Harper
Houf Peterson
Righellis Inc.

Woodhaven Park

SHR-13

Preliminary Stormwater Management Report

May 28 2015

Prepared For:

City of Sherwood

Prepared By:

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HHPR

ENGINEERS ◆ PLANNERS
LANDSCAPE ARCHITECTS ◆ SURVEYORS

Project Description

The proposed project consist of improvements to Woodhaven Park in Sherwood OR. The improvements include addition of parking lot, added playground features, a pervious asphalt concrete trail, restrooms, picnic facility, and a basketball court. The project will provide new drainage and upgrade the existing swale to current CWS standards.

Existing Conditions

The site consists of the existing park site with pedestrian access along Pinehurst Drive and Sunset Blvd and no off street parking available. The park has 2,404 sf of existing concrete walks and large play are covered in bark chips. Currently the site slopes from southeast to northwest with an average slope of 2% to 3%. There is currently no treatment facilities dedicated to the parks impervious surfaces. There is a grass lined swale that was constructed to treat storm runoff from Sunset Blvd. A review of the street as-builts and the City of Sherwood's GIS utility maps was used to determine the existing drainage basins that contribute to the storm system.

Proposed Conditions

The project will add improvements to the existing park and add impervious surfaces in the form of sidewalks, a basketball court, a new restroom/picnic shelter building and an asphalt parking lot. The total new impervious surfaces added to the site is 19,955 sf. The runoff produced will be captured and treated utilizing the existing swale that will be updated to current CWS standards.

Water Quality

Runoff treatment of the new impervious surfaces will be treated utilizing the water quality swale resides on the property. Exhibit E1.0 coveys the contributing impervious basins and the table below gives the associated areas.

Basin	AREA (sf)	CONTRIBUTING WQ FLOW (cfs)
PROPOSED 1	8,055	0.017
PROPOSED 2	5,504	0.011
PROPOSED 3	5,640	0.012
PROPOSED 4	512	0.001
EXISTING 1	65,419	0.136
EXISTING 2	2,204	0.005
TOTAL WQ FLOW		0.181

Vegetative Swale: The swale will be improved to meet current CWS standards. An analysis was performed to ensure treatment capacity of the swale was sufficient to treat the new surface runoff. There is currently 67,623 sf of impervious surface that the swale treats. Using CWS standards the water quality flow for the existing conditions is 0.14 cfs

Existing Impervious =	67,623	SF	=1.55	Acre

$$WaterQuality\ Flow\ (cfs) = \frac{0.36(in)x\ Area\ (sq.ft)}{12(\frac{in}{ft})(4hrs)(60\frac{min}{hr})(\frac{60\ sec}{\min})} =$$ 0.14 cfs

Existing Swale

Swale Length	180	ft		
Manning's "n"	0.24			
Sideslope	4:1	H:V		
Slope	0.02	ft/ft		
V	0.22	fps		
R(T)	13.63	Min	>9 min	OK

Analysis of the existing swale shows a treatment capacity of 0.5 cfs. This equates to a treatment area of 240,000 SF for a 9 min retention time.

Swale Length	180	ft
Max V for 9 min R(t)	0.333333	fps

Max Capacity from Civil Tools Pro for 9 Min retention time

Flow	0.5	cfs
Water Depth	0.29	ft
V	0.3333	fps
R(t)	9.00	Min

The proposed impervious area of 19,711.4 SF will increase the flow by 0.04 cfs for a total area of 87,578 sf and a flow of 0.18 cfs. The existing swale will provide a residence time of 12.5 mins.

Total Impervious	87,334	SF	2.0	Acre

$$WaterQuality\ Flow\ (cfs) = \frac{0.36(in)x\ Area\ (sq.ft)}{12(\frac{in}{ft})(4hrs)(60\frac{min}{hr})(\frac{60\ sec}{\min})} =$$ 0.18 cfs

Proposed Swale

Swale Length	180	ft		
Manning's "n"	0.24			
Sideslope	4:1	H:V		
Slope	0.02	ft/ft		
V	0.24	fps		
R(T)	12.5	Min	>9 min	OK

Water Quantity

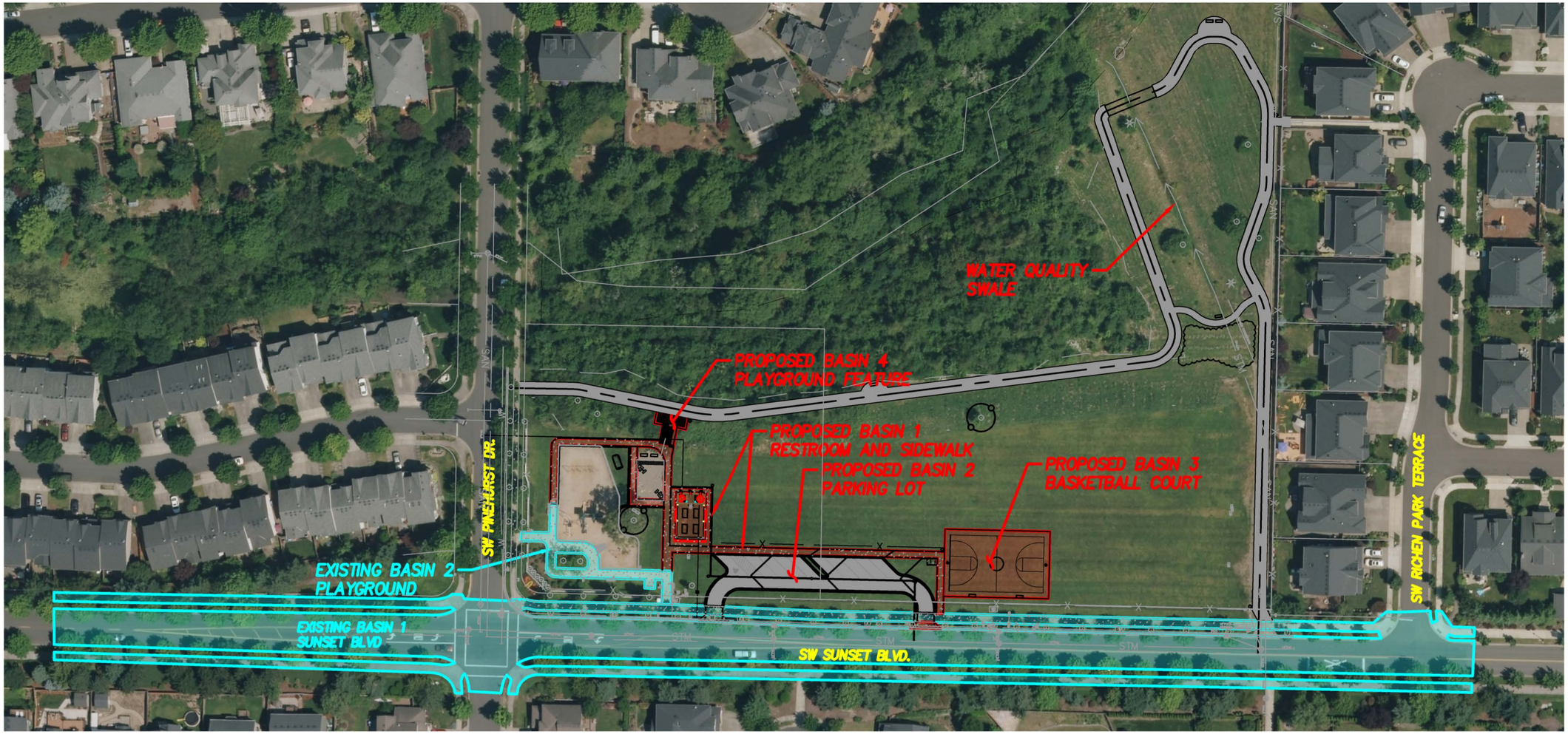
No detention is proposed on this project as no downstream conveyance issues exist.

Conveyance

The conveyance system is designed using Clean Water Services Design and Construction Standards, chapter 5. Flow determination was calculated using the Santa Barbra Urban hydrography method for a peak runoff for a 24 hour NRCS Type 1A storm. Runoff captured from the proposed improvements will be conveyed and discharged into the existing 12" storm sewer running east to west along Sunset Blvd. The peak flows from the existing and proposed drainage basins were used to determine if the existing system has capacity to convey the total flow of 1.82 cfs. Reviewing the survey and as-built information, the existing system has capacity of 4.94 cfs at the discharge point. All proposed drainage pipes will be 8" minimum per Chapter 5.06.1 C-3 of the Clean Water Services Design and Construction Standards and will discharge into the existing system and outfall into the water quality swale located on the property.

Operations and Maintenance

The proposed storm system will be maintained by the city of Sherwood maintenance forces.



Basin	AREA (sf)	CONTRIBUTING WQ FLOW (cfs)
PROPOSED 1	8055.20	0.017
PROPOSED 2	5503.99	0.011
PROPOSED 3	5640.00	0.012
PROPOSED 4	512.16	0.001
EXISTING 1	65418.75	0.136
EXISTING 2	2204.10	0.005
TOTAL		0.182

REGISTERED PROFESSIONAL ENGINEER
70,863
OREGON
JUL. 11, 2006
BENJAMIN R. AUSTIN
EXPIRES: 12/31/

DATE	NO.	DESCRIPTION

REVISIONS

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

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LAND USE SUBMITTAL

BASIN MAP
WOODHAVEN PARK
SHERWOOD, OREGON

SHEET NO. E1.0
JOB NO. SHR-13

P:\SHR (City of Sherwood)\SHR-13 (Woodhaven Park)\SHR13-DWGS\EXHIBIT\ SHR13-E1.dwg

City of Sherwood Oregon

Property Information

No Property Selected.

Map Themes

- ☐ Contours
- ☐ FEMA Flood Plain
- ☑ Utilities
  - ☐ Sanitary ☑ Storm ☐ Water
- ☐ Wetlands
- ☐ Zoning (Zoning Codes)

For questions contact City of Sherwood Planning at (503) 925-2308

New Search

The City of Sherwood's infrastructure records, drawings, and other documents have been gathered over many years, using many different formats and standards. While the data provided is generally believed to be accurate, occasionally it proves to be incorrect; thus its accuracy is not guaranteed. Prior to making any property purchases or other investments based in full or in part upon the material provided, it is specifically advised that you independently field verify the information contained within our records.

SHR-13

Existing Swale Treatment Flow

Man-Made Channels

CIVIL TOOLS PRO
English Units
05-12-2015 13:10:20

Results

Flow Depth	=	0.14	ft
Flowrate	=	0.14	cfs
Bottom Width	=	4.00	ft
Side Slope (H:V)	=	4.0000	H:V
Channel Slope (V:H)	=	0.0200	V:H
Manning's N	=	0.240	
Wetted Area	=	0.62	sq ft
Wetted Perimeter	=	5.13	ft
Velocity	=	0.22	fps
Froude No.	=	0.11	
Flow Regime	=	Sub-Critical	

SHR-13

Existing Swale Maximum Treatment Flow

Man-Made Channels

CIVIL TOOLS PRO
English Units
05-12-2015 13:11:52

Results

Flow Depth	=	0.29	ft
Flowrate	=	0.50	cfs
Bottom Width	=	4.00	ft
Side Slope (H:V)	=	4.0000	H:V
Channel Slope (V:H)	=	0.0200	V:H
Manning's N	=	0.240	
Wetted Area	=	1.50	sq ft
Wetted Perimeter	=	6.39	ft
Velocity	=	0.33	fps
Froude No.	=	0.12	
Flow Regime	=	Sub-Critical	

SHR-13

Existing Swale Total Flow with Proposed

Man-Made Channels

CIVIL TOOLS PRO
English Units
05-12-2015 13:13:12

Results

Flow Depth	=	0.16	ft
Flowrate	=	0.18	cfs
Bottom Width	=	4.00	ft
Side Slope (H:V)	=	4.0000	H:V
Channel Slope (V:H)	=	0.0200	V:H
Manning's N	=	0.240	
Wetted Area	=	0.74	sq ft
Wetted Perimeter	=	5.32	ft
Velocity	=	0.24	fps
Froude No.	=	0.11	
Flow Regime	=	Sub-Critical	

SHR-13 Existing Storm Conveyance Analysis

Sewer Pipes

CIVIL TOOLS PRO
English Units
05-14-2015 14:31:54

Results

Flow (cfs)	Diameter (in)	Manning's N	Slope (%)	Velocity (fps)
1.82	12.00	0.013	0.26	2.32
4.86	12.00	0.013	1.86	6.19

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

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	1	469	2,448	------	------	------	Proposed Basin 1
2	SBUH Runoff	0.115	1	473	1,676	------	------	------	Proposed Basin 2
3	SBUH Runoff	0.118	1	473	1,716	------	------	------	Proposed Basin 3
4	SBUH Runoff	0.016	1	473	239	------	------	------	Proposed Basin 4
5	Combine	0.420	1	472	6,080	1, 2, 3, 4	------	------	Total Proposed Flow
6	SBUH Runoff	1.376	1	473	19,984	------	------	------	Existing Basin 1
7	SBUH Runoff	0.047	1	473	679	------	------	------	Existing Basin 2
8	Combine	1.423	1	473	20,663	6, 7	------	------	Total Existing Flow
10	Combine	1.842	1	472	26,744	5, 8,	------	------	Total Flow at Outfall

Multi-Hydrograph Plot

Hyd. No. 6

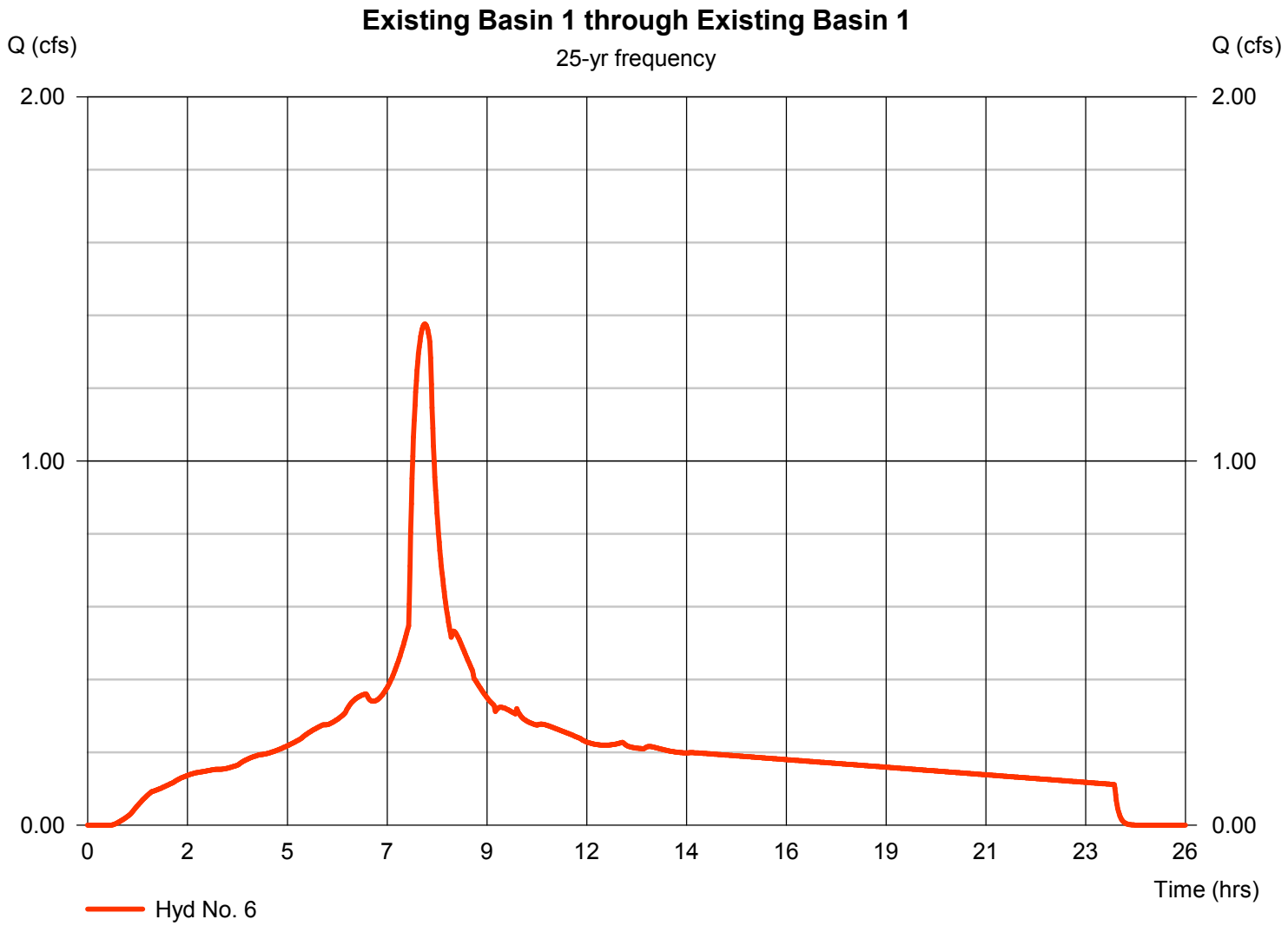
Existing Basin 1

Hydrograph type	=	SBUH Runoff
Peak discharge	=	1.376 cfs
Time to peak	=	7.88 hrs
Hyd. Volume	=	19,984 cuft

Hyd. No. 6

Existing Basin 1

Hydrograph type	=	SBUH Runoff
Peak discharge	=	1.38 cfs
Time to peak	=	7.88 hrs
Hyd. Volume	=	19,984 cuft



Multi-Hydrograph Plot

Hyd. No. 7

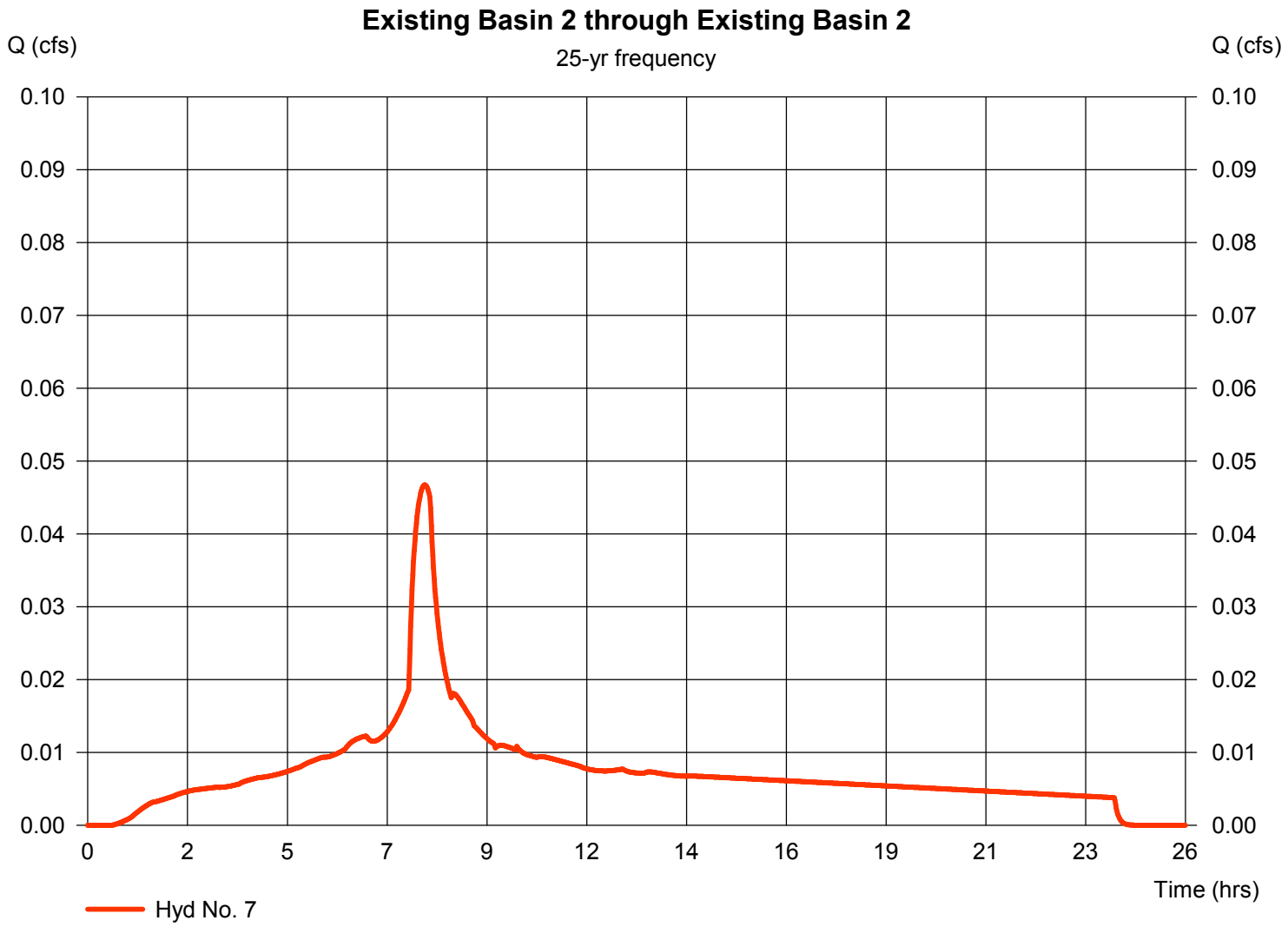
Existing Basin 2

Hydrograph type	=	SBUH Runoff
Peak discharge	=	0.047 cfs
Time to peak	=	7.88 hrs
Hyd. Volume	=	679 cuft

Hyd. No. 7

Existing Basin 2

Hydrograph type	=	SBUH Runoff
Peak discharge	=	0.05 cfs
Time to peak	=	7.88 hrs
Hyd. Volume	=	679 cuft



Multi-Hydrograph Plot

Hyd. No. 1

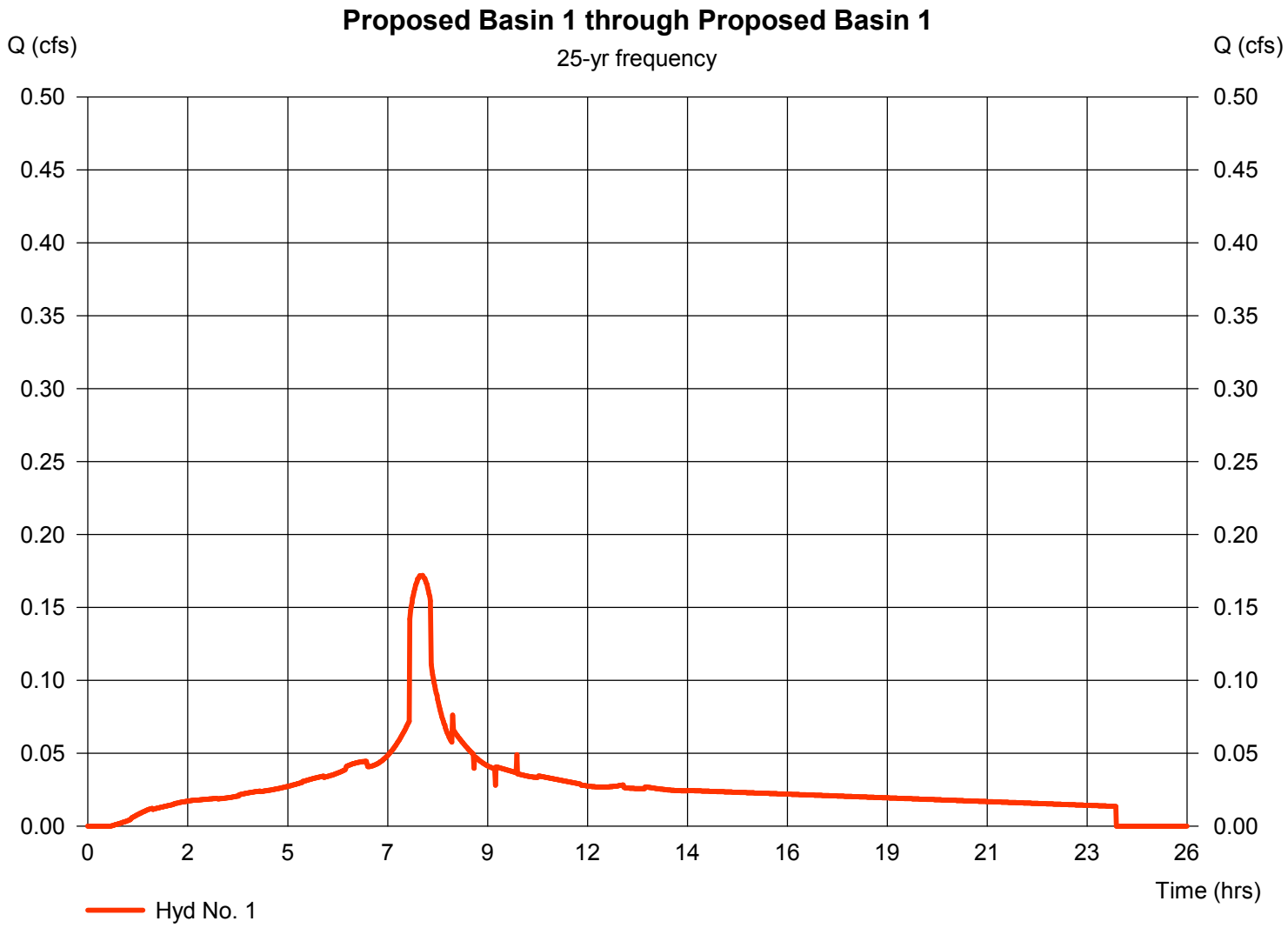
Proposed Basin 1

Hydrograph type	=	SBUH Runoff
Peak discharge	=	0.172 cfs
Time to peak	=	7.82 hrs
Hyd. Volume	=	2,448 cuft

Hyd. No. 1

Proposed Basin 1

Hydrograph type	=	SBUH Runoff
Peak discharge	=	0.17 cfs
Time to peak	=	7.82 hrs
Hyd. Volume	=	2,448 cuft



Multi-Hydrograph Plot

Hyd. No. 2

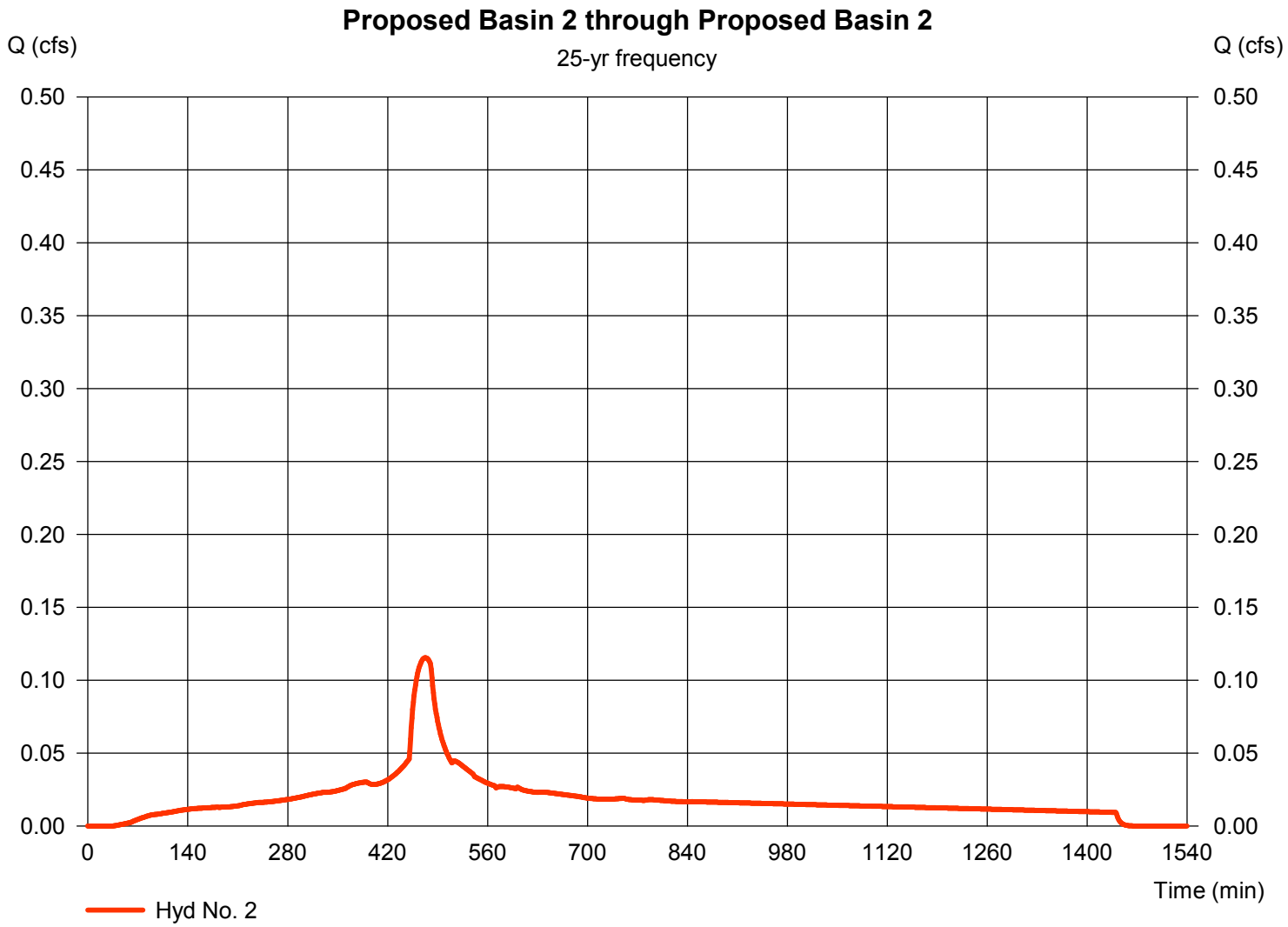
Proposed Basin 2

Hydrograph type	=	SBUH Runoff
Peak discharge	=	0.115 cfs
Time to peak	=	473 min
Hyd. Volume	=	1,676 cuft

Hyd. No. 2

Proposed Basin 2

Hydrograph type	=	SBUH Runoff
Peak discharge	=	0.12 cfs
Time to peak	=	473 min
Hyd. Volume	=	1,676 cuft



Multi-Hydrograph Plot

Hyd. No. 3

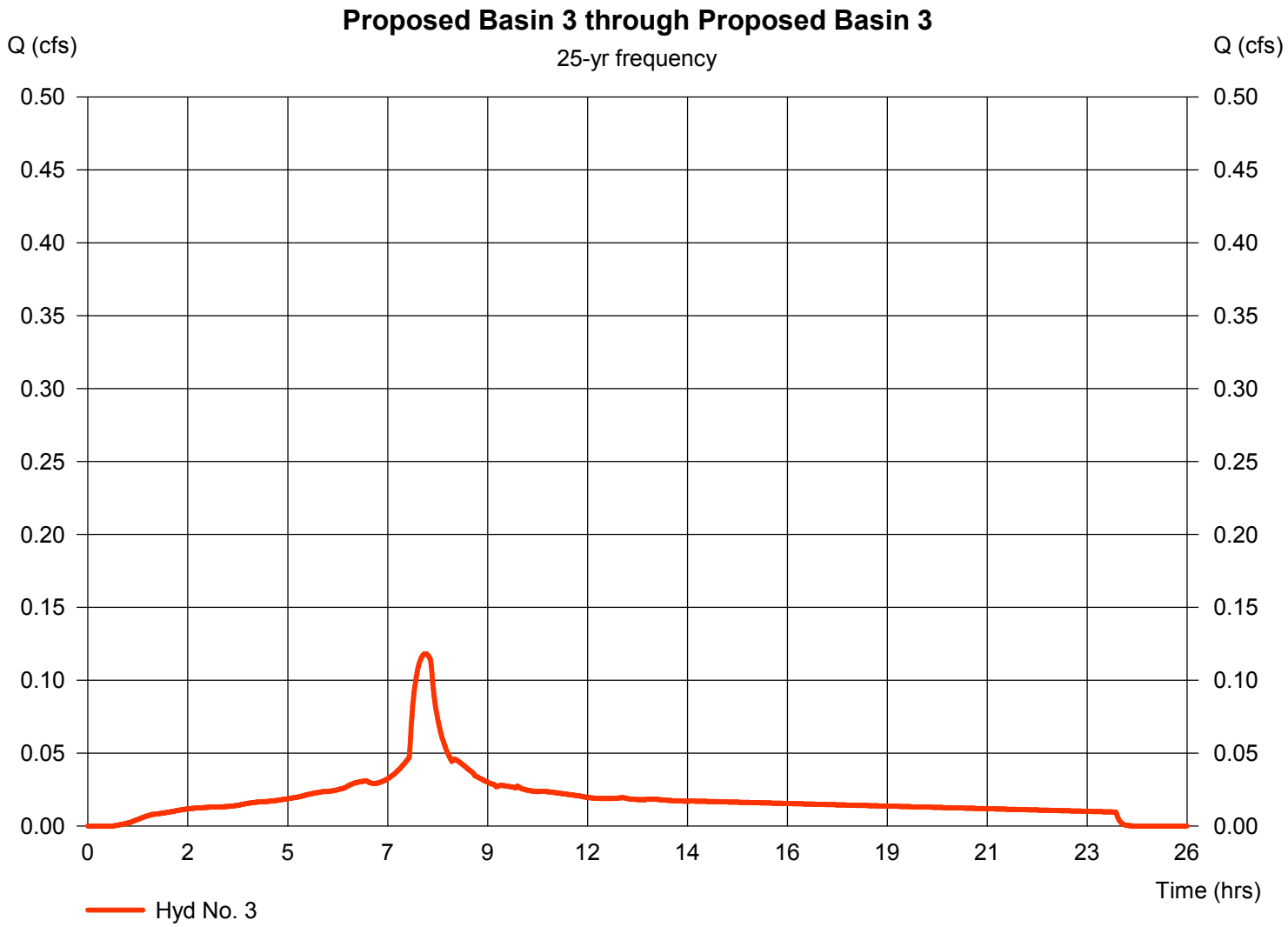
Proposed Basin 3

Hydrograph type	=	SBUH Runoff
Peak discharge	=	0.118 cfs
Time to peak	=	7.88 hrs
Hyd. Volume	=	1,716 cuft

Hyd. No. 3

Proposed Basin 3

Hydrograph type	=	SBUH Runoff
Peak discharge	=	0.12 cfs
Time to peak	=	7.88 hrs
Hyd. Volume	=	1,716 cuft



Multi-Hydrograph Plot

Hyd. No. 4

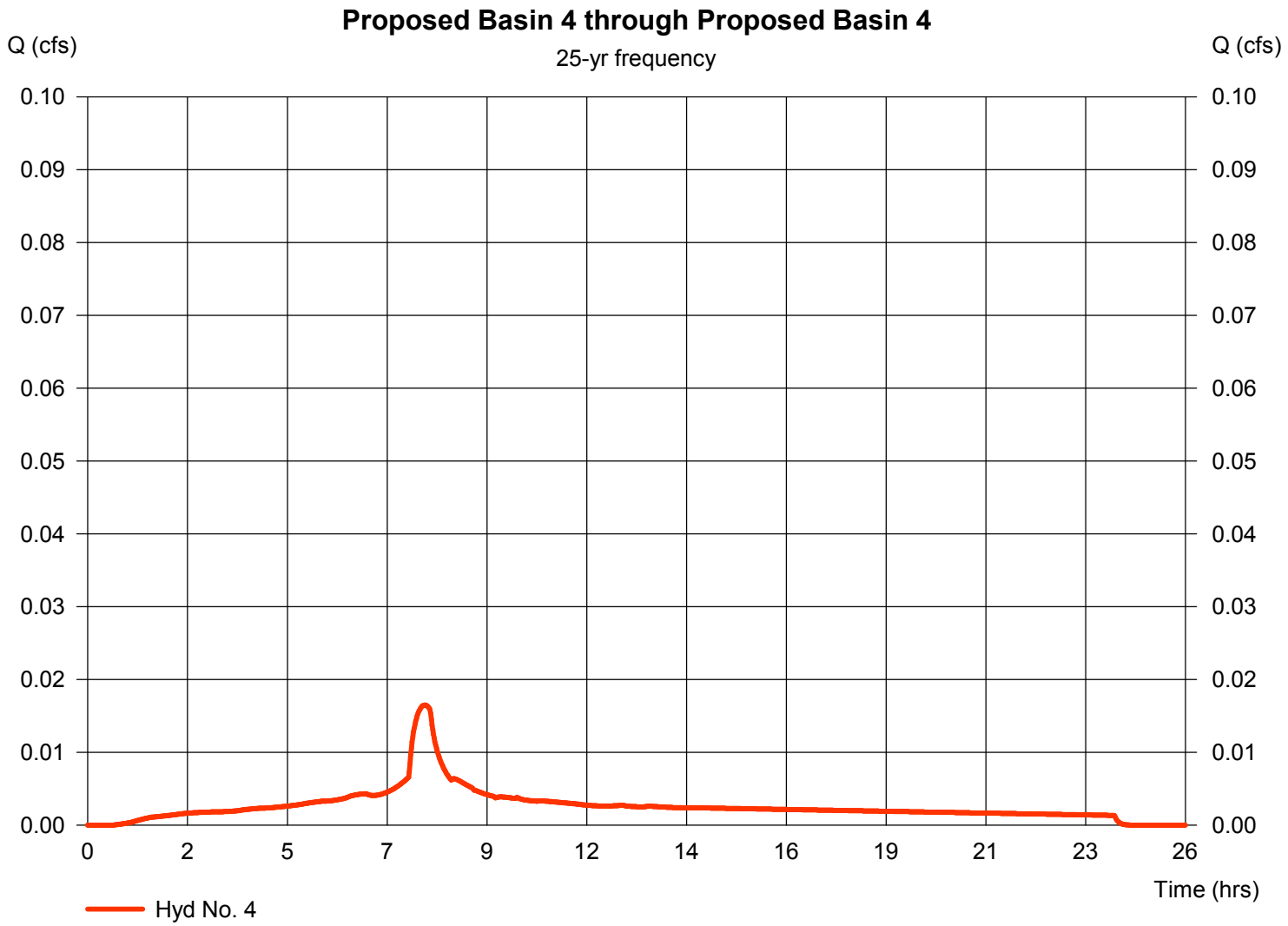
Proposed Basin 4

Hydrograph type	=	SBUH Runoff
Peak discharge	=	0.016 cfs
Time to peak	=	7.88 hrs
Hyd. Volume	=	239 cuft

Hyd. No. 4

Proposed Basin 4

Hydrograph type	=	SBUH Runoff
Peak discharge	=	0.02 cfs
Time to peak	=	7.88 hrs
Hyd. Volume	=	239 cuft



Multi-Hydrograph Plot

Hyd. No. 8

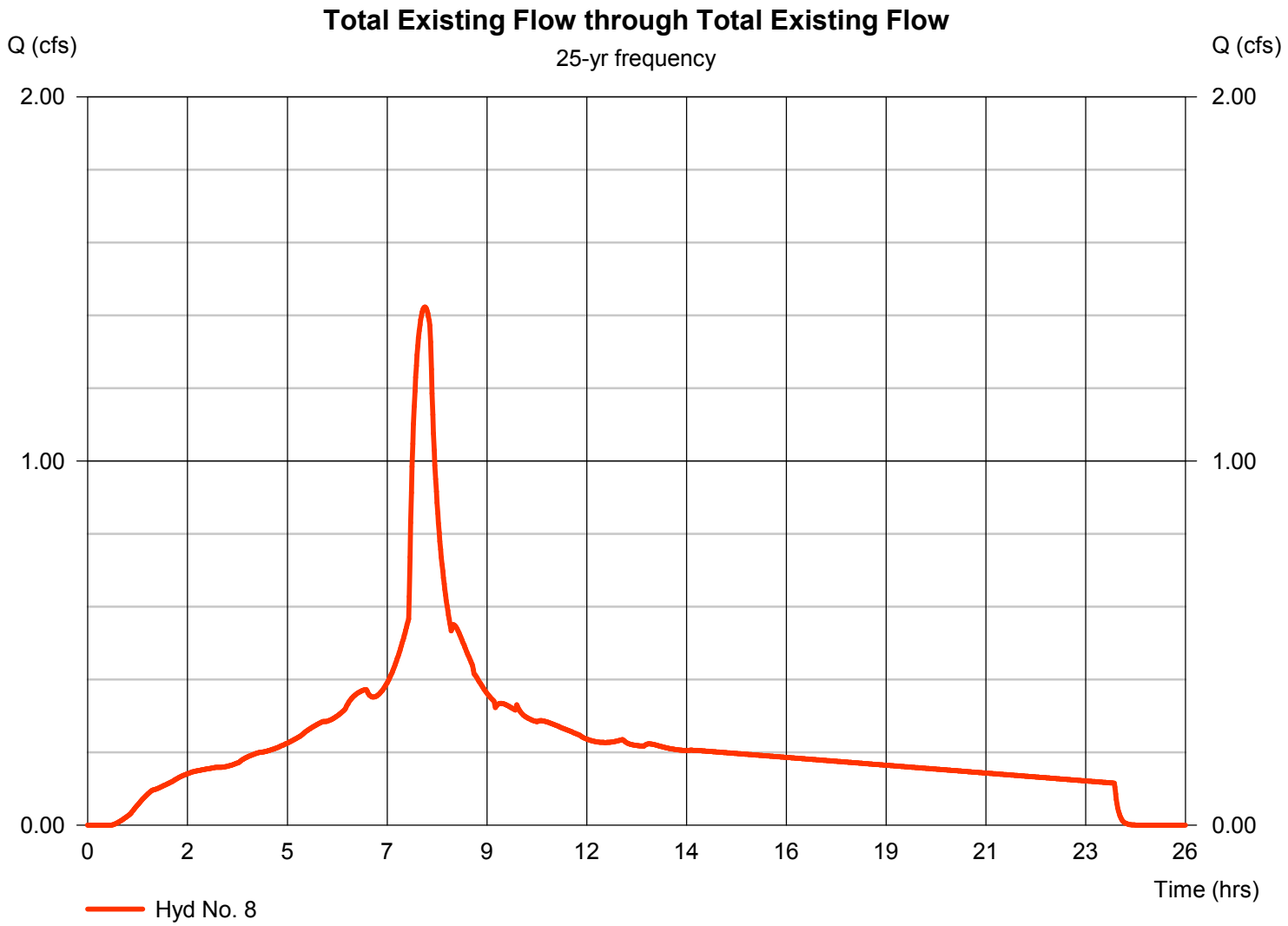
Total Existing Flow

Hydrograph type	=	Combine
Peak discharge	=	1.423 cfs
Time to peak	=	7.88 hrs
Hyd. Volume	=	20,663 cuft

Hyd. No. 8

Total Existing Flow

Hydrograph type	=	Combine
Peak discharge	=	1.42 cfs
Time to peak	=	7.88 hrs
Hyd. Volume	=	20,663 cuft



Multi-Hydrograph Plot

Hyd. No. 10

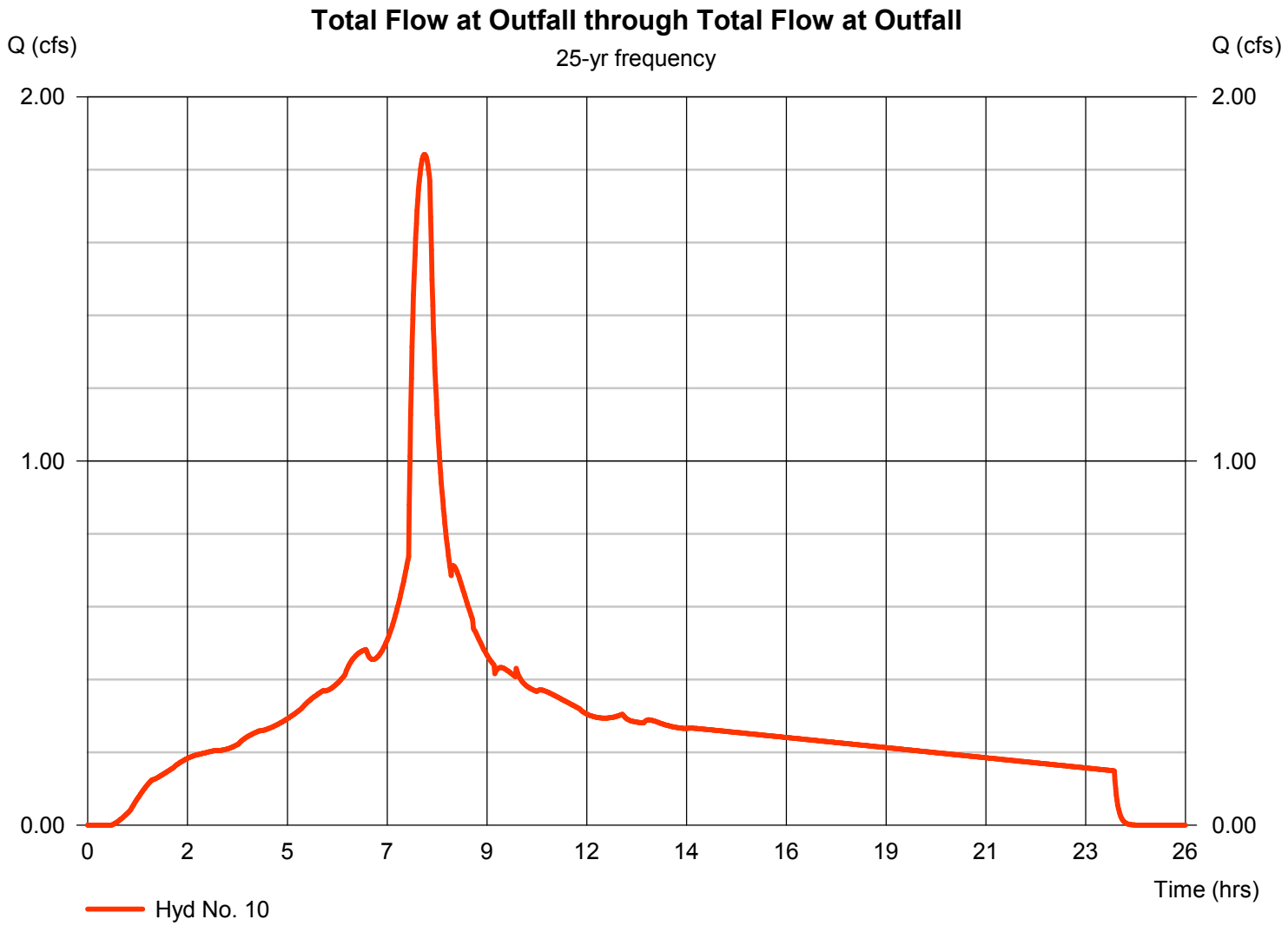
Total Flow at Outfall

Hydrograph type	=	Combine
Peak discharge	=	1.842 cfs
Time to peak	=	7.87 hrs
Hyd. Volume	=	26,744 cuft

Hyd. No. 10

Total Flow at Outfall

Hydrograph type	=	Combine
Peak discharge	=	1.84 cfs
Time to peak	=	7.87 hrs
Hyd. Volume	=	26,744 cuft



Multi-Hydrograph Plot

Hyd. No. 5

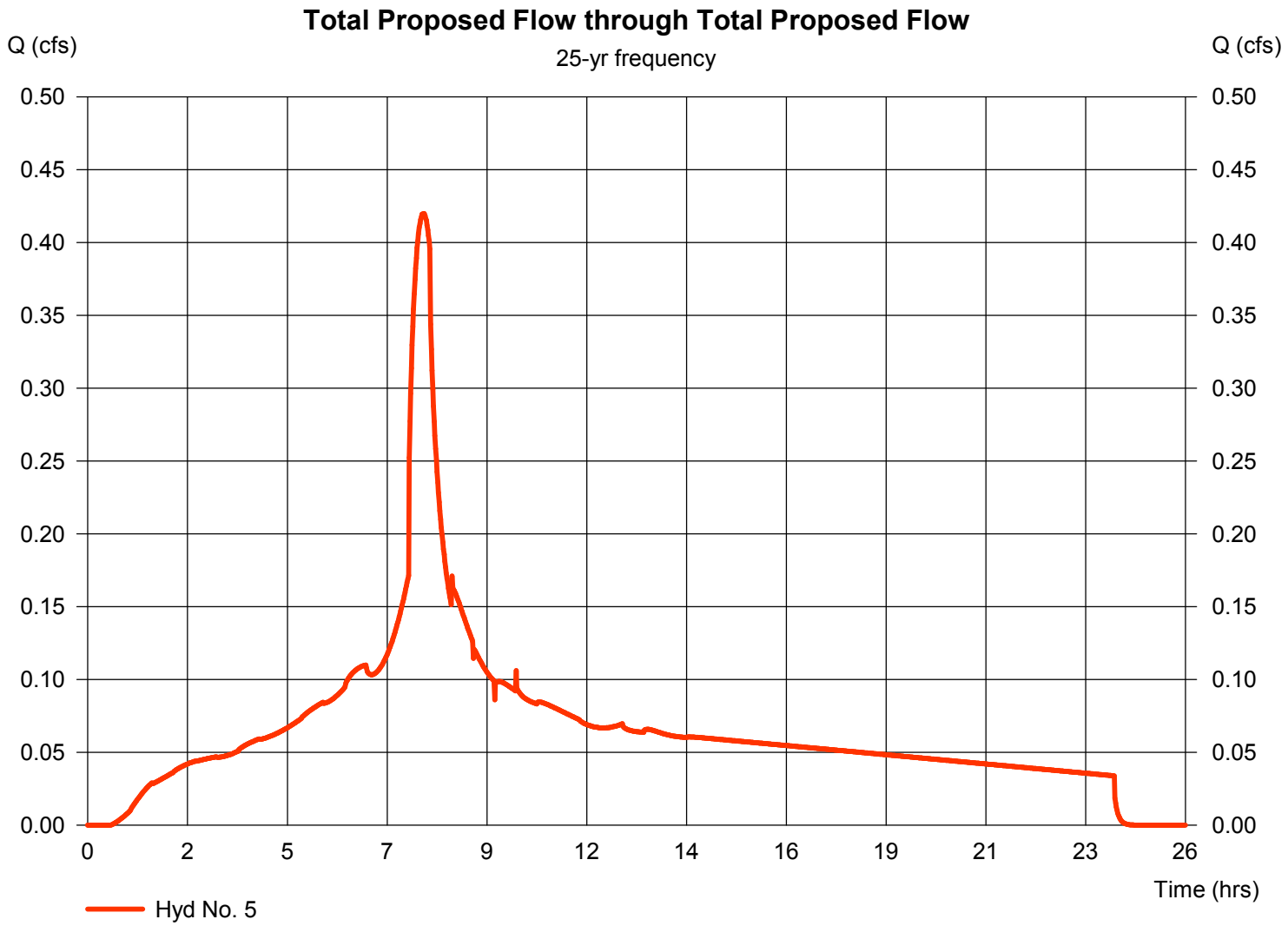
Total Proposed Flow

Hydrograph type	=	Combine
Peak discharge	=	0.420 cfs
Time to peak	=	7.87 hrs
Hyd. Volume	=	6,080 cuft

Hyd. No. 5

Total Proposed Flow

Hydrograph type	=	Combine
Peak discharge	=	0.42 cfs
Time to peak	=	7.87 hrs
Hyd. Volume	=	6,080 cuft



RATIONAL METHOD RAINFALL INTENSITIES

Rainfall intensity is for East Washington County and is shown as inches per hour

TIME OF CONCENTRATION (MINUTES)	STORM EVENT: YEAR AND PROBABILITY					
	2 50%	5 20%	10 10%	25 4%	50 2%	100 1%
0	1.90	2.50	3.00	3.40	4.00	4.50
5	1.90	2.50	3.00	3.40	4.00	4.50
10	1.30	1.70	2.20	2.50	3.00	3.50
15	1.10	1.40	1.80	2.10	2.50	2.90
20	0.90	1.20	1.50	1.80	2.10	2.40
30	0.75	0.95	1.20	1.40	1.65	1.90
40	0.60	0.75	1.00	1.15	1.30	1.60
50	0.55	0.70	0.85	1.00	1.15	1.35
70	0.45	0.55	0.70	0.82	0.95	1.10
100	0.40	0.45	0.55	0.67	0.75	0.90
180 >	0.35	0.40	0.50	0.60	0.70	0.85

24-HOUR RAINFALL DEPTHS

RECURRENCE INTERVAL (YEARS)	TOTAL PRECIPITATION DEPTH (INCHES)
2	2.50
5	3.10
10	3.45
25	3.90
50	4.20
100	4.50

DESIGN STORM DISTRIBUTION CHART

THE FOLLOWING TABLE CONTAINS THE NRCS TYPE 1A PRECIPITATION DIDTRIBUTION. THE TABLE IS FRM THE "SUB BASIN HYDROLOGIC MODLELING CRITERIA" BY KRAMER, CHIN, & MAYO INC., 1991

	PERCENT RAINFALL		RAINFALL DEPTH (INCHES)					
			2 YEAR	5 YEAR	10 YEAR	25 YEAR	50 YEAR	100 YEAR
HOUR	INCREMENTAL	CUMULATIVE	2.50	3.10	3.45	3.90	4.20	4.50
1	2.40	2.40	0.06	0.07	0.08	0.09	0.10	0.11
2	2.60	5.00	0.07	0.08	0.09	0.10	0.11	0.12
3	3.20	8.20	0.08	0.10	0.11	0.12	0.13	0.14
4	3.80	12.00	0.10	0.12	0.13	0.15	0.16	0.17
5	4.44	16.44	0.11	0.14	0.15	0.17	0.19	0.20
6	5.18	21.62	0.13	0.16	0.18	0.20	0.22	0.23
7	6.48	28.10	0.16	0.20	0.22	0.25	0.27	0.29
8	16.44	44.54	0.41	0.51	0.57	0.64	0.69	0.74
9	7.58	52.12	0.19	0.23	0.26	0.30	0.32	0.34
10	5.28	57.40	0.13	0.16	0.18	0.21	0.22	0.24
11	4.96	62.36	0.12	0.15	0.17	0.19	0.21	0.22
12	4.32	66.68	0.11	0.13	0.15	0.17	0.18	0.19
13	4.02	70.70	0.10	0.12	0.14	0.16	0.17	0.18
14	3.42	74.12	0.09	0.11	0.12	0.13	0.14	0.15
15	3.28	77.40	0.08	0.10	0.11	0.13	0.14	0.15
16	3.00	80.40	0.08	0.09	0.10	0.12	0.13	0.14
17	2.80	83.20	0.07	0.09	0.10	0.11	0.12	0.13
18	2.40	85.60	0.06	0.07	0.08	0.09	0.10	0.11
19	2.40	88.00	0.06	0.07	0.08	0.09	0.10	0.11
20	2.40	90.40	0.06	0.07	0.08	0.09	0.10	0.11
21	2.40	92.80	0.06	0.07	0.08	0.09	0.10	0.11
22	2.40	95.20	0.06	0.07	0.08	0.09	0.10	0.11
23	2.40	97.60	0.06	0.07	0.08	0.09	0.10	0.11
24	2.40	100.00	0.06	0.07	0.08	0.09	0.10	0.11

DESIGN STORM DISTRIBUTION CHART

DRAWING NO. 1285

REVISED 12–06

Clean Water Services
Our commitment is clear.