervious area (CN=98) and 1.09-ac of pervious (CN=77).

As a basis of design, existing times of concentration (T_c) are calculated within Hydraflow software using the TR55 methods. The flow begins on freeway asphalt, continues down the freeway slope, and across the site for 637-ft. Flow was considered Sheet flow for 300-ft and shallow concentrated flow for the remainder. In summary (for the 2-year, 24-hour storm event = 2.3 inches), it utilized:

Sheet	Sheet	Sheet	Shallow Concentrated
T _c = 1.26 minutes	$T_c = 6.65$ minutes	T _c = 17.04 minutes	T _c = 17.04 minutes



Manning's n=0.4	Manning's n=0.4	Surface=unpaved
94-foot length	101-foot length	337-foot length
Slope = 50%	Slope = 5.5%	<u> Slope = 5.5%</u>
	Manning's n=0.4 94-foot length Slope = 50%	Manning's n=0.4Manning's n=0.494-foot length101-foot lengthSlope = 50%Slope = 5.5%

Total T_c = 26.4 minutes

The proposed channel has the following characteristics:

- From Hydraflow, the 25-year flow (Q_{25}) is 0.785-cfs
- Side slopes are Z₁=6 and Z₂=2
- Maximum allowable flow depth y=0.56-ft (calculated per the ODOT Manual, section 8.15.2)
- Manning's n=0.21
- Bottom slope S=0.05 ft/ft

The original assumption was that the channel will be grass lined. The assumption is that the grass will not be mowed during the wet season and the hydraulic properties with be calculated using the "before mowing" grass height of 10-inches. Based on the ODOT Manual Table 8-2, the grass Retardance Class is C. Per section 8.15.4 in the ODOT Manual, shear stresses in the channel lining must be calculated to determine if additional armoring will be needed.

Shear Stresses along channel bottom.

(ODOT Manual, Eq. 8-52)

(ODOT Manual, Eq. 8-53)

 τ_y =YyS =62.4-lb/ft³(0.56-ft)(0.05-ft/ft) =1.75-lb/ft²

Shear Stresses along channel sides. The K_1 value is 1.3 (per ODOT Manual Figure 8-29 using Z=4):

 $\tau_b = K_1 \tau_y$ $= 1.3(1.75 - \text{lb/ft}^2)$ $= 2.28 - \text{lb/ft}^2$

Shear Stresses due to the channel bend. The K_b value is 1.0 (per ODOT Manual Figure 8-31 assuming the bend has a radius of 50-ft):

(ODOT Manual, Eq. 8-55)

 $\tau_b = K_b \tau_y$ $= 1.0(1.75 - lb/ft^2)$ $= 1.75 - lb/ft^2$

Per ODOT Manual Table 8.3, the shear stresses for the entire basin exceed Class C Retardance and must use additional armoring. To determine where additional armoring must start, the above calculations were performed for 100-ft segments beginning at the tangent point of the channel and moving upstream. The results are listed in the table below:

	Total Length	100' Upstream from Tangent	200' Upstream from Tangent	Note
Basin Area, ac	1.51	0.96	0.59	
Тс	26.4	26.3	25.8	Calculated using TR-55
Q, cfs	0.785	0.499	0.322	from hydraflow
y, ft	0.56	0.36	0.23	
Manning's n	0.21	0.35	large	ODOT Figure. 8-26
V, ft/s	0.66	0.29	0	ODOT Equation 8-12

Table 2: Summary of ODOT channel calculations.



Q, cfs	0.83	0.15	0	ODOT Equation 8-15
Ty, lb/ft²	1.75	1.12	0.72	ODOT Equation 8-15
Ts, lb/ft²	2.28	1.46	0.94	ODOT Equation 8-15
Tb, lb/ft²	1.75	1.12	0.72	ODOT Equation 8-15
Lining Type	Class 50	Class 50	Class C Retardance	ODOT Table 8-3

Class 50 riprap lining must extend to 200-ft upstream of the tangent point and will be installed such that the channel will be 18-in deep with 12" thick riprap. The channel will be grass-lined uphill of this location.

City Right-of-Way Drainage

Per City standards, the half-street section of Willamette Falls Drive is proposed to be treated via curb side flow-through planters. Design of these facilities is pending the public works design and submittal process, however the areas available (as shown on Sheet R1 and others) are sufficient for the stormwater mitigation.

The area from the start of the public improvements – station 0+47 to station 2+65 will be treated in Planter A. This is an area with 18' wide pavement, 6" curb and 6' of sidewalk for a total width of 24.5' of impervious area.

= length x width
= 218 x 24.5
= 5,341 sf
= 5,341 sf x 0.06
= 320.5 sf

Planter width is 6' but there will be a curb at the back reducing effective width to 5.5'

Therefore Planter A	= 320.5 / 5.5
	= 58.2'

Planter A will be built at 60' length.

The area from the start of the public improvements – station 2+65 to station 4+45 will be treated in Planter B. In addition, planter B will be upsized to over-treat the storm water from station 4+45 to station 5+52. This area has no availability for a planter due to slope constraints.

The revised area for Planter B is an area 287 feet long with 18' wide pavement, 6" curb and 6' of sidewalk for a total width of 24.5' of impervious area.

l otal impervious area	= length x width
	= 287 x 24.5
	= 7,031.5 sf
Planter area to treat	= 7,031.5 sf x 0.06
	= 421.9 sf
Planter width is 6' but t	there will be a curb at the back reducing effective width to 5.5'
Therefore Planter B	= 421.9 / 5.5
	= 76.7'



Planter B will be built at 77' length.

UTILITY NOTES



KEYNOTES:

- 1. CONNECT 6" STORM PIPE TO ROOF DRAIN DOWNSPOU
- 120 SF VEGETATED WATER QUALITY FACILITY (BASIN A), SEE DETAIL 7/C8.0 IE IN = 139.63 (6") TOP OF SOIL ELEV=138.88
- 3. CONSTRUCT CATCH BASIN, SEE DETAIL 3/C8.2 RIM=139.63 IE OUT=137.38 (6")
- 4. CONSTRUCT CATCH BASIN, SEE DETAIL 3/C8.2 RIM=138.16 IE OUT=135.91 (6")
- EMERGENCY SPILLWAY TOP OF POND =136.42 SPILLWAY IE=136.17 (3" BELOW TOP OF POND) 6. DETENTION POND (BASIN B), SEE DETAIL 8/C8.0
- IE IN = 135.42 (6") BOTTOM OF POND ELEV=133.67 TOP OF DETENTION ELEV=135.42 TOP OF FREEBOARD ELEV=136.42
- 7. STANDARD DETENTION POND OUTLET, SEE DETAIL 1/C8.2 RIM=133.67 IE IN=131.76 (4") IE OUT=131.56 (6" ORIFICE)
- 8. 115 SF VEGETATED WATER QUALITY FACILITY (BASIN E), SEE DETAIL 11/C8.0 IE IN = 138.16 (6") TOP OF SOIL ELEV=137.41
- 9. STANDARD DETENTION POND OUTLET, SEE DETAIL 1/C8.2 RIM=135.85 ORIFICE ELEVATION=131.56 (1.96") ORIFICE ELEVATION=132.81 (2.65") IE OUT=131.02 (6")
- 10. IE=135.42 (6" PVC)
- 11. SANITARY CONNECTION TO BUILDING, COORDINATE WITH PLUMBING PLANS
- 12. CONNECT TO EXISTING SANITARY MANHOLE RIM=135.01 RIM=135.01 IE IN=126.20 (6"), EXISTING IE IN=126.3 (6") IE OUT=126.10 (6"), EXISTING
- 13. 1" DOMESTIC WATER SERVICE WITH 1" METER, BY CITY OF WEST LINN
- 14. INSTALL 8" FIRE TAP TO 18" EXISTING MAIN
- 15. INSTALL 6" FIRE TAP TO 18" EXISTING MAIN
- 16. INSTALL STANDARD FIRE HYDRANT ASSEMBLY, SEE PUBLIC IMPROVEMENT PLANS
- 17. SEE PUBLIC IMPROVEMENTS FOR VAULT AND FDC.
- 18. INSTALL 1" WATER FROM METER TO BUILDING.
- . 1" DOMESTIC WATER CONNECTION TO BUILDING, COORDINATE WITH PLUMBING PLANS.
- 20. 8" FIRE WATER CONNECTION TO BUILDING, COORDINATE WITH PLUMBING PLANS.
- 21. 6'x3'x2' DEEP CLASS 50 RIPRAP PAD, SEE DETAIL 3/C8.1 22. INSTALL 30 LF OF 24" CULVERT CULVERT
- 23. NOT USED
- 24. NOT USED
- 25. NOT USED
- 26. NOT USED
- 27. IRRIGATION P.O.C., SEE LANDSCAPE PLANS
- 28. NOT USED
- 29. 2" PIPE CONNECTION TO PROPOSED MANHOLE OVER EXISTING CULVERT. SEE PUBLIC PLANS.
- 30. 23 SF VEGETATED WATER QUALITY FACILITY (BASIN C), IE IN = 137.83 (2") TOP OF SOIL ELEV=137.08
- 31. CONSTRUCT CATCH BASIN, SEE DETAIL 3/C8.2 RIM=137.83 IE OUT=135.58 (4")
- 32. 12 SF VEGETATED WATER QUALITY FACILITY (BASIN D), IE IN = 131.95 (4") TOP OF SOIL ELEV=131.20
- 33. CONSTRUCT CATCH BASIN, SEE DETAIL 3/C8.2 RIM=131.95 IE OUT=129.70 (6")
- 34. CONSTRUCT CATCH BASIN, SEE DETAIL 5/C8.2 RIM=139.59 IE OUT=135.61 (4")
- 35. CONSTRUCT CATCH BASIN, SEE DETAIL 5/C8.2 RIM=137.09 IE OUT=132.91 (2")
- 36. CONSTRUCT CATCH BASIN, SEE DETAIL 5/C8.2 RIM=135.48 IE OUT=132.13 (4")



Planning - Engineering

Portland, OR 03224,9560 Seattle, W/ 206,749,9993



NORTHWEST SELF STORAGE 14855 SE 82ND DR CLACKAMAS, OR 97015

NORTHWEST SELF STORAGE 2400 AND 2450 WILLAMETTE FALLS DRIVE



EXPIRES:	6/30/17				

USED WITH	ALL E DRAWIN MACKENZI OR REPR	ACKENZIE 2016 RIGHTS RESERVED NGS ARE THE PROPERTY E AND ARE NOT TO BE ODUCED IN ANY MANNER, DR WRITTEN PERMISSION
REVI	SIONS:	
REVISION	REVISION: THIS SHEET	5 REVISION DELTA CLOSING DATE
_		

SHEET TITLE: UTILITY PLAN

DRAWN BY:	BLF
CHECKED BY:	MWB
SHEET:	



JOB NO. 2150120.00

REVISED GRADING AND SURFACE WATER MANAGEMENT PLAN - 7/20/2016

	Presumptive Approach Calculato	r ver. 1.2 Catchment Data Catchment ID: BASIN 1
Project Name:	2150120.00 Northwest Self-Storage	Date: 02/01/10
Project Address:	2400 WILLAMETTE FALLS DRIVE	Permit Number: 0
	0	Due Trace 2/24/2016 5:55:52 DM
Designer:	BLF	Run Time 5/24/2010 5.55.55 PM
Company:	Mackenzie	-
Drainage Catchme	ent Information	
Catchment ID	BASIN 1	
	Catchment Area	
Impervious Area	12,575 SF	
Impervious Area	<u>0.29</u> ac	
Impervious Area Curve	Number, CN _{imp} 98	
Time of Concentration,	Tc, minutes 2 5 min.	
Site Soils & Infiltra	ation Testing Data	
Infiltration Testing Proc	edure: Open Pit Falling Head	
Native Soil Field Tested	d Infiltration Rate (I _{test}): 0.06 in/hr	
Bottom of Facility Meet	s Required Separation From	
High Groundwater Per	BES SWMM Section 1.4: Yes	
Correction Factor Cor	mponent	
CF _{test} (ranges from 1 to	3) 2	
Design Infiltration Rat	tes	
I _{dsgn} for Native (I _{test} / CF	t _{test}): 0.03 in/hr	Design infiltration rate < 0.5 in/hr
I _{dsgn} for Imported Growi	ing Medium: 2.00 in/hr	
		Execute SBUH











	Presumptive Approach Calculato	r ver. 1.2 Catchment Data Catchment ID: BASIN 2
Project Name:	2150120.00 Northwest Self-Storage	Date: 02/01/10
Project Address:	2400 WILLAMETTE FALLS DRIVE	Permit Number: 0
Designer:	BI F	Run Time 3/24/2010 6.27.15 PM
Company:	Mackenzie	
oompany.		
Drainage Catchmo	ent Information	
Catchment ID	BASIN 2	
	Catchment Area	
Impervious Area	12,100 SF	
Impervious Area	0.28 ac	
Impervious Area Curve	Number, CN _{imp} 98	
Time of Concentration,	Tc, minutes 5 min.	
Site Soils & Infiltra	ation Testing Data	
Infiltration Testing Proc	edure: Open Pit Falling Head	
Native Soil Field Tester	d Infiltration Rate (I _{test}): 0.06 in/hr	
Bottom of Facility Meet	s Required Separation From	
High Groundwater Per	BES SWMM Section 1.4: Yes	
Correction Factor Co	mponent	
CF _{test} (ranges from 1 to	2	
Design Infiltration Ra	tes	
I _{dsgn} for Native (I _{test} / CF	F _{test}): 0.03 in/hr	Design infiltration rate < 0.5 in/hr
I _{dsgn} for Imported Grow	ing Medium: 2.00 in/hr	
		Execute SBUH











2

<u>Legend</u>

<u>Hyd.</u>	<u>Origin</u>	Description
1	SCS Runoff	ROOF
2	SCS Runoff	EXISTING ROOF
3	Reservoir	ROOF RELEASE

Project: 120-DETENTION-SINGLE POND.gpw

Hydrograph Return Period Recap Hydrafiow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd.	Hydrograph	Inflow	Peak Outflow (cfs)						Hydrograph		
NO.	type (origin)	hyd(s)	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Description
1	SCS Runoff			0.285		0.377	0.442	0.508		0.573	ROOF
2	SCS Runoff			0.112		0.193	0.256	0.321		0.388	EXISTING ROOF
3	Reservoir	1		0.111		0.193	0.237	0.273		0.300	ROOF RELEASE
Dro	i file: 120 DI									/ 8 / 2016	

Hydrograph Summary Report Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.285	2	470	3,995				ROOF
2	SCS Runoff	0.112	2	486	2,016				EXISTING ROOF
3	Reservoir	0.111	2	504	3,992	1	101.25	615	ROOF RELEASE
120	DETENTION	N-SINGI F			Return P	Period: 2 Ye		Monday 08	/ 8 / 2016
120				9hm			ai		

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.285 cfs
Storm frequency	= 2 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 3,995 cuft
Drainage area	= 0.567 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.30 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



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Monday, 08 / 8 / 2016

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 2

EXISTING ROOF

Hydrograph type	= SCS Runoff	Peak discharge	= 0.112 cfs
Storm frequency	= 2 yrs	Time to peak	= 486 min
Time interval	= 2 min	Hyd. volume	= 2,016 cuft
Drainage area	= 0.567 ac	Curve number	= 84
Basin Slope	= 0.0 %	Hydraulic length	= 200 ft
Tc method	= TR55	Time of conc. (Tc)	= 21.50 min
Total precip.	= 2.30 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 2

EXISTING ROOF

<u>Description</u>	<u>A</u>		<u>B</u>		<u>C</u>		<u>Totals</u>
Sheet Flow Manning's n-value Flow length (ft) Two-year 24-hr precip. (in) Land slope (%)	= 0.400 = 200.0 = 2.30 = 12.00		0.011 0.0 0.00 0.00		0.011 0.0 0.00 0.00		
Travel Time (min)	= 21.54	+	0.00	+	0.00	=	21.54
Shallow Concentrated Flow Flow length (ft) Watercourse slope (%) Surface description Average velocity (ft/s)	= 0.00 = 0.00 = Paved =0.00		0.00 0.00 Paved 0.00		0.00 0.00 Paved 0.00		
Travel Time (min)	= 0.00	+	0.00	+	0.00	=	0.00
Channel Flow X sectional flow area (sqft) Wetted perimeter (ft) Channel slope (%) Manning's n-value Velocity (ft/s)	= 0.00 = 0.00 = 0.00 = 0.015 =0.00		0.00 0.00 0.00 0.015 0.00		0.00 0.00 0.00 0.015 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							21.50 min

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 3

ROOF RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 0.111 cfs
Storm frequency	= 2 yrs	Time to peak	= 504 min
Time interval	= 2 min	Hyd. volume	= 3,992 cuft
Inflow hyd. No.	= 1 - ROOF	Max. Elevation	= 101.25 ft
Reservoir name	= DETENTION	Max. Storage	= 615 cuft

Storage Indication method used.



Monday, 08 / 8 / 2016

Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Pond No. 1 - DETENTION

Pond Data

Trapezoid -Bottom L x W = 30.0 x 10.0 ft, Side slope = 3.00:1, Bottom elev. = 100.00 ft, Depth = 10.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)		
0.00	100.00	300	0	0		
1.00	101.00	576	432	432		
2.00	102.00	924	744	1,176		
3.00	103.00	1,344	1,128	2,304		
4.00	104.00	1,836	1,584	3,888		
5.00	105.00	2,400	2,112	6,000		
6.00	106.00	3,036	2,712	8,712		
7.00	107.00	3,744	3,384	12,096		
8.00	108.00	4,524	4,128	16,224		
9.00	109.00	5,376	4,944	21,168		
10.00	110.00	6,300	5,832	27,000		

Culvert / Orifice Structures

Weir Structures

	[A]	[B]	[C]	[PrfRsr]		[A]	[B]	[C]	[D]
Rise (in)	= 1.96	2.65	0.00	0.00	Crest Len (ft)	= 0.00	0.00	0.00	0.00
Span (in)	= 1.96	2.65	0.00	0.00	Crest El. (ft)	= 0.00	0.00	0.00	0.00
No. Barrels	= 1	1	0	0	Weir Coeff.	= 3.33	3.33	3.33	3.33
Invert El. (ft)	= 100.00	101.25	0.00	0.00	Weir Type	=			
Length (ft)	= 0.00	0.00	0.00	0.00	Multi-Stage	= No	No	No	No
Slope (%)	= 0.00	0.00	0.00	n/a	-				
N-Value	= .013	.013	.013	n/a					
Orifice Coeff.	= 0.60	0.60	0.60	0.60	Exfil.(in/hr)	= 0.000 (by	y Contour)		
Multi-Stage	= n/a	No	No	No	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). Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00	0.00									0.000
0.10	43	100.10	0.01 ic	0.00									0.014
0.20	86	100.20	0.03 ic	0.00									0.035
0.30	130	100.30	0.05 ic	0.00									0.047
0.40	173	100.40	0.06 ic	0.00									0.057
0.50	216	100.50	0.07 ic	0.00									0.065
0.60	259	100.60	0.07 ic	0.00									0.073
0.70	302	100.70	0.08 ic	0.00									0.079
0.80	346	100.80	0.09 ic	0.00									0.085
0.90	389	100.90	0.09 ic	0.00									0.091
1.00	432	101.00	0.10 ic	0.00									0.097
1.10	506	101.10	0.10 ic	0.00									0.102
1.20	581	101.20	0.11 ic	0.00									0.107
1.30	655	101.30	0.11 ic	0.00 ic									0.116
1.40	730	101.40	0.12 ic	0.04 ic									0.152
1.50	804	101.50	0.12 ic	0.07 ic									0.189
1.60	878	101.60	0.12 ic	0.09 ic									0.215
1.70	953	101.70	0.13 ic	0.11 ic									0.236
1.80	1,027	101.80	0.13 ic	0.12 ic									0.254
1.90	1,102	101.90	0.14 ic	0.14 ic									0.271
2.00	1,176	102.00	0.14 ic	0.15 ic									0.287
2.10	1,289	102.10	0.14 ic	0.16 ic									0.302
2.20	1,402	102.20	0.15 ic	0.17 ic									0.316
2.30	1,514	102.30	0.15 ic	0.18 ic									0.329
2.40	1,627	102.40	0.15 ic	0.19 ic									0.342
2.50	1,740	102.50	0.16 ic	0.20 ic									0.354
2.60	1,853	102.60	0.16 ic	0.21 ic									0.365
2.70	1,966	102.70	0.16 ic	0.21 ic									0.377
2.80	2,078	102.80	0.17 ic	0.22 ic									0.388
2.90	2,191	102.90	0.17 ic	0.23 ic									0.398
3.00	2,304	103.00	0.17 ic	0.24 ic									0.408
3.10	2,462	103.10	0.18 ic	0.24 ic									0.418

Continues on next page ...

DETENTION Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.20	2,621	103.20	0.18 ic	0.25 ic									0.428
3.30	2,779	103.30	0.18 ic	0.26 ic									0.438
3.40	2,938	103.40	0.18 IC	0.26 IC									0.447
3.50	3,090	103.50	0.191C	0.27 IC									0.450
3.00	3 413	103.00	0.19 ic	0.20 ic									0.403
3.80	3 571	103.80	0.19 ic	0.20 ic									0.483
3.90	3.730	103.90	0.20 ic	0.29 ic									0.491
4.00	3,888	104.00	0.20 ic	0.30 ic									0.499
4.10	4,099	104.10	0.20 ic	0.31 ic									0.507
4.20	4,310	104.20	0.20 ic	0.31 ic									0.515
4.30	4,522	104.30	0.21 ic	0.32 ic									0.523
4.40	4,733	104.40	0.21 IC	0.32 IC									0.531
4.50	4,944	104.50	0.21 IC	0.33 IC									0.539
4.00	5 366	104.00	0.21 IC	0.33 IC									0.540
4 80	5 578	104.80	0.22 ic	0.34 ic									0.561
4.90	5,789	104.90	0.22 ic	0.35 ic									0.568
5.00	6,000	105.00	0.22 ic	0.35 ic									0.576
5.10	6,271	105.10	0.23 ic	0.36 ic									0.583
5.20	6,542	105.20	0.23 ic	0.36 ic									0.590
5.30	6,814	105.30	0.23 ic	0.37 ic									0.596
5.40	7,085	105.40	0.23 ic	0.37 ic									0.603
5.50	7,350	105.50	0.23 IC	0.38 IC									0.610
5.60	7,027	105.00	0.24 IC	0.38 ic									0.017
5.80	8 170	105.70	0.24 ic	0.30 ic									0.023
5.90	8.441	105.90	0.24 ic	0.39 ic									0.636
6.00	8,712	106.00	0.25 ic	0.40 ic									0.643
6.10	9,050	106.10	0.25 ic	0.40 ic									0.649
6.20	9,389	106.20	0.25 ic	0.41 ic									0.655
6.30	9,727	106.30	0.25 ic	0.41 ic									0.661
6.40	10,066	106.40	0.25 ic	0.41 ic									0.668
6.50	10,404	106.50	0.26 10	0.42 IC									0.674
6.70	10,742	106.00	0.20 IC	0.42 IC									0.000
6.80	11,001	106.80	0.20 ic	0.43 ic									0.000
6.90	11,758	106.90	0.26 ic	0.43 ic									0.697
7.00	12,096	107.00	0.27 ic	0.44 ic									0.703
7.10	12,509	107.10	0.27 ic	0.44 ic									0.709
7.20	12,921	107.20	0.27 ic	0.45 ic									0.715
7.30	13,334	107.30	0.27 ic	0.45 ic									0.720
7.40	13,747	107.40	0.27 IC	0.45 IC									0.726
7.50	14,160	107.50	0.27 IC	0.46 IC									0.732
7.00	14,575	107.00	0.20 IC	0.40 iC 0.46 ic									0.737
7.80	15 398	107.80	0.20 ic	0.40 lc									0.748
7.90	15.811	107.90	0.28 ic	0.47 ic									0.754
8.00	16,224	108.00	0.28 ic	0.48 ic									0.759
8.10	16,718	108.10	0.29 ic	0.48 ic									0.764
8.20	17,213	108.20	0.29 ic	0.48 ic									0.770
8.30	17,707	108.30	0.29 ic	0.49 ic									0.775
8.40	18,201	108.40	0.29 IC	0.49 ic									0.780
8.50	18,696	108.50	0.29 IC	0.49 IC									0.785
8 70	19,190	108.00	0.29 ic	0.50 ic									0.791
8 80	20 179	108.80	0.30 ic	0.50 ic									0.730
8.90	20.673	108.90	0.30 ic	0.51 ic									0.806
9.00	21,168	109.00	0.30 ic	0.51 ic									0.811
9.10	21,751	109.10	0.30 ic	0.51 ic									0.816
9.20	22,334	109.20	0.30 ic	0.52 ic									0.821
9.30	22,917	109.30	0.31 ic	0.52 ic									0.826
9.40	23,501	109.40	0.31 IC	0.52 IC									0.831
9.5U 9.60	24,084 24 667	109.50	0.31 IC	0.53 IC									0.030
9.00	24,007	109.00	0.31 ic	0.53 iC 0.53 ic									0.041
9.80	25.833	109.80	0.31 ic	0.54 ic									0.850
9.90	26,417	109.90	0.32 ic	0.54 ic									0.855
10.00	27,000	110.00	0.32 ic	0.54 ic									0.860
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description				
-------------	--------------------------------	-----------------------	---------------------------	--------------------------	--------------------------	------------------	------------------------------	-------------------------------	---------------------------				
1	SCS Runoff	0.377	2	470	5,337				ROOF				
2	SCS Runoff	0.193	2	486	3,174				EXISTING ROOF				
3	Reservoir	0.193	2	494	5,334	1	101.51	815	ROOF RELEASE				
3	Reservoir	0.193	2	494	5,334	1	101.51	815	ROOF RELEASE				
120	-DETENTION	I-SINGLE	POND.	gpw	Return P	eriod: 5 Ye	ar	Monday, 08	/ 8 / 2016				

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.377 cfs
Storm frequency	= 5 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 5,337 cuft
Drainage area	= 0.567 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 2

EXISTING ROOF

Hydrograph type	= SCS Runoff	Peak discharge	= 0.193 cfs
Storm frequency	= 5 yrs	Time to peak	= 486 min
Time interval	= 2 min	Hyd. volume	= 3,174 cuft
Drainage area	= 0.567 ac	Curve number	= 84
Basin Slope	= 0.0 %	Hydraulic length	= 200 ft
Tc method	= TR55	Time of conc. (Tc)	= 21.50 min
Total precip.	= 3.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 3

ROOF RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 0.193 cfs
Storm frequency	= 5 yrs	Time to peak	= 494 min
Time interval	= 2 min	Hyd. volume	= 5,334 cuft
Inflow hyd. No.	= 1 - ROOF	Max. Elevation	= 101.51 ft
Reservoir name	= DETENTION	Max. Storage	= 815 cuft

Storage Indication method used.



13

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.442	2	470	6,297				ROOF
2	SCS Runoff	0.256	2	484	4,053				EXISTING ROOF
3	Reservoir	0.237	2	492	6,294	1	101.71	957	ROOF RELEASE
400									10.10010
120	-DETENTION	I-SINGLE	POND.	gpw	Return P	eriod: 10 Y	ear	Monday, 08	/ 8 / 2016

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.442 cfs
Storm frequency	= 10 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 6,297 cuft
Drainage area	= 0.567 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.50 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 2

EXISTING ROOF

Hydrograph type	= SCS Runoff	Peak discharge	= 0.256 cfs
Storm frequency	= 10 yrs	Time to peak	= 484 min
Time interval	= 2 min	Hyd. volume	= 4,053 cuft
Drainage area	= 0.567 ac	Curve number	= 84
Basin Slope	= 0.0 %	Hydraulic length	= 200 ft
Tc method	= TR55	Time of conc. (Tc)	= 21.50 min
Total precip.	= 3.50 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 3

ROOF RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 0.237 cfs
Storm frequency	= 10 yrs	Time to peak	= 492 min
Time interval	= 2 min	Hyd. volume	= 6,294 cuft
Inflow hyd. No.	= 1 - ROOF	Max. Elevation	= 101.71 ft
Reservoir name	= DETENTION	Max. Storage	= 957 cuft

Storage Indication method used.



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Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.508	2	470	7,259				ROOF
2	SCS Runoff	0.321	2	484	4,963				EXISTING ROOF
3	Reservoir	0.273	2	490	7,256	1	101.91	1,110	ROOF RELEASE
									10.10010
120	-DETENTION	I-SINGLE	POND.	gpw	Return P	eriod: 25 Y	ear	Monday, 08	/ 8 / 2016

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.508 cfs
Storm frequency	= 25 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 7,259 cuft
Drainage area	= 0.567 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 2

EXISTING ROOF

Hydrograph type =	SCS Runoff	Peak discharge	= 0.321 cfs
Storm frequency =	= 25 yrs	Time to peak	= 484 min
Time interval	= 2 min	Hyd. volume	= 4,963 cuft
Drainage area	= 0.567 ac	Curve number	= 84
Basin Slope =	= 0.0 %	Hydraulic length	= 200 ft
Tc method =	= TR55	Time of conc. (Tc)	= 21.50 min
Total precip.	= 4.00 in	Distribution	= Type IA
Storm duration =	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 3

ROOF RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 0.273 cfs
Storm frequency	= 25 yrs	Time to peak	= 490 min
Time interval	= 2 min	Hyd. volume	= 7,256 cuft
Inflow hyd. No.	= 1 - ROOF	Max. Elevation	= 101.91 ft
Reservoir name	= DETENTION	Max. Storage	= 1,110 cuft

Storage Indication method used.



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Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.573	2	470	8,220				ROOF
2	SCS Runoff	0.388	2	484	5,895				EXISTING ROOF
3	Reservoir	0.300	2	492	8,217	1	102.09	1,274	ROOF RELEASE
									10.10010
120-DETENTION-SINGLE POND.gpw				Return P	eriod: 100	Year	Monday, 08	/ 8 / 2016	

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.573 cfs
Storm frequency	= 100 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 8,220 cuft
Drainage area	= 0.567 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.50 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 2

EXISTING ROOF

Hydrograph type	= SCS Runoff	Peak discharge	= 0.388 cfs
Storm frequency	= 100 yrs	Time to peak	= 484 min
Time interval	= 2 min	Hyd. volume	= 5,895 cuft
Drainage area	= 0.567 ac	Curve number	= 84
Basin Slope	= 0.0 %	Hydraulic length	= 200 ft
Tc method	= TR55	Time of conc. (Tc)	= 21.50 min
Total precip.	= 4.50 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 3

ROOF RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 0.300 cfs
Storm frequency	= 100 yrs	Time to peak	= 492 min
Time interval	= 2 min	Hyd. volume	= 8,217 cuft
Inflow hyd. No.	= 1 - ROOF	Max. Elevation	= 102.09 ft
Reservoir name	= DETENTION	Max. Storage	= 1,274 cuft

Storage Indication method used.



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Hydraflow Rainfall Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Return Period	Intensity-Duration-Frequency Equation Coefficients (FHA)								
(Yrs)	В	D	E	(N/A)					
1	0.0000	0.0000	0.0000						
2	6.9527	2.1000	0.6577						
3	0.0000	0.0000	0.0000						
5	9.9393	2.7000	0.6824						
10	10.2300	2.0000	0.6569						
25	11.8938	2.0000	0.6571						
50	13.7560	2.2000	0.6602						
100	15.0837	2.1000	0.6597						

File name: Portland IDF.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	1.92	1.35	1.07	0.91	0.79	0.71	0.65	0.59	0.55	0.52	0.49	0.46
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	2.47	1.75	1.40	1.18	1.03	0.92	0.83	0.77	0.71	0.66	0.62	0.59
10	2.85	2.00	1.59	1.34	1.17	1.05	0.95	0.88	0.82	0.76	0.72	0.68
25	3.31	2.32	1.85	1.56	1.36	1.22	1.11	1.02	0.95	0.89	0.83	0.79
50	3.74	2.64	2.10	1.78	1.55	1.39	1.26	1.16	1.08	1.01	0.95	0.90
100	4.14	2.91	2.32	1.96	1.71	1.53	1.39	1.28	1.19	1.11	1.05	0.99

Tc = time in minutes. Values may exceed 60.

Precip	o. file name: H:\Projects\215012000\3	_Design\Calculations\Portland data\WEST LINN PRECIPITATION.pd	ср
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	Rainfall Precipitation Table (in)										
Storm Distribution	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr			
SCS 24-hour	0.00	2.30	0.00	3.00	3.50	4.00	0.00	4.50			
SCS 6-Hr	0.00	1.20	0.00	1.30	1.60	1.80	0.00	2.20			
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Custom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			

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1

<u>Legend</u>

<u>Hyd.</u>	<u>Origin</u>	Description
1	SCS Runoff	WEST ROAD
2	SCS Runoff	EXISTING WEST ROAD
3	Reservoir	WEST ROAD RELEASE

Project: 120-DETENTION-WEST-ROAD.gpw

Hydrograph Return Period Recap Hydrafiow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. Hydrograph Inflow Peak Outflow (cfs)							Hydrograph				
NO.	type (origin)	nya(s)	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Description
1 2 3	SCS Runoff SCS Runoff Reservoir	 1		0.054 0.023 0.023		0.071 0.039 0.028	0.084 0.052 0.031	0.096 0.065 0.034		0.108 0.078 0.037	WEST ROAD EXISTING WEST ROAD WEST ROAD RELEASE
Pro	j. file: 120-DE		-west	-ROAD.	gpw				Mc	nday, 06	/ 20 / 2016

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.054	2	470	754				WEST ROAD
2	SCS Runoff	0.023	2	480	386				EXISTING WEST ROAD
3	Reservoir	0.023	2	502	745	1	100.33	123	WEST ROAD RELEASE
3	Reservoir	0.023	2	502	745	1	100.33	123	WEST ROAD RELEASE
120	-DETENTION	I-WEST-I	ROAD.g	pw	Return P	eriod: 2 Ye	ar	Monday, 06	/ 20 / 2016

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 1

WEST ROAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.054 cfs
Storm frequency	= 2 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 754 cuft
Drainage area	= 0.107 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.30 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 2

EXISTING WEST ROAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.023 cfs
Storm frequency	= 2 yrs	Time to peak	= 480 min
Time interval	= 2 min	Hyd. volume	= 386 cuft
Drainage area	= 0.107 ac	Curve number	= 84
Basin Slope	= 12.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.00 min
Total precip.	= 2.30 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 2

EXISTING WEST ROAD

<u>Description</u>	<u>A</u>		<u>B</u>		<u>C</u>		<u>Totals</u>		
Sheet Flow Manning's n-value Flow length (ft) Two-year 24-hr precip. (in) Land slope (%)	= 0.400 = 68.6 = 2.30 = 6.10		0.011 0.0 0.00 0.00		0.011 0.0 0.00 0.00				
Travel Time (min)	= 11.99	+	0.00	+	0.00	=	11.99		
Shallow Concentrated Flow Flow length (ft) Watercourse slope (%) Surface description Average velocity (ft/s)	= 0.00 = 0.00 = Paved =0.00		0.00 0.00 Paved 0.00		0.00 0.00 Paved 0.00				
Travel Time (min)	= 0.00	+	0.00	+	0.00	=	0.00		
Channel Flow X sectional flow area (sqft) Wetted perimeter (ft) Channel slope (%) Manning's n-value Velocity (ft/s)	= 0.00 = 0.00 = 0.00 = 0.015 =0.00		0.00 0.00 0.00 0.015 0.00		0.00 0.00 0.00 0.015 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									

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 3

WEST ROAD RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 0.023 cfs
Storm frequency	= 2 yrs	Time to peak	= 502 min
Time interval	= 2 min	Hyd. volume	= 745 cuft
Inflow hyd. No.	= 1 - WEST ROAD	Max. Elevation	= 100.33 ft
Reservoir name	= Storage Section	Max. Storage	= 123 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Pond No. 1 - Storage Section

Pond Data

Trapezoid -Bottom L x W = 51.5 x 24.0 ft, Side slope = 0.00:1, Bottom elev. = 100.00 ft, Depth = 1.00 ft, Voids = 30.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	1,236	0	0
0.10	100.10	1,236	37	37
0.20	100.20	1,236	37	74
0.30	100.30	1,236	37	111
0.40	100.40	1,236	37	148
0.50	100.50	1,236	37	185
0.60	100.60	1,236	37	222
0.70	100.70	1,236	37	260
0.80	100.80	1,236	37	297
0.90	100.90	1,236	37	334
1.00	101.00	1,236	37	371

Culvert / Orifice Structures

Weir Structures

~ ~							
28 0.0	0.00	0.00	Crest Len (ft)	= 0.00	0.00	0.00	0.00
28 0.0	00.0 00	0.00	Crest El. (ft)	= 0.00	0.00	0.00	0.00
0	0	0	Weir Coeff.	= 3.33	3.33	3.33	3.33
0.00 0.0	0.00	0.00	Weir Type	=			
00 0.0	0.00	0.00	Multi-Stage	= No	No	No	No
00 0.0	0.00	n/a					
13 .0 [°]	.013	n/a					
60 0.0	0.60	0.60	Exfil.(in/hr)	= 0.000 (by	Wet area)		
a No	o No	No	TW Elev. (ft)	= 0.00			
	28 0.1 28 0.0 0 0.00 0.00 0.1 00 0.1 13 .0 50 0.1 a No	28 0.00 0.00 28 0.00 0.00 0 0 0 0.00 0.00 0.00 0.00 0.00 0.00 00 0.00 0.00 00 0.00 0.00 00 0.00 0.00 13 .013 .013 60 0.60 0.60 a No No	28 0.00 0.00 0.00 28 0.00 0.00 0.00 0 0 0 0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 00 0.00 0.00 n/a 13 .013 .013 n/a 60 0.60 0.60 a No No No No	28 0.00 0.00 0.00 Crest Len (ft) 28 0.00 0.00 0.00 Crest El. (ft) 0 0 0 0 Weir Coeff. 0.00 0.00 0.00 Weir Type 00 0.00 0.00 Multi-Stage 00 0.00 0.00 n/a 13 .013 .013 n/a 60 0.60 0.60 Exfil.(in/hr) a No No No TW Elev. (ft)	28 0.00 0.00 0.00 Crest Len (ft) = 0.00 28 0.00 0.00 0.00 Crest El. (ft) = 0.00 28 0.00 0.00 0.00 Crest El. (ft) = 0.00 0 0 0 0 Weir Coeff. = 3.33 0.00 0.00 0.00 Weir Type = 00 0.00 0.00 n/a No 13 .013 .013 n/a 60 0.60 0.60 Exfil.(in/hr) = 0.000 (by a No No No TW Elev. (ft) = 0.00	28 0.00 0.00 0.00 Crest Len (ft) = 0.00 0.00 28 0.00 0.00 0.00 Crest El. (ft) = 0.00 0.00 0 0 0 0 Weir Coeff. = 3.33 3.33 0.00 0.00 0.00 Weir Type = 00 0.00 0.00 Multi-Stage = No No 00 0.00 0.00 n/a 00 0.00 0.00 n/a 00 0.00 0.00 n/a 00 0.60 0.60 0.60 Exfil.(in/hr) = 0.000 (by Wet area) 00 0.60 0.60 0.60 Exfil.(in/hr) = 0.00	28 0.00 0.00 0.00 Crest Len (ft) = 0.00 0.00 0.00 28 0.00 0.00 0.00 Crest El. (ft) = 0.00 0.00 0.00 28 0.00 0.00 0.00 Crest El. (ft) = 0.00 0.00 0.00 0 0 0 0 Weir Coeff. = 3.33 3.33 3.33 0.00 0.00 0.00 Weir Type = 00 0.00 0.00 Multi-Stage = No No No 13 .013 .013 n/a a No No No 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). Stace / Storace / Discharce Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00										0.000
0.10	37	100.10	0.01 ic										0.009
0.20	74	100.20	0.02 ic										0.016
0.30	111	100.30	0.02 ic										0.021
0.40	148	100.40	0.03 ic										0.025
0.50	185	100.50	0.03 ic										0.029
0.60	222	100.60	0.03 ic										0.032
0.70	260	100.70	0.03 ic										0.035
0.80	297	100.80	0.04 ic										0.037
0.90	334	100.90	0.04 ic										0.040
1.00	371	101.00	0.04 ic										0.042

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.071	2	470	1,008				WEST ROAD
2	SCS Runoff	0.039	2	480	607				EXISTING WEST ROAD
3	Reservoir	0.028	2	506	998	1	100.46	172	WEST ROAD RELEASE
120		west			Return P	eriod: 5 Ye		Monday 06	/ 20 / 2016
120			NOAD.9	P * *		chou. 5 Te	,ai		

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 1

WEST ROAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.071 cfs
Storm frequency	= 5 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 1,008 cuft
Drainage area	= 0.107 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 2

EXISTING WEST ROAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.039 cfs
Storm frequency	= 5 yrs	Time to peak	= 480 min
Time interval	= 2 min	Hyd. volume	= 607 cuft
Drainage area	= 0.107 ac	Curve number	= 84
Basin Slope	= 12.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.00 min
Total precip.	= 3.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 3

WEST ROAD RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 0.028 cfs
Storm frequency	= 5 yrs	Time to peak	= 506 min
Time interval	= 2 min	Hyd. volume	= 998 cuft
Inflow hyd. No.	= 1 - WEST ROAD	Max. Elevation	= 100.46 ft
Reservoir name	= Storage Section	Max. Storage	= 172 cuft

Storage Indication method used.



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Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.084	2	470	1,189				WEST ROAD
2	SCS Runoff	0.052	2	480	776				EXISTING WEST ROAD
3	Reservoir	0.031	2	508	1,180	1	100.57	211	WEST ROAD RELEASE
120	-DETENTION	I-WEST-I	ROAD.g	pw	Return P	eriod: 10 Y	/ear	Monday, 06	/ 20 / 2016

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 1

WEST ROAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.084 cfs
Storm frequency	= 10 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 1,189 cuft
Drainage area	= 0.107 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.50 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 2

EXISTING WEST ROAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.052 cfs
Storm frequency	= 10 yrs	Time to peak	= 480 min
Time interval	= 2 min	Hyd. volume	= 776 cuft
Drainage area	= 0.107 ac	Curve number	= 84
Basin Slope	= 12.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.00 min
Total precip.	= 3.50 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 3

WEST ROAD RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 0.031 cfs
Storm frequency	= 10 yrs	Time to peak	= 508 min
Time interval	= 2 min	Hyd. volume	= 1,180 cuft
Inflow hyd. No.	= 1 - WEST ROAD	Max. Elevation	= 100.57 ft
Reservoir name	= Storage Section	Max. Storage	= 211 cuft

Storage Indication method used.



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Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.096	2	470	1,371				WEST ROAD
2	SCS Runoff	0.065	2	480	950				EXISTING WEST ROAD
3	Reservoir	0.034	2	522	1,361	1	100.68	252	WEST ROAD RELEASE
120-DETENTION-WEST-ROAD.gpw		Return Period: 25 Year		Monday, 06	5 / 20 / 2016				

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 1

WEST ROAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.096 cfs
Storm frequency	= 25 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 1,371 cuft
Drainage area	= 0.107 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484


Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 2

EXISTING WEST ROAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.065 cfs
Storm frequency	= 25 yrs	Time to peak	= 480 min
Time interval	= 2 min	Hyd. volume	= 950 cuft
Drainage area	= 0.107 ac	Curve number	= 84
Basin Slope	= 12.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.00 min
Total precip.	= 4.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 3

WEST ROAD RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 0.034 cfs
Storm frequency	= 25 yrs	Time to peak	= 522 min
Time interval	= 2 min	Hyd. volume	= 1,361 cuft
Inflow hyd. No.	= 1 - WEST ROAD	Max. Elevation	= 100.68 ft
Reservoir name	= Storage Section	Max. Storage	= 252 cuft

Storage Indication method used.



Hydrograph Summary Report Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.108	2	470	1,553				WEST ROAD
2	SCS Runoff	0.078	2	480	1,128				EXISTING WEST ROAD
3	Reservoir	0.037	2	526	1,543	1	100.80	295	WEST ROAD RELEASE
								Marada 22	
120-DETENTION-WEST-ROAD.gpw					Return P	eriod: 100	rear	Monday, 06	/ 20 / 2016

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 1

WEST ROAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.108 cfs
Storm frequency	= 100 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 1,553 cuft
Drainage area	= 0.107 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.50 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 2

EXISTING WEST ROAD

Hydrograph type	= SCS Runoff	Peak discharge	= 0.078 cfs
Storm frequency	= 100 yrs	Time to peak	= 480 min
Time interval	= 2 min	Hyd. volume	= 1,128 cuft
Drainage area	= 0.107 ac	Curve number	= 84
Basin Slope	= 12.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.00 min
Total precip.	= 4.50 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 3

WEST ROAD RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 0.037 cfs
Storm frequency	= 100 yrs	Time to peak	= 526 min
Time interval	= 2 min	Hyd. volume	= 1,543 cuft
Inflow hyd. No.	= 1 - WEST ROAD	Max. Elevation	= 100.80 ft
Reservoir name	= Storage Section	Max. Storage	= 295 cuft

Storage Indication method used.



Hydraflow Rainfall Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)								
	В	D	E	(N/A)					
1	0.0000	0.0000	0.0000						
2	6.9527	2.1000	0.6577						
3	0.0000	0.0000	0.0000						
5	9.9393	2.7000	0.6824						
10	10.2300	2.0000	0.6569						
25	11.8938	2.0000	0.6571						
50	13.7560	2.2000	0.6602						
100	15.0837	2.1000	0.6597						

File name: Portland IDF.IDF

Intensity = B / (Tc + D)^E

Return	n Intensity Values (in/hr)											
(Yrs)	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	1.92	1.35	1.07	0.91	0.79	0.71	0.65	0.59	0.55	0.52	0.49	0.46
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	2.47	1.75	1.40	1.18	1.03	0.92	0.83	0.77	0.71	0.66	0.62	0.59
10	2.85	2.00	1.59	1.34	1.17	1.05	0.95	0.88	0.82	0.76	0.72	0.68
25	3.31	2.32	1.85	1.56	1.36	1.22	1.11	1.02	0.95	0.89	0.83	0.79
50	3.74	2.64	2.10	1.78	1.55	1.39	1.26	1.16	1.08	1.01	0.95	0.90
100	4.14	2.91	2.32	1.96	1.71	1.53	1.39	1.28	1.19	1.11	1.05	0.99

Tc = time in minutes. Values may exceed 60.

Precip	o. file name: H:\Projects\215012000\3	_Design\Calculations\Portland data\WEST LINN PRECIPITATION.pd	ср
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		Rainfall Precipitation Table (in)								
Storm Distribution	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr		
SCS 24-hour	0.00	2.30	0.00	3.00	3.50	4.00	0.00	4.50		
SCS 6-Hr	0.00	1.20	0.00	1.30	1.60	1.80	0.00	2.20		
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Custom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

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IDE Banart	25

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<u>Legend</u>

<u>Origin</u>	Description
SCS Runoff	EAST ROAD 1
SCS Runoff	EX ROAD 1
Reservoir	ROAD RELEASE 1
SCS Runoff	EAST ROAD 2
SCS Runoff	EX ROAD 2
SCS Runoff	EXISTING ROAD 3
SCS Runoff	EAST ROAD 3
Reservoir	RELEASE 2
Reservoir	RELEASE 3
	Origin SCS Runoff SCS Runoff SCS Runoff SCS Runoff SCS Runoff Reservoir Reservoir

Project: 120-DETENTION-EAST-ROAD.gpw

Hydrograph Return Period Recap Hydrafiow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd.	Hydrograph	rograph Inflow Peak Outflow (cfs)							Hydrograph		
NO.	type (origin)	hyd(s)	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Description
1	SCS Runoff			0.008		0.011	0.013	0.015		0.017	EAST ROAD 1
2	SCS Runoff			0.003		0.006	0.007	0.009		0.011	EX ROAD 1
3	Reservoir	1		0.003		0.004	0.004	0.005		0.005	ROAD RELEASE 1
4	SCS Runoff			0.011		0.015	0.017	0.020		0.023	EAST ROAD 2
5	SCS Runoff			0.005		0.008	0.011	0.013		0.016	EX ROAD 2
6	SCS Runoff			0.006		0.009	0.012	0.015		0.019	EXISTING ROAD 3
7	SCS Runoff			0.013		0.017	0.020	0.023		0.026	EAST ROAD 3
8	Reservoir	4		0.004		0.005	0.006	0.007		0.000	RELEASE 2
9	Reservoir	7		0.005		0.009	0.011	0.013		0.014	RELEASE 3
Pro	i file: 120-DE		V-FAST-	ROAD							/ 20 / 2016

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Hydrograph Summary Report Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
SCS Runoff	0.008	2	470	116				EAST ROAD 1
SCS Runoff	0.003	2	478	54				EX ROAD 1
Reservoir	0.003	2	504	114	1	100.95	17.1	ROAD RELEASE 1
SCS Runoff	0.011	2	470	157				EAST ROAD 2
SCS Runoff	0.005	2	480	78				EX ROAD 2
SCS Runoff	0.006	2	480	91				EXISTING ROAD 3
SCS Runoff	0.013	2	470	184				EAST ROAD 3
Reservoir	0.004	2	506	156	4	101.33	24.0	RELEASE 2
Reservoir	0.005	2	504	183	7	101.53	27.5	RELEASE 3
-DETENTION	I-FAST-6			Return P	eriod: 2 Ye	ar	Monday 06	7 20 / 2016
-DETENTION	I-EAST-F	ROAD.gp	W	Return P	eriod: 2 Ye	ar	Monday, 06	5 / 20 / 2016
	Hydrograph type (origin) SCS Runoff SCS Runoff SCS Runoff SCS Runoff Reservoir Reservoir	Hydrograph type (origin)Peak flow (cfs)SCS Runoff0.008SCS Runoff0.003Reservoir0.0011SCS Runoff0.006SCS Runoff0.004Reservoir0.005	Hydrograph (origin)Peak flow (offs)Time interval (min)SCS Runoff0.0082SCS Runoff0.0032SCS Runoff0.0112SCS Runoff0.0062SCS Runoff0.0132Reservoir0.0042Reservoir0.0052SCS Runoff0.0132Reservoir0.0052SCS Runoff0.0132Reservoir0.0052SCS Runoff0.0132Reservoir0.0052SCS Runoff0.0132Reservoir0.0052SCS Runoff0.0052Reservoir0.0052SCS Runoff0.0052Reservoir0.0052SCS Runoff0.0052Reservoir0.0052SCS RunoffNNSCS RunoffNNSCS RunoffNNSCS RunoffNNSCS RunoffNNSCS RunoffNNSCS RunoffNNSCS RunoffNNSCS RunoffNNReservoirNNSCS RunoffNNSCS RunoffNNSCS RunoffNNSCS RunoffNNSCS RunoffNNSCS RunoffNNSCS RunoffNNSCS RunoffN<	Hydrograph type (origin)Peak flow (cfs)Time to interval (min)Ime to Peak (min)SCS Runoff0.0082470SCS Runoff0.0012470SCS Runoff0.0112480SCS Runoff0.0052480SCS Runoff0.0132506SCS Runoff0.0132506Reservoir0.0052504	Hydrograph (origin) Peak (cs Time on (cs Fue on (cs Hyd. (cs SCS Runoff 0.008 2 470 116 SCS Runoff 0.003 2 470 114 SCS Runoff 0.003 2 470 114 SCS Runoff 0.011 2 470 157 SCS Runoff 0.015 2 480 91 SCS Runoff 0.005 2 480 114 SCS Runoff 0.013 2 470 181 SCS Runoff 0.004 2 506 156 Reservoir 0.005 2 504 183 Reservoir 0.005 2 504 183	Hydrograph type (origin) Peak flow (cr) Time to (min) Hyd. (cr) Inflow hyd(s) SCS Runoff 0.008 2 470 116 SCS Runoff 0.003 2 470 114 1 SCS Runoff 0.003 2 470 157 SCS Runoff 0.005 2 480 78 SCS Runoff 0.005 2 480 91 SCS Runoff 0.005 2 506 158 4 Reservoir 0.005 2 504 183 7 Reservoir 0.005 2 504 183 7	Hydrograph (origin) Resk (n) Interval (n) Interval (n) Hydrograph (n) Interval (n) Interval (n) <	Hydrograph (origin) Peak frow (rst) Time (rst) Time to (rst) Hydr. (rotub) Inflow (rst) Maximum elevation (rst) Total strge used (rst) SCS Runoff 0.008 2 470 116 SCS Runoff 0.003 2 478 54 Reservoir 0.003 2 470 157 SCS Runoff 0.01 2 470 157 SCS Runoff 0.015 2 470 184 SCS Runoff 0.004 2 506 156 4 101.33 24.0 Reservoir 0.005 2 504 183 7 101.53 27.5

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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Hyd. No. 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.008 cfs
Storm frequency	= 2 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 116 cuft
Drainage area	= 0.016 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.30 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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Hyd. No. 2

EX ROAD 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.003 cfs
Storm frequency	= 2 yrs	Time to peak	= 478 min
Time interval	= 2 min	Hyd. volume	= 54 cuft
Drainage area	= 0.016 ac	Curve number	= 84
Basin Slope	= 69.0 %	Hydraulic length	= 12 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.30 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 3

ROAD RELEASE 1

Hydrograph type	= Reservoir	Peak discharge	= 0.003 cfs
Storm frequency	= 2 yrs	Time to peak	= 504 min
Time interval	= 2 min	Hyd. volume	= 114 cuft
Inflow hyd. No.	= 1 - EAST ROAD 1	Max. Elevation	= 100.95 ft
Reservoir name	= EAST STORAGE 1	Max. Storage	= 17 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Pond No. 1 - EAST STORAGE 1

Pond Data

Trapezoid -Bottom L x W = 3.0 x 20.0 ft, Side slope = 0.00:1, Bottom elev. = 100.00 ft, Depth = 3.00 ft, Voids = 30.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	60	0	0
0.30	100.30	60	5	5
0.60	100.60	60	5	11
0.90	100.90	60	5	16
1.20	101.20	60	5	22
1.50	101.50	60	5	27
1.80	101.80	60	5	32
2.10	102.10	60	5	38
2.40	102.40	60	5	43
2.70	102.70	60	5	49
3.00	103.00	60	5	54

Culvert / Orifice Structures

Weir Structures

	[A]	[B]	[C]	[PrfRsr]		[A]	[B]	[C]	[D]
Rise (in)	= 0.36	0.00	0.00	0.00	Crest Len (ft)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.36	0.00	0.00	0.00	Crest El. (ft)	= 0.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0	Weir Coeff.	= 3.33	3.33	3.33	3.33
Invert El. (ft)	= 100.00	0.00	0.00	0.00	Weir Type	=			
Length (ft)	= 0.00	0.00	0.00	0.00	Multi-Stage	= No	No	No	No
Slope (%)	= 0.00	0.00	0.00	n/a					
N-Value	= .013	.013	.013	n/a					
Orifice Coeff.	= 0.60	0.60	0.60	0.60	Exfil.(in/hr)	= 0.000 (by	/Wet area)		
Multi-Stage	= n/a	No	No	No	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). Stace / Storace / Discharce Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00										0.000
0.30	5	100.30	0.00 ic										0.002
0.60	11	100.60	0.00 ic										0.003
0.90	16	100.90	0.00 ic										0.003
1.20	22	101.20	0.00 ic										0.004
1.50	27	101.50	0.00 ic										0.004
1.80	32	101.80	0.00 ic										0.005
2.10	38	102.10	0.00 ic										0.005
2.40	43	102.40	0.01 ic										0.005
2.70	49	102.70	0.01 ic										0.006
3.00	54	103.00	0.01 ic										0.006

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Hyd. No. 4

Hydrograph type	= SCS Runoff	Peak discharge	= 0.011 cfs
Storm frequency	= 2 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 157 cuft
Drainage area	= 0.022 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.30 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 5

EX ROAD 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.005 cfs
Storm frequency	= 2 yrs	Time to peak	= 480 min
Time interval	= 2 min	Hyd. volume	= 78 cuft
Drainage area	= 0.022 ac	Curve number	= 84
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.00 min
Total precip.	= 2.30 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 5

EX ROAD 2

Description	A		<u>B</u>		<u>C</u>		<u>Totals</u>
Sheet Flow Manning's n-value Flow length (ft) Two-year 24-hr precip. (in) Land slope (%)	= 0.400 = 54.0 = 2.30 = 14.60		0.011 0.0 0.00 0.00		0.011 0.0 0.00 0.00		
Travel Time (min)	= 6.99	+	0.00	+	0.00	=	6.99
Shallow Concentrated Flow Flow length (ft) Watercourse slope (%) Surface description Average velocity (ft/s)	= 0.00 = 0.00 = Paved =0.00		0.00 0.00 Paved 0.00		0.00 0.00 Paved 0.00		
Travel Time (min)	= 0.00	+	0.00	+	0.00	=	0.00
Channel Flow X sectional flow area (sqft) Wetted perimeter (ft) Channel slope (%) Manning's n-value Velocity (ft/s)	= 0.00 = 0.00 = 0.00 = 0.015 =0.00		0.00 0.00 0.00 0.015 0.00		0.00 0.00 0.00 0.015 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						7.00 min	

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Hyd. No. 6

EXISTING ROAD 3

Hydrograph type :	SCS Runoff	Peak discharge	= 0.006 cfs
Storm frequency :	= 2 yrs	Time to peak	= 480 min
Time interval	= 2 min	Hyd. volume	= 91 cuft
Drainage area	= 0.026 ac	Curve number	= 84
Basin Slope :	= 0.0 %	Hydraulic length	= 0 ft
Tc method :	= TR55	Time of conc. (Tc)	= 7.60 min
Total precip.	= 2.30 in	Distribution	= Type IA
Storm duration :	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 6

EXISTING ROAD 3

Description	A		<u>B</u>		<u>C</u>		<u>Totals</u>
Sheet Flow Manning's n-value Flow length (ft) Two-year 24-hr precip. (in) Land slope (%)	= 0.400 = 51.4 = 2.30 = 10.70		0.011 0.0 0.00 0.00		0.011 0.0 0.00 0.00		
Travel Time (min)	= 7.60	+	0.00	+	0.00	=	7.60
Shallow Concentrated Flow Flow length (ft) Watercourse slope (%) Surface description Average velocity (ft/s)	= 0.00 = 0.00 = Paved =0.00		0.00 0.00 Paved 0.00		0.00 0.00 Paved 0.00		
Travel Time (min)	= 0.00	+	0.00	+	0.00	=	0.00
Channel Flow X sectional flow area (sqft) Wetted perimeter (ft) Channel slope (%) Manning's n-value Velocity (ft/s)	= 0.00 = 0.00 = 0.015 =0.00		0.00 0.00 0.00 0.015 0.00		0.00 0.00 0.00 0.015 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							7.60 min

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 7

Hydrograph type	= SCS Runoff	Peak discharge	= 0.013 cfs
Storm frequency	= 2 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 184 cuft
Drainage area	= 0.026 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.30 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 8

RELEASE 2

Hydrograph type	= Reservoir	Peak discharge	= 0.004 cfs
Storm frequency	= 2 yrs	Time to peak	= 506 min
Time interval	= 2 min	Hyd. volume	= 156 cuft
Inflow hyd. No.	= 4 - EAST ROAD 2	Max. Elevation	= 101.33 ft
Reservoir name	= EAST STORAGE 2	Max. Storage	= 24 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Pond No. 2 - EAST STORAGE 2

Pond Data

Trapezoid -Bottom L x W = 3.0 x 20.0 ft, Side slope = 0.00:1, Bottom elev. = 100.00 ft, Depth = 4.00 ft, Voids = 30.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	60	0	0
0.40	100.40	60	7	7
0.80	100.80	60	7	14
1.20	101.20	60	7	22
1.60	101.60	60	7	29
2.00	102.00	60	7	36
2.40	102.40	60	7	43
2.80	102.80	60	7	50
3.20	103.20	60	7	58
3.60	103.60	60	7	65
4.00	104.00	60	7	72

Culvert / Orifice Structures

Weir Structures

	[A]	[B]	[C]	[PrfRsr]		[A]	[B]	[C]	[D]
Rise (in)	= 0.90	0.00	0.00	0.00	Crest Len (ft)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.90	0.00	0.00	0.00	Crest El. (ft)	= 0.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0	Weir Coeff.	= 3.33	3.33	3.33	3.33
Invert El. (ft)	= 100.00	0.00	0.00	0.00	Weir Type	=			
Length (ft)	= 0.00	0.00	0.00	0.00	Multi-Stage	= No	No	No	No
Slope (%)	= 0.00	0.00	0.00	n/a					
N-Value	= .013	.013	.013	n/a					
Orifice Coeff.	= 0.60	0.60	0.60	0.60	Exfil.(in/hr)	= 0.000 (b	y Contour)		
Multi-Stage	= n/a	No	No	No	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). Stage / Storage / Discharge Table

		0											
Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00										0.000
0.40	7	100.40	0.01 ic										0.013
0.80	14	100.80	0.02 ic										0.019
1.20	22	101.20	0.02 ic										0.023
1.60	29	101.60	0.03 ic										0.027
2.00	36	102.00	0.03 ic										0.030
2.40	43	102.40	0.03 ic										0.033
2.80	50	102.80	0.04 ic										0.035
3.20	58	103.20	0.04 ic										0.038
3.60	65	103.60	0.04 ic										0.040
4.00	72	104.00	0.04 ic										0.042

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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Monday, 06 / 20 / 2016

Hyd. No. 9

RELEASE 3

Hydrograph type	= Reservoir	Peak discharge	= 0.005 cfs
Storm frequency	= 2 yrs	Time to peak	= 504 min
Time interval	= 2 min	Hyd. volume	= 183 cuft
Inflow hyd. No.	= 7 - EAST ROAD 3	Max. Elevation	= 101.53 ft
Reservoir name	= EAST STORAGE 3	Max. Storage	= 28 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Pond No. 3 - EAST STORAGE 3

Pond Data

Trapezoid -Bottom L x W = 3.0 x 20.0 ft, Side slope = 0.00:1, Bottom elev. = 100.00 ft, Depth = 4.00 ft, Voids = 30.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	60	0	0
0.40	100.40	60	7	7
0.80	100.80	60	7	14
1.20	101.20	60	7	22
1.60	101.60	60	7	29
2.00	102.00	60	7	36
2.40	102.40	60	7	43
2.80	102.80	60	7	50
3.20	103.20	60	7	58
3.60	103.60	60	7	65
4.00	104.00	60	7	72

Culvert / Orifice Structures

Weir Structures

	[A]	[B]	[C]	[PrfRsr]		[A]	[B]	[C]	[D]
Rise (in)	= 0.48	0.00	0.00	0.00	Crest Len (ft)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.48	0.00	0.00	0.00	Crest El. (ft)	= 0.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0	Weir Coeff.	= 3.33	3.33	3.33	3.33
Invert El. (ft)	= 100.00	0.00	0.00	0.00	Weir Type	=			
Length (ft)	= 0.00	0.00	0.00	0.00	Multi-Stage	= No	No	No	No
Slope (%)	= 0.00	0.00	0.00	n/a					
N-Value	= .013	.013	.013	n/a					
Orifice Coeff.	= 0.60	0.60	0.60	0.60	Exfil.(in/hr)	= 0.000 (by	y Wet area)		
Multi-Stage	= n/a	No	No	No	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). Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00										0.000
0.40	7	100.40	0.00 ic										0.004
0.80	14	100.80	0.01 ic										0.005
1.20	22	101.20	0.01 ic										0.007
1.60	29	101.60	0.01 ic										0.008
2.00	36	102.00	0.01 ic										0.009
2.40	43	102.40	0.01 ic										0.009
2.80	50	102.80	0.01 ic										0.010
3.20	58	103.20	0.01 ic										0.011
3.60	65	103.60	0.01 ic										0.011
4.00	72	104.00	0.01 ic										0.012

Hydrograph Summary Report Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. Hydrograph No. type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1 SCS Runoff	0.011	2	470	155				EAST ROAD 1
2 SCS Runoff	0.006	2	476	85				EX ROAD 1
3 Reservoir	0.004	2	520	153	1	101.40	25.3	ROAD RELEASE 1
4 SCS Runoff	0.015	2	470	210				EAST ROAD 2
5 SCS Runoff	0.008	2	480	123				EX ROAD 2
6 SCS Runoff	0.009	2	480	144				EXISTING ROAD 3
7 SCS Runoff	0.017	2	470	246				EAST ROAD 3
8 Reservoir	0.005	2	522	209	4	101.97	35.5	RELEASE 2
9 Reservoir	0.009	2	490	245	7	101.99	35.8	RELEASE 3
120-DETENTION	J-EAST-F	2OAD.gp		Return P	eriod: 5 Ye	ar	Monday, 06	7 20 / 2016

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Monday, 06 / 20 / 2016

Hyd. No. 1

EAST	ROAD	1
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Hydrograph type	= SCS Runoff	Peak discharge	= 0.011 cfs
Storm frequency	= 5 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 155 cuft
Drainage area	= 0.016 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



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Hyd. No. 2

EX ROAD 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.006 cfs
Storm frequency	= 5 yrs	Time to peak	= 476 min
Time interval	= 2 min	Hyd. volume	= 85 cuft
Drainage area	= 0.016 ac	Curve number	= 84
Basin Slope	= 69.0 %	Hydraulic length	= 12 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 3

ROAD RELEASE 1

Hydrograph type	= Reservoir	Peak discharge	= 0.004 cfs
Storm frequency	= 5 yrs	Time to peak	= 520 min
Time interval	= 2 min	Hyd. volume	= 153 cuft
Inflow hyd. No.	= 1 - EAST ROAD 1	Max. Elevation	= 101.40 ft
Reservoir name	= EAST STORAGE 1	Max. Storage	= 25 cuft

Storage Indication method used.



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 4

EAST ROAD 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.015 cfs
Storm frequency	= 5 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 210 cuft
Drainage area	= 0.022 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 5

EX ROAD 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.008 cfs
Storm frequency	= 5 yrs	Time to peak	= 480 min
Time interval	= 2 min	Hyd. volume	= 123 cuft
Drainage area	= 0.022 ac	Curve number	= 84
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.00 min
Total precip.	= 3.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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Hyd. No. 6

EXISTING ROAD	3
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Hydrograph type	= SCS Runoff	Peak discharge	= 0.009 cfs
Storm frequency	= 5 yrs	Time to peak	= 480 min
Time interval	= 2 min	Hyd. volume	= 144 cuft
Drainage area	= 0.026 ac	Curve number	= 84
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.60 min
Total precip.	= 3.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 7

EAST	ROAD	3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.017 cfs
Storm frequency	= 5 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 246 cuft
Drainage area	= 0.026 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 8

RELEASE 2

Hydrograph type	= Reservoir	Peak discharge	= 0.005 cfs
Storm frequency	= 5 yrs	Time to peak	= 522 min
Time interval	= 2 min	Hyd. volume	= 209 cuft
Inflow hyd. No.	= 4 - EAST ROAD 2	Max. Elevation	= 101.97 ft
Reservoir name	= EAST STORAGE 2	Max. Storage	= 36 cuft

Storage Indication method used.



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 9

RELEASE 3

Hydrograph type	= Reservoir	Peak discharge	= 0.009 cfs
Storm frequency	= 5 yrs	Time to peak	= 490 min
Time interval	= 2 min	Hyd. volume	= 245 cuft
Inflow hyd. No.	= 7 - EAST ROAD 3	Max. Elevation	= 101.99 ft
Reservoir name	= EAST STORAGE 3	Max. Storage	= 36 cuft

Storage Indication method used.



Hydrograph Summary Report Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
SCS Runoff	0.013	2	470	182				EAST ROAD 1
SCS Runoff	0.007	2	476	108				EX ROAD 1
Reservoir	0.004	2	524	180	1	101.76	31.6	ROAD RELEASE 1
SCS Runoff	0.017	2	470	248				EAST ROAD 2
SCS Runoff	0.011	2	478	157				EX ROAD 2
SCS Runoff	0.012	2	478	183				EXISTING ROAD 3
SCS Runoff	0.020	2	470	290				EAST ROAD 3
Reservoir	0.006	2	526	246	4	102.47	44.5	RELEASE 2
Reservoir	0.011	2	490	289	7	102.36	42.4	RELEASE 3
-DETENTION	I-FAST-F			Return P	eriod: 10 Y	ear	Monday 06	/ 20 / 2016
-DETENTION	I-EAST-F	 ROAD.gp	 w	Return P	eriod: 10 Y	íear	Monday, 06	/ 20 / 2016
	Hydrograph type (origin) SCS Runoff SCS Runoff SCS Runoff SCS Runoff Reservoir Reservoir	Hydrograph type (origin)Peak flow (cfs)SCS Runoff0.013SCS Runoff0.007Reservoir0.0017SCS Runoff0.012SCS Runoff0.020Reservoir0.011SCS Runoff0.012SCS Runoff0.011	Hydrograph (origin)Peak flow (origin)Timerval mierval (min)SCS Runoff0.0132SCS Runoff0.0072SCS Runoff0.0172SCS Runoff0.0122SCS Runoff0.0202Reservoir0.0062Reservoir0.0112SCS Runoff0.0112SCS Runoff0.0122Reservoir0.0112SCS Runoff0.0112SCS Runoff0.0112Reservoir0.0112SCS Runoff0.0112Reservoir0.0112SCS Runoff0.0112Reservoir0.0112SCS Runoff0.0112Reservoir0.0112SCS Runoff0.0112SCS Runoff0.0112Reservoir0.0112SCS RunoffNNSCS Runoff<	Hydrograph type (origin)Peak flow (sts)Time to heak (min)Ime to heak (min)SCS Runoff0.0172470Reservoir0.0172470SCS Runoff0.0172470SCS Runoff0.0122470SCS Runoff0.0122470SCS Runoff0.0202470Reservoir0.0102470Reservoir0.0112490Reservoir0.0112490	Hydrograph (origin) Pack (rs) Time on (rs) Fue on (rs) Hyd. (ut) SCS Runoff 0.013 2 470 182 SCS Runoff 0.007 2 470 182 SCS Runoff 0.017 2 470 182 SCS Runoff 0.017 2 470 248 SCS Runoff 0.011 2 470 248 SCS Runoff 0.012 2 478 183 SCS Runoff 0.020 2 470 246 Reservoir 0.011 2 490 289 Reservoir 0.011 2 490 289	Hydrograph (origin) Peak (ox) Time volume (min) Hyd. volume (crit) Inflow (vrit) Inflow (vrit) SCS Runoff 0.013 2 470 182	Hydrograph (origin) Resk (n) Interval (n) Interval (n) Hydrograph (n) Interval (n) Interval (n)	Hydrograph type (origin) Peak ftw (rb) Time interve (rb) Time (rb) Time (rb) Hydrograph (rb) Inflow (rb) Maximum (rb) Total streaused (rb) SCS Runoff 0.013 2 470 182 SCS Runoff 0.007 2 476 108 Reservoir 0.004 2 524 180 1 10176 31.6 SCS Runoff 0.017 2 478 183 SCS Runoff 0.012 2 470 280 SCS Runoff 0.012 2 470 280 SCS Runoff 0.011 2 490 289 7 102.36 42.4 Reservoir 0.011 2 490 289 7 102.36 14.5 SC Runoff Number of the servoir Number of the servoir Number of the ser
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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Hyd. No. 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.013 cfs
Storm frequency	= 10 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 182 cuft
Drainage area	= 0.016 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.50 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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Hyd. No. 2

EX ROAD 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.007 cfs
Storm frequency	= 10 yrs	Time to peak	= 476 min
Time interval	= 2 min	Hyd. volume	= 108 cuft
Drainage area	= 0.016 ac	Curve number	= 84
Basin Slope	= 69.0 %	Hydraulic length	= 12 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.50 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 3

ROAD RELEASE 1

Hydrograph type	= Reservoir	Peak discharge	= 0.004 cfs
Storm frequency	= 10 yrs	Time to peak	= 524 min
Time interval	= 2 min	Hyd. volume	= 180 cuft
Inflow hyd. No.	= 1 - EAST ROAD 1	Max. Elevation	= 101.76 ft
Reservoir name	= EAST STORAGE 1	Max. Storage	= 32 cuft

Storage Indication method used.



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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 4

EAST ROAD 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.017 cfs
Storm frequency	= 10 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 248 cuft
Drainage area	= 0.022 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.50 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



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Hyd. No. 5

EX ROAD 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.011 cfs
Storm frequency	= 10 yrs	Time to peak	= 478 min
Time interval	= 2 min	Hyd. volume	= 157 cuft
Drainage area	= 0.022 ac	Curve number	= 84
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.00 min
Total precip.	= 3.50 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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Hyd. No. 6

EXISTING ROAD 3

Hydrograph type =	SCS Runoff	Peak discharge	= 0.012 cfs
Storm frequency =	= 10 yrs	Time to peak	= 478 min
Time interval =	= 2 min	Hyd. volume	= 183 cuft
Drainage area =	= 0.026 ac	Curve number	= 84
Basin Slope =	= 0.0 %	Hydraulic length	= 0 ft
Tc method =	= TR55	Time of conc. (Tc)	= 7.60 min
Total precip. =	= 3.50 in	Distribution	= Type IA
Storm duration =	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 7

Hydrograph type	= SCS Runoff	Peak discharge	= 0.020 cfs
Storm frequency	= 10 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 290 cuft
Drainage area	= 0.026 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.50 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Monday, 06 / 20 / 2016

Hyd. No. 8

RELEASE 2

Hydrograph type	= Reservoir	Peak discharge	= 0.006 cfs
Storm frequency	= 10 yrs	Time to peak	= 526 min
Time interval	= 2 min	Hyd. volume	= 246 cuft
Inflow hyd. No.	= 4 - EAST ROAD 2	Max. Elevation	= 102.47 ft
Reservoir name	= EAST STORAGE 2	Max. Storage	= 44 cuft

Storage Indication method used.



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Monday, 06 / 20 / 2016

Hyd. No. 9

RELEASE 3

Hydrograph type	= Reservoir	Peak discharge	= 0.011 cfs
Storm frequency	= 10 yrs	Time to peak	= 490 min
Time interval	= 2 min	Hyd. volume	= 289 cuft
Inflow hyd. No.	= 7 - EAST ROAD 3	Max. Elevation	= 102.36 ft
Reservoir name	= EAST STORAGE 3	Max. Storage	= 42 cuft

Storage Indication method used.



Hydrograph Summary Report Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
SCS Runoff	0.015	2	470	210				EAST ROAD 1
SCS Runoff	0.009	2	476	132				EX ROAD 1
Reservoir	0.005	2	528	208	1	102.13	38.4	ROAD RELEASE 1
SCS Runoff	0.020	2	470	286				EAST ROAD 2
SCS Runoff	0.013	2	478	192				EX ROAD 2
SCS Runoff	0.015	2	478	225				EXISTING ROAD 3
SCS Runoff	0.023	2	470	334				EAST ROAD 3
Reservoir	0.007	2	530	284	4	103.00	54.0	RELEASE 2
Reservoir	0.013	2	490	333	7	102.75	49.5	RELEASE 3
-DETENTION	I-FAST-F	OAD.gr		Return P	eriod: 25 Y	ear	Monday, 06	20/2016
-DETENTION	I-EAST-F	 ROAD.gp	 w	Return P	eriod: 25 Y	íear	Monday, 06	5 / 20 / 2016
	Hydrograph type (origin) SCS Runoff SCS Runoff SCS Runoff SCS Runoff Reservoir Reservoir	Hydrograph type (origin)Peak flow (cfs)SCS Runoff0.015SCS Runoff0.007SCS Runoff0.013SCS Runoff0.023Reservoir0.013Reservoir0.013	Hydrograph (origin)Peak flow (offs)Timerval miterval (min)SCS Runoff0.0152SCS Runoff0.0052SCS Runoff0.0132SCS Runoff0.0132SCS Runoff0.0232Reservoir0.0132Reservoir0.0132Reservoir0.0132Reservoir0.0132Reservoir0.0132Reservoir0.0132Reservoir0.0132Reservoir0.0132Reservoir0.0132Reservoir0.0132Reservoir0.0132Reservoir0.0132Reservoir0.0132Reservoir0.0132Reservoir0.0132Reservoir0.0132Reservoir0.0132Reservoir0.0132ReservoirReservoir8ReservoirReservoir8ReservoirReservoir8ReservoirReservoir8ReservoirReservoir8ReservoirReservoir8ReservoirReservoir8ReservoirReservoir8ReservoirReservoir8ReservoirReservoir8ReservoirReservoir8ReservoirReservoir8ReservoirReservoir8ReservoirReser	Hydrograph (origin)Peak (fsowTime travel (minor)Peak (minor)SCS Runoff0.0152470Reservoir0.0052470SCS Runoff0.0132470SCS Runoff0.0132470SCS Runoff0.0152470SCS Runoff0.0232470Reservoir0.0132470Reservoir0.0132490	Hydrograph (origin) Peak (sts) Time on (ninn) Fue on (ninn) Hyd. (ninn) SCS Runoff 0.015 2 470 132 SCS Runoff 0.005 2 470 132 Reservoir 0.005 2 470 286 SCS Runoff 0.020 2 470 286 SCS Runoff 0.020 2 470 320 SCS Runoff 0.015 2 478 225 SCS Runoff 0.023 2 470 334 Reservoir 0.017 2 530 284 Reservoir 0.013 2 490 333 Preservoir 0.013 2 490 334 SC Runoff Nong Nong Nog Nog Preservoir 0.013 2 490 333 Preservoir Nog Nog Nog Nog Preservoir Nog Nog Nog Nog Preservoir	Hydrograph (origin) Peak (sc) Time voing (min) Hyd. voing (sc) Inflow (voing) Inflow (voing) Inflow (voing) SCS Runoff 0.015 2 470 210	Hydrograph (origin) Resk (n) Innerval (n) Innerval (n) Hydrograph (n) Innerval (n) Innerval (n) <	Нудгодгарћ (усиди) Реак поч (усиди) Титем поч (усиди) Титем (усиди) Нуд. (усиди) Іпбоу (усиди) Махилици (усиди) Тотаl зигде изод (сиди) SCS Runoff 0.015 2 476 132 Reservoir 0.005 2 476 132 SCS Runoff 0.005 2 476 132 SCS Runoff 0.020 2 478 192 SCS Runoff 0.013 2 478 192 SCS Runoff 0.013 2 470 334 SCS Runoff 0.013 2 490 333 7 102.75 49.5 Reservoir 0.013 2 490 333 7 102.75 49.5

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Monday, 06 / 20 / 2016

Hyd. No. 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.015 cfs
Storm frequency	= 25 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 210 cuft
Drainage area	= 0.016 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



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Monday, 06 / 20 / 2016

Hyd. No. 2

EX ROAD 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.009 cfs
Storm frequency	= 25 yrs	Time to peak	= 476 min
Time interval	= 2 min	Hyd. volume	= 132 cuft
Drainage area	= 0.016 ac	Curve number	= 84
Basin Slope	= 69.0 %	Hydraulic length	= 12 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 3

ROAD RELEASE 1

Hydrograph type	= Reservoir	Peak discharge	= 0.005 cfs
Storm frequency	= 25 yrs	Time to peak	= 528 min
Time interval	= 2 min	Hyd. volume	= 208 cuft
Inflow hyd. No.	= 1 - EAST ROAD 1	Max. Elevation	= 102.13 ft
Reservoir name	= EAST STORAGE 1	Max. Storage	= 38 cuft

Storage Indication method used.



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Hyd. No. 4

Hydrograph type	= SCS Runoff	Peak discharge	= 0.020 cfs
Storm frequency	= 25 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 286 cuft
Drainage area	= 0.022 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Monday, 06 / 20 / 2016

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 5

EX ROAD 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.013 cfs
Storm frequency	= 25 yrs	Time to peak	= 478 min
Time interval	= 2 min	Hyd. volume	= 192 cuft
Drainage area	= 0.022 ac	Curve number	= 84
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.00 min
Total precip.	= 4.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Monday, 06 / 20 / 2016

Hyd. No. 6

EXISTING ROAD	3
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Hydrograph type	= SCS Runoff	Peak discharge	= 0.015 cfs
Storm frequency	= 25 yrs	Time to peak	= 478 min
Time interval	= 2 min	Hyd. volume	= 225 cuft
Drainage area	= 0.026 ac	Curve number	= 84
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.60 min
Total precip.	= 4.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 7

Hydrograph type	= SCS Runoff	Peak discharge	= 0.023 cfs
Storm frequency	= 25 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 334 cuft
Drainage area	= 0.026 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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Hyd. No. 8

RELEASE 2

Hydrograph type	= Reservoir	Peak discharge	= 0.007 cfs
Storm frequency	= 25 yrs	Time to peak	= 530 min
Time interval	= 2 min	Hyd. volume	= 284 cuft
Inflow hyd. No.	= 4 - EAST ROAD 2	Max. Elevation	= 103.00 ft
Reservoir name	= EAST STORAGE 2	Max. Storage	= 54 cuft

Storage Indication method used.



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Monday, 06 / 20 / 2016

Hyd. No. 9

RELEASE 3

Hydrograph type	= Reservoir	Peak discharge	= 0.013 cfs
Storm frequency	= 25 yrs	Time to peak	= 490 min
Time interval	= 2 min	Hyd. volume	= 333 cuft
Inflow hyd. No.	= 7 - EAST ROAD 3	Max. Elevation	= 102.75 ft
Reservoir name	= EAST STORAGE 3	Max. Storage	= 50 cuft

Storage Indication method used.



Hydrograph Summary Report Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.017	2	470	238				EAST ROAD 1
2	SCS Runoff	0.011	2	474	157				EX ROAD 1
3	Reservoir	0.005	2	530	236	1	102.52	45.4	ROAD RELEASE 1
4	SCS Runoff	0.023	2	470	324				EAST ROAD 2
5	SCS Runoff	0.016	2	478	228				EX ROAD 2
6	SCS Runoff	0.019	2	478	267				EXISTING ROAD 3
7	SCS Runoff	0.026	2	470	379				EAST ROAD 3
8	Reservoir	0.000	2	n/a	0	4	0.00	0.000	RELEASE 2
9	Reservoir	0.014	2	492	377	7	103.13	56.4	RELEASE 3
120	-DETENTION	I-FAST-F			Return P	eriod: 100	Year	Monday 06	7 20 / 2016
120	-DETENTION	I-EAST-R	ROAD.gp) w	Return P	eriod: 100	Year	Monday, 06	/ 20 / 2016

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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Monday, 06 / 20 / 2016

Hyd. No. 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.017 cfs
Storm frequency	= 100 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 238 cuft
Drainage area	= 0.016 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.50 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Monday, 06 / 20 / 2016

Hyd. No. 2

EX ROAD 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.011 cfs
Storm frequency	= 100 yrs	Time to peak	= 474 min
Time interval	= 2 min	Hyd. volume	= 157 cuft
Drainage area	= 0.016 ac	Curve number	= 84
Basin Slope	= 69.0 %	Hydraulic length	= 12 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.50 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 3

ROAD RELEASE 1

Hydrograph type	= Reservoir	Peak discharge	= 0.005 cfs
Storm frequency	= 100 yrs	Time to peak	= 530 min
Time interval	= 2 min	Hyd. volume	= 236 cuft
Inflow hyd. No.	= 1 - EAST ROAD 1	Max. Elevation	= 102.52 ft
Reservoir name	= EAST STORAGE 1	Max. Storage	= 45 cuft

Storage Indication method used.



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 4

Hydrograph type	= SCS Runoff	Peak discharge	= 0.023 cfs
Storm frequency	= 100 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 324 cuft
Drainage area	= 0.022 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.50 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 5

EX ROAD 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.016 cfs
Storm frequency	= 100 yrs	Time to peak	= 478 min
Time interval	= 2 min	Hyd. volume	= 228 cuft
Drainage area	= 0.022 ac	Curve number	= 84
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.00 min
Total precip.	= 4.50 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Monday, 06 / 20 / 2016

Hyd. No. 6

EXISTING ROAD	3
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Hydrograph type =	SCS Runoff	Peak discharge	= 0.019 cfs
Storm frequency =	= 100 yrs	Time to peak	= 478 min
Time interval	= 2 min	Hyd. volume	= 267 cuft
Drainage area =	= 0.026 ac	Curve number	= 84
Basin Slope =	= 0.0 %	Hydraulic length	= 0 ft
Tc method =	= TR55	Time of conc. (Tc)	= 7.60 min
Total precip. =	= 4.50 in	Distribution	= Type IA
Storm duration =	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 7

EAST ROAD 3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.026 cfs
Storm frequency	= 100 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 379 cuft
Drainage area	= 0.026 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.50 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484



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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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Hyd. No. 8

RELEASE 2

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 100 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 4 - EAST ROAD 2	Max. Elevation	= 0.00 ft
Reservoir name	= EAST STORAGE 2	Max. Storage	= 0 cuft

Storage Indication method used.



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Monday, 06 / 20 / 2016

Hyd. No. 9

RELEASE 3

Hydrograph type	= Reservoir	Peak discharge	= 0.014 cfs
Storm frequency	= 100 yrs	Time to peak	= 492 min
Time interval	= 2 min	Hyd. volume	= 377 cuft
Inflow hyd. No.	= 7 - EAST ROAD 3	Max. Elevation	= 103.13 ft
Reservoir name	= EAST STORAGE 3	Max. Storage	= 56 cuft

Storage Indication method used.



Hydraflow Rainfall Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Return	Intensity-Duration-Frequency Equation Coefficients (FHA)							
(Yrs)	В	D	E	(N/A)				
1	0.0000	0.0000	0.0000					
2	6.9527	2.1000	0.6577					
3	0.0000	0.0000	0.0000					
5	9.9393	2.7000	0.6824					
10	10.2300	2.0000	0.6569					
25	11.8938	2.0000	0.6571					
50	13.7560	2.2000	0.6602					
100	15.0837	2.1000	0.6597					

File name: Portland IDF.IDF

Intensity = B / (Tc + D)^E

Return		Intensity Values (in/hr)										
(Yrs)	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	1.92	1.35	1.07	0.91	0.79	0.71	0.65	0.59	0.55	0.52	0.49	0.46
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	2.47	1.75	1.40	1.18	1.03	0.92	0.83	0.77	0.71	0.66	0.62	0.59
10	2.85	2.00	1.59	1.34	1.17	1.05	0.95	0.88	0.82	0.76	0.72	0.68
25	3.31	2.32	1.85	1.56	1.36	1.22	1.11	1.02	0.95	0.89	0.83	0.79
50	3.74	2.64	2.10	1.78	1.55	1.39	1.26	1.16	1.08	1.01	0.95	0.90
100	4.14	2.91	2.32	1.96	1.71	1.53	1.39	1.28	1.19	1.11	1.05	0.99

Tc = time in minutes. Values may exceed 60.

Preci	p. file name: H:\Projec	ts\215012000\3_	Design\Calculations\Portland data\WEST LINN PRECIPITATION.pcp)
				п

	Rainfall Precipitation Table (in)							
Storm Distribution	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	2.30	0.00	3.00	3.50	4.00	0.00	4.50
SCS 6-Hr	0.00	1.20	0.00	1.30	1.60	1.80	0.00	2.20
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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Watershed Model Schematic Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 1

<u>Legend</u>

<u>Hyd.</u> Origin **Description**

SCS Runoff ODOT BASIN 1

Project: 120-ODOT.gpw

Hydrograph Return Period Recap Hydrafiow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Description
1	type (origin)	hyd(s)	1-yr	2-yr 0.262	3-yr	5-yr 0.464	10-yr 0.621	25-yr 0.785	50-yr	100-yr 0.954	ODOT BASIN

Hydrograph Summary Report Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

			(min)	(min)	(cuft)	nyd(s)	elevation (ft)	strge used (cuft)	Description
1	SCS Runoff	0.785	(min) 1	(min) 488	12,629	nya(s)	elevation (ft)	strge used (cuft)	Description ODOT BASIN
120	-ODOT.anw				Return P	eriod: 25 Y	ear	Monday, 06	/ 20 / 2016

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 1

ODOT BASIN

Hydrograph type	= SCS Runoff	Peak discharge	= 0.785 cfs
Storm frequency	= 25 yrs	Time to peak	= 488 min
Time interval	= 1 min	Hyd. volume	= 12,629 cuft
Drainage area	= 1.510 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 26.40 min
Total precip.	= 4.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.420 x 98) + (1.090 x 77)] / 1.510



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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No. 1

ODOT BASIN

<u>Description</u>	A		<u>B</u>		<u>C</u>		<u>Totals</u>
Sheet Flow Manning's n-value Flow length (ft) Two-year 24-hr precip. (in) Land slope (%)	= 0.011 = 105.0 = 2.30 = 3.00		0.400 94.0 2.30 50.00		0.400 101.0 2.30 5.50		
Travel Time (min)	= 1.26	+	6.65	+	17.04	=	24.95
Shallow Concentrated Flow Flow length (ft) Watercourse slope (%) Surface description Average velocity (ft/s)	= 337.00 = 5.50 = Unpave =3.78	d	0.00 0.00 Unpave 0.00	ed	0.00 0.00 Unpave 0.00	ed	
Travel Time (min)	= 1.48	+	0.00	+	0.00	=	1.48
Channel Flow X sectional flow area (sqft) Wetted perimeter (ft) Channel slope (%) Manning's n-value Velocity (ft/s)	= 0.00 = 0.00 = 0.015 =0.00		0.00 0.00 0.00 0.015 0.00		0.00 0.00 0.00 0.015 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							26.40 min

ODOT CHANNEL CALCULATIONS

Project:	Willamette Falls Self-Storage
#:	2150120.00
By:	BLF
Date:	07-01-2016

Summary: Per ODOT Manual Table 8.3, the shear stresses for the entire basin exceed Class C Retardance and must use additional armoring. To determine where additional armoring must start, the below calculations were performed for 100-ft segments beginning at the tangent point of the channel and moving upstream.

TOTAL BASIN

GIVEN

Q25	0.785 cfs
Z1	6
Z2	2
У	0.56 ft
S	0.05 ft/ft
Y	62.4 lb/ft ³

FIND

Depth where Qc=Q25

ASSUME

Grass Retardance Class C

.

SOLVE

A	1.25 ft²	
Р	4.66 ft	
R	0.27 ft	
n	0.21	(from ODOT Figure. 8-26)
V	0.66 ft/s	(ODOT Equation 8-12)
Qc	0.83 cfs	(ODOT Equation 8-15)
К1	1.30	(from ODOT Figure. 8-29)
Kb	1.00	(from ODOT Figure. 8-31)
Ту	1.75 lb/ft ²	(ODOT Equation 8-52)
Тs	2.27 lb/ft ²	(ODOT Equation 8-53)
Тb	1.75 lb/ft ²	(ODOT Equation 8-55)

ODOT CHANNEL CALCULATIONS

Project: Willamette Falls Self-Storage
#: 2150120.00
By: BLF
Date: 07-01-2016
Summary: Continuation of shear stress calculations.

100FT UPSTREAM FROM TANGENT GIVEN

Q25	0.499 cfs
Z1	6
Z2	2
у	0.36 ft
S	0.05 ft/ft
Y	62.4 lb/ft ³

FIND

Depth where Qc=Q25

ASSUME

Grass Retardance Class C

SOLVE

A P R	0.52 ft ² 2.99 ft 0.17 ft	
n	0.35	(from ODOT Figure. 8-26)
V	0.29 ft/s	(ODOT Equation 8-12)
Qc	0.15 cfs	(ODOT Equation 8-15)
K1	1.30	(from ODOT Figure. 8-29)
Kb	1.00	(from ODOT Figure. 8-31)
Ту	1.12 lb/ft ²	(ODOT Equation 8-52)
Ts	1.46 lb/ft ²	(ODOT Equation 8-53)
Tb	1.12 lb/ft ²	(ODOT Equation 8-55)

ODOT CHANNEL CALCULATIONS

Project: Willamette Falls Self-Storage
#: 2150120.00
By: BLF
Date: 07-01-2016
Summary: Continuation of shear stress calculations and lining selection.

200FT UPSTREAM FROM TANGENT GIVEN

Q25	0.322 cfs
Z1	6
Z2	2
У	0.23 ft
S	0.05 ft/ft
Y	62.4 lb/ft ³

FIND

Depth where Qc=Q25

ASSUME

Grass Retardance Class C

SOLVE

A P	0.22 ft ² 1.93 ft	
R	0.11 ft	
n	1	(from ODOT Figure. 8-26)
V	0.08 ft/s	(ODOT Equation 8-12)
Qc	0.02 cfs	(ODOT Equation 8-15)
K1	1.30	(from ODOT Figure. 8-29)
Kb	1.00	(from ODOT Figure. 8-31)
Τу	0.72 lb/ft ²	(ODOT Equation 8-52)
Тs	0.94 lb/ft ²	(ODOT Equation 8-53)
Тb	0.72 lb/ft ²	(ODOT Equation 8-55)

LINING: Grass lining with Class C retardance has a maximum permissible shear stress of 1.0 lbs/ft². ODOT Class 50 riprap has a maximum permissible shear stress of 2.36 lbs/ft². Given the shear stresses shown above, the channel must be lined with ODOT Class 50 ripap 200-ft upstream of the tangent point.

Pipe Sizing Calculation 25-YR, 24-HR



DESIGN DRIVEN I CLIENT FOCUSED

Based on SCS flow inputs (Flows calculated in "Hydraflow")

Project:	Willamette Self-Storage
By:	BLF
Date:	7/25/2016
Job:	2150120.00
Mannings n=	0.013

Mannings n= Mannings n=

0.013

pipe ductile iron

Link		Incremental	Total	Pipe	Pipe	Pipe	Used Pipe	Pipe
		Flow	Flow	Slope	Diameter	Capacity	Capacity	Velocity
#	Storm Input Descriptions	(cfs)	(cfs)	(%)	(inches)	(cfs)	(%)	(fps)
	West and	Combined Co	nveyance					
1	North Roof to Pond A	0.259	0.259	0.60	6	0.43	60	2.21
2	Pond A to Combined pipe	0.259	0.259	0.60	6	0.43	60	2.21
3	South Roof to combined pipe	0.249	0.249	20.00	6	2.51	10	12.77
4	Combined Roof Flow to Detention Pond	0.000	0.508	0.60	8	0.93	54	2.68
5	Detention pond outlet	0.273	0.273	3.30	6	1.02	27	5.19
6	West Road to Pond C	0.034	0.034	5.70	4	0.45	7	5.20
7	Pond C to outlet	0.034	0.034	9.20	6	1.70	2	8.66
	Ea	st Conveyand	e					
7	East Road 3 Release to East Road 2	0.010	0.010	5.40	2	0.07	14	3.19
8	East Road 2 Release to combined pipe	0.017	0.027	8.70	2	0.09	31	4.05
8	East Road 1 Release to combined pipe	0.005	0.032	0.60	4	0.15	22	1.69
9	Pond D to outlet	0.067	0.067	0.60	6	0.43	15	2.21





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EXIST	ING 8	SITE A	NALY	SIS:	
EXISTING	SITE A	REA		68,663 SF	(1.58
SLOPES:	0–15	PERCENT	TYPE I*	45,648 SF	(66.5
	15–25	PERCENT	TYPE II*	8,435 SF	(12.3

22,142 SF (32.2%)** NON-TYPE I & II LANDS PER CDC 02.030: 46,521 SF (67.8%)

**THIS INCLUDES BERNERT CREEK AND ASSOCIATED WETLANDS PLUS ALL SLOPES 25% OR GREATER

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SHEET TITLE: SITE ANALYSIS PLAN

DRAWN BY:	BLF
CHECKED BY	MWR
SHFFT:	

C1.0

JOB NO. 2150120.00

- Assessment prepared by Schott and Associates, April 2016
- of disturbed area within the Water Resource Area
- Area 1-6.



REVISED 8/8/2016 REVISED GRADING AND SURFACE WATER MANAGEMENT PLAN - 7/20/2016

JOB NO. 2150120.00





GENERAL NOTES

- 1. ALL WORK SHALL CONFORM TO THE STANDARD SPECIFICATIONS AND THE REQUIREMENTS OF THE CITY OF WEST LINN AND THE CURRENT AMERICAN PUBLIC WORKS ASSOCIATION STANDARDS FOR PUBLIC WORKS CONSTRUCTION.
- 2. THE WORKING DRAWINGS ARE GENERALLY DIAGRAMMATIC. THEY DO NOT SHOW EVERY OFFSET, BEND OR ELBOW REQUIRED FOR INSTALLATION IN THE SPACE PROVIDED. THEY DO NOT SHOW EVERY DIMENSION, COMPONENT PIECE, SECTION, JOINT OR FITTING REQUIRED TO COMPLETE THE PROJECT. ALL LOCATIONS FOR WORK SHALL BE CHECKED AND COORDINATED WITH EXISTING CONDITIONS IN THE FIELD BEFORE BEGINNING CONSTRUCTION. EXISTING UNDERGROUND UTILITIES LAYING WITHIN THE LIMITS OF EXCAVATION SHALL BE VERIFIED AS TO CONDITION, SIZE AND LOCATION BY UNCOVERING, PROVIDING SUCH IS PERMITTED BY LOCAL PUBLIC AUTHORITIES WITH JURISDICTION, BEFORE BEGINNING CONSTRUCTION. CONTRACTOR TO NOTIFY ENGINEER IF THERE ARE ANY DISCREPANCIES.
- 3. EFFECTIVE EROSION PREVENTION AND SEDIMENT CONTROL IS REQUIRED. EROSION CONTROL DEVICES MUST BE INSTALLED AND MAINTAINED TO MEET CITY OF WEST LINN REQUIREMENTS. THE GOVERNING JURISDICTION MAY, AT ANY TIME, ORDER CORRECTIVE ACTION AND STOPPAGE OF WORK TO ACCOMPLISH EFFECTIVE EROSION CONTROL.
- 4. EFFECTIVE DRAINAGE CONTROL IS REQUIRED. DRAINAGE SHALL BE CONTROLLED WITHIN THE WORK SITE AND SHALL BE ROUTED SO THAT ADJACENT PRIVATE PROPERTY, PUBLIC PROPERTY, AND THE RECEIVING SYSTEM ARE NOT ADVERSELY IMPACTED. THE GOVERNING JURISDICTION MAY, AT ANY TIME, ORDER CORRECTIVE ACTION AND STOPPAGE OF WORK TO ACCOMPLISH EFFECTIVE DRAINAGE CONTROL.
- 5. CONTRACTOR SHALL ADJUST ALL STRUCTURES IMPACTED BY CONSTRUCTION IMPROVEMENTS TO NEW FINISH GRADES.
- 6. EXCAVATION: EXCAVATE FOR SLABS, PAVING, AND OTHER IMPROVEMENTS TO SIZES AND LEVELS SHOWN OR REQUIRED. ALLOW FOR FORM CLEARANCE AND FOR PROPER COMPACTION OF REQUIRED BACKFILLING MATERIAL. EXCAVATOR(S) MUST COMPLY WITH O.R.S. 757.541 THROUGH 757.571; EXCAVATOR(S) SHALL NOTIFY ALL UTILITY COMPANIES FOR LINE LOCATIONS SEVENTY-TWO (72) HOURS (MINIMUM) PRIOR TO START OF WORK. DAMAGE TO UTILITIES SHALL BE CORRECTED AT THE CONTRACTOR'S EXPENSE. (ONE CALL LOCATE UTILITY NOTIFICATION CENTER - PORTLAND METRO AREA 246-6699, OREGON 696-4848, ALL OTHER AREAS 1-800-332-2344).
- WHERE CONNECTING TO AN EXISTING PIPE, AND PRIOR TO ORDERING MATERIALS, THE CONTRACTOR SHALL EXPOSE THE END OF THE EXISTING PIPE VERIFY THE LOCATION, SIZE, AND ELEVATION. NOTIFY ENGINEER OF ANY DISCREPANCIES.
- REQUEST BY THE CONTRACTOR FOR CHANGES TO THE PLANS MUST BE APPROVED BY THE ENGINEER.
- WASTE DISPOSAL AND RECYCLING IN BUILDING

KEYNOTES:

- 1. CONCRETE VERTICAL CURB, SEE DETAIL 1/C8.0
- 2. PERVIOUS CONCRETE SIDEWALK, SEE DETAIL 2/C8.0
- 3. ASPHALT PAVEMENT, SEE PUBLIC IMPROVEMENT PLANS
- 4. PERVIOUS PAVEMENT, SEE DETAIL 5/C8.0
- 5. LANDSCAPE AREA, SEE LANDSCAPE PLANS
- 6. WATER QUALITY POND, SEE UTILITY PLAN
- 7. CONSTRUCT CONCRETE DRIVEWAY, SEE PUBLIC IMPROVEMENT PLANS
- 8. CONSTRUCT 6' CHAINLINK FENCE ON TOP OF WALL
- 9. CONSTRUCT ROCK RETAINING WALL, SEE DETAIL 9/C8.0
- 10. VISION CLEARANCE TRIANGLE
- 11. INSTALL BIKE RACK, SEE DETAIL 6/8.
- 12. CONSTRUCT CONCRETE RETAINING WALL, SEE DETAIL 4/C8.0
- 13. SHEET PILE WALL, DESIGN-BUILD BY CONTRACTOR-DEFERRED SUBMITTAL
- 14. OPEN PRECAST ARCH STRUCTURE, SEE SHEET C4.0
- 15. TREE PROTECTION
- 16. PROTECTED TREE CONSTRUCTION LIMITS
- 17. INSTALL DIRECTIONAL ARROW, SEE DETAIL 3/C8.0
- 18. DETENTION POND, SEE UTILITY PLAN
- 19. SURFACE WATER FACILITY GATE, 15' WIDE, SEE DETAIL 4/C8.2

SITE COVERAGE SUMMARY:

PREVIOUSLY DISTURBED AREA	13,000 SF
TEMPORARILY DISTURBED AREA	29,412 SF
PERMANENTLY DISTURBED AREA	30,726 SF
LANDSCAPED AREA	29,412 SF
TREE CANOPY AREA	10,954 SF
MAXIMUM DISTURBED AREA ALLOWED IN WRA	15,890 SF
MAXIMUM DISTURBED AREA IN WRA	15,214 SF



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GRADING NOTES

- ROUGH GRADING: BRING ALL FINISH GRADES TO APPROXIMATE LEVELS INDICATED. WHERE GRADES ARE NOT OTHERWISE INDICATED, FINISH GRADES ARE TO BE THE SAME AS ADJACENT SIDEWALKS, CURBS, OR THE OBVIOUS GRADE OF ADJACENT STRUCTURE. GRADE TO UNIFORM LEVELS OR SLOPES BETWEEN POINTS WHERE GRADES ARE GIVEN. ROUND OFF SURFACES, AVOID ABRUPT CHANGES IN LEVELS. ROUGH GRADE TO ALLOW FOR DEPTH OF CONCRETE SLABS, WALKS, AND THEIR BASE COURSES. GRADE FOR PAVED DRIVES AND PAVED PARKING AREAS AS INDICATED AND SPECIFIED HEREIN, AND PROVIDE FOR SURFACE DRAINAGE AS SHOWN, ALLOWING FOR THICKNESS OF SURFACING MATERIAL. FINISH GRADING AT COMPLETION OF JOB AND AFTER BACKFILLING BY OTHER CRAFTS HAS BEEN COMPLETED, REFILL AND COMPACT AREAS WHICH HAVE SETTLED OR ERODED TO BRING TO FINAL GRADES. **GRADING TOLERANCES:** ROUGH GRADE AT PAVED OR LANDSCAPED AREAS: ±0.1 FT. FINISH GRADE PRIOR TO PLACING FINAL SURFACING: ±0.03 FT.
- EXCAVATION: EXCAVATE FOR SLABS, PAVING, AND OTHER 2. IMPROVEMENTS TO SIZES AND LEVELS SHOWN OR REQUIRED. ALLOW FOR FORM CLEARANCE AND FOR PROPER COMPACTION OF REQUIRED BACKFILLING MATERIAL. EXCAVATOR(S) MUST COMPLY WITH O.R.S. 757.541 THROUGH 757.571; EXCAVATOR(S) SHALL NOTIFY ALL UTILITY COMPANIES FOR LINE LOCATIONS 72 HOURS (MINIMUM) PRIOR TO START OF WORK. DAMAGE TO UTILITIES SHALL BE CORRECTED AT THE CONTRACTOR'S EXPENSE.
- 3. EFFECTIVE EROSION PREVENTION AND SEDIMENT CONTROL IS REQUIRED. EROSION CONTROL DEVICES MUST BE INSTALLED AND MAINTAINED MEETING THE CITY OF WEST LINN REQUIREMENTS. THE GOVERNING JURISDICTION MAY, AT ANY TIME, ORDER CORRECTIVE ACTION AND STOPPAGE OF WORK TO ACCOMPLISH EFFECTIVE EROSION CONTROL.
- EFFECTIVE DRAINAGE CONTROL IS REQUIRED. DRAINAGE SHALL BE CONTROLLED WITHIN THE WORK SITE AND SHALL BE SO ROUTED THAT ADJACENT PRIVATE PROPERTY, PUBLIC PROPERTY, AND THE RECEIVING SYSTEM ARE NOT ADVERSELY IMPACTED. THE GOVERNING JURISDICTION MAY, AT ANY TIME, ORDER CORRECTIVE ACTION AND STOPPAGE OF WORK TO ACCOMPLISH EFFECTIVE DRAINAGE CONTROL.
- SITE TOPSOIL SHALL BE STOCKPILED DURING CONSTRUCTION AND USED FOR LANDSCAPING.
- THE SURVEY INFORMATION SHOWN AS A BACKGROUND SCREEN ON THIS SHEET IS BASED ON A SURVEY BY NORTHWEST SURVEYING, AND IS SHOWN FOR REFERENCE ONLY. CONTRACTOR TO VERIFY ALL EXISTING CONDITIONS WITH HIS OWN RESOURCES PRIOR TO START OF ANY CONSTRUCTION.
- CONTRACTOR TO COORDINATE GRADES AT ENTRANCE WITH ARCHITECTURAL PLANS PRIOR TO CONSTRUCTION.
- 8. 2% MAXIMUM SLOPE AT ALL ADA-COMPLIANT PARKING SPACES AND LOADING ZONES
- 5% MAX SLOPE (EXCLUDING RAMPS) AT PEDESTRIAN SIDEWALK CONNECTIONS BÈTWEEN PUBLIC R.Ó.W. AND BUILDING ENTRANCES.
- 10. WHERE SLOPES ARE STEEPER THAN 3:1, CONTRACTOR SHALL INSTALL JUTE MATTING. SLOPE SHALL BE PREPARED TO ENSURE COMPLETE AND DIRECT CONTACT OF MATTING WITH SOIL. FOLLOW MANUFACTURER'S RECOMMENDATIONS
- . REFER TO PUBLIC IMPROVEMENT PLANS FOR GRADING IN RIGHT OF WAY

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SHEET TITLE:

GRADING PLAN	

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149.40 TW 141.97 BW |141.47 |[142.00 TW 150.05 BW 141.50 BC N V V PROPOSED BUILDING FF=141.5 2 EAST ENTRANCE C3.1 1"=5'





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SURFACE ELEVATION SPOT GRADE SURFACE ELEVATION CONTOUR SLOPE ARROW WETLAND BOUNDARY CONCRETE RETAINING WALL ROCK RETAINING WALL GROUND ELEVATION AT TOP OF WALL GROUND ELEVATION AT BOTTOM OF WALL BOTTOM OF CURB CONCRETE CURB

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GROUND ELEVATION AT TOP OF WALL GROUND ELEVATION AT BOTTOM OF WALL

1:1

UTILITY NOTES

- THE UNIFORM PLUMBING CODE AND THE INTERNATIONAL BUILDING CODE. ALL WORK WITHIN
- THEY DO NOT SHOW EVERY OFFSET, BEND OR ELBOW REQUIRED FOR INSTALLATION IN THE SPACE PROVIDED. THEY DO NOT SHOW EVERY DIMENSION, COMPONENT PIECE, SECTION, JOINT OR FITTING REQUIRED TO COMPLETE THE PROJECT. ALL LOCATIONS FOR WORK SHALL BE CHECKED AND COORDINATED WITH EXISTING CONDITIONS IN THE FIELD BEFORE BEGINNING CONSTRUCTION. EXISTING UNDERGROUND UTILITIES LAYING WITHIN THE LIMITS OF EXCAVATION SHALL BE VERIFIED AS TO CONDITION, SIZE AND LOCATION BY UNCOVERING, PROVIDING SUCH IS PERMITTED BY LOCAL PUBLIC AUTHORITIES WITH JURISDICTION, BEFORE BEGINNING CONSTRUCTION. CONTRACTOR TO NOTIFY
- UNIFORM PLUMBING CODE CHAPTER 7, SECTIONS 707 AND 719, AND CHAPTER 11, SECTION 1101.12. NOTE: NOT ALL REQUIRED CLEANOUTS ARE SHOWN ON THE

- WITHIN THE BUILDING AND TO 5' OUTSIDE THE BUILDING.
- ALL DOWNSPOUT LEADERS TO BE 6" AT 2.0% MIN. UNLESS NOTED OTHERWISE.
- VERIFY LOCATION, SIZE AND DEPTH OF EXISTING UTILITIES BY POTHOLING PRIOR TO CONSTRUCTION. NOTIFY ENGINEER OF DISCREPANCIES.
- METER VAULT AND BACKFLOW PREVENTER VAULT TO THE DOUBLE DETECTOR CHECK VALVE (FIRE) VAULT. PROVIDE 1/3 HP SUMP PUMP AT BASE OF FIRE VAULT FROM SUMP PUMP TO DAYLIGHT AT NEAREST CURB. FURNISH ³/₄" DIAMETER CONDUIT FROM BUILDING ELECTRICAL ROOM TO FIRE VAULT FOR SUMP PUMP ELECTRICAL SERVICE. NOTE: COORDINATE WITH FIRE PROTECTION CONTRACTOR FOR FLOW SENSOR INSTALLATION AND CONDUIT REQUIREMENTS.



KEYNOTES:

- 1. CONNECT 6" STORM PIPE TO ROOF DRAIN DOWNSPOU
- 2. 120 SF VEGETATED WATER QUALITY FACILITY (BASIN A), SEE DETAIL 7/C8.0IE IN = 139.63 (6") TOP OF SOIL ELEV=138.88
- 3. CONSTRUCT CATCH BASIN, SEE DETAIL 3/C8.2 RIM=139.63 IE OUT=137.38 (6")
- 4. CONSTRUCT CATCH BASIN, SEE DETAIL 3/C8.2 RIM=138.16 IE OUT=135.91 (6")
- 5. EMERGENCY SPILLWAY TOP OF POND =136.42 SPILLWAY IE=136.17 (3" BELOW TOP OF POND)
- 6. DETENTION POND (BASIN B), SEE DETAIL 8/C8.0 IE IN = 135.42 (6") BOTTOM OF POND ELEV=133.67 TOP OF DETENTION ELEV=135.42 TOP OF FREEBOARD ELEV=136.42
- STANDARD DETENTION POND OUTLET, SEE DETAIL 1/C8.2 RIM=133.67 IE IN=131.76 (4") IE OUT=131.56 (6" ORIFICE)
- 8. 115 SF VEGETATED WATER QUALITY FACILITY (BASIN E), SEE DETAIL 11/C8.0IE IN = 138.16 (6") TOP OF SOIL ELEV=137.41
- STANDARD DETENTION POND OUTLET, SEE DETAIL 1/C8.2 RIM=135.85 ORIFICE ELEVATION=131.56 (1.96") ORIFICE ELEVATION=132.81 (2.65") IE OUT=131.02 (6")
- 10. IE=135.42 (6" PVC)
- 11. SANITARY CONNECTION TO BUILDING, COORDINATE WITH PLUMBING PLANS
- 12. CONNECT TO EXISTING SANITARY MANHOLE RIM=135.01 IE IN=126.20 (6"), EXISTING IE IN=126.3 (6") IE OUT=126.10 (6"), EXISTING
- 13. 1" DOMESTIC WATER SERVICE WITH 1" METER, BY CITY OF WEST LINN 14. INSTALL 8" FIRE TAP TO 18" EXISTING MAIN
- 15. INSTALL 6" FIRE TAP TO 18" EXISTING MAIN
- 16. INSTALL STANDARD FIRE HYDRANT ASSEMBLY, SEE PUBLIC IMPROVEMENT PLANS
- 17. SEE PUBLIC IMPROVEMENTS FOR VAULT AND FDC.
- 18. INSTALL 1" WATER FROM METER TO BUILDING.
- 1" DOMESTIC WATER CONNECTION TO BUILDING, COORDINATE WITH PLUMBING PLANS.
- 20. 8" FIRE WATER CONNECTION TO BUILDING, COORDINATE WITH PLUMBING PLANS.
- 21. 6'x3'x2' DEEP CLASS 50 RIPRAP PAD, SEE DETAIL 3/C8.1
- 22. INSTALL 30 LF OF 24" CULVERT CULVERT
- 23. NOT USED
- 24. NOT USED
- 25. NOT USED 26. NOT USED
- 27. IRRIGATION P.O.C., SEE LANDSCAPE PLANS
- 28. NOT USED
- 29. 2" PIPE CONNECTION TO PROPOSED MANHOLE OVER EXISTING CULVERT. SEE PUBLIC PLANS.
- 30. 23 SF VEGETATED WATER QUALITY FACILITY (BASIN C), IE IN = 137.83 (2") TOP OF SOIL ELEV=137.08
- 31. CONSTRUCT CATCH BASIN, SEE DETAIL 3/C8.2 RIM=137.83 IE OUT=135.58 (4")
- 32. 12 SF VEGETATED WATER QUALITY FACILITY (BASIN D), IE IN = 131.95 (4")TOP OF SOIL ELEV=131.20
- 33. CONSTRUCT CATCH BASIN, SEE DETAIL 3/C8.2 RIM=131.95 IE OUT=129.70 (6")
- 34. CONSTRUCT CATCH BASIN, SEE DETAIL 5/C8.2 RIM=139.59 IE OUT=135.61 (4")
- 35. CONSTRUCT CATCH BASIN, SEE DETAIL 5/C8.2 RIM=137.09 IE OUT=132.91 (2")
- 36. CONSTRUCT CATCH BASIN, SEE DETAIL 5/C8.2 RIM=135.48 IE OUT=132.13 (4")



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EROSION CONTROL GENERAL NOTES

- 1. HOLD A PRE-CONSTRUCTION MEETING OF PROJECT CONSTRUCTION PERSONNEL THAT INCLUDES THE INSPECTOR TO DISCUSS EROSION AND SEDIMENT CONTROL MEASURES AND CONSTRUCTION LIMITS.
- 2. EROSION AND SEDIMENT CONTROL MEASURES INCLUDING PERIMETER SEDIMENT CONTROL MUST BE IN PLACE BEFORE VEGETATION IS DISTURBED AND MUST REMAIN IN PLACE AND BE MAINTAINED, REPAIRED, AND PROMPTLY IMPLEMENTED FOLLOWING PROCEDURES ESTABLISHED FOR THE DURATION OF CONSTRUCTION, INCLUDING PROTECTION FOR ACTIVE STORM DRAIN INLETS AND CATCH BASINS AND APPROPRIATE NON-STORMWATER POLLUTION CONTROLS.
- 3. THIS DRAWING IS FOR GENERAL GUIDANCE ONLY. THE CONTRACTOR SHALL MEET ALL ODOT EROSION/SEDIMENT CONTROL REQUIREMENTS. ALL EROSION CONTROL MEASURES SHALL CONFORM TO THE AUTHORITY HAVING JURISDICTION REQUIREMENTS AND THE PLANS AND SPECIFICATIONS SPECIFIC TO THIS PROJECT.
- 4. CONSTRUCT EROSION CONTROL IN CONJUNCTION WITH ALL CLEARING AND GRADING ACTIVITIES, AND IN SUCH A MANNER AS TO ENSURE THAT SEDIMENT AND SEDIMENT LADEN WATER DO NOT ENTER THE DRAINAGE SYSTEM, ROADWAYS, OR VIOLATE APPLICABLE WATER STANDARDS. STAGE CONSTRUCTION TO INCLUDE INSTALLATION OF PERIMETER SEDIMENT FENCING AS REQUIRED.
- 5. METHOD OF INSTALLATION FOR SEDIMENT FENCE SHALL NOT CAUSE DAMAGE TO VEGETATED SLOPE EXCEPT AT POINT OF INSTALLATION. SIDECAST MATERIAL SHALL BE KEPT TO A MINIMUM AND SHALL BE TO THE UPHILL SIDE OF THE SEDIMENT FENCE. THE FENCE SHALL BE INSTALLED AT LEAST 4 FEET FROM ADJACENT TREES. ANY EXPOSED GROUND SHALL BE SEEDED AND COVERED WITH STRAW MULCH TO PREVENT EROSION. TEMPORARY GROUND COVER SHALL BE MAINTAINED UNTIL A HEALTHY STAND OF GRASS HAS BEEN ESTABLISHED. SEEDING SHALL BE WITH NATURAL SPECIES FOR THE AREA. SEE THE SPECIAL SPECIFICATIONS FOR PROPER SEED MIX.

ALL EROSION CONTROL DEVICES SHALL BE EXAMINED AND REPAIRED AFTER EACH STORM OCCURRENCE, AND INLETS SHALL BE CLEANED OF SEDIMENT WHENEVER NECESSARY.

HYDROSEED AND MULCH ALL DISTURBED AREAS UPON COMPLETION OF CONSTRUCTION OR AS DIRECTED BY THE INSPECTOR. THE CONTRACTOR SHALL LIMIT CONSTRUCTION TRAFFIC TO PAVED AREAS TO PREVENT AND MINIMIZE SEDIMENT TRACKING OFF-SITE. CONTRACTOR SHALL SWEEP OR VACUUM PAVED AREAS IF SEDIMENT ACCUMULATION OCCURS. DO NOT TRACK SEDIMENT TO THE PUBLIC STREET.

8. THE CONTRACTOR SHALL LIMIT CONSTRUCTION TRAFFIC TO PAVED AREAS TO PREVENT AND MINIMIZE SEDIMENT TRACKING OFF-SITE. CONTRACTOR SHALL SWEEP OR VACUUM PAVED AREAS IF SEDIMENT ACCUMULATION OCCURS. DO NOT TRACK SEDIMENT TO THE PUBLIC STREET.



Architecture - Interiors Planning - Engineering

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Client NORTHWEST SELF STORAGE 14855 SE 82ND DR CLACKAMAS, OR 97015

Project NORTHWEST SELF STORAGE 2400 AND 2450 WILLAMETTE FALLS DRIVE



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CONCRETE WASHOUT

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	LENGTH (U.O.N.) IN INCHES					
BAR	F'c = 3000 PSI		F'c = 4000 PSI		F'c = 5000 PSI	
	TOP BARS	OTHER BARS	TOP BARS	OTHER BARS	TOP BARS	OTHER BARS
#3	36	21	33	19	29	17
#4	50	29	43	25	39	23
#5	61	36	55	32	48	28
#6	73	43	63	37	56	33
#7	107	63	93	55	83	49
#8	122	72	105	62	93	55
#9	137	81	120	71	107	63

WHEN TWO BAR SIZES ARE SPLICED, USE LAP LENGTH

- TABLE IS FOR CLASS B SPLICES

- BE 60,000 PSI
- SUCH THAT MORE THAN 12 INCHES OF FRESH CONCRETE IS CAST BELOW THE BARS







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STERED PROFESSION
R. HENDERS
EXPIRES: 6/30/17

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