Exhibit 3.10

FROELICH ENGINEERS

Stormwater Drainage Report

BSD – Mountainside Training Facility

12500 SW 175th Ave
Beaverton, OR 97007

For

CIDA

RENEWS: 12/31/25

Regular maintenance and inspection are required on all components of the stormwater system. This plan provides instruction on how to maintain and inspect the system.

Prepared by: Evan Eykelbosch, PE
Froelich Engineers
17700 SW Upper Boones Ferry Rd, Suite 115
Portland, OR 97224
Froelich Project Number: 24-C003
Date: May 31, 2024

Designer's Certification and Statement

"I hereby certify that this Stormwater Management Report for this project has been prepared by me or under my supervision and meets the minimum standards of the City of Beaverton and normal standards of engineering practice. I hereby acknowledge and agree that the jurisdiction does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities design by me."

Evan Eykelbosch, PE

Contents

I. Project Overview and Description

This stormwater report has been prepared in accordance with the 2019 City of Beaverton Engineering Design Manual guideline and the South Cooper Mountain High School Final Stormwater Management Report prepared in April 2015 by Harper Houf Peterson Righellis Inc. (HHPR) to support the permit applications for the proposed project improvements. The intent of this report is to indicate that the existing facilities have sufficient capacity to accommodate the proposed development.

BSD – Mountainside Training Facility is a new facility located between two ball fields in the northwest corner of the Mountainside High School property (See Appendix A: Vicinity Map).

Existing Conditions

The existing condition of the site is primarily two multi-use artificial turf fields used for softball and baseball. There are some impervious surfaces present for bleachers, vehicle storage, dug-outs and a concrete sidewalk. The existing topography is generally flat and gently sloping from south to north and east to west. The northwest edge of the site has 6'-10' retaining wall. The existing runoff from the turf fields is detained and collected through a below grade gravel retention system. Sidewalk and turf runoff are routed to a low impact development appraoch (LIDA) basin located to the northwest prior to discharge into wetland that lies north of the site.

An existing condition Basin Map is provided in Appendix B.

Proposed Conditions

The development will include two new structures (Training Facility) in the existing landscaped area located between the turf fields. The proposed grading will maintain the drainage patterns of the existing conditions. The new impervious area will be collected and conveyed into the existing stormwater system. All new runoff will be treated by the existing LIDA facility.

A proposed condition Basin Map is provided in Appendix B.

'Table 1a & 1b: Catchment Areas' provides the basin characteristics for the various catchment areas under the existing and proposed conditions.

II. Methodology

Per the 2015 South Cooper Mountain High School Final Stormwater Management Report, the stormwater facilities were designed to comply with Clean Water Services (CWS), City of Beaverton (COB), and National Marine Fisheries Service (NMFS). Stormwater requirements include stormwater treatment and flow control. The proposed development has 4,596 sf of new or modified impervious surface. The existing LIDA basin as well Basins 14 and 15 were analyzed in their present conditions and adjusted to account for the increased peak flow rates due to the increase of impervious area (See Appendix B: Basin Map and Areas, and 'Table 1a & 1b: Catchment Areas').

The CWS Standards require that all development and redevelopment that creates and/or modifies 1,000 square feet or more of impervious area must comply with the stormwater management requirements for treatment, hydromodification and conveyance.

The proposed development has between 1,000 sf and 12,000 sf of new or modified impervious surface, is within the developed area, and has a reach-specific risk level rating of moderate, based on the hydromodification map web tool on Clean Water Services website, designation the site as a Category 1 project, per CWS Table 4-2. While a fee in lieu of stormwater management is an option for this site, this report intends to show that the existing stormwater system is sufficiently sized for water quality treatment. As hydromodification was not analyzed with the original 2015 design, it is not possible to fully determine if

the site meets the 5-year hydromodification requirements. If management of the site runoff to meet the 2015 approved design is not sufficient then a fee-in-lieu for hydromodification may be required.

The existing LIDA basin was designed for peak flow to not exceed facility detention of 2-yr post development to ½ the 2-year predevelopment, and for the Water quality event (50% of the 2-year event (See Appendix D: Detention Calculations). All larger stormwater events overflow the LIDA facility. A summary of the detention facilities is provided in 'Table 2a & 2b: Catchment and Facility Table' and a summary of the flow rate results is provided in 'Table 3: Stormwater Flow Rate Table'.

The conveyance calculations were designed for the 25-year storm event (4.00 in/24-hr) per Table 4-4 of CWS Design and Construction Standards (See Appendix D: Conveyance Calculations). All new runoff can sufficiently be conveyed by a 4" storm line with a 1.0% minimum slope.

- Total New/Modified Impervious Area = 4,596 sf

III. Analysis

The analysis of the site is based on the Storwmater Report prepared by HHPR. Different basin areas were used depending on the analysis of the Water Quality and Flow Control requirements. The focus of the analysis was on the changes to Basin 15. The analysis of the project is based on the Santa Barbara Urban Hydrograph (SBUH) Method and was implemented using a NRCS Type 1A rainfall distribution for a 24-hour storm. The system was designed using Hydraflow software. Conveyance calculations are based on the Manning Formula for uniform pipe flow. (See Appendix D: Conveyance and Detention Calculations).

For the Water Quality analysis, it was necessary to determine if the existing LIDA Basin is sufficiently sized to accommodate the new Training Facility structures. Based on our analysis the depth of the LIDA Basin will not increase from elevation 304.28 (see Table 1c: Peak Flow and LIDA elevation). It will continue to stay below the required elevation of 304.50. Therefore, Water Quality is adequately provided by the existing facility.

Basin Area Water Quality Analysis

Table 1a: Existing Catchment Areas

BASIN	ORIGINAL BASIN AREA*					
	pervious		impervious		total	
	sf	ac	sf	ac	sf	ac
Basin 14	2,270	0.1	51,675	1.2	53,945	1.2
Basin 15	26,462	0.6	236,818	5.4	263,280	6.0
Total	28,732	0.7	288,493	6.6	317,225	7.3

*** Areas based on SCM High School Water Quality Per CWS: HHPR Stormwater Report Dated September 2015 (see Appendix G)**

Table 1b: Proposed Catchment Areas

BASIN	PROPOSED BASIN AREA*					
	pervious		impervious		total	
	sf	ac	sf	ac	sf	ac
Basin 14	2,270	0.1	51,675	1.2	53,945	1.2
Basin 15	21,866	0.5	241,414	5.3	263,280	6.0
Total	24,136	0.6	293,089	6.5	317,225	7.3

*** Areas based on modification of Existing Conditions (4,596 SF)**

Table 1c: Peak Flow and LIDA Elevation for Basins 14 & 15 (See Appendix F for existing hydrographs)

Storm Event	Existing Peak Discharge (cfs)	Existing Max LIDA Basin Elevation (ft)	Proposed Peak Discharge (cfs)	Proposed Max LIDA Basin Elevation (ft)
50% of 2-year (NMFS)	0.104	304.28	0.104	304.28

For the Flow Control analysis, it was necessary to determine if the increase impervious area in Basin 15, would result in an exceeding of the LIDA Basin for 42% of the 2-year event, and if the larger event would result in an exceeding of the allowed Onsite Discharge. Based on our analysis, there is no change in the peak flows for 42% of the 2-year event, and the other stormwater events have only a minor increase. The revisions to Basin 15 do not increase runoff to exceed the "Onsite Allowed Release Rate", See Table 3.

Basin Area: Flow Control Analysis

Table 2a: Existing Catchment and Facility Areas

BASIN	**ORIGINAL BASIN AREA**					
	pervious		**impervious**		**total**	
	sf	**ac**	**sf**	**ac**	**sf**	**ac**
Basin 14	48,731	1.12	5,214	0.12	53,945	1.24
Basin 15	225,460	5.18	37,820	0.87	263,280	6.04
Total	274,191	6.29	43,034	0.99	317,225	7.28

*** Areas based on SCM High School Flow Control Summary: HHPR Stormwater Memo Dated May 2016 (see Appendix F)**

Table 2b: Proposed Catchment and Facility Areas

BASIN	**PROPOSED BASIN AREA**					
	pervious		**impervious**		**total**	
	sf	**ac**	**sf**	**ac**	**sf**	**ac**
Basin 14	48,731	1.12	5,214	0.12	53,945	1.24
Basin 15	220,864	5.07	42,416	0.97	263,280	6.04
Total	269,595	6.19	47,630	1.09	317,225	7.28

*** Areas based on modification of Existing Conditions**

Table 3: Stormwater Flowrate for Basin 15

Storm Event	BSD High School Total Onsite Allowed Release Rate (cfs)*	BSD High School Total Onsite Allowed Rate (cfs)*	BSD High School Existing Flow Basin 15 (cfs)**	BSD High School Proposed Flow Basin 15 (cfs) 2024	BSD High School Total Onsite Proposed Flow Rate (cfs)*** 2024
42% of 2-year (NMFS)	0.47	0.46	0.057	0.057	0.46
2-Year (CWS & NMFS)	8.63	6.29	0.757	0.763	6.30
10-Year (NMFS)	20.0	14.1	1.824	1.839	14.12
25-Year (NMFS)	21.9	15.7	2.004	2.021	15.72

***Flows based HHPR Stormwater Memo dated February 2016 (see Appendix E)**
****Flows based HHPR Stormwater Memo dated May 2016 (see Appendix F)**
*****Flows based Total Onsite Allowed Rate – Existing Flow Basin 15 + Proposed Flow Basin 15**

IV. Engineering Conclusion

Based on the requirements of the Engineering Design Manual, all facilities and conveyance components have enough capacity to handle the runoff from the required storm event and should be approved as designed.

V. Appendices

Appendix A: Vicinity Map


PROJECT SITE
Vineyard by New Home Co
SW Barrows Rd
SW Goose Ln
SW 175th Ave
Kite & Barrows Playground
Mountainside Heights by Everett
SW 171st Terrace
Arazo
Mountainside High School
SW Mountainside Way
DuraKru Visions
SW Scholls Ferry Rd
210
SW Forest Hollow St
SW Roy Rogers Rd

Appendix B: Basin Map and Areas

EXISTING BASIN MAP

P:\BOR (Boora Architects)\BOR-13 (BSD New HS)\BOR13-DOCS\REPORTS\STORM - (Storm Report)\Site Development (SWM Report)\Final to reflect StormTech

PROPOSED DISCHARGE LOCATION FOR PUBLIC POND DISCHARGE PIPE REROUTE/EXTENSION
PROTECTED WETLANDS
PROPOSED DISCHARGE LOCATION
14 & 15 – LIDA BASIN
SOFTBALL FIELD (ARTIFICIAL TURF)
BASEBALL FIELD (ARTIFICIAL TURF)
SOFTBALL FIELD (ARTIFICIAL TURF)
MODIFIED EX PUBLIC WQ/DET FACILITY
BASIN 14 & 15
17 – UG DET SYSTEM
PRIVATE FLOW CONTROL MANHOLE (STUDENT PARKING LOT MANAGEMENT)
12C – LIDA BASIN
ACCESS ROAD
FOOTBALL/LACROSSE/SOCCER/TRACK FIELD (ARTIFICIAL TURF)
STUDENT PARKING LOT
17 – LIDA SWALE
STADIUM
4 – MECH TREATMENT
16 – LIDA BASIN
5 – LIDA SWALE
STAFF/BUS PARKING LOT
2, 3, 5 & 16 – POND DET
PRIVATE OUTFLOW CONTROL STRUCTURES
2 & 3 – MECH TREATMENT
SW 175TH AVENUE
12B
HIGH SCHOOL
10 (PORTION) & 12B LIDA BASIN
OFF7 – LIDA PLANTERS
1 – LIDA SWALE
10 (PORTION) LIDA PLANTERS
TENNIS COURTS
8, 9 & 10 (PORTION) LIDA PLANTER
JV BASEBALL/SOCCER FIELDS (ARTIFICIAL TURF)
FIRE ACCESS ROAD (PERVIOUS PAVERS)
6 – LIDA SWALE
10 (PORTION) MECH TREATMENT
10 – UG DET SYSTEM
PROPOSED DISCHARGE LOCATION
PUBLIC FLOW CONTROL MANHOLE
SW SCHOLLS FERRY ROAD
SW ROY ROGERS R
OFF8 – LIDA PLANTER
OFFSITE UG DET (175/SCHOLLS)
OFF8 – LIDA PLANTER
PRIVATE FLOW CONTROL MANHOLE (SCHOOL BLDG MANAGEMENT)

0 50 100 200
SCALE: 1" = 200'

STORMWATER MANAGEMENT PLAN
SCM HIGH SCHOOL
BEAVERTON, OREGON

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

DESIGNED:	AMM
DRAWN:	AMM
CHECKED:	HHPR
DATE:	FEBRUARY 2016

REVISIONS

NO.	DESCRIPTION	DATE

SHEET NO. 3

JOB NO. BOR-13

PROPOSED BASIN MAP

P:\BOR (Boora Architects)\BOR-13 (BSD New HS)\BOR13-DOCS\REPORTS\STORM - (Storm Report)\Site Development (SWM Report)\Final to reflect StormTech

NEW IMPERVIOUS AREA IN Ex. BASIN 15

BASIN 14 & 15

PROPOSED DISCHARGE LOCATION FOR PUBLIC POND DISCHARGE PIPE REROUTE/EXTENSION

PROTECTED WETLANDS

PROPOSED DISCHARGE LOCATION

14 & 15 – LIDA BASIN

SOFTBALL FIELD (ARTIFICIAL TURF)

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STADIUM

4 – MECH TREATMENT

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10 – UG DET SYSTEM

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OFFSITE UG DET (175/SCHOLLS)

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0 50 100 200

SCALE: 1" = 200'

STORMWATER MANAGEMENT PLAN

SCM HIGH SCHOOL

BEAVERTON, OREGON

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

DESIGNED:	AMM
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SHEET NO. 3

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*** Areas based on modification of Existing Conditions (4,596 SF)**

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50% of 2-year (NMFS)	0.104	304.28	0.104	304.280

FROELICH ENGINEERS

Basin Area: Flow Control Analysis

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Total	274,191	6.29	43,034	0.99	317,225	7.28

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*** Areas based on modification of Existing Conditions (4,596 SF)**

Table 3: Stormwater Flowrate for Basin 15

Storm Event	BSD High School Total Onsite Allowed	BSD High School Total Onsite Allowed	BSD High School Existing Flow Basin 15	BSD High School Proposed Flow	BSD High School Total Onsite Proposed Flow Rate
42% of 2-year (NMFS)	0.47	0.46	0.057	0.057	0.46
2-Year (CWS & NMFS)	8.63	6.29	0.757	0.763	6.30
10-Year (NMFS)	20.0	14.1	1.824	1.839	14.12
25-Year (NMFS)	21.9	15.7	2.004	2.021	15.72

***Flows based HHPR Stormwater Memo dated February 2016 (See Appendix E)**

****Flows based HHPR Stormwater Memo dated May 2016 (See Appendix F)**

*****Flows based Total Onsite Allowed Rate – Existing Flow Basin 15 + Proposed Flow**

Appendix C: Assumptions

New Beaverton High School

Precipitation rates governing water quality and detention

Prepared by Harper Houf Peterson Righellis Inc.
Job No. BOR-13
January 2015

Water Quality:

NMFS		CWS		COB		Return Period in Hydroflow Model for governing design storm
Event	**Precip (in/hr)**	**Event**	**Precip (in/hr)**	**Event**	**Precip (in/hr)**	
50% of 2-yr:	1.25	0.36" in 4 hrs (100% impervious)		Per CWS		3-yr (NMFS)

Detention:

NMFS		CWS		COB		Return Period in Hydroflow Model for governing design storm
Event	**Precip (in/hr)**	**Event**	**Precip (in/hr)**	**Event**	**Precip (in/hr)**	
42% of 2-yr:	1.05	6 mo.:	N/A	6 mo.:	2.00	1-yr (NMFS)
2-yr:	2.45	2-yr:	2.5	2-yr:	2.5	2-yr (CWS/COB)
5-yr:	3.0	5-yr:	3.1	5-yr:	N/A	5-yr (CWS)
10-yr:	3.8	10-yr:	3.45	10-yr:	3.5	10-yr (NMFS)
25-yr:	4.0	25-yr:	3.9	25-yr:	4.0	25-yr (COB/MNFS)
100-yr:	4.5	100-yr:	4.5	100-yr:	4.5	100-yr (CWS/COB/NMFS)

Legend:

Governs design

Land Use Zoning

For the purpose of the conveyance analysis, contributing upstream basins will be assumed to be in full built-out, un-detained condition based on South Cooper Mountain Master Plan land use zoning.

Soils Characteristics

The Natural Resources Conservation Service (NRCS) with the United States Department of Agriculture (USDA) has classified the soils within Washington County in the Soil Survey of Washington County Manual. Soils are categorized into Hydrologic Soil Groups based on estimated runoff from precipitation. These groupings assume the soils are saturated and receive precipitation from long-duration storms. This rainfall to runoff relationship is complex and includes the Drainage and Permeability characteristics of the soil. The soils are silt loam and have hydrological grouping classifications as shown in Appendix B.

Existing (E) and Proposed (P) Soil Assumptions:
Curve Numbers = (E & P) 98 for Impervious Area
(E) 85 for Poor Conditions Small Grain Contoured (Soil Type D)
(E) 82 for Poor Conditions Small Grain Contoured (Soil Type C)
(E) 77 for Fair Conditions Brush (Soil Type D)
(E) 70 for Fair Conditions Brush (Soil Type C)
(P) 80 for Good Conditions Open Space (Soil Type D)
(P) 74 for Good Conditions Open Space (Soil Type C)
(P) 77 for Good Conditions LIDA (Soil Type D)
(P) 70 for Good Conditions LIDA (Soil Type C)
(P) 85 for Artificial Turf (mimics existing conditions) (Soil Type D)
(P) 82 for Artificial Turf (mimics existing conditions) (Soil Type C)

Sheet Flow Mannings "n" = 0.011 for pavement
0.150 for short prairie grass and lawn

Shallow Concentrated Flow "Cp" = 16.13 for unpaved surfaces
Per FHWA, English units 20.32 for paved surfaces

Conduit Flow Mannings "n" = 0.013 for pipe flow

Tested infiltration rates (by GeoDesign Dec 16, 2014. See Appendix D) = 0.0 in/hr

Refer to the water quality section for LID amended topsoil information.

Proposed Improvements and Impervious Surfaces

Proposed onsite impervious surface area will consist of the parking lot, roads, and school building. The existing and proposed impervious area for the disturbed site area is 0.2 acres and 17.7 acres, respectively.

Proposed offsite impervious surface area will consist of the half street widening and the addition of a 10' multiuse path identified in the South Cooper Mountain Master Plan. The existing and proposed impervious area for the disturbed offsite area is 5.2 acres and 7.1 acres, respectively.

Appendix D: Detention, Flow Control, and Conveyance

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

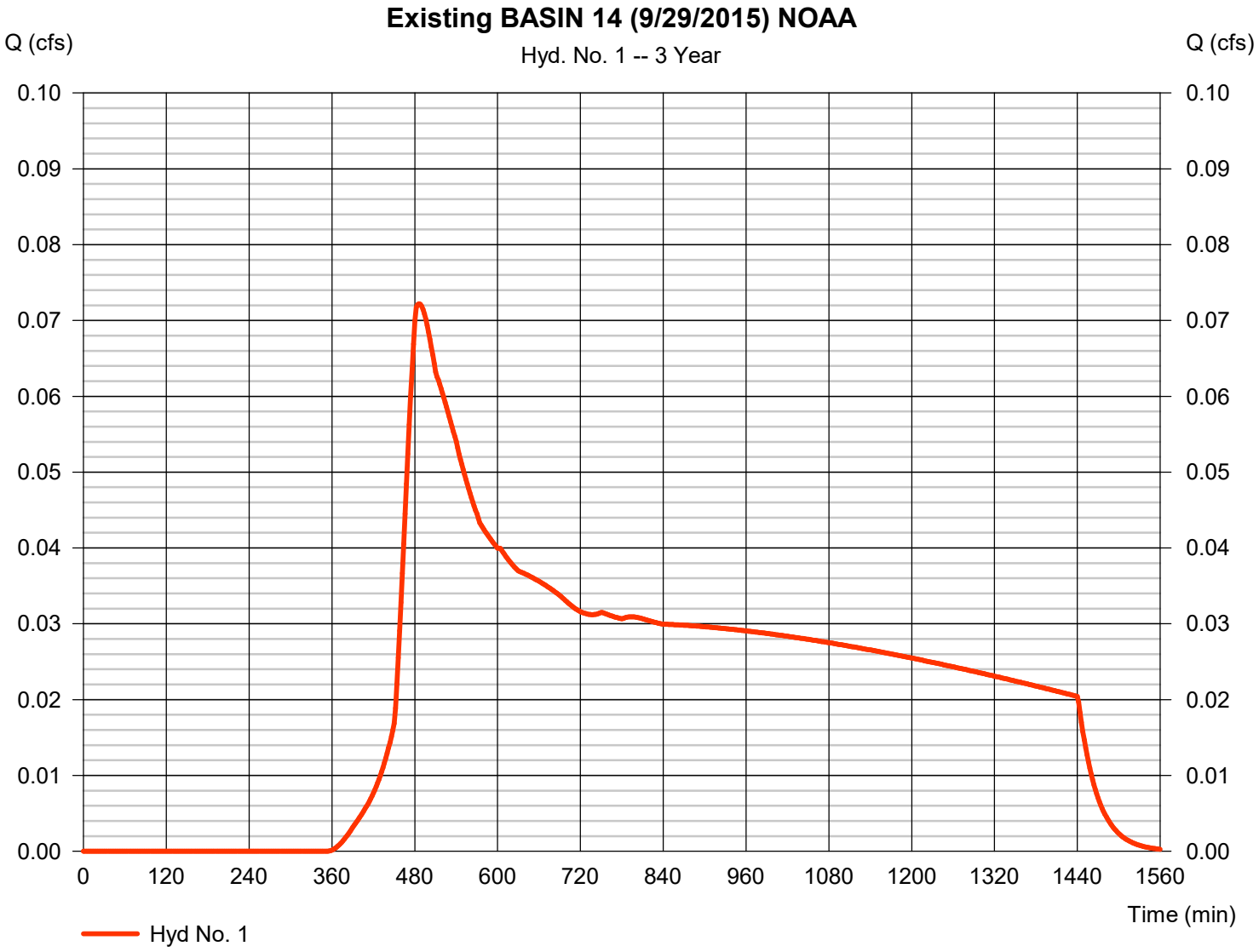
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SBUH Runoff	0.072	2	486	1,957	------	------	------	Existing BASIN 14 (9/29/2015) NOAA
2	SBUH Runoff	0.079	2	1014	4,248	------	------	------	Existing BASIN 15 (9/29/2015) NOAA
3	Combine	0.119	2	536	6,204	1, 2	------	------	Existing (Basi14 + 15)
4	Reservoir	0.104	2	1122	6,203	3	304.28	296	14 & 15 - LIDA Basin
6	SBUH Runoff	0.072	2	486	1,957	------	------	------	Proposed BASIN 14 (9/29/2015) NOA
7	SBUH Runoff	0.079	2	1014	4,248	------	------	------	Propoed BASIN 15
8	Combine	0.119	2	536	6,204	6, 7	------	------	Proposed (Basin 14+15)
9	Reservoir	0.104	2	1122	6,203	8	304.28	296	Existing LIDA Basin

Hydrograph Report

Hyd. No. 1

Existing BASIN 14 (9/29/2015) NOAA

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.072 cfs
Storm frequency	= 3 yrs	Time to peak	= 486 min
Time interval	= 2 min	Hyd. volume	= 1,957 cuft
Drainage area	= 1.200 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 27.30 min
Total precip.	= 1.25 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a

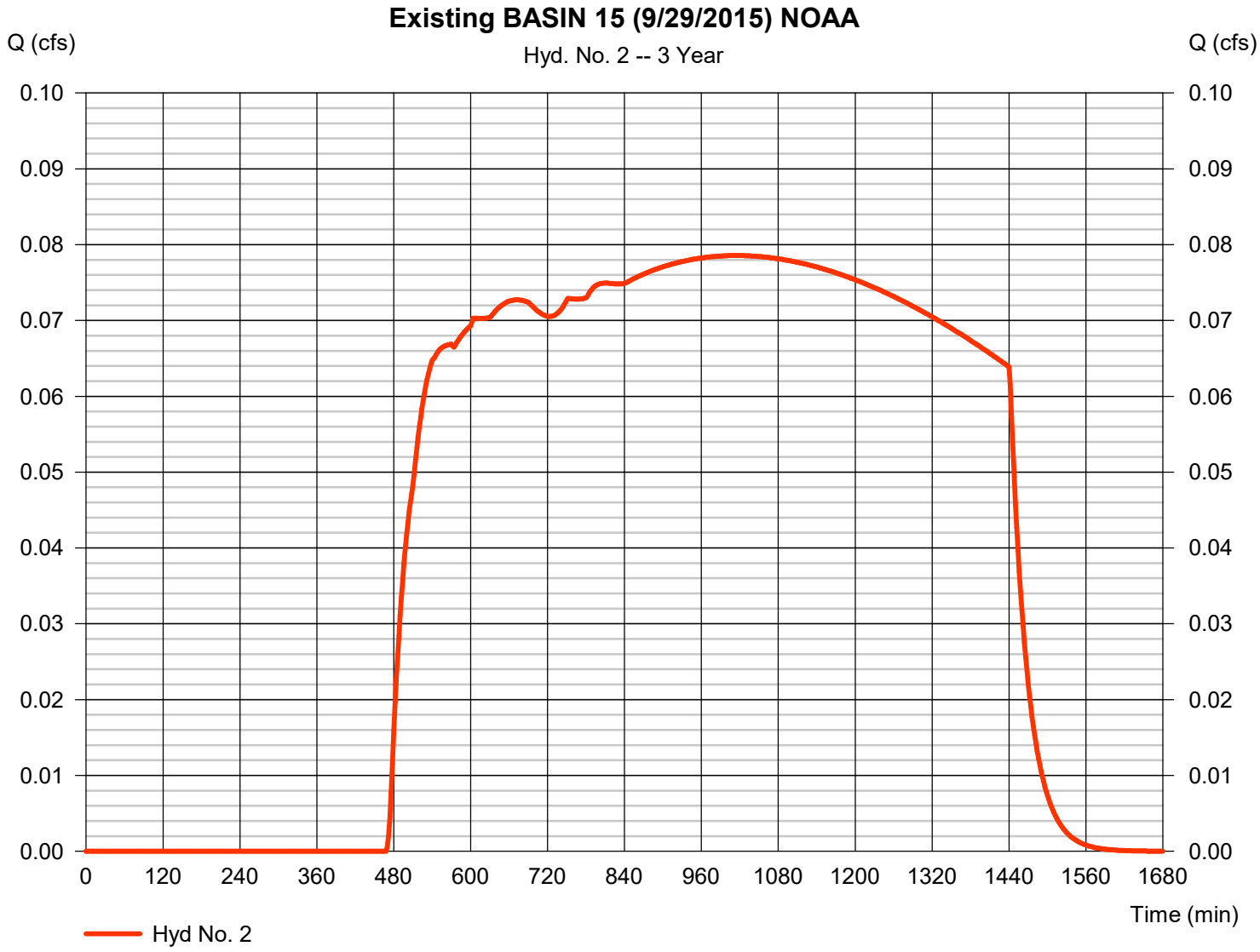


Hydrograph Report

Hyd. No. 2

Existing BASIN 15 (9/29/2015) NOAA

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.079 cfs
Storm frequency	= 3 yrs	Time to peak	= 1014 min
Time interval	= 2 min	Hyd. volume	= 4,248 cuft
Drainage area	= 6.000 ac	Curve number	= 81
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 27.30 min
Total precip.	= 1.25 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a

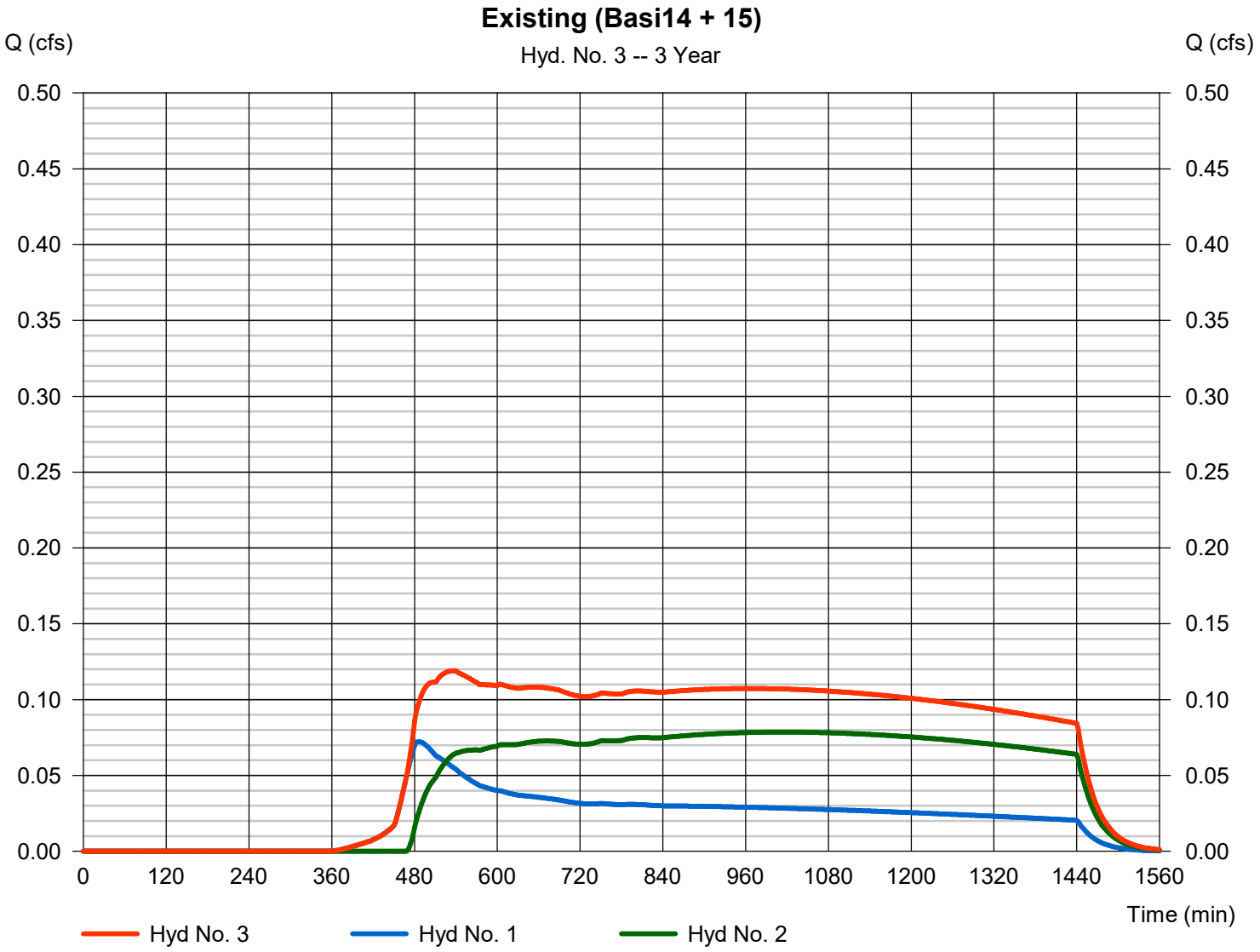


Hydrograph Report

Hyd. No. 3

Existing (Basi14 + 15)

Hydrograph type	=	Combine	Peak discharge	=	0.119 cfs
Storm frequency	=	3 yrs	Time to peak	=	536 min
Time interval	=	2 min	Hyd. volume	=	6,204 cuft
Inflow hyds.	=	1, 2	Contrib. drain. area	=	7.200 ac



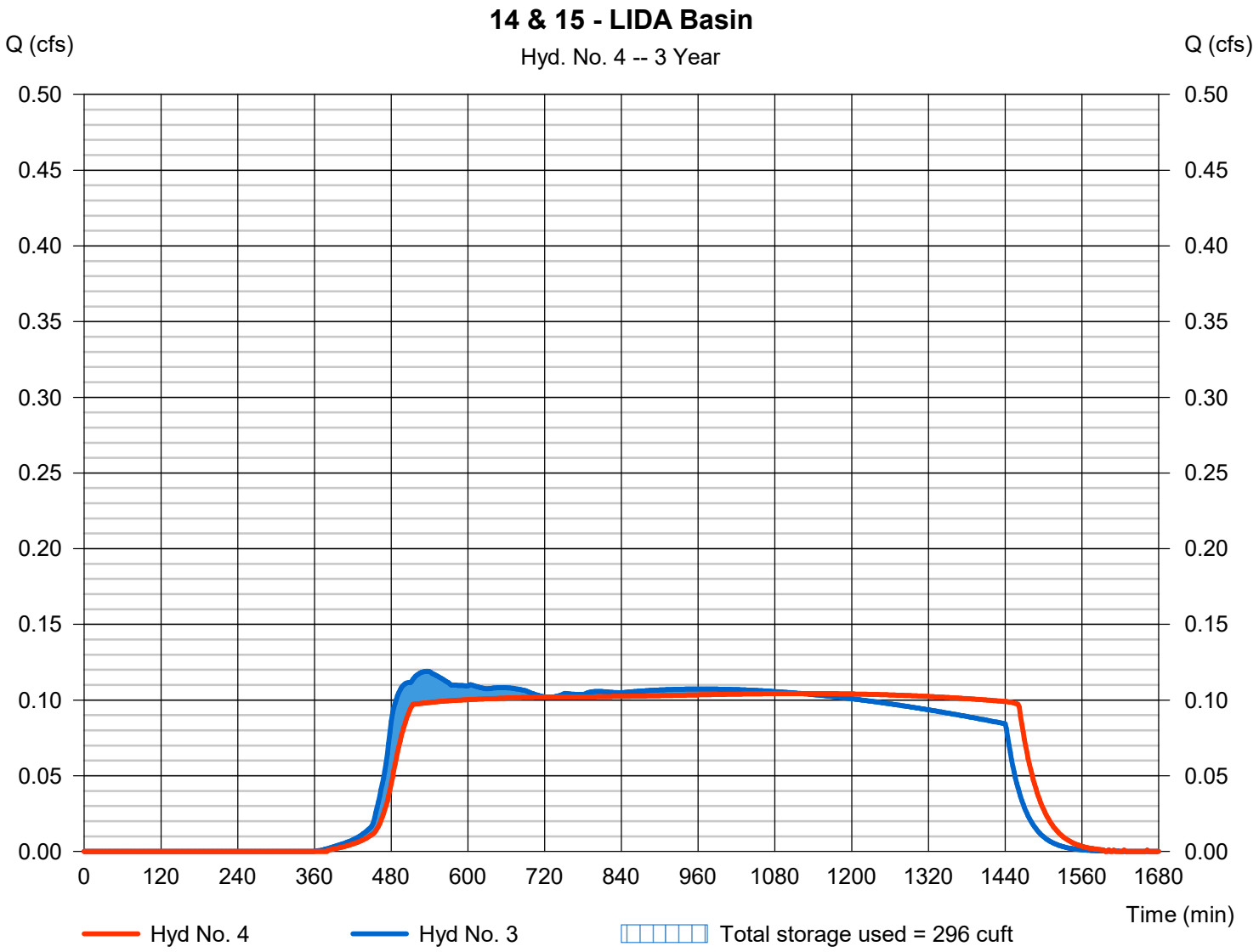
Hydrograph Report

Hyd. No. 4

14 & 15 - LIDA Basin

Hydrograph type	=	Reservoir	Peak discharge	=	0.104 cfs
Storm frequency	=	3 yrs	Time to peak	=	1122 min
Time interval	=	2 min	Hyd. volume	=	6,203 cuft
Inflow hyd. No.	=	3 - Existing (Basi14 + 15)	Max. Elevation	=	304.28 ft
Reservoir name	=	LIDA Basin	Max. Storage	=	296 cuft

Storage Indication method used. Outflow includes exfiltration.

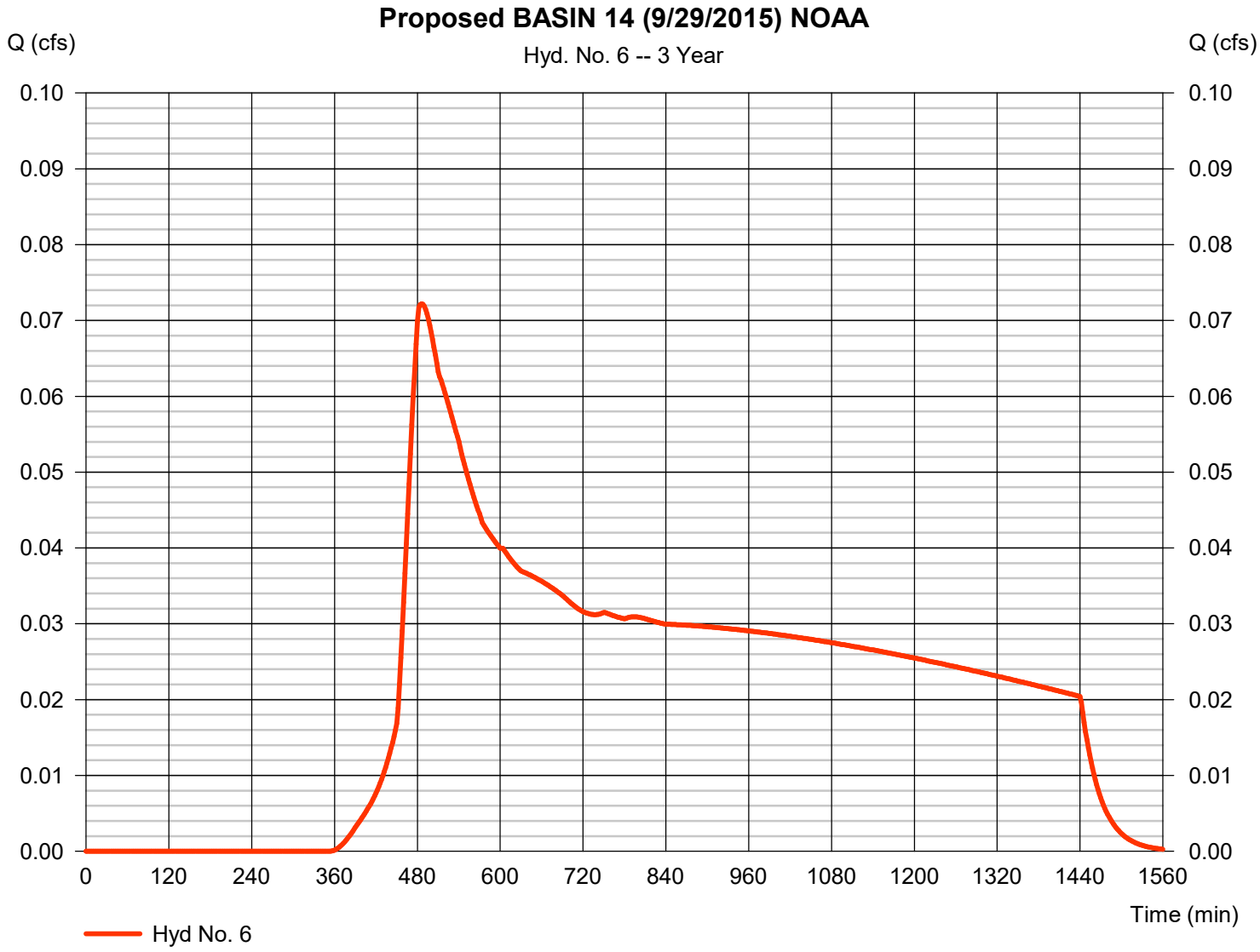


Hydrograph Report

Hyd. No. 6

Proposed BASIN 14 (9/29/2015) NOAA

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.072 cfs
Storm frequency	= 3 yrs	Time to peak	= 486 min
Time interval	= 2 min	Hyd. volume	= 1,957 cuft
Drainage area	= 1.200 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 27.30 min
Total precip.	= 1.25 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a



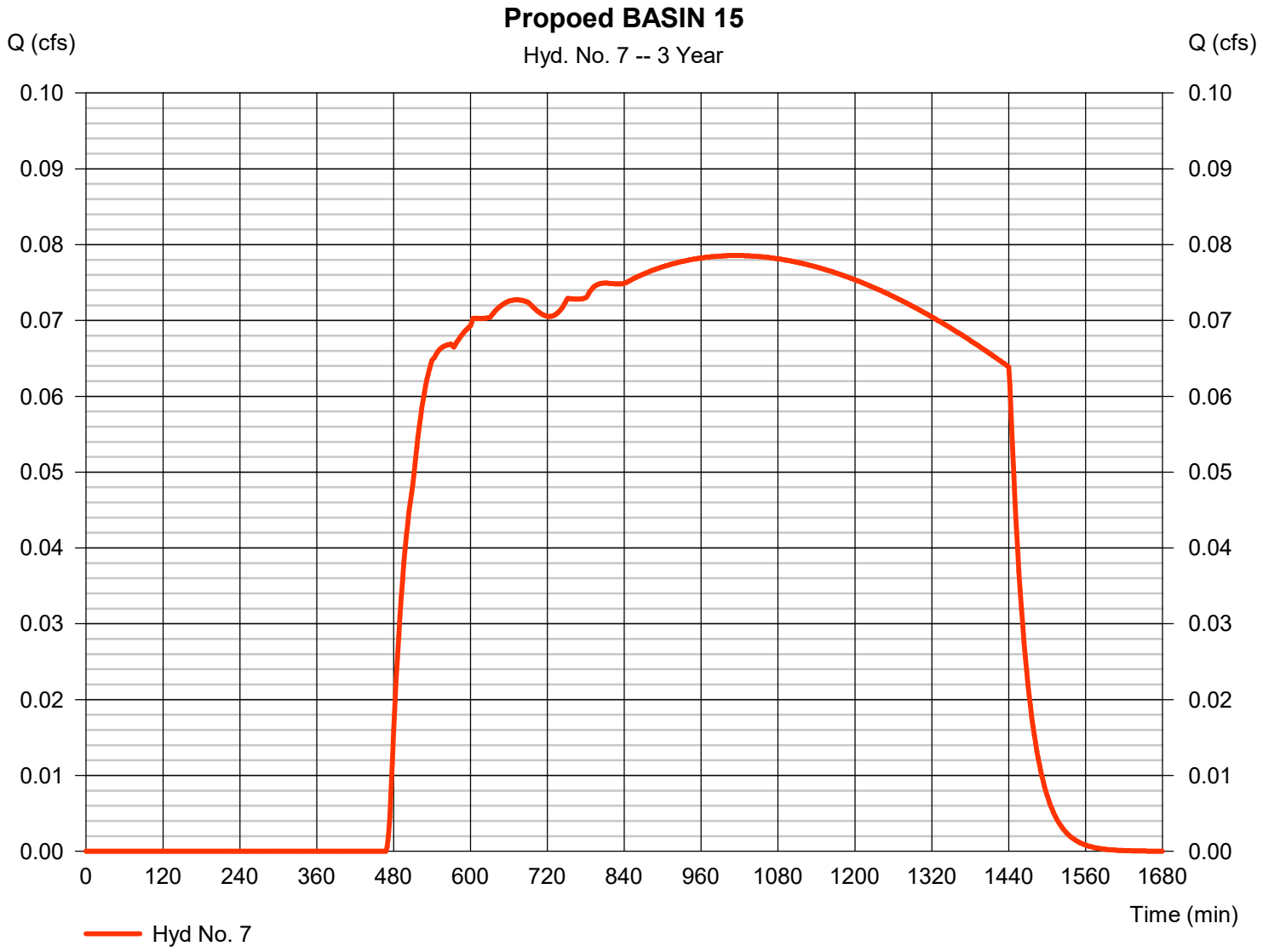
Hydrograph Report

Hyd. No. 7

Propoed BASIN 15

Hydrograph type	=	SBUH Runoff	Peak discharge	=	0.079 cfs
Storm frequency	=	3 yrs	Time to peak	=	1014 min
Time interval	=	2 min	Hyd. volume	=	4,248 cuft
Drainage area	=	6.000 ac	Curve number	=	81*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	27.30 min
Total precip.	=	1.25 in	Distribution	=	Type IA
Storm duration	=	24 hrs	Shape factor	=	n/a

* Composite (Area/CN) = [(0.500 x 81) + (5.400 x 81) + (0.100 x 98)] / 6.000

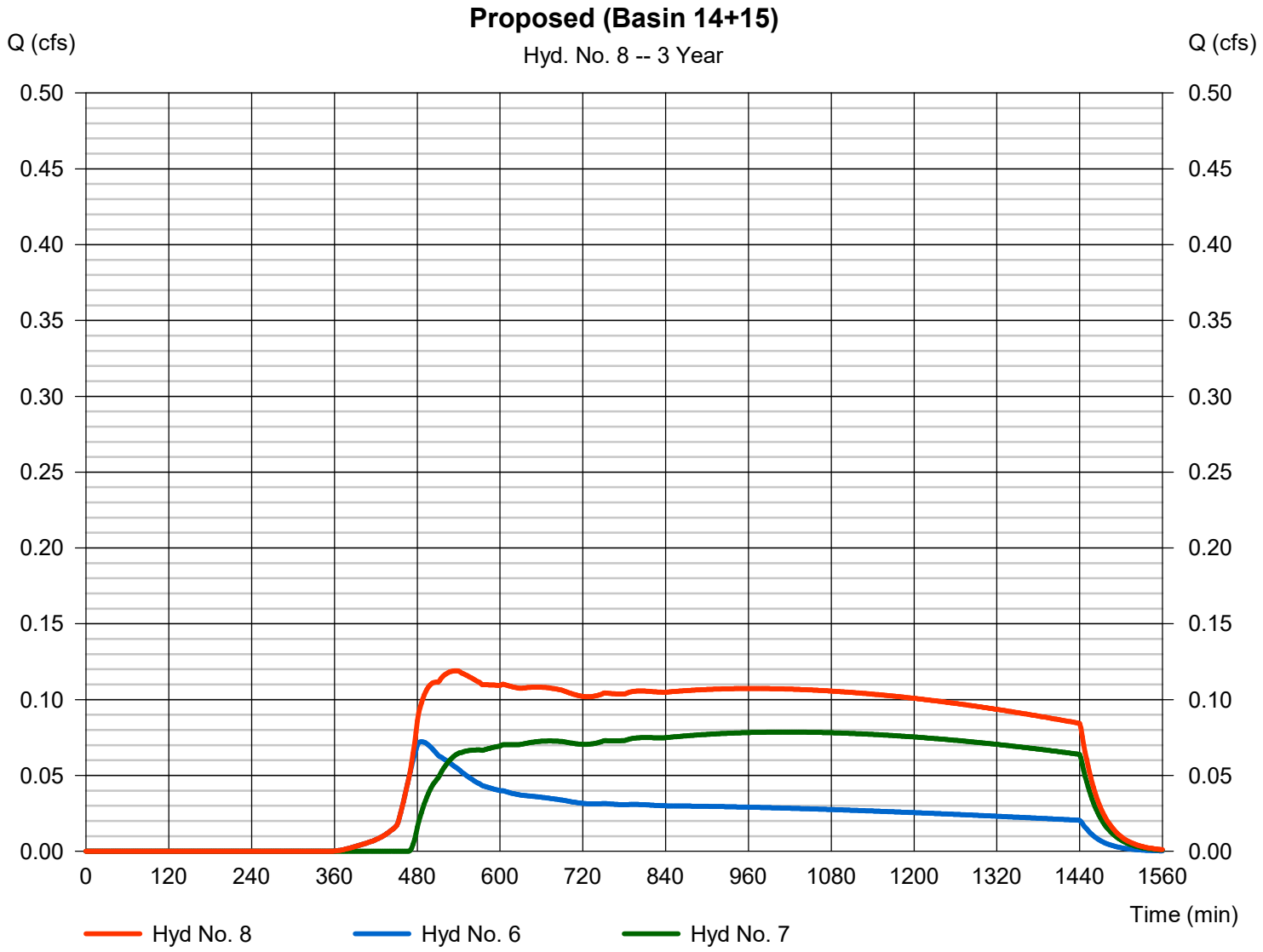


Hydrograph Report

Hyd. No. 8

Proposed (Basin 14+15)

Hydrograph type	=	Combine	Peak discharge	=	0.119 cfs
Storm frequency	=	3 yrs	Time to peak	=	536 min
Time interval	=	2 min	Hyd. volume	=	6,204 cuft
Inflow hyds.	=	6, 7	Contrib. drain. area	=	7.200 ac



Hydrograph Report

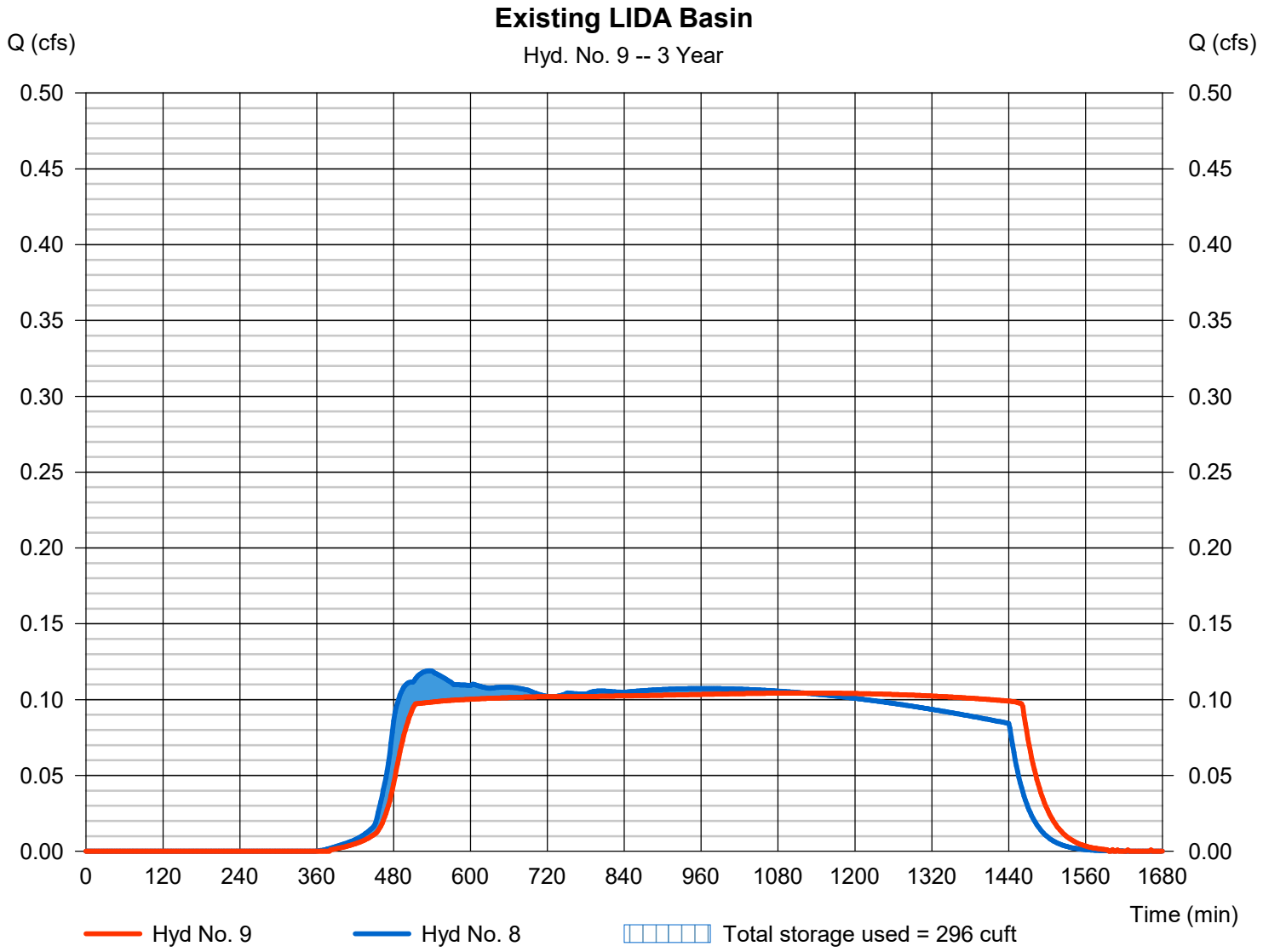
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Thursday, 05 / 30 / 2024

Hyd. No. 9

Existing LIDA Basin

Hydrograph type	=	Reservoir	Peak discharge	=	0.104 cfs
Storm frequency	=	3 yrs	Time to peak	=	1122 min
Time interval	=	2 min	Hyd. volume	=	6,203 cuft
Inflow hyd. No.	=	8 - Proposed (Basin 14+15)	Max. Elevation	=	304.28 ft
Reservoir name	=	LIDA Basin	Max. Storage	=	296 cuft

Storage Indication method used. Outflow includes exfiltration.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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	0.057	2	1076	2,917	------	------	------	Existing BASIN 15 (5/20/2016) NOAA
3	SBUH Runoff	0.057	2	1076	2,917	------	------	------	Proposed BASIN 15

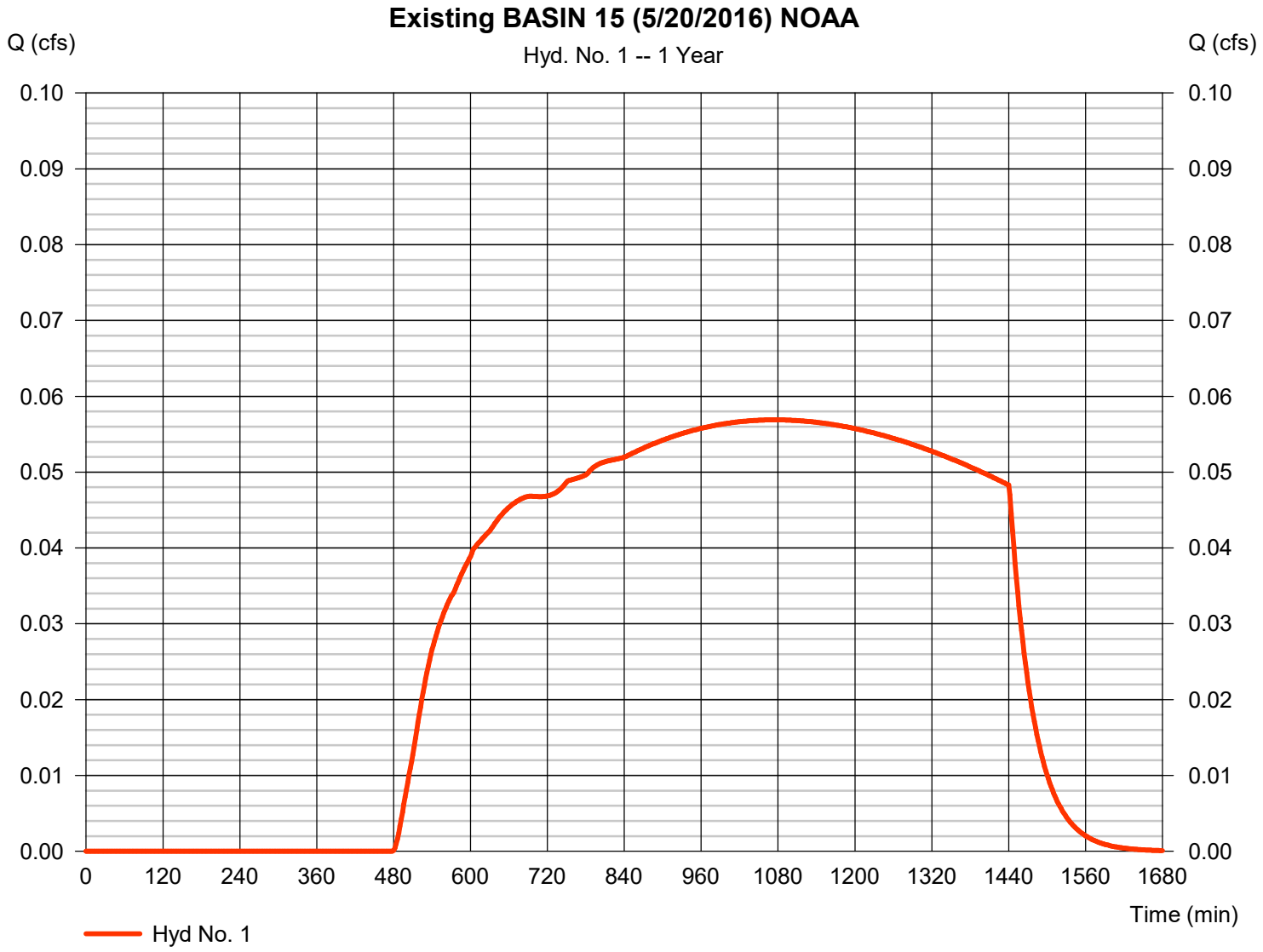
Hydrograph Report

Hyd. No. 1

Existing BASIN 15 (5/20/2016) NOAA

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.057 cfs
Storm frequency	= 1 yrs	Time to peak	= 1076 min
Time interval	= 2 min	Hyd. volume	= 2,917 cuft
Drainage area	= 6.040 ac	Curve number	= 82*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 37.60 min
Total precip.	= 1.05 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a

* Composite (Area/CN) = [(0.868 x 98) + (5.175 x 79)] / 6.040



Hydrograph Report

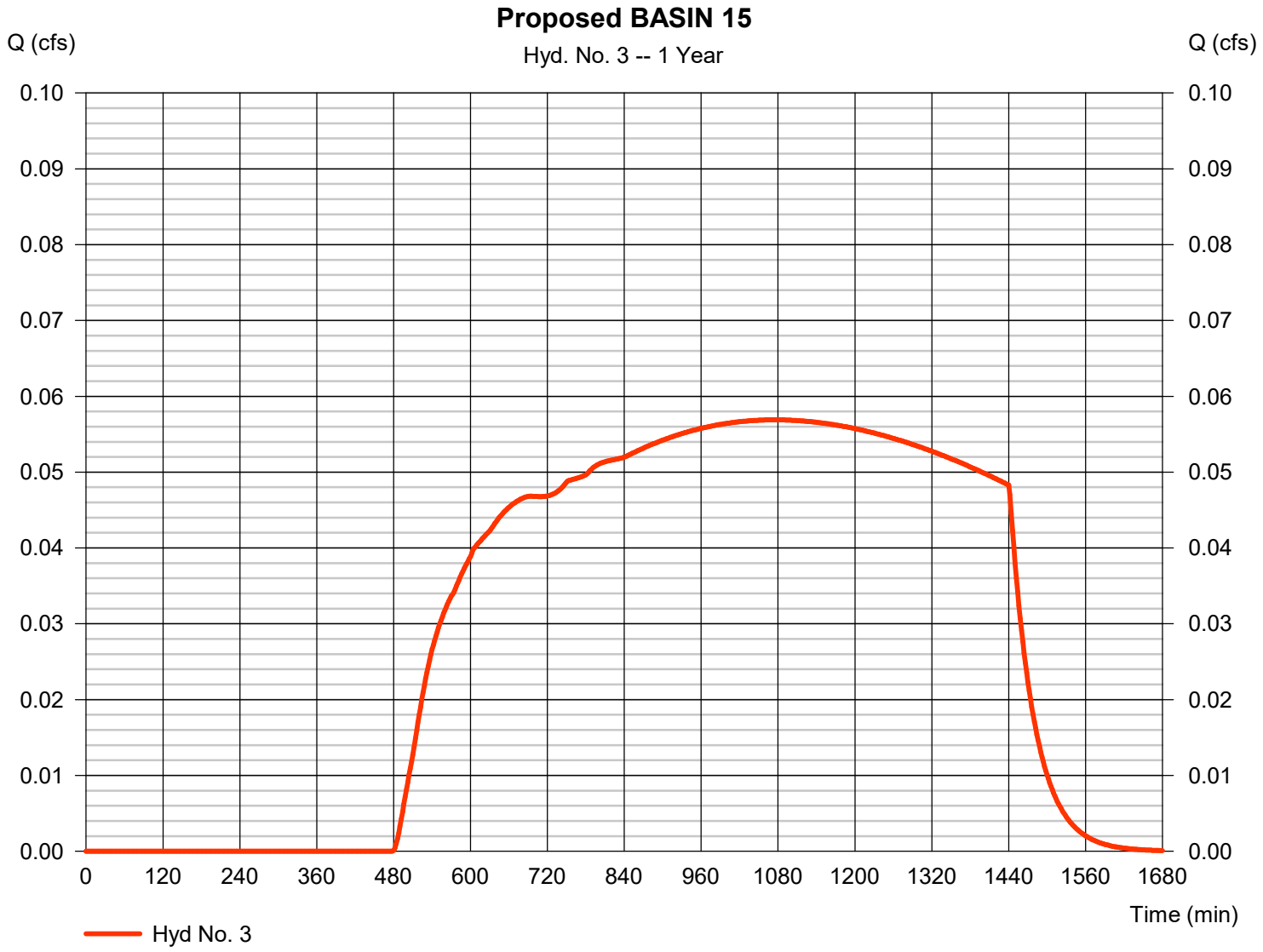
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Thursday, 05 / 30 / 2024

Hyd. No. 3

Proposed BASIN 15

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.057 cfs
Storm frequency	= 1 yrs	Time to peak	= 1076 min
Time interval	= 2 min	Hyd. volume	= 2,917 cuft
Drainage area	= 6.040 ac	Curve number	= 82*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 37.60 min
Total precip.	= 1.05 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a

* Composite (Area/CN) = [(0.970 x 98) + (5.070 x 79)] / 6.040



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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	0.762	2	492	21,882	------	------	------	Existing BASIN 15 (5/20/2016) NOAA
3	SBUH Runoff	0.762	2	492	21,882	------	------	------	Proposed BASIN 15

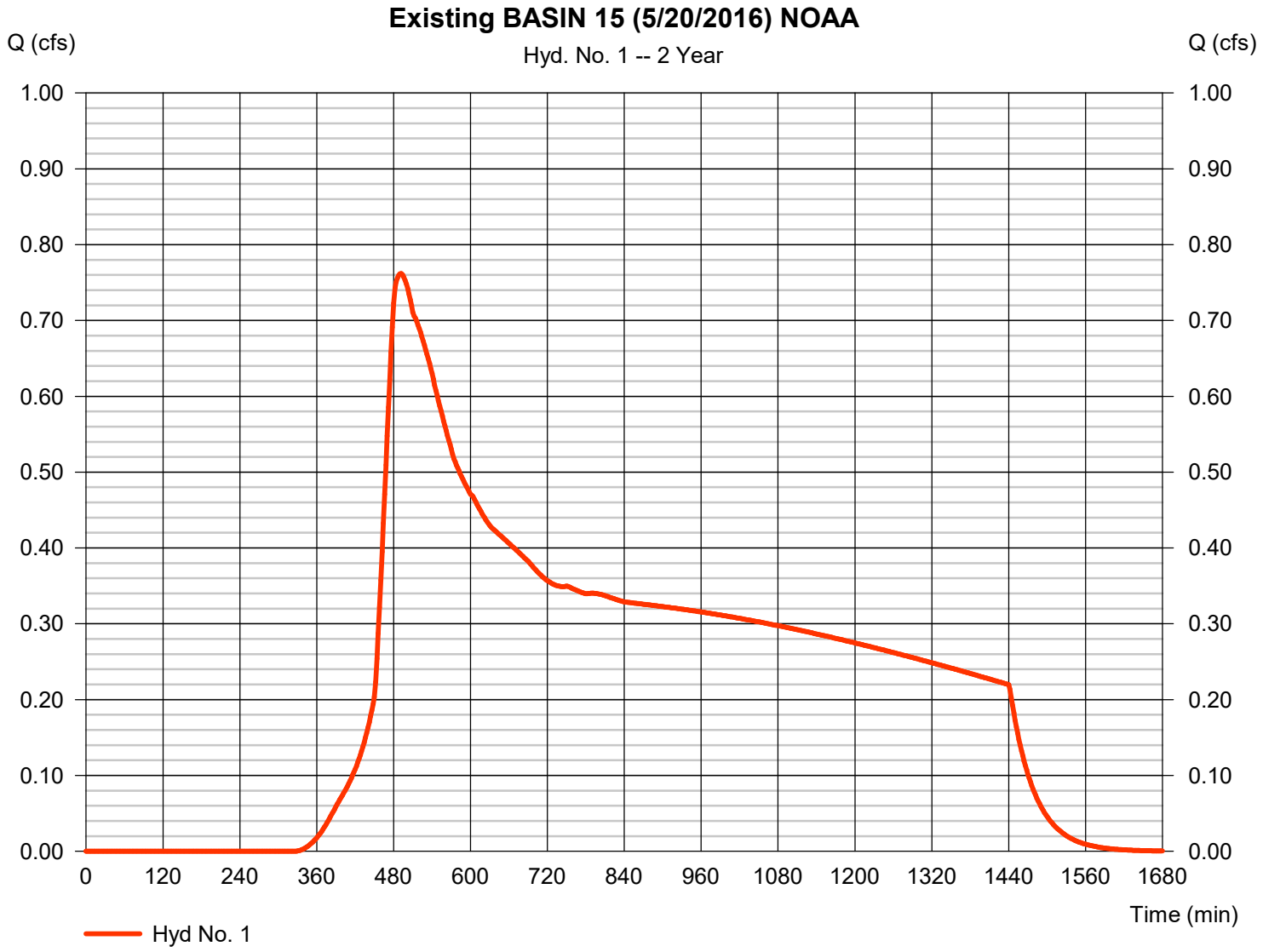
Hydrograph Report

Hyd. No. 1

Existing BASIN 15 (5/20/2016) NOAA

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.762 cfs
Storm frequency	= 2 yrs	Time to peak	= 492 min
Time interval	= 2 min	Hyd. volume	= 21,882 cuft
Drainage area	= 6.040 ac	Curve number	= 82*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 37.60 min
Total precip.	= 2.50 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a

* Composite (Area/CN) = [(0.868 x 98) + (5.175 x 79)] / 6.040



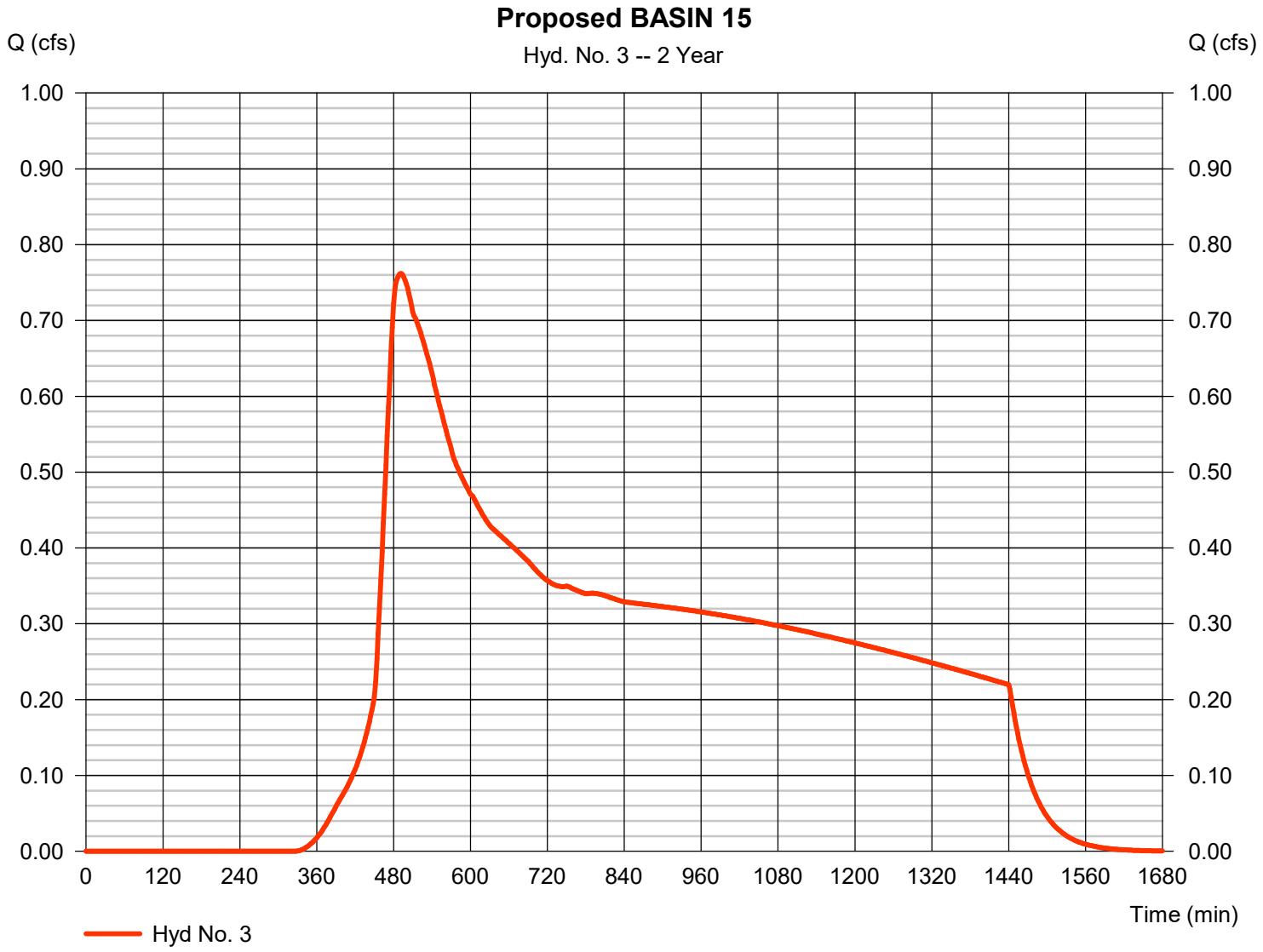
Hydrograph Report

Hyd. No. 3

Proposed BASIN 15

Hydrograph type	=	SBUH Runoff	Peak discharge	=	0.762 cfs
Storm frequency	=	2 yrs	Time to peak	=	492 min
Time interval	=	2 min	Hyd. volume	=	21,882 cuft
Drainage area	=	6.040 ac	Curve number	=	82*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	37.60 min
Total precip.	=	2.50 in	Distribution	=	Type IA
Storm duration	=	24 hrs	Shape factor	=	n/a

* Composite (Area/CN) = [(0.970 x 98) + (5.070 x 79)] / 6.040



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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	1.836	2	486	44,576	------	------	------	Existing BASIN 15 (5/20/2016) NOAA
3	SBUH Runoff	1.836	2	486	44,576	------	------	------	Proposed BASIN 15

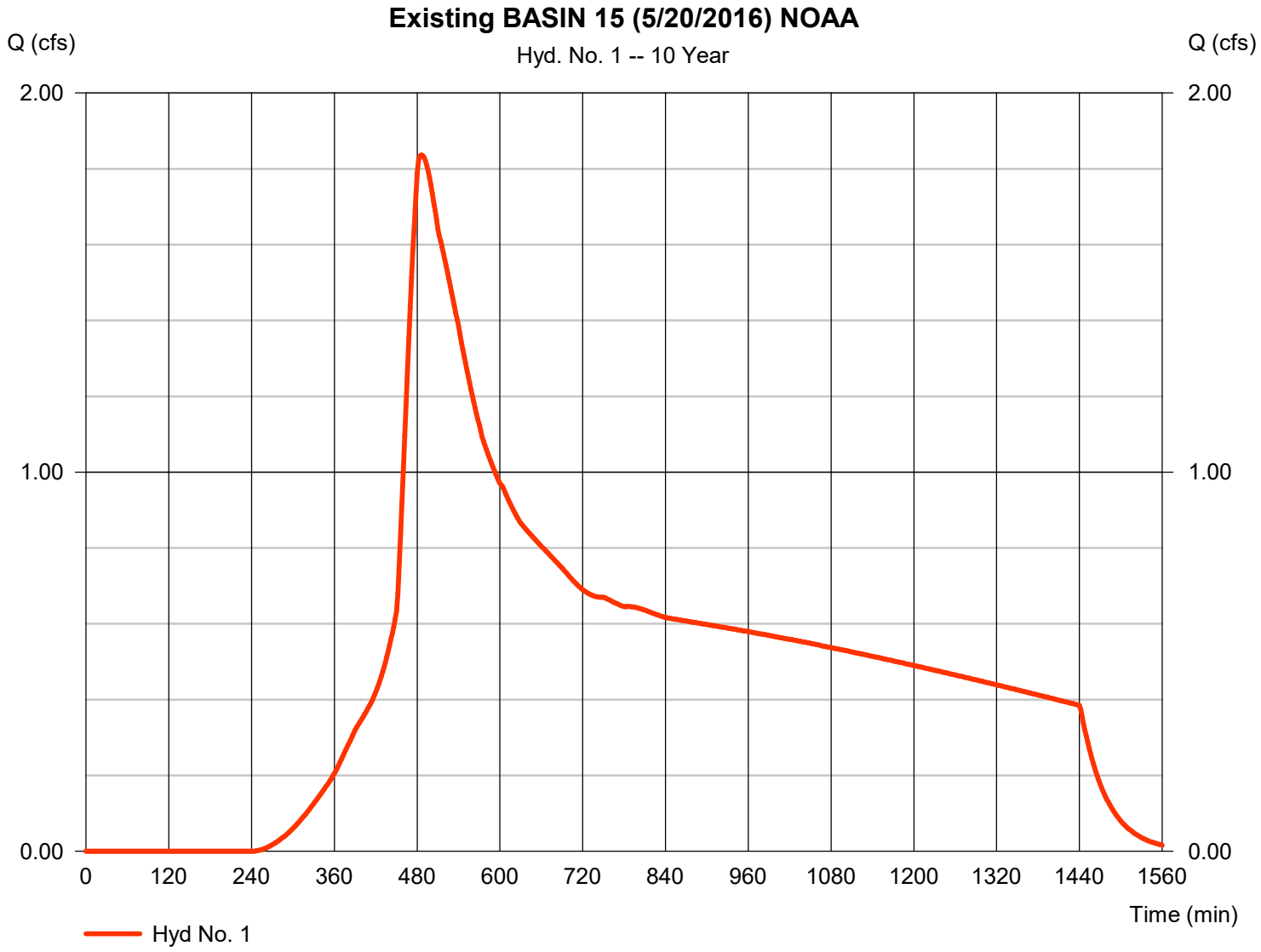
Hydrograph Report

Hyd. No. 1

Existing BASIN 15 (5/20/2016) NOAA

Hydrograph type	= SBUH Runoff	Peak discharge	= 1.836 cfs
Storm frequency	= 10 yrs	Time to peak	= 486 min
Time interval	= 2 min	Hyd. volume	= 44,576 cuft
Drainage area	= 6.040 ac	Curve number	= 82*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 37.60 min
Total precip.	= 3.80 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a

* Composite (Area/CN) = [(0.868 x 98) + (5.175 x 79)] / 6.040



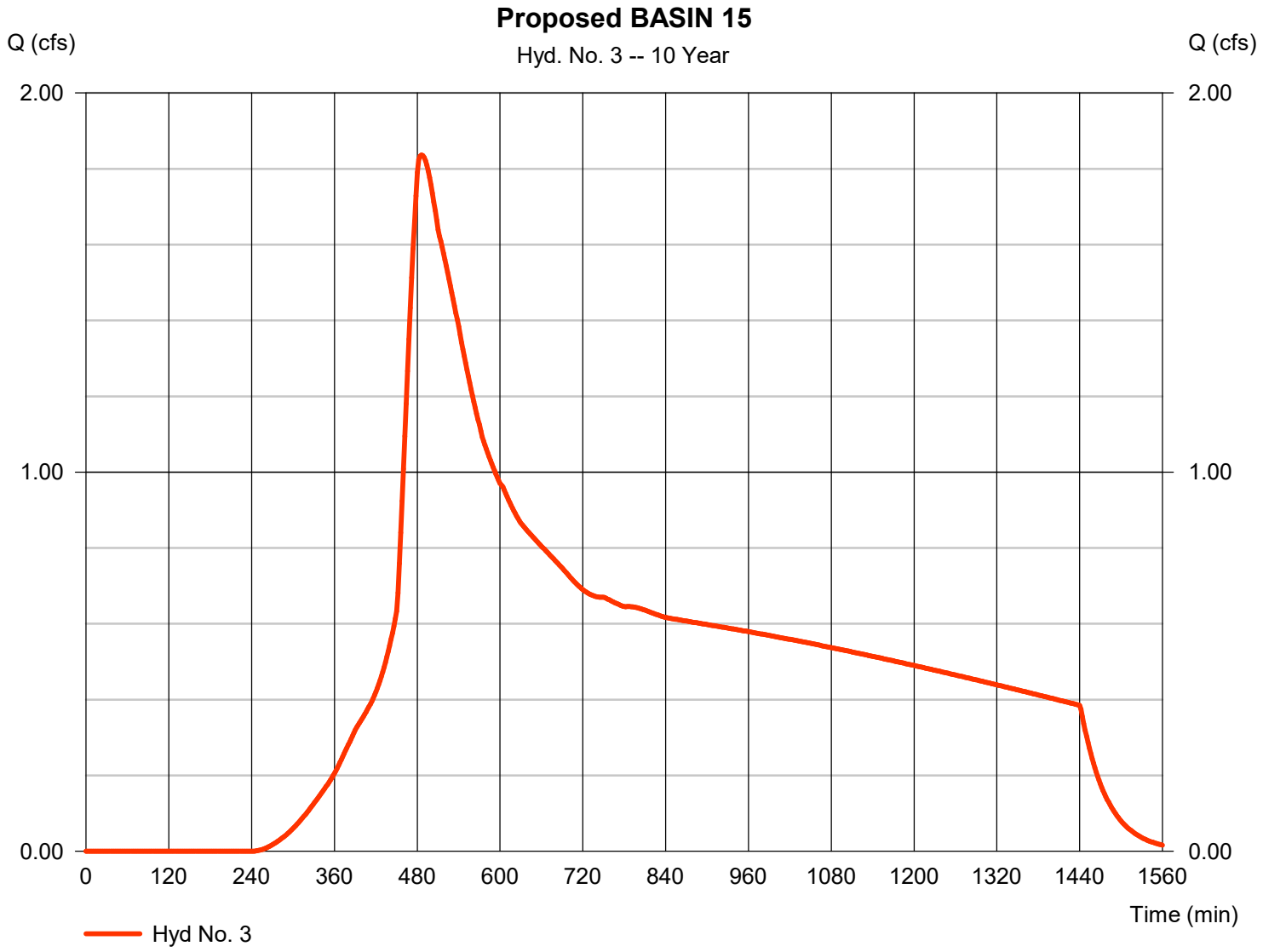
Hydrograph Report

Hyd. No. 3

Proposed BASIN 15

Hydrograph type	=	SBUH Runoff	Peak discharge	=	1.836 cfs
Storm frequency	=	10 yrs	Time to peak	=	486 min
Time interval	=	2 min	Hyd. volume	=	44,576 cuft
Drainage area	=	6.040 ac	Curve number	=	82*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	37.60 min
Total precip.	=	3.80 in	Distribution	=	Type IA
Storm duration	=	24 hrs	Shape factor	=	n/a

* Composite (Area/CN) = [(0.970 x 98) + (5.070 x 79)] / 6.040



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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	2.017	2	486	48,301	------	------	------	Existing BASIN 15 (5/20/2016) NOAA
3	SBUH Runoff	2.017	2	486	48,301	------	------	------	Proposed BASIN 15

Hydrograph Report

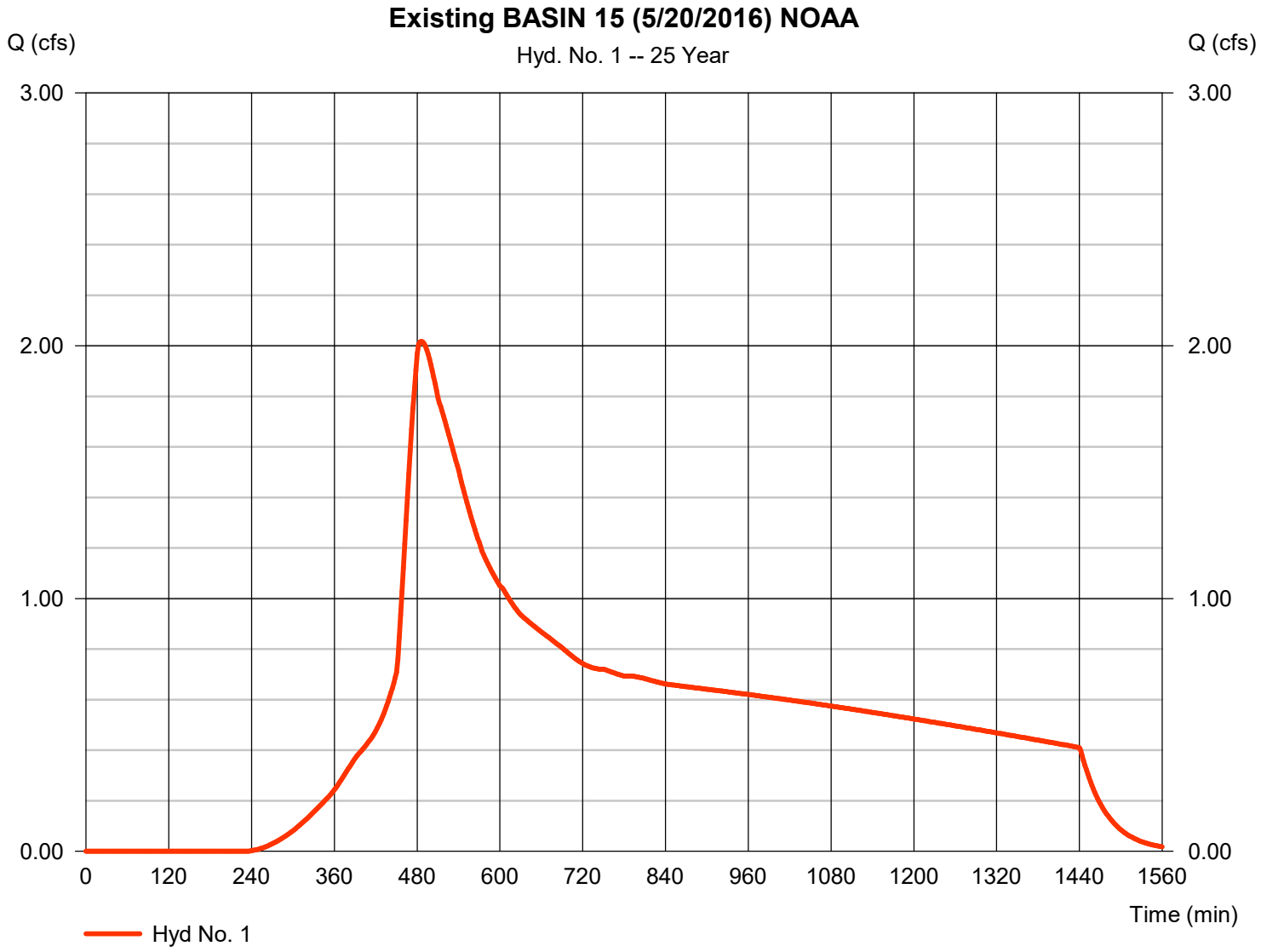
Hyd. No. 1

Existing conveyance in existing 12" pipe

Existing BASIN 15 (5/20/2016) NOAA

Hydrograph type	=	SBUH Runoff	Peak discharge	=	2.017 cfs
Storm frequency	=	25 yrs	Time to peak	=	486 min
Time interval	=	2 min	Hyd. volume	=	48,301 cuft
Drainage area	=	6.040 ac	Curve number	=	82*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	37.60 min
Total precip.	=	4.00 in	Distribution	=	Type IA
Storm duration	=	24 hrs	Shape factor	=	n/a

* Composite (Area/CN) = [(0.868 x 98) + (5.175 x 79)] / 6.040



Hydrograph Report

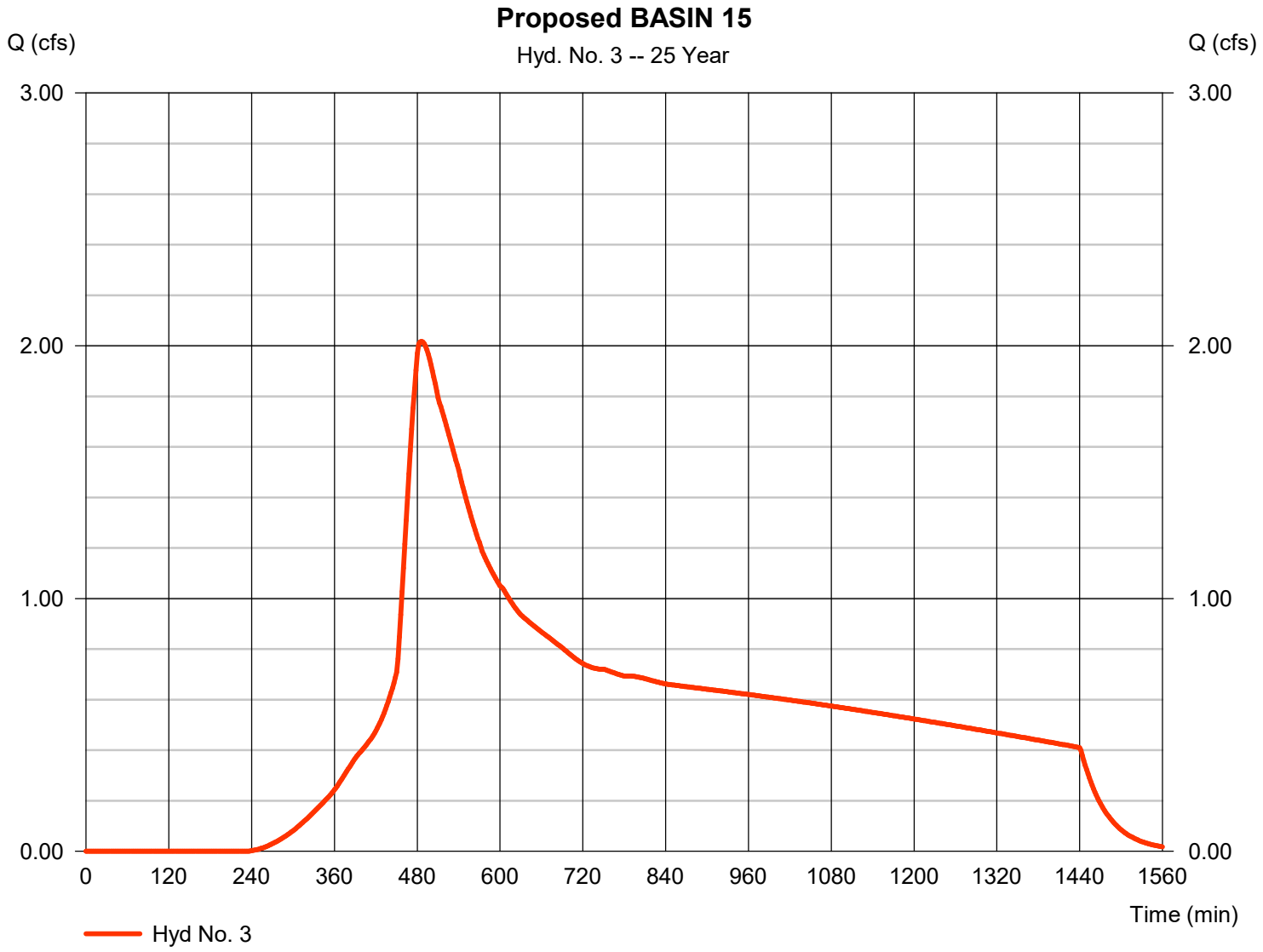
Hyd. No. 3

Proposed conveyance in existing 12" pipe

Proposed BASIN 15

Hydrograph type	=	SBUH Runoff	Peak discharge	=	2.017 cfs
Storm frequency	=	25 yrs	Time to peak	=	486 min
Time interval	=	2 min	Hyd. volume	=	48,301 cuft
Drainage area	=	6.040 ac	Curve number	=	82*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	37.60 min
Total precip.	=	4.00 in	Distribution	=	Type IA
Storm duration	=	24 hrs	Shape factor	=	n/a

* Composite (Area/CN) = [(0.970 x 98) + (5.070 x 79)] / 6.040



Project 24-C003
BSD Mountainside Training Facility

RUNOFF by the SANTA BARBARA URBAN HYDROGRAPH
Drainage Area

total Time of Concentration = 5.0'

storm hyetograph: SCS TypeIA
return period = 25 years
storm duration = 24 hr.
total rainfall = 4.00 in.

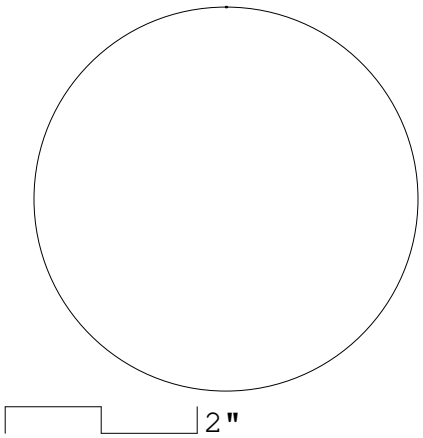
pervious area = 0.06 A CN = 81 GpC:Open.space,pr.cnd
impervious area = 0.13 A CN = 98
total site area = 0.20 A

peak flow = 0.18cfs @ 7.83 hr.
runoff volume = 2,317 cu.ft.

25-yr peak flow for project size

Project 24-C003
BSD Mountainside Training Facility

GRAVITY PIPE FLOW (Chezy-Manning)
4-inch Pipe @ 1%

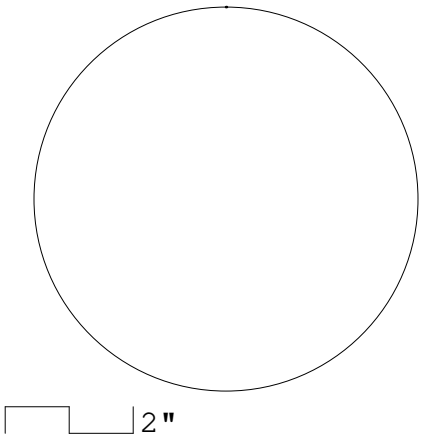


diameter = 4.0"
slope = 1.00%
material: ABS, PVC
Manning's n = 0.013
depth of flow = 100.00% of diameter (full)

wetted perimeter = 1.05'
area = 0.09 s.f.
hydraulic radius = 0.08'
velocity = 2.18 fps
flow = 0.19 cfs

Project 24-C003
BSD Mountainside Training Facility

GRAVITY PIPE FLOW (Chezy-Manning)
6-inc Pipe @1%

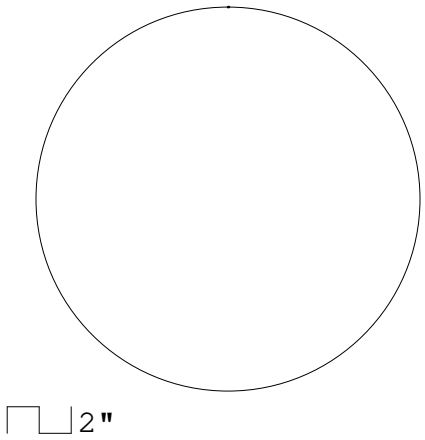


diameter = 6.0"
slope = 1.00%
material: ABS, PVC
Manning's n = 0.013
depth of flow = 100.00% of diameter (full)

wetted perimeter = 1.57'
area = 0.20 s.f.
hydraulic radius = 0.13'
velocity = 2.86 fps
flow = 0.56 cfs

Project 24-C003
BSD Mountainside Training Facility

GRAVITY PIPE FLOW (Chezy-Manning)
Existing 12" Pipe @ 1%



diameter = 12.0"
slope = 1.00%
material: ABS, PVC
Manning's n = 0.013
depth of flow = 100.00% of diameter (full)

wetted perimeter = 3.14'
area = 0.79 s.f.
hydraulic radius = 0.25'
velocity = 4.55 fps
flow = 3.57 cfs

Appendix E: Addendum to Stormwater Report by HHPR

South Cooper Mountain High School
Final Stormwater Management Report Addendum

Prepared For:
The City of Beaverton
Clean Water Services
and
National Marine Fisheries Service

Prepared By:
Angela Martinec, P.E. – Civil Engineer

February 10, 2016

Harper Houf Peterson Righellis Inc.
ENGINEERS ◆ PLANNERS
LANDSCAPE ARCHITECTS ◆ SURVEYORS

205 SE Spokane Street, Suite 200
Portland, OR 97202
ph: 503-221-1131 fax: 503-221-1171

Table of Contents

Project Description

Beaverton School District has acquired approximately 48 acres located at the northwest corner of SW Scholls Ferry Road and SW 175th Avenue in the recently annexed South Cooper Mountain (SCM) area. A new High School is planned for the site. The site currently consists of approximately 3.5 acres of wetland with 0.82 acres proposed to be maintained and protected during development of the new high school campus.

Public half-street frontage improvements are proposed along Scholls Ferry and 175th Ave. Improvements include but are not limited to right-of-way dedication, street widening, a 10' wide multi-use path/sidewalk, green street facilities, conveyance pipe system, and underground detention system.

The school site includes an approximately 148,000 sf school building, separate student and staff parking lots, multiple sports fields, fire access road, and appropriate utilities.

Low impact development approaches (LIDA) are proposed to treat the majority of the impervious and pervious surface runoff. The LID facilities will also provide some level of detention with the majority of flow control occurring within a combination of detention ponds and underground Stormtech detention system.

Onsite, multiple facilities are proposed including a detention pond located west of the proposed staff parking lot, an underground Stormtech detention system located north of the stadium, and an underground Stormtech detention system located south of the proposed fire access road and school building. The pond will receive runoff from the proposed football field, track, stadium, JV baseball/soccer fields, and the staff parking lot following treatment via LIDA and a mechanical unit (JV baseball/soccer fields). The underground Stormtech detention system north of the stadium will manage runoff from the student parking lot following treatment via LID swales. The underground Stormtech detention system located south of the fire access road will manage runoff from the proposed school building following treatment via LID planters and mechanical vault.

Offsite, an existing public detention pond will be utilized to manage the proposed half street improvements along the northern 1200' of the 175th frontage improvements. Underground detention pipe will be located along Scholls Ferry road near the west property line/collector road to manage the runoff associated with approximately 2400' of frontage improvements along 175th and Scholls.

The proposed stormwater facilities shall comply with current Clean Water Services (CWS), City of Beaverton (COB), and National Marine Fisheries Service (NMFS) stormwater standards. Refer to Appendix F for the Department of Environmental Quality (DEQ) stormwater management plan checklist, SLOPES V Stormwater Information Form, and the COB certified impervious area inventory sheet and Appendix A for existing and proposed basin maps and the stormwater management plan.

Purpose and Objectives

The purpose of this drainage report is to present options for best management practices (BMP) for conveyance, detention, infiltration and water quality treatment to be installed as part of this SCM High School project. CWS' Design and Construction Standards (June 2007), CWS' Low

Impact Development Approaches Handbook (July 2009), City of Beaverton Engineering Design Manual (February 22, 2007), NFMS SLOPES V STU Programmatic Biological Opinion (March 14, 2014), and DEQ's 401 Removal/Fill – SWMP Submission Guidelines (January 2012) have been used as design requirements and guidelines.

Basin Characteristics

The site is currently divided into two primary basins, north and south, with each basin containing three sub-basin (N1, N2, N3, S1, S2, & S3) and all of which ultimately converge to an adjacent unnamed tributary to the Tualatin River. In 2008, Washington County realigned 175th Ave and constructed a water quality and detention pond within a triangular shaped lot located at the intersection of the new and old 175th right-of-way near the northeast property boundary. This facility manages runoff from the northern portion of 175th as well as a few upstream contributing basins (OFF1-OFF4). Basin OFF5 encompasses the pond area and any sheet flow contributing area. Existing upstream basin OFF6 sheet flows to the subject property. Basin OFF7 consists of the southern portion along 175th Ave not able to be collected and routed to the existing public facility due to grade limitations. Basin OFF8 includes the north side of Scholls Ferry which is collected in the northern roadside ditch traveling west and comingles with the existing onsite south basins.

The existing onsite north basins sheet flow directly to an existing wetland located near the north property boundary. Stormwater discharge from this wetland ultimately flows west approximately 620' to the unnamed tributary.

The existing south basins sheet flow to the existing north roadside ditch traveling west along Scholls Ferry where it converges with basins OFF7 and OFF8. The concentrated flow travels through a series of existing culverts. Approximately 250' west of the western school property line an existing 12" diameter culvert conveys the runoff south under Scholls Ferry. This culvert daylights to an existing energy dissipater/concrete box just south of Scholls Ferry where it bubbles out and continues on its unofficial open channel flow path (approx. 3,770') towards the unnamed tributary leading to the Tualatin River.

Ground Cover and Stormwater Runoff

Pre-developed conditions for the site were found to be 90% contoured small grain in poor condition with the remaining 10% being fair condition wetland (brush cover type used for obtaining curve numbers). Soil classification and curve numbers are located in Appendix B.

Proposed improvements will gradually modify existing flow patterns and discharge locations. Although the existing public detention and water quality pond outfall will be extended to accommodate proposed development, the runoff will continue to contribute to the remaining existing wetland. The existing wetland onsite will see a slight increase in runoff volume during smaller storm events (42% of 2-year and 2-year) and a slight decrease during the 10 & 25-year events. Peak flows contributing to the remaining north wetland will be decreased during all storm events. Refer to the north wetland hydrology spreadsheet provided in Appendix C for specific results.

Existing roadside ditches and wetlands were analyzed as fair condition brush. Existing fields were analyzed as small grain crops in poor condition. Proposed stormwater facilities are

analyzed to be equivalent to woods in good condition and landscaped/open areas will be in good condition. Proposed artificial turf fields were modeled to mimic existing conditions.

Land Use Zoning

For the purpose of the conveyance analysis, contributing upstream basins will be assumed to be in full built-out, un-detained condition based on South Cooper Mountain Master Plan land use zoning.

Soils Characteristics

The Natural Resources Conservation Service (NRCS) with the United States Department of Agriculture (USDA) has classified the soils within Washington County in the Soil Survey of Washington County Manual. Soils are categorized into Hydrologic Soil Groups based on estimated runoff from precipitation. These groupings assume the soils are saturated and receive precipitation from long-duration storms. This rainfall to runoff relationship is complex and includes the Drainage and Permeability characteristics of the soil. The soils are silt loam and have hydrological grouping classifications as shown in Appendix B.

Existing (E) and Proposed (P) Soil Assumptions:
Curve Numbers = (E & P) 98 for Impervious Area
(E) 85 for Poor Conditions Small Grain Contoured (Soil Type D)
(E) 82 for Poor Conditions Small Grain Contoured (Soil Type C)
(E) 77 for Fair Conditions Brush (Soil Type D)
(E) 70 for Fair Conditions Brush (Soil Type C)
(P) 80 for Good Conditions Open Space (Soil Type D)
(P) 74 for Good Conditions Open Space (Soil Type C)
(P) 77 for Good Conditions LIDA (Soil Type D)
(P) 70 for Good Conditions LIDA (Soil Type C)
(P) 85 for Artificial Turf (mimics existing conditions) (Soil Type D)
(P) 82 for Artificial Turf (mimics existing conditions) (Soil Type C)

Sheet Flow Mannings “n” = 0.011 for pavement
0.150 for short prairie grass and lawn

Shallow Concentrated Flow “Cp” = 16.13 for unpaved surfaces
Per FHWA, English units 20.32 for paved surfaces

Conduit Flow Mannings “n” = 0.013 for pipe flow

Tested infiltration rates (by GeoDesign Dec 16, 2014. See Appendix D) = 0.0 in/hr

Refer to the water quality section for LID amended topsoil information.

Proposed Improvements and Impervious Surfaces

Proposed onsite impervious surface area will consist of the parking lot, roads, and school building. The existing and proposed impervious area for the disturbed site area is 0.2 acres and 17.7 acres, respectively.

Proposed offsite impervious surface area will consist of the half street widening and the addition of a 10' multiuse path identified in the South Cooper Mountain Master Plan. The existing and proposed impervious area for the disturbed offsite area is 5.2 acres and 7.1 acres, respectively. Pollutants of concern related to commercial development include sediment, nutrients, pesticides, herbicides, fungicides, metals (zinc, copper, lead, etc.), oil, grease, and other petroleum.

Stormwater Management

Table 1 – CWS, COB, and NMFS Stormwater Management Requirements

Design Requirement	COB, CWS, & NMFS Criteria
Conveyance Design Storm	25-Year; 24-hour SBUH Method for Pipe 25-Year; 24-hour SBUH Method for Open Channel
Treatment Area	All Area within the Limits of Improvements
Treatment Storm	0.36 inches in 4-hours, 96 hr return period per CWS 50% of 2-year, 24 hour storm (1.25"/24 hr) per NMFS
Detention	Match pre-developed discharge rates between the 2-year event and the 25-year flow event per COB & CWS Match pre-developed discharge rates between 42% of the 2-year event and the 10-year flow event per NMFS

Table 2a - CWS Precipitation-Frequency Estimates

Frequency	**Precipitation**
WQ	0.36 inches in 4-hrs
2-yr; 24-hr	2.5 inches
25-yr; 24-hr	3.9 inches
100-yr; 24-hr	4.5 inches

Table 2b - COB Precipitation-Frequency Estimates

Frequency	**Precipitation**
WQ; 24-hr	0.36 inches in 4-hrs
2-yr; 24-hr	2.5 inches
25-yr; 24-hr	4.0 inches
100-yr; 24-hr	4.5 inches

Table 2c - NMFS Precipitation-Frequency Estimates

Frequency	**Precipitation**
WQ: 50% of the 2-yr; 24-hr	1.25 inches
42% of the 2-yr; 24-hr	1.05 inches
2-yr; 24-hr	2.45 inches
5-yr; 24-hr	3.0 inches
10-yr; 24-hr	3.8 inches
100-yr; 24-hr	4.5 inches

Proposed Basins

The proposed site is divided into sub-basins 1-18 consisting of 47.4 acres with the total onsite disturbed area of 43.0 acres. Undisturbed area includes the remaining north wetland and buffer (basins 13) to be protected. Basins 14, 15, and 17 will discharge to the remaining north wetland along the north property line to prevent dewatering effects during small storm events. Basins 1-12B will contribute to the existing 175th downstream drainage system. The total onsite impervious area will be 17.7 acres, which is approximately 37% of the site.

Offsite basins OFF1 through OFF5 will continue to contribute to the existing public water quality and detention pond which discharges to the north wetland. Proposed basin 12C will be routed to the existing pond following treatment via a LID basin. The net new impervious area for offsite basins OFF1 through OFF5 is 0.7 acres. OFF6 will be native ground cover and continue to sheet flow to the site. OFF7 will have a net new impervious area of approximately 0.4 acres and will be collected via green street planters and curb inlets along the west side of 175th Avenue for treatment and routed south to Scholls Ferry. OFF8 will increase impervious area by 0.9 acres and will be collected via green street planters and curb inlets along the north side of Scholls Ferry Road.

A proposed conveyance pipe will route basins OFF7, OFF8, and onsite basins 1-12B west down Scholls Ferry where it will tee into a proposed 24" diameter culvert approximately 270' downstream (west) of the site.

Water Quality

The COB, CWS, and NMFS treatment criteria will be met by treatment of the site runoff through a combination of LID facilities and mechanical mechanisms. Offsite treatment will be satisfied with a combination of LID flow through planters and the existing public vegetated swales. Treatment will occur via biofiltration which targets all expected pollutants listed under Proposed Improvements and Impervious Surfaces on page 3.

DEQ has referenced OAR 340-041-0345 which identifies the required phosphorus removal efficiency of proposed improvements. The removal efficiency calculation yielded a negative number which potentially identifies the site as having adequate pervious/impervious ratio and adequate treatment of impervious areas that specific phosphorus removal efficiency is not required. CWS however, requires 65% phosphorus removal efficiency. Their design standards recommend using biofiltration (LID) to satisfy this requirement.

The majority of onsite runoff will be treated via LID facilities with filtration which will remove particulates as phosphorus has a tendency to sorb to soil particles and organic matter. Studies from the International Stormwater BMP Database (July 2012) indicate media filter BMPs as being a good candidate for treatment of phosphorus.

The basic parameter for sizing the infiltration capacity, with respect to water quality of the LID planters, basins/rain gardens and swales, is the infiltration capacity (rate) of the topsoil mix used in the LID. The amended soil mix in the treatment area shall be composed of equal parts of organic compost, gravelly sand and topsoil. CWS' LIDA Handbook provides guidance for obtaining appropriate amended soils within the Seal of Testing Approval Program (STA) for use within the 18" topsoil section of LID facilities. They reference the US Composting Council STA Compost Technical Data Sheet at www.compostingcouncil.org/programs/sta/ and the US

Composting Council STA Compost Providers at www.compostingcouncil.org/programs/sta/participants.phb.

The topsoil material has an estimated hydraulic conductivity of approximately 4 in/hr. The NRCS soil survey confirmed this is within a reasonable range. It is advised that the amended soil mixture be tested for phosphorus content prior to being installed. It is also recommended to avoid chemical fertilizers and virgin compost.

Onsite basins 2 and 3 (WQ flow = 0.043 cfs (NMFS) and 0.00 cfs (CWS)) will be treated with a 2-cartridge mechanical filtration structure (0.033 cfs capacity/cartridge). Studies from the International Stormwater BMP Database indicate manufactured devices as being a good candidate for treatment of phosphorus. Additionally, basin 4 (WQ flow = 0.005 cfs (NMFS) and 0.011 cfs (CWS)) will be treated via a 1-cartridge mechanical filtration structure.

Because treatment is governed by NMFS requirements, it is required to treat pervious areas as well as impervious. The site proposes four (4) synthetic turf field which will provide subsurface storage rock with at least the capacity to detain the water quality event volume, giving it the opportunity to infiltrate into native soils. Storage volumes greater than or equal to the water quality runoff volumes will be provided to specifically satisfy the COB request. Stormwater in excess of the volume provided will be collected via perforated underdrain and routed to either a mechanical treatment structure (basins 2&3) or a LIDA facility (basins 14, 15, & 16) for treatment. Refer to table 3 below for volumes per artificial turf basin.

Table 3 – Water Quality Storage Volume Required for Artificial Turf Fields

Basin	Field	Approx. Turf Area (sf)	WQ Runoff Volume (cf)	Required Rock (40% voids) Depth (in)	Provided Rock (40% voids) Depth (in)	Provided Volume (cf)
2&3	JV Baseball/Soccer	139,105	2,621	0.6	3.0	13,911
14	Softball	43,089	1,957	1.4	3.0	4,309
15	Baseball	176,358	4,283	0.7	3.0	17,636
16	Football	95,279	6,146	1.9	3.0	9,528

Offsite basins OFF1, OFF2, and OFF4 will be treated in the existing public north swale within the existing detention pond along 175th. OFF3 will be treated in the existing public south swale within the same existing detention facility. It should be noted that runoff will be routed through existing pre-treatment manholes located upstream of both existing swale outfalls. The Washington County stormwater management report for the 175th Realignment project identifies both pretreatment manholes having a water quality flow capacity of 0.60 cfs, satisfying proposed water quality flow to both the north and south vegetated swales. The following are existing parameters obtained from topographic survey and table 4 on the following page includes calculated retention times for CWS and NMFS. Refer to Appendix C for documentation.

- Channel Roughness - 0.24
- Side Slope - 2:1 (per survey)
- Max Treatment depth (D_t) – 0.50 ft
- Min Residence Time (R_t) – 9 minutes

Table 4 - Existing Public Vegetated Swale Parameters

Swale	Length (ft)	Width (ft)	Long. Slope (%)	NMFS WQ Demand (cfs)	NMFS Rt (Min)	CWS WQ Demand (cfs)	CWS Rt (Min)
North	143	17	0.90	0.53	13.2	0.29	17.0
South	110	22	0.40	0.12	15.2	0.09	29.1

Offsite basins OFF7 and OFF8 will be treated with LID flow through planters fronting the subject property. A small portion of Scholls at the proposed public collector along the west property line will be collected and treated via a 1-cartidge mechanical filtration structure as this area cannot be routed to a LIDA facility due to elevation constraints.

Hydrographs, calculations, and spreadsheets of the proposed treatment methods which meet both CWS and NMFS treatment criteria can be located in Appendix C.

BMP design constrains include area limitations, existing topography, and existing soil permeability. The Beaverton School District has strict physical education requirements for newly developed sites, resulting in several proposed sports fields. Per NMFS treatment requirements, the project shall treat all surfaces to the maximum extent practical. This includes runoff from pervious surfaces. Underdrain systems will be necessary for collecting and routing stormwater that will filter through the proposed fill material but will not infiltrate the underlining native soils.

Following treatment and detention, stormwater will ultimately discharge to an unnamed tributary of the Tualatin River. DEQ has the Tualatin River RM 0 to 44.7 listed for ammonia, chlorophyll, flow modification, phosphorus, and temperature. RM 0 to 80.8 is listed for iron and manganese. RM 44.7 to 69.9 is listed for phosphorus and RM 66.9 to 80.7 is listed for habitat modification. There are no known NPDES permits nearby and the site is not located within a groundwater management area. Refer to Appendix A for a proposed storm drainage schematic.

Detention

All proposed LID facilities are proposed to have 0.5’ of dead storage to provide some level of detention. Additionally, underground Stormtech detention systems and a pond facility will be utilized for onsite flow control. Underground detention pipe will be used for offsite flow control. Detention shall comply with NMFS, COB, and CWS requirements as identified in Table 1 on page 4.

The proposed onsite pond will consist of an outflow control structure (double ditch inlet style). The ability to modify the proposed pond footprint is limited due to constraints including an existing property line to the west, a proposed road to the south and east, and a proposed LID basin/rain garden to the north. The proposed onsite pond has an available storage capacity of 48,412 cf which will handle runoff from the track/football field and stadium, the staff parking lot located south of the stadium, and the JV baseball/soccer field. Additionally, underground Stormtech detention systems will provide 6,211 cf of storage for the school building runoff and 7,066 cf of storage for the student parking lot located north of the school building.

The existing public offsite water quality/detention pond is currently metered via double ditch outflow control structures. The ability to modify the existing public pond footprint is nonexistent as the property is already built out to maximum capacity. The existing crest elevation is at 322.80 with an existing 25-year surface water elevation found to be 321.46, yielding a 1.34’

freeboard. CWS requires a 1' minimum freeboard, therefore it is proposed to raise the overflow control structure 0.32' to 321.40 which will provide 5,724 cf of additional storage for the public improvements within basins OFF1 through OFF5. This will raise the proposed 25-year surface water elevation to 321.80, maintaining a 1' freeboard during the 25-year storm event. LID facilities will provide a small amount of detention for basins OFF7 and OFF8 but the majority of detention for these basins will be provided in public underground detention pipes providing 3,846 cf of storage.

Both on and offsite underground detention systems will require the use of flow control manholes. Refer to Appendix C for the water quantity spreadsheet which identifies detained peak flows per proposed basin and for details of each structure.

The on and offsite pond designs maintain a minimum 1-foot freeboard up to the 25-year, 24-hour storm event at which point high flows are routed through the overflow structures. Refer to Appendix C for the outflow and flow control structure details and design data. As shown in tables 5a and 5b below, the proposed outflow control structures will at a minimum, release peak flows such that they match pre-developed discharge rates for events between 42% of the 2-year event thorough the 25-year event per NMFS, COB, and CWS requirements.

Additionally, the 100-year; 24-hour storm inundation areas and emergency overflow paths have been identified in the plan set.

Table 5a – Total Onsite Detention Performance

Storm Event	Pre-developed Flow (cfs)	Allowable Release Rate (cfs)	Post-developed Flow (cfs)	Provided Detention Volume (cf)
42% of 2-Year (NMFS)	0.47	0.47	0.46	26,785
2-Year (WES & NMFS)	8.63	8.63	6.29	50,586
10-Year (NMFS)	20.0	20.0	14.1	71,474
25-Year (NMFS)	21.9	21.9	15.7	74,211

Table 5b – Total Offsite Detention Performance

Storm Event	Pre-developed Flow (cfs)	Allowable Release Rate (cfs)	Post-developed Flow (cfs)	Provided Detention Volume (cf)
42% of 2-Year (NMFS)	0.288	0.288	0.288	8,770
2-Year (WES & NMFS)	1.34	1.34	1.30	73,073
10-Year (NMFS)	3.82	3.82	3.77	102,748
25-Year (NMFS)	4.20	4.20	4.15	103,956

Conveyance

The existing northern public pipe conveyance system and proposed southern public pipe conveyance system was analyzed using the 25-year; 24-hour SBUH Method and as previously mentioned, contributing upstream basins were analyzed in full build out, un-detained conditions based on the SCM master plan.

The existing 24" diameter discharge pipe from the existing public water quality and detention pond will be upsized to 30" and re-routed north and west such that the future adjacent

development to the west can easily tie into (post treatment and detention) to maintain flow contributions to the remaining north wetland.

The existing ditch along the north side of Scholls and west of the site was analyzed to convey existing sheet flow contributions as the proposed site will now be piped to tie into a culvert crossing Scholls. The existing 12" culvert flowing south under Scholls is proposed to be upgraded to a 30" pipe at 1.13% minimum slope to convey 25-year full buildout upstream contributions assuming no detention. The existing 12" culvert enters an existing private concrete junction box to the south of Scholls ROW. The limits of the improvement will be within the ROW and therefore does not incorporate the existing said junction box. A proposed ditch inlet with an oversized manhole base will be located at the south property line to connect to the proposed 30" public storm to the existing 12" private storm system. Refer to Appendix G for supporting information and Appendix A for conveyance basin map.

Downstream Analysis

The existing private storm system downstream of the proposed improvements are believed to be a downstream deficiency. The junction box mentioned in the conveyance section has a 12" diameter pipe exiting which the discharge location could not located. The outlet pipe is assumed to be undersized as water overtops the junction box to an unofficial channel/depression which slopes south towards the unnamed tributary. To satisfy NMFS detention requirements, the school district will provide detention which meets and exceeds COB and CWS flow control requirements (Post peak flow = Pre peak flow). CWS requires detention if a downstream deficiency is identified and cannot be corrected with the proposed project.

The project will reduce the existing 25-year peak flow by 24%, therefore a visual inspection of the downstream system was conducted for ¼ mile downstream. The system looks to contribute to erosion directly downstream of the existing private junction box in its existing state. Future development of the private property shall consider mitigating for full build-out, un-detained flows. The proposed improvements will decrease the peak flows leaving the site during all storm events, therefore there will not have any adverse impacts to the downstream system.

BMP Operation and Maintenance

Private Facilities: Proposed LID swales, LID basin/rain gardens, and LID planters are proposed to treat and provide some detention of the runoff from the private property. A private detention pond and underground Stormtech storage system will provide additional detention to satisfy CWS, COB, and NMFS discharge requirements. The developer, Beaverton School District, will enter a private stormwater maintenance agreement with the City of Beaverton which identifies Beaverton School District as the party responsible for O&M of private facilities. Mike Ali and can be reached at 503-591-4391 and Michael_Ali@beaverton.k12.or.us.

Public Facilities: Proposed LID planters will be constructed intermittently along the site frontage on 175th and Scholls Ferry which provide adequate treatment of the contributing basin. The planters, in combination with proposed underground detention pipes, will provide detention to satisfy CWS, COB, and NMFS discharge requirements. The City of Beaverton will be responsible for the operation and maintenance of the public facilities. Contact Kevin Azar at 503-350-4089 and kazar@beavertonoregon.gov.

Additionally, the existing detention pond with two water quality treatment swales located in a triangular lot to the south of the new and old 175th right of way. This facility will be minimally modified to provide additional storage for the net new impervious area that will contribute to this system. The existing water quality swales are currently sized such that they will provide adequate treatment to suffice with CWS, COB, and NMFS treatment requirements. The City currently maintains this facility and will continue to do so. See previous paragraph for contact information.

All public and private facilities shall be maintained per the O&M plan included in Appendix E. Also refer to CWS' LIDA Handbook for guidance.

Conclusion

The proposed stormwater management plan will achieve pollutant removal to the maximum extent practicable via biofiltration designed to target pollutants expected with a commercial development. The proposed public and private facilities satisfy COB, CWS and NMFS water quality and water quantity requirements. As designed, this project shall not create any adverse impacts to the downstream storm system.

Appendix F: HHPR Stormwater Management Memo

Job No.: BOR-13

Date: May 20, 2016

To: Sergey Dezhnyuk, City of Beaverton

From: Janelle Brannan, HHPR

Project/Subject: **SCM HS – Stormwater Management Memo**

☐ Fax - Number:_____; Number of pages_____
(If you did not receive the correct number of pages, please call 503-221-1131)
☐ E-mail ☐ Mail ☐ Hand Deliver ☐ Interoffice

The intent of this memo is to provide an update to the Stormwater Management Report, dated September 2015, and Stormwater Management Report Addendum dated February 2016.

The September 2015 Report and February 2016 Addendum has been reviewed and updated to the current plan set. The following pages include updated on-site basin maps, spreadsheets and summary Hydraflow Hydrograph reports.

In summary, the original requirements stated in the September 2015 report continue to be met.

Water Quality Summary

Proposed Conditions:

ONSITE:

BASIN	TOTAL AREA (SF)	TOTAL AREA (AC)	IMPERVIOUS AREA (SF)	IMPERVIOUS AREA (AC)	PERVIOUS AREA (SF)	PERVIOUS AREA (AC)	CWS WQ Area, Volume and Flow: CWS WQ Volume (cf)	CWS WQ Flow (cfs)	Proposed LIDA Facility Bottom Area (SF)	Required CWS Treatment Area, 6% sizing factor (SF)	Using 6% Sizing Factor, Adequate CWS Treatment Area per Sub-basin (Yes/No)
1	70,380	1.6	25,230	0.58	45,150	1.04	757	0.053	1,165	1,514	No
2	63,330	1.5	0	0.00	63,330	1.45	0	0.000	0*	376	No**,***
3	91,010	2.1	6,274	0.14	84,736	1.95	188	0.013			
4	15,367	0.4	5,174	0.12	10,193	0.23	155	0.011	0*	310	Yes
5	252,861	5.8	157,500	3.62	95,361	2.19	4,725	0.328	13,073	9,450	Yes
6	90,344	2.1	68,940	1.58	21,404	0.49	2,068	0.144	4,755	4,136	Yes
7	33,505	0.8	0	0.00	33,505	0.77	0	0.000	0	0	Yes
8	15,076	0.3	7,720	0.18	7,356	0.17	232	0.016	1,044	463	Yes
9	19,347	0.4	11,380	0.26	7,967	0.18	341	0.024	1,044	683	Yes
9A	40,574	0.9	15,690	0.36	24,884	0.57	471	0.033	717	1,676	No****
10A	16,600	0.4	16,600	0.38	0	0.00	498	0.035	3473	996	Yes
10B	60,550	1.4	60,550	1.39	0	0.00	1,817	0.126	See 9A	3,633	-
10C	74,870	1.7	59,070	1.36	15,800	0.36	1,772	0.123	0*	3,544	Yes
10D	12,250	0.3	12,250	0.28	0	0.00	368	0.026	See 12B	735	-
11	32,110	0.7	2,795	0.06	29,315	0.67	84	0.006	0	168	No
12A	105,964	2.4	0	0.00	105,964	2.43	0	0.000	0	0	No
12B	25,645	0.6	13,620	0.31	12,025	0.28	409	0.028	2,560	4,450	No****
12C	47,574	1.1	16,060	0.37	31,514	0.72	482	0.033	1,009	964	Yes
13	170,737	3.9	0	0.00	170,737	3.92	0	0.000	0	0	No
14	53,945	1.2	5,214	0.12	48,731	1.12	156	0.011	1,327	2,582	No**
15	263,280	6.0	37,820	0.87	225,460	5.18	1,135	0.079			
16	244,480	5.6	83,050	1.91	161,430	3.71	2,492	0.173	3,654	4,983	No**
17	227,860	5.2	177,470	4.07	50,390	1.16	5,324	0.370	12,280	10,648	Yes
18	26,452	0.6	0	0.00	26,452	0.61	0	0.000	0	0	Yes
TOTAL	**2,054,111**	**47.2**	**782,407**	**17.96**	**1,271,704**	**29.19**	**23,472**	**1.630**	**46,101**	**51,312**	**No*,***

***Proposed Mechanical Treatment to treat additional CWS and NOAA WQ flow (Basin 10 capacity of 0.40 cfs, equivalent to 11,500 sf LIDA facility).**

****Turf fields provide rock storage beneath the underdrain system to store at least the WQ event volume, promoting infiltration.**

*****Proposed Mechanical Treatment to treat additional CWS and NOAA WQ flow (Basins 2 & 3 capacity of 0.066 cfs, equivalent to 1,928 sf LIDA facility).**

******Additional calculations show WQ depth does not exceed the maximum 6" depth.**

Flow Control Summary

Proposed Conditions:

ONSITE:

BASIN	TOTAL AREA (AC)	IMPERVIOUS AREA (AC)	PERVIOUS AREA (AC)	t_c (min)	Composite Hydrologic Curve Number (CN)	$Q_{42\%}$ (cfs)	Q_{2yr} (cfs)	Q_{10yr} (cfs)	Q_{25yr} (cfs)
1	1.62	0.58	1.04	5.0	83	0.017	0.18	0.51	0.61
2	1.45	0.00	1.45	35.9	82	See basin 16 for discharge			
3	2.09	0.14	1.95	35.9	83				
4	0.35	0.12	0.23	5.0	83	0.003	0.074	0.170	0.186
5	5.80	3.62	2.19	5.0	89	See basin 16 for discharge			
6	2.07	1.58	0.49	5.0	93	0.161	0.516	0.622	0.684
7	0.77	0.00	0.77	5.0	74	0.003	0.070	0.241	0.271
8	0.35	0.18	0.17	5.0	87	0.037	0.189	0.281	0.283
9	0.44	0.26	0.18	5.0	89				
9A	0.93	0.36	0.57	5.0	87	0.067	0.443	0.697	0.735
10A	0.38	0.38	0.00	5.0	98	0.096	1.409	2.588	2.721
10B	1.39	1.39	0.00	5.0	98	See basin 10A			
10C	1.72	1.36	0.36	5.0	77	See Basin 10A			
10D	0.28	0.28	0.00	5.0	98	See basin 9A			
11	0.74	0.06	0.67	5.0	76	0.003	0.084	0.251	0.280
12A	2.43	0.00	2.43	5.0	74	0.009	0.210	0.723	0.814
12B	0.59	0.31	0.28	5.0	84	See basin 10A			
12C	1.09	0.37	0.72	5.0	82	0.010	0.231	0.388	0.465
13	3.92	0.00	3.92	5.0	74	0.014	0.343	1.176	1.323
14	1.24	0.87	0.37	27.3	92	0.085	1.142	2.541	2.770
15	6.04	0.12	5.92	37.6	82				
16	5.61	1.91	3.71	35.9	85	0.071	0.639	1.873	2.076
17	5.23	4.07	1.16	5.0	92	0.052	1.293	1.542	1.583
18	0.61	0.00	0.61	5.0	73	0.002	0.045	0.171	0.194
TOTAL	**47.2**	**18.0**	**29.2**			**0.401**	**4.91**	**10.55**	**11.76**

EXISTING TOTAL	0.468	8.63	20.01	21.90

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

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	0.407	2	482	14,643	----	----	----	Ex N1
2	SBUH Runoff	0.021	2	536	1,112	----	----	----	Ex N2
3	SBUH Runoff	0.032	2	540	1,747	----	----	----	Ex N3
4	Combine	0.438	2	482	17,502	1, 2, 3	----	----	Existing North Runoff
5	SBUH Runoff	0.073	2	986	4,050	----	----	----	Ex S1
6	SBUH Runoff	0.177	2	540	9,721	----	----	----	Ex S2
7	SBUH Runoff	0.150	2	982	8,339	----	----	----	Ex S3
8	Combine	0.398	2	982	22,110	5, 6, 7	----	----	Existing South Runoff
9	Combine	0.745	2	532	39,612	4, 8	------	------	Existing Site (pre-dev.)
11	SBUH Runoff	0.039	2	482	1,420	----	----	----	Prop 1
12	Reservoir	0.029	2	530	1,419	11	283.14	28.5	1 - Swale
14	SBUH Runoff	0.021	2	994	1,191	----	----	----	Prop 2
15	SBUH Runoff	0.035	2	540	1,855	----	----	----	Prop 3
16	Combine	0.054	2	552	3,046	14, 15	------	------	2 & 3 - Mech Treatment
	Mechanical treatment, via 2 cartridges (0.033cfs/cartridge)								
18	SBUH Runoff	0.006	2	482	278	----	----	----	Prop 4 - Mech Treatment
	Mechanical treatment, via 1 cartridge (0.033cfs/cartridge)								
20	SBUH Runoff	0.523	2	480	9,457	----	----	----	Prop 5
21	Reservoir	0.350	2	492	9,456	20	324.68	544	5 - LIDA Swale
23	SBUH Runoff	0.320	2	478	4,904	----	----	----	Prop 6
24	Reservoir	0.227	2	488	4,903	23	293.07	350	6 - LIDA Swale
26	SBUH Runoff	0.005	2	1196	214	----	----	----	Prop 7
28	SBUH Runoff	0.023	2	480	470	----	----	----	Prop 8
29	SBUH Runoff	0.040	2	480	717	----	----	----	Prop 9
30	Combine	0.062	2	480	1,187	28, 29	------	------	Prop 8 & 9
31	Reservoir	0.041	2	494	1,186	30	307.91	64.3	8 & 9 LIDA Planter
32	SBUH Runoff	0.060	2	480	1,249	----	----	----	Prop 9A (routed to 9A LIDA)
33	SBUH Runoff	0.152	2	474	2,141	----	----	----	Prop 10A (routed to 10A LIDA)
34	SBUH Runoff	0.369	2	474	5,183	----	----	----	Prop 10B (routed to 12B LIDA)
35	SBUH Runoff	0.314	2	478	4,675	----	----	----	Prop 10C Mech. Treatement
	Mechanical Treatment, via 8 cartridges (0.050cfs/cartridge)								
36	SBUH Runoff	0.075	2	474	1,052	----	----	----	Prop 10D (routed to 9A LIDA)
37	Reservoir	0.126	2	484	2,140	33	324.04	134	10a - LIDA Planters

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

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
38	Combine	0.134	2	480	2,300	32, 36,	------	------	to 9A - LIDA Planter
39	Reservoir	0.068	2	502	2,299	38	324.21	153	9A - LIDA Planter depth = 0.21'
41	SBUH Runoff	0.006	2	1138	268	——	——	——	Prop 11
43	SBUH Runoff	0.016	2	1196	643	——	——	——	Prop 12A
45	SBUH Runoff	0.022	2	480	642	——	——	——	Prop 12B
46	Combine	0.388	2	476	5,825	34, 45	------	------	to 12B LIDA Planter
47	Reservoir	0.250	2	490	5,824	46	336.65	386	12B - LIDA Planter depth = 0.15'
48	Combine	0.684	2	480	12,638	35, 37, 47	------	------	To StormTech 10aLIDA, 10c, 12bLID
49	Reservoir	0.167	2	756	12,633	48	312.03	5,697	StormTech
51	SBUH Runoff	0.018	2	482	866	——	——	——	Prop 12C
52	Reservoir	0.016	2	540	865	51	333.02	16.9	12C - LIDA Basin
54	SBUH Runoff	0.026	2	1196	1,044	——	——	——	Prop 13
56	SBUH Runoff	0.125	2	482	2,809	——	——	——	Prop 14
57	SBUH Runoff	0.086	2	996	4,765	——	——	——	Prop 15
58	Combine	0.168	2	498	7,574	56, 57	------	------	14 & 15 - For Treatment
59	Reservoir	0.126	2	702	7,572	58	304.51	571	14 & 15 - LIDA Basin
62	SBUH Runoff	0.139	2	528	6,146	——	——	——	Prop 16
63	Reservoir	0.135	2	548	6,145	62	325.04	144	16 - LIDA Basin
65	SBUH Runoff	0.713	2	480	11,299	——	——	——	Prop 17
66	Reservoir	0.567	2	486	11,298	65	334.55	589	17 - LIDA Swale
67	Reservoir	0.137	2	1126	11,288	66	325.03	6,849	17 - StormTech
69	Combine	0.488	2	502	18,646	16, 21, 63,	------	------	2,3,5,16 - Combined
70	Reservoir	0.010	2	1554	2,894	69	323.24	18,144	2,3,5,16 - Pond
72	SBUH Runoff	0.004	2	1228	135	——	——	——	Prop 18
74	Combine	0.261	2	490	9,843	12, 18, 24,	------	------	combined proposed south1
75	Combine	0.220	2	756	16,118	26, 70, 72, 31, 39, 49,	------	------	combined proposed south2
76	Combine	0.297	2	1126	20,769	52, 54, 59,	------	------	combined proposed north
77	Combine	0.573	2	1124	46,730	67, 74, 75, 76	------	------	total proposed site

Hydrograph Summary Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

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	0.172	2	1010	9,135	----	----	----	Ex N1
2	SBUH Runoff	0.013	2	1054	676	----	----	----	Ex N2
3	SBUH Runoff	0.021	2	1058	1,062	----	----	----	Ex N3
4	Combine	0.206	2	1018	10,874	1, 2, 3	------	-------	Existing North Runoff
5	SBUH Runoff	0.048	2	1066	2,463	----	----	----	Ex S1
6	SBUH Runoff	0.115	2	1058	5,911	----	----	----	Ex S2
7	SBUH Runoff	0.099	2	1062	5,070	----	----	----	Ex S3
8	Combine	0.263	2	1060	13,444	5, 6, 7	------	-------	Existing South Runoff
9	Combine	0.468	2	1042	24,317	4, 8	------	-------	Existing Site (pre-dev.)
11	SBUH Runoff	0.017	2	1010	886	----	----	----	Prop 1
12	Reservoir	0.017	2	1026	885	11	283.13	16.2	1 - Swale
14	SBUH Runoff	0.014	2	1072	724	----	----	----	Prop 2
15	SBUH Runoff	0.022	2	1042	1,157	----	----	----	Prop 3
16	Combine	0.036	2	1054	1,881	14, 15	------	-------	2 & 3 - Mech Treatment (Routed Detention Pond Facility)
18	SBUH Runoff	0.003	2	1042	169	----	----	----	Prop 4 - Mech Treatment
20	SBUH Runoff	0.326	2	480	6,656	----	----	----	Prop 5
21	Reservoir	0.211	2	496	6,654	20	324.66	329	5 - LIDA Swale (Routed Detention Pond Facility)
23	SBUH Runoff	0.231	2	480	3,680	----	----	----	Prop 6
24	Reservoir	0.161	2	490	3,678	23	293.05	248	6 - LIDA Swale
26	SBUH Runoff	0.003	2	1312	91	----	----	----	Prop 7
28	SBUH Runoff	0.012	2	480	319	----	----	----	Prop 8
29	SBUH Runoff	0.025	2	480	505	----	----	----	Prop 9
30	Combine	0.037	2	480	824	28, 29	------	-------	Prop 8 & 9
31	Reservoir	0.024	2	498	823	30	307.90	37.1	8 & 9 LIDA Planter
32	SBUH Runoff	0.033	2	480	848	----	----	----	Prop 9A (Routed to 9A LIDA Facility)
33	SBUH Runoff	0.124	2	474	1,737	----	----	----	Prop 10A (Routed to 10A LIDA Facility)
34	SBUH Runoff	0.300	2	474	4,205	----	----	----	Prop 10B (Routed to 12B LIDA Facility)
35	SBUH Runoff	0.232	2	478	3,562	----	----	----	Prop 10C (Mech. Treatment and then to Stormtech Chambers)
36	SBUH Runoff	0.061	2	474	853	----	----	----	Prop 10D (Routed to 9A LIDA Facility)
37	Reservoir	0.102	2	484	1,736	33	324.03	109	10a - LIDA Planters (Routed to Stormtech Chambers)

Hydrograph Summary Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

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
38	Combine	0.093	2	480	1,701	32, 36,	------	------	to 9A - LIDA Planter
39	Reservoir	0.067	2	488	1,700	38	324.11	77.8	9A - LIDA Planter
41	SBUH Runoff	0.003	2	1238	130	----	----	----	Prop 11
43	SBUH Runoff	0.009	2	1312	272	----	----	----	Prop 12A
45	SBUH Runoff	0.008	2	526	410	----	----	----	Prop 12B
46	Combine	0.304	2	476	4,615	34, 45	------	------	to 12B LIDA Planter
47	Reservoir	0.246	2	484	4,614	46	336.60	266	12B - LIDA Planter
48	Combine	0.574	2	480	9,912	35, 37, 47	------	------	To StormTech 10aLIDA, 10c, 12bLID
49	Reservoir	0.096	2	1208	9,906	48	312.00	5,676	StormTech
51	SBUH Runoff	0.010	2	1042	526	----	----	----	Prop 12C
52	Reservoir	0.010	2	1058	525	51	333.01	10.9	12C - LIDA Basin
54	SBUH Runoff	0.014	2	1312	442	----	----	----	Prop 13
56	SBUH Runoff	0.085	2	484	2,075	----	----	----	Prop 14
57	SBUH Runoff	0.057	2	1076	2,897	----	----	----	Prop 15
58	Combine	0.088	2	494	4,972	56, 57	------	------	14 & 15 - For Treatment
59	Reservoir	0.085	2	546	4,971	58	304.10	98.4	14 & 15 - LIDA Basin
62	SBUH Runoff	0.072	2	552	4,012	----	----	----	Prop 16
63	Reservoir	0.071	2	614	4,011	62	325.02	76.0	16 - LIDA Basin (Routed to detention pond facility)
65	SBUH Runoff	0.500	2	480	8,347	----	----	----	Prop 17
66	Reservoir	0.390	2	486	8,346	65	334.53	405	17 - LIDA Swale
67	Reservoir	0.052	2	1454	8,336	66	323.81	5,721	17 - StormTech
69	Combine	0.263	2	532	12,547	16, 21, 63,	------	------	2,3,5,16 - Combined
70	Reservoir	0.008	2	1550	2,389	69	322.57	12,145	2,3,5,16 - Pond
72	SBUH Runoff	0.002	2	1350	52	----	----	----	Prop 18
74	Combine	0.169	2	492	7,264	12, 18, 24, 26, 70, 72,	------	------	combined proposed south1
75	Combine	0.134	2	500	12,429	31, 39, 49,	------	------	combined proposed south2
76	Combine	0.154	2	1150	14,275	52, 54, 59, 67,	------	------	combined proposed north
77	Combine	0.401	2	500	33,968	74, 75, 76	------	------	total proposed site

Hydrograph Summary Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

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	3.801	2	480	63,239	----	----	----	Ex N1
2	SBUH Runoff	0.239	2	482	5,072	----	----	----	Ex N2
3	SBUH Runoff	0.348	2	482	7,970	----	----	----	Ex N3
4	Combine	4.381	2	480	76,281	1, 2, 3	----	----	Existing North Runoff
5	SBUH Runoff	0.725	2	486	18,476	----	----	----	Ex S1
6	SBUH Runoff	1.942	2	482	44,343	----	----	----	Ex S2
7	SBUH Runoff	1.578	2	482	38,039	----	----	----	Ex S3
8	Combine	4.243	2	482	100,858	5, 6, 7	------	-------	Existing South Runoff
9	Combine	8.551	2	480	177,139	4, 8	------	-------	Existing Site (pre-dev.)
11	SBUH Runoff	0.369	2	480	6,132	----	----	----	Prop 1
12	Reservoir	0.183	2	506	6,131	11	283.41	452	1 - Swale
14	SBUH Runoff	0.193	2	490	5,434	----	----	----	Prop 2
15	SBUH Runoff	0.295	2	490	8,010	----	----	----	Prop 3
16	Combine	0.488	2	490	13,444	14, 15	------	-------	2 & 3 - Mech Treatment (Routed to detention pond facility)
18	SBUH Runoff	0.074	2	480	1,268	----	----	----	Prop 4 - Mech Treatment
20	SBUH Runoff	2.068	2	478	30,628	----	----	----	Prop 5
21	Reservoir	1.372	2	490	30,626	20	324.81	2,354	5 - LIDA Swale (Routed to detention pond facility)
23	SBUH Runoff	0.945	2	476	13,371	----	----	----	Prop 6
24	Reservoir	0.516	2	496	13,369	23	293.24	1,241	6 - LIDA Swale
26	SBUH Runoff	0.070	2	480	1,766	----	----	----	Prop 7
28	SBUH Runoff	0.109	2	478	1,666	----	----	----	Prop 8
29	SBUH Runoff	0.157	2	478	2,323	----	----	----	Prop 9
30	Combine	0.266	2	478	3,989	28, 29	------	-------	Prop 8 & 9
31	Reservoir	0.189	2	488	3,988	30	307.99	296	8 & 9 LIDA Planter
32	SBUH Runoff	0.289	2	478	4,426	----	----	----	Prop 9A (Routed to 9A LIDA Facility)
33	SBUH Runoff	0.328	2	474	4,698	----	----	----	Prop 10A (Routed to 10A LIDA Facility)
34	SBUH Runoff	0.795	2	474	11,375	----	----	----	Prop 10B (Routed to 12B LIDA Facility)
35	SBUH Runoff	0.868	2	476	12,214	----	----	----	Prop 10C (Mech. Treatment and then to Stormtech Chambers)
36	SBUH Runoff	0.161	2	474	2,308	----	----	----	Prop 10D (Routed to 9A LIDA Facility)
37	Reservoir	0.272	2	484	4,697	33	324.08	290	10a - LIDA Planters (Routed to Stormtech Chambers)

Hydrograph Summary Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

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
38	Combine	0.449	2	476	6,734	32, 36,	------	------	to 9A - LIDA Planter
39	Reservoir	0.443	2	480	6,733	38	324.52	374	9A - LIDA Planter
41	SBUH Runoff	0.084	2	480	1,840	----	----	----	Prop 11
43	SBUH Runoff	0.210	2	480	5,299	----	----	----	Prop 12A
45	SBUH Runoff	0.162	2	480	2,633	----	----	----	Prop 12B
46	Combine	0.952	2	474	14,008	34, 45	------	------	to 12B LIDA Planter
47	Reservoir	0.478	2	498	14,007	46	337.06	1,576	12B - LIDA Planter
48	Combine	1.414	2	480	30,919	35, 37, 47	------	------	To StormTech 10aLIDA, 10c, 12bLID
49	Reservoir	1.409	2	482	30,913	48	312.17	5,800	StormTech
51	SBUH Runoff	0.231	2	480	3,949	----	----	----	Prop 12C
52	Reservoir	0.105	2	528	3,948	51	333.28	297	12C - LIDA Basin
54	SBUH Runoff	0.342	2	480	8,611	----	----	----	Prop 13
56	SBUH Runoff	0.412	2	482	7,990	----	----	----	Prop 14
57	SBUH Runoff	0.757	2	492	21,737	----	----	----	Prop 15
58	Combine	1.156	2	486	29,727	56, 57	------	------	14 & 15 - For Treatment
59	Reservoir	1.142	2	492	29,725	58	304.80	939	14 & 15 - LIDA Basin
62	SBUH Runoff	0.943	2	488	23,956	----	----	----	Prop 16
63	Reservoir	0.639	2	558	23,955	62	325.58	2,381	16 - LIDA Basin (Routed to detention pond facility)
65	SBUH Runoff	2.252	2	476	32,144	----	----	----	Prop 17
66	Reservoir	1.305	2	494	32,143	65	334.69	2,449	17 - LIDA Swale
67	Reservoir	1.293	2	510	32,133	66	325.18	6,967	17 - StormTech
69	Combine	2.241	2	492	68,025	16, 21, 63,	------	------	2,3,5,16 - Combined
70	Reservoir	1.123	2	704	49,901	69	323.78	23,269	2,3,5,16 - Pond
72	SBUH Runoff	0.045	2	480	1,236	----	----	----	Prop 18
74	Combine	1.497	2	692	73,672	12, 18, 24, 26, 70, 72,	------	------	combined proposed south1
75	Combine	2.029	2	482	41,634	31, 39, 49,	------	------	combined proposed south2
76	Combine	2.659	2	508	74,417	52, 54, 59, 67,	------	------	combined proposed north
77	Combine	4.907	2	506	189,725	74, 75, 76	------	------	total proposed site

Hydrograph Summary Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

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	8.436	2	478	126,590	----	----	----	Ex N1
2	SBUH Runoff	0.565	2	482	10,332	----	----	----	Ex N2
3	SBUH Runoff	0.831	2	482	16,236	----	----	----	Ex N3
4	Combine	9.798	2	480	153,159	1, 2, 3	------	-------	Existing North Runoff
5	SBUH Runoff	1.749	2	482	37,639	----	----	----	Ex S1
6	SBUH Runoff	4.635	2	482	90,333	----	----	----	Ex S2
7	SBUH Runoff	3.792	2	482	77,492	----	----	----	Ex S3
8	Combine	10.18	2	482	205,464	5, 6, 7	------	-------	Existing South Runoff
9	Combine	19.87	2	480	358,623	4, 8	------	-------	Existing Site (pre-dev.)
11	SBUH Runoff	0.818	2	478	12,275	----	----	----	Prop 1
12	Reservoir	0.510	2	494	12,274	11	283.73	1,202	1 - Swale
14	SBUH Runoff	0.465	2	486	11,070	----	----	----	Prop 2
15	SBUH Runoff	0.686	2	484	16,035	----	----	----	Prop 3
16	Combine	1.151	2	486	27,105	14, 15	------	-------	2 & 3 - Mech Treatment (routed to detention pond facility)
18	SBUH Runoff	0.170	2	478	2,583	----	----	----	Prop 4 - Mech Treatment
20	SBUH Runoff	3.905	2	476	55,495	----	----	----	Prop 5
21	Reservoir	1.554	2	522	55,494	20	325.08	6,589	5 - LIDA Swale (routed to detention pond facility)
23	SBUH Runoff	1.621	2	474	22,734	----	----	----	Prop 6
24	Reservoir	0.622	2	522	22,732	23	293.52	2,927	6 - LIDA Swale
26	SBUH Runoff	0.241	2	480	4,214	----	----	----	Prop 7
28	SBUH Runoff	0.216	2	476	3,118	----	----	----	Prop 8
29	SBUH Runoff	0.296	2	476	4,210	----	----	----	Prop 9
30	Combine	0.512	2	476	7,328	28, 29	------	-------	Prop 8 & 9
31	Reservoir	0.281	2	496	7,326	30	308.12	664	8 & 9 LIDA Planter
32	SBUH Runoff	0.575	2	476	8,284	----	----	----	Prop 9A (routed to 9A LIDA Facility)
33	SBUH Runoff	0.508	2	474	7,378	----	----	----	Prop 10A (routed to 10A LIDA Facility)
34	SBUH Runoff	1.231	2	474	17,862	----	----	----	Prop 10B (routed to 12B LIDA Facility)
35	SBUH Runoff	1.457	2	474	20,442	----	----	----	Prop 10C Mech. Treatment and then to Stormtech Chambers)
36	SBUH Runoff	0.250	2	474	3,624	----	----	----	Prop 10D (routed to 9A LIDA Facility)
37	Reservoir	0.327	2	490	7,377	33	324.15	520	10a - LIDA Planters (routed to Stormtech Chambers)

Hydrograph Summary Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

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
38	Combine	0.823	2	476	11,908	32, 36,	------	------	to 9A - LIDA Planter
39	Reservoir	0.697	2	484	11,907	38	324.91	654	9A - LIDA Planter
41	SBUH Runoff	0.251	2	480	4,205	----	----	----	Prop 11
43	SBUH Runoff	0.723	2	480	12,642	----	----	----	Prop 12A
45	SBUH Runoff	0.349	2	478	5,181	----	----	----	Prop 12B
46	Combine	1.576	2	474	23,042	34, 45	------	------	to 12B LIDA Planter
47	Reservoir	0.891	2	494	23,041	46	337.42	2,757	12B - LIDA Planter (routed to Stormtech Chambers)
48	Combine	2.588	2	480	50,860	35, 37, 47	------	------	To StormTech 10aLIDA, 10c, 12bLID
49	Reservoir	2.588	2	480	50,854	48	312.26	5,862	StormTech
51	SBUH Runoff	0.529	2	478	8,044	----	----	----	Prop 12C
52	Reservoir	0.388	2	488	8,043	51	333.64	733	12C - LIDA Basin
54	SBUH Runoff	1.176	2	480	20,544	----	----	----	Prop 13
56	SBUH Runoff	0.732	2	482	13,802	----	----	----	Prop 14
57	SBUH Runoff	1.824	2	486	44,281	----	----	----	Prop 15
58	Combine	2.547	2	484	58,083	56, 57	------	------	14 & 15 - For Treatment
59	Reservoir	2.541	2	486	58,082	58	304.92	1,114	14 & 15 - LIDA Basin
62	SBUH Runoff	2.050	2	484	46,345	----	----	----	Prop 16
63	Reservoir	1.873	2	504	46,344	62	325.77	3,215	16 - LIDA Basin (Routed to detention pond facility)
65	SBUH Runoff	3.954	2	474	55,525	----	----	----	Prop 17
66	Reservoir	1.542	2	522	55,524	65	334.95	6,434	17 - LIDA Swale
67	Reservoir	1.542	2	522	55,514	66	325.20	6,986	17 - StormTech
69	Combine	4.499	2	500	128,943	16, 21, 63,	------	------	2,3,5,16 - Combined
70	Reservoir	3.575	2	562	110,786	69	324.10	26,566	2,3,5,16 - Pond
72	SBUH Runoff	0.168	2	480	3,018	----	----	----	Prop 18
74	Combine	4.664	2	558	155,608	12, 18, 24, 26, 70, 72,	------	------	combined proposed south1
75	Combine	3.552	2	480	70,087	31, 39, 49,	------	------	combined proposed south2
76	Combine	5.418	2	482	142,183	52, 54, 59, 67,	------	------	combined proposed north
77	Combine	10.55	2	538	367,879	74, 75, 76	------	------	total proposed site

Hydrograph Summary Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

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	9.200	2	478	136,930	----	----	----	Ex N1
2	SBUH Runoff	0.620	2	482	11,196	----	----	----	Ex N2
3	SBUH Runoff	0.911	2	482	17,593	----	----	----	Ex N3
4	Combine	10.69	2	480	165,719	1, 2, 3	------	-------	Existing North Runoff
5	SBUH Runoff	1.920	2	482	40,784	----	----	----	Ex S1
6	SBUH Runoff	5.084	2	482	97,881	----	----	----	Ex S2
7	SBUH Runoff	4.161	2	482	83,966	----	----	----	Ex S3
8	Combine	11.17	2	482	222,631	5, 6, 7	------	-------	Existing South Runoff
9	Combine	21.75	2	480	388,350	4, 8	------	-------	Existing Site (pre-dev.)
11	SBUH Runoff	0.892	2	478	13,278	----	----	----	Prop 1
12	Reservoir	0.607	2	490	13,277	11	283.76	1,276	1 - Swale
14	SBUH Runoff	0.511	2	486	11,995	----	----	----	Prop 2
15	SBUH Runoff	0.751	2	484	17,344	----	----	----	Prop 3
16	Combine	1.262	2	484	29,340	14, 15	------	-------	2 & 3 - Mech Treatment (routed to detention pond facility)
18	SBUH Runoff	0.186	2	478	2,799	----	----	----	Prop 4 - Mech Treatment
20	SBUH Runoff	4.195	2	476	59,437	----	----	----	Prop 5
21	Reservoir	1.588	2	528	59,435	20	325.13	7,439	5 - LIDA Swale (routed to detention pond facility)
23	SBUH Runoff	1.725	2	474	24,194	----	----	----	Prop 6
24	Reservoir	0.684	2	518	24,193	23	293.56	3,145	6 - LIDA Swale
26	SBUH Runoff	0.271	2	480	4,636	----	----	----	Prop 7
28	SBUH Runoff	0.233	2	476	3,350	----	----	----	Prop 8
29	SBUH Runoff	0.318	2	476	4,509	----	----	----	Prop 9
30	Combine	0.552	2	476	7,859	28, 29	------	-------	Prop 8 & 9
31	Reservoir	0.283	2	500	7,857	30	308.15	752	8 & 9 LIDA Planter
32	SBUH Runoff	0.620	2	476	8,901	----	----	----	Prop 9A routed to 9A LIDA Facility
33	SBUH Runoff	0.536	2	474	7,790	----	----	----	Prop 10A routed to 10A LIDA Facility
34	SBUH Runoff	1.297	2	474	18,861	----	----	----	Prop 10B routed to 12B LIDA Facility
35	SBUH Runoff	1.547	2	474	21,721	----	----	----	Prop 10C Mech. Treatment and then to Stormtech Chambers)
36	SBUH Runoff	0.263	2	474	3,827	----	----	----	Prop 10D routed to 9A LIDA Facility
37	Reservoir	0.327	2	492	7,789	33	324.16	572	10a - LIDA Planters routed to stormtech chambers

Hydrograph Summary Report

25yr Storm Event, pg 2 of 2

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

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
38	Combine	0.882	2	476	12,728	32, 36,	------	------	to 9A - LIDA Planter
39	Reservoir	0.735	2	484	12,727	38	324.98	705	9A - LIDA Planter
41	SBUH Runoff	0.280	2	480	4,607	------	------	------	Prop 11
43	SBUH Runoff	0.814	2	480	13,907	------	------	------	Prop 12A
45	SBUH Runoff	0.380	2	478	5,595	------	------	------	Prop 12B
46	Combine	1.674	2	474	24,456	34, 45	------	------	to 12B LIDA Planter
47	Reservoir	0.936	2	494	24,454	46	337.49	2,988	12B - LIDA Planter
48	Combine	2.721	2	478	53,965	35, 37, 47	------	------	To StormTech 10aLIDA, 10c, 12bLID
49	Reservoir	2.721	2	480	53,960	48	312.27	5,868	StormTech
51	SBUH Runoff	0.579	2	478	8,717	------	------	------	Prop 12C
52	Reservoir	0.465	2	486	8,715	51	333.66	766	12C - LIDA Basin
54	SBUH Runoff	1.323	2	480	22,599	------	------	------	Prop 13
56	SBUH Runoff	0.782	2	482	14,712	------	------	------	Prop 14
57	SBUH Runoff	2.004	2	486	47,981	------	------	------	Prop 15
58	Combine	2.776	2	484	62,693	56, 57	------	------	14 & 15 - For Treatment
59	Reservoir	2.770	2	486	62,691	58	304.94	1,137	14 & 15 - LIDA Basin
62	SBUH Runoff	2.231	2	484	49,962	------	------	------	Prop 16
63	Reservoir	2.076	2	500	49,961	62	325.79	3,323	16 - LIDA Basin routed to detention pond facility
65	SBUH Runoff	4.218	2	474	59,186	------	------	------	Prop 17
66	Reservoir	1.583	2	526	59,185	65	334.99	7,170	17 - LIDA Swale
67	Reservoir	1.583	2	526	59,175	66	325.20	6,989	17 - StormTech
69	Combine	4.851	2	498	138,736	16, 21, 63,	------	------	2,3,5,16 - Combined
70	Reservoir	3.933	2	554	120,576	69	324.14	26,985	2,3,5,16 - Pond
72	SBUH Runoff	0.190	2	480	3,327	------	------	------	Prop 18
74	Combine	5.145	2	548	168,808	12, 18, 24, 26, 70, 72,	------	------	combined proposed south1
75	Combine	3.723	2	480	74,544	31, 39, 49,	------	------	combined proposed south2
76	Combine	5.921	2	482	153,181	52, 54, 59, 67,	------	------	combined proposed north
77	Combine	11.76	2	530	396,533	74, 75, 76	------	------	total proposed site

Appendix G: HHPR Stormwater Management Report

SCM High School

Water Quality Per NOAA

Prepared by Harper Houf Peterson Righellis Inc.
Job No. BOR-13
September 2015

Proposed Conditions:

ONSITE:

BASIN	TOTAL AREA (SF)	TOTAL AREA (AC)	IMPERVIOUS AREA (SF)	IMPERVIOUS AREA (AC)	PERVIOUS AREA (SF)	PERVIOUS AREA (AC)	NOAA WQ Volume (cf)	NOAA WQ Flow*, 50% of 2-YR (cfs)	Maximum WQ Storage Depth** (ft)	Adequate NOAA Treatment Area per Sub-basin (Yes/No)
							NOAA WQ Area, Volume and Flow			
1	70,380	1.6	26,899	0.6	43,481	1.0	1,420	0.039	0.02	Yes
2	61,945	1.4	0	0.0	61,945	1.4	2,378	0.043	N/A*	Yes
3	83,180	1.9	0	0.0	83,180	1.9				
4	15,367	0.4	5,174	0.1	10,193	0.2	238	0.005	N/A*	Yes
5	284,556	6.5	182,582	4.2	101,974	2.3	11,653	0.679	0.05	Yes
6	85,282	2.0	66,464	1.5	18,818	0.4	4,738	0.309	0.07	Yes
7	36,675	0.8	0	0.0	36,675	0.8	241	0.006	N/A	**No**
8	17,066	0.4	6,912	0.2	10,154	0.2	1,996	0.090	0.03	Yes
9	50,238	1.2	21,238	0.5	29,000	0.7				
10	175,559	4.0	156,334	3.6	19,225	0.4	11,386	0.785	0.12	Yes
11	31,207	0.7	3,020	0.1	28,187	0.6	297	0.006	N/A	**No**
12A	105,964	2.4	0	0.0	105,964	2.4	643	0.016	N/A	**No**
12B	23,350	0.5	13,620	0.3	9,730	0.2	671	0.032	0.01	Yes
12C	47,574	1.1	16,668	0.4	30,906	0.7	976	0.027	0.02	Yes
13	170,737	3.9	0	0.0	170,737	3.9	1,044	0.026	N/A	**No**
14	53,945	1.2	2,270	0.1	51,675	1.2	6,274	0.105	0.29	Yes
15	263,280	6.0	26,462	0.6	236,818	5.4				
16	244,480	5.6	74,746	1.7	169,734	3.9	6,145	0.135	0.04	Yes
17	216,429	5.0	170,405	3.9	46,024	1.1	11,846	0.773	0.05	Yes
18	26,452	0.6	0	0.0	26,452	0.6	135	0.004	N/A	Yes
TOTAL	**2,063,666**	**47.4**	**772,794**	**17.7**	**1,290,872**	**29.6**	**62,081**	**3.08**		**Yes**

***Proposed Mechanical Treatment to treat CWS and NOAA WQ flow**

OFFSITE:

BASIN	TOTAL AREA (SF)	TOTAL AREA (AC)	IMPERVIOUS AREA (SF)	IMPERVIOUS AREA (AC)	PERVIOUS AREA (SF)	PERVIOUS AREA (AC)	NOAA WQ Volume (cf)	NOAA WQ Flow*, 50% of 2-YR (cfs)	Residence Time (min) for Existing Swales / Maximum WQ Storage Depth for planters (ft)	Adequate NOAA Treatment Area per Sub-basin (Yes/No)
							NOAA WQ Area, Volume and Flow			
OFF1	32,319	0.7	17,873	0.4	14,446	0.3	851	0.037	13.24 (N.Swale)	Yes
OFF2	115,864	2.7	47,346	1.1	68,518	1.6	3,281	0.144	13.24 (N.Swale)	Yes
OFF3	139,209	3.2	43,100	1.0	96,109	2.2	4,297	0.121	29.10 (S.Swale)	Yes
OFF4	654,172	15.0	74,400	1.7	579,772	13.3	13,312	0.35	13.24 (N.Swale)	Yes
OFF5	36,094	0.8	0	0.0	36,094	0.8	503	0.01	N/A	No
OFF6	27,977	0.6	0	0.0	27,977	0.6	161	0.004	N/A	No
OFF7	39,605	0.9	34,399	0.8	5,206	0.1	2,337	0.157	0.07 (Planters)	Yes
OFF8	103,750	2.4	94,022	2.2	9,728	0.2	6,832	0.47	0.11 (Planters)	Yes
TOTAL	**1,148,990**	**26.4**	**311,140**	**7.1**	**837,850**	**19.2**	**31,574**			**Yes**

PCR = CIA * DS	
CIA =	1,083,934 sf
DS = 0.5*2.5/12 =	0.104 ft
Treatment Vol. =	112,910 CF

0.531 cfs Proposed NOAA WQ Flow to Existing North Swale
0.121 cfs Proposed NOAA WQ Flow to Existing South Swale

SCM High School

Water Quality Per CWS

Prepared by Harper Houf Peterson Righellis Inc.

Job No. BOR-13

August 2015

Proposed Conditions:

ONSITE:

BASIN	TOTAL AREA (SF)	TOTAL AREA (AC)	IMPERVIOUS AREA (SF)	IMPERVIOUS AREA (AC)	PERVIOUS AREA (SF)	PERVIOUS AREA (AC)	CWS WQ Volume (cf)	CWS WQ Flow (cfs)	Proposed LIDA Facility Bottom Area (SF)	Required CWS Treatment Area, 6% sizing factor (SF)	Adequate CWS Treatment Area per Sub-basin (Yes/No)
							CWS WQ Area, Volume and Flow				
1	70,380	1.6	26,899	0.6	43,481	1.0	807	0.056	1,165	1,614	No
2	61,945	1.4	0	0.0	61,945	1.4	0	0.000	0*	0	Yes
3	83,180	1.9	0	0.0	83,180	1.9	0	0.000			
4	15,367	0.4	5,174	0.1	10,193	0.2	155	0.011	0*	310	Yes
5	284,556	6.5	182,582	4.2	101,974	2.3	5,477	0.380	13,073	10,955	Yes
6	85,282	2.0	66,464	1.5	18,818	0.4	1,994	0.138	4,755	3,988	Yes
7	36,675	0.8	0	0.0	36,675	0.8	0	0.000	0	0	Yes
8	17,066	0.4	6,912	0.2	10,154	0.2	207	0.014	1,044	415	Yes
9	50,238	1.2	21,238	0.5	29,000	0.7	637	0.044	1,942	1,274	Yes
10	175,559	4.0	156,334	3.6	19,225	0.4	4,690	0.326	5,948	9,380	No
11	31,207	0.7	3,020	0.1	28,187	0.6	91	0.006	0	181	No
12A	105,964	2.4	0	0.0	105,964	2.4	0	0.000	0	0	No
12B	23,350	0.5	13,620	0.3	9,730	0.2	409	0.028	2,469	817	Yes
12C	47,574	1.1	16,668	0.4	30,906	0.7	500	0.035	1,009	1,000	Yes
13	170,737	3.9	0	0.0	170,737	3.9	0	0.000	0	0	No
14	53,945	1.2	2,270	0.1	51,675	1.2	68	0.005	1,327	1,724	No
15	263,280	6.0	26,462	0.6	236,818	5.4	794	0.055			
16	244,480	5.6	74,746	1.7	169,734	3.9	2,242	0.156	3,654	4,485	No
17	216,429	5.0	170,405	3.9	46,024	1.1	5,112	0.355	12,280	10,224	Yes
18	26,452	0.6	0	0.0	26,452	0.6	0	0.000	0	0	Yes
TOTAL	2,063,666	47.4	772,794	17.7	1,290,872	29.6	23,184	1.610	48,666	46,368	Yes

*Proposed Mechanical Treatment to treat CWS and NOAA WQ flow

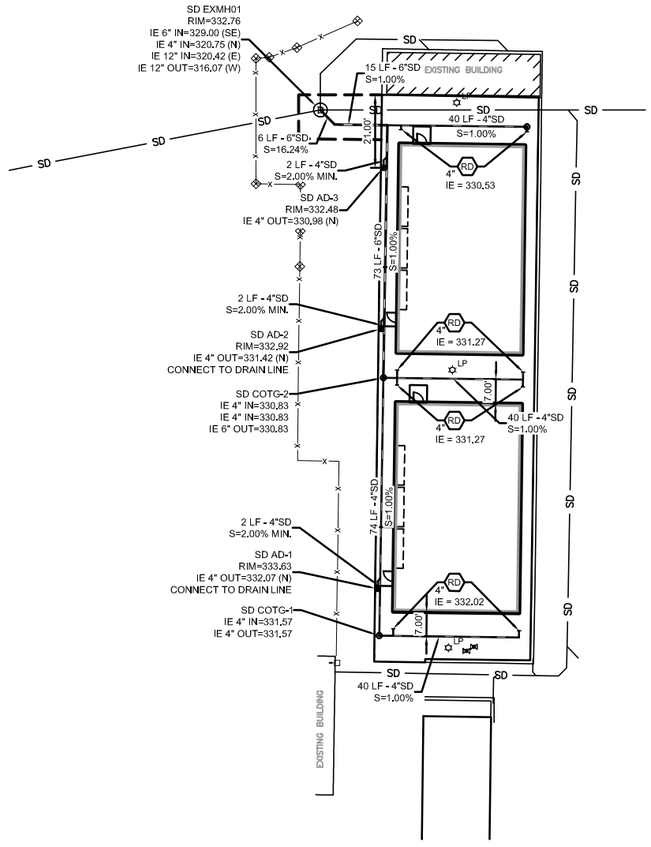
OFFSITE:

BASIN	TOTAL AREA (SF)	TOTAL AREA (AC)	IMPERVIOUS AREA (SF)	IMPERVIOUS AREA (AC)	PERVIOUS AREA (SF)	PERVIOUS AREA (AC)	CWS WQ Volume (cf)	CWS WQ Flow (cfs)	Proposed LIDA Facility Bottom Area (SF)	Required CWS Treatment Area, 6% sizing factor (SF)	Adequate CWS Treatment Area per Sub-basin (Yes/No)
							CWS WQ Area, Volume and Flow				
OFF1	32,319	0.7	17,873	0.4	14,446	0.3	536	0.037	N/A - Basins to be treated via existing WQ swale/pond along SW 175th Avenue		Yes
OFF2	115,864	2.7	47,346	1.1	68,518	1.6	1,420	0.099			No
OFF3	139,209	3.2	43,100	1.0	96,109	2.2	1,293	0.090			No
OFF4	654,172	15.0	74,400	1.7	579,772	13.3	2,232	0.155			No
OFF5	36,094	0.8	0	0.0	36,094	0.8	0	0.000			No
OFF6	27,977	0.6	0	0.0	27,977	0.6	0	0.000	0	0	No
OFF7	39,605	0.9	34,399	0.8	5,206	0.1	1,032	0.072	5,206	2,064	Yes
OFF8	103,750	2.4	94,022	2.2	9,728	0.2	2,821	0.196	9,728	5,641	Yes
TOTAL	1,148,990	26.4	311,140	7.1	837,850	19.2	9,334	0.648	14,934	7,705	Yes

0.291 cfs Proposed CWS WQ Flow to Existing North Swale

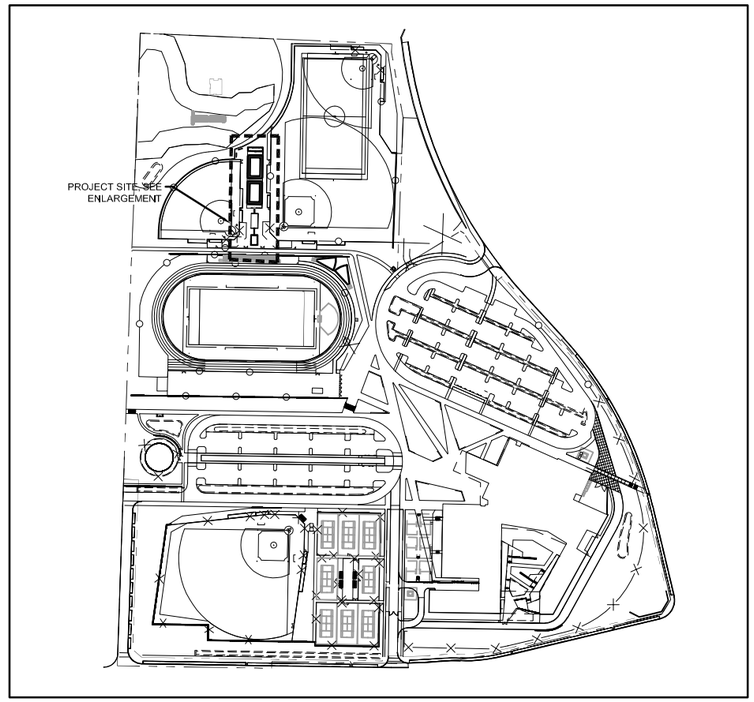
0.090 cfs Proposed CWS WQ Flow to Existing South Swale

Appendix H: Plans and Details



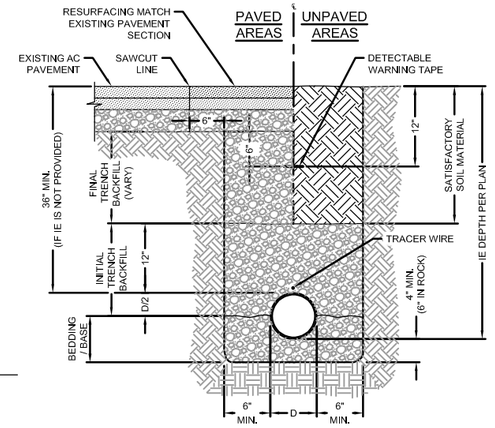
2 SITE PLAN ENLARGEMENT

SCALE: 1" = 20'



1 OVERALL SITE PLAN

SCALE: 1" = 200'



3 TYPICAL PIPE BEDDING AND BACKFILL

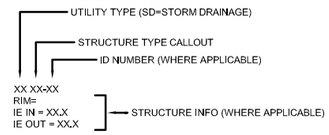
SCALE: NTS

KEY NOTES

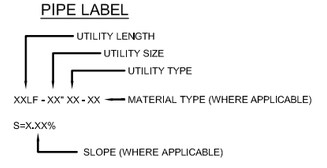
1 REMOVE AND REPLACE CONCRETE PAVEMENT AS NECESSARY FOR CONSTRUCTION OF STORM PIPE.

UTILITY LABEL LEGEND

STRUCTURE LABEL



PIPE LABEL



STRUCTURE TYPE

CALLOUT	DESCRIPTION	DETAIL REF.
RD	ROOF DRAIN	5 / C201
AD	AREA DRAIN	4 / C201
COTG	CLEANOUT	6 / C201

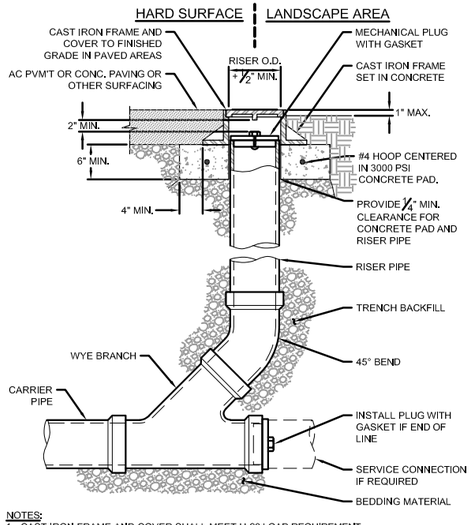
SHEET LEGEND

RD CONNECT TO ROOF DRAIN. SEE PLUMBING PLANS FOR CONTINUATION. SIZE AND IE AS NOTED.

!! UTILITY CROSSING. PROVIDE 12" MIN. CLEARANCE, U.N.O.

SCALE 1 INCH = 40 FEET

40 0 40 80

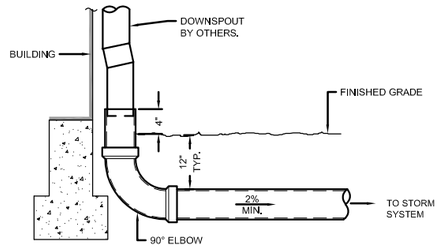


NOTES:

1. CAST IRON FRAME AND COVER SHALL MEET H-20 LOAD REQUIREMENT.
2. FOR CARRIER PIPE SIZE 6"∅ AND LESS, PROVIDE RISER PIPE SIZE TO MATCH CARRIER PIPE.
3. RISER PIPE MATERIAL TO MATCH CARRIER PIPE MATERIAL.

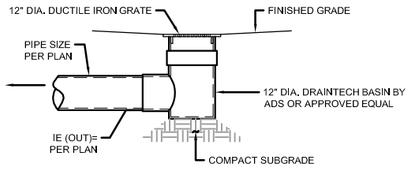
6 STANDARD CLEANOUT (COTG)

SCALE: NTS



5 DOWNSPOUT/STORM DRAIN CONNECTION

SCALE: NTS



NOTES:

1. DRAIN AND GRATE BY ADS OR APPROVED EQUAL.

4 AREA DRAIN

SCALE: NTS

REGISTERED PROFESSIONAL ENGINEER
83603PE
OREGON
JUNE 2, 1978
EVAN M. EYKELBOSCH
RENEWS: 12/31/25

FROELICH ENGINEERS
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FAX: 503.226.1670
WWW.CIDAINC.COM

NEW PROJECT FOR:

MOUNTAINSIDE TRAINING FACILITY

12500 SW 175th AVENUE
BEAVERTON, OR

STORMWATER PLAN

C201

220191.01

Appendix I: Operations and Maintenance

I. Responsibility

The facility is to be maintained by the owner. The preparer has designed a system that can be easily maintained by maintenance staff.

A copy of the O&M Plan shall be provided to all property owners and tenants.

II. Description

Stormwater improvements include area drains, cleanouts, roof downspouts, and a piped conveyance system. The proposed system is only for collection and conveyance.

Definitions

- Area Drain: Inlet Structure that collect stormwater and conveys it to the stormwater. Structures shall be maintained with a vacuum using a vactor truck per manufacturer's recommendations.
- Cleanout: A vertical pipe with a removable cover. Cleanouts are typically located at ends, bends, or changes in pipe slopes to facility maintenance in the piped system.
- Sumps: Storage depressions in stormwater structures such as manholes, and trapped catch basins. The depressions are located below the elevation of the structures inlets and outlets. When stormwater collects in the depression, it allows sediment that is suspended in the stormwater to settle to the bottom of the structure and helps prevent clogging of pipes and the [infiltration gallery}
- Source Control: A designation used to identify areas that may generate pollutants of concern. Stormwater from source control areas may drain to the sanitary sewer instead of being treated onsite. Source Control drains must be protected from spills and not be used to dispose of cleaners, oil, or other pollutants.

III. Schedule

The whole system shall be inspected and maintained quarterly and within 48-hours after each major storm event. For this O&M plan, a major storm event is defined as 1.0 inch of rain or more in 24-hours. All components of the storm system as described below must be inspected and maintained frequently or they will cease to function properly. The facility owner must keep a log recording all inspection date, observations, and maintenance activities. Receipts shall be saved when maintenances is performed and there is record of expense.

IV. Procedure

The following items shall be inspected and maintained as stated:

Area Drain and Piped Storm System

- Quarterly inspection for clogging shall be performed.
- Shall be inspected for cracks or leaks during each inspection. The trapped catch basins and manhole shall be cleaned out at a minimum of once per year or more frequrely if inspections

deem it necessary. Cleanout shall be done in a manner to minimize the amount of sediment and trapped oil entering the outlet pipe. Outlet pipes shall be closed or plugged prior to cleaning.

- Water, oil, and sediment in the separating chamber shall be removed, tested, and disposed of in accordance with the federal and state regulations. Girt and sediment that has settled to the bottom of the structure shall be removed during each cleaning.
- Clean shall be done without the use of detergents or surfactants. A pressure washer may be used if necessary.

Source Control

- Source control measures prevent pollutants from mixing with stormwater. Typical non-structural control measure include raking and removing leaves, street sweeping, vacuum sweeping, limited and controlled application and pesticides and fertilizers, and other good maintenance practices.

Spill Prevention

- Spill prevention measures shall be exercised when handling substances that can contaminate stormwater. Activities that pose the chance of hazardous material spill shall not take place near collection structures.
- Contact facility owner immediately in spill is observed.
- Release of pollutants shall be corrected as soon as identified.