

# PRELIMINARY STORMWATER MANAGEMENT REPORT

# Fred Meyer Fueling Facility Store #0225

2980 River Road North Salem, Oregon

Permit #: 21 119291 00 RP

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> Revised May 5, 2022 March 3, 2022 Our Job No. 14855



EXPIRES: 6-30-23

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# Tab 1.0

#### 1.0 PROJECT OVERVIEW AND DESCRIPTION

The proposed Fred Meyer Fueling Facility at Store #0225 project is located on a 0.89-acre site on the existing Fred Meyer store site in Salem, Oregon. The project address is 2980 River Road North, Salem, Oregon with the parcel number being 073W15AA09400. The site is located on the east side of River Road North and Liberty Street NE. The current zoning of the project site is Retail Commercial (CR). Please see the enclosed Figure 1 - Vicinity Map for additional location information.

The existing site consists of one basin that slopes toward an existing catch basin in the middle of the parcel. The existing site is paved without any existing vegetation. Runoff is directed south and then west in existing underground conveyance pipes. Access to the site is from Liberty Street NE and the existing parking lot drive aisles.

The proposal for this site is to remove the existing pavement and construct a fueling station with kiosk, fuel canopy, associated utilities, stormwater planters and an underground detention system.

The existing site is currently developed with existing storm conveyance and catch basins. There are some small areas around the perimeter of the proposed project that drain onto this parcel. Those areas are included in the stormwater design. See Figure 2 - Existing Conditions Map.

There are no known site constraints or sensitive areas on or adjacent to the site. The site is located within the Zone 'X' flood hazard area per FIRM 41047C0332G dated 1/19/2000. This area is shaded as having a 0.2% annual chance of flooding, a 1% chance with a flood depth of less than 1 foot or with a drainage area of less than 1 square mile. See Figure 3.

The existing soils in this area are terrace deposit alluvium per the Geotechnical Report prepared for this site. The soils are a mixture of silt, silty fine to medium sand and poorly graded sand with silt. Infiltration rates measured were very low and field measurements ranged from 0 inches per hour to 0.6 inches per hour.

In order to provide flow control and water quality measures, this project proposes to use stormwater planters with partial infiltration around the project perimeter and a detention tank to control release rates. The stormwater planters will provide water quality treatment for the pollution generating impervious surfaces and the detention tank will reduce release rates to a predeveloped condition based on City of Salem requirements.

The Green Stormwater Infrastructure is being met by providing 10% of the replaced impervious areas as stormwater planters and landscape areas. Approximately 36,741 square feet of replaced impervious area is proposed. Approximately 4935 square feet of landscaping and stormwater planters are proposed to meet the green stormwater infrastructure requirement. This exceeds the required 10% requirement.

**Regulatory Permits Required:** 

Class 3 Site Plan Review

Class 2 Adjustment

If runoff were to backup on this site and cause localized flooding, runoff would overflow around the proposed planter along the south side of the site and into Liberty Street NE.

Figure 1 Vicinity Map



Figure 2 Existing Conditions Map





LEGEND:

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O

- CATCH BASIN

🗖 – CURB INLET

- - FIRE HYDRANT

H - WATER METER - WATER VALVE

GV - GAS VALVE

80 - BOLLARD

- SIGN

VERTICAL DATUM:

60 - UNKNOWN CLEANOUT

UNKNOWN UTILITY STANDPIPE 🗞 – HANDICAPPED PARKING STALL

- PARKING LOT LIGHT POLE

EXISTING ASPHALT

EXISTING CONCRETE 

FO- - UNDERGROUND TELECOMMUNICATION LINE - UNDERGROUND GAS LINE - UNDERGROUND WATER LINE - DECIDUOUS TREE

- SANITARY SEWER MANHOLE

- STORM DRAINAGE MANHOLE

WERE IDENTIFIED BY MANHOLE LIDS AND MAY NOT BE LABELED CORRECTL

THIS SURVEY MAKES NO GUARANTEES THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE OF ALL SUCH UTILITES IN THE AREA. THE UNDERGROUND UTILITIES SHOWN MAY NOT BE IN THE EXACT LOCATION AS NOTED ON THIS SURVEY, BUT ARE LOCATED AS ACCURATELY AS POSSIBLE FROM THE INFORMATION PROVIDED. MANHOLES OTHER THAN SANITARY AND STORM SEVER

UTILIT STATEWICHT. THE UNDERGROUND UTILITES SHOWN HAVE BEEN LOCATED FROM LOCATE PAINT MARKINGS TIED IN THE FIELD SURVEY AND AS-BUILT DRAWINGS PROVIDED BY UTILITY COMPANES. THIS SURVEY DOES NOT SHOW ANY PAINT MARKINGS PROVIDED AFTER THE FIELD SURVEY WAS COMPLETED, AS-BUILT DRAWING INFORMATION THAT WAS NOT PROVIDED IS NOT REFLECTED ON THIS SURVEY. AS-BUILT INFORMATION, IF PROVIDED, WAS USED TO IDENTIFY UNDERGROUND PIPE SIZE AND TYPE. IF NO LOCATE PAINT MARKINGS WERE PROVIDED, AS-BUILT INFORMATION WAS USED TO HORIZONTALLY LOCATE THE UNDERGROUND UTILITIES.

UTILITY STATEMENT:

BENCHMARK: A81 PROJECT DATUM: CITY OF SALEM (NGVD 1929) DESCRPTION: 3' BRASS DISK IN THE BACK OF SIDEWALK ON THE EAST SIDE OF N. RIVER ROAD, APPROXMATELY 86 FEET SOUTH OF THE CENTERLINE OF THE ENTRANCE BETWEN FRED MEYER AND LES SCHWAB.

CONVERSION: IN ORDER TO CONVERT FROM CITY OF SALEM (NGVD 29) VERTICAL DATUM TO NAVD 88 VERTICAL DATUM, 2.675 FEET MUST BE ADDED TO THE PROJECT ELEVATIONS SHOWN HEREON.





errac

Land Surveying 1615 NE Miller St.

McMinnville, OR 97128 (503) 857-0935 www.Terra-calc.com

REGISTERED PROFESSIONAL LAND SURVEYOR



SHEET NO.

1 OF 1



# National Flood Hazard Layer FIRMette



## Legend



Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

# Tab 2.0

### 2.0 METHODOLOGY

#### Groundwater

Per the Geotechnical Engineering Report prepared for this site, groundwater was not encountered in an borings onsite. From nearby data, it is estimated that groundwater is approximately 20 feet below the ground surface.

#### Existing Trees and Vegetation

There are no existing trees or vegetation on this parcel. The site is paved or gravel and there are no existing landscape islands in the construction area.

#### Infiltration and Vegetative Treatment

The proposal for this site is to use stormwater planters around the site perimeter. Onsite runoff will be directed to these planters for water quality treatment and partial infiltration. Infiltration rates measured were very low and field measurements ranged from 0 inches per hour to 0.6 inches per hour. An infiltration rate of 0.05 inches per hour was assumed for the stormwater planters. See Figure 4 for an excerpt from the Geotechnical Engineering report prepared for this project showing the infiltration testing results.

#### Soil Types

The existing soils in this area are terrace deposit alluvium per the Geotechnical Report prepared for this site. The soils are a mixture of silt, silty fine to medium sand and poorly graded sand with silt.

#### Hazardous Materials

No hazardous materials are known to be onsite or present from past uses.

Figure 4 Infiltration Testing Results from Geotechnical Report

## **3.3. Subsurface Conditions**

We completed field explorations at the site on December 13, 2021. Our explorations consisted of two machine-drilled borings to depths of about 21½ feet below ground surface (bgs) and five shallow infiltration test borings drilled to 5 feet bgs at the approximate locations shown in Figure 2, Site Plan. Appendix A summarizes our exploration methods and presents our exploration logs. Laboratory test results are provided on the exploration logs or in Appendix A, Field Explorations and Laboratory Testing.

In general, subsurface conditions consist of a highly variable mantle of terrace deposit alluvium ranging from silt and silty fine sand to silty gravel and poorly graded gravel with sand and silt. The following paragraphs describe these materials in more detail.

#### 3.3.1. Pavement and Aggregate Base

The bulk of the site is mantled by asphaltic concrete pavement. This pavement section typically consisted of about 2 inches of asphaltic concrete over approximately 6 inches of crushed rock aggregate base. Our observations suggest that the pavement is in fair to very poor condition.

#### 3.3.2. Terrace Deposit Alluvium

At the ground surface in IT-4 and IT-5, and below the pavement section in the remaining borings, we encountered highly variable terrace deposit alluvium to the maximum depths explored. The infiltration test borings and the uppermost roughly 10 feet of Borings B-1 and B-2 encountered a mixture of silt, silty fine to medium sand, and poorly grade sand with silt. The infiltration test borings terminated in this surface layer.

Below 20 feet in B-1 and below roughly 9 to 10 feet in B-2, we encountered poorly graded gravel to poorly graded gravel with sand and silt that we interpret as the coarse-grained high-energy phase of the terrace deposits that probably extends to tens of feet bgs.

The silty terrace deposits were generally medium stiff to stiff and the sandy materials ranged from loose to medium dense (occasionally very loose). The gravels were typically medium dense to very dense.

#### **3.4. Groundwater**

Groundwater was not encountered in our explorations to the maximum depth explored. Water well log coverage is poor for this site, but a single log from roughly half a mile north as well as soil coloration suggests that the depth to permanent groundwater is not far below 20 feet bgs. Based on our observations of the materials in the explorations, the soils above the permanent groundwater elevations are unlikely to be saturated for more than the wettest portions of the year. Groundwater conditions at the site are expected to vary seasonally due to rainfall events and other factors not observed in our explorations.

### **4.0 INFILTRATION TESTING**

We conducted five infiltration tests at a depth of approximately 5 feet bgs. Test locations are shown in Figure 2. Testing was conducted using the encased falling head method consistent with the procedures outlined in the City of Salem Department of Public Works Administrative Rules, Chapter 109, Division 004, Appendix C. A 2-inch-thick layer of washed bagged gravel was placed in the pipe prior to adding water to reduce disturbance from flowing water at the base of the pipe interior. The test areas were pre-soaked for



approximately 4 hours by repeated addition of water into the pipe when necessary, in order to completely saturate the native soils.

After the saturation period, the pipe was filled with clean water to approximately 12 inches above the soil in the bottom of the boring. The drop in water level was measured for three iterations of 1 hour each. The field test results are summarized in Table 1.

Infiltration Test No.	Location	Depth (feet)	USCS Material Type	Field Measured Infiltration Rate <sup>1</sup> (inches/hour)
IT-1	See Site Plan	5	ML	0.0
IT-2	See Site Plan	5	ML	0.6
IT-3	See Site Plan	5	ML	0.2
IT-4	See Site Plan	5	ML	0.1
IT-5	See Site Plan	5	ML	0.2

#### **TABLE 1. INFILTRATION TEST RESULTS**

Notes:

<sup>1</sup> Appropriate factors should be applied to the field measured infiltration rate, based on the design methodology

and specific system used.

USCS = Unified Soil Classification System

The infiltration rates shown in Table 1 are field-measured infiltration rates. They represent the short-term measured rates, and factors of safety have not been applied for the type of infiltration system being considered, or for variability that may be present in the on-site soil. In our opinion, and consistent with the state of the practice, correction factors should be applied.

From a geotechnical perspective, we recommend a factor of safety (correction factor) of at least 2 be applied to the field-measured infiltration values to account for potential soil variability with depth and location within the area tested. In addition, the stormwater system design engineer should determine and apply appropriate correction factors to account for repeated wetting and drying that occur in this area, degree of in-system filtration, frequency and type of system maintenance, vegetation, potential for siltation and bio-fouling, etc., as well as system design correction factors for overflow or redundancy, and base and facility size.

## **5.0 CONCLUSIONS**

#### 5.1. General

Based on our explorations, testing, and analyses, it is our opinion that the site is suitable for the proposed project from a geotechnical standpoint, provided the recommendations in this report are included in design and construction. We offer the following conclusions regarding geotechnical design at the site.

- Measured on-site infiltration rates are very low. Stormwater infiltration will likely be impractical and/or require large detention facilities.
- No groundwater was encountered to the maximum depths explored.



<u>Start</u> Drilled 12/13/2021	<u>End</u> 12/13/2021	Total Depth (ft)	5	Logged By Checked By	JLL GAL	Driller Western States Drilling		Drilling Method Hollow-stem Auger
Surface Elevation (ft) Vertical Datum	1 NAV	.41 /D88		Hammer Data	140	Autohammer ) (lbs) / 30 (in) Drop	Drilling Equipment	CME 85
Latitude Longitude	44.968848 -123.031236		System Datum		[	Decimal Degrees WGS84	Groundwate	er not observed at time of exploration

Notes:

_						_				_	
			FIE	LD D	ATA						
Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0 — - -	-					AC GM SP-SM	Approximately 2 inches asphalt concrete pavement Approximately 6 inches aggregate base course Gray poorly graded sand with silt and gravel (loose, moist) (Lower Terrace Deposits)			
L	5 -	6			1		ML	Brown silt with occasional gravei			IT-1 performed at 5 feet. See report text for

Note: See Figure A-1 for explanation of symbols. Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

## Log of Boring IT-1



Project: Fred Meyer - Salem Fuel Center Project Location: 2980 River Road North, Salem, Oregon Project Number: 2831-110-01

Figure A-4 Sheet 1 of 1

<u>Start</u> Drilled 12/13/2021	<u>End</u> 12/13/2021	Total Depth (ft)	5	Logged By Checked By	JLL GAL	Driller Western States Drillir	ıg	Drilling Method Hollow-stem Auger
Surface Elevation (ft) Vertical Datum	1 NA	41 VD88		Hammer Data	140	Autohammer ) (lbs) / 30 (in) Drop	Drilling Equipment	CME 85
Latitude Longitude	44.969304 -123.031222			System Datum	I	Decimal Degrees WGS84	Groundwate	r not observed at time of exploration

Notes:

			FIEL	LD D	ATA		i T				
Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
- 2 <sup>AO</sup> - -	0  - -	-					AC GM SP-SM ML	Approximately 2 inches asphalt concrete pavement Approximately 6 inches aggregate base course Gray poorly graded sand with silt and gravel (loose, moist) (Lower Terrace Deposits) Brown silt with gravel	-		
	5 <b>—</b>	6			1						IT-2 performed at 5 feet. See report text for

Note: See Figure A-1 for explanation of symbols. Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

## Log of Boring IT-2



Project: Fred Meyer - Salem Fuel Center Project Location: 2980 River Road North, Salem, Oregon Project Number: 2831-110-01

Figure A-5 Sheet 1 of 1

<u>Start</u> Drilled 12/13/2021	<u>End</u> 12/13/2021	Total Depth (ft)	5	Logged By Checked By	JLL GAL	Driller Western States Drillir	ıg	Drilling Method Hollow-stem Auger
Surface Elevation (ft) Vertical Datum	1 NA	41 VD88		Hammer Data	140	Autohammer ) (lbs) / 30 (in) Drop	Drilling Equipment	CME 85
Latitude Longitude	44.9 -123.0	69411 031415		System Datum		Decimal Degrees WGS84	Groundwate	er not observed at time of exploration

Notes:

			FIEL	D D	ATA						
Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	<u>Sample Name</u> Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
AO 	-0						AC GM SM ML	Approximately 2 inches asphalt concrete pavement Approximately 6 inches aggregate base course Gray silty sand with gravel (loose, moist) (Lower Terrace Deposits) Brown silt with trace sand (medium stiff, moist)			
_	5 —	6			1						IT-3 performed at 5 feet. See report text for

Note: See Figure A-1 for explanation of symbols. Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

## Log of Boring IT-3



Project: Fred Meyer - Salem Fuel Center Project Location: 2980 River Road North, Salem, Oregon Project Number: 2831-110-01

Figure A-6 Sheet 1 of 1

Drilled	<u>s</u> 12/1	<u>Start</u> .3/2021	<u>E</u> 12/13	<u>ind</u> 3/2021	Total Depth	(ft)	5	Logged By Checked By	Western States	s Drilling			Drilling Method H	Iollow-stem Auger			
Surface Vertical	e Eleva Datui	ntion (ft) m		N	141 AVD88			Hammer Data	140	Autohan O (Ibs) / 30	nmer 0 (in) Drop		Drilling Equipn	hent		CME 85	
Latitude Longitu	e de	44.969296SystemDecimal Degrees-123.03176DatumWGS84								Groundwater not observed at time of exploration							
Notes:																	
			FIEL	D DA	TA												
Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	<u>Sample Name</u> Testing	Graphic Log	Group Classification		M/ DES	ATERIAL CRIPTIC	L N		Moisture Content (%)	Fines Content (%)		REMARKS	
-240	-						ML	Dark brown sil plasticity (s _ _	Dark brown silt with trace sand, low to moderate plasticity (soft, moist) (Lower Terrace Deposits)								

Becomes brown, medium stiff

2831110\GinT\283111001.GPLibrary/Library.GEOENGINEERS\_DF\_STD\_US\_UURE\_2017.GLB/GE18\_GEOTECH\_STANDARD\_%F\_N0\_GN ate:1/13/22 Patl 6

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Note: See Figure A-1 for explanation of symbols. Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

## Log of Boring IT-4



Project: Fred Meyer - Salem Fuel Center Project Location: 2980 River Road North, Salem, Oregon Project Number: 2831-110-01

Figure A-7 Sheet 1 of 1

IT-4 performed at 5 feet. See report text for details.

	- 10/	Start	10/1	End	Total				Logged By JLL	Driller Western States Dri	illing			Drilling Hollow-stem Auger
Surfa	ice Eleva	ation (ft)	12/1	3/2021	Depth 141	(ft)		Ha	Checked By GAL	Autohammer	Dril	lling		CME 85
Verti	cal Datu	m		N	AVD88			Da	sta 140	) (lbs) / 30 (in) Drop	Equ	uipm	nent	
Long	itude			-123	3.031782			Da	atum	WGS84	Gro	ound	water	not observed at time of exploration
Note	s:													
			FIE	LD DA	TA									
Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	<u>Sample Name</u> Testing	Graphic Log	Group Classification		MA DESC	TERIAL CRIPTION	Moisture	Content (%)	Fines Content (%)	REMARKS
AO 	-0  -						ML	_	Dark brown silt with san moist) (Lower Terrac	d and occasional gravel (soft, e Deposits)	-			
-	-	6			1			_	Grades to brown		-			IT-5 performed at 5 feet. See report text for
2831110\GINT283111001.GPJ DBLbbary/LibraryGEOENGINEERS_DF_STD_US_JUNE_201/.GLB/.GEBS_GEOIECH_SIANDARU_%F_NU_GW	ote: See oordinat	e Figure A ies Data	1-1 for e Source	explana : Horizc	tion of syr intal appr	mbols	5. ated base	d or	n . Vertical approximated I	based on .				
/22 Path:F			λ.		1.1		C:		Project: Fred M	eyer - Salem Fuel Cen	ter			
Date:1/13	GEOENGINEERS						2		Project Location: 2980 River Road North, Salem, Oregon Figu					Oregon Figure A-8



Project: Fred Meyer - Salem Fuel Center Project Location: 2980 River Road North, Salem, Oregon Project Number: 2831-110-01

Figure A-8 Sheet 1 of 1

# Tab 3.0

### 3.0 ANALYSIS

The AutoDesk Hydraflow Hydrographs Extension was used for the detention sizing on this project. This program used SBUH methodology to determine predeveloped and post developed hydrographs and to model detention routing.

Per Appendix D of the City of Salem Administrative Rules, the pre-developed curve number for this site was 72 based on the assumed type C soils. For the developed condition, a curve number of 98 was used for impervious surfaces and 74 for landscaped areas, assuming amended soils. Because of the small area being modeled the time of concentration was set at the minimum 5 minutes.

Existing Co	nditions					
Basin ID	Area (acres)	Curve Number	Time of Concentration	Q2 (cfs)	Q10 (cfs)	Q100 (cfs)
AA	0.20	72	5 minutes	0.006	0.030	0.072
BB	0.36	72	5 minutes	0.010	0.054	0.129
CC	0.20	72	5 minutes	0.006	0.030	0.072
DD	0.20	72	5 minutes	0.006	0.030	0.072
Total Basin	0.97	72	5 minutes	0.027	0.144	0.345

Develo	ped Condition	S					
Basin ID	Source	Area (acres)	Pervious Area (acres)	Impervious Area (acres)	Facility Type	Facility Size (SF)	Curve Number
AA	Parking	0.20	0.03	0.17	Stormwater Planter	1094	94
BB	Asphalt Maneuvering Area and roof	0.36	0.06	0.30	Stormwater Planter	2767	94
CC	Asphalt Maneuvering Area	0.20	0.03	0.17	Stormwater Planter	1074	94
DD	Asphalt Maneuvering Area	0.20	0	0.20	Infiltration/detention pipe		98
Total Basin		0.96	0.12	0.84		4935 sf stormwater planter	

See Figure 5 for Developed Conditions Map. All proposed facilities are private.

See Figure 6 for hydrology calculations.

	Pre vs Post Construction Flow Rates												
Facility ID	Peak Flow Rate (cfs)												
	Half of the 2 year storm     10 year storm     100 year storm												
Project Site	Pre	Post	Pre	Post	Pre	Post							
AA	0.003	0.043	0.030	0.136	0.072	0.195							
BB	0.005	0.073	0.054	0.236	0.129	0.343							
CC	0.003	0.041	0.030	0.131	0.072	0.191							
DD	0.003	0.050	0.030	0.148	0.072	0.206							
After Detention	0.0135 0.0135 0.144 0.105 0.345 0.292												

The proposed detention facility is 130 feet of 6 foot diameter perforated pipe in a 9' wide gravel trench with 6" of rock above and below the pipe. The 0.05 inch per hour infiltration rate was also included for the detention system.

# Figure 5 Developed Conditions Map



# Figure 6 Flow Control Calculations

# Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021



# Hydrograph Return Period Recap Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd.	Hydrograph Inflov type hyd(s (origin)	Inflow	Peak Outflow (cfs)					Hydrograph			
NO.		nya(s)	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Description
1	SBUH Runoff			0.006		0.016	0.030	0.043	0.061	0.072	AA Existing
2	SBUH Runoff			0.086		0.111	0.136	0.156	0.181	0.195	AA Developed
3	SBUH Runoff			0.010		0.028	0.054	0.077	0.109	0.129	BB Existing
4	SBUH Runoff			0.146		0.191	0.236	0.272	0.317	0.343	BB Developed
5	SBUH Runoff			0.006		0.016	0.030	0.043	0.061	0.072	CC Existing
6	SBUH Runoff			0.081		0.106	0.131	0.151	0.176	0.191	CC Developed
7	SBUH Runoff			0.006		0.016	0.030	0.043	0.061	0.072	DD Existing
8	SBUH Runoff			0.100		0.124	0.148	0.167	0.191	0.206	DD Developed
9	Reservoir	2		0.087		0.112	0.137	0.157	0.182	0.197	AA Planter Routing
10	Reservoir	4		0.045		0.115	0.205	0.252	0.300	0.327	BB Planter Routing
11	Reservoir	6		0.081		0.107	0.132	0.152	0.178	0.193	CC Planter Routing
12	Combine	8, 9, 10,		0.273		0.374	0.607	0.734	0.856	0.927	Total Site Runoff
<mark>13</mark>	Reservoir	12		0.027		0.070	0.105	0.148	0.224	0.292	Detention Routing
<mark>14</mark>	Combine	1, 3, 5, 7		0.027		0.075	0.144	0.206	0.291	0.345	Total Existing Site
											Flows after detention are less than existing

# Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

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	SBUH Runoff	0.006	10	490	276				AA Existing
2	SBUH Runoff	0.086	10	480	1,215				AA Developed
3	SBUH Runoff	0.010	10	490	498				BB Existing
4	SBUH Runoff	0.146	10	480	2,070				BB Developed
5	SBUH Runoff	0.006	10	490	276				CC Existing
6	SBUH Runoff	0.081	10	480	1,150				CC Developed
7	SBUH Runoff	0.006	10	490	276				DD Existing
8	SBUH Runoff	0.100	10	480	1,432				DD Developed
9	Reservoir	0.087	10	480	1,086	2	139.54	117	AA Planter Routing
10	Reservoir	0.045	10	550	1,244	4	139.53	734	BB Planter Routing
11	Reservoir	0.081	10	480	948	6	139.54	188	CC Planter Routing
12	Combine	0.273	10	480	4,776	8, 9, 10,			Total Site Runoff
13	Reservoir	0.027	10	1450	3,847	11 12	136.92	3,593	Detention Routing
14	Combine	0.027	10	490	1,327	1, 3, 5,			Total Existing Site
14855-sbuh.gpw				Return P	eriod: 2 Ye	ar	Thursday, C	95 / 5 / 2022	

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

## Hyd. No. 1

AA Existing

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.006 cfs
Storm frequency	= 2 yrs	Time to peak	= 8.17 hrs
Time interval	= 10 min	Hyd. volume	= 276 cuft
Drainage area	= 0.200 ac	Curve number	= 72
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.20 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

# Hyd. No. 2

AA Developed

Hydrograph type :	SBUH Runoff	Peak discharge	= 0.086 cfs
Storm frequency :	= 2 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 1,215 cuft
Drainage area	= 0.200 ac	Curve number	= 95*
Basin Slope :	= 0.0 %	Hydraulic length	= 0 ft
Tc method :	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.20 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a

\* Composite (Area/CN) = [(0.170 x 98) + (0.030 x 74)] / 0.200



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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

## Hyd. No. 3

**BB** Existing

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.010 cfs
Storm frequency	= 2 yrs	Time to peak	= 8.17 hrs
Time interval	= 10 min	Hyd. volume	= 498 cuft
Drainage area	= 0.360 ac	Curve number	= 72
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.20 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

# Hyd. No. 4

**BB** Developed

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.146 cfs
Storm frequency	= 2 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 2,070 cuft
Drainage area	= 0.360 ac	Curve number	= 94*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.20 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a

\* Composite (Area/CN) = [(0.300 x 98) + (0.060 x 74)] / 0.360



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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

## Hyd. No. 5

CC Existing

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.006 cfs
Storm frequency	= 2 yrs	Time to peak	= 8.17 hrs
Time interval	= 10 min	Hyd. volume	= 276 cuft
Drainage area	= 0.200 ac	Curve number	= 72
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.20 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a


Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

## Hyd. No. 6

CC Developed

Hydrograph type =	= SBUH Runoff	Peak discharge	= 0.081 cfs
Storm frequency :	= 2 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 1,150 cuft
Drainage area =	= 0.200 ac	Curve number	= 94*
Basin Slope :	= 0.0 %	Hydraulic length	= 0 ft
Tc method =	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.20 in	Distribution	= Type IA
Storm duration :	= 24 hrs	Shape factor	= n/a

\* Composite (Area/CN) = [(0.170 x 98) + (0.030 x 74)] / 0.200



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

## Hyd. No. 7

**DD** Existing

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.006 cfs
Storm frequency	= 2 yrs	Time to peak	= 8.17 hrs
Time interval	= 10 min	Hyd. volume	= 276 cuft
Drainage area	= 0.200 ac	Curve number	= 72
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.20 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

## Hyd. No. 8

DD Developed

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.100 cfs
Storm frequency	= 2 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 1,432 cuft
Drainage area	= 0.200 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.20 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a

\* Composite (Area/CN) = [(0.200 x 98)] / 0.200



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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

## Hyd. No. 9

AA Planter Routing

Hydrograph type	= Reservoir	Peak discharge	= 0.087 cfs
Storm frequency	= 2 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 1,086 cuft
Inflow hyd. No.	= 2 - AA Developed	Max. Elevation	= 139.54 ft
Reservoir name	= AA Planter	Max. Storage	= 117 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



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## **Pond Report**

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

#### Pond No. 1 - AA Planter

#### **Pond Data**

Trapezoid -Bottom L x W = 80.0 x 1.0 ft, Side slope = 3.00:1, Bottom elev. = 139.00 ft, Depth = 1.00 ft

#### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	139.00	80	0	0
0.10	139.10	129	10	10
0.20	139.20	179	15	26
0.30	139.30	229	20	46
0.40	139.40	280	25	72
0.50	139.50	332	31	102
0.60	139.60	385	36	138
0.70	139.70	438	41	179
0.80	139.80	492	46	226
0.90	139.90	547	52	278
1.00	140.00	602	57	335

#### **Culvert / Orifice Structures**

#### **Weir Structures**

	[A]	[B]	[C]	[PrfRsr]		[A]	[B]	[C]	[D]
Rise (in)	= 12.00	0.00	0.00	0.00	Crest Len (ft)	= 3.14	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00	Crest El. (ft)	= 139.50	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)	= 139.00	0.00	0.00	0.00	Weir Type	= 1			
Length (ft)	= 50.00	0.00	0.00	0.00	Multi-Stage	= Yes	No	No	No
Slope (%)	= 0.50	0.00	0.00	n/a					
N-Value	= .013	.013	.013	n/a					
Orifice Coeff.	= 0.60	0.60	0.60	0.60	Exfil.(in/hr)	= 0.050 (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). 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	139.00	0.00				0.00				0.000		0.000
0.10	10	139.10	0.00				0.00				0.000		0.000
0.20	26	139.20	0.00				0.00				0.000		0.000
0.30	46	139.30	0.00				0.00				0.000		0.000
0.40	72	139.40	0.00				0.00				0.000		0.000
0.50	102	139.50	0.00				0.00				0.000		0.000
0.60	138	139.60	0.34 ic				0.33				0.000		0.331
0.70	179	139.70	0.94 oc				0.93 s				0.001		0.933
0.80	226	139.80	1.37 oc				1.37 s				0.001		1.368
0.90	278	139.90	1.68 oc				1.68 s				0.001		1.683
1.00	335	140.00	1.85 oc				1.85 s				0.001		1.849

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

## Hyd. No. 10

**BB** Planter Routing

Hydrograph type	= Reservoir	Peak discharge	= 0.045 cfs
Storm frequency	= 2 yrs	Time to peak	= 9.17 hrs
Time interval	= 10 min	Hyd. volume	= 1,244 cuft
Inflow hyd. No.	= 4 - BB Developed	Max. Elevation	= 139.53 ft
Reservoir name	= BB Planter	Max. Storage	= 734 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



## **Pond Report**

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

#### Pond No. 2 - BB Planter

#### **Pond Data**

Trapezoid -Bottom L x W = 210.0 x 5.0 ft, Side slope = 3.00:1, Bottom elev. = 139.00 ft, Depth = 1.00 ft

#### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	139.00	1,050	0	0
0.10	139.10	1,179	111	111
0.20	139.20	1,309	124	236
0.30	139.30	1,440	137	373
0.40	139.40	1,572	151	524
0.50	139.50	1,704	164	688
0.60	139.60	1,837	177	865
0.70	139.70	1,971	190	1,055
0.80	139.80	2,105	204	1,259
0.90	139.90	2,240	217	1,476
1.00	140.00	2,376	231	1,707

#### **Culvert / Orifice Structures**

#### **Weir Structures**

	[A]	[B]	[C]	[PrfRsr]		[A]	[B]	[C]	[D]
Rise (in)	= 12.00	0.00	0.00	0.00	Crest Len (ft)	= 3.14	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00	Crest El. (ft)	= 139.50	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)	= 139.00	0.00	0.00	0.00	Weir Type	= 1			
Length (ft)	= 50.00	0.00	0.00	0.00	Multi-Stage	= Yes	No	No	No
Slope (%)	= 0.50	0.00	0.00	n/a					
N-Value	= .013	.013	.013	n/a					
Orifice Coeff.	= 0.60	0.60	0.60	0.60	Exfil.(in/hr)	= 0.050 (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). 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	139.00	0.00				0.00				0.000		0.000
0.10	111	139.10	0.00				0.00				0.001		0.001
0.20	236	139.20	0.00				0.00				0.002		0.002
0.30	373	139.30	0.00				0.00				0.002		0.002
0.40	524	139.40	0.00				0.00				0.002		0.002
0.50	688	139.50	0.00				0.00				0.002		0.002
0.60	865	139.60	0.34 ic				0.33				0.002		0.333
0.70	1,055	139.70	0.94 oc				0.93 s				0.002		0.935
0.80	1,259	139.80	1.37 oc				1.37 s				0.003		1.370
0.90	1.476	139.90	1.68 oc				1.68 s				0.003		1.685
1.00	1,707	140.00	1.85 oc				1.85 s				0.003		1.851

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

## Hyd. No. 11

CC Planter Routing

Hydrograph type	= Reservoir	Peak discharge	= 0.081 cfs
Storm frequency	= 2 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 948 cuft
Inflow hyd. No.	= 6 - CC Developed	Max. Elevation	= 139.54 ft
Reservoir name	= CC Planter	Max. Storage	= 188 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



## **Pond Report**

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

#### Pond No. 3 - CC Planter

#### **Pond Data**

Trapezoid -Bottom L x W = 60.0 x 4.0 ft, Side slope = 3.00:1, Bottom elev. = 139.00 ft, Depth = 1.00 ft

#### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	139.00	240	0	0
0.10	139.10	279	26	26
0.20	139.20	318	30	56
0.30	139.30	358	34	90
0.40	139.40	399	38	127
0.50	139.50	441	42	170
0.60	139.60	483	46	216
0.70	139.70	526	50	266
0.80	139.80	570	55	321
0.90	139.90	615	59	380
1.00	140.00	660	64	444

#### **Culvert / Orifice Structures**

#### **Weir Structures**

	[A]	[B]	[C]	[PrfRsr]		[A]	[B]	[C]	[D]
Rise (in)	= 12.00	0.00	0.00	0.00	Crest Len (ft)	= 3.14	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00	Crest El. (ft)	= 139.50	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)	= 139.00	0.00	0.00	0.00	Weir Type	= 1			
Length (ft)	= 50.00	0.00	0.00	0.00	Multi-Stage	= Yes	No	No	No
Slope (%)	= 0.50	0.00	0.00	n/a	-				
N-Value	= .013	.013	.013	n/a					
Orifice Coeff.	= 0.60	0.60	0.60	0.60	Exfil.(in/hr)	= 0.050 (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). 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	139.00	0.00				0.00				0.000		0.000
0.10	26	139.10	0.00				0.00				0.000		0.000
0.20	56	139.20	0.00				0.00				0.000		0.000
0.30	90	139.30	0.00				0.00				0.000		0.000
0.40	127	139.40	0.00				0.00				0.000		0.000
0.50	170	139.50	0.00				0.00				0.001		0.001
0.60	216	139.60	0.34 ic				0.33				0.001		0.331
0.70	266	139.70	0.94 oc				0.93 s				0.001		0.933
0.80	321	139.80	1.37 oc				1.37 s				0.001		1.368
0.90	380	139.90	1.68 oc				1.68 s				0.001		1.683
1.00	444	140.00	1.85 oc				1.85 s				0.001		1.849

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

#### Hyd. No. 12

**Total Site Runoff** 

Type= CombineFeak discharge= 0.273 cStorm frequency= 2 yrsTime to peak= 8.00 hrTime interval= 10 minHyd. volume= 4,776 cInflow hyds.= 8, 9, 10, 11Contrib. drain. area= 0.200 a	s suft IC
Inflow hyds. $= 8, 9, 10, 11$ Contrib. drain. area $= 0.200$ a	IC



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

#### Hyd. No. 13

**Detention Routing** 

Hydrograph type	= Reservoir	Peak discharge	= 0.027 cfs
Storm frequency	= 2 yrs	Time to peak	= 24.17 hrs
Time interval	= 10 min	Hyd. volume	= 3,847 cuft
Inflow hyd. No.	= 12 - Total Site Runoff	Max. Elevation	= 136.92 ft
Reservoir name	= Detention Pipes	Max. Storage	= 3,593 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



## **Pond Report**

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

#### Pond No. 5 - Detention Pipes

#### **Pond Data**

**UG Chambers -**Invert elev. = 133.00 ft, Rise x Span =  $6.00 \times 6.00$  ft, Barrel Len = 130.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No **Encasement -**Invert elev. = 132.50 ft, Width = 9.00 ft, Height = 7.00 ft, Voids = 40.00%

#### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	132.50	n/a	0	0
0.70	133.20	n/a	350	350
1.40	133.90	n/a	513	863
2.10	134.60	n/a	593	1,455
2.80	135.30	n/a	634	2,089
3.50	136.00	n/a	652	2,742
4.20	136.70	n/a	652	3,394
4.90	137.40	n/a	634	4,027
5.60	138.10	n/a	592	4,620
6.30	138.80	n/a	512	5,132
7.00	139.50	n/a	350	5,482

#### **Culvert / Orifice Structures**

#### **Weir Structures**

	[A]	[B]	[C]	[PrfRsr]		[A]	[B]	[C]	[D]
Rise (in)	= 12.00	0.61	0.00	0.00	Crest Len (ft)	= 3.14	0.12	0.00	0.00
Span (in)	= 12.00	0.61	0.00	0.00	Crest El. (ft)	= 139.00	136.85	0.00	0.00
No. Barrels	= 1	1	0	0	Weir Coeff.	= 3.33	3.33	3.33	3.33
Invert El. (ft)	= 133.00	133.01	0.00	0.00	Weir Type	= 1	Rect		
Length (ft)	= 50.00	0.00	0.00	0.00	Multi-Stage	= Yes	No	No	No
Slope (%)	= 0.50	0.00	0.00	n/a					
N-Value	= .013	.013	.013	n/a					
Orifice Coeff.	= 0.60	0.60	0.60	0.60	Exfil.(in/hr)	= 0.050 (by	Wet area)		
Multi-Stage	= n/a	Yes	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	132.50	0.00	0.00			0.00	0.00			0.000		0.000
0.70	350	133.20	0.00 ic	0.00 ic			0.00	0.00			0.002		0.006
1.40	863	133.90	0.01 ic	0.01 ic			0.00	0.00			0.002		0.011
2.10	1,455	134.60	0.01 ic	0.01 ic			0.00	0.00			0.002		0.014
2.80	2,089	135.30	0.01 ic	0.01 ic			0.00	0.00			0.002		0.017
3.50	2,742	136.00	0.02 ic	0.02 ic			0.00	0.00			0.002		0.019
4.20	3,394	136.70	0.02 ic	0.02 ic			0.00	0.00			0.003		0.021
4.90	4,027	137.40	0.02 ic	0.02 ic			0.00	0.16			0.003		0.186
5.60	4,620	138.10	0.02 ic	0.02 ic			0.00	0.56			0.003		0.583
6.30	5,132	138.80	0.02 ic	0.02 ic			0.00	1.09			0.003		1.115
7.00	5,482	139.50	2.37 oc	0.02 ic			2.34 ic	1.72			0.003		4.093
	,												

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

#### Hyd. No. 14

**Total Existing Site** 

Hydrograph type	= Combine	Peak discharge	= 0.027 cfs
Storm frequency	= 2 yrs	Time to peak	= 8.17 hrs
Time interval	= 10 min	Hyd. volume	= 1,327 cuft
Inflow hyds.	= 1, 3, 5, 7	Contrib. drain. area	= 0.960 ac



# Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

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	SBUH Runoff	0.030	10	480	675				AA Existing
2	SBUH Runoff	0.136	10	480	1,920				AA Developed
3	SBUH Runoff	0.054	10	480	1,215				BB Existing
4	SBUH Runoff	0.236	10	480	3,324				BB Developed
5	SBUH Runoff	0.030	10	480	675				CC Existing
6	SBUH Runoff	0.131	10	480	1,847				CC Developed
7	SBUH Runoff	0.030	10	480	675				DD Existing
8	SBUH Runoff	0.148	10	480	2,154				DD Developed
9	Reservoir	0.137	10	480	1,789	2	139.56	122	AA Planter Routing
10	Reservoir	0.205	10	490	2,487	4	139.57	816	BB Planter Routing
11	Reservoir	0.132	10	480	1,642	6	139.55	195	CC Planter Routing
12	Combine	0.607	10	480	8,145	8, 9, 10,			Total Site Runoff
13	Reservoir	0.105	10	770	7,186	11 12	137.21	3,852	Detention Routing
14	Combine	0.144	10	480	3,240	1, 3, 5,			Total Existing Site
						Ι,			
148	55-sbuh.gpw	1	1	1	Return P	eriod: 10 Y	/ear	Thursday, 0	)5 / 5 / 2022

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

## Hyd. No. 1

AA Existing

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.030 cfs
Storm frequency	= 10 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 675 cuft
Drainage area	= 0.200 ac	Curve number	= 72
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.20 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

## Hyd. No. 2

AA Developed

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.136 cfs
Storm frequency	= 10 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 1,920 cuft
Drainage area	= 0.200 ac	Curve number	= 95*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.20 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a

\* Composite (Area/CN) = [(0.170 x 98) + (0.030 x 74)] / 0.200



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## Hyd. No. 3

**BB** Existing

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.054 cfs
Storm frequency	= 10 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 1,215 cuft
Drainage area	= 0.360 ac	Curve number	= 72
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.20 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a



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## Hyd. No. 4

**BB** Developed

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.236 cfs
Storm frequency	= 10 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 3,324 cuft
Drainage area	= 0.360 ac	Curve number	= 94*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.20 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a

\* Composite (Area/CN) = [(0.300 x 98) + (0.060 x 74)] / 0.360



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## Hyd. No. 5

CC Existing

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.030 cfs
Storm frequency	= 10 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 675 cuft
Drainage area	= 0.200 ac	Curve number	= 72
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.20 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

## Hyd. No. 6

CC Developed

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.131 cfs
Storm frequency	= 10 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 1,847 cuft
Drainage area	= 0.200 ac	Curve number	= 94*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.20 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a

\* Composite (Area/CN) = [(0.170 x 98) + (0.030 x 74)] / 0.200



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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

## Hyd. No. 7

**DD** Existing

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.030 cfs
Storm frequency	= 10 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 675 cuft
Drainage area	= 0.200 ac	Curve number	= 72
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.20 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a



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## Hyd. No. 8

DD Developed

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.148 cfs
Storm frequency	= 10 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 2,154 cuft
Drainage area	= 0.200 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.20 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a

\* Composite (Area/CN) = [(0.200 x 98)] / 0.200



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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

## Hyd. No. 9

AA Planter Routing

Hydrograph type	= Reservoir	Peak discharge	= 0.137 cfs
Storm frequency	= 10 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 1,789 cuft
Inflow hyd. No.	= 2 - AA Developed	Max. Elevation	= 139.56 ft
Reservoir name	= AA Planter	Max. Storage	= 122 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

## Hyd. No. 10

**BB** Planter Routing

Hydrograph type	= Reservoir	Peak discharge	= 0.205 cfs
Storm frequency	= 10 yrs	Time to peak	= 8.17 hrs
Time interval	= 10 min	Hyd. volume	= 2,487 cuft
Inflow hyd. No.	= 4 - BB Developed	Max. Elevation	= 139.57 ft
Reservoir name	= BB Planter	Max. Storage	= 816 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

## Hyd. No. 11

CC Planter Routing

Hydrograph type	= Reservoir	Peak discharge	= 0.132 cfs
Storm frequency	= 10 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 1,642 cuft
Inflow hyd. No.	= 6 - CC Developed	Max. Elevation	= 139.55 ft
Reservoir name	= CC Planter	Max. Storage	= 195 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

#### Hyd. No. 12

**Total Site Runoff** 

Storm requency= 10 yrsTime to peak= 8.00 hrsTime interval= 10 minHyd. volume= 8,145 cuftInflow hyds.= 8, 9, 10, 11Contrib. drain. area= 0.200 ac	Hydrograph type	= Combine	Peak discharge	= 0.607 cfs
	Storm frequency	= 10 yrs	Time to peak	= 8.00 hrs
	Time interval	= 10 min	Hyd. volume	= 8,145 cuft
	Inflow hyds.	= 8, 9, 10, 11	Contrib. drain. area	= 0.200 ac



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#### Hyd. No. 13

**Detention Routing** 

Hydrograph type	= Reservoir	Peak discharge	= 0.105 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.83 hrs
Time interval	= 10 min	Hyd. volume	= 7,186 cuft
Inflow hyd. No.	= 12 - Total Site Runoff	Max. Elevation	= 137.21 ft
Reservoir name	= Detention Pipes	Max. Storage	= 3,852 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

#### Hyd. No. 14

**Total Existing Site** 

Hydrograph type	= Combine	Peak discharge	= 0.144 cfs
Storm frequency	= 10 vrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 3,240 cuft
Inflow hvds.	= 1, 3, 5, 7	Contrib. drain. area	= 0.960 ac
nnow nyus.	- 1, 5, 5, 7	Contrib. drain. area	- 0.300 ac



# Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

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	SBUH Runoff	0.072	10	480	1,268				AA Existing
2	SBUH Runoff	0.195	10	480	2,778				AA Developed
3	SBUH Runoff	0.129	10	480	2,283				BB Existing
4	SBUH Runoff	0.343	10	480	4,857				BB Developed
5	SBUH Runoff	0.072	10	480	1,268				CC Existing
6	SBUH Runoff	0.191	10	480	2,699				CC Developed
7	SBUH Runoff	0.072	10	480	1,268				DD Existing
8	SBUH Runoff	0.206	10	480	3,023				DD Developed
9	Reservoir	0.197	10	480	2,645	2	139.57	128	AA Planter Routing
10	Reservoir	0.327	10	480	4,011	4	139.60	863	BB Planter Routing
11	Reservoir	0.193	10	480	2,491	6	139.57	202	CC Planter Routing
12	Combine	0.927	10	480	12,249	8, 9, 10,			Total Site Runoff
13	Reservoir	0.292	10	550	11,276	11 12	137.62	4,215	Detention Routing
14	Combine	0.345	10	480	6,087	1, 3, 5,			Total Existing Site
148	55-sbuh.apw				Return P	eriod: 100	⊥ Year	Thursdav. 0	)5 / 5 / 2022

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

## Hyd. No. 1

AA Existing

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.072 cfs
Storm frequency	= 100 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 1,268 cuft
Drainage area	= 0.200 ac	Curve number	= 72
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.40 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

## Hyd. No. 2

AA Developed

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.195 cfs
Storm frequency	= 100 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 2,778 cuft
Drainage area	= 0.200 ac	Curve number	= 95*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.40 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a

\* Composite (Area/CN) = [(0.170 x 98) + (0.030 x 74)] / 0.200



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

## Hyd. No. 3

**BB** Existing

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.129 cfs
Storm frequency	= 100 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 2,283 cuft
Drainage area	= 0.360 ac	Curve number	= 72
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.40 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

## Hyd. No. 4

**BB** Developed

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.343 cfs
Storm frequency	= 100 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 4,857 cuft
Drainage area	= 0.360 ac	Curve number	= 94*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.40 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a

\* Composite (Area/CN) = [(0.300 x 98) + (0.060 x 74)] / 0.360



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

## Hyd. No. 5

CC Existing

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.072 cfs
Storm frequency	= 100 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 1,268 cuft
Drainage area	= 0.200 ac	Curve number	= 72
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.40 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

## Hyd. No. 6

CC Developed

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.191 cfs
Storm frequency	= 100 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 2,699 cuft
Drainage area	= 0.200 ac	Curve number	= 94*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.40 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a

\* Composite (Area/CN) = [(0.170 x 98) + (0.030 x 74)] / 0.200



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

## Hyd. No. 7

DD Existing

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.072 cfs
Storm frequency	= 100 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 1,268 cuft
Drainage area	= 0.200 ac	Curve number	= 72
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.40 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a


Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

### Hyd. No. 8

DD Developed

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.206 cfs
Storm frequency	= 100 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 3,023 cuft
Drainage area	= 0.200 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.40 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a

\* Composite (Area/CN) = [(0.200 x 98)] / 0.200



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

## Hyd. No. 9

AA Planter Routing

Hydrograph type	= Reservoir	Peak discharge	= 0.197 cfs
Storm frequency	= 100 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 2,645 cuft
Inflow hyd. No.	= 2 - AA Developed	Max. Elevation	= 139.57 ft
Reservoir name	= AA Planter	Max. Storage	= 128 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

### Hyd. No. 10

**BB** Planter Routing

Hydrograph type	= Reservoir	Peak discharge	= 0.327 cfs
Storm frequency	= 100 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 4,011 cuft
Inflow hyd. No.	= 4 - BB Developed	Max. Elevation	= 139.60 ft
Reservoir name	= BB Planter	Max. Storage	= 863 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

#### Hyd. No. 11

CC Planter Routing

Hydrograph type	= Reservoir	Peak discharge	= 0.193 cfs
Storm frequency	= 100 yrs	Time to peak	= 8.00 hrs
Time interval	= 10 min	Hyd. volume	= 2,491 cuft
Inflow hyd. No.	= 6 - CC Developed	Max. Elevation	= 139.57 ft
Reservoir name	= CC Planter	Max. Storage	= 202 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



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#### Hyd. No. 12

**Total Site Runoff** 



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#### Hyd. No. 13

**Detention Routing** 

Hydrograph type	= Reservoir	Peak discharge	= 0.292 cfs
Storm frequency	= 100 yrs	Time to peak	= 9.17 hrs
Time interval	= 10 min	Hyd. volume	= 11,276 cuft
Inflow hyd. No.	= 12 - Total Site Runoff	Max. Elevation	= 137.62 ft
Reservoir name	= Detention Pipes	Max. Storage	= 4,215 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

#### Hyd. No. 14

**Total Existing Site** 

Hydrograph type Storm frequency	= Combine = 100 vrs	Peak discharge Time to peak	= 0.345 cfs = 8.00 brs
Time interval	= 10 min	Hyd. volume	= 6,087 cuft
Inflow hyds.	= 1, 3, 5, 7	Contrib. drain. area	= 0.960 ac



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## **Hydraflow Rainfall Report**

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Return Period	Intensity-Duration-Frequency Equation Coefficients (FHA)							
(Yrs)	В	D	E	(N/A)				
1	0.0000	0.0000	0.0000					
2	0.0000	0.0000	0.0000					
3	0.0000	0.0000	0.0000					
5	0.0000	0.0000	0.0000					
10	0.0000	0.0000	0.0000					
25	0.0000	0.0000	0.0000					
50	0.0000	0.0000	0.0000					
100	0.0000	0.0000	0.0000					

File name: SampleFHA.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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Tc = time in minutes. Values may exceed 60.

		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	1.10	2.20	0.00	2.70	3.20	3.60	4.10	4.40		
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
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	1.10	2.20	0.00	2.70	3.20	3.60	4.10	4.40		

Precip. file name: P:\14000s\14855\engineering\hydrology\salem.pcp

# Tab 4.0

#### 4.0 GSI ANALYSIS

The proposed site is meeting conformance with the MEF requirement by routing runoff from new and replaced impervious surfaces into stormwater planters around the perimeter of the project site. The stormwater planters have an area that is greater than 10% of the total of new and replaced impervious surfaces.

New and replaced impervious area = 36,741 square feet

Stormwater Planter area = 4935 square feet (13.4%)



#### 5.0 SOURCE CONTROL

A Stormwater Pollution Control Plan and Operations and Maintenance Manual will be prepared with the permit level documents.

This project is a fueling facility so there are structural source controls in place as well as operations and maintenance procedures to be followed after construction. The under canopy area near the fuel dispensers will be concrete to prevent fuel or other hazardous liquids to infiltrate into the ground. Under the canopy will be graded to catch basins under the canopy that will drain through an oil/water separator and then to the sanitary sewer. The site is graded so that rain water is directed away from the canopy. Facility operators will be trained in the event of a spill and how to clean up the site to prevent oil and other hazardous materials from entering the storm system. The fuel facility will also include an emergency shut off valve in case of emergency. Appropriate signage will be installed per City of Salem requirements.