STORMWATER NARRATIVE

FIFTH THIRD BANK

Rolesville Wallbrook
Rolesville, North Carolina, 27587

IEG JOB NO. 15-309.00

August 2024

INFINITY ENGINEERING GROUP, LLC

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Digitally signed by Nisit Sapparkhao
Date: 2024.08.23 15:35:57 -04'00'

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Section No. 1.0

Project Narrative

Project Narrative

Project Statement:

Fifth Third Bank is proposing to construct a 1900 sf financial branch on a 0.70-acre site located within the previously permitted Wallbrook development. The proposed Fifth Third branch is to be located on Lot 3 that was created with the referenced development.

This project site will consist of:

- 1900 sf Building
- Driveways/Internal Drives
- Standard, Accessible Parking Spaces, and EV Charging spaces
- Two Lane drive thru
- Stormwater/Utility Infrastructure

Location:

This project is located on an outparcel within Wallbrook development. The outparcel is currently vacant. See maps section of this report for location.

Existing conditions:

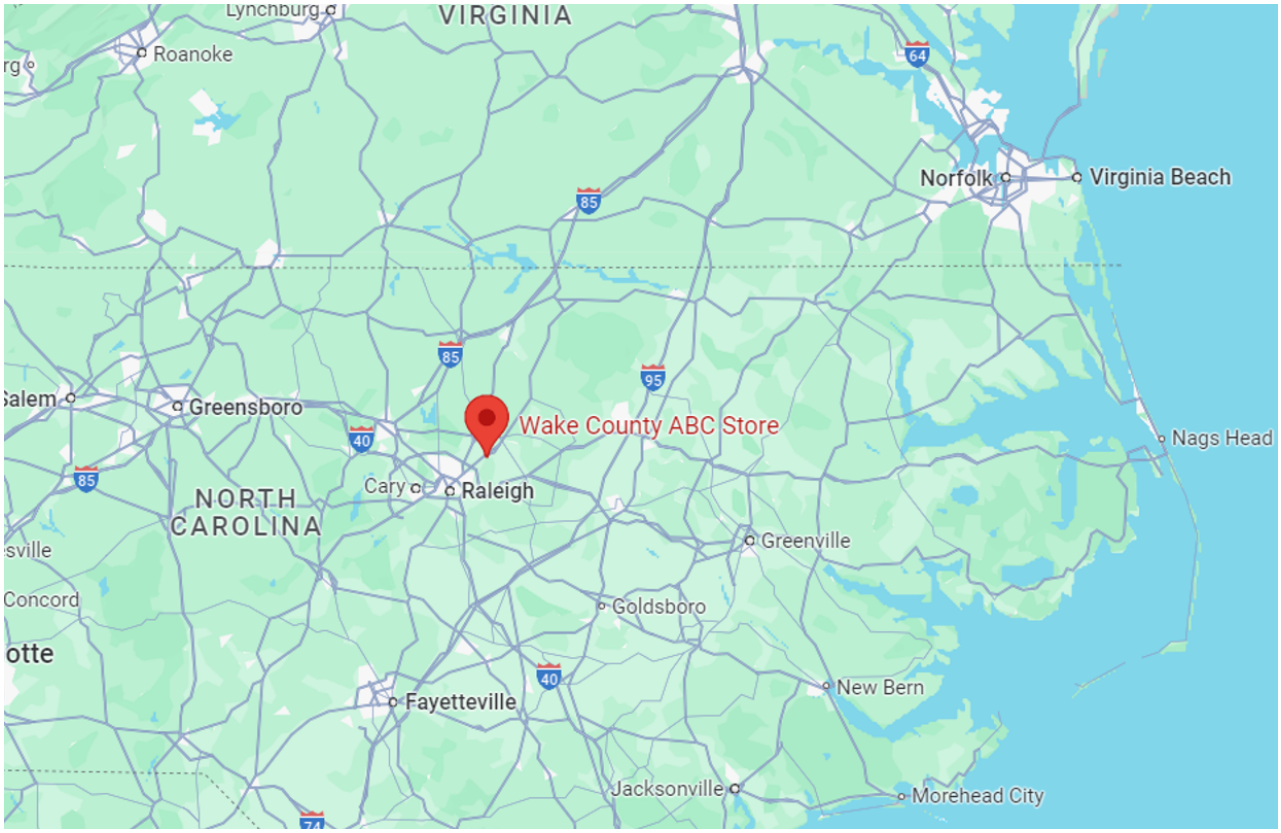
The site is currently in a vacant state.

Proposed conditions:

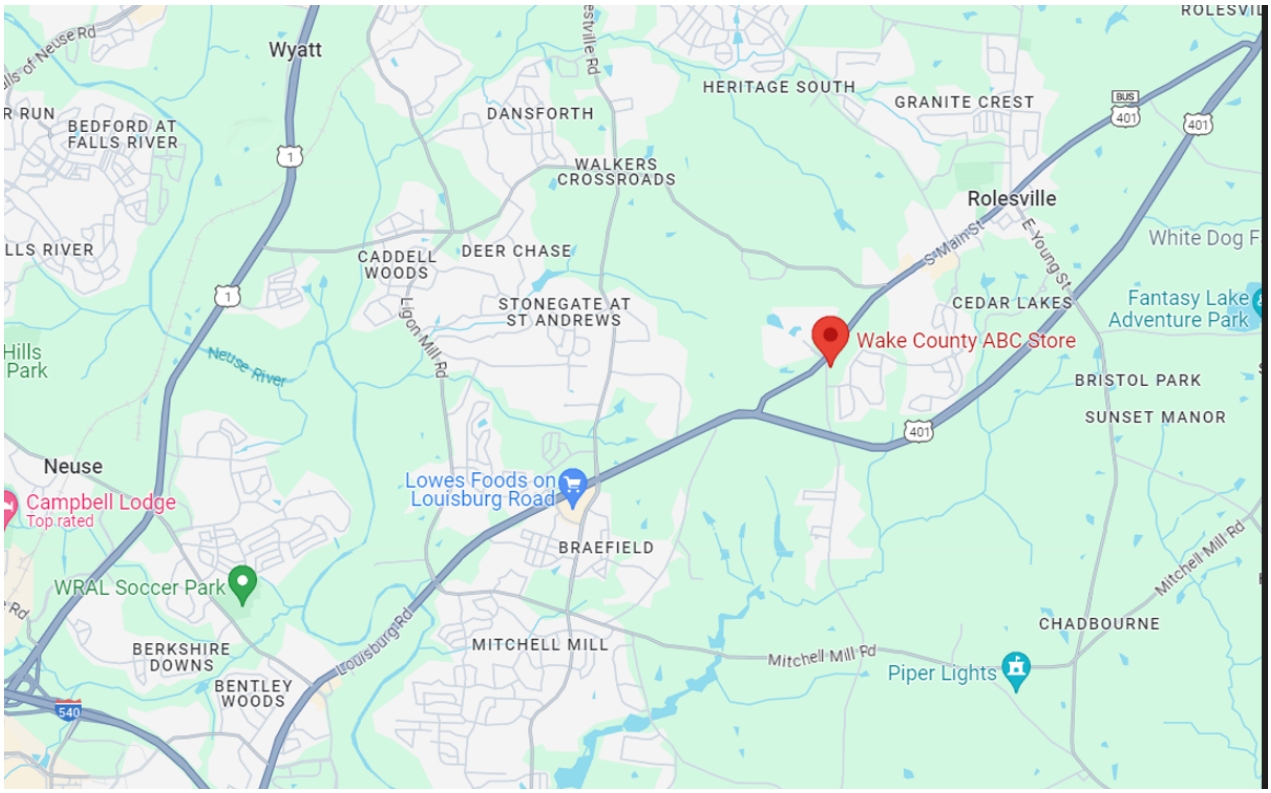
Fifth Third Bank proposes to construct a 1900 sf building with its associated driveways/drive lanes, parking spaces (Standard and ADA), drive thru, and storm/utility infrastructure. This project has been designed to stay within the design parameters of the master drainage report. Please refer to the Appendix for copies of the master system information. The proposed system allowed for 60% BUA coverage of the outparcel (see page 261 of this report). A summary of the impervious/pervious areas are included herein comparing the allowable impervious area with the development. This proposed improvement proposes 0.42% BUA which is less than allowable and is therefore consistent with the master calculations.

Section No. 2.0

Site Maps



VICINITY MAP



LOCATION MAP


Dental Care of Rolesville
Lake Dr
Wake County ABC Store
Jamescroft Wy

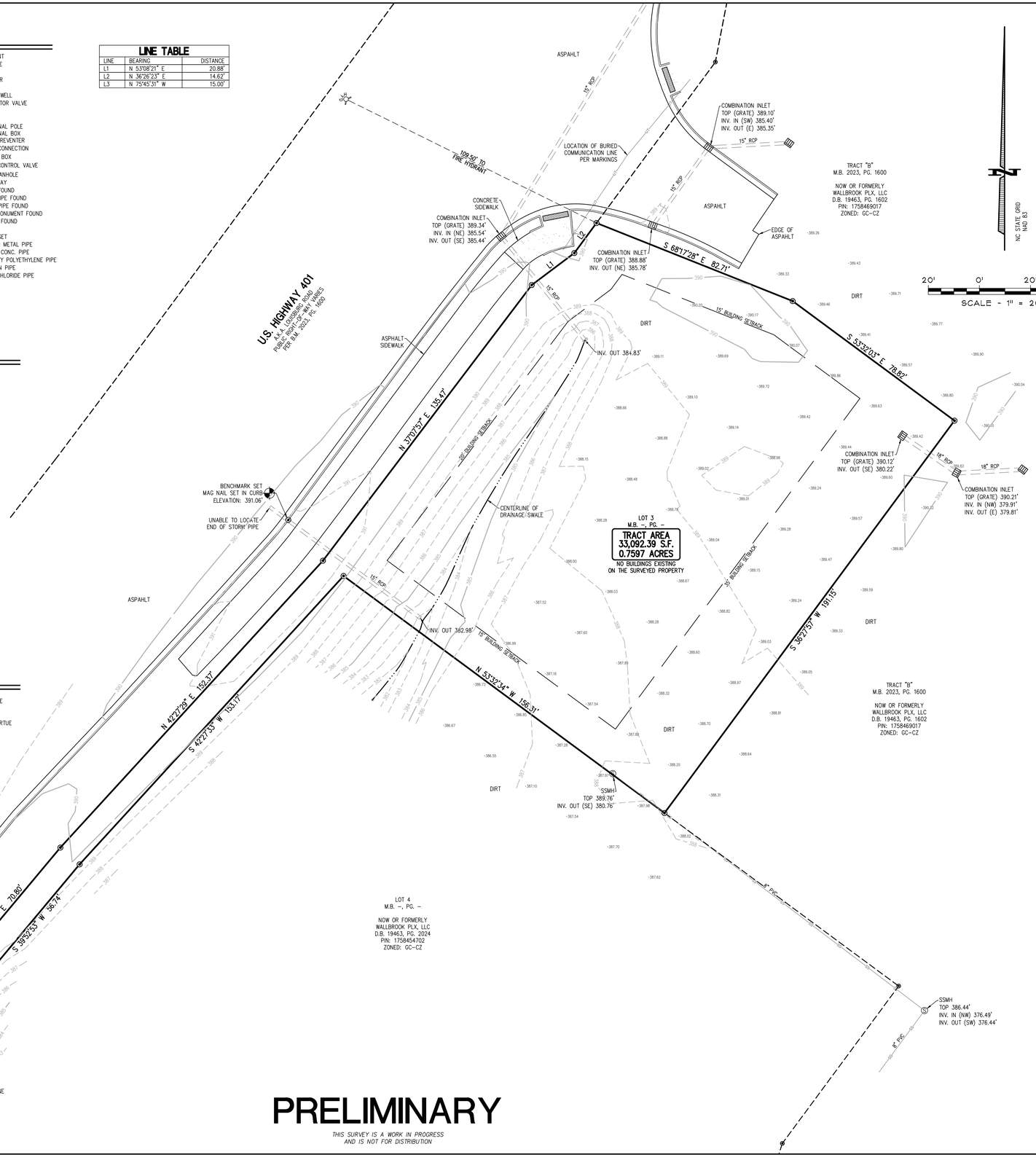
AERIAL MAP

LEGEND

- EXISTING BUILDING
- LAND LOT LINE (LLL)
- PROPERTY LINE
- UTILITY POLE (UP), OVERHEAD LINES & GUY
- FIBER OPTIC CABLE
- TREE LINE
- SANITARY SEWER MANHOLE
- SCO — SANITARY CLEAN-OUT (SCO)
- SANITARY SEWER STUB OUT
- TELEPHONE MANHOLE/PEDESTAL
- STORM DRAIN PIPE WITH HEADWALL
- DOUBLE-WING CATCH BASIN
- SINGLE-WING CATCH BASIN
- JUNCTION BOX (JB)
- DROP OR CURB INLET (DI OR CI)
- FENCE
- DRAINAGE DITCH OR SWALE
- 200 — EXISTING 10 FOOT CONTOUR
- EXISTING 2 FOOT CONTOUR
- X 350.00 — EXISTING GRADE SPOT ELEVATION
- DIRECTION OF SURFACE FLOW
- (N 47°13'27"E) — RECORDED DATA
- 13 — PARKING SPACE COUNT
- LIGHT POLE (LP)
- E — ELECTRICAL TRANSFORMER BOX
- EM — ELECTRICAL METER
- ELECTRICAL STUB OUT
- UNKNOWN UTILITY STUB OUT
- WATER STUB OUT
- FIRE HYDRANT
- WV — WATER VALVE
- GV — GAS VALVE
- WM — WATER METER
- GM — GAS METER
- MONITORING WELL
- PIV — POST INDICATOR VALVE
- MB — MAILBOX
- STREET SIGN
- TRAFFIC SIGNAL POLE
- TSB — TRAFFIC SIGNAL BOX
- BFP — BACKFLOW PREVENTER
- FIRE DEPT. CONNECTION
- FOB — FIBER OPTIC BOX
- IRRIGATION CONTROL VALVE
- DRAINAGE MANHOLE
- R/W — RIGHT-OF-WAY
- RBF — REBAR PIN FOUND
- OTF — OPEN TOP PIPE FOUND
- CTF — CRIMP TOP PIPE FOUND
- CMF — CONCRETE MONUMENT FOUND
- BDF — BRASS DISK FOUND
- AXF — AXLE FOUND
- RBS — REBAR PIN SET
- CMP — CORRUGATED METAL PIPE
- RCP — REINFORCED CONC. PIPE
- HDPE — HIGH-DENSITY POLYETHYLENE PIPE
- DIP — DUCTILE IRON PIPE
- PVC — POLYVINYL CHLORIDE PIPE

LINE TABLE

LINE	BEARING	DISTANCE
L1	N 53°08'21" E	20.88'
L2	N 36°26'23" E	14.62'
L3	N 75°45'31" W	15.00'



LEGAL DESCRIPTION

ALL THAT TRACT OR PARCEL OF LAND LYING AND BEING IN AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

TITLE EXCEPTIONS

THIS SURVEY WAS PERFORMED WITH THE BENEFIT OF [TITLE COMPANY] COMMITMENT FOR TITLE INSURANCE NUMBER [NO.] DATED [DATE & TIME].

SURVEYORS COMMENTS ARE WITH RESPECT TO THAT PARCEL CONVEYED TO ....[OWNER] BY VIRTUE OF [INSTRUMENT] RECORDED IN [DB, PG.]

SURVEY RELATED SCHEDULE B – SECTION 2 EXCEPTIONS

1. EXCEPTION #1...

PRELIMINARY

THIS SURVEY IS A WORK IN PROGRESS AND IS NOT FOR DISTRIBUTION

LOCATION MAP

GENERAL NOTES

1. SURVEY PROCEDURES: THIS SURVEY IS BASED ON MEASUREMENTS OBTAINED USING A SPECTRA PRECISION FOCUS 35 ROBOTIC INSTRUMENT CAPABLE OF READING ANGULAR MEASUREMENTS DIRECTLY TO A MINIMUM OF 3 SECONDS OF ARC AND LINEAR DIMENSIONS DIRECTLY TO 0.01 FEET AND/OR A GEOMAX ZENITH 60 DUEL FREQUENCY BASE AND RECEIVER, CAPABLE OF AN ACCURACY OF 8 MM HORIZONTAL AND 15 MM VERTICAL.
2. THIS PLAT HAS BEEN CALCULATED FOR CLOSURE AND IS FOUND TO BE ACCURATE WITHIN ONE FOOT IN 133,661 FEET.
3. TITLE TO THE SURVEYED PROPERTY IS CURRENTLY VESTED IN [OWNER] BY VIRTUE OF A [INSTRUMENT TYPE] RECORDED IN [D.B. & PG], [COUNTY] COUNTY RECORDS.
4. I HAVE EXAMINED FEMA FLOOD INSURANCE RATE MAP NO. 3720175800K, LAST REVISED ON JULY 19, 2022 AND HAVE DETERMINED BASED SOLELY BY GRAPHICALLY SCALING THE LOCATION ON THE MAP THAT THIS PROPERTY IS SHOWN NOT TO BE LOCATED WITHIN THE LIMITS OF A DESIGNATED FLOOD HAZARD AREA.
5. THE BASIS OF BEARING USED FOR THIS SURVEY IS N.C. STATE GRID (NAD 83). ELEVATIONS SHOWN ON THIS SURVEY ARE BASED ON NAVD 88.
6. THE SURVEYED PROPERTY IS ZONED GC–CZ (GENERAL COMMERCIAL–CONDITIONAL ZONING DISTRICT) ACCORDING TO THE TOWN OF ROLESVILLE, NORTH CAROLINA PLANNING & ZONING DEPARTMENT AND IS SUBJECT TO THE REQUIREMENTS AND RESTRICTIONS OF THIS ZONING CLASSIFICATION. THE SETBACK REQUIREMENTS FOR THIS ZONING CLASSIFICATION ARE:

FRONT	20 FT.
SIDE	15 FT.
REAR	35 FT.
CORNER	25 FT.
MAXIMUM BUILDING HEIGHT	35 FT.

7. THE TAX PARCEL ID FOR THE SUBJECT PROPERTY IS 1758454702.
8. UTILITY INFORMATION SHOWN ON THIS SURVEY IS BASED ON ABOVE GROUND EVIDENCE OBSERVED AT THE TIME OF FIELD SURVEY. NO CERTIFICATION, GUARANTEE, OR WARRANTY OF ANY KIND IS MADE AS TO THE ACCURACY OR THOROUGHNESS OF THE INFORMATION CONCERNING UTILITIES SHOWN OR NOT SHOWN ON THIS SURVEY.
9. THERE WAS EVIDENCE OF RECENT EARTH MOVING WORK, BUILDING CONSTRUCTION, OR BUILDING ADDITIONS OBSERVED DURING THE PROCESS OF CONDUCTING THE FIELDWORK.
10. THERE WERE NO KNOWN PROPOSED CHANGES IN STREET RIGHT OF WAY LINES. THERE WAS EVIDENCE OF RECENT STREET OR SIDEWALK CONSTRUCTION OR REPAIRS OBSERVED DURING THE PROCESS OF CONDUCTING THE FIELDWORK.
11. THE CONTOURS SHOWN ON THIS SURVEY ARE AT 1.0 FOOT INTERVALS.
12. ALL DISTANCES SHOWN ON THIS SURVEY ARE GROUND DISTANCES.
13. AREA COMPUTED BY COORDINATES.

I CERTIFY THAT THIS MAP WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION (DEED DESCRIPTION RECORDED IN D.B. ---, PG. --- & B.M. ---, PG. ---, WAKE COUNTY, NORTH CAROLINA RECORDS) THAT THE BOUNDARIES NOT SURVEYED ARE INDICATED AS DASHED LINES AND ARE DRAWN FROM INFORMATION IN OTHER REFERENCE SOURCES (M.B. 2023, PG. 1600); WAKE COUNTY, NORTH CAROLINA RECORDS); THAT THE RATIO OF PRECISION OR POSITIONAL ACCURACY EXCEEDS 1: 10,000'±; AND THAT THIS MAP MEETS THE REQUIREMENTS OF A CLASS A SURVEY PER THE STANDARDS OF PRACTICE FOR LAND SURVEYING IN NORTH CAROLINA (21 NCAC 56.1600)

AND I CERTIFY FURTHER THAT THIS PROJECT WAS COMPLETED UNDER MY DIRECT AND RESPONSIBLE CHARGE FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION; THAT THIS GROUND SURVEY WAS PERFORMED AT THE 95 PERCENT CONFIDENCE LEVEL (2 SIGMA) TO MEET FEDERAL GEOGRAPHIC DATA COMMITTEE STANDARDS; THAT THE VERTICAL ACCURACY MEETS AND EXCEEDS THE VERTICAL ACCURACY REQUIREMENTS OF THE NATIONAL MAP ACCURACY STANDARDS AND THAT THE ORIGINAL DATA WAS OBTAINED ON MAY 14, 2024; THAT THE SURVEY WAS COMPLETED ON _____; THAT CONTOURS SHOWN AS BROKEN LINES MAY NOT MEET THE STATED STANDARD; AND ALL COORDINATES ARE BASED ON NC STATE GRID NAD 83 AND ALL ELEVATIONS ARE BASED ON NAVD 88.

THIS _____ DAY OF _____, 2024

SIGNED: _____
RODNEY E. ABNEY, JR.
NORTH CAROLINA PLS NO. L-4510

CERTIFICATION

TO: _____

THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IS IS BASED WERE MADE IN ACCORDANCE WITH THE 2021 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/NSPS LAND TITLE SURVEYS", JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDES ITEMS 1, 2, 3, 4, 5, 6(a)(b), 7(a)(b)(1)(2)(c), 8, 9, 11(a)(b), 13, 14, 16, 17, AND 18 OF TABLE A THEREOF. THE FIELD WORK WAS COMPLETED ON MAY 14, 2024.

DATE OF PLAT OR MAP: --------

_____ _____
RODNEY E. ABNEY, JR. DATE
NORTH CAROLINA PLS NO. L-4510

GreenbergFarrow
1230 Peachtree St. NE, Suite 2900
Atlanta, GA 30309
Phone: (770) 422-8181
Fax: (770) 422-8101
www.greenbergfarrow.com

DRAWING SCALE: 1" = 20' FT.
FIELDWORK DATE: 05-14-24
RELEASE DATE:
FIELDWORK BY: RWS
DRAWN BY: RWS
CHECKED BY: PCG

NO.	DATE	REVISIONS DESCRIPTION
1		
2		
3		
4		

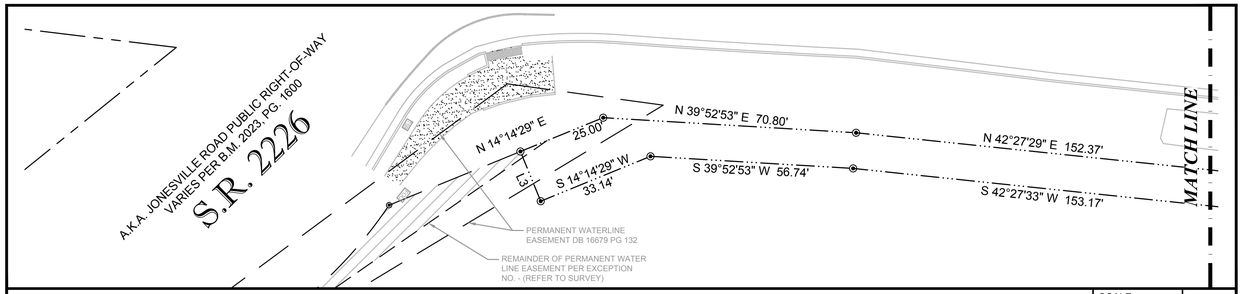
LOT 3 ~ B.M. -, PG. -
U.S. HIGHWAY 401
ROLESVILLE, NC 27571
TOWN OF ROLESVILLE - WAKE COUNTY - NORTH CAROLINA

ALTA/NSPS LAND TITLE SURVEY
FOR
BDG ARCHITECTS, LLP

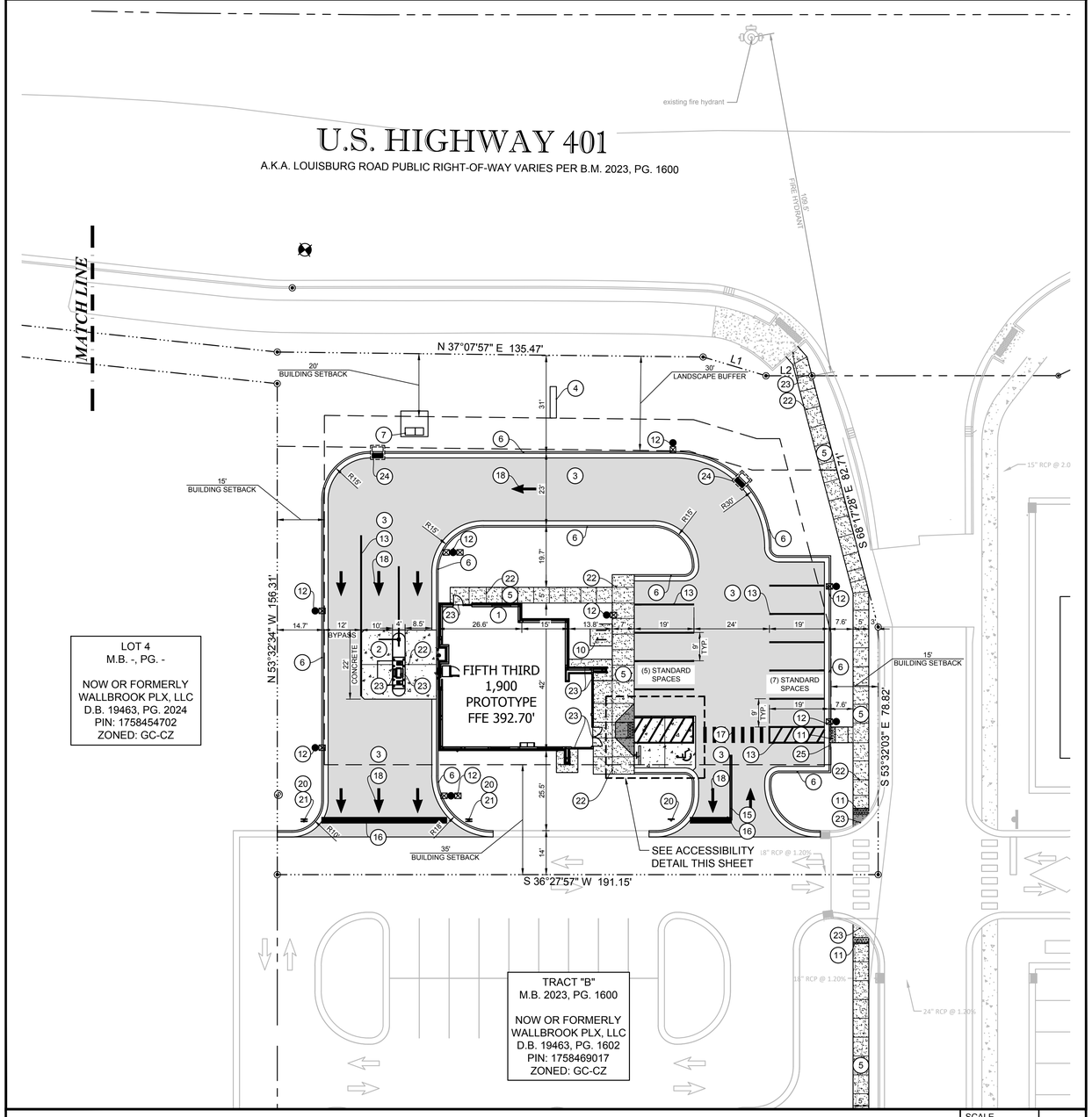
PROJECT NO.
24-118-0

DRAWING FILE:
24-118-0 SURVEY.DWG

SHEET NO.
S-1
1 OF 1



PLAN VIEW | SCALE: AS NOTED | -



PLAN VIEW | SCALE: AS NOTED | -

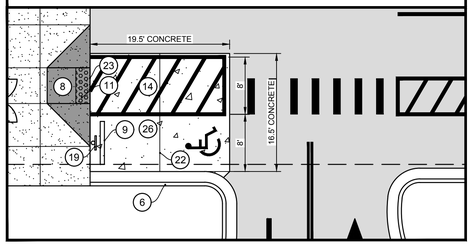
KEYED NOTES

1	NEW BUILDING (SEE ARCHITECTURAL PLANS).
2	NEW 6" CONCRETE PAVEMENT. SEE DETAILS, SHEET C05.01.
3	NEW ASPHALT PAVEMENT. SEE DETAILS, SHEET C05.01.
4	NEW ID SIGN (DESIGNED AND PERMITTED BY OTHERS)
5	NEW 4" CONCRETE SIDEWALK, SEE PLAN FOR WIDTH. SEE DETAILS, SHEET C05.01.
6	NEW 24" CURB AND GUTTER. SEE DETAILS, SHEET C05.01.
7	NEW TRANSFORMER PAD. SEE UTILITY PLAN, SHEET C04.01.
8	NEW ADA RAMP. SEE DETAILS, SHEET C05.01.
9	NEW WHEEL STOP. SEE DETAILS, SHEET C05.01.
10	NEW FIFTH THIRD BANK STANDARD BICYCLE RACK. SEE DETAILS, SHEET C05.01.
11	NEW DETECTABLE WARNING. SEE DETAILS, SHEET C05.01.
12	NEW AREA LIGHT POLE. SEE ELECTRICAL SITE PLANS.
13	NEW 6-INCH "WHITE" PARKING/AISLE STRIPE (CONTINUOUS PAINT)
14	NEW VAN ACCESSIBLE PARKING SPACES AND ACCESS AISLE. SEE DETAILS, SHEET C05.01.
15	NEW 6-INCH "DOUBLE YELLOW" LANE STRIPE (CONTINUOUS PAINT).
16	NEW 24-INCH "WHITE" STOP BAR (CONTINUOUS PAINT).
17	5-FOOT WIDE CROSSWALK, 12-INCH "WHITE" STRIPE @ 36" O.C. (CONTINUOUS PAINT)
18	NEW "WHITE" DIRECTIONAL ARROW (CONTINUOUS PAINT).
19	NEW ACCESSIBLE PARKING SIGN. SEE DETAILS, SHEET C05.02. (PROVIDED AND INSTALLED BY FIFTH THIRD SIGN VENDOR.)
20	NEW 30" R1-1 "STOP" SIGN (TYP. OF 3). SEE DETAILS, SHEET C05.02. (PROVIDED AND INSTALLED BY FIFTH THIRD SIGN VENDOR.)
21	NEW 30" R5-1 "DO NOT ENTER" SIGN (TYP. OF 2). SEE DETAILS, SHEET C05.02. (PROVIDED AND INSTALLED BY FIFTH THIRD SIGN VENDOR.)
22	NEW CONTROL JOINT. SEE DETAILS, SHEET C05.01.
23	NEW EXPANSION JOINT. SEE DETAILS, SHEET C05.01.
24	STORMWATER STRUCTURE. SEE STORM PIPING PLAN, SHEET C03.02.
25	CURB TRANSITION (TYPICAL). SEE DETAILS, SHEET C05.01.
26	NEW 6" BLACK TINTED CONCRETE. SEE DETAILS, SHEET C05.01.

SITE PLAN GENERAL NOTES

1. ALL DIMENSIONS SHOWN ARE TO FACE OF CURB. BUILDING DIMENSIONS ARE TO FACE OF BUILDING.
2. EXISTING IMPROVEMENTS SHOWN ARE TAKEN FROM THE SURVEY.
3. BUILDING AND SIDEWALK DIMENSIONS ARE TO OUTSIDE EDGE OF WALL
4. ALL TIES TO THE PROPERTY LINE ARE BASED ON THE SURVEY.
5. ALL CURB RADIUS ARE 3' UNLESS OTHERWISE NOTED

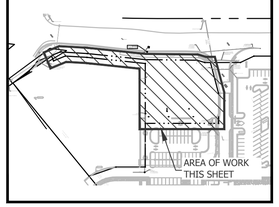
ACCESSIBILITY DETAIL — SCALE: 1' = 10'



LANDSCAPE NOTE:

1. CONTRACTOR TO RE-GRADE SURROUNDING GRADE ELEVATION AND RE-SOD AS NEED TO MEET PROPOSED TOP OF SIDEWALK ELEVATIONS.
2. CONTRACTOR SHALL REPLACE ALL DISTURBED LANDSCAPING TO MATCH EXISTING.
3. CONTRACTOR SHALL TIE INTO EXISTING IRRIGATION SYSTEM AND EXTEND NEW DRIP IRRIGATION AS REQUIRED TO ACCOMMODATE NEW CONSTRUCTION.

KEY PLAN:



LEGEND

- PROPERTY LINE
- EXISTING TO REMAIN
- EXISTING CONCRETE TO REMAIN
- PROPOSED CONCRETE LESS THAN 6"
- PROPOSED CONCRETE 6" OR GREATER
- NEW ASPHALT PAVEMENT
- SETBACK/BUFFER
- PROPOSED CURB
- PROPOSED CURB AND GUTTER

SITE DATA

SITE ADDRESS:	LOT 3 - PUBLIX AT WALLBROOK ROLESVILLE, NC 27587
PIN:	76667,76635
BUILDING AREA:	2,084 GSF BUILDING
EXISTING ZONING:	GC-CZ
SITE AREA:	33,092 SF / 0.76 AC
EXISTING USE:	VACANT
FUTURE USE:	BANK WITH DRIVE THRU

PARKING DATA

BANK PARKING REQUIRED:	MAX. 6 SPACES PER 1000 SF OF G.F.A. 2,084 SF x (6 SPACES/1000 SF) = 13 SPACES MIN. 2.5 SPACES PER 1000 SF OF G.F.A. 2,084 SF x (2.5 SPACES/1000 SF) = 6 SPACES
TOTAL PARKING PROVIDED:	STANDARD PARKING = 12 SPACES ADA PARKING = 1 SPACE TOTAL PARKING PROVIDED = 13 SPACES
PARKING SPACE SIZE:	9'x 19' MINIMUM
LOADING ZONE:	*NOTE-FINANCIAL INSTITUTIONS DO NOT USE LOADING ZONES FOR SECURITY PURPOSES DELIVERY TRUCK WILL PARK DIRECTLY IN FRONT OF MAIN ENTRANCE.

LANDSCAPE REQUIREMENTS:	REQUIRED
LANDSCAPE BUFFER - FRONT (S. MAIN ST)	= 30'
LANDSCAPE BUFFER - SIDES	= 0'
LANDSCAPE BUFFER - REAR	= 0'

BUILDING REQUIREMENTS:	REQUIRED
BUILDING SETBACK - FRONT (S. MAIN ST)	= 20'
BUILDING SETBACK - SIDES	= 15'
BUILDING SETBACK - REAR	= 35'
MAXIMUM BUILDING HEIGHT	= 35'

FLOOD ZONE:

THE SUBJECT PROPERTY IS LOCATED IN FLOOD ZONE X

**DUMPSTER ENCLOSURE:

FIFTH THIRD BANK TO COORDINATE WITH THE DEVELOPER FOR A SHARED DUMPSTER AGREEMENT.

PRE VS POST SITE AREAS

	ACRE	S.F.	PERCENT
SITE AREA	0.76	33,092	100.00%
PRE-DEVELOPMENT			
PERVIOUS AREA:	0.06	2,725	8.00%
IMPERVIOUS AREA:	0.69	30,368	92.00%
POST-DEVELOPMENT			
PERVIOUS AREA:	0.34	14,905	45.00%
IMPERVIOUS AREA:	0.42	18,187	55.00%

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FIFTH THIRD BANK

FIFTH THIRD BANK
ROLESVILLE WALLBROOK

LOT 3 - PUBLIX AT WALLBROOK
ROLESVILLE, NORTH CAROLINA 27587

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SEAL

NISIT SAPPARKHAO, P.E.
NC REG. NO. 38066

NORTH CAROLINA PROFESSIONAL SEAL 38066 ENGINEER NISIT SAPPARKHAO

08/20/2024
DATE

ISSUE	BY	DATE	DESCRIPTION
		08/16/24	PERMIT SET

PROJECT INFORMATION BLOCK

JOB #	230634
DATE:	08/16/2024
DRAWN BY:	IEG
CHECKED BY:	DC

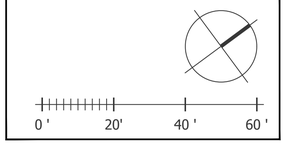
SHEET TITLE

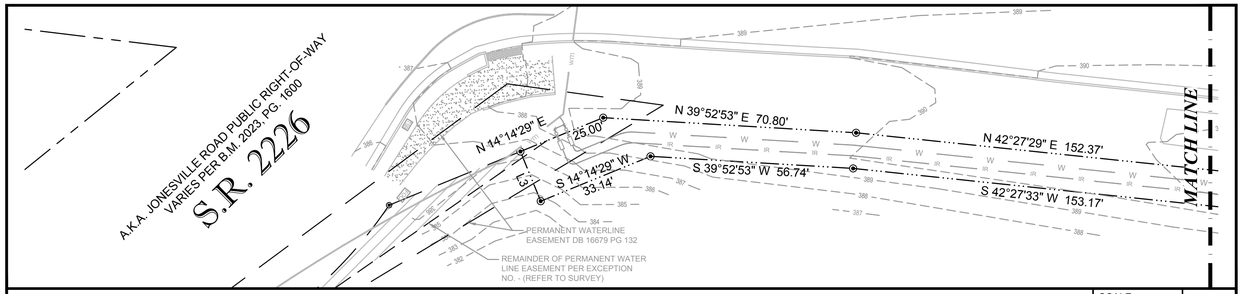
SITE PLAN

SHEET NUMBER

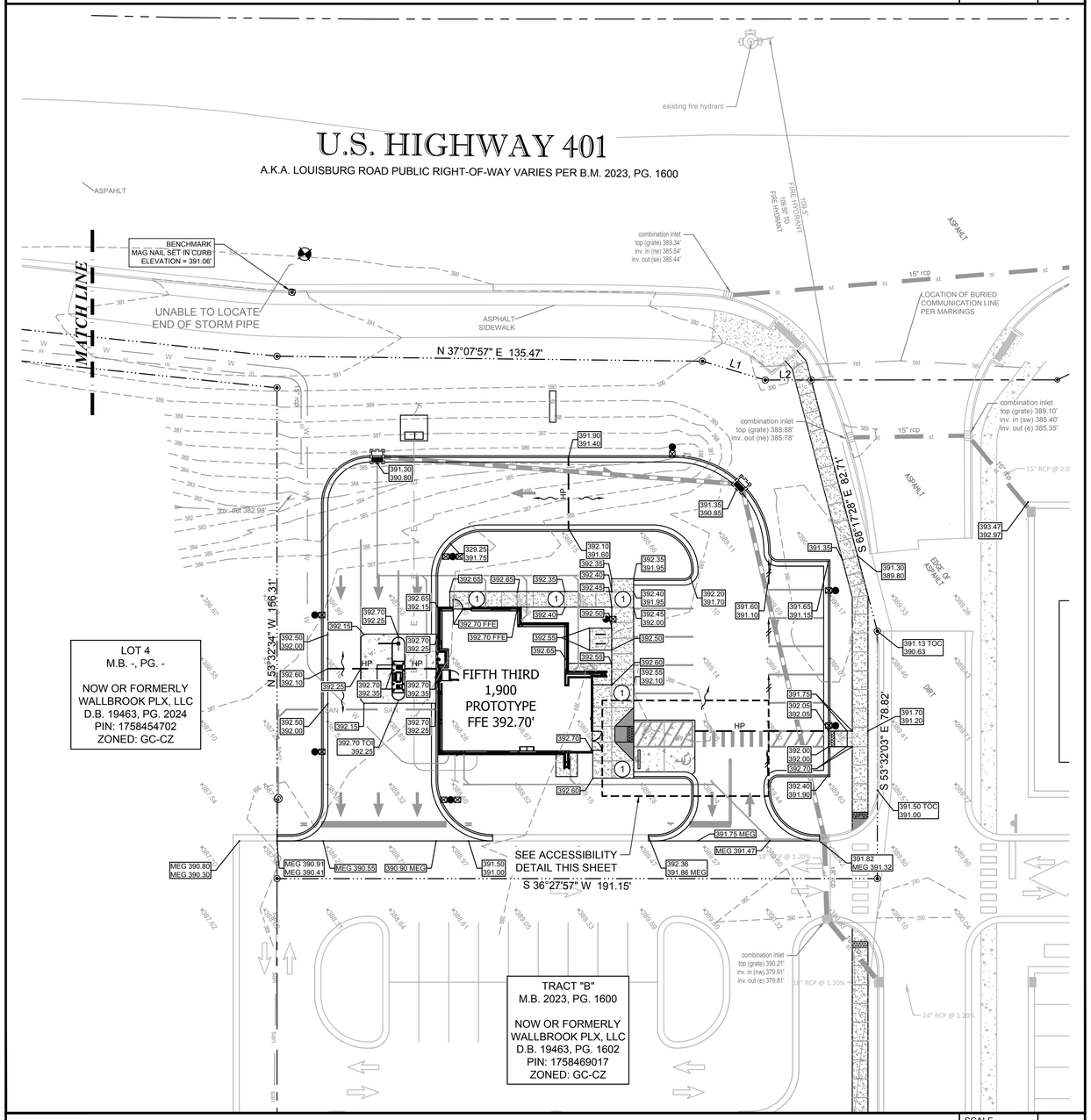
C02.01

SCALE





PLAN VIEW | SCALE: AS NOTED | -



PLAN VIEW | SCALE: AS NOTED | -

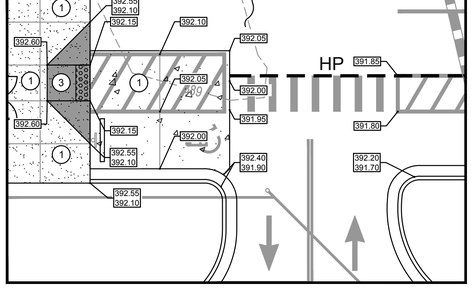
KEYED NOTES:

1	SURFACE SLOPES NOT TO EXCEED 1:48 IN ALL DIRECTIONS.
2	SURFACE SLOPES NOT TO EXCEED 1:48 CROSS SLOPES AND 1:20 RUNNING.
3	SURFACE SLOPES NOT TO EXCEED 1:48 CROSS SLOPES AND 1:12 RUNNING.

ACCESSIBILITY NOTES

1. THE DRAWINGS ARE DESIGNED TO MEET ACCESSIBILITY STANDARDS AT MINIMUM. LOCAL AND STATE REQUIREMENTS OR CODES MAY HAVE ADDITIONAL STANDARDS.
2. ACCESSIBLE PARKING SPACES, SIGNAGE, LOGOS, WHEEL STOPS AND ACCESSIBLE AISLES TO MEET ALL OF THE 2010 ADA STANDARDS REQUIREMENTS - PROVIDE SPACES IN SIZE, QUANTITY AND LOCATIONS REQUIRED BY THE ADA STANDARDS AND APPLICABLE CODES AS DETERMINED BY LOCAL JURISDICTION. PROVIDE A MAXIMUM SLOPE IN EITHER DIRECTION OF 1:48 (1:64 RECOMMENDED).
3. ACCESSIBLE PARKING SIGNAGE ON POST. BOTTOM OF SIGNAGE TO BE MINIMUM 60" ABOVE GRADE. VERIFY ALL REQUIREMENTS WITH ACCESSIBILITY REQUIREMENTS AND LOCAL CODE.
4. CONCRETE WHEEL STOP. ALL ACCESSIBLE SPACES- LOCATE FIXED WHEEL STOP SO AS NOT TO REDUCE THE WIDTH OF THE ADJOINING ACCESSIBLE ROUTE.
5. ACCESSIBLE ROUTE TO PUBLIC RIGHT OF WAY (1 REQUIRED). MAXIMUM RUNNING SLOPE OF 1:20 AND MAXIMUM CROSS SLOPE OF 1:48 (1:64 RECOMMENDED). ALL PAVED SURFACES, CURB RAMPS AND TRANSITIONS ALONG PATH TO MEET ACCESSIBILITY REQUIREMENTS.
6. ACCESSIBLE PATH/WALKWAY TO BE 5'-0" MINIMUM, RUNNING SLOPE 1:20 MAXIMUM, CROSS SLOPE 1:48 MAXIMUM, SLOPE AWAY FROM BUILDING - BROOM FINISH CONCRETE.
7. CURB RAMP TO MEET ALL ACCESSIBILITY REQUIREMENTS, MAXIMUM SLOPE OF RUN 1:12 (1:14 RECOMMENDED), MAXIMUM CRISS SLOPE 1:48 (1:64 RECOMMENDED). REFER TO SITE DETAILS SHEET FOR ADDITIONAL INFORMATION. PROVIDE 36" LONG MINIMUM LANDDING AT TOP AND 60. MINIMUM LANDING AT BOTTOM OF RAMP WITH MAXIMUM SLOPE IN EITHER DIRECTION OF LANDING TO BE 1:48 (1:64 RECOMMENDED)
8. SURFACE CONDITIONS AT ACCESSIBLE WALKWAYS AND ACCESSIBLE AREAS (PAVERS SYSTEMS AND/OR CONCRETE SURFACES) SHALL NOT INCLUDE GAPS GREATER THAT 1/2" OR VERTICAL CHANGES AT JOINTS OR BETWEEN UNITS GREATER THAN 1/4" - UNLESS THE OVERALL LEVEL CHANGE DOES NOT EXCEED 1/2" AND THE LEVEL CHANGE IS BEVELED AT 1:2.
9. IT WILL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO ENSURE THAT THE HANDICAP PARKING SPACES, ACCESSIBLE ROUTES, AND SIDEWALK/CROSSWALKS ARE CONSTRUCTED TO MEET ADA REQUIREMENTS.
10. ANY REQUIREMENTS LISTED ABOVE THAT CAN NOT BE MET SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION IMMEDIATELY. ANYTHING NOT BUILT TO THE ABOVE STANDARDS WILL REQUIRE REMOVAL AND REPLACEMENT OF THE NON COMPLIANT AREAS AT THE GENERAL CONTRACTORS COST.

ACCESSIBILITY DETAIL — SCALE: 1' = 10'



GEOTECHNICAL NOTE:

THE PLACEMENT OF ANY FILL MATERIAL MUST BE CONDUCTED UNDER THE OBSERVATION OF A QUALIFIED LICENSED GEOTECHNICAL ENGINEER AND UPON COMPLETION OF THE EARTHWORK ACTIVITIES THE TOWN MUST BE PROVIDED WITH A FINAL GRADING REPORT THAT INCLUDES THE CORRESPONDING COMPACTION TEST RESULTS AND CERTIFIES THE TYPE OF FILL MATERIAL AND ITS PROPER PLACEMENT.

LEGEND

EL	ELEVATION
TYP	TYPICAL
CO	CLEANOUT
IE	INVERT ELEVATION
SE	SUMP ELEVATION
×49.58	EXISTING ELEVATION
0.00	PROPOSED PAVEMENT ELEVATION
0.00 / 0.00	TOP OF SIDEWALK/CURB EDGE OF PAVEMENT
	DITCH BOTTOM INLET
	CURB INLET
FFE	FINISH FLOOR ELEVATION
RCP	REINFORCED CONCRETE PIPE
HP	HIGH POINT
MEG	MATCH EXISTING GRADE
TOI	TOP OF ISLAND
DS	BUILDING DOWN SPOUT
	12" OR GREATER STORMWATER PIPE
	LESS THAN 12" STORMWATER PIPE
	PROPOSED SURFACE STORMWATER FLOW
	PROPOSED SWALE STORMWATER FLOW
–389–	EXISTING CONTOUR
389	PROPOSED CONTOUR
	DIRECTION OF PIPE FLOW

CONTROL BENCHMARKS

THE BASIS OF BEARING USEDD FOR THIS SURVEY IS N.C STATE GRID (NAD 83). ELEVATIONS SHOWN ON THIS SURVEY ARE BASED ON NAVD 88.

NOTE:
CONTRACTOR TO ESTABLISH CONTROL BENCHMARKS BEYOND LIMITS OF DEMOLITION PRIOR TO CONSTRUCTION.

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PAVING AND GRADING GENERAL NOTES

1. SEE GENERAL NOTES SHEET FOR EROSION AND SILTATION CONTROL ALONG WITH GENERAL NOTES.
2. SEE SITE PLAN SHEET FOR SITE DATA.
3. SEE SURVEY FOR TEMPORARY BENCH MARK (TBM) LOCATIONS.
4. THE CONTRACTOR SHALL MEET ALL REQUIREMENTS FOR LOCAL MUNICIPALITY AND THE DEPARTMENT OF TRANSPORTATION WITH REGARD TO IMPROVEMENTS WITHIN THEIR RESPECTIVE RIGHTS-OF-WAY.
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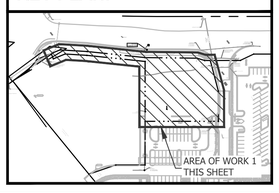
North Carolina 811 www.nc811.org

KEY PLAN:



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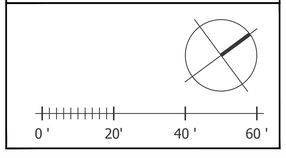

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FIFTH THIRD BANK

FIFTH THIRD BANK
ROLESVILLE WALLBROOK

LOT 3 - PUBLIX AT WALLBROOK
ROLESVILLE, NORTH CAROLINA 27587

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www.iegroup.net
NC Firm Certificate No. P-1836
IEG Job No. 15-309.00

SEAL

NISIT SAPPARKHAO, P.E.
NC REG. NO. 38066

NORTH CAROLINA PROFESSIONAL SEAL 38066 ENGINEER NISIT SAPPARKHAO

08/20/2024
DATE

ISSUE	BY	DATE	DESCRIPTION
		08/16/24	PERMIT SET

PROJECT INFORMATION BLOCK

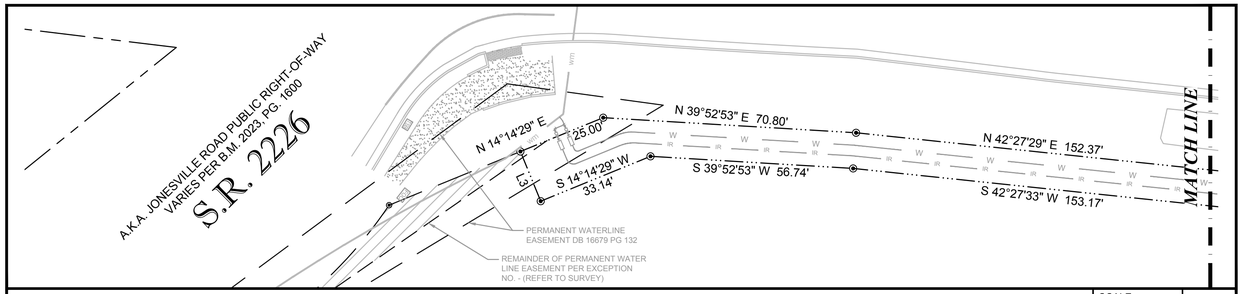
JOB #	230634
DATE:	08/16/2024
DRAWN BY:	IEG
CHECKED BY:	DC

SHEET TITLE

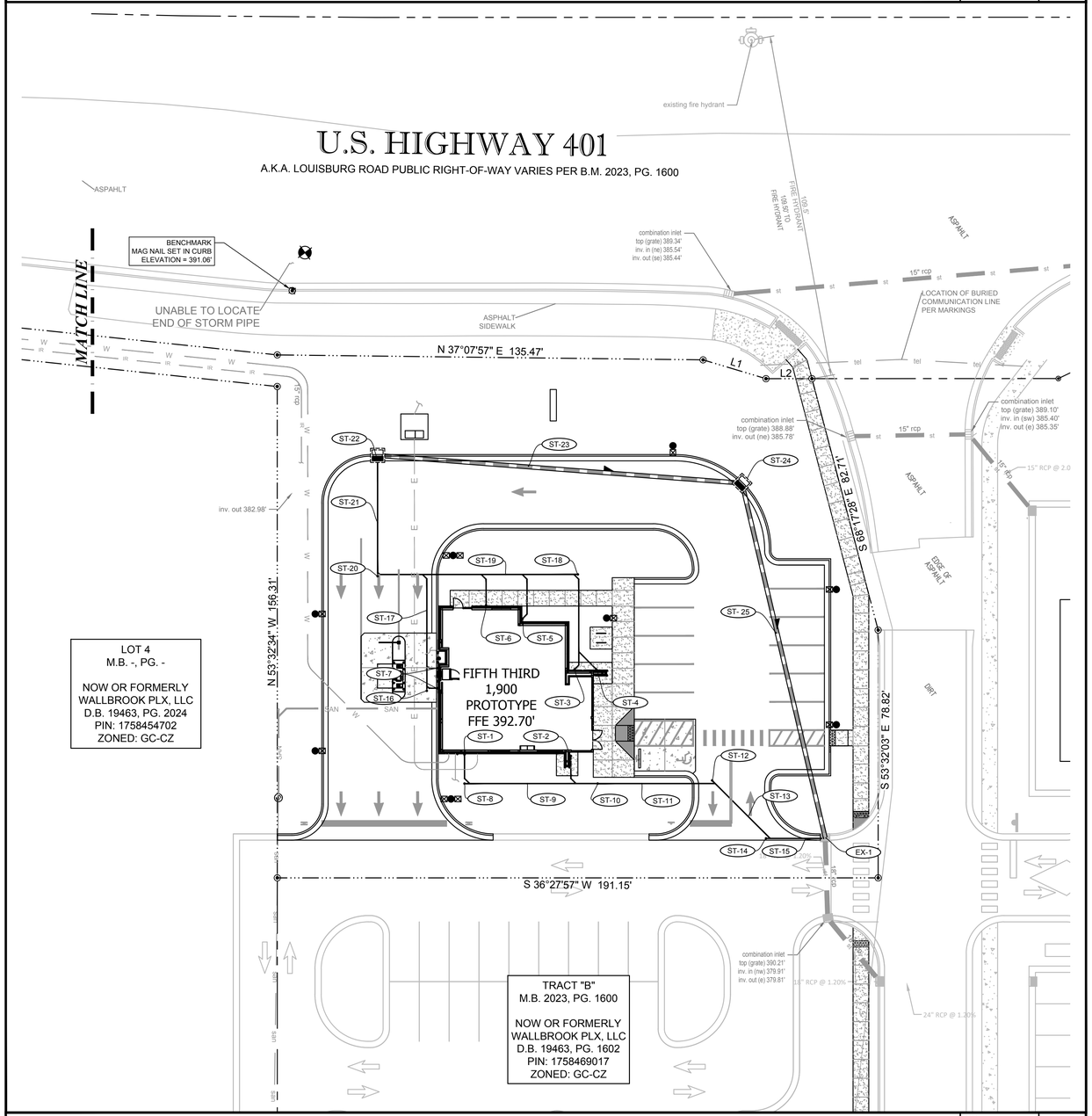
GRADING PLAN

SHEET NUMBER

C03.01



PLAN VIEW | SCALE: AS NOTED | -



PLAN VIEW | SCALE: AS NOTED | -

EXISTING STORM STRUCTURE/PIPING DATA

EX-1
EXISTING GRATE TO MATCH EXISTING PROPOSED ELEVATIONS
TOP = 390.12'
IE(SE) OUT = 380.22' (EXISTING 18"RCP)
IE(NW) IN = 383.70 (PROPOSED 15" HDPE)
IE (SW) IN = 386.60 (PROPOSED 6" PVC)

STORM STRUCTURE/PIPING DATA

ST-1
BUILDING DOWNSPOUT AND CLEANOUT
TOP ELEVATION TO MATCH PROPOSED GRADE
10 LF OF 4-INCH PVC @ 1.00% MIN. SLOPE.
IE = 389.70

ST-2
BUILDING DOWNSPOUT AND CLEANOUT
TOP ELEVATION TO MATCH PROPOSED GRADE
9 LF OF 3-INCH PVC @ 1.00% MIN. SLOPE.
IE = 389.70

ST-3
BUILDING DOWNSPOUT AND CLEANOUT
TOP ELEVATION TO MATCH PROPOSED GRADE
31 LF OF 4-INCH PVC @ 1.00% MIN. SLOPE.
IE = 389.70

ST-4
BUILDING DOWNSPOUT AND CLEANOUT
TOP ELEVATION TO MATCH PROPOSED GRADE
8 LF OF 3-INCH PVC @ 1.00% MIN. SLOPE.
IE = 389.70

ST-5
BUILDING DOWNSPOUT AND CLEANOUT
TOP ELEVATION TO MATCH PROPOSED GRADE
15 LF OF 3-INCH PVC @ 1.00% MIN. SLOPE.
IE = 389.70

ST-6
BUILDING DOWNSPOUT AND CLEANOUT
TOP ELEVATION TO MATCH PROPOSED GRADE
10 LF OF 3-INCH PVC @ 1.00% MIN. SLOPE
IE = 389.70

ST-7
BUILDING DOWNSPOUT AND CLEANOUT
TOP ELEVATION TO MATCH PROPOSED GRADE
4 LF OF 4-INCH PVC @ 1.00% MIN. SLOPE.
IE = 389.70

ST-8
CONSTRUCT CLEANOUT
TOP TO BE SET AT GRADE
IE = 389.50

ST-9
42 LF OF 6" PVC
@ 3.33% SLOPE

ST-10
CONSTRUCT CLEANOUT
TOP TO BE SET AT GRADE
IE = 388.10'

ST-11
37 LF OF 6" PVC
@ 2.70% SLOPE

ST-12
CONSTRUCT CLEANOUT
TOP TO BE SET AT GRADE
IE = 387.10

ST-13
26 LF OF 6" PVC
@ 1.15% SLOPE

ST-14
CONSTRUCT CLEANOUT
TOP TO BE SET AT GRADE
IE = 386.80

ST-15
18 LF OF 6" PVC
@ 1.11% SLOPE
CONNECT TO EX- @ 386.60

ST-16
CONSTRUCT CLEANOUT
TOP TO BE SET AT GRADE
IE = 389.65'

ST-17
38 LF OF 6" PVC
@1.00% MIN. SLOPE

ST-18
CONSTRUCT CLEANOUT
TOP TO BE SET AT GRADE
IE = 389.30

ST-19
64 LF OF 8" PVC
@1.00% MIN. SLOPE

ST-20
CONSTRUCT CLEANOUT
TOP TO BE SET AT GRADE
IE = 387.50'

ST-21
38 LF OF 6" PVC
@1.31% SLOPE

ST-22
CONCRETE CATCH BASIN (DROP INLET)
NCDOT INDEX 719-001
TOP = 390.80'
IE (NE) OUT = 386.00 (15" HDPE)
IE (SE) IN = 387.00 (8" PVC)

ST-23
116 LF OF 15" HDPE
@ 1.00% SLOPE

ST-24
CONCRETE CATCH BASIN (DROP INLET)
NCDOT INDEX 719-001
TOP = 390.85'
IE (SW) IN = 384.85'
IE (E) OUT = 384.85'

ST-25
116 LF OF 15" HDPE
@ 1.00% SLOPE

LEGEND

EL	ELEVATION
TYP	TYPICAL
CO	CLEANOUT
IE	INVERT ELEVATION
SE	SUMP ELEVATION
	EXISTING ELEVATION
	DITCH BOTTOM INLET
	CURB INLET
FFE	FINISH FLOOR ELEVATION
RCP	REINFORCED CONCRETE PIPE
ST-23	STORM SEWER STRUCTURE NUMBER
DS	BUILDING DOWN SPOUT
	12" OR GREATER STORMWATER PIPE
	LESS THAN 12" STORMWATER PIPE
	DIRECTION OF PIPE FLOW
29	EXISTING CONTOUR
29	PROPOSED CONTOUR

CONTROL BENCHMARKS

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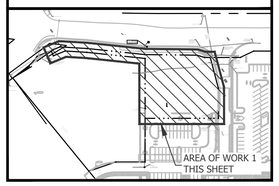
PRE VS POST SITE AREAS

	ACRE	S.F.	PERCENT
SITE AREA	0.76	33,092	100.00%
PRE-DEVELOPMENT			
PERVIOUS AREA:	0.06	2,725	8.00%
IMPERVIOUS AREA:	0.69	30,368	92.00%
POST-DEVELOPMENT			
PERVIOUS AREA:	0.34	14,905	45.00%
IMPERVIOUS AREA:	0.42	18,187	55.00%

KEY PLAN:



SCALE
0 ' 20' 40 ' 60 '

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08/20/2024
DATE

ISSUE	BY	DATE	DESCRIPTION
		08/16/24	PERMIT SET

PROJECT INFORMATION BLOCK

JOB #	230634
DATE:	08/16/2024
DRAWN BY:	IEG
CHECKED BY:	DC

SHEET TITLE
STORM PIPING PLAN

SHEET NUMBER
C03.02

Soil Map—Wake County, North Carolina

Map Scale: 1:1,060 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Wake County, North Carolina
Survey Area Data: Version 25, Oct 2, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

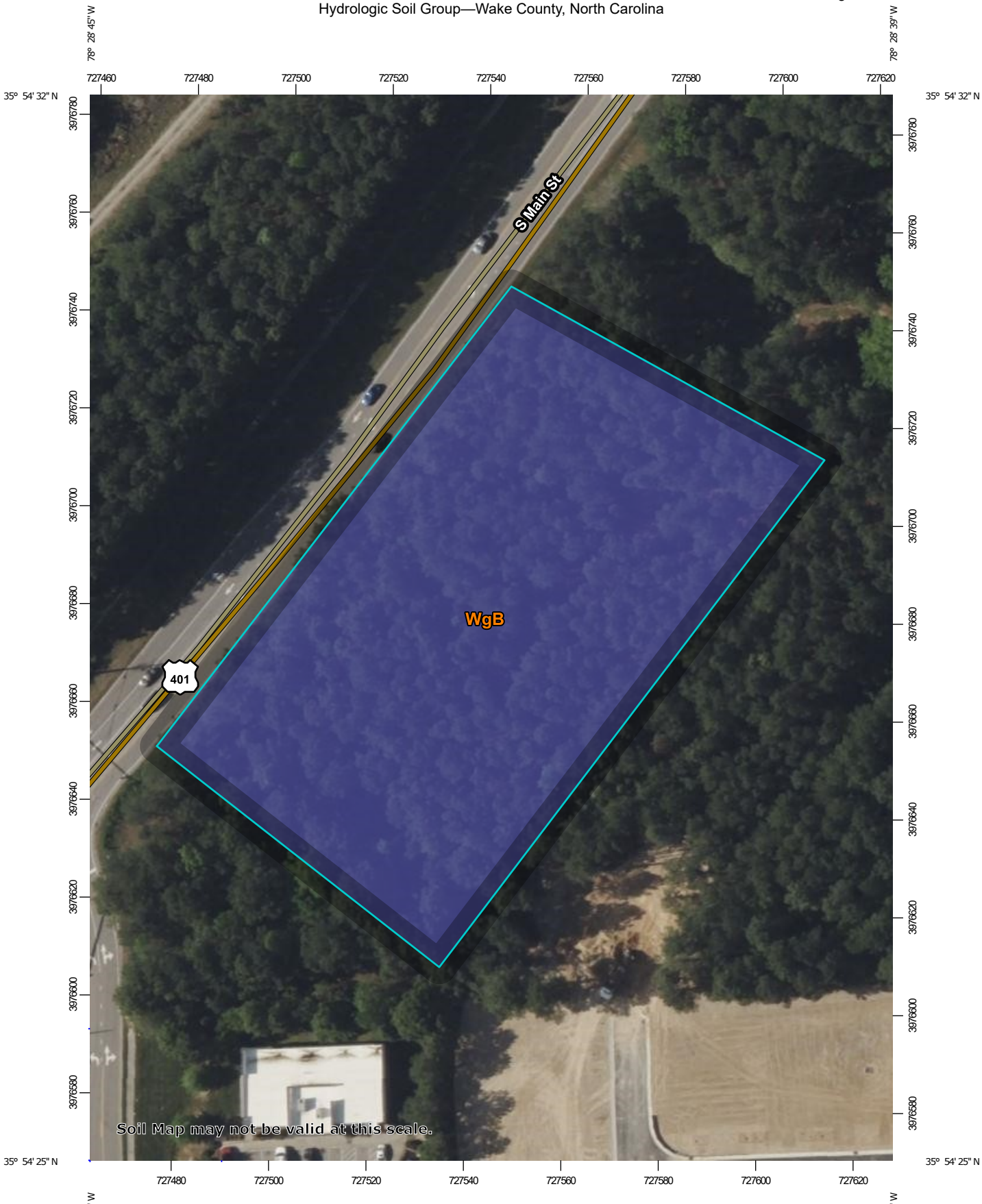
Date(s) aerial images were photographed: Apr 24, 2022—May 9, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
WgB	Wedowee-Urban land complex, 2 to 6 percent slopes	2.3	100.0%
Totals for Area of Interest		**2.3**	**100.0%**

Hydrologic Soil Group—Wake County, North Carolina



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N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

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The soil surveys that comprise your AOI were mapped at 1:24,000.

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Coordinate System: Web Mercator (EPSG:3857)

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Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
WgB	Wedowee-Urban land complex, 2 to 6 percent slopes	B	2.3	100.0%
Totals for Area of Interest			**2.3**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

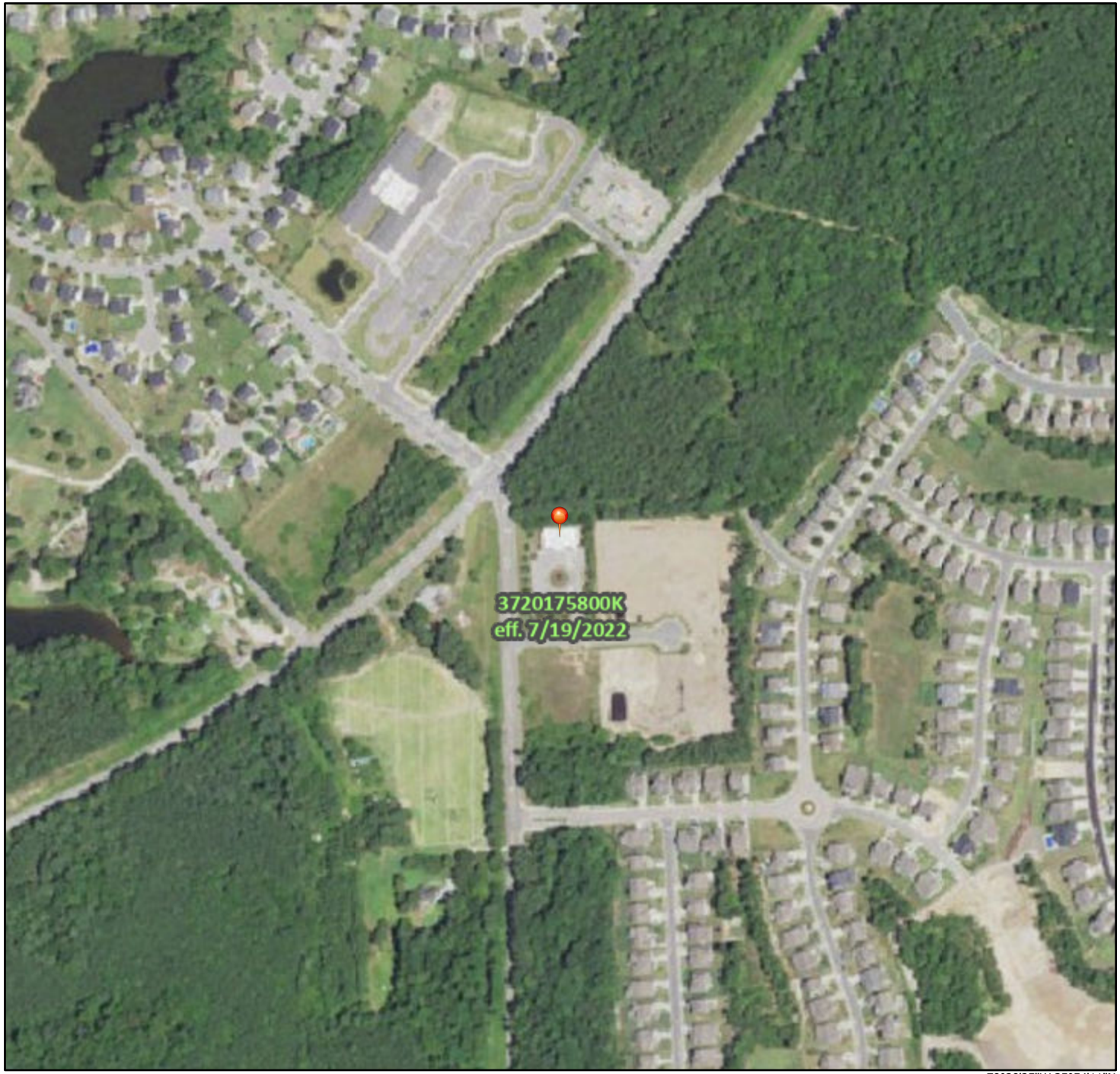
Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

National Flood Hazard Layer FIRMette

78°29'3"W 35°54'40"N



78°28'25"W 35°54'11"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/20/2024 at 4:47 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

NOAA Atlas 14, Volume 2, Version 3
Location name: Rolesville, North Carolina, USA*
Latitude: 35.9078°, Longitude: -78.4788°
Elevation: 383 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.403 (0.369-0.441)	0.468 (0.430-0.512)	0.534 (0.490-0.583)	0.599 (0.548-0.654)	0.665 (0.606-0.725)	0.717 (0.650-0.781)	0.763 (0.688-0.831)	0.803 (0.720-0.877)	0.849 (0.754-0.927)	0.889 (0.783-0.972)
10-min	0.644 (0.590-0.704)	0.749 (0.687-0.818)	0.855 (0.784-0.934)	0.959 (0.877-1.05)	1.06 (0.965-1.16)	1.14 (1.04-1.24)	1.21 (1.09-1.32)	1.27 (1.14-1.39)	1.34 (1.19-1.47)	1.40 (1.23-1.53)
15-min	0.805 (0.738-0.880)	0.942 (0.864-1.03)	1.08 (0.992-1.18)	1.21 (1.11-1.32)	1.34 (1.22-1.46)	1.44 (1.31-1.58)	1.53 (1.38-1.67)	1.61 (1.44-1.75)	1.69 (1.50-1.84)	1.76 (1.55-1.92)
30-min	1.10 (1.01-1.21)	1.30 (1.19-1.42)	1.54 (1.41-1.68)	1.76 (1.61-1.92)	1.99 (1.81-2.17)	2.18 (1.97-2.37)	2.35 (2.12-2.56)	2.50 (2.24-2.73)	2.69 (2.39-2.94)	2.84 (2.51-3.11)
60-min	1.38 (1.26-1.50)	1.63 (1.50-1.78)	1.97 (1.81-2.15)	2.29 (2.09-2.50)	2.65 (2.41-2.89)	2.95 (2.68-3.21)	3.23 (2.91-3.52)	3.51 (3.14-3.83)	3.86 (3.43-4.21)	4.15 (3.66-4.54)
2-hr	1.61 (1.46-1.77)	1.92 (1.75-2.10)	2.34 (2.13-2.57)	2.74 (2.49-3.01)	3.22 (2.90-3.53)	3.64 (3.27-3.98)	4.04 (3.61-4.42)	4.46 (3.95-4.87)	4.99 (4.38-5.46)	5.46 (4.75-5.98)
3-hr	1.70 (1.55-1.89)	2.03 (1.85-2.24)	2.49 (2.26-2.74)	2.94 (2.67-3.23)	3.49 (3.14-3.83)	3.98 (3.56-4.37)	4.46 (3.96-4.89)	4.97 (4.38-5.44)	5.64 (4.92-6.18)	6.25 (5.39-6.87)
6-hr	2.04 (1.87-2.26)	2.44 (2.23-2.68)	2.99 (2.73-3.28)	3.53 (3.22-3.88)	4.21 (3.81-4.61)	4.82 (4.33-5.27)	5.43 (4.84-5.93)	6.08 (5.36-6.62)	6.94 (6.05-7.57)	7.74 (6.65-8.45)
12-hr	2.41 (2.21-2.66)	2.88 (2.64-3.15)	3.54 (3.24-3.88)	4.21 (3.84-4.61)	5.06 (4.58-5.52)	5.83 (5.24-6.34)	6.61 (5.88-7.18)	7.45 (6.55-8.08)	8.60 (7.45-9.33)	9.66 (8.24-10.5)
24-hr	2.86 (2.66-3.08)	3.46 (3.22-3.72)	4.34 (4.04-4.68)	5.04 (4.68-5.42)	6.00 (5.55-6.45)	6.76 (6.24-7.27)	7.54 (6.94-8.12)	8.35 (7.66-9.00)	9.47 (8.64-10.2)	10.3 (9.40-11.2)
2-day	3.32 (3.09-3.57)	3.99 (3.72-4.30)	4.98 (4.63-5.36)	5.75 (5.35-6.19)	6.81 (6.30-7.33)	7.64 (7.06-8.23)	8.50 (7.83-9.15)	9.38 (8.61-10.1)	10.6 (9.66-11.4)	11.6 (10.5-12.5)
3-day	3.52 (3.28-3.77)	4.23 (3.94-4.53)	5.24 (4.89-5.62)	6.04 (5.63-6.48)	7.14 (6.62-7.66)	8.01 (7.41-8.59)	8.90 (8.21-9.55)	9.82 (9.02-10.6)	11.1 (10.1-11.9)	12.1 (11.0-13.0)
4-day	3.72 (3.48-3.97)	4.46 (4.17-4.77)	5.51 (5.15-5.88)	6.34 (5.91-6.77)	7.47 (6.94-7.98)	8.38 (7.76-8.96)	9.30 (8.59-9.96)	10.3 (9.44-11.0)	11.6 (10.6-12.4)	12.6 (11.5-13.5)
7-day	4.31 (4.04-4.60)	5.15 (4.82-5.49)	6.28 (5.88-6.70)	7.17 (6.70-7.65)	8.40 (7.83-8.97)	9.38 (8.72-10.0)	10.4 (9.62-11.1)	11.4 (10.5-12.2)	12.8 (11.8-13.8)	13.9 (12.7-15.0)
10-day	4.91 (4.60-5.23)	5.84 (5.48-6.22)	7.03 (6.59-7.49)	7.96 (7.45-8.48)	9.23 (8.61-9.83)	10.2 (9.52-10.9)	11.2 (10.4-12.0)	12.2 (11.3-13.1)	13.6 (12.6-14.6)	14.7 (13.5-15.8)
20-day	6.58 (6.20-7.01)	7.78 (7.32-8.28)	9.20 (8.65-9.79)	10.3 (9.70-11.0)	11.9 (11.1-12.6)	13.1 (12.2-13.9)	14.3 (13.3-15.2)	15.5 (14.4-16.5)	17.2 (15.9-18.4)	18.5 (17.0-19.8)
30-day	8.18 (7.72-8.68)	9.62 (9.07-10.2)	11.2 (10.6-11.9)	12.4 (11.7-13.2)	14.1 (13.2-14.9)	15.3 (14.3-16.3)	16.5 (15.5-17.6)	17.8 (16.6-19.0)	19.4 (18.0-20.7)	20.7 (19.2-22.1)
45-day	10.4 (9.88-11.0)	12.2 (11.6-12.9)	14.0 (13.3-14.7)	15.4 (14.6-16.2)	17.1 (16.2-18.1)	18.5 (17.5-19.5)	19.8 (18.7-20.9)	21.1 (19.9-22.3)	22.9 (21.4-24.2)	24.2 (22.6-25.6)
60-day	12.5 (11.9-13.1)	14.6 (13.9-15.3)	16.5 (15.7-17.4)	18.0 (17.1-18.9)	19.9 (18.9-21.0)	21.4 (20.2-22.5)	22.8 (21.5-24.0)	24.1 (22.7-25.4)	25.9 (24.3-27.4)	27.2 (25.5-28.8)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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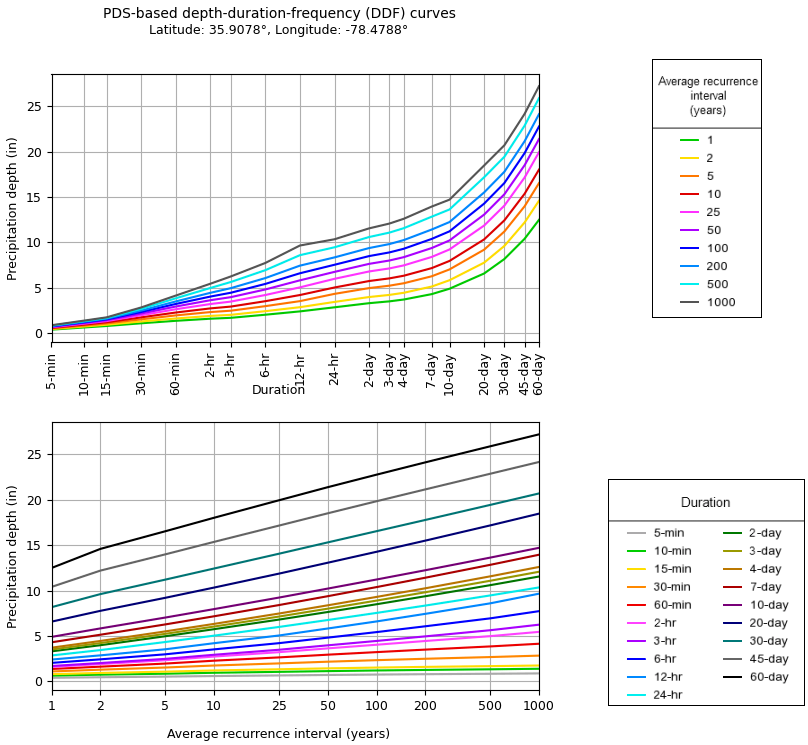
PF graphical



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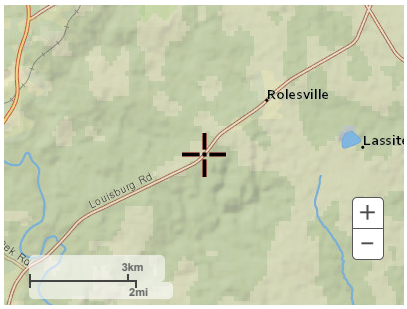
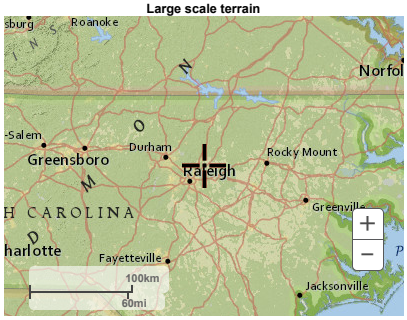
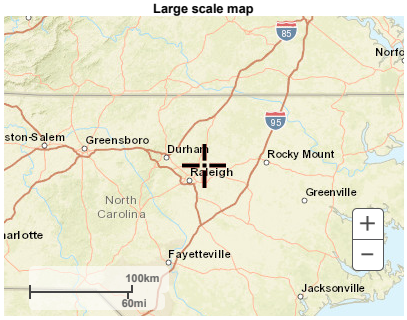
Small scale terrain



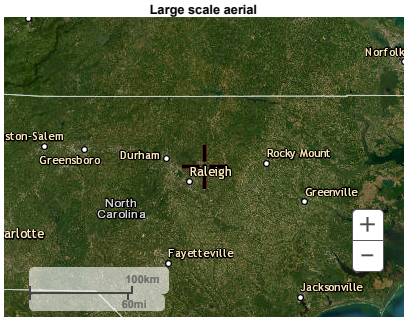
Large scale terrain



Large scale map



Large scale aerial



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Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

NOAA Atlas 14, Volume 2, Version 3
Location name: Rolesville, North Carolina, USA*
Latitude: 35.9078°, Longitude: -78.4788°
Elevation: 383 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.84 (4.43-5.29)	5.62 (5.16-6.14)	6.41 (5.88-7.00)	7.19 (6.58-7.85)	7.98 (7.27-8.70)	8.60 (7.80-9.37)	9.16 (8.26-9.97)	9.64 (8.64-10.5)	10.2 (9.05-11.1)	10.7 (9.40-11.7)
10-min	3.86 (3.54-4.22)	4.49 (4.12-4.91)	5.13 (4.70-5.60)	5.75 (5.26-6.28)	6.36 (5.79-6.93)	6.85 (6.21-7.46)	7.27 (6.56-7.92)	7.64 (6.85-8.34)	8.05 (7.16-8.80)	8.40 (7.40-9.19)
15-min	3.22 (2.95-3.52)	3.77 (3.46-4.12)	4.33 (3.97-4.72)	4.85 (4.44-5.29)	5.37 (4.89-5.86)	5.78 (5.24-6.30)	6.13 (5.52-6.68)	6.43 (5.76-7.02)	6.76 (6.00-7.38)	7.03 (6.20-7.69)
30-min	2.21 (2.02-2.41)	2.60 (2.39-2.84)	3.07 (2.82-3.36)	3.51 (3.21-3.83)	3.98 (3.62-4.34)	4.35 (3.95-4.74)	4.69 (4.23-5.11)	5.00 (4.48-5.46)	5.38 (4.78-5.87)	5.69 (5.02-6.23)
60-min	1.38 (1.26-1.50)	1.63 (1.50-1.78)	1.97 (1.81-2.15)	2.29 (2.09-2.50)	2.65 (2.41-2.89)	2.95 (2.68-3.21)	3.23 (2.91-3.52)	3.51 (3.14-3.83)	3.86 (3.43-4.21)	4.15 (3.66-4.54)
2-hr	0.804 (0.731-0.887)	0.957 (0.874-1.05)	1.17 (1.06-1.28)	1.37 (1.24-1.50)	1.61 (1.45-1.76)	1.82 (1.64-1.99)	2.02 (1.80-2.21)	2.23 (1.97-2.44)	2.50 (2.19-2.73)	2.73 (2.38-2.99)
3-hr	0.567 (0.516-0.628)	0.676 (0.617-0.746)	0.828 (0.753-0.913)	0.979 (0.888-1.08)	1.16 (1.05-1.28)	1.32 (1.19-1.45)	1.48 (1.32-1.63)	1.65 (1.46-1.81)	1.88 (1.64-2.06)	2.08 (1.80-2.29)
6-hr	0.341 (0.311-0.377)	0.406 (0.372-0.448)	0.499 (0.455-0.548)	0.590 (0.537-0.647)	0.703 (0.636-0.770)	0.805 (0.723-0.880)	0.907 (0.808-0.990)	1.01 (0.894-1.11)	1.16 (1.01-1.26)	1.29 (1.11-1.41)
12-hr	0.200 (0.183-0.220)	0.238 (0.219-0.261)	0.293 (0.269-0.322)	0.349 (0.318-0.382)	0.419 (0.380-0.458)	0.483 (0.434-0.525)	0.548 (0.488-0.595)	0.618 (0.543-0.670)	0.713 (0.618-0.774)	0.801 (0.684-0.871)
24-hr	0.119 (0.110-0.128)	0.143 (0.134-0.155)	0.180 (0.168-0.194)	0.210 (0.195-0.226)	0.249 (0.231-0.268)	0.281 (0.260-0.303)	0.314 (0.289-0.338)	0.348 (0.319-0.374)	0.394 (0.359-0.425)	0.431 (0.391-0.465)
2-day	0.069 (0.064-0.074)	0.083 (0.077-0.089)	0.103 (0.096-0.111)	0.119 (0.111-0.129)	0.141 (0.131-0.152)	0.159 (0.147-0.171)	0.177 (0.163-0.190)	0.195 (0.179-0.210)	0.220 (0.201-0.238)	0.240 (0.218-0.260)
3-day	0.048 (0.045-0.052)	0.058 (0.054-0.062)	0.072 (0.067-0.078)	0.083 (0.078-0.090)	0.099 (0.091-0.106)	0.111 (0.102-0.119)	0.123 (0.114-0.132)	0.136 (0.125-0.146)	0.153 (0.140-0.165)	0.167 (0.152-0.180)
4-day	0.038 (0.036-0.041)	0.046 (0.043-0.049)	0.057 (0.053-0.061)	0.066 (0.061-0.070)	0.077 (0.072-0.083)	0.087 (0.080-0.093)	0.096 (0.089-0.103)	0.106 (0.098-0.114)	0.120 (0.110-0.129)	0.131 (0.119-0.141)
7-day	0.025 (0.024-0.027)	0.030 (0.028-0.032)	0.037 (0.034-0.039)	0.042 (0.039-0.045)	0.050 (0.046-0.053)	0.055 (0.051-0.059)	0.061 (0.057-0.066)	0.067 (0.062-0.072)	0.076 (0.070-0.081)	0.083 (0.075-0.089)
10-day	0.020 (0.019-0.021)	0.024 (0.022-0.025)	0.029 (0.027-0.031)	0.033 (0.031-0.035)	0.038 (0.035-0.040)	0.042 (0.039-0.045)	0.046 (0.043-0.049)	0.051 (0.047-0.054)	0.056 (0.052-0.060)	0.061 (0.056-0.065)
20-day	0.013 (0.012-0.014)	0.016 (0.015-0.017)	0.019 (0.018-0.020)	0.021 (0.020-0.022)	0.024 (0.023-0.026)	0.027 (0.025-0.028)	0.029 (0.027-0.031)	0.032 (0.029-0.034)	0.035 (0.033-0.038)	0.038 (0.035-0.041)
30-day	0.011 (0.010-0.012)	0.013 (0.012-0.014)	0.015 (0.014-0.016)	0.017 (0.016-0.018)	0.019 (0.018-0.020)	0.021 (0.019-0.022)	0.022 (0.021-0.024)	0.024 (0.023-0.026)	0.026 (0.025-0.028)	0.028 (0.026-0.030)
45-day	0.009 (0.009-0.010)	0.011 (0.010-0.011)	0.012 (0.012-0.013)	0.014 (0.013-0.014)	0.015 (0.015-0.016)	0.017 (0.016-0.018)	0.018 (0.017-0.019)	0.019 (0.018-0.020)	0.021 (0.019-0.022)	0.022 (0.020-0.023)
60-day	0.008 (0.008-0.009)	0.010 (0.009-0.010)	0.011 (0.010-0.012)	0.012 (0.011-0.013)	0.013 (0.013-0.014)	0.014 (0.014-0.015)	0.015 (0.014-0.016)	0.016 (0.015-0.017)	0.017 (0.016-0.018)	0.018 (0.017-0.019)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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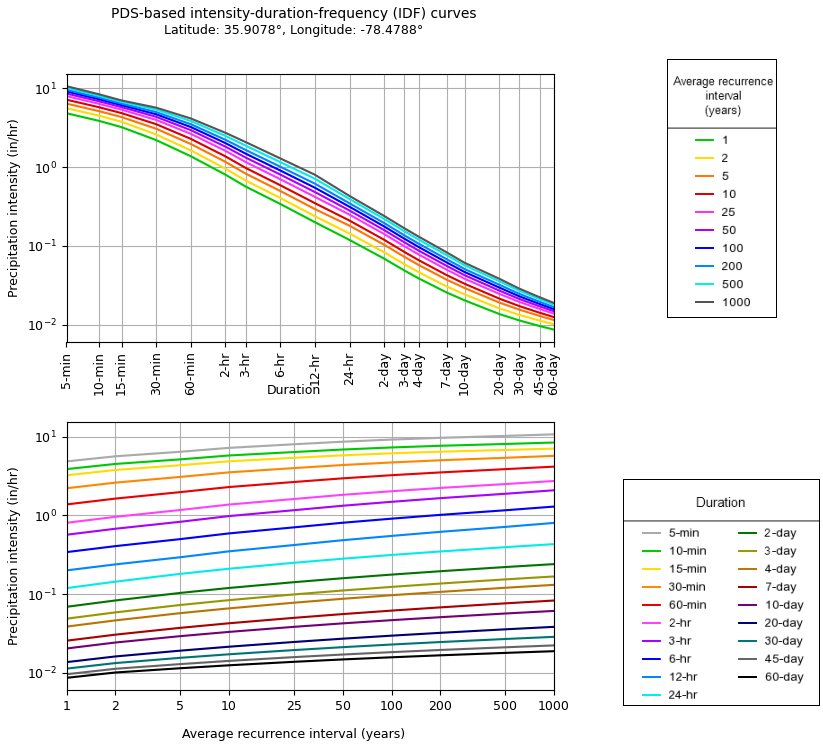
PF graphical



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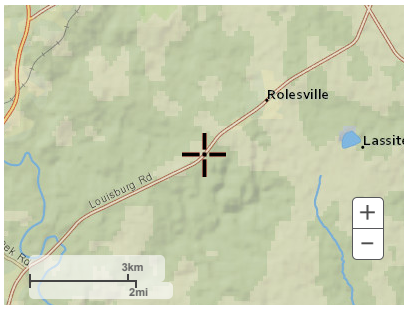
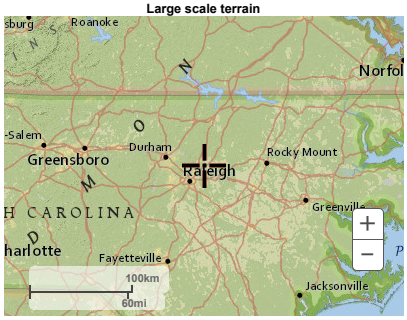
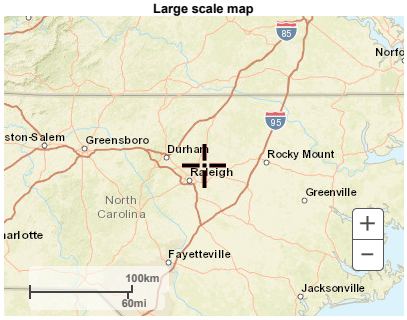
Small scale terrain



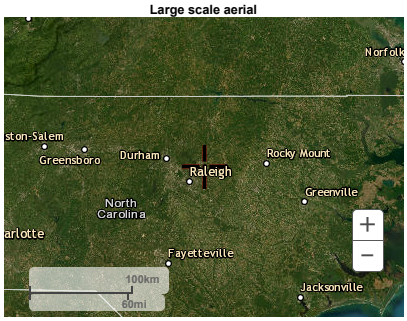
Large scale terrain



Large scale map



Large scale aerial



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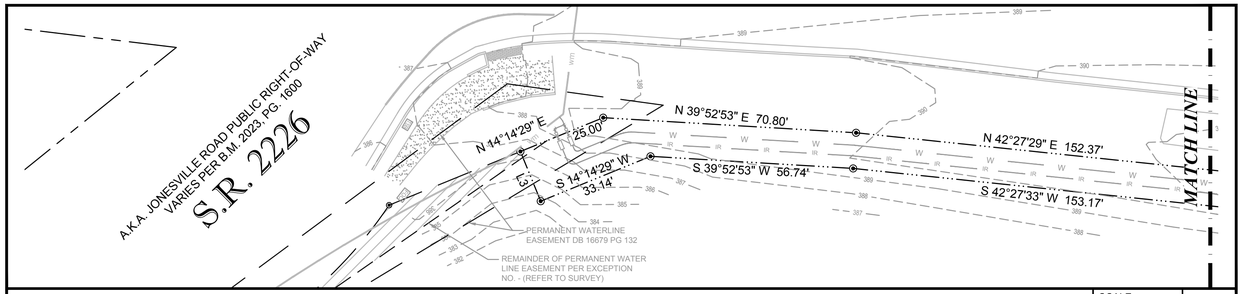
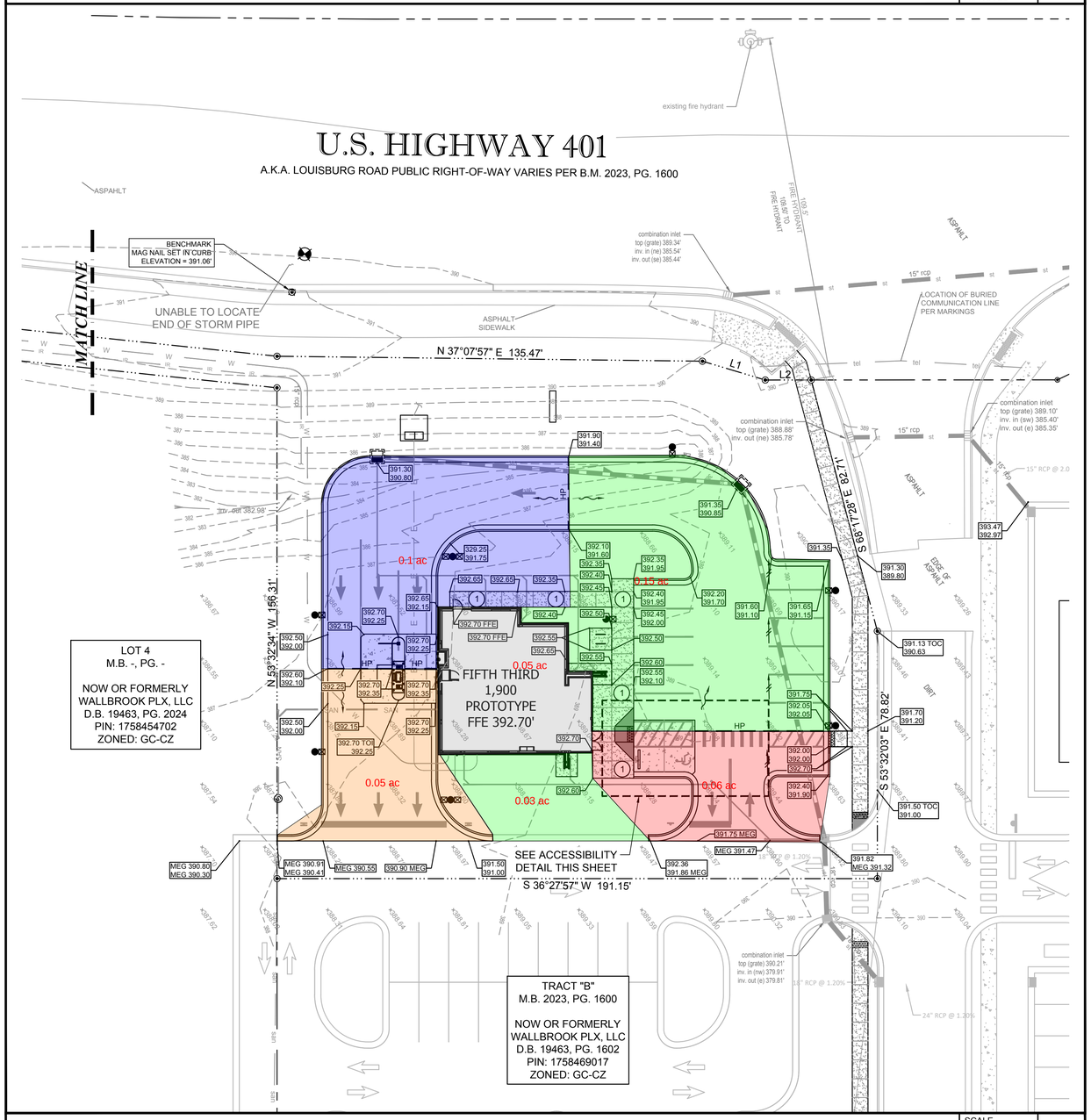
Section No. 3.0

Hydraulic Grade Line and Pipe Basin Map



PLAN VIEW | SCALE: AS NOTED | -



PLAN VIEW | SCALE: AS NOTED | -

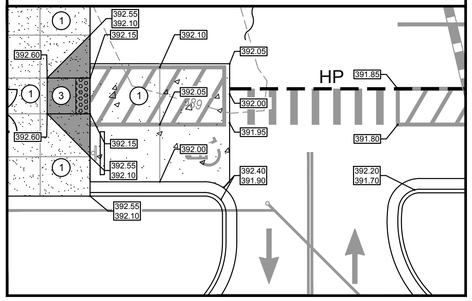
KEYED NOTES:

1	SURFACE SLOPES NOT TO EXCEED 1:48 IN ALL DIRECTIONS.
2	SURFACE SLOPES NOT TO EXCEED 1:48 CROSS SLOPES AND 1:20 RUNNING.
3	SURFACE SLOPES NOT TO EXCEED 1:48 CROSS SLOPES AND 1:12 RUNNING.

ACCESSIBILITY NOTES

1. THE DRAWINGS ARE DESIGNED TO MEET ACCESSIBILITY STANDARDS AT MINIMUM. LOCAL AND STATE REQUIREMENTS OR CODES MAY HAVE ADDITIONAL STANDARDS.
2. ACCESSIBLE PARKING SPACES, SIGNAGE, LOGOS, WHEEL STOPS AND ACCESSIBLE AISLES TO MEET ALL OF THE 2010 ADA STANDARDS REQUIREMENTS - PROVIDE SPACES IN SIZE, QUANTITY AND LOCATIONS REQUIRED BY THE ADA STANDARDS AND APPLICABLE CODES AS DETERMINED BY LOCAL JURISDICTION. PROVIDE A MAXIMUM SLOPE IN EITHER DIRECTION OF 1:48 (1:64 RECOMMENDED).
3. ACCESSIBLE PARKING SIGNAGE ON POST. BOTTOM OF SIGNAGE TO BE MINIMUM 60" ABOVE GRADE. VERIFY ALL REQUIREMENTS WITH ACCESSIBILITY REQUIREMENTS AND LOCAL CODE.
4. CONCRETE WHEEL STOP. ALL ACCESSIBLE SPACES- LOCATE FIXED WHEEL STOP SO AS NOT TO REDUCE THE WIDTH OF THE ADJOINING ACCESSIBLE ROUTE.
5. ACCESSIBLE ROUTE TO PUBLIC RIGHT OF WAY (1 REQUIRED). MAXIMUM RUNNING SLOPE OF 1:20 AND MAXIMUM CROSS SLOPE OF 1:48 (1:64 RECOMMENDED). ALL PAVED SURFACES, CURB RAMPS AND TRANSITIONS ALONG PATH TO MEET ACCESSIBILITY REQUIREMENTS.
6. ACCESSIBLE PATH/WALKWAY TO BE 5'-0" MINIMUM, RUNNING SLOPE 1:20 MAXIMUM, CROSS SLOPE 1:48 MAXIMUM, SLOPE AWAY FROM BUILDING - BROOM FINISH CONCRETE.
7. CURB RAMP TO MEET ALL ACCESSIBILITY REQUIREMENTS, MAXIMUM SLOPE OF RUN 1:12 (1:14 RECOMMENDED), MAXIMUM CRISS SLOPE 1:48 (1:64 RECOMMENDED). REFER TO SITE DETAILS SHEET FOR ADDITIONAL INFORMATION. PROVIDE 36" LONG MINIMUM LANDDING AT TOP AND 60. MINIMUM LANDING AT BOTTOM OF RAMP WITH MAXIMUM SLOPE IN EITHER DIRECTION OF LANDING TO BE 1:48 (1:64 RECOMMENDED)
8. SURFACE CONDITIONS AT ACCESSIBLE WALKWAYS AND ACCESSIBLE AREAS (PAVERS SYSTEMS AND/OR CONCRETE SURFACES) SHALL NOT INCLUDE GAPS GREATER THAT 1/2" OR VERTICAL CHANGES AT JOINTS OR BETWEEN UNITS GREATER THAN 1/4" - UNLESS THE OVERALL LEVEL CHANGE DOES NOT EXCEED 1/2" AND THE LEVEL CHANGE IS BEVELED AT 1:2.
9. IT WILL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO ENSURE THAT THE HANDICAP PARKING SPACES, ACCESSIBLE ROUTES, AND SIDEWALK/CROSSWALKS ARE CONSTRUCTED TO MEET ADA REQUIREMENTS.
10. ANY REQUIREMENTS LISTED ABOVE THAT CAN NOT BE MET SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION IMMEDIATELY. ANYTHING NOT BUILT TO THE ABOVE STANDARDS WILL REQUIRE REMOVAL AND REPLACEMENT OF THE NON COMPLIANT AREAS AT THE GENERAL CONTRACTORS COST.

ACCESSIBILITY DETAIL — SCALE: 1' = 10'



GEOTECHNICAL NOTE:

THE PLACEMENT OF ANY FILL MATERIAL MUST BE CONDUCTED UNDER THE OBSERVATION OF A QUALIFIED LICENSED GEOTECHNICAL ENGINEER AND UPON COMPLETION OF THE EARTHWORK ACTIVITIES THE TOWN MUST BE PROVIDED WITH A FINAL GRADING REPORT THAT INCLUDES THE CORRESPONDING COMPACTION TEST RESULTS AND CERTIFIES THE TYPE OF FILL MATERIAL AND ITS PROPER PLACEMENT.

LEGEND

EL	ELEVATION
TYP	TYPICAL
CO	CLEANOUT
IE	INVERT ELEVATION
SE	SUMP ELEVATION
×49.58	EXISTING ELEVATION
0.00	PROPOSED PAVEMENT ELEVATION
0.00 / 0.00	TOP OF SIDEWALK/CURB EDGE OF PAVEMENT
	DITCH BOTTOM INLET
	CURB INLET
FFE	FINISH FLOOR ELEVATION
RCP	REINFORCED CONCRETE PIPE
HP	HIGH POINT
MEG	MATCH EXISTING GRADE
TOI	TOP OF ISLAND
DS	BUILDING DOWN SPOUT
	12" OR GREATER STORMWATER PIPE
	LESS THAN 12" STORMWATER PIPE
	PROPOSED SURFACE STORMWATER FLOW
	PROPOSED SWALE STORMWATER FLOW
–389–	EXISTING CONTOUR
389	PROPOSED CONTOUR
	DIRECTION OF PIPE FLOW

CONTROL BENCHMARKS

THE BASIS OF BEARING USEDD FOR THIS SURVEY IS N.C STATE GRID (NAD 83). ELEVATIONS SHOWN ON THIS SURVEY ARE BASED ON NAVD 88.

NOTE:
CONTRACTOR TO ESTABLISH CONTROL BENCHMARKS BEYOND LIMITS OF DEMOLITION PRIOR TO CONSTRUCTION.

EROSION CONTROL MEASURE NOTE

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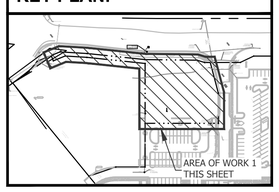
2. SEE SITE PLAN SHEET FOR SITE DATA.
3. SEE SURVEY FOR TEMPORARY BENCH MARK (TBM) LOCATIONS.
4. THE CONTRACTOR SHALL MEET ALL REQUIREMENTS FOR LOCAL MUNICIPALITY AND THE DEPARTMENT OF TRANSPORTATION WITH REGARD TO IMPROVEMENTS WITHIN THEIR RESPECTIVE RIGHTS-OF-WAY.
5. ALL DISTURBED AREAS WITHIN RIGHT-OF-WAY TO BE RETURNED TO MATCH EXISTING CONDITION.
6. ALL CLEANOUT TOP ELEVATION SHALL MATCH FINISH GRADE ELEVATIONS.
7. CONTRACTOR SHALL INSTALL EROSION CONTROL SILT FENCE AROUND THE PERIMETER OF THE SITE AND MUST MAINTAIN THE SILT FENCE IN GOOD REPAIR UNTIL ALL CONSTRUCTION IS COMPLETE AND THE AREA IS STABILIZED.
8. THE CONTRACTOR SHALL CONTACT THE ENGINEER PRIOR TO ANY CONSTRUCTION IF ANY PROBLEMS OR DISCREPANCIES EXIST.

North Carolina 811 www.nc811.org

KEY PLAN:



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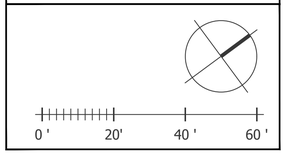

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P: 704.981.8951
Lic. #: AA - 0003590
W: www.bdglp.com

FIFTH THIRD BANK

FIFTH THIRD BANK
ROLESVILLE WALLBROOK

LOT 3 - PUBLIX AT WALLBROOK
ROLESVILLE, NORTH CAROLINA 27587

INFINITY ENGINEERING GROUP, PLLC
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www.iegroup.net
NC Firm Certificate No. P-1836
IEG Job No. 15-309.00

SEAL

NISIT SAPPARKHAO, P.E.
NC REG. NO. 38066

NORTH CAROLINA PROFESSIONAL SEAL 38066 ENGINEER NISIT SAPPARKHAO

08/20/2024
DATE

ISSUE	BY	DATE	DESCRIPTION
		08/16/24	PERMIT SET

PROJECT INFORMATION BLOCK

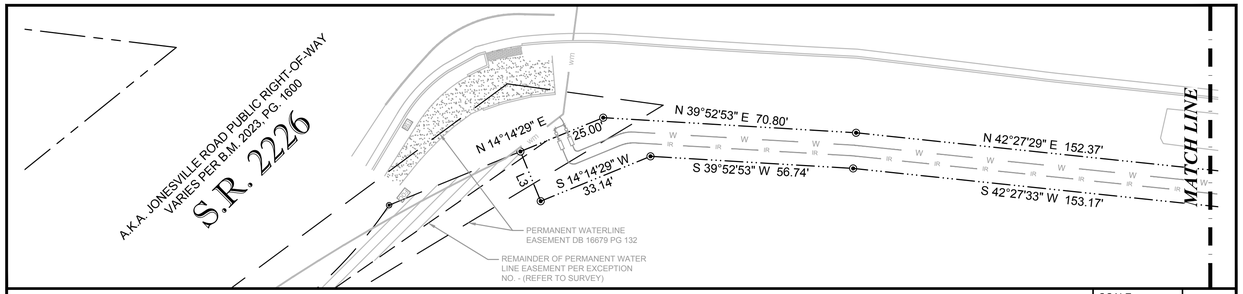
JOB #	230634
DATE:	08/16/2024
DRAWN BY:	IEG
CHECKED BY:	DC

SHEET TITLE

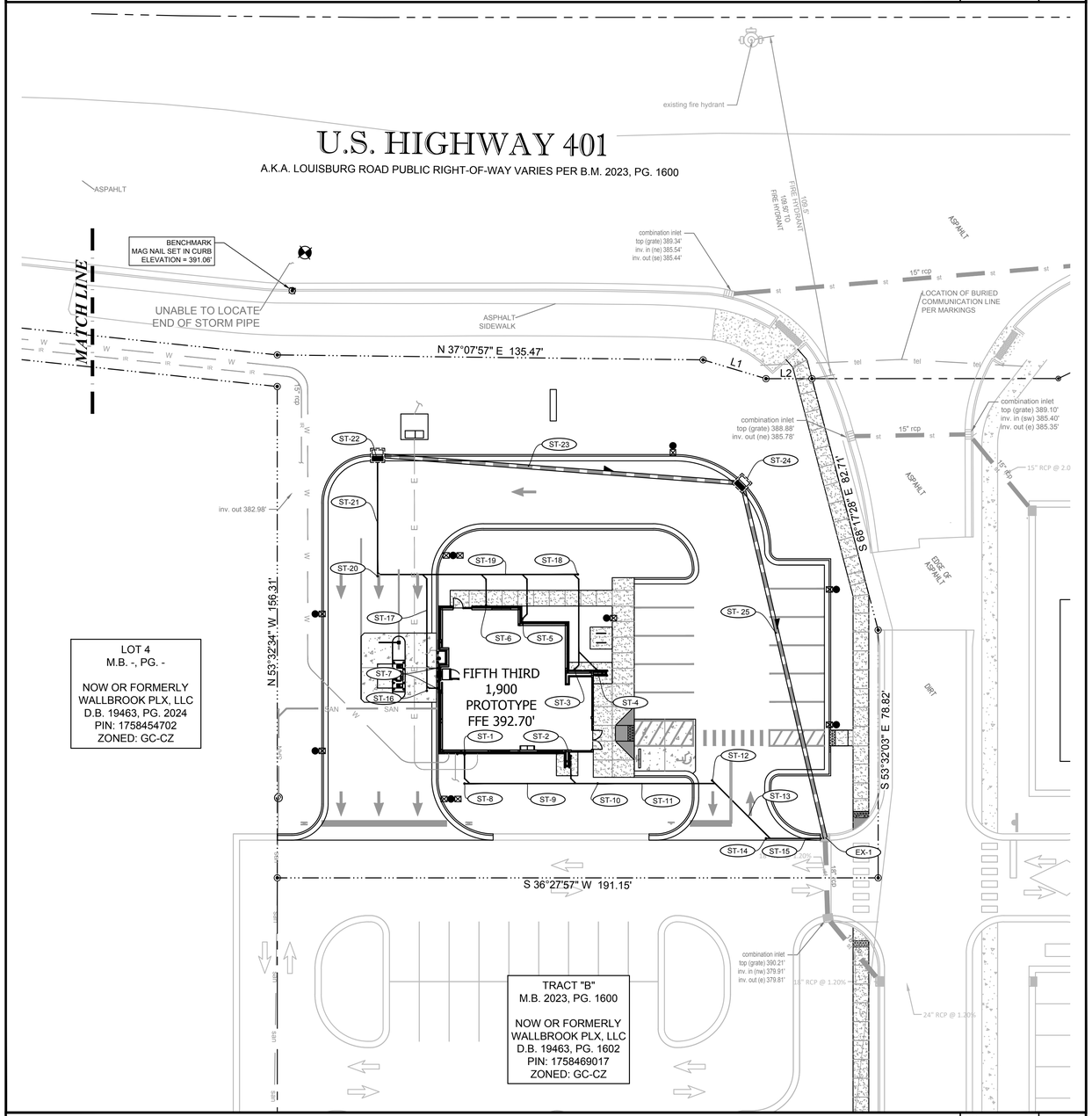
GRADING PLAN

SHEET NUMBER

C03.01



PLAN VIEW | SCALE: AS NOTED | -



LOT 4
M.B. -, PG. -

NOW OR FORMERLY
WALLBROOK PLX, LLC
D.B. 19463, PG. 2024
PIN: 1758454702
ZONED: GC-CZ

TRACT "B"
M.B. 2023, PG. 1600

NOW OR FORMERLY
WALLBROOK PLX, LLC
D.B. 19463, PG. 1602
PIN: 1758469017
ZONED: GC-CZ

PLAN VIEW | SCALE: AS NOTED | -

EXISTING STORM STRUCTURE/PIPING DATA

EX-1
EXISTING GRATE TO MATCH EXISTING PROPOSED ELEVATIONS
TOP = 390.12'
IE(SE) OUT = 380.22' (EXISTING 18"RCP)
IE(NW) IN = 383.70 (PROPOSED 15" HDPE)
IE (SW) IN = 386.60 (PROPOSED 6" PVC)

STORM STRUCTURE/PIPING DATA

ST-1
BUILDING DOWNSPOUT AND CLEANOUT
TOP ELEVATION TO MATCH PROPOSED GRADE
10 LF OF 4-INCH PVC @ 1.00% MIN. SLOPE.
IE = 389.70

ST-2
BUILDING DOWNSPOUT AND CLEANOUT
TOP ELEVATION TO MATCH PROPOSED GRADE
9 LF OF 3-INCH PVC @ 1.00% MIN. SLOPE.
IE = 389.70

ST-3
BUILDING DOWNSPOUT AND CLEANOUT
TOP ELEVATION TO MATCH PROPOSED GRADE
31 LF OF 4-INCH PVC @ 1.00% MIN. SLOPE.
IE = 389.70

ST-4
BUILDING DOWNSPOUT AND CLEANOUT
TOP ELEVATION TO MATCH PROPOSED GRADE
8 LF OF 3-INCH PVC @ 1.00% MIN. SLOPE.
IE = 389.70

ST-5
BUILDING DOWNSPOUT AND CLEANOUT
TOP ELEVATION TO MATCH PROPOSED GRADE
15 LF OF 3-INCH PVC @ 1.00% MIN. SLOPE.
IE = 389.70

ST-6
BUILDING DOWNSPOUT AND CLEANOUT
TOP ELEVATION TO MATCH PROPOSED GRADE
10 LF OF 3-INCH PVC @ 1.00% MIN. SLOPE
IE = 389.70

ST-7
BUILDING DOWNSPOUT AND CLEANOUT
TOP ELEVATION TO MATCH PROPOSED GRADE
4 LF OF 4-INCH PVC @ 1.00% MIN. SLOPE.
IE = 389.70

ST-8
CONSTRUCT CLEANOUT
TOP TO BE SET AT GRADE
IE = 389.50

ST-9
42 LF OF 6" PVC
@ 3.33% SLOPE

ST-10
CONSTRUCT CLEANOUT
TOP TO BE SET AT GRADE
IE = 388.10'

ST-11
37 LF OF 6" PVC
@ 2.70% SLOPE

ST-12
CONSTRUCT CLEANOUT
TOP TO BE SET AT GRADE
IE = 387.10

ST-13
26 LF OF 6" PVC
@ 1.15% SLOPE

ST-14
CONSTRUCT CLEANOUT
TOP TO BE SET AT GRADE
IE = 386.80

ST-15
18 LF OF 6" PVC
@ 1.11% SLOPE
CONNECT TO EX- @ 386.60

ST-16
CONSTRUCT CLEANOUT
TOP TO BE SET AT GRADE
IE = 389.65'

ST-17
38 LF OF 6" PVC
@1.00% MIN. SLOPE

ST-18
CONSTRUCT CLEANOUT
TOP TO BE SET AT GRADE
IE = 389.30

ST-19
64 LF OF 8" PVC
@1.00% MIN. SLOPE

ST-20
CONSTRUCT CLEANOUT
TOP TO BE SET AT GRADE
IE = 387.50'

ST-21
38 LF OF 6" PVC
@1.31% SLOPE

ST-22
CONCRETE CATCH BASIN (DROP INLET)
NCDOT INDEX 719-001
TOP = 390.80'
IE (NE) OUT = 386.00 (15" HDPE)
IE (SE) IN = 387.00 (8" PVC)

ST-23
116 LF OF 15" HDPE
@ 1.00% SLOPE

ST-24
CONCRETE CATCH BASIN (DROP INLET)
NCDOT INDEX 719-001
TOP = 390.85'
IE (SW) IN = 384.85'
IE (E) OUT = 384.85'

ST-25
116 LF OF 15" HDPE
@ 1.00% SLOPE

LEGEND

EL	ELEVATION
TYP	TYPICAL
CO	CLEANOUT
IE	INVERT ELEVATION
SE	SUMP ELEVATION
	EXISTING ELEVATION
	DITCH BOTTOM INLET
	CURB INLET
FFE	FINISH FLOOR ELEVATION
RCP	REINFORCED CONCRETE PIPE
ST-23	STORM SEWER STRUCTURE NUMBER
DS	BUILDING DOWN SPOUT
	12" OR GREATER STORMWATER PIPE
	LESS THAN 12" STORMWATER PIPE
	DIRECTION OF PIPE FLOW
29	EXISTING CONTOUR
29	PROPOSED CONTOUR

CONTROL BENCHMARKS

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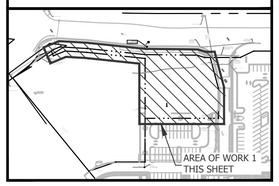
PRE VS POST SITE AREAS

	ACRE	S.F.	PERCENT
SITE AREA	0.76	33,092	100.00%
PRE-DEVELOPMENT			
PERVIOUS AREA:	0.06	2,725	8.00%
IMPERVIOUS AREA:	0.69	30,368	92.00%
POST-DEVELOPMENT			
PERVIOUS AREA:	0.34	14,905	45.00%
IMPERVIOUS AREA:	0.42	18,187	55.00%

North Carolina 811 www.nc811.org

KEY PLAN:



SCALE
0 ' 20' 40 ' 60 '

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W: www.bdgllp.com

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NC REG. NO. 38066

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 38066 NISIT SAPPARKHAO

08/20/2024
DATE

ISSUE	BY	DATE	DESCRIPTION
		08/16/24	PERMIT SET

PROJECT INFORMATION BLOCK

JOB #	230634
DATE:	08/16/2024
DRAWN BY:	IEG
CHECKED BY:	DC

SHEET TITLE
STORM PIPING PLAN

SHEET NUMBER
C03.02

Pipe Sizing Calculations

INFINITY ENGINEERING GROUP, LLC

1208 E. Kennedy Blvd, Suite 230

Tampa, Florida 33602

Fifth Third Wallbrook

15-309.00

Design Frequency: **10 YEAR**

Manning's n (HDPE): **0.012**

DTW Elevation: **381.72** **(18" FLOWING FULL)**

Pipe No.	Str. fr. Str. to	Length (ft)	Runoff C Runoff "C" weghted paved unpaved	Drainage Area (ac)	Offsite Drainage Area (ac)	Rainfall Intensity (in/hr)	Area Runoff (cfs)	Upline Contributing Runoff (cfs)	Total Runoff (cfs)	M.H. Grate Elev. (ft)	Elev. of Hydraulic Gradeline / Crown Elevation / Flow Line Elevation Upper End (ft)	Lower end (ft)	Pipe Dia. (in)	Hydraulic Grade Line Design: Hyd. Rad. Velocity (ft/s)	Manning "n" Capacity (cfs)	Hyd.grade line (ft/ft) Slope	use
ST-23	**ST-22**	**116**	0.95	**0.15**	**0.00**	**5.75**	*0.82*	**0.00**	0.82	*390.80*	*384.02*	*382.87*	**15**	*0.31*	**0.012**	*0.0001*	*0.0099*
			0.95	**0.15**							*387.25*	*386.10*				*ft/ft*	
	ST-24		**0.25**	**0.00**							**386.00**	**384.85**		*5.69*	*6.99*	*0.0099*	
ST-25	**ST-24**	**116**	0.95	**0.15**	**0.00**	**5.75**	*0.82*	**0.82**	1.64	*390.85*	*382.87*	*381.72*	**15**	*0.31*	**0.012**	*0.0005*	*0.0099*
			0.95	**0.15**							*386.10*	*384.95*				*ft/ft*	
	EX-1		**0.25**	**0.00**							**384.85**	**383.70**		*5.69*	*6.99*	*0.0099*	

***Bold indicates user input** **Italics indicate calculated values*

Section No. 4.0

Operation and Maintenance Instructions

Operation and Maintenance Instructions

Stormwater management systems should be inspected on a routine basis to ensure that they are functioning properly. Inspections should be performed on a monthly and semi-annual basis following major storms. systems that incorporate percolation are most critical since poor maintenance practices can soon render them ineffective. records should be kept on all maintenance operations to help plan future work and identify facilities requiring attention. considerable damage, as well as loss of structures and effective use of the stormwater facilities can result from a failure to protect and maintain the drainage systems. providing maintenance in a timely manner often saves costly repair jobs when the unusual storms occur. remember, the SFWMD permit dictates that the system must be maintained and that the owner is responsible for system maintenance.

a. general

Normal maintenance requirements are as follows:

a. retention areas and swales should be mowed at regular intervals. all clippings should be picked up and any accumulated debris should be removed.

b. sod should be routinely thatched.

c. the bottom area of dry basins should be periodically broken with a disk to maintain design percolation rate.

d. sod cover on slopes and embankments should be inspected and repaired or replaced as necessary.

e. periodically, following a storm event, the outfall structure should be inspected to check that the orifice or weir is not clogged and is flowing at a substantial rate.

f. the discharge pipe(s) should be visually inspected to determine if the pipe(s) require cleaning. all debris found in the pipe should be removed.

g. inlet structures should be inspected after each storm. all debris accumulated in the sump or on the grate should be removed.

h. outlets should be inspected for clogging and erosion.

i. berms and other structures should be inspected for breaks. repairs, if necessary, should be performed immediately.

j. sediment collected in forebays shall be removed during routine maintenance. In no case shall the sediment be allowed to exceed on half the height of the rock within the forebay. Forebay may be cleaned using water jet and hydrovac techniques.

b. catch basins

Catch basins should be inspected after major storms and should be cleaned as often as needed. various techniques and equipment are available for maintenance of catch basins. filter bags can be used in catch basins at street grade to reduce the frequency of cleaning catch basins and outfall pipes.

c. dry bottom retention system

the retention area must become dry within 72 hours after a rainfall event. if the retention area is regularly wet, it is out of compliance with the permitted design, and the pond bottom must be scarified, or the bottom foot or so replaced with clean sands, to ensure that the permitted percolation rate is maintained.

d. methods and equipment for system maintenance

various types of equipment are commercially available for maintenance of stormwater management systems. the most frequently used equipment and techniques are listed below:

1. <u>vacuum pump</u>

this device is normally used to remove sediment from sumps and pipes. the equipment for this system is generally mounted on a vehicle. it requires a 200-to-300-gallon (0.757 to 1.136 m ^3) holding tank and a vacuum pump that has a 10-inch (254 mm) diameter flexible hose with a serrated metal end for breaking up cake sediment. a two-man crew can clean a catch basin in 5 to 10 minutes. this system can remove stones, bricks, leaves, litter, and sediment deposits. normal working depth is 0 to 20 feet (0 to 6 m).

2. <u>water jet spray</u>

this equipment is generally mounted on a vehicle equipped with a high-pressure pump and a 200-to-300-gallon (0.760 to 1.140 m ^3) water supply. a 3-inch (76 mm) flexible hose line with a metal nozzle directs jets of water to loosen debris in pipes or trenches. normal length of hose is approximately 200 feet (61 m). this system should not be used to clean

erodible trench walls.

3. fire hose flushing

this equipment consists of various fittings that can be placed on the end of a fire hose such as rotating nozzles, rotating cutter, etc. when this equipment is dragged through a pipe, it can be effective in removing light material from walls.

4. sewer jet flusher

sewer jet flushers are usually truck-mounted and consists of a large water tank of at least 1000 gallons (3.785 m ^3), a triple action water pump capable of producing 1000 psi (6900 kn/m^2) or more pressure, a gasoline motor to run the pump, a hose reel large enough for 500 feet (153 m) of 1-inch (25 mm) inside diameter high pressure hose, and a hydraulic pump to operate the hose reel. in order to clean pipes properly, a minimum nozzle pressure of 600 psi (4140 kn/m ^2) is required. all material is flushed ahead of the nozzle by spray action. this extremely mobile machine can be used for cleaning areas with light grease problems, sand and gravel infiltration, and for general cleaning.

references

1. sewer maintenance manual prepared by municipal engineer's association of ontario for ministry of the environment, ontario, canada, march 1974.

2. smith, t.w., peter, r.r., smith, r.e., shirley, e.c., "infiltration drainage of highway surface water", transportation laboratory, california department of transportation, research report
m & r 632820-1, august, 1969.

Section No. 5.0

Appendix

WALLBROOK

ROLESVILLE, WAKE COUNTY, NORTH CAROLINA

STORMWATER MANAGEMENT PLAN

PREPARED BY:

ARK CONSULTING GROUP, PLLC

JANUARY 2023

WALLBROOK

ROLESVILLE, WAKE COUNTY, NORTH CAROLINA

STORMWATER MANAGEMENT PLAN

DRAWING NO. D-1219

9/26/2023

BRYAN C. FAGUNDUS, P.E.

January 31, 2023 Rev. June 29, 2023 Rev. August 28, 2023 Rev. September 25, 2023

OWNER / DEVELOPER

WALLBROOK LANDCO, LLC
3 KEEL ST., SUITE 2
WRIGHTSVILLE BEACH, NC 28480-1709
(704) 621-6430

ARK CONSULTING GROUP, PLLC

2755-B CHARLES BLVD
GREENVILLE, NC 27858
(252) 558-0888
NCBELS LICENSE NO. P-1199

WALLBROOK
STORMWATER MANAGEMENT PLAN
ROLESVILLE, WAKE COUNTY, NORTH CAROLINA
JANUARY 2023

LOCATION:

The proposed project site consists of Wake County Tax Parcel Numbers 1758469017, 175856963, 1758454702, 1758465891, & 1758468940. Parcel numbers 1758469017, 1758563963, & 1758454702 are located along the south side of South Main Street, while Parcel Numbers 1758465891 and 1758468940 are located on the north side of South Main Street in the Town of Rolesville, Wake County, North Carolina. The site is located within the Neuse River Basin, drains to Harris Creek (C;NSW), and is subject to the Town of Rolesville's Post-Construction Stormwater Ordinance.

DESCRIPTION:

The project site consists of a 30.48 acre assemblage of three parcels along South Main Street, with a total of 36.90 acres included within this master stormwater management plan. The properties are currently undeveloped, with existing wooded vegetation.

The property assemblage to the south of South Main Street (1758469017, 1758563963, and 1758454702) is bound on the north and west by South Main Street; on the east by Carlton Pointe Subdivision and a future Townhome development (Lot 6 as shown on the Wallbrook Preliminary Plat (PR 21-04)); and on the south by The Townes at Carlton Pointe and a Wake County ABC Store.

The property assemblage to the north of South Main Street (1758465891 and 1758468940), is bound by Bojangles Restaurant and Rolesville Charter Academy to the south; Hampton Pointe to the west; City of Raleigh property to the north, South Main Street and an undeveloped lot owned by Grand Park Properties, LLC to the east.

The native soil types found on the property are Rawlings-Rion Complex (RgC), Wedowee-Urban land complex (WgB), Rawlings-Rion complex (RgB), Wedowee-Saw complex (WfB), Rawlings-Rion complex (RgD), Wake-Rolesville complex (WaE), Urban land (Ur) as indicated on the NRCS / USDA Wake County Soils Survey.

PROPOSED PROJECT:

The proposed project is a commercial subdivision comprised of multiple commercial parcels that will develop in phases. Included appurtenant improvements are new public streets, utility improvements, buildings, and parking areas. While the multiple parcels included in this stormwater management plan will be developed / constructed in phases, the stormwater control measure will be constructed in its entirety with the first phase of development. The total area included in this stormwater management plan is 36.90 acres with 34.86 acres being routed through the proposed wet detention pond.

The first construction / development phase will consist of the Grocery store anchored development as shown on the Site Plan entitled Publix at Wallbrook (SDP 23-05). The Grocery store development occurs on Lots 1A, 1B, 1C and 2 as shown on the Wallbrook Preliminary Plat (PR 21-04). Also included in the first phase of construction is the extension of Virginia Water Drive from its current terminus in Carlton Pointe Subdivision to a new signalized intersection at South Main Street (CID 23-01).

The following is a listing of parcels developing in future phases that will be served by the proposed stormwater control measure.

- Lots 9, 10, and 11 as shown on the Wallbrook Preliminary Plat (PR 21-04), referred to as the Paris Tract.
- Lots 3 and 4 as shown on the Wallbrook Preliminary Plat (PR 21-04).
- Lot 5 as shown on the Wallbrook Preliminary Plat (PR 21-04), referred to as the Boat Tract
- Wallbrook Drive
- Virginia Water Drive
- Portion of Wallbrook Townhomes – Lot 6 as shown on the Wallbrook Preliminary Plat (PR 21-04)
- A portion of the South Main Street Improvements being constructed under NCDOT U-6241 will have drainage that is routed through the proposed stormwater control measure.

The table below summarizes the parcel areas and built upon areas included in this Stormwater Management Plan.

Parcel ID	Lot Number on PR 21-04	Parcel Area (AC)	Built Upon Area (AC)
Publix	1A, 1B, 1C	10.97	8.05
Publix	2	1.97	1.33
Wallbrook Dr. & Va. Water Dr.	n/a	2.49	2.20
Paris Tract	9, 10, 11	7.06	6.00 (85% BUA)
Boat Tract	5	5.07	4.31 (85% BUA)
Outparcel	3	0.70	0.60 (85% BUA)
Outparcel	4	1.81	1.54 (85% BUA)
NCDOT Roadway – U-6241	n/a	6.45	4.96
Portion of Wallbrook Townhomes	6	0.37	0.28
Total BUA to SCM			29.27
Total BUA Bypass			0.56

See the attached Area & Coverage Calculations for further details.

STORMWATER MANAGEMENT REQUIREMENTS:

The project is within the Town of Rolesville limits and is subject to the Town's Post-Construction Stormwater Ordinance. Stormwater management is provided in accordance with the Town of Rolesville requirements and will utilize a wet detention pond designed to the Minimum Design Criteria in the NCDEQ Stormwater Design Manual to achieve 85% TSS removal, nitrogen treatment, and peak flow reduction.

The pre-development peak flows have been calculated utilizing Hydraflow Hydrographs and named "Overall Pre-Development" in the attachments. Hydrograph 1 (Pre – Wallbrook Lots 1 & 2) is comprised of 12.94 acres consisting of Lots 1A, 1B, 1C and 2 as shown on the Wallbrook Preliminary Plat (PR 21-04) with a curve number of 79 for Woods in fair condition of Hydrological Soil Group D and a time of concentration of 6.7 minutes.

Hydrograph 2 (Pre – New Roadways (Wallbrook Dr/ Va Water Dr)) is comprised of 2.49 acres representing the proposed roadway and right-of-way areas with a curve number of 79 for Woods in fair condition of Hydrological Soil Group D and a time of concentration of 8.4 minutes.

Hydrograph 3 (Pre – Boat Tract) is comprised of the 5.07 acre parcel (Lot 5 as shown on the Wallbrook Preliminary Plat (PR 21-04)) with a curve number of 73 for Woods in fair condition of Hydrological Soil Group C and a time of concentration of 10.5 minutes.

Hydrograph 4 (Pre – Paris Tract) is comprised of the 7.06 acre parcel (Lots 9, 10, and 11 as shown on the Wallbrook Preliminary Plat (PR 21-04)) with a curve number of 79 for Woods in fair condition of Hydrological Soil Group D and a time of concentration of 5 minutes. (Wake County Tax Parcel Number 1758467822)

Hydrograph 5 (Pre – DOT Roadway) is comprised of 6.45 acres with a curve number of 80 for Open Space in good condition of Hydrological Soil Group D and a time of concentration of 5 minutes. This hydrograph represents the pre-development area of the area within the South Main Street public right of way that will be routed through the stormwater control measure.

Hydrograph 6 (Pre – Lots 3 & 4) is comprised of the combined 2.51 acre parcels (Lots 3 & 4 as shown on the Wallbrook Preliminary Plat (PR 21-04)) with a curve number of 79 for Woods in fair condition of Hydrological Soil Group D and a time of concentration of 7.5 minutes.

Hydrograph 7 (Pre – Wallbrook Townhomes) is comprised of a 0.37 acre portion of the Wallbrook Townhome development (CD 22-02) with a curve number of 79 for Woods in fair condition of Hydrological Soil Group D and a time of concentration of 5 minutes. This represents the pre-development area of the area within the Wallbrook Townhomes (Lot 6 as shown on the Wallbrook Preliminary Plat (PR 21-04)) that will be routed through the stormwater control measure.

Hydrographs 1-4 are totaled into Hydrograph 8 (Pre-Development) and Hydrographs 5-7 are totaled into Hydrograph 9 (Pre-Development). Hydrographs 8 and 9 are then totaled into Hydrograph 10 (Pre-Development Total).

The post-development peak flows have been calculated utilizing Hydraflow Hydrographs and named “Overall Post-Development” in the attachments. Hydrograph 1 (Post –

Wallbrook Lots 1 & 2) is comprised of 11.35 acres with a composite curve number of 95 and a time of concentration of 5 minutes.

Hydrograph 2 (Post – New Roadways (Wallbrook Dr / Va Water Dr)) is comprised of 2.05 acres of the proposed roadway and right-of-way areas with a composite curve number of 96 and a time of concentration of 5 minutes.

Hydrograph 3 (Post – Boat Tract) is comprised of the 5.07 acre parcel (Lot 5 as shown on the Wallbrook Preliminary Plat (PR 21-04)) with a composite curve number of 94 and a time of concentration of 5 minutes. This models the future site with 85% built upon area.

Hydrograph 4 (Post – Paris Tract) is comprised of the 7.06 acre parcel (Lots 9, 10, and 11 as shown on the Wallbrook Preliminary Plat (PR 21-04)) with a composite curve number of 95 and a time of concentration of 5 minutes. This models the future site with 85% built upon area. (Wake County Tax Parcel Number 1758467822)

Hydrograph 5 (Post – DOT Roadway) is comprised of 6.45 acres with a composite curve number of 94 and a time of concentration of 5 minutes. This hydrograph represents the area of the proposed DOT improvements associated with NCDOT U-6241 that will be routed through the stormwater control measure.

Hydrograph 7 (Post – Lots 3 & 4) is comprised of the combined 2.51 acre parcels (Lots 3 & 4 as shown on the Wallbrook Preliminary Plat (PR 21-04)) with a composite curve number of 95 and a time of concentration of 5 minutes. This models the future sites with combined 85% built upon area.

Hydrograph 6 (Post – Direct Release) is comprised of 2.04 acres with a composite curve number of 85 and a time of concentration of 5 minutes. This models all areas that will be directly released offsite and will not be routed through the stormwater control measure.

Hydrograph 8 (Post – Wallbrook Townhomes) is comprised of a 0.37 acre portion of Wallbrook Townhome development (CD 22-02) with a composite curve number of 94 and a time of concentration of 5 minutes. This represents the post-development area within the Wallbrook Townhomes (Lot 6 as shown on the Wallbrook Preliminary Plat (PR 21-04)) that will be routed through the stormwater control measure.

Hydrographs 1, 2, 3, 4, 5, and 7 are totaled to create Hydrograph 9 (Post – Total). Hydrograph 9 is added to Hydrograph 8 to create Hydrograph 10 (Post – Total with Townhomes). Hydrograph 10 is then routed through the proposed wet detention pond creating Hydrograph 11 (Post- Route), and then added to Hydrograph 6 creating Hydrograph 12 (Post-Development Total).

The peak flow rates in the post-development condition are less than the peak flow rates in the pre-development condition. See the table below and the attached Hydraflow Hydrograph calculations for further details.

	1-yr Peak Flow (cfs)	2-yr Peak Flow (cfs)	10-yr Peak Flow (cfs)	100-yr Peak Flow (cfs)
Pre-Development	57.26	81.75	151.63	266.24
Post-Development	44.09	62.28	86.96	111.72

STORMWWATER MANAGEMENT CALCULATIONS FOR LOTS 3 & 4:

Lots 3 & 4 as shown on the Wallbrook Preliminary Plat (PR 21-04) will be cleared and mass graded as part of this project. To comply with Wake County and Town of Rolesville stormwater regulations, an analysis was performed comparing the pre-development peak flow rates to the cleared and graded condition peak flow rates for the 1-yr, 2-yr, 10-yr, and 100-yr 24-hour storms. The descriptions and table below summarize the analysis and conclusions.

Hydrograph 1 (Pre-Dev Lots 3 & 4) is comprised of the 3.91 acre drainage area that is currently draining to the point of analysis along Jonesville Road adjacent to Wake County parcel number 1758453307. Using Table 4 from the NCDEQ Stormwater Design Manual, a curve number of 77 for Woods in good condition (Woods are protected from grazing, and litter and brush adequately cover the soil) of Hydrological Soil Group D was utilized. Using the Kirpich equation to calculate time of concentration with a length of 503', height of 14', and a flow path multiplier of 2 for overland flow in grassy/wooded condition, yielded a time of concentration of 7.5 minutes for the analysis.

Hydrograph 2 (Post-Dev Lots 3 & 4) is comprised of the 2.34 acre drainage area that will be draining to the point of analysis along Jonesville Road adjacent to Wake County parcel number 1758453307 in the mass graded/cleared condition associated with this plan and permit. Using Table 4 from the NCDEQ Stormwater Design Manual, curve number of 80 for Open Space / Lawn (>75% grass cover) in good condition of

Hydrological Soil Group D was utilized. Using the Kirpich equation to calculate time of concentration with a length of 470', height of 12', and a flow path multiplier of 2 for overland flow in grassy/wooded condition, yielded a time of concentration of 7.3 minutes for the analysis.

Hydrograph 1 is then compared to Hydrograph 2 showing no net increase in peak flow leaving the area from the pre-development condition.

	1-yr Peak Flow (cfs)	2-yr Peak Flow (cfs)	10-yr Peak Flow (cfs)	100-yr Peak Flow (cfs)
Pre-Development (Hydrograph 1)	5.679	8.235	15.60	27.79
Interim Graded Condition (Hydrograph 2)	4.051	5.675	10.24	17.62

Future site development plans showing further development from the cleared/graded condition to finish grade with associated infrastructure for these lots will be submitted showing the site is in compliance with the requirements set forth in this stormwater permit: The impervious area must be less than or equal to 85% of the site area. Refer to table on page 3 for impervious limitations.

ATTACHMENTS:

The following sets of calculations and supporting information are included for demonstrating compliance with the pertinent regulations:

- Wet Detention Pond Calculations
- Anti-Flotation Calculations
- Peak Flow and routing calculations for pre-development and post-development peak for the 1-yr, 2-yr, 10-yr, 25-yr, and 100-yr 24-hour storms
- Peak Flow and routing calculations pre-development and interim mass graded condition peak for the 1-yr, 2-yr, 10-yr, 25-yr, and 100-yr 24-hour storms for Lots 3 & 4
- Time of Concentration Calculations utilizing the Kirpich Equation
- Rational C / Curve Number Area & Coverage Calculations
- Rational C / Curve Number Area & Coverage Calculations for Lots 3 & 4 in the mass graded condition
- Wake County Municipal Stormwater Tool
- Rip Rap Apron sizing calculations

- NOAA Atlas 14 Neuse 2 NE Station rainfall data
- Wake County Soil Survey Map
- USGS Quad Map
- Drainage Area Map

WALLBROOK

ROLESVILLE, WAKE COUNTY, NORTH CAROLINA

STORMWATER MANAGEMENT PLAN

DRAWING NO. D-1219

SUPPORTING DOCUMENTS & CALCULATIONS

NOAA Atlas 14, Volume 2, Version 3
Location name: Raleigh, North Carolina, USA*
Latitude: 35.9167°, Longitude: -78.5667°
Elevation: 243.35 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**4.82** (4.42-5.28)	**5.62** (5.15-6.13)	**6.42** (5.89-7.01)	**7.18** (6.56-7.82)	**7.94** (7.24-8.66)	**8.53** (7.74-9.30)	**9.06** (8.16-9.86)	**9.50** (8.53-10.4)	**10.0** (8.90-10.9)	**10.4** (9.20-11.4)
10-min	**3.85** (3.53-4.21)	**4.49** (4.12-4.91)	**5.15** (4.72-5.62)	**5.74** (5.25-6.26)	**6.33** (5.77-6.90)	**6.79** (6.16-7.40)	**7.19** (6.49-7.84)	**7.54** (6.76-8.23)	**7.92** (7.04-8.64)	**8.22** (7.25-8.99)
15-min	**3.21** (2.94-3.51)	**3.76** (3.45-4.11)	**4.34** (3.98-4.74)	**4.84** (4.43-5.28)	**5.35** (4.87-5.83)	**5.74** (5.20-6.25)	**6.06** (5.47-6.60)	**6.34** (5.68-6.92)	**6.64** (5.91-7.25)	**6.88** (6.06-7.52)
30-min	**2.20** (2.02-2.41)	**2.60** (2.38-2.84)	**3.08** (2.83-3.36)	**3.51** (3.21-3.82)	**3.96** (3.61-4.32)	**4.32** (3.92-4.71)	**4.64** (4.19-5.06)	**4.93** (4.42-5.38)	**5.29** (4.70-5.77)	**5.57** (4.91-6.09)
60-min	**1.37** (1.26-1.50)	**1.63** (1.50-1.78)	**1.98** (1.81-2.16)	**2.28** (2.09-2.49)	**2.64** (2.40-2.88)	**2.93** (2.65-3.19)	**3.20** (2.88-3.48)	**3.46** (3.10-3.78)	**3.79** (3.37-4.14)	**4.07** (3.59-4.44)
2-hr	**0.800** (0.728-0.883)	**0.956** (0.872-1.05)	**1.17** (1.06-1.28)	**1.36** (1.24-1.50)	**1.60** (1.44-1.75)	**1.80** (1.61-1.97)	**1.99** (1.77-2.17)	**2.18** (1.93-2.38)	**2.43** (2.13-2.65)	**2.64** (2.30-2.89)
3-hr	**0.565** (0.514-0.625)	**0.675** (0.616-0.744)	**0.829** (0.755-0.913)	**0.974** (0.884-1.07)	**1.15** (1.04-1.26)	**1.31** (1.17-1.43)	**1.46** (1.30-1.60)	**1.62** (1.43-1.77)	**1.83** (1.60-2.00)	**2.01** (1.74-2.21)
6-hr	**0.340** (0.311-0.375)	**0.407** (0.373-0.447)	**0.500** (0.457-0.549)	**0.588** (0.536-0.644)	**0.699** (0.632-0.764)	**0.796** (0.716-0.869)	**0.893** (0.796-0.973)	**0.994** (0.877-1.08)	**1.13** (0.985-1.23)	**1.25** (1.08-1.37)
12-hr	**0.200** (0.183-0.220)	**0.239** (0.220-0.261)	**0.295** (0.270-0.323)	**0.349** (0.318-0.381)	**0.417** (0.378-0.455)	**0.478** (0.431-0.519)	**0.540** (0.481-0.586)	**0.606** (0.534-0.657)	**0.697** (0.604-0.754)	**0.778** (0.664-0.843)
24-hr	**0.119** (0.111-0.128)	**0.144** (0.134-0.154)	**0.180** (0.168-0.193)	**0.209** (0.194-0.224)	**0.248** (0.230-0.266)	**0.279** (0.258-0.299)	**0.310** (0.286-0.333)	**0.343** (0.315-0.368)	**0.387** (0.355-0.415)	**0.422** (0.385-0.454)
2-day	**0.069** (0.064-0.074)	**0.083** (0.078-0.089)	**0.103** (0.096-0.111)	**0.119** (0.111-0.128)	**0.141** (0.131-0.151)	**0.158** (0.146-0.169)	**0.175** (0.162-0.188)	**0.192** (0.177-0.207)	**0.217** (0.199-0.233)	**0.235** (0.215-0.254)
3-day	**0.049** (0.046-0.052)	**0.059** (0.055-0.063)	**0.073** (0.068-0.078)	**0.083** (0.078-0.089)	**0.098** (0.092-0.105)	**0.110** (0.102-0.118)	**0.122** (0.113-0.131)	**0.134** (0.124-0.144)	**0.151** (0.139-0.162)	**0.165** (0.150-0.177)
4-day	**0.039** (0.036-0.041)	**0.046** (0.043-0.049)	**0.057** (0.054-0.061)	**0.066** (0.061-0.070)	**0.077** (0.072-0.082)	**0.086** (0.080-0.092)	**0.096** (0.089-0.102)	**0.105** (0.097-0.113)	**0.119** (0.109-0.127)	**0.129** (0.118-0.138)
7-day	**0.026** (0.024-0.027)	**0.031** (0.029-0.032)	**0.037** (0.035-0.040)	**0.042** (0.040-0.045)	**0.050** (0.046-0.053)	**0.055** (0.052-0.059)	**0.061** (0.057-0.065)	**0.067** (0.062-0.072)	**0.075** (0.069-0.080)	**0.082** (0.075-0.087)
10-day	**0.020** (0.019-0.022)	**0.024** (0.023-0.026)	**0.029** (0.027-0.031)	**0.033** (0.031-0.035)	**0.038** (0.036-0.041)	**0.042** (0.039-0.045)	**0.046** (0.043-0.049)	**0.050** (0.047-0.054)	**0.056** (0.052-0.060)	**0.060** (0.056-0.065)
20-day	**0.014** (0.013-0.015)	**0.016** (0.015-0.017)	**0.019** (0.018-0.020)	**0.021** (0.020-0.023)	**0.024** (0.023-0.026)	**0.027** (0.025-0.029)	**0.029** (0.027-0.031)	**0.032** (0.030-0.034)	**0.035** (0.033-0.038)	**0.038** (0.035-0.041)
30-day	**0.011** (0.011-0.012)	**0.013** (0.013-0.014)	**0.015** (0.015-0.016)	**0.017** (0.016-0.018)	**0.019** (0.018-0.021)	**0.021** (0.020-0.022)	**0.023** (0.021-0.024)	**0.024** (0.023-0.026)	**0.027** (0.025-0.028)	**0.028** (0.026-0.030)
45-day	**0.010** (0.009-0.010)	**0.011** (0.011-0.012)	**0.013** (0.012-0.014)	**0.014** (0.013-0.015)	**0.016** (0.015-0.017)	**0.017** (0.016-0.018)	**0.018** (0.017-0.019)	**0.019** (0.018-0.020)	**0.021** (0.020-0.022)	**0.022** (0.021-0.023)
60-day	**0.009** (0.008-0.009)	**0.010** (0.010-0.011)	**0.011** (0.011-0.012)	**0.012** (0.012-0.013)	**0.014** (0.013-0.014)	**0.015** (0.014-0.015)	**0.016** (0.015-0.016)	**0.017** (0.016-0.017)	**0.018** (0.017-0.019)	**0.019** (0.018-0.020)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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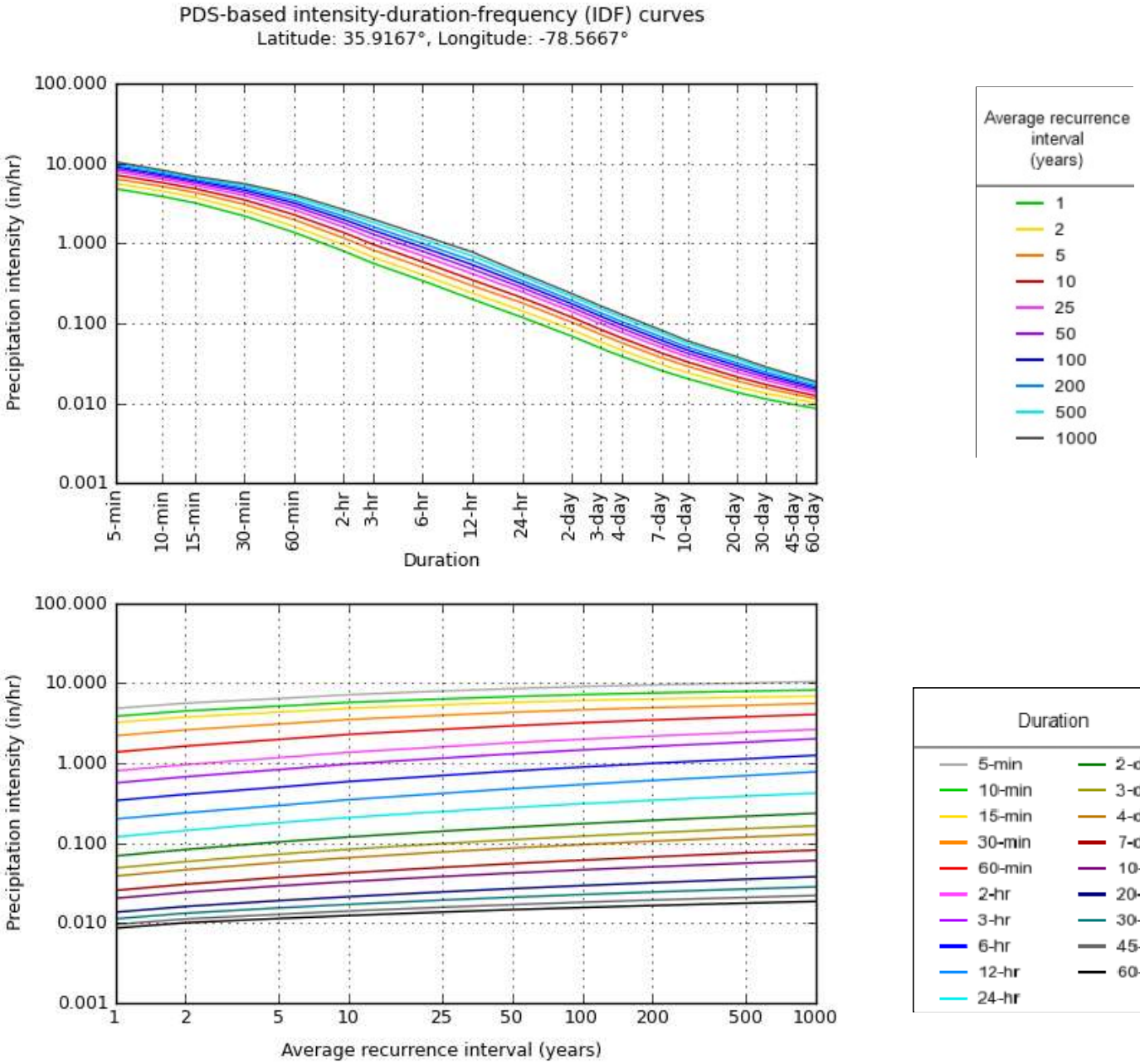
PF graphical



NOAA Atlas 14, Volume 2, Version 3

Created (GMT): Fri Jan 6 13:04:06 2023

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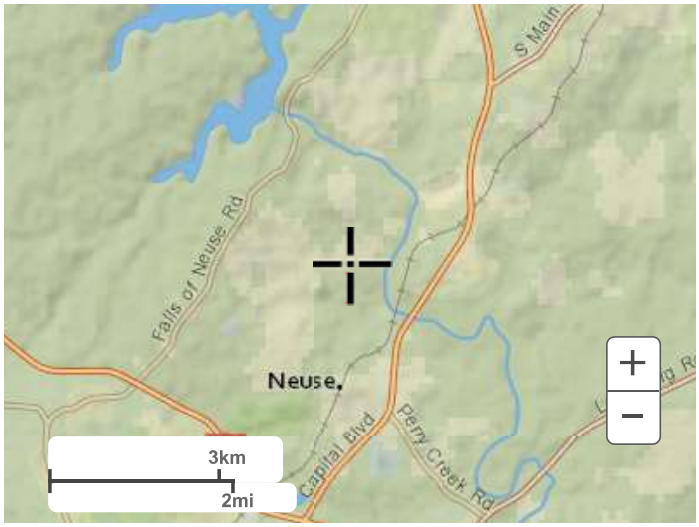
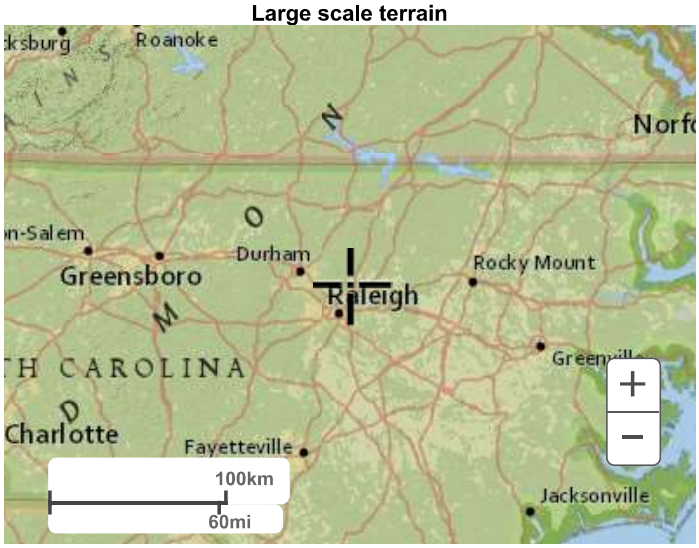
Maps & aerials

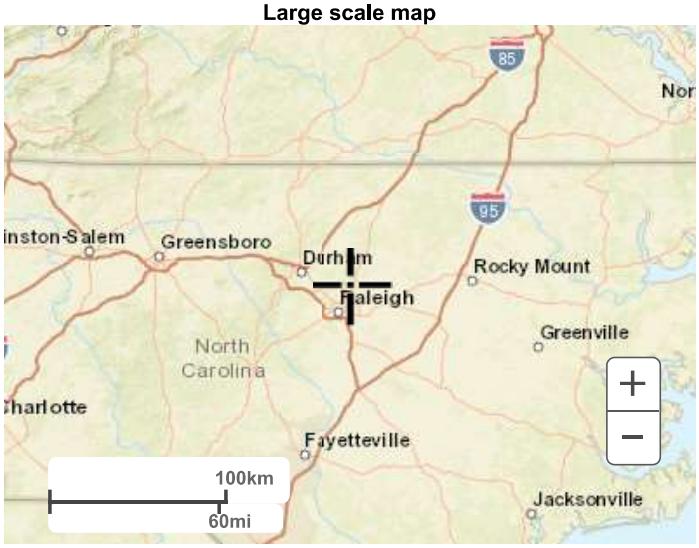
Small scale terrain



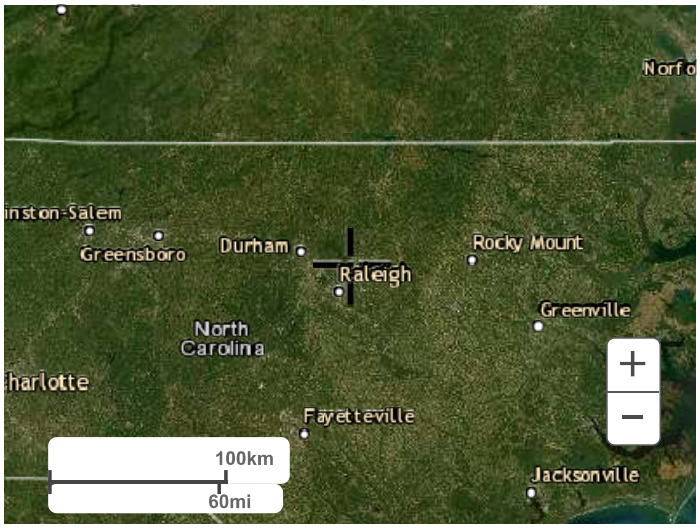
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

HEC14, Section 10 and NCDOT 876.02 Rip Rap Outlet Design

Pipe Properties																	NCDOT 876.02 Dimension Ratios			Selected Pad Dimensions				
From	To	Type	Manning's N	Slope (ft/ft)	Diameter (in)	Ditch Outlet?	Vfull (ft/s)	Qfull (cfs)	Diameter (ft)	Tailwater Depth TW/D	Tailwater Depth TW (ft)	Rip Rap Size D50 (in)	Apron Length La/D	Apron Length La (ft)	Rip Rap Size Selected D50 (in)	Apron Depth Da/D50	Apron Depth Da (in)	Pad Entry	Pad Exit	Pad Length	Pad Entry (ft)	Pad Exit (ft)	Pad Length (ft)	Pad Depth (in)	Class
201	200	RCP	0.013	0.0200	42	No Ditch	14.8	142.7	3.50	0.4	1.4	23.76	8	28	22	2	48	2	4	4	7	14	28	48	6
301	300	RCP	0.013	0.0200	36	No Ditch	13.4	94.6	3.00	0.4	1.2	19.68	7	21	20	2	40	2	4	4	6	12	21	40	5
401	400	RCP	0.013	0.0100	30	No Ditch	8.4	41.1	2.50	0.4	1	9.92	5	12.5	10	2.4	24	2	4	4	5	10	13	24	3
501A	500	RCP	0.013	0.0100	15	No Ditch	5.3	6.5	1.25	0.4	0.5	4.25	4	5	5	3.5	15	2	4	4	3	5	5	15	1
601	600	RCP	0.013	0.0030	15	No Ditch	2.9	3.5	1.25	0.4	0.5	1.91	4	5	5	3.5	7	2	4	4	3	5	5	7	1
SCM	100	RCP	0.013	0.0100	30	No Ditch	8.4	41.1	2.50	0.4	1	9.92	5	12.5	10	2.4	24	2	4	4	5	10	13	24	3

Runoff & Coverages Calculation

Pre-Development - Lot 5 (Boat Tract)

	Area (SF)	Area (AC)	C	CN
A Soils - Open Space	-	0.00	0.20	39
B Soils - Open Space	-	0.00	0.22	61
C Soils - Open Space	-	0.00	0.48	74
D Soils - Open Space	-	0.00	0.60	80
A Soils - Woods	-	0.00	0.15	36
B Soils - Woods	-	0.00	0.20	60
C Soils - Woods	220,849	5.07	0.46	73
D Soils - Woods	-	0.00	0.58	79
TOTAL/COMPOSITE	220,849	5.07	0.46	73.00

Pre-Development - Wallbrook Lot 1A, 1B, & 1C

	Area (SF)	Area (AC)	C	CN
A Soils - Open Space	-	0.00	0.20	39
B Soils - Open Space	-	0.00	0.22	61
C Soils - Open Space	-	0.00	0.48	74
D Soils - Open Space	-	0.00	0.60	80
A Soils - Woods	-	0.00	0.15	36
B Soils - Woods	-	0.00	0.20	60
C Soils - Woods	-	0.00	0.46	73
D Soils - Woods	477,918	10.97	0.58	79
TOTAL/COMPOSITE	477,918	10.97	0.58	79.00

Pre-Development - Wallbrook Lot 2

	Area (SF)	Area (AC)	C	CN
A Soils - Open Space	-	0.00	0.20	39
B Soils - Open Space	-	0.00	0.22	61
C Soils - Open Space	-	0.00	0.48	74
D Soils - Open Space	-	0.00	0.60	80
A Soils - Woods	-	0.00	0.15	36
B Soils - Woods	-	0.00	0.20	60
C Soils - Woods	-	0.00	0.46	73
D Soils - Woods	85,907	1.97	0.58	79
TOTAL/COMPOSITE	85,907	1.97	0.58	79.00

Pre-Development - Lots 3 & 4

	Area (SF)	Area (AC)	C	CN
A Soils - Open Space	-	0.00	0.20	39
B Soils - Open Space	-	0.00	0.22	61
C Soils - Open Space	-	0.00	0.48	74
D Soils - Open Space	-	0.00	0.60	80
A Soils - Woods	-	0.00	0.15	36
B Soils - Woods	-	0.00	0.20	60
C Soils - Woods	-	0.00	0.46	73
D Soils - Woods	109,239	2.51	0.58	79
TOTAL/COMPOSITE	109,239	2.51	0.58	79.00

Runoff & Coverages Calculation

Post-Development - Lot 5 (Boat Tract)

	Area (SF)	Area (AC)	C	CN
Bldg. Imp. - C soils	37,544	0.86	0.96	98
Trans. Imp. - C soils	150,177	3.45	0.96	98
Remaining - A Soils - Good Condition Lawn	-	0.00	0.20	39
Remaining - B Soils - Good Condition Lawn	-	0.00	0.22	61
Remaining - C Soils - Good Condition Lawn	33,127	0.76	0.48	74
Remaining - D Soils - Good Condition Lawn	-	0.00	0.60	80
Remaining - A Soils - Woods	-	0.00	0.15	36
Remaining - B Soils - Woods	-	0.00	0.20	60
Remaining - C Soils - Woods	-	0.00	0.46	73
Remaining - D Soils - Woods	-	0.00	0.58	79
TOTAL/COMPOSITE	220,849	5.07	0.89	94.40

Post-Development - Wallbrook Lot 1A, 1B, & 1C

	Area (SF)	Area (AC)	C	CN
Bldg. Imp. - D soils	77,757	1.79	0.96	98
Trans. Imp. - D soils	272,876	6.26	0.96	98
Remaining - A Soils - Good Condition Lawn	-	0.00	0.20	39
Remaining - B Soils - Good Condition Lawn	-	0.00	0.22	61
Remaining - C Soils - Good Condition Lawn	-	0.00	0.48	74
Remaining - D Soils - Good Condition Lawn	86,661	1.99	0.60	80
Remaining - A Soils - Woods	-	0.00	0.15	36
Remaining - B Soils - Woods	-	0.00	0.20	60
Remaining - C Soils - Woods	-	0.00	0.46	73
Remaining - D Soils - Woods	-	0.00	0.58	79
Direct Release - D Soils - Good Condition Lawn	40,624	0.93	0.60	80
Direct Release - Trans. Imp.	-	0.00	0.96	98
TOTAL/COMPOSITE	477,918	10.97	0.89	94.43

Post-Development - Wallbrook Lot 2

	Area (SF)	Area (AC)	C	CN
Bldg. Imp. - D soils	11,900	0.27	0.96	98
Trans. Imp. - D soils	38,828	0.89	0.96	98
Remaining - A Soils - Good Condition Lawn	-	0.00	0.20	39
Remaining - B Soils - Good Condition Lawn	-	0.00	0.22	61
Remaining - C Soils - Good Condition Lawn	-	0.00	0.48	74
Remaining - D Soils - Good Condition Lawn	6,610	0.15	0.60	80
Remaining - A Soils - Woods	-	0.00	0.15	36
Remaining - B Soils - Woods	-	0.00	0.20	60
Remaining - C Soils - Woods	-	0.00	0.46	73
Remaining - D Soils - Woods	-	0.00	0.58	79
Direct Release - D Soils - Good Condition Lawn	21,164	0.49	0.60	80
Direct Release - Trans. Imp.	7,405	0.17	0.96	98
TOTAL/COMPOSITE	85,907	1.97	0.92	95.92

Post-Development - Lots 3 & 4

	Area (SF)	Area (AC)	C	CN
Bldg. Imp. - D soils	13,928	0.32	0.96	98
Trans. Imp. - D soils	78,925	1.81	0.96	98
Remaining - A Soils - Good Condition Lawn	-	0.00	0.20	39
Remaining - B Soils - Good Condition Lawn	-	0.00	0.22	61
Remaining - C Soils - Good Condition Lawn	-	0.00	0.48	74
Remaining - D Soils - Good Condition Lawn	16,386	0.38	0.60	80
Remaining - A Soils - Woods	-	0.00	0.15	36
Remaining - B Soils - Woods	-	0.00	0.20	60
Remaining - C Soils - Woods	-	0.00	0.46	73
Remaining - D Soils - Woods	-	0.00	0.58	79
TOTAL/COMPOSITE	109,239	2.51	0.91	95.30

Pre-Development - Paris Tract (Lots 9, 10, & 11)	Area (SF)	Area (AC)	C	CN
A Soils - Open Space	-	0.00	0.20	39
B Soils - Open Space	-	0.00	0.22	61
C Soils - Open Space	-	0.00	0.48	74
D Soils - Open Space	-	0.00	0.60	80
A Soils - Woods	-	0.00	0.15	36
B Soils - Woods	-	0.00	0.20	60
C Soils - Woods	-	0.00	0.46	73
D Soils - Woods	307,534	7.06	0.58	79
TOTAL/COMPOSITE	307,534	7.06	0.58	79.00

Post-Development - Paris Tract (Lots 9, 10, & 11)	Area (SF)	Area (AC)	C	CN
Bldg. Imp. - D soils	52,281	1.20	0.96	98
Trans. Imp. - D soils	209,123	4.80	0.96	98
Remaining - A Soils - Good Condition Lawn	-	0.00	0.20	39
Remaining - B Soils - Good Condition Lawn	-	0.00	0.22	61
Remaining - C Soils - Good Condition Lawn	-	0.00	0.48	74
Remaining - D Soils - Good Condition Lawn	46,130	1.06	0.60	80
Remaining - A Soils - Woods	-	0.00	0.15	36
Remaining - B Soils - Woods	-	0.00	0.20	60
Remaining - C Soils - Woods	-	0.00	0.46	73
Remaining - D Soils - Woods	-	0.00	0.58	79
TOTAL/COMPOSITE	307,534	7.06	0.91	95.30

Pre-Development - New Roadways (VA Water & Wallbrook)	Area (SF)	Area (AC)	C	CN
A Soils - Open Space	-	0.00	0.20	39
B Soils - Open Space	-	0.00	0.22	61
C Soils - Open Space	-	0.00	0.48	74
D Soils - Open Space	-	0.00	0.60	80
A Soils - Woods	-	0.00	0.15	36
B Soils - Woods	-	0.00	0.20	60
C Soils - Woods	-	0.00	0.46	73
D Soils - Woods	108,464	2.49	0.58	79
TOTAL/COMPOSITE	108,464	2.49	0.58	79.00

Post-Development - New Roadways (VA Water & Wallbrook)	Area (SF)	Area (AC)	C	CN
Bldg. Imp. - D soils	-	0.00	0.96	98
Trans. Imp. - D soils	79,263	1.82	0.96	98
Remaining - A Soils - Good Condition Lawn	-	0.00	0.20	39
Remaining - B Soils - Good Condition Lawn	-	0.00	0.22	61
Remaining - C Soils - Good Condition Lawn	-	0.00	0.48	74
Remaining - D Soils - Good Condition Lawn	9,863	0.23	0.60	80
Remaining - A Soils - Woods	-	0.00	0.15	36
Remaining - B Soils - Woods	-	0.00	0.20	60
Remaining - C Soils - Woods	-	0.00	0.46	73
Remaining - D Soils - Woods	-	0.00	0.58	79
Direct Release - D Soils - Good Condition Lawn	2,578	0.06	0.60	80
Direct Release - Trans. Imp.	16,760	0.38	0.96	98
TOTAL/COMPOSITE	108,464	2.49	0.76	96.0

Post-Development - DOT Roadway (Main St.)	Area (SF)	Area (AC)	C	CN
A Soils - Open Space	-	0.00	0.20	39
B Soils - Open Space	-	0.00	0.22	61
C Soils - Open Space	-	0.00	0.48	74
D Soils - Open Space	281,175	6.45	0.60	80
A Soils - Woods	-	0.00	0.15	36
B Soils - Woods	-	0.00	0.20	60
C Soils - Woods	-	0.00	0.46	73
D Soils - Woods	-	0.00	0.58	79
TOTAL/COMPOSITE	281,175	6.45	0.60	80.00

Post-Development - DOT Roadway (Main St.)	Area (SF)	Area (AC)	C	CN
Bldg. Imp. - D soils	-	0.00	0.96	98
Trans. Imp. - D soils	216,200	4.96	0.96	98
Remaining - A Soils - Good Condition Lawn	-	0.00	0.20	39
Remaining - B Soils - Good Condition Lawn	-	0.00	0.22	61
Remaining - C Soils - Good Condition Lawn	-	0.00	0.48	74
Remaining - D Soils - Good Condition Lawn	64,975	1.49	0.60	80
Remaining - A Soils - Woods	-	0.00	0.15	36
Remaining - B Soils - Woods	-	0.00	0.20	60
Remaining - C Soils - Woods	-	0.00	0.46	73
Remaining - D Soils - Woods	-	0.00	0.58	79
TOTAL/COMPOSITE	281,175	6.45	0.88	93.84

Post-Development - Wallbrook Townhomes (Lot 6)	Area (SF)	Area (AC)	C	CN
A Soils - Open Space	-	0.00	0.20	39
B Soils - Open Space	-	0.00	0.22	61
C Soils - Open Space	-	0.00	0.48	74
D Soils - Open Space	-	0.00	0.60	80
A Soils - Woods	-	0.00	0.15	36
B Soils - Woods	-	0.00	0.20	60
C Soils - Woods	-	0.00	0.46	73
D Soils - Woods	16,117	0.37	0.58	79
TOTAL/COMPOSITE	16,117	0.37	0.58	79.00

Post-Development - Wallbrook Townhomes (Lot 6)	Area (SF)	Area (AC)	C	CN
Bldg. Imp. - D soils	12,088	0.28	0.96	98
Trans. Imp. - D soils	-	0.00	0.96	98
Remaining - A Soils - Good Condition Lawn	-	0.00	0.20	39
Remaining - B Soils - Good Condition Lawn	-	0.00	0.22	61
Remaining - C Soils - Good Condition Lawn	-	0.00	0.48	74
Remaining - D Soils - Good Condition Lawn	4,029	0.09	0.60	80
Remaining - A Soils - Woods	-	0.00	0.15	36
Remaining - B Soils - Woods	-	0.00	0.20	60
Remaining - C Soils - Woods	-	0.00	0.46	73
Remaining - D Soils - Woods	-	0.00	0.58	79
TOTAL/COMPOSITE	16,117	0.37	0.87	93.50

Runoff & Coverages Calculation

Pre-Development - Lots 3 & 4	Area (SF)	Area (AC)	C	CN
A Soils - Open Space	-	0.00	0.20	39
B Soils - Open Space	-	0.00	0.22	61
C Soils - Open Space	-	0.00	0.48	74
D Soils - Open Space	-	0.00	0.60	80
A Soils - Woods	-	0.00	0.15	36
B Soils - Woods	-	0.00	0.20	60
C Soils - Woods	-	0.00	0.46	73
D Soils - Woods	170,237	3.91	0.58	77
TOTAL/COMPOSITE	170,237	3.91	0.58	77.00

Pre-Development - Lots 3 & 4

Overland Flow (Grassy/Wooded)		
Hydraulic length of watershed, L	503	ft
Height of watershed, H	14	ft
Flow Path Multiplier, K	2	
Channelized Flow		
Hydraulic length of watershed, L	0	ft
Height of watershed, H	0.01	ft
Flow Path Multiplier, K	0.2	
Time of concentration, tc	7.5	min
Time of concentration, tc	7.5	min

Runoff & Coverages Calculation

Interim Grading Condition - Lots 3 & 4	Area (SF)	Area (AC)	C	CN
Bldg. Imp. - D soils	-	0.00	0.96	98
Trans. Imp. - D soils	-	0.00	0.96	98
Remaining - A Soils - Good Condition Lawn	-	0.00	0.20	39
Remaining - B Soils - Good Condition Lawn	-	0.00	0.22	61
Remaining - C Soils - Good Condition Lawn	-	0.00	0.48	74
Remaining - D Soils - Good Condition Lawn	102,017	2.34	0.60	80
Remaining - A Soils - Woods	-	0.00	0.15	36
Remaining - B Soils - Woods	-	0.00	0.20	60
Remaining - C Soils - Woods	-	0.00	0.46	73
Remaining - D Soils - Woods	-	0.00	0.58	79
TOTAL/COMPOSITE	102,017	2.34	0.60	80.00

Interim Grading Condtion - Lots 3 & 4

Overland Flow (Grassy/Wooded)		
Hydraulic length of watershed, L	470	ft
Height of watershed, H	12	ft
Flow Path Multiplier, K	2	
Channelized Flow		
Hydraulic length of watershed, L	0	ft
Height of watershed, H	0.01	ft
Flow Path Multiplier, K	0.2	
Time of concentration, tc	7.3	min
Time of concentration, tc	7.3	min

Towns of Rolesville, Wendell and Zebulon Stormwater Tool Directions

The Wake County Municipal Stormwater Tool is required for all stormwater submittals in Rolesville Wendell, and Zebulon. Engineer will input all data requested that is highlighted in blue. Engineer may follow provided links to view calculations used in this tool. Calculations for peak flow, runoff, time of concentration, etc. are for individual drainage areas. Engineer should complete a worksheet for each drainage area within a project limit.

1	Complete SITE DATA worksheet. SITE DATA worksheet should be submitted with preliminary plan submittals and modified and submitted for construction plan submittals. The 2-yr, 24-hr rainfall input will be used for projects requesting LID classification further into the tool. The 10-year, 24-hour rainfall input will be used for potential Downstream Impact Analyses (DIA). Stormwater Narrative should describe the site conditions in pre- and post-development conditions including a description of site improvements and proposed stormwater BMPs.
2	Complete DA worksheets. Most of the site data is inputted by the engineer on the DA worksheets. DA worksheets are designed essentially to account for Ultra-Low, Low, and High Density project requirements per Ordinance standards. DA Worksheets will calculate runoff, time of concentration, peak flow, and volume to be managed per drainage area. Inputs will also be used to calculate the site composite curve numbers for pre and post development, Target Curve Number (TCN), and total nitrogen loading (TN) calculations. This sheet will also calculate required volume management for the 1st inch rainfall for high density projects. 1st inch of runoff should be handled by each DA BMP for High Density projects. Disconnected Impervious - This area will be used to provide an adjusted post development composite curve number ($CN_{adjusted}$) to allow a credit for the use of disconnected impervious. Site plans should clearly indicate areas of disconnected impervious.
3	SITE SUMMARY worksheet summarizes the pre and post runoff, Tc, and peak flow per drainage area based on inputs from DA worksheets. This worksheet denotes the volume required for management per drainage area based on high density requirements. TCN and composite curve numbers for pre and post development are also calculated and summarized. If the TCN is exceeded, this worksheet will calculate total volume to be managed for the entire site based on TCN requirements. Nitrogen Loading: Nitrogen Loading Rate for the site is calculated based on the Hydrologic Soil Groups and site acreages imputed on DA worksheets. This worksheet calculates the total amount of nitrogen loading. Nitrogen total will be used on following BMP worksheets. Note: There are no engineer inputs on this sheet and all exeedances from DA worksheets will be flagged in red.
4	DA BMP worksheets require engineer to input proposed BMP information. BMPs are categorized by sub-basins within the drainage area. Engineer should input BMP device name, type, and volume provided. BMP requirements are automatically imported from previous inputs. Engineer should input land uses by sub-basin. Off-site drainage to the sub-basin may also be inputted to allow credit for nitrogen removal (if said drainage is routed through the BMP). BMPs are required in each DA where post-development peak flow is higher than pre-development peak flow. Only under special circumstances will a BMP not be required. In these cases, the engineer must show the following: 1. Total runoff volume for the DA must be less than 10% of the entire site runoff. 2. TN must be handled for the site elsewhere. 3. Runoff must not leave the DA at an erosive velocity. 4. Proposed design must comply with all state and federal regulations. DA BMP worksheets will ensure that proposed BMPs meet requirements for peak flow, TCN, and for Nitrogen. Engineer must input post-BMP discharge. Note: Engineers are required to input post BMP peak flow for the 1-year, 2-year, and 10-year storms for each DA. The SW Design Tool uses the TR-55 method. The TR-55 method is preferred for post BMP calculations. If engineer uses a method/model other than TR-55 for the post-BMP peak discharge and runoff, engineer must also provide pre-development calculations from the method/model (in addition to the SW Design Tool) and pre-development calculations must be within 10% of results computed by the SW Design Tool). A summary sheet should be attached with the submittal to for all inputs used in design.
5	BMP SUMMARY worksheet summarizes the pre and post BMP runoff, and peak flow per drainage area based on inputs from DA BMP worksheets. Nitrogen Loading: Nitrogen mitigated for the site is calculated based on the inputs on DA BMP worksheets. This worksheet calculates the total amount of nitrogen left to be mitigated for the site (Wendell only). Site expansions use the aportioning method. Note: There are no engineer inputs on this sheet and all exeedances from DA BMP worksheets will be flagged in red.
6	LID worksheet summarizes the pre and post runoff, Tc, and peak flow per drainage area for the 2-year, 24-hour storm based on inputs from DA and BMP worksheets. This worksheet will determine if design calculations provided meet LID classification. Engineers may wish to modify site design or mitigate with additional BMPs to meet LID Requirements. In that case, DA and BMP worksheets should be modified to meet these requirements and the LID sheet will be updated automatically. If calculation requirements for LID are met, Engineer should complete the *LID CHECKLIST* on **LID** worksheet and provide associated documentation to determine if project meets ALL LID requirements.
7	Downstream Impact Analysis DIA worksheet presents requirements for a downstream impact analysis. Based on engineer inputs, this sheet will report if a DIA is required for the project based on the 10-year storm discharge leaving each discharge point. This stormwater tool does NOT complete the actual downstream impact analyses. A DIA shall be performed at the outlet(s) of the site, and downstream at each tributary junction to the point(s) in the conveyance system where the area of the portion of the site draining into the system is less than or equal to 10 percent of the total drainage area above that point. The outflow hydrograph at these points is to be determined for the pre-development condition. Then, the outflow hydrograph at each of these points is to be determined for the conditions after the site in question has been developed. All hydrographs and inputs should be provided with plan submittal.

WAKE COUNTY
NORTH CAROLINA

SITE DATA

Project Information	
Project Name:	**21089 - Wallbrook**
Applicant:	Ark Consulting Group, PLLC
Applicant Contact Name:	Bryan C. Fagundus, P.E.
Applicant Contact Number:	252-565-1024
Contact Email:	bryan@arkconsultinggroup.com
Municipal Jurisdiction (Select from dropdown menu):	Rolesville
Last Updated:	Tuesday, September 19, 2023
Site Data:	
Total Site Area (Ac):	36.90
Existing Lake/Pond Area (Ac):	0.00
Proposed Disturbed Area (Ac):	36.90
Impervious Surface Area (acre):	29.27
Type of Development (Select from Dropdown menu):	Non-Residential
Percent Built Upon Area (BUA):	79%
Project Density:	High
Is the proposed project a site expansion?	No
Number of Drainage Areas on Site:	8
NOAA — **1-Year, 24-Hour Storm (inches) (See NOAA Website):**	2.86
NOAA — **2-Year, 24-Hour Storm (inches) (See NOAA Website):**	3.45
NOAA — **10-Year, 24-Hour Storm (inches) (See NOAA Website):**	5.01
Lot Data (if applicable):	
Total Acreage in Lots:	
Number of Lots:	
Average Lot Size (SF):	
Total Impervious Surface Area on Lots (SF):	
Average Impervious Surface Area Per Lot (SF):	
Stormwater Narrative (limit to 1,200 characters - attach additional pages with submittal if necessary):	

See Stormwater Management Narrative. Due to multiple tracts of land having separate drainage pattens, Time of Concentration calculations have been attached in the narrative submittal. All post-development Time of Concentrations have been assumed as 5 minutes. See attached Hydraflow Hydrograph for Pre-Development and Post-Development Peak Flows.

Project Name: 21089 - Wallbrook

DRAINAGE AREA 1
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=	5.07				5.07			
Site Acreage within Drainage=	5.07				5.07			
One-year, 24-hour rainfall (in)=	2.86							
Two-year, 24-hour rainfall (in)=	3.45							
Ten-year, 24-hour storm (in)=	5.01							
Total Lake/Pond Area (Acres)=	0.00				0.00			
Lake/Pond Area not in the Tc flow path (Acres)=	0.00				0.00			
Site Land Use (acres):	A	B	C	D	A	B	C	D
Pasture								
Woods, Poor Condition								
Woods, Fair Condition								
Woods, Good Condition			5.07					
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition							0.76	
Reforestation (in dedicated OS)								
Connected Impervious							4.31	
Disconnected Impervious								
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
n-value=								
T_t (hrs)=								
Shallow Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
Average Velocity (ft/sec)=								
T_t (hrs)=								
Channel Flow 1								
Length (ft)=								
Slope (ft/ft)=								
Cross Sectional Flow Area (ft^2)=								
Wetted Perimeter (ft)=								
Channel Lining:								
n-value=								
Hydraulic Radius (ft)=								
Average Velocity (ft/sec)=								
T_t (hrs)=								

Project Name: 21089 - Wallbrook

DRAINAGE AREA 1
STORMWATER PRE-POST CALCULATIONS

Channel Flow 2		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Channel Flow 3		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Tc (hrs)=	0.18	0.08
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=		
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=		
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =		
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=		
Volume of runoff (ft^3) =		
Volume change (ft^3) =		
Peak Discharge (cfs)= $Q_{1\text{-}year}$=		
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{2\text{-}year}$=		
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{10\text{-}year}$=		

Project Name: 21089 - Wallbrook

DRAINAGE AREA 2
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=	10.97				10.97			
Site Acreage within Drainage=	10.97				10.97			
One-year, 24-hour rainfall (in)=	2.86							
Two-year, 24-hour rainfall (in)=	3.45							
Ten-year, 24-hour storm (in)=	5.01							
Total Lake/Pond Area (Acres)=								
Lake/Pond Area not in the Tc flow path (Acres)=								
Site Land Use (acres):	A	B	C	D	A	B	C	D
Pasture								
Woods, Poor Condition								
Woods, Fair Condition								
Woods, Good Condition				10.97				
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition								2.92
Reforestation (in dedicated OS)								
Connected Impervious								8.05
Disconnected Impervious								
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
n-value=								
T_t (hrs)=								
Shallow Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
Average Velocity (ft/sec)=								
T_t (hrs)=								
Channel Flow 1								
Length (ft)=								
Slope (ft/ft)=								
Cross Sectional Flow Area (ft^2)=								
Wetted Perimeter (ft)=								
Channel Lining:								
n-value=								
Hydraulic Radius (ft)=								
Average Velocity (ft/sec)=								
T_t (hrs)=								

Project Name: 21089 - Wallbrook

DRAINAGE AREA 2
STORMWATER PRE-POST CALCULATIONS

Channel Flow 2		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Channel Flow 3		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Tc (hrs)=	0.11	0.08
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=		
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=		
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =		
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=		
Volume of runoff (ft^3) =		
Volume change (ft^3) =		
Peak Discharge (cfs)= $Q_{1\text{-}year}$=		
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{2\text{-}year}$=		
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{10\text{-}year}$=		

Project Name: 21089 - Wallbrook

DRAINAGE AREA 3
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=	1.97				1.97			
Site Acreage within Drainage=	1.97				1.97			
One-year, 24-hour rainfall (in)=	2.86							
Two-year, 24-hour rainfall (in)=	3.45							
Ten-year, 24-hour storm (in)=	5.01							
Total Lake/Pond Area (Acres)=	0.00				0.00			
Lake/Pond Area not in the Tc flow path (Acres)=	0.00				0.00			
Site Land Use (acres):	A	B	C	D	A	B	C	D
Pasture								
Woods, Poor Condition								
Woods, Fair Condition								
Woods, Good Condition				1.97				
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition								0.64
Reforestation (in dedicated OS)								
Connected Impervious								1.33
Disconnected Impervious								
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
n-value=								
T_t (hrs)=								
Shallow Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
Average Velocity (ft/sec)=								
T_t (hrs)=								
Channel Flow 1								
Length (ft)=								
Slope (ft/ft)=								
Cross Sectional Flow Area (ft^2)=								
Wetted Perimeter (ft)=								
Channel Lining:								
n-value=								
Hydraulic Radius (ft)=								
Average Velocity (ft/sec)=								
T_t (hrs)=								

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DRAINAGE AREA 3
STORMWATER PRE-POST CALCULATIONS

Channel Flow 2		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Channel Flow 3		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Tc (hrs)=	0.11	0.08
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=		
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=		
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =		
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=		
Volume of runoff (ft^3) =		
Volume change (ft^3) =		
Peak Discharge (cfs)= $Q_{1\text{-}year}$=		
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{2\text{-}year}$=		
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{10\text{-}year}$=		

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DRAINAGE AREA 4
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=	2.51				2.51			
Site Acreage within Drainage=	2.51				2.51			
One-year, 24-hour rainfall (in)=	2.86							
Two-year, 24-hour rainfall (in)=	3.45							
Ten-year, 24-hour storm (in)=	5.01							
Total Lake/Pond Area (Acres)=								
Lake/Pond Area not in the Tc flow path (Acres)=								
Site Land Use (acres):	A	B	C	D	A	B	C	D
Pasture								
Woods, Poor Condition								
Woods, Fair Condition								
Woods, Good Condition				2.51				
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition								0.38
Reforestation (in dedicated OS)								
Connected Impervious								2.13
Disconnected Impervious								
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
n-value=								
T_t (hrs)=								
Shallow Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
Average Velocity (ft/sec)=								
T_t (hrs)=								
Channel Flow 1								
Length (ft)=								
Slope (ft/ft)=								
Cross Sectional Flow Area (ft^2)=								
Wetted Perimeter (ft)=								
Channel Lining:								
n-value=								
Hydraulic Radius (ft)=								
Average Velocity (ft/sec)=								
T_t (hrs)=								

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DRAINAGE AREA 4
STORMWATER PRE-POST CALCULATIONS

Channel Flow 2		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Channel Flow 3		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Tc (hrs)=	0.15	0.08
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=	77	95
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=	**95**	
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =	7,414	
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=	0.98	2.34
Volume of runoff (ft^3) =	8,885	21,320
Volume change (ft^3) =	12,435	
Peak Discharge (cfs)= $Q_{1\text{-}year}$=	3.061	9.743
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=	1.39	2.92
Volume of runoff (ft^3) =	12,696	26,589
Peak Discharge (cfs)= $Q_{2\text{-}year}$=	4.374	12.152
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=	2.63	4.46
Volume of runoff (ft^3) =	23,975	40,635
Peak Discharge (cfs)= $Q_{10\text{-}year}$=	8.260	18.571

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DRAINAGE AREA 5
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=	7.06				7.06			
Site Acreage within Drainage=	7.06				7.06			
One-year, 24-hour rainfall (in)=	2.86							
Two-year, 24-hour rainfall (in)=	3.45							
Ten-year, 24-hour storm (in)=	5.01							
Total Lake/Pond Area (Acres)=								
Lake/Pond Area not in the Tc flow path (Acres)=								
Site Land Use (acres):	A	B	C	D	A	B	C	D
Pasture								
Woods, Poor Condition								
Woods, Fair Condition								
Woods, Good Condition				7.06				
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition								1.06
Reforestation (in dedicated OS)								
Connected Impervious								6.00
Disconnected Impervious								
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
n-value=								
T_t (hrs)=								
Shallow Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
Average Velocity (ft/sec)=								
T_t (hrs)=								
Channel Flow 1								
Length (ft)=								
Slope (ft/ft)=								
Cross Sectional Flow Area (ft^2)=								
Wetted Perimeter (ft)=								
Channel Lining:								
n-value=								
Hydraulic Radius (ft)=								
Average Velocity (ft/sec)=								
T_t (hrs)=								

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DRAINAGE AREA 5
STORMWATER PRE-POST CALCULATIONS

Channel Flow 2		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Channel Flow 3		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Tc (hrs)=	0.08	0.08
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=	77	95
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=	**95**	
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =	20,883	
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=	0.98	2.34
Volume of runoff (ft^3) =	24,992	60,044
Volume change (ft^3) =	35,052	
Peak Discharge (cfs)= $Q_{1\text{-}year}$=	10.793	27.441
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=	1.39	2.92
Volume of runoff (ft^3) =	35,712	74,870
Peak Discharge (cfs)= $Q_{2\text{-}year}$=	15.422	34.217
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=	2.63	4.46
Volume of runoff (ft^3) =	67,436	114,382
Peak Discharge (cfs)= $Q_{10\text{-}year}$=	29.123	52.275

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DRAINAGE AREA 6
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=	2.49				2.49			
Site Acreage within Drainage=	2.49				2.49			
One-year, 24-hour rainfall (in)=	2.86							
Two-year, 24-hour rainfall (in)=	3.45							
Ten-year, 24-hour storm (in)=	5.01							
Total Lake/Pond Area (Acres)=								
Lake/Pond Area not in the Tc flow path (Acres)=								
Site Land Use (acres):	A	B	C	D	A	B	C	D
Pasture								
Woods, Poor Condition								
Woods, Fair Condition								
Woods, Good Condition				2.49				
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition								0.29
Reforestation (in dedicated OS)								
Connected Impervious								2.20
Disconnected Impervious								
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
n-value=								
T_t (hrs)=								
Shallow Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
Average Velocity (ft/sec)=								
T_t (hrs)=								
Channel Flow 1								
Length (ft)=								
Slope (ft/ft)=								
Cross Sectional Flow Area (ft^2)=								
Wetted Perimeter (ft)=								
Channel Lining:								
n-value=								
Hydraulic Radius (ft)=								
Average Velocity (ft/sec)=								
T_t (hrs)=								

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DRAINAGE AREA 6
STORMWATER PRE-POST CALCULATIONS

Channel Flow 2		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Channel Flow 3		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Tc (hrs)=	0.14	0.08
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=	77	96
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=	**96**	
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =	7,639	
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=	0.98	2.40
Volume of runoff (ft^3) =	8,814	21,729
Volume change (ft^3) =	12,915	
Peak Discharge (cfs)= $Q_{1\text{-}year}$=	3.098	9.931
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=	1.39	2.99
Volume of runoff (ft^3) =	12,595	26,982
Peak Discharge (cfs)= $Q_{2\text{-}year}$=	4.426	12.331
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=	2.63	4.53
Volume of runoff (ft^3) =	23,784	40,955
Peak Discharge (cfs)= $Q_{10\text{-}year}$=	8.358	18.717

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DRAINAGE AREA 7
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=	6.45				6.45			
Site Acreage within Drainage=	6.45				6.45			
One-year, 24-hour rainfall (in)=	2.86							
Two-year, 24-hour rainfall (in)=	3.45							
Ten-year, 24-hour storm (in)=	5.01							
Total Lake/Pond Area (Acres)=								
Lake/Pond Area not in the Tc flow path (Acres)=								
Site Land Use (acres):	A	B	C	D	A	B	C	D
Pasture								
Woods, Poor Condition								
Woods, Fair Condition								
Woods, Good Condition								
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition				6.45				1.49
Reforestation (in dedicated OS)								
Connected Impervious								4.96
Disconnected Impervious								
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
n-value=								
T_t (hrs)=								
Shallow Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
Average Velocity (ft/sec)=								
T_t (hrs)=								
Channel Flow 1								
Length (ft)=								
Slope (ft/ft)=								
Cross Sectional Flow Area (ft^2)=								
Wetted Perimeter (ft)=								
Channel Lining:								
n-value=								
Hydraulic Radius (ft)=								
Average Velocity (ft/sec)=								
T_t (hrs)=								

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DRAINAGE AREA 7
STORMWATER PRE-POST CALCULATIONS

Channel Flow 2		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Channel Flow 3		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Tc (hrs)=	0.08	0.08
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=	80	94
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=	**94**	
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =	17,375	
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=	1.15	2.20
Volume of runoff (ft^3) =	26,832	51,500
Volume change (ft^3) =	24,668	
Peak Discharge (cfs)= $Q_{1\text{-}year}$=	12.263	23.536
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=	1.60	2.77
Volume of runoff (ft^3) =	37,386	64,871
Peak Discharge (cfs)= $Q_{2\text{-}year}$=	17.086	29.647
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=	2.90	4.30
Volume of runoff (ft^3) =	67,936	100,681
Peak Discharge (cfs)= $Q_{10\text{-}year}$=	31.048	46.013

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DRAINAGE AREA 8
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=	0.37				0.37			
Site Acreage within Drainage=	0.37				0.37			
One-year, 24-hour rainfall (in)=	2.86							
Two-year, 24-hour rainfall (in)=	3.45							
Ten-year, 24-hour storm (in)=	5.01							
Total Lake/Pond Area (Acres)=								
Lake/Pond Area not in the Tc flow path (Acres)=								
Site Land Use (acres):	A	B	C	D	A	B	C	D
Pasture								
Woods, Poor Condition								
Woods, Fair Condition								
Woods, Good Condition				0.37				
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition								0.09
Reforestation (in dedicated OS)								
Connected Impervious								0.28
Disconnected Impervious								
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
n-value=								
T_t (hrs)=								
Shallow Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
Average Velocity (ft/sec)=								
T_t (hrs)=								
Channel Flow 1								
Length (ft)=								
Slope (ft/ft)=								
Cross Sectional Flow Area (ft^2)=								
Wetted Perimeter (ft)=								
Channel Lining:								
n-value=								
Hydraulic Radius (ft)=								
Average Velocity (ft/sec)=								
T_t (hrs)=								

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DRAINAGE AREA 8
STORMWATER PRE-POST CALCULATIONS

Channel Flow 2		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Channel Flow 3		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Tc (hrs)=	0.08	0.08
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=	77	94
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=	**94**	
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =	982	
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=	0.98	2.18
Volume of runoff (ft^3) =	1,310	2,926
Volume change (ft^3) =	1,616	
Peak Discharge (cfs)= $Q_{1\text{-}year}$=	0.566	1.337
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=	1.39	2.75
Volume of runoff (ft^3) =	1,872	3,691
Peak Discharge (cfs)= $Q_{2\text{-}year}$=	0.808	1.687
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=	2.63	4.28
Volume of runoff (ft^3) =	3,534	5,743
Peak Discharge (cfs)= $Q_{10\text{-}year}$=	1.526	2.625

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DRAINAGE AREA 9
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=								
Site Acreage within Drainage=								
One-year, 24-hour rainfall (in)=	2.86							
Two-year, 24-hour rainfall (in)=	3.45							
Ten-year, 24-hour storm (in)=	5.01							
Total Lake/Pond Area (Acres)=								
Lake/Pond Area not in the Tc flow path (Acres)=								
Site Land Use (acres):	A	B	C	D	A	B	C	D
Pasture								
Woods, Poor Condition								
Woods, Fair Condition								
Woods, Good Condition								
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition								
Reforestation (in dedicated OS)								
Connected Impervious								
Disconnected Impervious								
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
n-value=								
T_t (hrs)=								
Shallow Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
Average Velocity (ft/sec)=								
T_t (hrs)=								
Channel Flow 1								
Length (ft)=								
Slope (ft/ft)=								
Cross Sectional Flow Area (ft^2)=								
Wetted Perimeter (ft)=								
Channel Lining:								
n-value=								
Hydraulic Radius (ft)=								
Average Velocity (ft/sec)=								
T_t (hrs)=								

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DRAINAGE AREA 9
STORMWATER PRE-POST CALCULATIONS

Channel Flow 2		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Channel Flow 3		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Tc (hrs)=	0.00	0.00
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=		
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=		
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =		
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=		
Volume of runoff (ft^3) =		
Volume change (ft^3) =		
Peak Discharge (cfs)= $Q_{1\text{-}year}$=		
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{2\text{-}year}$=		
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{10\text{-}year}$=		

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DRAINAGE AREA 10
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=								
Site Acreage within Drainage=								
One-year, 24-hour rainfall (in)=	2.86							
Two-year, 24-hour rainfall (in)=	3.45							
Ten-year, 24-hour storm (in)=	5.01							
Total Lake/Pond Area (Acres)=								
Lake/Pond Area not in the Tc flow path (Acres)=								
Site Land Use (acres):	A	B	C	D	A	B	C	D
Pasture								
Woods, Poor Condition								
Woods, Fair Condition								
Woods, Good Condition								
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition								
Reforestation (in dedicated OS)								
Connected Impervious								
Disconnected Impervious								
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
n-value=								
T_t (hrs)=								
Shallow Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
Average Velocity (ft/sec)=								
T_t (hrs)=								
Channel Flow 1								
Length (ft)=								
Slope (ft/ft)=								
Cross Sectional Flow Area (ft^2)=								
Wetted Perimeter (ft)=								
Channel Lining:								
n-value=								
Hydraulic Radius (ft)=								
Average Velocity (ft/sec)=								
T_t (hrs)=								

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DRAINAGE AREA 10
STORMWATER PRE-POST CALCULATIONS

Channel Flow 2		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Channel Flow 3		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Tc (hrs)=	0.00	0.00
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=		
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=		
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =		
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=		
Volume of runoff (ft^3) =		
Volume change (ft^3) =		
Peak Discharge (cfs)= $Q_{1\text{-}year}$=		
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{2\text{-}year}$=		
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{10\text{-}year}$=		

Project Name:

DA SITE SUMMARY
STORMWATER PRE-POST CALCULATIONS

SITE SUMMARY										
DRAINAGE AREA SUMMARIES										
DRAINAGE AREA:	DA1	DA2	DA3	DA4	DA5	DA6	DA7	DA8	DA9	DA10
Pre-Development (1-year, 24-hour storm)										
Runoff (in) = $Q_{pre,1\text{-}year}$ =				0.98	0.98	0.98	1.15	0.98		
Peak Flow (cfs)=$Q_{1\text{-}year}$ =				3.061	10.793	3.098	12.263	0.566		
Post-Development (1-year, 24-hour storm)										
Proposed Impervious Surface (acre) =	4.31	8.05	1.33	2.13	6.00	2.20	4.96	0.28		
Runoff (in)=$Q_{1\text{-}year}$ =				2.34	2.34	2.40	2.20	2.18		
Peak Flow (cfs)=$Q_{1\text{-}year}$ =				9.743	27.441	9.931	23.536	1.337		
Increase in volume per DA (ft^3)_1-yr storm=				12,435	35,052	12,915	24,668	1,616		
Minimum Volume to be Managed for DA HIGH DENSITY REQUIREMENT = (ft^3) =				7,414	20,883	7,639	17,375	982		

TARGET CURVE NUMBER (TCN)

Site Data

SITE \SOIL COMPOSITION

HYDROLOGIC SOIL GROUP	Site Area	%	Target CN
A	0.00	0%	N/A
B	0.00	0%	N/A
C	5.07	14%	N/A
D	31.82	86%	N/A

Total Site Area (acres) =	36.89
Percent BUA (Includes Existing Lakes/Pond Areas) =	79%
Project Density =	High
Target Curve Number (TCN) =	N/A
$CN_{adjusted\ (1\text{-}year)}$=	49
Minimum Volume to be Managed (Total Site) Per TCN Requirement= ft^3 =	N/A

Site Nitrogen Loading Data

HSG	TN export coefficient (lbs/ac/yr)	Site Acreage	N Export
Pasture	1.2	0.00	0.00
Woods, Poor Condition	1.6	0.00	0.00
Woods, Fair Condition	1.2	0.00	0.00
Woods, Good Condition	0.8	0.00	0.00
Open Space, Poor Condition	1.0	0.00	0.00
Open Space, Fair Condition	0.8	0.00	0.00
Open Space, Good Condition	0.6	7.63	4.58
Reforestation (in dedicated OS)	0.6	0.00	0.00
Impervious	21.2	29.26	620.31

SITE NITROGEN LOADING RATE (lbs/ac/yr)=	16.94
Nitrogen Load (lbs/yr)=	624.89
TOTAL SITE NITROGEN TO MITIGATE (lbs/yr)_Wendell Only=	492.09

Site Nitrogen Loading Data For Expansions Only

	Existing	New
Impervious(acres)=	NA	NA
"Expansion Area" (acres=)		
Nitrogen Load (lbs/yr)=	NA	NA
SITE NITROGEN LOADING RATE (lbs/ac/yr)=	NA	NA
Total Site loading rate (lbs/ac/yr)		
TOTAL SITE NITROGEN TO MITIGATE (lbs/yr)=	NA	

Project Name:

DRAINAGE AREA 1
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA1 Site Acreage=	5.07			
DA1 Off-Site Acreage=				
Total Required Storage Volume for Site TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA1 1" Rainfall for High Density (ft^3)=				
Will site use underground detention/cistern?	No	Enter % of the year water will be reused=	0%	Note: Supporting information/details should be submitted to demonstrate water usage.

ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA

HSG	Sub-DA1(a) (Ac)		Sub-DA1(b) (Ac)		Sub-DA1(c) (Ac)		Sub-DA1(d) (Ac)		Sub-DA1(e) (Ac)	
	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site
Pasture										
Woods, Poor Condition										
Woods, Fair Condition										
Woods, Good Condition										
Open Space, Poor Condition										
Open Space, Fair Condition										
Open Space, Good Condition	0.76									
Reforestation (in dedicated OS)										
Impervious	4.31									

Sub-DA1(a) BMP(s)

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
SCM 1	Wet Detention Basin	15,001	99,381	25%	91.83	22.96	52.8
				0%	68.87	0.00	
				0%	68.87	0.00	
				0%	68.87	0.00	
				0%	68.87	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):		**68.87**					

Sub-DA1(b) BMP(s)

If Sub-DA1(b) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
			0	0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1 (c) BMP(s)

If Sub-DA1(c) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
			0	0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Project Name:

DRAINAGE AREA 1
BMP CALCULATIONS

Sub-DA1(d) BMP(s)							
If Sub-DA1(d) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
			0	0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1(e) BMP(s)							
If Sub-DA1(e) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
			0	0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

DA1 BMP SUMMARY	
Total Volume Treated (ft^3)=	99,381
Nitrogen Mitigated(lbs)=	22.96
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	0.00
Post BMP $CN_{(1\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	41.550
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(2\text{-year})}$=	
Post BMP $CN_{(2\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-year})}$=	60.610
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(10\text{-year})}$=	
Post BMP $CN_{(10\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=	85.850

Project Name:

DRAINAGE AREA 2
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA2 Site Acreage=	10.97			
DA2 Off-Site Acreage=				
Total Required Storage Volume TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA2 1" Rainfall for High Density (ft3)=				
Will site use underground detention/cistern?	No	Enter % of the year water will be reused=	0%	Note: Supporting information/details should be submitted to demonstrate water usage.

ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA

HSG	Sub-DA2(a) (Ac)		Sub-DA2(b) (Ac)		Sub-DA2(c) (Ac)		Sub-DA2(d) (Ac)		Sub-DA2(e) (Ac)	
	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site
Pasture										
Woods, Poor Condition										
Woods, Fair Condition										
Woods, Good Condition										
Open Space, Poor Condition										
Open Space, Fair Condition										
Open Space, Good Condition	1.99		0.93							
Reforestation (in dedicated OS)										
Impervious	8.05									

Sub-DA1(a) BMP(s)

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
SCM 1	Wet Detention Basin	25,892	99,381	25%	171.85	42.96	52.8
				0%	128.89	0.00	
				0%	128.89	0.00	
				0%	128.89	0.00	
				0%	128.89	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):		**128.89**					

Sub-DA1(b) BMP(s)

If Sub-DA1(b) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
N/A - Direct Release		169		0%	0.56	0.00	
				0%	0.56	0.00	
				0%	0.56	0.00	
				0%	0.56	0.00	
				0%	0.56	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):		**0.56**					

Sub-DA1 (c) BMP(s)

If Sub-DA1(c) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Project Name:

DRAINAGE AREA 2
BMP CALCULATIONS

Sub-DA1(d) BMP(s)							
If Sub-DA1(d) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1(e) BMP(s)							
If Sub-DA1(e) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

DA2 BMP SUMMARY	
Total Volume Treated (ft^3)=	99,381
Nitrogen Mitigated(lbs)=	42.96
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	0.00
Post BMP $CN_{(1\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	41.550
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(2\text{-year})}$=	
Post BMP $CN_{(2\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-year})}$=	60.610
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(10\text{-year})}$=	
Post BMP $CN_{(10\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=	85.850

Project Name:

DRAINAGE AREA 3
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA3 Site Acreage=	1.97			
DA3 Off-Site Acreage=				
Total Required Storage Volume TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA3 1" Rainfall for High Density (ft3)=				
Will site use underground detention/cistern?	No	Enter % of the year water will be reused=	0%	Note: Supporting information/details should be submitted to demonstrate water usage.

ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA

HSG	Sub-DA3(a) (Ac)		Sub-DA3(b) (Ac)		Sub-DA3(c) (Ac)		Sub-DA3(d) (Ac)		Sub-DA3(e) (Ac)	
	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site
Pasture										
Woods, Poor Condition										
Woods, Fair Condition										
Woods, Good Condition										
Open Space, Poor Condition										
Open Space, Fair Condition										
Open Space, Good Condition	0.15		0.49							
Reforestation (in dedicated OS)										
Impervious	1.16		0.17							

Sub-DA1(a) BMP(s)

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
SCM 1	Wet Detention Basin	2,758	99,381	25%	24.68	6.17	52.8
				0%	18.51	0.00	
				0%	18.51	0.00	
				0%	18.51	0.00	
				0%	18.51	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):		**18.51**					

Sub-DA1(b) BMP(s)

If Sub-DA1(b) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
N/A - Direct Release		306	0	0%	3.90	0.00	
				0%	3.90	0.00	
				0%	3.90	0.00	
				0%	3.90	0.00	
				0%	3.90	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):		**3.90**					

Sub-DA1 (c) BMP(s)

If Sub-DA1(c) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
			0	0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Project Name:

DRAINAGE AREA 3
BMP CALCULATIONS

Sub-DA1(d) BMP(s)							
If Sub-DA1(d) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
			0	0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1(e) BMP(s)							
If Sub-DA1(e) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
			0	0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

DA3 BMP SUMMARY	
Total Volume Treated (ft^3)=	99,381
Nitrogen Mitigated(lbs)=	6.17
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	0.00
Post BMP $CN_{(1\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	41.550
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(2\text{-year})}$=	
Post BMP $CN_{(2\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-year})}$=	60.610
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(10\text{-year})}$=	
Post BMP $CN_{(10\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=	85.850

Project Name:

DRAINAGE AREA 4
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA4 Site Acreage=	2.51			
DA4 Off-Site Acreage=				
Total Required Storage Volume TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA4 1" Rainfall for High Density (ft3)=	7,414			
Will site use underground detention/cistern?	No	Enter % of the year water will be reused=	0%	Note: Supporting information/details should be submitted to demonstrate water usage.

ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA

HSG	Sub-DA4(a) (Ac)		Sub-DA4(b) (Ac)		Sub-DA4(c) (Ac)		Sub-DA4(d) (Ac)		Sub-DA4(e) (Ac)	
	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site
Pasture										
Woods, Poor Condition										
Woods, Fair Condition										
Woods, Good Condition										
Open Space, Poor Condition										
Open Space, Fair Condition										
Open Space, Good Condition	0.38									
Reforestation (in dedicated OS)										
Impervious	2.13									

Sub-DA1(a) BMP(s)

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
SCM 1	Wet Detention Basin	7,414	99,381	25%	45.38	11.35	52.8
				0%	34.04	0.00	
				0%	34.04	0.00	
				0%	34.04	0.00	
				0%	34.04	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):		**34.04**					

Sub-DA1(b) BMP(s)

If Sub-DA1(b) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1 (c) BMP(s)

If Sub-DA1(c) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

WAKE COUNTY
NORTH CAROLINA

Project Name:

DRAINAGE AREA 4
BMP CALCULATIONS

Sub-DA1(d) BMP(s)							
If Sub-DA1(d) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1(e) BMP(s)							
If Sub-DA1(e) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

DA4 BMP SUMMARY	
Total Volume Treated (ft^3)=	99,381
Nitrogen Mitigated(lbs)=	11.35
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	0.00
Post BMP $CN_{(1\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	41.550
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-year})}$=	0
Post BMP Runoff (inches) = $Q^*_{(2\text{-year})}$=	0.00
Post BMP $CN_{(2\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-year})}$=	60.610
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-year})}$=	0
Post BMP Runoff (inches) = $Q^*_{(10\text{-year})}$=	0.00
Post BMP $CN_{(10\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=	85.850

Project Name:

DRAINAGE AREA 5
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA5 Site Acreage=	7.06			
DA5 Off-Site Acreage=				
Total Required Storage Volume TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA5 1" Rainfall for High Density (ft3)=	20,883			
Will site use underground detention/cistern?	No	Enter % of the year water will be reused=	0%	Note: Supporting information/details should be submitted to demonstrate water usage.

ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA

HSG	Sub-DA5(a) (Ac)		Sub-DA5(b) (Ac)		Sub-DA5(c) (Ac)		Sub-DA5(d) (Ac)		Sub-DA5(e) (Ac)	
	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site
Pasture										
Woods, Poor Condition										
Woods, Fair Condition										
Woods, Good Condition										
Open Space, Poor Condition										
Open Space, Fair Condition										
Open Space, Good Condition	1.06									
Reforestation (in dedicated OS)										
Impervious	6.00									

Sub-DA1(a) BMP(s)

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
SCM 1	Wet Detention Basin	20,883	99,381	25%	127.84	31.96	52.8
				0%	95.88	0.00	
				0%	95.88	0.00	
				0%	95.88	0.00	
				0%	95.88	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):		**95.88**					

Sub-DA1(b) BMP(s)

If Sub-DA1(b) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1 (c) BMP(s)

If Sub-DA1(c) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Project Name:

DRAINAGE AREA 5
BMP CALCULATIONS

Sub-DA1(d) BMP(s)							
If Sub-DA1(d) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1(e) BMP(s)							
If Sub-DA1(e) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

DA5 BMP SUMMARY	
Total Volume Treated (ft^3)=	99,381
Nitrogen Mitigated(lbs)=	31.96
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	0.00
Post BMP $CN_{(1\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	41.550
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-year})}$=	0
Post BMP Runoff (inches) = $Q^*_{(2\text{-year})}$=	0.00
Post BMP $CN_{(2\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-year})}$=	60.610
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-year})}$=	15,001
Post BMP Runoff (inches) = $Q^*_{(10\text{-year})}$=	0.59
Post BMP $CN_{(10\text{-year})}$=	61
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=	85.850

Project Name:

DRAINAGE AREA 6
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA6 Site Acreage=	2.49			
DA6 Off-Site Acreage=				
Total Required Storage Volume TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA6 1" Rainfall for High Density (ft3)=	7,639			
Will site use underground detention/cistern?	No	Enter % of the year water will be reused=	0%	Note: Supporting information/details should be submitted to demonstrate water usage.

ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA

HSG	Sub-DA6(a) (Ac)		Sub-DA6(b) (Ac)		Sub-DA6(c) (Ac)		Sub-DA6(d) (Ac)		Sub-DA6(e) (Ac)	
	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site
Pasture										
Woods, Poor Condition										
Woods, Fair Condition										
Woods, Good Condition										
Open Space, Poor Condition										
Open Space, Fair Condition										
Open Space, Good Condition	0.23		0.06							
Reforestation (in dedicated OS)										
Impervious	1.82		0.38							

Sub-DA1(a) BMP(s)

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
SCM 1	Wet Detention Basin	5,267	99,381	25%	38.72	9.68	52.8
				0%	29.04	0.00	
				0%	29.04	0.00	
				0%	29.04	0.00	
				0%	29.04	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):		**29.04**					

Sub-DA1(b) BMP(s)

If Sub-DA1(b) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
N/A - Direct Release		299		0%	8.09	0.00	
				0%	8.09	0.00	
				0%	8.09	0.00	
				0%	8.09	0.00	
				0%	8.09	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):		**8.09**					

Sub-DA1 (c) BMP(s)

If Sub-DA1(c) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

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DRAINAGE AREA 6
BMP CALCULATIONS

Sub-DA1(d) BMP(s)							
If Sub-DA1(d) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1(e) BMP(s)							
If Sub-DA1(e) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

DA6 BMP SUMMARY	
Total Volume Treated (ft^3)=	99,381
Nitrogen Mitigated(lbs)=	9.68
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	0.00
Post BMP $CN_{(1\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	41.550
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-year})}$=	0
Post BMP Runoff (inches) = $Q^*_{(2\text{-year})}$=	0.00
Post BMP $CN_{(2\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-year})}$=	60.610
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-year})}$=	0
Post BMP Runoff (inches) = $Q^*_{(10\text{-year})}$=	0.00
Post BMP $CN_{(10\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=	85.850

Project Name:

DRAINAGE AREA 7
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA7 Site Acreage=	6.45			
DA7 Off-Site Acreage=				
Total Required Storage Volume TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA7 1" Rainfall for High Density (ft3)=	17,375			
Will site use underground detention/cistern?	No	Enter % of the year water will be reused=	0%	Note: Supporting information/details should be submitted to demonstrate water usage.

ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA

HSG	Sub-DA7(a) (Ac)		Sub-DA7(b) (Ac)		Sub-DA7(c) (Ac)		Sub-DA7(d) (Ac)		Sub-DA7(e) (Ac)	
	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site
Pasture										
Woods, Poor Condition										
Woods, Fair Condition										
Woods, Good Condition										
Open Space, Poor Condition										
Open Space, Fair Condition										
Open Space, Good Condition	1.49									
Reforestation (in dedicated OS)										
Impervious	4.96									

Sub-DA1(a) BMP(s)

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
SCM 1	Wet Detention Basin	17,375	99,381	25%	106.05	26.51	52.8
				0%	79.53	0.00	
				0%	79.53	0.00	
				0%	79.53	0.00	
				0%	79.53	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):		**79.53**					

Sub-DA1(b) BMP(s)

If Sub-DA1(b) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1 (c) BMP(s)

If Sub-DA1(c) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

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DRAINAGE AREA 7
BMP CALCULATIONS

Sub-DA1(d) BMP(s)							
If Sub-DA1(d) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1(e) BMP(s)							
If Sub-DA1(e) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

DA7 BMP SUMMARY	
Total Volume Treated (ft^3)=	99,381
Nitrogen Mitigated(lbs)=	26.51
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	0.00
Post BMP $CN_{(1\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	41.550
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-year})}$=	0
Post BMP Runoff (inches) = $Q^*_{(2\text{-year})}$=	0.00
Post BMP $CN_{(2\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-year})}$=	60.610
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-year})}$=	1,300
Post BMP Runoff (inches) = $Q^*_{(10\text{-year})}$=	0.06
Post BMP $CN_{(10\text{-year})}$=	43
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=	85.850

Project Name:

DRAINAGE AREA 8
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA8 Site Acreage=	0.37			
DA8 Off-Site Acreage=				
Total Required Storage Volume TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA8 1" Rainfall for High Density (ft3)=	982			
Will site use underground detention/cistern?	No	Enter % of the year water will be reused=	0%	Note: Supporting information/details should be submitted to demonstrate water usage.

ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA

HSG	Sub-DA8(a) (Ac)		Sub-DA8(b) (Ac)		Sub-DA8(c) (Ac)		Sub-DA8(d) (Ac)		Sub-DA8(e) (Ac)	
	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site
Pasture										
Woods, Poor Condition										
Woods, Fair Condition										
Woods, Good Condition										
Open Space, Poor Condition										
Open Space, Fair Condition										
Open Space, Good Condition	0.09									
Reforestation (in dedicated OS)										
Impervious	0.28									

Sub-DA1(a) BMP(s)

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
SCM 1	Wet Detention Basin	982	99,381	25%	5.99	1.50	52.8
				0%	4.49	0.00	
				0%	4.49	0.00	
				0%	4.49	0.00	
				0%	4.49	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):		**4.49**					

Sub-DA1(b) BMP(s)

If Sub-DA1(b) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1 (c) BMP(s)

If Sub-DA1(c) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

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DRAINAGE AREA 8
BMP CALCULATIONS

Sub-DA1(d) BMP(s)							
If Sub-DA1(d) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							
Sub-DA1(e) BMP(s)							
If Sub-DA1(e) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

DA8 BMP SUMMARY	
Total Volume Treated (ft^3)=	99,381
Nitrogen Mitigated(lbs)=	1.50
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	0.00
Post BMP $CN_{(1\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	41.550
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-year})}$=	0
Post BMP Runoff (inches) = $Q^*_{(2\text{-year})}$=	0.00
Post BMP $CN_{(2\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-year})}$=	60.610
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-year})}$=	0
Post BMP Runoff (inches) = $Q^*_{(10\text{-year})}$=	0.00
Post BMP $CN_{(10\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=	85.850

Project Name:

DRAINAGE AREA 9
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA9 Site Acreage=				
DA9 Off-Site Acreage=				
Total Required Storage Volume TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA9 1" Rainfall for High Density (ft3)=				
Will site use underground detention/cistern?		Enter % of the year water will be reused=		Note: Supporting information/details should be submitted to demonstrate water usage.

ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA

HSG	Sub-DA9(a) (Ac)		Sub-DA9(b) (Ac)		Sub-DA9(c) (Ac)		Sub-DA9(d) (Ac)		Sub-DA9(e) (Ac)	
	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site
Pasture										
Woods, Poor Condition										
Woods, Fair Condition										
Woods, Good Condition										
Open Space, Poor Condition										
Open Space, Fair Condition										
Open Space, Good Condition										
Reforestation (in dedicated OS)										
Impervious										

Sub-DA1(a) BMP(s)

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1(b) BMP(s)

If Sub-DA1(b) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1 (c) BMP(s)

If Sub-DA1(c) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

WAKE COUNTY
NORTH CAROLINA

Project Name:

DRAINAGE AREA 9
BMP CALCULATIONS

Sub-DA1(d) BMP(s)							
If Sub-DA1(d) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1(e) BMP(s)							
If Sub-DA1(e) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

DA9 BMP SUMMARY	
Total Volume Treated (ft^3)=	
Nitrogen Mitigated(lbs)=	
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	
Post BMP $CN_{(1\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(2\text{-year})}$=	
Post BMP $CN_{(2\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-year})}$=	
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(10\text{-year})}$=	
Post BMP $CN_{(10\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=	

Project Name:

DRAINAGE AREA 10
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA10 Site Acreage=				
DA10 Off-Site Acreage=				
Total Required Storage Volume TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA10 1" Rainfall for High Density (ft3)=				
Will site use underground detention/cistern?		Enter % of the year water will be reused=		Note: Supporting information/details should be submitted to demonstrate water usage.

ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA

HSG	Sub-DA10(a) (Ac)		Sub-DA10(b) (Ac)		Sub-DA10(c) (Ac)		Sub-DA10(d) (Ac)		Sub-DA10(e) (Ac)	
	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site
Pasture										
Woods, Poor Condition										
Woods, Fair Condition										
Woods, Good Condition										
Open Space, Poor Condition										
Open Space, Fair Condition										
Open Space, Good Condition										
Reforestation (in dedicated OS)										
Impervious										

Sub-DA1(a) BMP(s)

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1(b) BMP(s)

If Sub-DA1(b) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1 (c) BMP(s)

If Sub-DA1(c) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Project Name:

DRAINAGE AREA 10
BMP CALCULATIONS

Sub-DA1(d) BMP(s)							
If Sub-DA1(d) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1(e) BMP(s)							
If Sub-DA1(e) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

DA10 BMP SUMMARY	
Total Volume Treated (ft^3)=	
Nitrogen Mitigated(lbs)=	
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	
Post BMP $CN_{(1\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(2\text{-year})}$=	
Post BMP $CN_{(2\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-year})}$=	
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(10\text{-year})}$=	
Post BMP $CN_{(10\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=	

Project Name:

DA SITE SUMMARY
BMP CALCULATIONS

BMP SUMMARY										
DRAINAGE AREA SUMMARIES										
DRAINAGE AREA:	DA1	DA2	DA3	DA4	DA5	DA6	DA7	DA8	DA9	DA10
Pre-Development (1-year, 24-hour storm)										
Runoff (in)=$Q^*_{1\text{-year}}$ =				0.98	0.98	0.98	1.15	0.98		
Peak Flow (cfs)=$Q_{1\text{-year}}$ =				3.061	10.793	3.098	12.263	0.566		
Post-Development (1-year, 24-hour storm)										
Target Curve Number (TCN) =	NA									
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=										
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	41.550	41.550	41.550	41.550	41.550	41.550	41.550	41.550		
Post BMP $CN_{(1\text{-year})}$=										
Post-BMP Nitrogen Loading										
TOTAL SITE NITROGEN MITIGATED (lbs)=	153.09									
SITE NITROGEN LOADING RATE (lbs/ac/yr)=	12.79									
TOTAL SITE NITROGEN LEFT TO MITIGATE_Wendell Only (lbs)=	**339.00**									

Project Name:	

LOW IMPACT DEVELOPMENT SUMMARY

DRAINAGE AREA SUMMARIES										
DRAINAGE AREA:	DA1	DA2	DA3	DA4	DA5	DA6	DA7	DA8	DA9	DA10
Pre-Development										
Runoff (in) = $Q_{pre\_2\text{-}year}$ =				1.39	1.39	1.39	1.60	1.39		
Total Runoff Volume (ft^3)=				12,696	35,712	12,595	37,386	1,872		
Peak Flow (cfs)=$Q_{2\text{-}year}$ =				4.374	15.422	4.426	17.086	0.808		
Post-Development										
2-year, 24-hour storm (LID)										
Post BMP Runoff (inches) = $Q^*_{(2\text{-}year)}$=										
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-}year)}$=	60.610	60.610	60.610	60.610	60.610	60.610	60.610	60.610		
Post BMP Volume of Runoff $(ft3)_{(2\text{-}year)}$=										
Does Runoff meet LID requirements?				Yes	Yes	Yes	Yes	Yes		
Does Peak Flow meet LID requirements?				No	No	No	No	No		
Does Runoff Volume meet LID requirements?				Yes	Yes	Yes	Yes	Yes		

SITE SUMMARY	
Site Data	
Target CN =	N/A
Post-Development CN =	0
Does CN meet LID requirements?	

LID CHECKLIST
Complete the below checklist if all requirements have been met above:

LID Narrative (limit to 600 characters - attach additional pages with submittal if necessary):
Describe in detail how the proposed development has utilized "Natural Site Design". Narrative should include the location of site buildings, roads and other land disturbances in the least environmentally-sensitive areas, preservation of steep slopes, and preservation of naturally well draining soils and other hydrologically valuable features.

LID Techniques (check all that apply)
At least **one** of the following techniques must be used to achieve LID classification:

☐	Bioretention
☐	On-site infiltration

Additional LID Techniques (check all that apply)
At least **two** (**one for Wendell**) of the following techniques must be used to achieve LID classification:

☐	Retention of 50% of vegetated area, including open space, landscaping or forests
☐	Use of permeable pavement for all private driveways, private roads, sidewalks and parking areas
☐	Installation of one rain cistern per lot or three rain barrels per lot
☐	Installation of vegetative roofs
☐	Increasing all buffers in the Riparian buffer zone or the Flood Protection Zone, whichever is greater, by 50 feet
☐	Use of reclaimed water for all buildings
☐	Use of innovative LID techniques subject to approval

Project Name:	

DOWNSTREAM IMPACT ANALYSIS SITE SUMMARY

DRAINAGE AREA SUMMARIES										
DRAINAGE AREA:	DA1	DA2	DA3	DA4	DA5	DA6	DA7	DA8	DA9	DA10
Pre-Development										
Peak Discharge (cfs)=$Q_{10\text{-year}}$ =				8.26	29.12	8.36	31.05	1.53		
Volume of Runoff (ft^3)$_{(10\text{-year})}$ =				23,975	67,436	23,784	67,936	3,534		
Post-Development										
10-year, 24-hour storm (DIA)										
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=	85.85	85.85	85.85	85.85	85.85	85.85	85.85	85.85		
Post BMP Volume of Runoff (ft^3)$_{(10\text{-year})}$=					15,001		1,300			

CALCULATIONS AND REFERENCE

TARGET CURVE NUMBER				
MAXIMUM CURVE NUMBER AFTER DEVELOPMENT				
PROJECT DENSITY	**A**	**B**	**C**	**D**
Ultra-Low	43	63	76	81
Low	48	66	78	83
High	N/A	N/A	N/A	N/A

WEIGHTED CURVE NUMBER				
RUNOFF CURVE NUMBERS FOR URBAN AREAS				
LAND USE	**A**	**B**	**C**	**D**
Pasture	39	61	74	80
Woods, Poor Condition[1]	45	66	77	83
Woods, Fair Condition[2]	36	60	73	79
Woods, Good Condition[3]	30	55	70	77
Open Space, Poor Condition[4]	68	79	86	89
Open Space, Fair Condition[5]	49	69	79	84
Open Space, Good Condition[6]	39	61	74	80
Reforestation (in dedicated OS)[7]	30	55	70	77
Impervious[8]	98	98	98	98

Notes:
[1] Poor Condition = Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
[2] Fair Condition = Woods are grazed but not burned, and some forest litter covers the soil.
[3] Good Condition = Woods that are protected from grazing, litter, and brush adequately cover the soil
[4] Poor Condition = Grass Cover <50% (lawns, parks, golf courses, cemeteries, etc.)
[5] Fair Condition = Grass Cover = 50% - 75% (lawns, parks, golf courses, cemeteries, etc.)
[6] Good Condition = Grass Cover >75% (lawns, parks, golf courses, cemeteries, etc.)
[7] Includes paved/gravel/compacted soil driveways and roads, roofs, etc.
[8] Includes paved/gravel/compacted soil driveways and roads, roofs, etc.

SCS RUNOFF METHOD

$$Q^* = (P-.2S)^2/(P+.8S)$$

Where:
Q*= Runoff (in)
P= Precipitation (in)
S= Potential max retention after runoff begins (in) = (1000/CN)-10

Notes:
Calculations used on Drainage Area Sheets

DISCRETE RUNOFF METHOD (HIGH DENSITY ONLY)

$$Q^*_{High} = Q^*_{(imp)} \times DA_{(imp)} + Q^*_{(pervious)} \times DA_{(pervious)}$$

$Q^*_{(imp)}$ = Runoff from Impervious Area (in)
$DA_{(imp)}$ = Drainage from impervious area (acre)
$Q^*_{(pervious)}$ = Runoff from pervious area (in)
$DA_{(pervious)}$ = Drainage from pervious area (acre)

PEAK FLOW

Method: TR-55 Graphical Peak Discharge Method for Type II Distribution

$$Q_p = q_u A_m Q^* F_p$$

Where:
Q_p = Peak Discharge (cfs)
q_u = Unit peak discharge (csm/in) *TR-55 Appendix F*
A_m = Drainage Area (mi^2)
Q* = runoff (inches)
F_p = pond adjustment factor

$$\log(q_u) = C_o + C_1 \log(Tc) + C_2 [\log(Tc)]^2$$

Where:
C_o, C_1, C_2 = coefficient from Table F-1
T_c = time of concentration (hr)

Limitations:
The watershed must be hydrologically homogeneous
The watershed may have only one main stream or, if more than one, the branches must have nearly equal T_c's.
The Fp factor can be applied only for ponds or swamps that are not in the T_c flow path
This method should be used only if the weighted CN is greater than 40.
When this method is used to develop estimates of peak discharge for both pre and post development, use the same procedure for estimating Tc.
T_c values with this method may range from 0.1 to 10 hours.

TIME OF CONCENTRATION

$$T_t = \frac{L}{3600V}$$

T_t =travel time (hr)
L = flow length (ft)
V = average velocity (ft/s)
3600 = conversion factor from seconds to hours

T_c = sum of T_t values for consecutive flow segments
$T_c = T_1 + T_2 + T_3 + ... T_m$

T_c = time of concentration (hr)
m = # of flow segments

Note: Minimal 5 minute Tc

SHEET FLOW (FOR FLOW LESS THAN 300 FEET)

$$T_t = \frac{0.0007(nL)^{0.8}}{(P_2)^{0.5}s^{0.4}}$$

T_t =travel time (hr)
n = Manning's roughness coefficient (Table 3-1)
L = flow length (ft)
P_2 = 2-year, 24-hour rainfall (in)
s = slope of hydraulic grade line (land slope, ft/ft)

SHALLOW FLOW

Surface Cover

Unpaved: $V = 16.1345(s)^{0.5}$
Paved: $V = 20.3282(s)^{0.6}$

V=Average Velocity (ft/s)
s = slope of hydraulic grade line (watercourse slope, ft/ft)

$$T_t = \frac{L}{3600V}$$

T_t =travel time (hr)
L = flow length (ft)
V = average velocity (ft/s)
3600 = conversion factor from seconds to hours

OPEN CHANNEL FLOW

$$V = \frac{1.49r^{2/3}s^{1/2}}{n}$$

V=Average Velocity (ft/s)
r = hydraulic radius (ft)
s = slope of hydraulic grade line (channel slope, ft/ft)
n = Manning's roughness coefficient for open channel flow

$$r = \frac{a}{p_w}$$

a = cross sectional flow area (ft2)
p_w=wetted perimeter (ft)

$$T_t = \frac{L}{3600V}$$

T_t =travel time (hr)
L = flow length (ft)
V = average velocity (ft/s)
3600 = conversion factor (sec-hrs)

Modified Table 3-1 for Stormwater Tool

SURFACE DESCRIPTION	n
Paved, Gravel, or Bare Soil	0.011
Grass	0.24
Woods	0.40

TABLE 4-1, TR-55
I_a values for runoff curve numbers

CN	I_a (in)	CN	I_a (in)	CN	I_a (in)
40	3.000	60	1.333	80	0.500
41	2.878	61	1.279	81	0.469
42	2.762	62	1.226	82	0.439
43	2.651	63	1.175	83	0.410
44	2.545	64	1.125	84	0.381
45	2.444	65	1.077	85	0.353
46	2.348	66	1.030	86	0.326
47	2.255	67	0.985	87	0.299
48	2.167	68	0.941	88	0.273
49	2.082	69	0.899	89	0.247
50	2.000	70	0.857	90	0.222
51	1.922	71	0.817	91	0.198
52	1.846	72	0.778	92	0.174
53	1.774	73	0.740	93	0.151
54	1.704	74	0.703	94	0.128
55	1.636	75	0.667	95	0.105
56	1.571	76	0.632	96	0.083
57	1.509	77	0.597	97	0.062
58	1.448	78	0.564	98	0.041
59	1.390	79	0.532		

TABLE 3-9, TR-55
Rational Runoff Coefficients

CHANNEL LINING	n
Asphalt	0.016
Concrete, finished	0.012
Concrete, unfinished	0.014
Grass	0.035
Gravel Bottom/riprap sides	0.033
Weeds	0.040

DISCONNECTED IMPERVIOUS CALCULATION

$$CN_{adjusted} = CN_p + [(P_{imp}/100)*(98-CN_p)*(1-(0.5*R))]$$

Where:

$CN_{adjusted}$ = Composite Curve Number

CN_p = Pervious runoff curve number =(PostCN - (Pimp/100)*98)/(1 -(Pimp/100))

P_{imp} = Percent Imperviousness

R = ratio of unconnected impervious area to total impervious area

TABLE 4-1, SW BMP MANUAL
BMP ABILITY FOR SW QUANTITY CONTROL

BMP	TSS	TN
Bioretention without IWS	**85%**	**35%**
Bioretention with IWS	**85%**	**40%**
Stormwater Wetlands	**85%**	**40%**
Wet Detention Basin	**85%**	**25%**
Sand Filter	**85%**	**35%**
Filter Strip	**25-40%**	**20%**
Grass Swale	**35%**	**20%**
Restored Riparian Buffer	**60%**	**30%**
Infiltration Device	**85%**	**30%**
Dry Extended Detention Basin	**50%**	**10%**
Permeable Pavement	**0%**	**0%**
Rooftop Runoff Management (Excluding Cisterns)	**0%**	**0%**
Cistern/Underground Detention	**See Note**	**100%**

[1] Use of underground detention reduces total volume required for storage as well total nitrogen load. To receive total reduction,

	engineer must show year-round use of reclaimed water. If water is not reused year-round, a percent of the total reduction may be given (See DA BMP sheets).	

Tim of Concentration (Tc)

Pre-Development - Lot 5 (Boat Tract)

Overland Flow (Grassy/Wooded)		
Hydraulic length of watershed, L	660	ft
Height of watershed, H	13	ft
Flow Path Multiplier, K	2	
Channelized Flow		
Hydraulic length of watershed, L	0	ft
Height of watershed, H	0.01	ft
Flow Path Multiplier, K	0.2	
Time of concentration, tc	10.5	min
Time of concentration, tc	10.5	min

Pre-Development - Paris Tract (Lots 9, 10, & 11)

Overland Flow (Grassy/Wooded)		
Hydraulic length of watershed, L	300	ft
Height of watershed, H	12	ft
Flow Path Multiplier, K	2	
Channelized Flow		
Hydraulic length of watershed, L	0	ft
Height of watershed, H	0.01	ft
Flow Path Multiplier, K	0.2	
Time of concentration, tc	4.4	min
Time of concentration, tc	5.0	min

Pre-Development - Lots 3 & 4

Overland Flow (Grassy/Wooded)		
Hydraulic length of watershed, L	503	ft
Height of watershed, H	14	ft
Flow Path Multiplier, K	2	
Channelized Flow		
Hydraulic length of watershed, L	0	ft
Height of watershed, H	0.01	ft
Flow Path Multiplier, K	0.2	
Time of concentration, tc	7.5	min
Time of concentration, tc	7.5	min

Pre-Development - Wallbrook Lots 1A, 1B, 1C & 2

Overland Flow (Grassy/Wooded)		
Hydraulic length of watershed, L	675	ft
Height of watershed, H	44	ft
Flow Path Multiplier, K	2	
Channelized Flow		
Hydraulic length of watershed, L	0	ft
Height of watershed, H	0.01	ft
Flow Path Multiplier, K	0.2	
Time of concentration, tc	6.7	min
Time of concentration, tc	6.7	min

Pre-Development - New Roadways (Wallbrook Dr/Va Water Dr)

Overland Flow (Grassy/Wooded)		
Hydraulic length of watershed, L	640	ft
Height of watershed, H	21	ft
Flow Path Multiplier, K	2	
Channelized Flow		
Hydraulic length of watershed, L	0	ft
Height of watershed, H	0.01	ft
Flow Path Multiplier, K	0.2	
Time of concentration, tc	8.4	min
Time of concentration, tc	8.4	min

Pre-Development - DOT Roadway (Main St Improvements)

Overland Flow (Paved)		
Hydraulic length of watershed, L	50	ft
Height of watershed, H	3	ft
Flow Path Multiplier, K	0.4	
Channelized Flow (Natural Channel)		
Hydraulic length of watershed, L	100	ft
Height of watershed, H	6	ft
Flow Path Multiplier, K	1	
Time of concentration, tc	1.0	min
Time of concentration, tc	5.0	min

Post-Development - Wallbrook Lots 1A, 1B, 1C, & 2

Overland Flow (Paved)		
Hydraulic length of watershed, L	100	ft
Height of watershed, H	1	ft
Flow Path Multiplier, K	0.4	
Channelized Flow (Piped)		
Hydraulic length of watershed, L	700	ft
Height of watershed, H	5.5	ft
Flow Path Multiplier, K	0.2	
Time of concentration, tc	2.2	min
Time of concentration, tc	5.0	min

Post-Development - Paris Tract (Lots 9, 10, & 11)

Overland Flow (Paved)		
Hydraulic length of watershed, L	200	ft
Height of watershed, H	5	ft
Flow Path Multiplier, K	0.4	
Channelized Flow (Piped)		
Hydraulic length of watershed, L	600	ft
Height of watershed, H	27	ft
Flow Path Multiplier, K	0.2	
Time of concentration, tc	1.5	min
Time of concentration, tc	5.0	min

Post-Development - Lot 5 (Boat Tract)

Overland Flow (Paved)		
Hydraulic length of watershed, L	150	ft
Height of watershed, H	2	ft
Flow Path Multiplier, K	0.4	
Channelized Flow (Piped)		
Hydraulic length of watershed, L	890	ft
Height of watershed, H	27	ft
Flow Path Multiplier, K	0.2	
Time of concentration, tc	1.9	min
Time of concentration, tc	5.0	min

Post-Development - New Roadways (Wallbrook Dr/Va Water Dr)

Overland Flow (Paved)		
Hydraulic length of watershed, L	200	ft
Height of watershed, H	2	ft
Flow Path Multiplier, K	0.4	
Channelized Flow (Piped)		
Hydraulic length of watershed, L	1140	ft
Height of watershed, H	22	ft
Flow Path Multiplier, K	0.2	
Time of concentration, tc	2.7	min
Time of concentration, tc	5.0	min

Post-Development - DOT Roadway (Main St Improvements)

Overland Flow (Paved)		
Hydraulic length of watershed, L	0	ft
Height of watershed, H	0.1	ft
Flow Path Multiplier, K	0.4	
Channelized Flow (Piped)		
Hydraulic length of watershed, L	2110	ft
Height of watershed, H	36	ft
Flow Path Multiplier, K	0.2	
Time of concentration, tc	2.7	min
Time of concentration, tc	5.0	min

Post-Development - Lots 3 & 4

Overland Flow (Paved)		
Hydraulic length of watershed, L	100	ft
Height of watershed, H	2	ft
Flow Path Multiplier, K	0.4	
Channelized Flow (Piped)		
Hydraulic length of watershed, L	300	ft
Height of watershed, H	6	ft
Flow Path Multiplier, K	0.2	
Time of concentration, tc	1.1	min
Time of concentration, tc	5.0	min

WALLBROOK

ROLESVILLE, WAKE COUNTY, NORTH CAROLINA

STORMWATER MANAGEMENT PLAN

DRAWING NO. D-1219

STORMWATER CONTROL MEASURE CALCULATIONS

Ark Consulting Group, PLLC
2755-B Charles Boulevard
Greenville, NC 27858
252-558-0888

JOB 21089-Wallbrrok
DATE Sep-23
CALCULATED BY TGN
CHECKED BY BCF

Wet Pond Design
Surface Area Requirements

		Units	Symbols & Governing Equations
Site Calculations			
Total Site Catchment Area	34.86	ac	A_{site}
Roof Impervious	4.72	ac	A_{roof}
Transportation Impervious	24.00	ac	A_{trans}
Total Impervious Area	28.72	ac	$A_{impervious}$
Percent Impervious	82	%	$(A_{impervious} / A_{site})*100$
Average Depth Calculation			
Area of Bottom Shelf	27059	sq ft	A_{bot_shelf}
Area of Permanent Pool	31149	sq ft	A_{perm_pool}
Area of Bottom of Pond	15061	sq ft	A_{bot_pond}
Depth	9.0	ft	d
Main pool volume at permanent pool elevation	196328	cu ft	V_{pp}
Main pool area at permanent pool elevation	31149	sq ft	V_{pp}
Average Depth	6.3	ft	$d_{av} = V_{pp} / SA$ (Eq. 2)
Average Depth (Rounded to nearest 0.5 ft)	6.5	ft	d_{av}
Coastal Region? (Y or N)	N		
Surface Area/Drainage Area Ratio	1.76	%	SA/DA
Permanent Pool Surface Area Req'd	26786	sq ft	$SA/DA*A_{site}*43560/100$
Permanent Pool Surface Area Provided	31149	sq ft	A_{perm_pool}
Size of BMP (number times minimum size)	1.16		

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Wet Pond Design
Storage Volume Requirements

		Units	Symbols & Governing Equations
Site Calculations			
Total Site Area (Catchment 1)	34.86	ac	A_{site}
Roof Impervious	4.72	ac	A_{roof}
Transportation Impervious	24.00	ac	A_{trans}
Total Impervious Area	28.72	ac	$A_{impervious}$
Percent Impervious	82	%	$(A_{impervious} / A_{site})*100$
Runoff Volume - Simple Method			
Design Storm Rainfall Depth	1.00	in	R_D
Design Storm Runoff Volume	100155	cu ft	V (Simple Method Equation)
Storage Volume Provided	104312	cu ft	

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Wet Pond Design
Drawdown Time

		Units	Symbols & Governing Equation
Orifice Sizing			
Design Storage Volume	100155	cu ft	V
Desired Drawdown Time (2-5 Days)	2	days	T
Discharge	0.58	cfs	Q (V/T/24/3600)
Discharge Coefficient	0.60		C_D
Design Storm Stage	1.94	ft	H_O
Driving Head	0.65	ft	H_O = (TPE - PPE)/3
Appoximate Orifice Diameter	5.24	in	
Orifice Diameter	5.00	in	
Actual Discharge	0.53	cfs	Q (Orifice Equation)
Actual Drawdown Time	2.2	days	

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Forebay Sizing Calculations

Main Pool

Contour	Stage [ft]	Side Slope	Contour Area [sq ft]	Incremental Volume [cu ft]	Cumulative Volume [cu ft]
353.00	0	2.5:1	15061		0
357.00	4	2.5:1	20746	71614	71614
361.00	8	2.5:1	27059	95610	167224
362.00	9	6:1	31149	29104	196328

Forebay 1

Contour	Stage [ft]	Side Slope	Contour Area [sq ft]	Incremental Volume [cu ft]	Cumulative Volume [cu ft]	Percentage of Permanent Pool
358.00	0	3:1	4730		0	
360.00	2	3:1	7460	12190	12190	
362.00	4	3:1	10619	18079	30269	**18.1%**

* Acceptable range for Forebay Volume is 15%-20% of Main Pool Volume

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Stage-Storage Function

Contour ft MSL	Contour Area ft^2	Incremental Volume ft^3	Cumulative Volume, S ft^3	ln(S)	Stage, Z ft	ln(Z)	ln(Z), est.	Z, est. ft
362	42672	----	0	----	0	----	----	
363	55150	48911	48911	10.7977576	1	0	-0.01	0.99032282
364	56091	55620.5	104531.5	11.55724374	2	0.69315	0.70	2.01635307
365	57040	56565.5	161097	11.98976195	3	1.09861	1.11	3.02286428
366	57500	57270	218367	12.29393241	4	1.38629	1.39	4.01871719
367	57700	57600	275967	12.52803657	5	1.60944	1.61	5.00344203
368	57900	57800	333767	12.71819842	6	1.79176	1.79	5.97839158
369	58100	58000	391767	12.87842255	7	1.94591	1.94	6.94588912

Design Storm Runoff	100155	ft^3 (via simple method from SA/DA spreadsheet)
Design Storm Stage	1.94	ft
Design Storm El.	363.94	ft MSL
Surface Area at Design Storm	56017	

Regression Analysis ("linest" Excel Function):

Slope, m =	1.068172085
Intercept, b =	10.80814484

Coastal SA/DA Table

Items in bold from NCDEQ Stormwater Design Manual; others interpolated linearly.

% Impervious	Permanent Pool Average Depth										
Cover	**3**	3.5	**4**	4.5	**5**	5.5	**6**	6.5	**7**	7.5	**8**
10	**0.78**	0.70	**0.61**	0.53	**0.44**	0.22	**0.00**	0.00	**0.00**	0.00	**0.00**
11	0.85	0.75	0.65	0.57	0.48	0.28	0.07	0.06	0.05	0.04	0.04
12	0.92	0.81	0.70	0.61	0.53	0.33	0.14	0.12	0.10	0.09	0.07
13	0.99	0.86	0.74	0.65	0.57	0.39	0.21	0.18	0.16	0.13	0.11
14	1.06	0.92	0.78	0.70	0.61	0.45	0.28	0.24	0.21	0.17	0.14
15	1.13	0.98	0.83	0.74	0.66	0.50	0.35	0.31	0.26	0.22	0.18
16	1.20	1.03	0.87	0.78	0.70	0.56	0.42	0.37	0.31	0.26	0.21
17	1.27	1.09	0.91	0.83	0.74	0.62	0.49	0.43	0.36	0.30	0.25
18	1.34	1.15	0.95	0.87	0.78	0.67	0.56	0.49	0.42	0.35	0.28
19	1.41	1.20	1.00	0.91	0.83	0.73	0.63	0.55	0.47	0.39	0.32
20	**1.48**	1.26	**1.04**	0.96	**0.87**	0.79	**0.70**	0.61	**0.52**	0.44	**0.35**
21	1.55	1.33	1.10	1.01	0.92	0.83	0.74	0.65	0.56	0.47	0.39
22	1.62	1.39	1.16	1.07	0.97	0.88	0.79	0.69	0.59	0.51	0.42
23	1.69	1.46	1.22	1.12	1.02	0.93	0.83	0.73	0.63	0.54	0.46
24	1.76	1.52	1.28	1.18	1.07	0.97	0.87	0.77	0.66	0.58	0.49
25	1.83	1.59	1.35	1.24	1.13	1.02	0.92	0.81	0.70	0.61	0.53
26	1.90	1.65	1.41	1.29	1.18	1.07	0.96	0.84	0.73	0.65	0.56
27	1.97	1.72	1.47	1.35	1.23	1.11	1.00	0.88	0.77	0.68	0.60
28	2.04	1.78	1.53	1.40	1.28	1.16	1.04	0.92	0.80	0.72	0.63
29	2.11	1.85	1.59	1.46	1.33	1.21	1.09	0.96	0.84	0.75	0.67
30	**2.18**	1.92	**1.65**	1.52	**1.38**	1.26	**1.13**	1.00	**0.87**	0.79	**0.70**
31	2.26	1.98	1.71	1.57	1.43	1.29	1.16	1.02	0.88	0.79	0.71
32	2.34	2.05	1.77	1.62	1.47	1.33	1.18	1.04	0.89	0.80	0.72
33	2.41	2.12	1.83	1.67	1.52	1.36	1.21	1.05	0.90	0.81	0.72
34	2.49	2.19	1.89	1.73	1.56	1.40	1.23	1.07	0.91	0.82	0.73
35	2.57	2.26	1.96	1.78	1.61	1.43	1.26	1.09	0.92	0.83	0.74
36	2.65	2.33	2.02	1.83	1.65	1.47	1.29	1.11	0.92	0.84	0.75
37	2.73	2.40	2.08	1.89	1.70	1.50	1.31	1.12	0.93	0.84	0.76
38	2.80	2.47	2.14	1.94	1.74	1.54	1.34	1.14	0.94	0.85	0.76
39	2.88	2.54	2.20	1.99	1.79	1.57	1.36	1.16	0.95	0.86	0.77
40	**2.96**	2.61	**2.26**	2.05	**1.83**	1.61	**1.39**	1.18	**0.96**	0.87	**0.78**
41	3.03	2.68	2.32	2.10	1.88	1.66	1.43	1.21	1.00	0.95	0.90
42	3.10	2.74	2.38	2.16	1.93	1.71	1.48	1.25	1.03	1.02	1.02
43	3.17	2.81	2.44	2.21	1.99	1.75	1.52	1.29	1.07	1.10	1.13
44	3.24	2.87	2.50	2.27	2.04	1.80	1.57	1.33	1.10	1.18	1.25
45	3.31	2.94	2.57	2.33	2.09	1.85	1.61	1.37	1.14	1.25	1.37
46	3.37	3.00	2.63	2.38	2.14	1.90	1.65	1.41	1.17	1.33	1.49
47	3.44	3.07	2.69	2.44	2.19	1.95	1.70	1.45	1.21	1.41	1.61
48	3.51	3.13	2.75	2.50	2.25	1.99	1.74	1.49	1.24	1.48	1.72
49	3.58	3.20	2.81	2.55	2.30	2.04	1.79	1.53	1.28	1.56	1.84
50	**3.65**	3.26	**2.87**	2.61	**2.35**	2.09	**1.83**	1.57	**1.31**	1.64	**1.96**
51	3.72	3.32	2.91	2.65	2.39	2.13	1.87	1.61	1.35	1.62	1.88
52	3.79	3.37	2.96	2.70	2.44	2.18	1.92	1.66	1.40	1.60	1.79
53	3.86	3.43	3.00	2.74	2.48	2.22	1.96	1.70	1.44	1.58	1.71
54	3.93	3.49	3.05	2.78	2.52	2.26	2.00	1.74	1.48	1.56	1.63
55	4.00	3.55	3.09	2.83	2.57	2.31	2.05	1.79	1.53	1.54	1.55
56	4.68	3.91	3.13	2.87	2.61	2.35	2.09	1.83	1.57	1.52	1.46
57	4.14	3.66	3.18	2.91	2.65	2.39	2.13	1.87	1.61	1.50	1.38
58	4.21	3.72	3.22	2.96	2.69	2.43	2.17	1.91	1.65	1.48	1.30
59	4.28	3.77	3.27	3.00	2.74	2.48	2.22	1.96	1.70	1.46	1.21
60	**4.35**	3.83	**3.31**	3.05	**2.78**	2.52	**2.26**	2.00	**1.74**	1.44	**1.13**

61	4.44	3.90	3.37	3.10	2.82	2.56	2.29	2.02	1.75	1.45	1.15
62	4.52	3.98	3.43	3.15	2.87	2.59	2.31	2.04	1.76	1.46	1.17
63	4.61	4.05	3.49	3.20	2.91	2.63	2.34	2.05	1.77	1.48	1.18
64	4.70	4.13	3.55	3.26	2.96	2.66	2.36	2.07	1.78	1.49	1.20
65	4.79	4.20	3.62	3.31	3.00	2.70	2.39	2.09	1.79	1.50	1.22
66	4.87	4.27	3.68	3.36	3.04	2.73	2.42	2.11	1.79	1.52	1.24
67	4.96	4.35	3.74	3.41	3.09	2.77	2.44	2.12	1.80	1.53	1.26
68	5.05	4.42	3.80	3.47	3.13	2.80	2.47	2.14	1.81	1.54	1.27
69	5.13	4.50	3.86	3.52	3.18	2.84	2.49	2.16	1.82	1.56	1.29
70	**5.22**	4.57	**3.92**	3.57	**3.22**	2.87	**2.52**	2.18	**1.83**	1.57	**1.31**
71	5.29	4.64	3.98	3.62	3.26	2.90	2.55	2.19	1.84	1.59	1.34
72	5.36	4.70	4.04	3.67	3.31	2.94	2.57	2.21	1.85	1.60	1.36
73	5.43	4.77	4.10	3.72	3.35	2.97	2.60	2.23	1.85	1.62	1.39
74	5.50	4.83	4.16	3.78	3.39	3.01	2.62	2.24	1.86	1.64	1.41
75	5.57	4.90	4.22	3.83	3.44	3.04	2.65	2.26	1.87	1.66	1.44
76	5.64	4.96	4.28	3.88	3.48	3.08	2.68	2.28	1.88	1.67	1.47
77	5.71	5.03	4.34	3.93	3.52	3.11	2.70	2.29	1.89	1.69	1.49
78	5.78	5.09	4.40	3.98	3.56	3.15	2.73	2.31	1.89	1.71	1.52
79	5.85	5.16	4.46	4.03	3.61	3.18	2.75	2.33	1.90	1.72	1.54
80	**5.92**	5.22	**4.52**	4.09	**3.65**	3.22	**2.78**	2.35	**1.91**	1.74	**1.57**
81	5.98	5.28	4.57	4.14	3.70	3.25	2.80	2.38	1.96	1.78	1.59
82	6.04	5.33	4.63	4.19	3.76	3.29	2.82	2.42	2.02	1.81	1.60
83	6.10	5.39	4.68	4.24	3.81	3.32	2.83	2.45	2.07	1.85	1.62
84	6.16	5.45	4.73	4.30	3.86	3.36	2.85	2.49	2.12	1.88	1.64
85	6.23	5.51	4.79	4.35	3.92	3.39	2.87	2.52	2.18	1.92	1.66
86	6.29	5.56	4.84	4.40	3.97	3.43	2.89	2.56	2.23	1.95	1.67
87	6.35	5.62	4.89	4.46	4.02	3.46	2.91	2.59	2.28	1.99	1.69
88	6.41	5.68	4.94	4.51	4.07	3.50	2.92	2.63	2.33	2.02	1.71
89	6.47	5.73	5.00	4.56	4.13	3.53	2.94	2.66	2.39	2.06	1.72
90	**6.53**	5.79	**5.05**	4.62	**4.18**	3.57	**2.96**	2.70	**2.44**	2.09	**1.74**
91	6.59	5.86	5.14	4.69	4.25	3.65	3.05	2.76	2.47	2.11	1.75
92	6.65	5.94	5.22	4.77	4.32	3.73	3.13	2.82	2.51	2.13	1.76
93	6.71	6.01	5.31	4.85	4.39	3.80	3.22	2.88	2.54	2.15	1.77
94	6.77	6.08	5.40	4.93	4.46	3.88	3.31	2.94	2.58	2.18	1.78
95	6.83	6.16	5.49	5.01	4.53	3.96	3.40	3.00	2.61	2.20	1.79
96	6.89	6.23	5.57	5.08	4.59	4.04	3.48	3.06	2.64	2.22	1.79
97	6.95	6.30	5.66	5.16	4.66	4.12	3.57	3.12	2.68	2.24	1.80
98	7.01	6.38	5.75	5.24	4.73	4.19	3.66	3.18	2.71	2.26	1.81
99	7.07	6.45	5.83	5.32	4.80	4.27	3.74	3.24	2.75	2.28	1.82
100	**7.13**	6.53	**5.92**	5.40	**4.87**	4.35	**3.83**	3.31	**2.78**	2.31	**1.83**

Piedmont and Mountain SA/DA Table

Items in bold from NCDEQ Stormwater Design Manual; others interpolated linearly.

% Impervious	Permanent Pool Average Depth										
Cover	**3**	3.5	**4**	4.5	**5**	5.5	**6**	6.5	**7**	7.5	**8**
10	**0.51**	0.47	**0.43**	0.40	**0.37**	0.34	**0.30**	0.29	**0.27**	0.26	**0.25**
11	0.54	0.50	0.46	0.43	0.39	0.36	0.32	0.30	0.29	0.28	0.27
12	0.58	0.53	0.48	0.45	0.42	0.38	0.34	0.32	0.30	0.29	0.28
13	0.61	0.56	0.51	0.48	0.44	0.40	0.36	0.34	0.32	0.31	0.30
14	0.64	0.59	0.53	0.50	0.47	0.43	0.38	0.36	0.34	0.32	0.31
15	0.68	0.62	0.56	0.53	0.49	0.45	0.41	0.38	0.36	0.34	0.33
16	0.71	0.65	0.59	0.55	0.51	0.47	0.43	0.40	0.37	0.36	0.34
17	0.74	0.68	0.61	0.58	0.54	0.49	0.45	0.42	0.39	0.37	0.36
18	0.77	0.71	0.64	0.60	0.56	0.52	0.47	0.44	0.41	0.39	0.37
19	0.81	0.74	0.66	0.63	0.59	0.54	0.49	0.46	0.42	0.40	0.39
20	**0.84**	0.77	**0.69**	0.65	**0.61**	0.56	**0.51**	0.48	**0.44**	0.42	**0.40**
21	0.87	0.79	0.72	0.67	0.63	0.58	0.53	0.49	0.46	0.44	0.42
22	0.91	0.82	0.74	0.70	0.66	0.60	0.55	0.51	0.47	0.45	0.43
23	0.94	0.85	0.77	0.72	0.68	0.63	0.57	0.53	0.49	0.47	0.45
24	0.97	0.88	0.79	0.75	0.70	0.65	0.59	0.55	0.51	0.49	0.46
25	1.01	0.91	0.82	0.77	0.73	0.67	0.62	0.57	0.53	0.50	0.48
26	1.04	0.94	0.84	0.79	0.75	0.69	0.64	0.59	0.54	0.52	0.50
27	1.07	0.97	0.87	0.82	0.77	0.71	0.66	0.61	0.56	0.54	0.51
28	1.10	1.00	0.89	0.84	0.79	0.74	0.68	0.63	0.58	0.55	0.53
29	1.14	1.03	0.92	0.87	0.82	0.76	0.70	0.65	0.59	0.57	0.54
30	**1.17**	1.06	**0.94**	0.89	**0.84**	0.78	**0.72**	0.67	**0.61**	0.59	**0.56**
31	1.20	1.09	0.97	0.92	0.87	0.80	0.74	0.68	0.63	0.60	0.58
32	1.24	1.12	1.00	0.95	0.89	0.82	0.76	0.70	0.64	0.62	0.59
33	1.27	1.15	1.03	0.97	0.92	0.85	0.78	0.72	0.66	0.63	0.61
34	1.31	1.18	1.06	1.00	0.94	0.87	0.80	0.74	0.68	0.65	0.62
35	1.34	1.22	1.09	1.03	0.97	0.89	0.82	0.76	0.70	0.67	0.64
36	1.37	1.25	1.12	1.06	0.99	0.91	0.83	0.77	0.71	0.68	0.65
37	1.41	1.28	1.15	1.08	1.02	0.93	0.85	0.79	0.73	0.70	0.67
38	1.44	1.31	1.18	1.11	1.04	0.96	0.87	0.81	0.75	0.71	0.68
39	1.48	1.34	1.21	1.14	1.07	0.98	0.89	0.83	0.76	0.73	0.70
40	**1.51**	1.38	**1.24**	1.17	**1.09**	1.00	**0.91**	0.85	**0.78**	0.75	**0.71**
41	1.54	1.40	1.27	1.19	1.11	1.02	0.93	0.86	0.80	0.76	0.73
42	1.57	1.43	1.29	1.21	1.13	1.04	0.95	0.88	0.81	0.78	0.74
43	1.59	1.46	1.32	1.24	1.16	1.07	0.98	0.90	0.83	0.79	0.76
44	1.62	1.49	1.35	1.26	1.18	1.09	1.00	0.92	0.85	0.81	0.77
45	1.65	1.51	1.38	1.29	1.20	1.11	1.02	0.94	0.87	0.83	0.79
46	1.68	1.54	1.40	1.31	1.22	1.13	1.04	0.96	0.88	0.84	0.81
47	1.71	1.57	1.43	1.34	1.24	1.15	1.06	0.98	0.90	0.86	0.82
48	1.73	1.60	1.46	1.36	1.27	1.18	1.09	1.00	0.92	0.88	0.84
49	1.76	1.62	1.48	1.39	1.29	1.20	1.11	1.02	0.93	0.89	0.85
50	**1.79**	1.65	**1.51**	1.41	**1.31**	1.22	**1.13**	1.04	**0.95**	0.91	**0.87**
51	1.82	1.68	1.54	1.43	1.33	1.24	1.15	1.06	0.97	0.93	0.89
52	1.85	1.71	1.56	1.45	1.35	1.26	1.17	1.08	0.98	0.94	0.90
53	1.88	1.73	1.59	1.48	1.36	1.27	1.18	1.09	1.00	0.96	0.92
54	1.91	1.76	1.61	1.50	1.38	1.29	1.20	1.11	1.02	0.98	0.93
55	1.94	1.79	1.64	1.52	1.40	1.31	1.22	1.13	1.04	0.99	0.95
56	1.97	1.82	1.67	1.54	1.42	1.33	1.24	1.15	1.05	1.01	0.97
57	2.00	1.85	1.69	1.56	1.44	1.35	1.26	1.16	1.07	1.03	0.98
58	2.03	1.87	1.72	1.59	1.45	1.36	1.27	1.18	1.09	1.04	1.00
59	2.06	1.90	1.74	1.61	1.47	1.38	1.29	1.20	1.10	1.06	1.01
60	**2.09**	1.93	**1.77**	1.63	**1.49**	1.40	**1.31**	1.22	**1.12**	1.08	**1.03**

61	2.13	1.97	1.80	1.66	1.52	1.43	1.34	1.24	1.14	1.09	1.04
62	2.17	2.00	1.83	1.69	1.55	1.46	1.36	1.26	1.16	1.11	1.06
63	2.22	2.04	1.87	1.72	1.58	1.48	1.39	1.29	1.19	1.13	1.07
64	2.26	2.08	1.90	1.76	1.61	1.51	1.41	1.31	1.21	1.15	1.09
65	2.30	2.12	1.93	1.79	1.65	1.54	1.44	1.33	1.23	1.17	1.10
66	2.34	2.15	1.96	1.82	1.68	1.57	1.46	1.36	1.25	1.18	1.11
67	2.38	2.19	1.99	1.85	1.71	1.60	1.49	1.38	1.27	1.20	1.13
68	2.43	2.23	2.03	1.88	1.74	1.62	1.51	1.40	1.30	1.22	1.14
69	2.47	2.26	2.06	1.91	1.77	1.65	1.54	1.43	1.32	1.24	1.16
70	**2.51**	2.30	**2.09**	1.95	**1.80**	1.68	**1.56**	1.45	**1.34**	1.26	**1.17**
71	2.55	2.34	2.12	1.97	1.83	1.71	1.59	1.48	1.37	1.28	1.19
72	2.59	2.37	2.15	2.00	1.85	1.73	1.61	1.50	1.40	1.31	1.22
73	2.63	2.41	2.19	2.03	1.88	1.76	1.64	1.53	1.42	1.33	1.24
74	2.67	2.45	2.22	2.06	1.91	1.79	1.66	1.56	1.45	1.36	1.26
75	2.72	2.48	2.25	2.09	1.94	1.81	1.69	1.59	1.48	1.38	1.29
76	2.76	2.52	2.28	2.12	1.96	1.84	1.72	1.61	1.51	1.41	1.31
77	2.80	2.56	2.31	2.15	1.99	1.87	1.74	1.64	1.54	1.43	1.33
78	2.84	2.59	2.35	2.18	2.02	1.89	1.77	1.67	1.56	1.46	1.35
79	2.88	2.63	2.38	2.21	2.04	1.92	1.79	1.69	1.59	1.48	1.38
80	**2.92**	2.67	**2.41**	2.24	**2.07**	1.95	**1.82**	1.72	**1.62**	1.51	**1.40**
81	2.95	2.69	2.43	2.26	2.09	1.97	1.84	1.74	1.64	1.53	1.42
82	2.99	2.72	2.46	2.29	2.12	1.99	1.86	1.76	1.66	1.55	1.44
83	3.02	2.75	2.48	2.31	2.14	2.01	1.89	1.79	1.69	1.57	1.46
84	3.05	2.78	2.50	2.33	2.17	2.04	1.91	1.81	1.71	1.59	1.48
85	3.09	2.81	2.53	2.36	2.19	2.06	1.93	1.83	1.73	1.61	1.50
86	3.12	2.83	2.55	2.38	2.21	2.08	1.95	1.85	1.75	1.63	1.51
87	3.15	2.86	2.57	2.40	2.24	2.11	1.97	1.87	1.77	1.65	1.53
88	3.18	2.89	2.59	2.43	2.26	2.13	2.00	1.90	1.80	1.67	1.55
89	3.22	2.92	2.62	2.45	2.29	2.15	2.02	1.92	1.82	1.69	1.57
90	**3.25**	2.95	**2.64**	2.48	**2.31**	2.18	**2.04**	1.94	**1.84**	1.72	**1.59**
91	3.28	2.97	2.66	2.49	2.33	2.20	2.07	1.97	1.86	1.73	1.61
92	3.31	2.99	2.67	2.51	2.35	2.23	2.10	1.99	1.88	1.75	1.62
93	3.34	3.01	2.69	2.53	2.37	2.25	2.13	2.02	1.90	1.77	1.64
94	3.37	3.04	2.70	2.55	2.39	2.28	2.16	2.04	1.92	1.79	1.65
95	3.40	3.06	2.72	2.57	2.42	2.30	2.19	2.07	1.94	1.81	1.67
96	3.43	3.08	2.73	2.58	2.44	2.33	2.22	2.09	1.96	1.82	1.69
97	3.46	3.10	2.75	2.60	2.46	2.35	2.25	2.12	1.98	1.84	1.70
98	3.49	3.13	2.76	2.62	2.48	2.38	2.28	2.14	2.00	1.86	1.72
99	3.52	3.15	2.78	2.64	2.50	2.40	2.31	2.17	2.02	1.88	1.73
100	**3.55**	3.17	**2.79**	2.66	**2.52**	2.43	**2.34**	2.19	**2.04**	1.90	**1.75**

Ark Consulting Group, PLLC
2755-B Charles Boulevard
Greenville, NC 27858
252-558-0888

JOB 21089 - Wallbrook
DATE Jan-23
CALCULATED BY TGN/JDW
CHECKED BY BCF

OUTLET STRUCTURE FLOTATION ANALYSIS:

Calculate the weight of water displaced by the structure:

Circular Items: N/A

	Outer Length (ft)	Inner Length (ft)	Height (ft)	Volume Displaced (ft^3)
Top				0.00
Riser				0.00
Base				0.00
Subtotal				0.00

Rectangular Items

	Length (ft)	Width (ft)	Height (ft)	Volume Displaced (ft^3)
Top	11.00	7.00	0.50	38.50
Riser	11.00	7.00	13.00	1001.00
Base	11.00	7.00	0.50	38.50
Subtotal				1078.00

Unit weight of water =	62.4	pcf
Total volume displaced =	1078.0	ft^3
Total weight displaced =	67267.2	lbs

Calculate the weight of structure and soil:

Circular Concrete Items: N/A

	Outer Diameter (ft)	Inner Diameter (ft)	Height (ft)	Volume (ft^3)
Top				0.00
Riser				0.00
Base				0.00
Subtotal				0.00

Rectangular Concrete Items

	Length (ft)	Width (ft)	Height (ft)	Volume (ft^3)
Top	11.00	7.00	0.50	38.50
Left Wall	7.00		13.00	91.00
Right Wall	7.00		13.00	91.00
Front Wall	11.00		13.00	143.00
Back Wall	11.00		13.00	143.00
Base	11.00	7.00	0.50	38.50
Subtotal				545.00

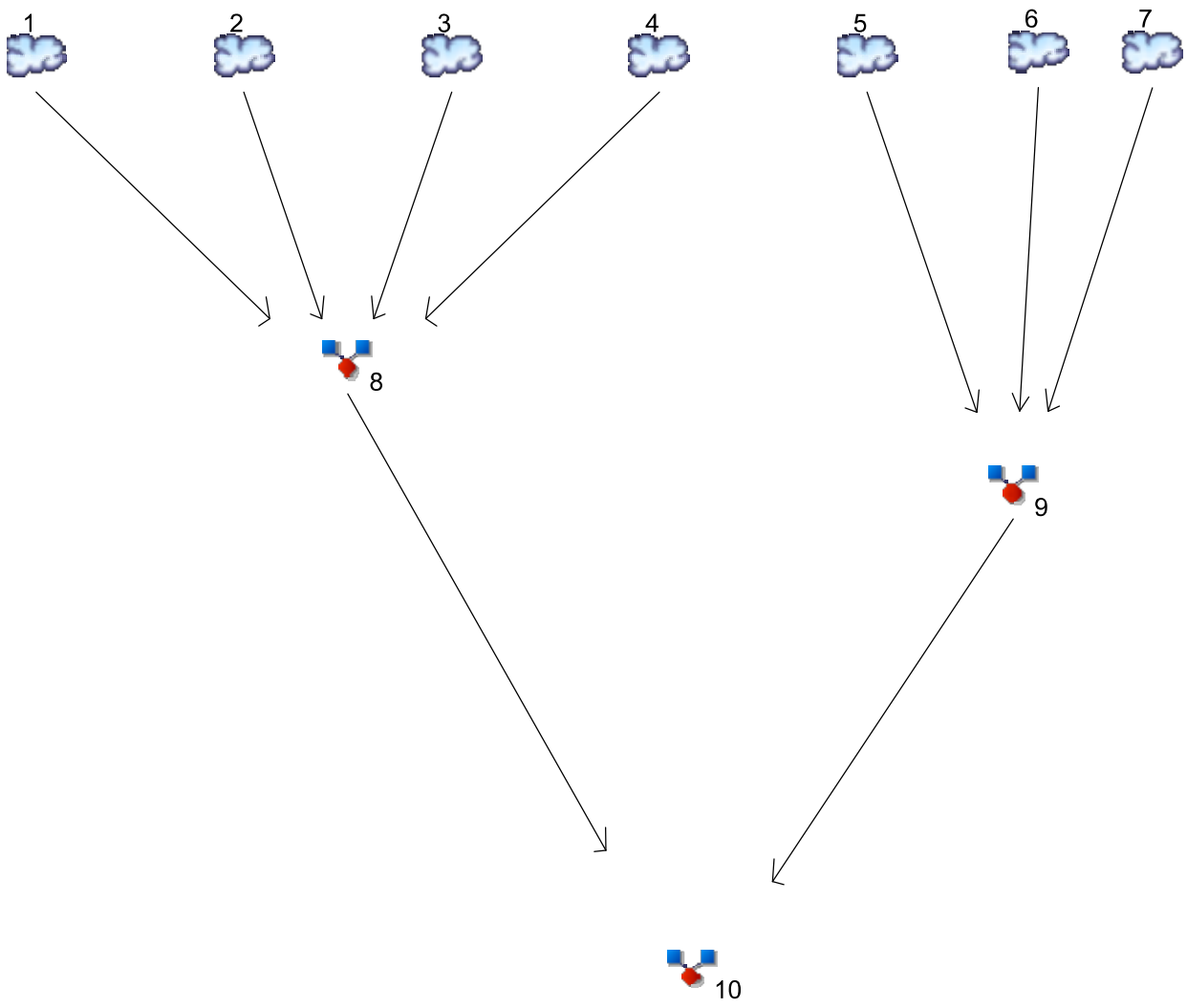
Unit weight of concrete =	150.0	pcf
Total volume concrete =	545.0	ft^3
Total weight concrete =	81750.0	lbs

Calculate the uplift and factor of safety:

Total weight of displaced water =	67267	lbs
Total weight of concrete =	81750	lbs
Total weight of soil =	0	lbs
Total uplift =	14483	lbs
Factor of Safety =	1.22	

COMMENT: Recommended factor of safety is 1.15, plus or minus. However, this calculation is very conservative as it does not take into account frictional resistance between the soil and concrete.

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	SCS Runoff	Pre - Wallbrook Lots 1 & 2
2	SCS Runoff	Pre - New Roadways (Wallbrook/Va Water)
3	SCS Runoff	Pre - Boat Tract (Lot 5)
4	SCS Runoff	Pre - Paris Tract (Lots 9, 10, 11)
5	SCS Runoff	Pre - DOT Roadway
6	SCS Runoff	Pre - Lots 3 & 4
7	SCS Runoff	Pre - Wallbrook Townhomes
8	Combine	Pre-Development
9	Combine	Pre-Development
10	Combine	Pre-Development Total

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	21.18	29.99	-------	43.71	54.97	70.42	83.00	95.65	Pre - Wallbrook Lots 1 & 2
2	SCS Runoff	------	4.075	5.770	-------	8.412	10.58	13.55	15.97	18.40	Pre - New Roadways (Wallbrook/Va
3	SCS Runoff	------	4.739	7.336	-------	11.55	15.12	20.12	24.28	28.49	Pre - Boat Tract (Lot 5)
4	SCS Runoff	------	12.53	17.59	-------	25.44	31.85	40.62	47.76	54.91	Pre - Paris Tract (Lots 9, 10, 11)
5	SCS Runoff	------	12.08	16.78	-------	24.03	29.93	37.97	44.50	51.04	Pre - DOT Roadway
6	SCS Runoff	------	4.108	5.817	-------	8.479	10.66	13.66	16.10	18.55	Pre - Lots 3 & 4
7	SCS Runoff	------	0.657	0.922	-------	1.333	1.669	2.129	2.503	2.878	Pre - Wallbrook Townhomes
8	Combine	1, 2, 3, 4,	40.68	58.43	-------	86.45	109.58	141.52	167.64	193.95	Pre-Development
9	Combine	5, 6, 7,	16.66	23.33	-------	33.64	42.05	53.56	62.91	72.30	Pre-Development
10	Combine	8, 9	57.26	81.75	-------	120.08	151.63	195.08	230.55	266.24	Pre-Development Total

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	21.18	2	720	52,755	------	------	------	Pre - Wallbrook Lots 1 & 2
2	SCS Runoff	4.075	2	720	10,151	------	------	------	Pre - New Roadways (Wallbrook/Va
3	SCS Runoff	4.739	2	722	14,321	------	------	------	Pre - Boat Tract (Lot 5)
4	SCS Runoff	12.53	2	718	25,904	------	------	------	Pre - Paris Tract (Lots 9, 10, 11)
5	SCS Runoff	12.08	2	718	24,947	------	------	------	Pre - DOT Roadway
6	SCS Runoff	4.108	2	720	10,233	------	------	------	Pre - Lots 3 & 4
7	SCS Runoff	0.657	2	718	1,358	------	------	------	Pre - Wallbrook Townhomes
8	Combine	40.68	2	720	103,132	1, 2, 3, 4,	------	------	Pre-Development
9	Combine	16.66	2	718	36,538	5, 6, 7,	------	------	Pre-Development
10	Combine	57.26	2	718	139,669	8, 9	------	------	Pre-Development Total

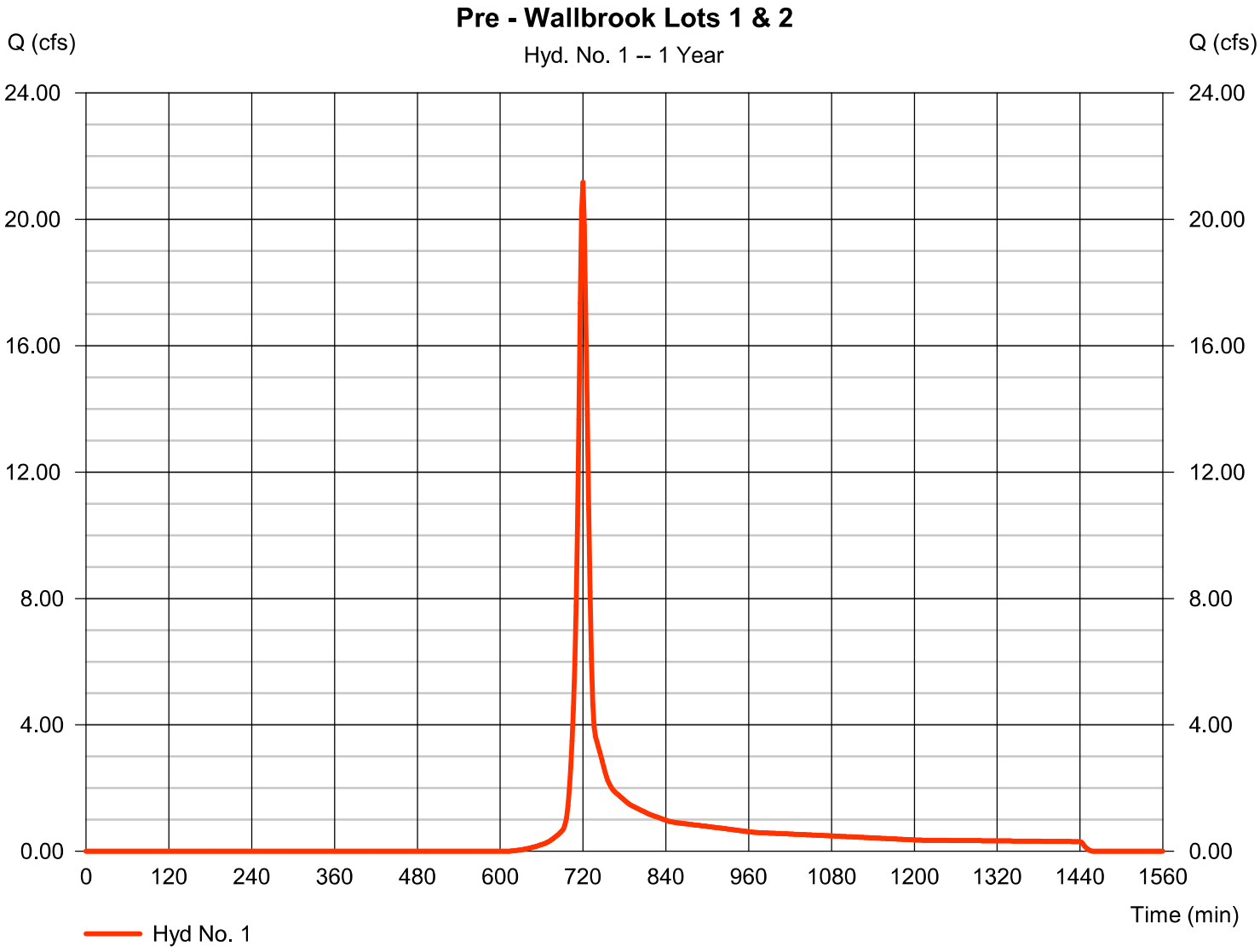
Hydrograph Report

Hyd. No. 1

Pre - Wallbrook Lots 1 & 2

Hydrograph type	= SCS Runoff	Peak discharge	= 21.18 cfs
Storm frequency	= 1 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 52,755 cuft
Drainage area	= 12.940 ac	Curve number	= 79*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.70 min
Total precip.	= 2.86 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

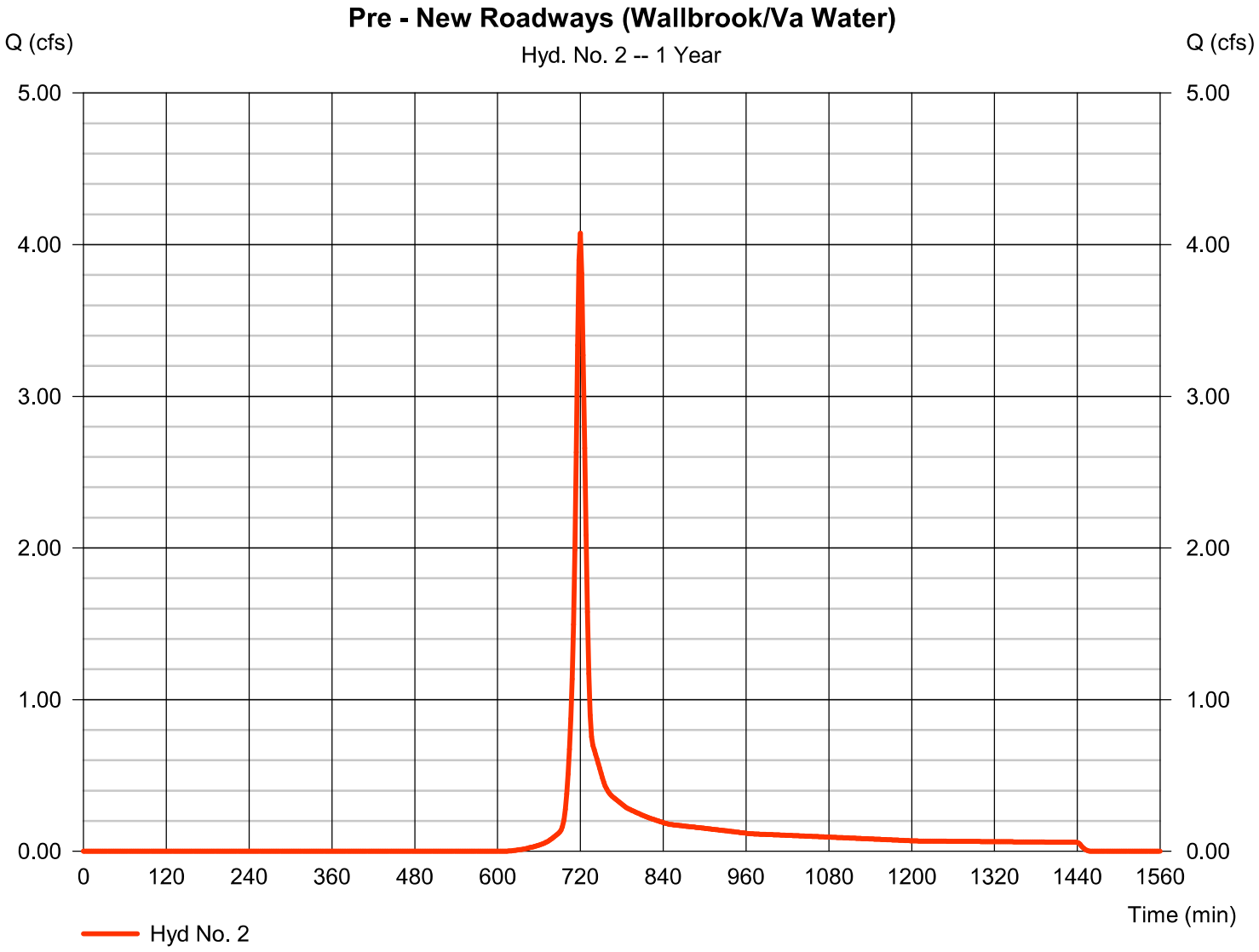
* Composite (Area/CN) = [(10.970 x 79) + (1.970 x 79)] / 12.940



Hyd. No. 2

Pre - New Roadways (Wallbrook/Va Water)

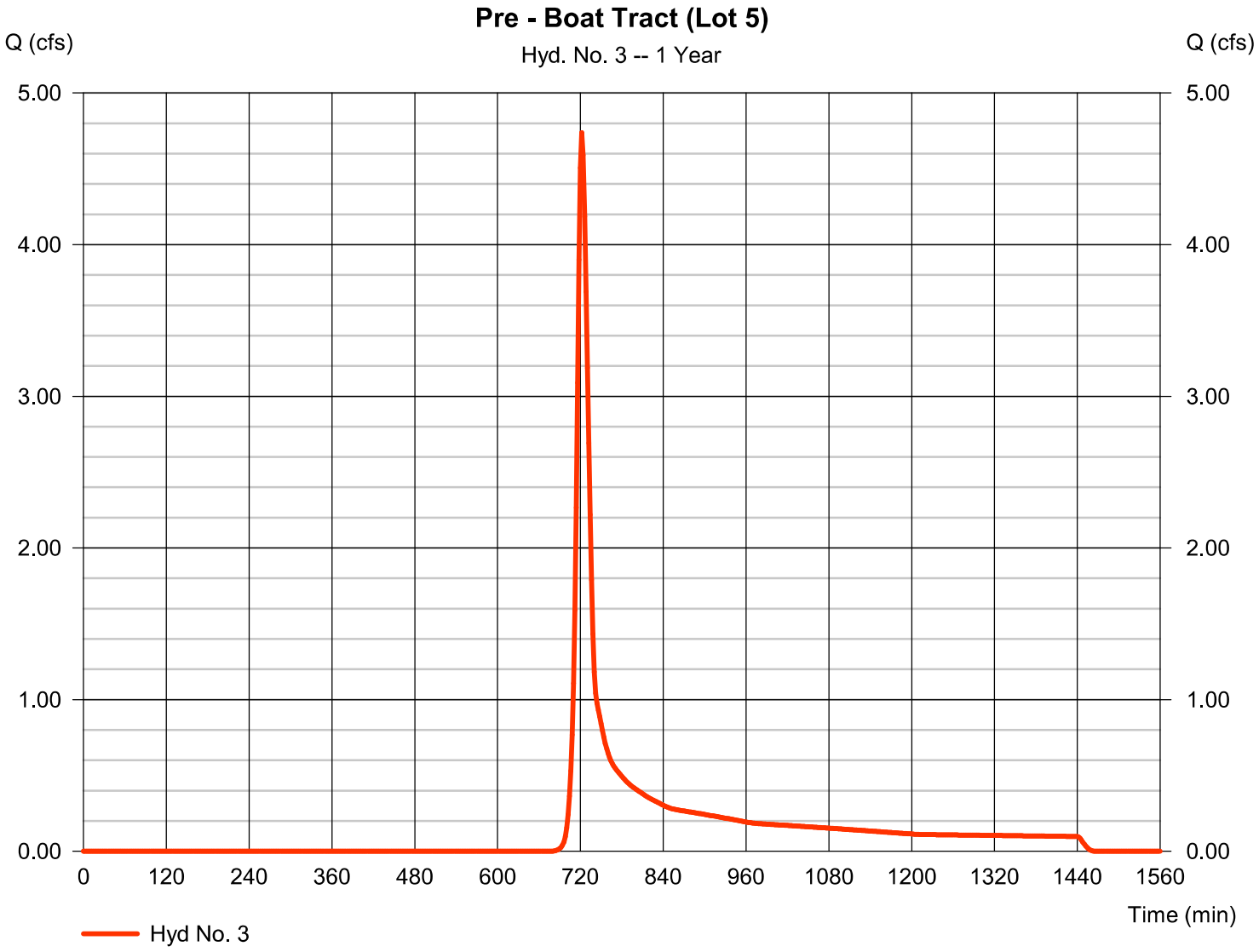
Hydrograph type	= SCS Runoff	Peak discharge	= 4.075 cfs
Storm frequency	= 1 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 10,151 cuft
Drainage area	= 2.490 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.40 min
Total precip.	= 2.86 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400



Hyd. No. 3

Pre - Boat Tract (Lot 5)

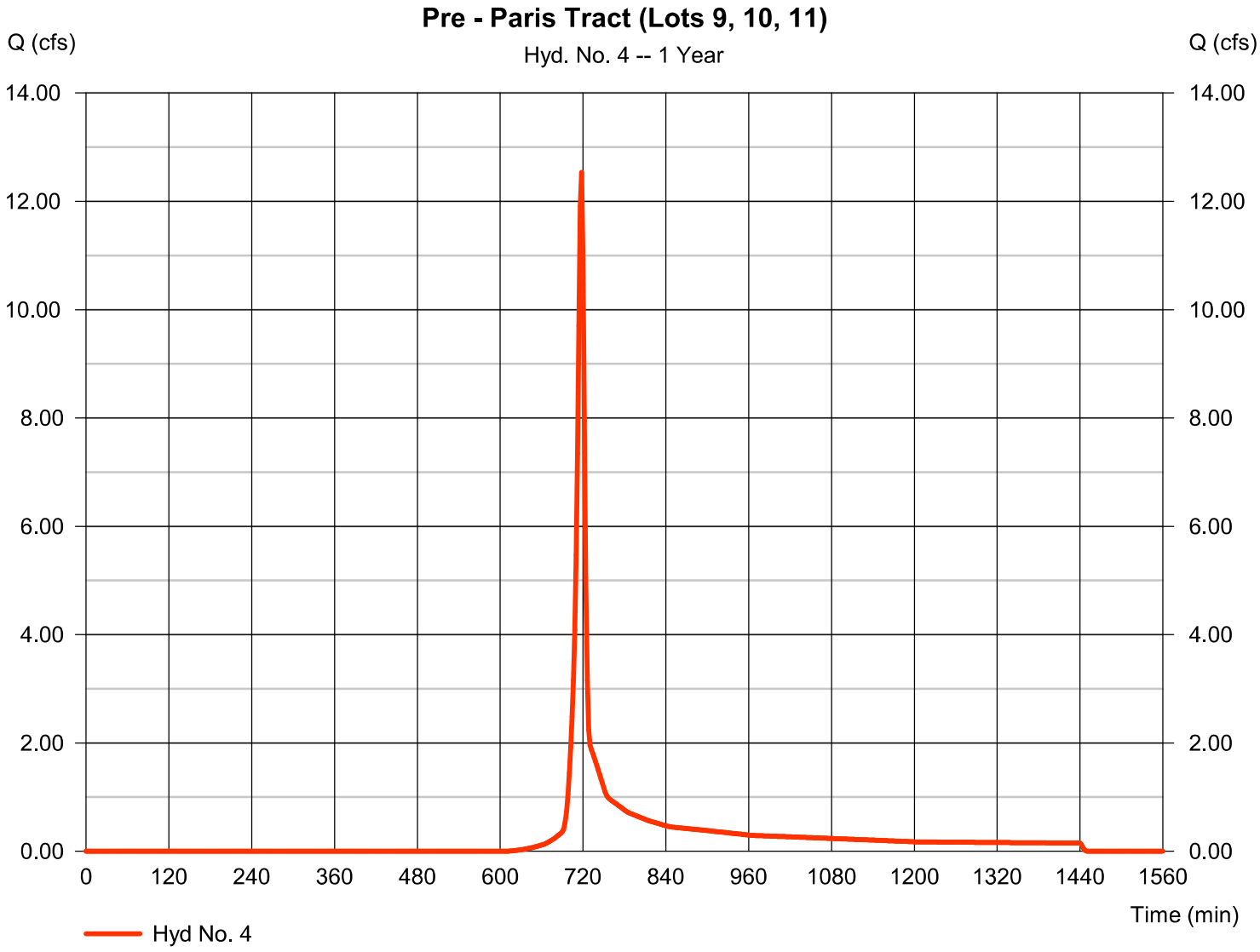
Hydrograph type	= SCS Runoff	Peak discharge	= 4.739 cfs
Storm frequency	= 1 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 14,321 cuft
Drainage area	= 5.070 ac	Curve number	= 73
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.50 min
Total precip.	= 2.86 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400



Hyd. No. 4

Pre - Paris Tract (Lots 9, 10, 11)

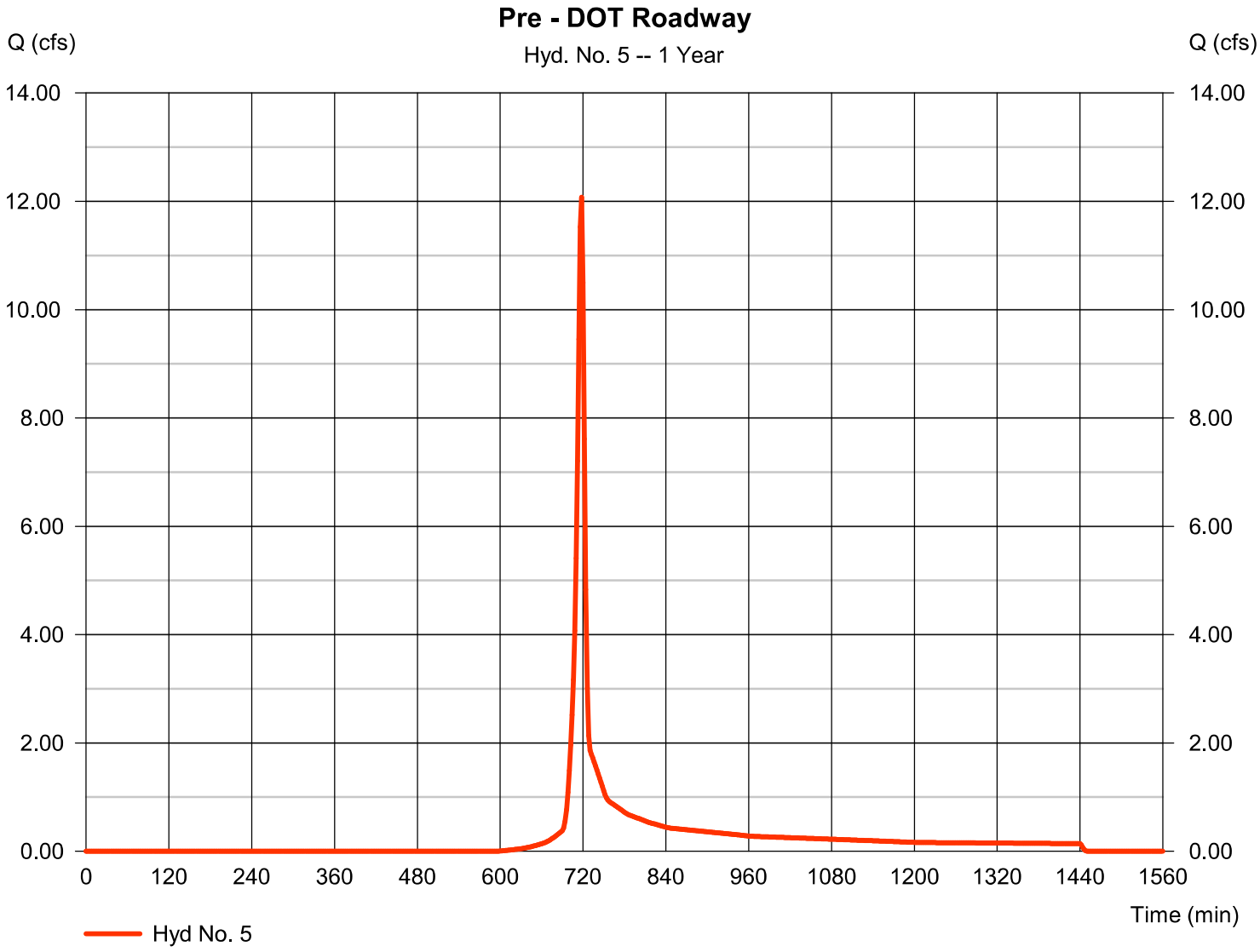
Hydrograph type	= SCS Runoff	Peak discharge	= 12.53 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 25,904 cuft
Drainage area	= 7.060 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.86 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400



Hyd. No. 5

Pre - DOT Roadway

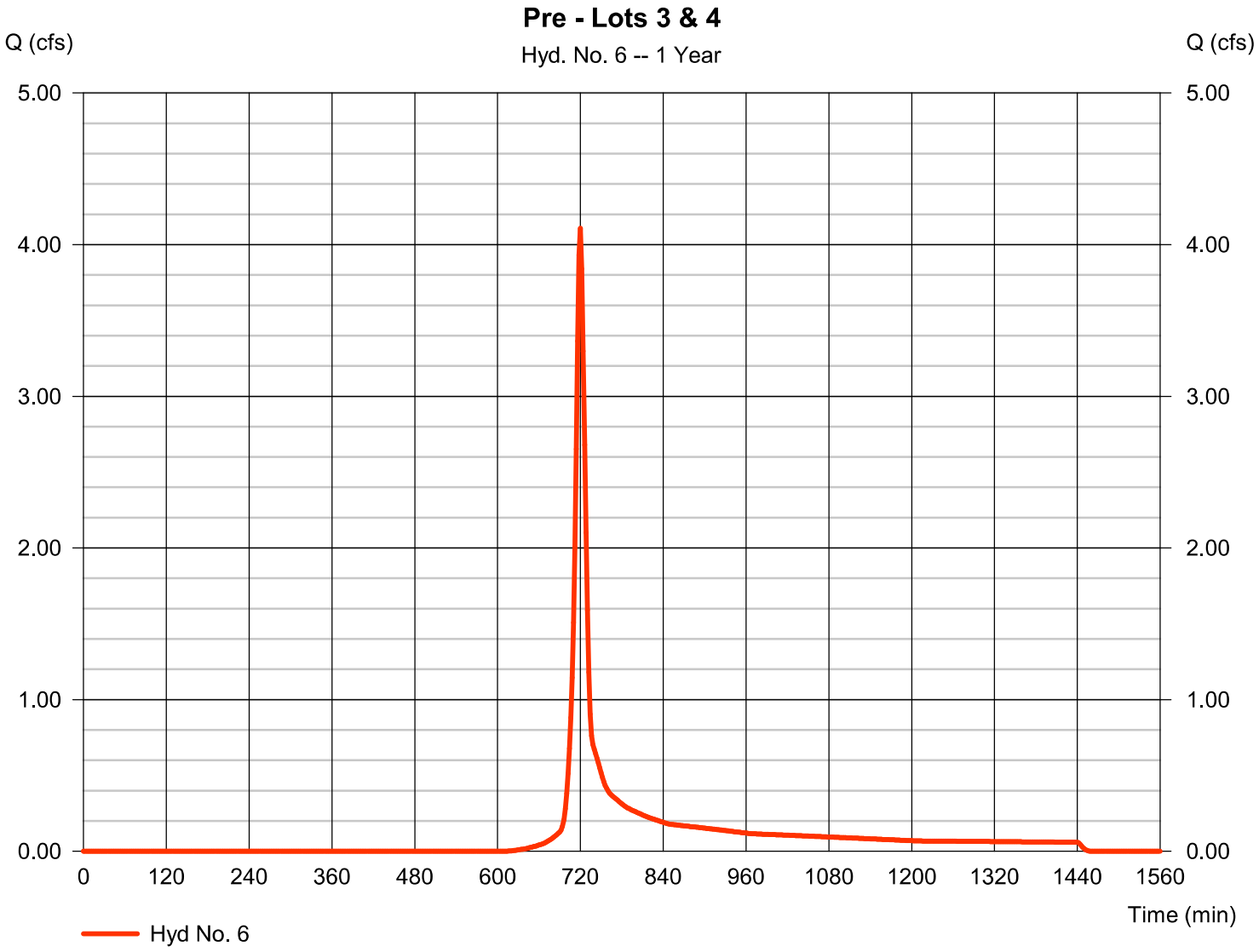
Hydrograph type	= SCS Runoff	Peak discharge	= 12.08 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 24,947 cuft
Drainage area	= 6.450 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.86 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400



Hyd. No. 6

Pre - Lots 3 & 4

Hydrograph type	= SCS Runoff	Peak discharge	= 4.108 cfs
Storm frequency	= 1 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 10,233 cuft
Drainage area	= 2.510 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 2.86 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

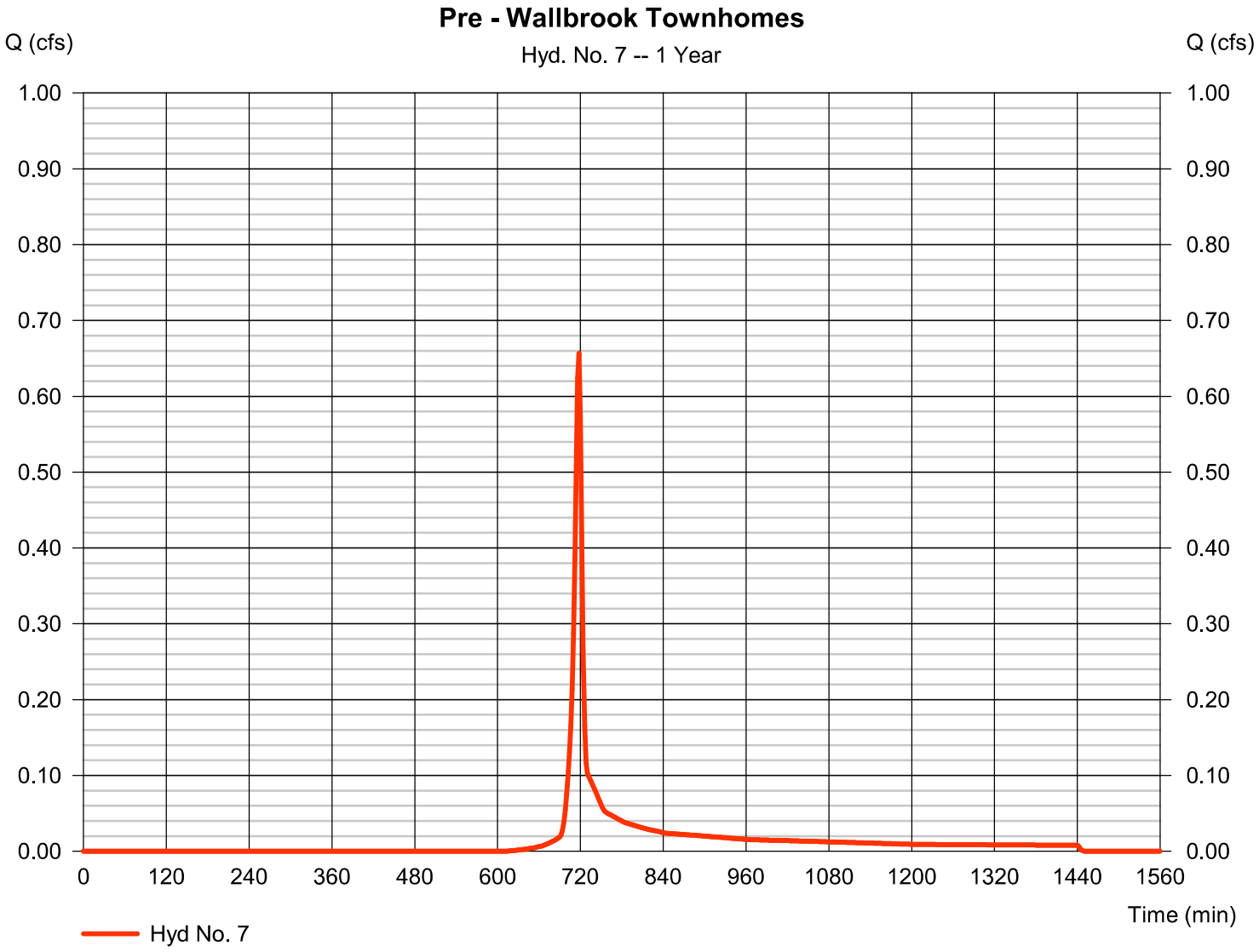


Hydrograph Report

Hyd. No. 7

Pre - Wallbrook Townhomes

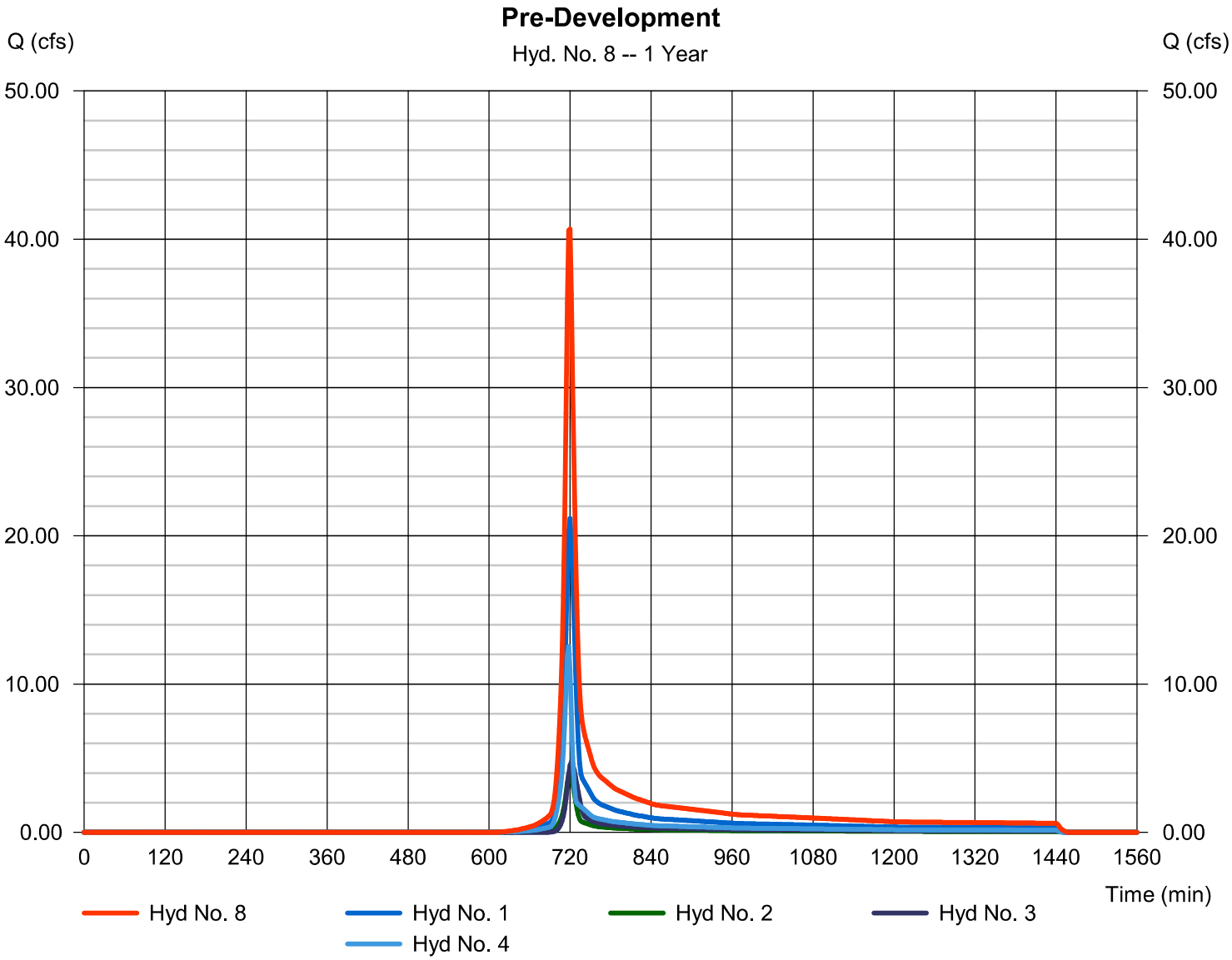
Hydrograph type	= SCS Runoff	Peak discharge	= 0.657 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 1,358 cuft
Drainage area	= 0.370 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.86 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400



Hyd. No. 8

Pre-Development

Hydrograph type	= Combine	Peak discharge	= 40.68 cfs
Storm frequency	= 1 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 103,132 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 27.560 ac

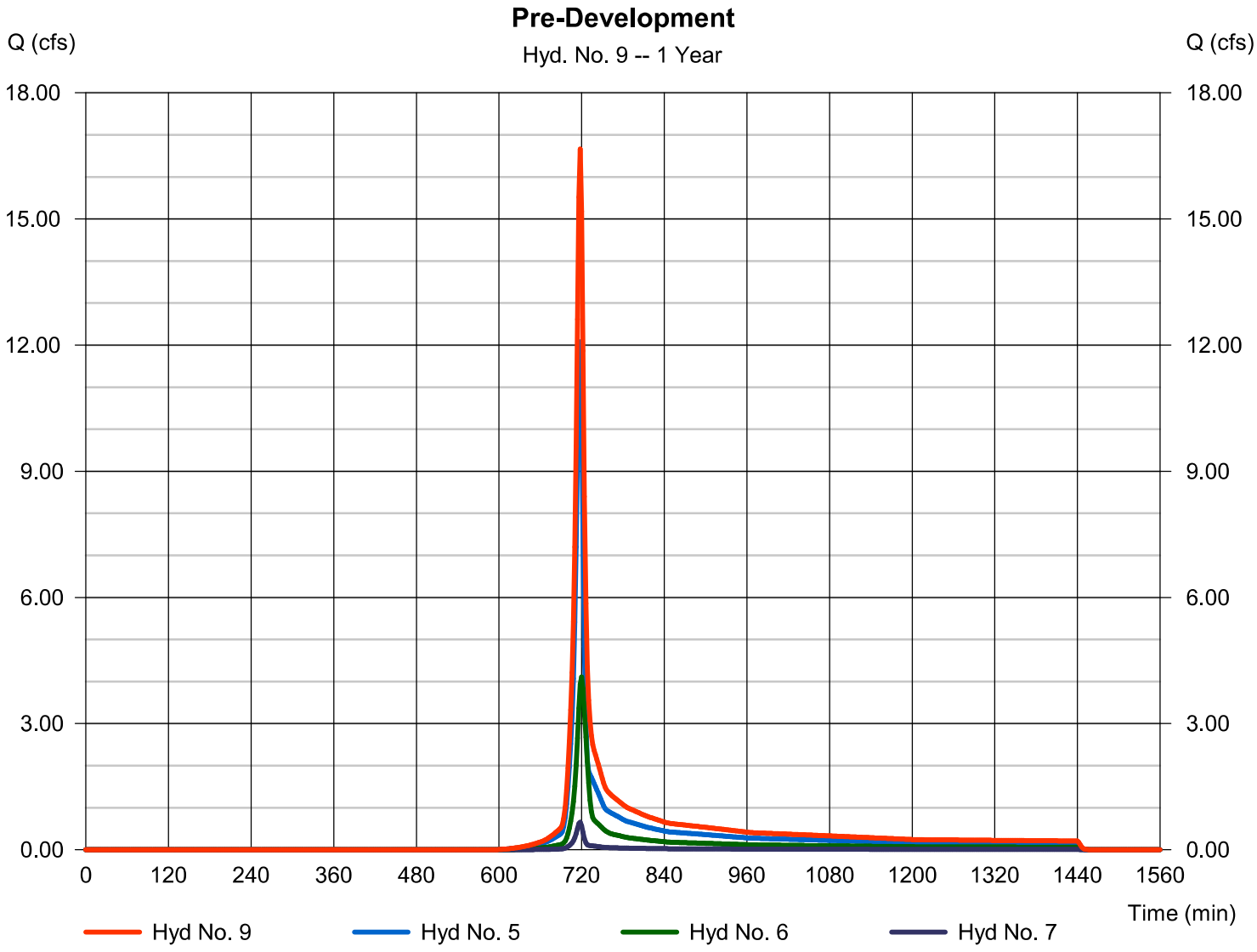


Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Sunday, 08 / 27 / 2023

Hyd. No. 9

Pre-Development

Hydrograph type	= Combine	Peak discharge	= 16.66 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 36,538 cuft
Inflow hyds.	= 5, 6, 7	Contrib. drain. area	= 9.330 ac

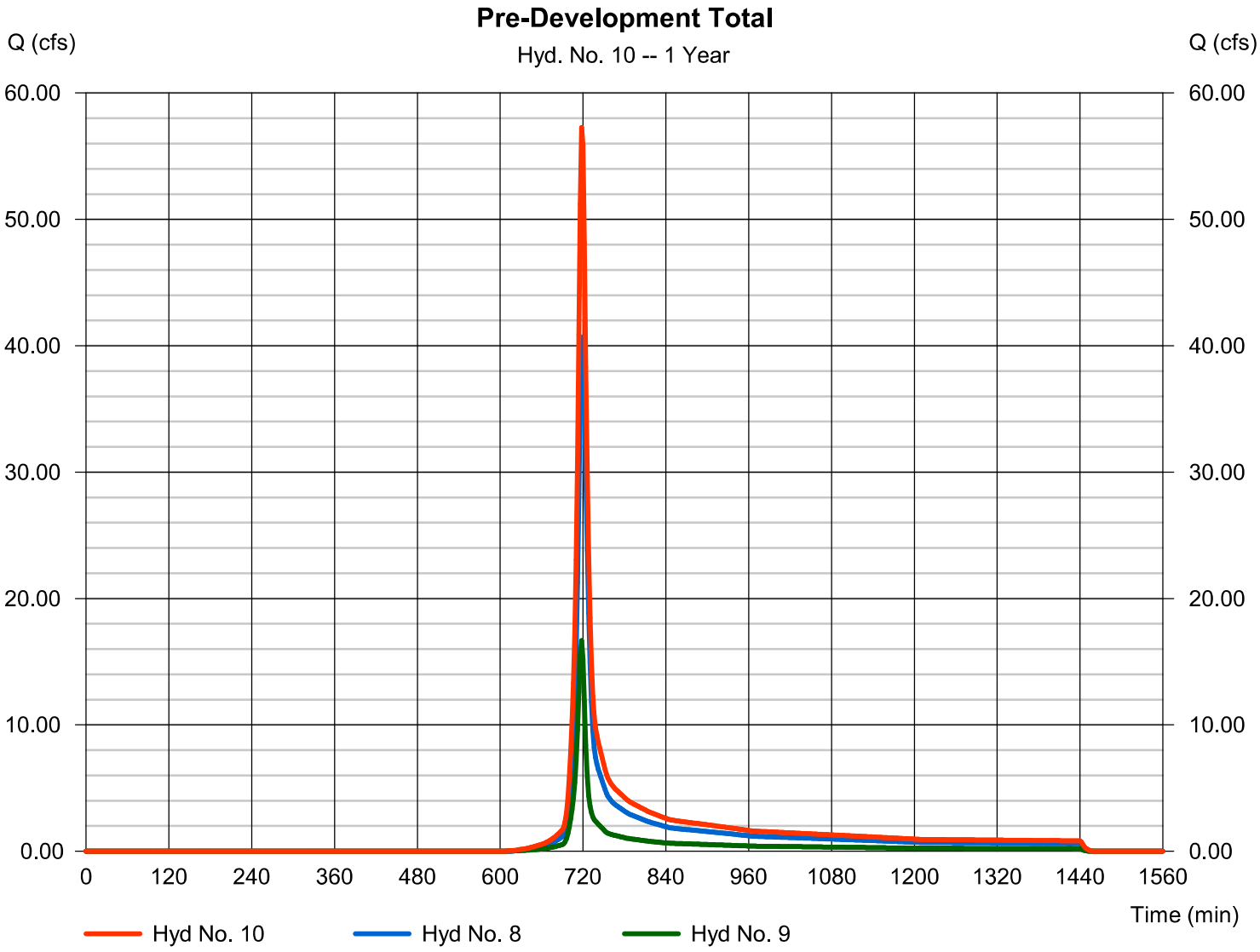


Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Sunday, 08 / 27 / 2023

Hyd. No. 10

Pre-Development Total

Hydrograph type	= Combine	Peak discharge	= 57.26 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 139,669 cuft
Inflow hyds.	= 8, 9	Contrib. drain. area	= 0.000 ac



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	SCS Runoff	29.99	2	720	74,109	------	------	------	Pre - Wallbrook Lots 1 & 2
2	SCS Runoff	5.770	2	720	14,261	------	------	------	Pre - New Roadways (Wallbrook/Va
3	SCS Runoff	7.336	2	722	21,246	------	------	------	Pre - Boat Tract (Lot 5)
4	SCS Runoff	17.59	2	718	36,390	------	------	------	Pre - Paris Tract (Lots 9, 10, 11)
5	SCS Runoff	16.78	2	718	34,760	------	------	------	Pre - DOT Roadway
6	SCS Runoff	5.817	2	720	14,375	------	------	------	Pre - Lots 3 & 4
7	SCS Runoff	0.922	2	718	1,907	------	------	------	Pre - Wallbrook Townhomes
8	Combine	58.43	2	718	146,007	1, 2, 3, 4,	------	------	Pre-Development
9	Combine	23.33	2	718	51,042	5, 6, 7,	------	------	Pre-Development
10	Combine	81.75	2	718	197,049	8, 9	------	------	Pre-Development Total

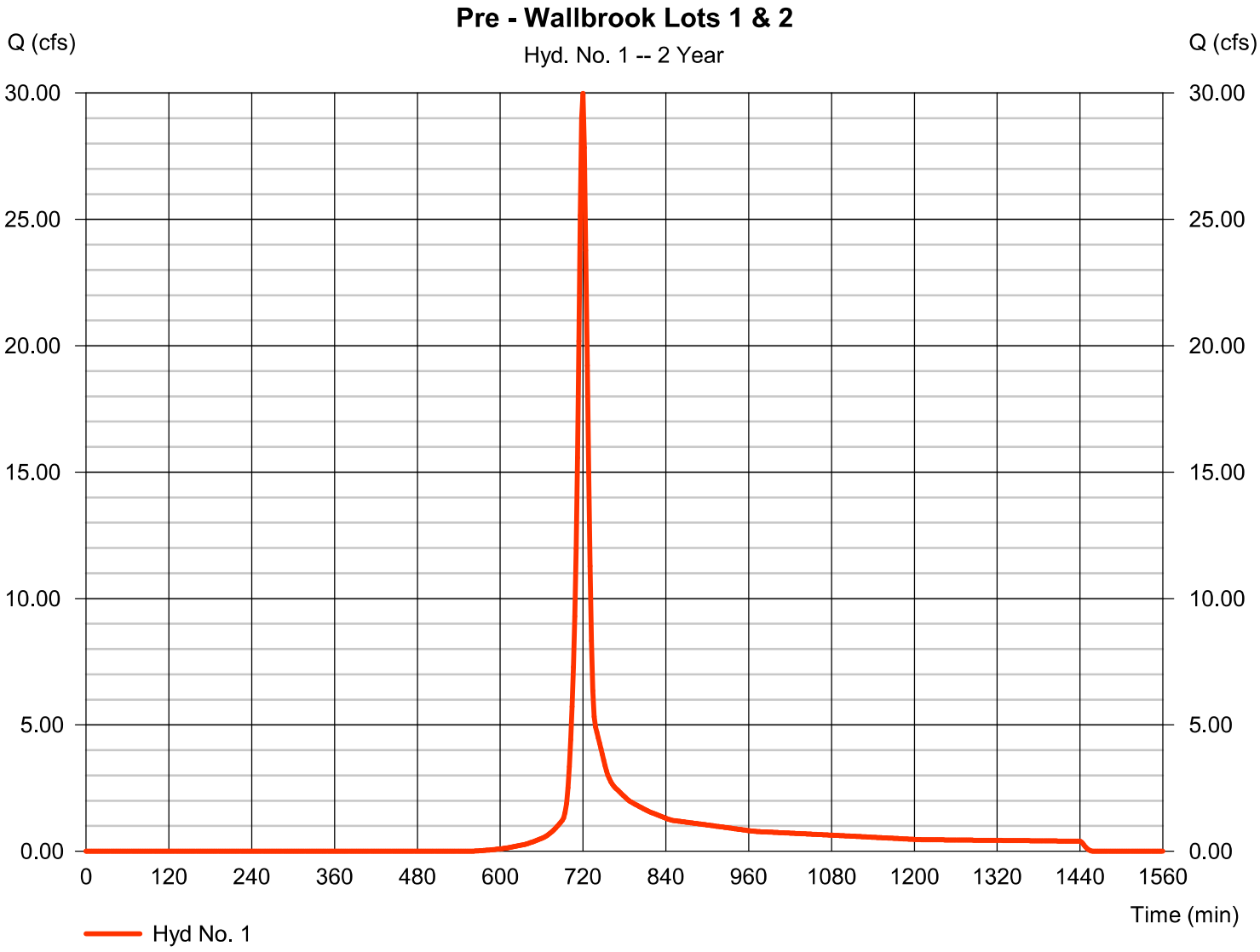
Hydrograph Report

Hyd. No. 1

Pre - Wallbrook Lots 1 & 2

Hydrograph type	= SCS Runoff	Peak discharge	= 29.99 cfs
Storm frequency	= 2 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 74,109 cuft
Drainage area	= 12.940 ac	Curve number	= 79*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.70 min
Total precip.	= 3.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

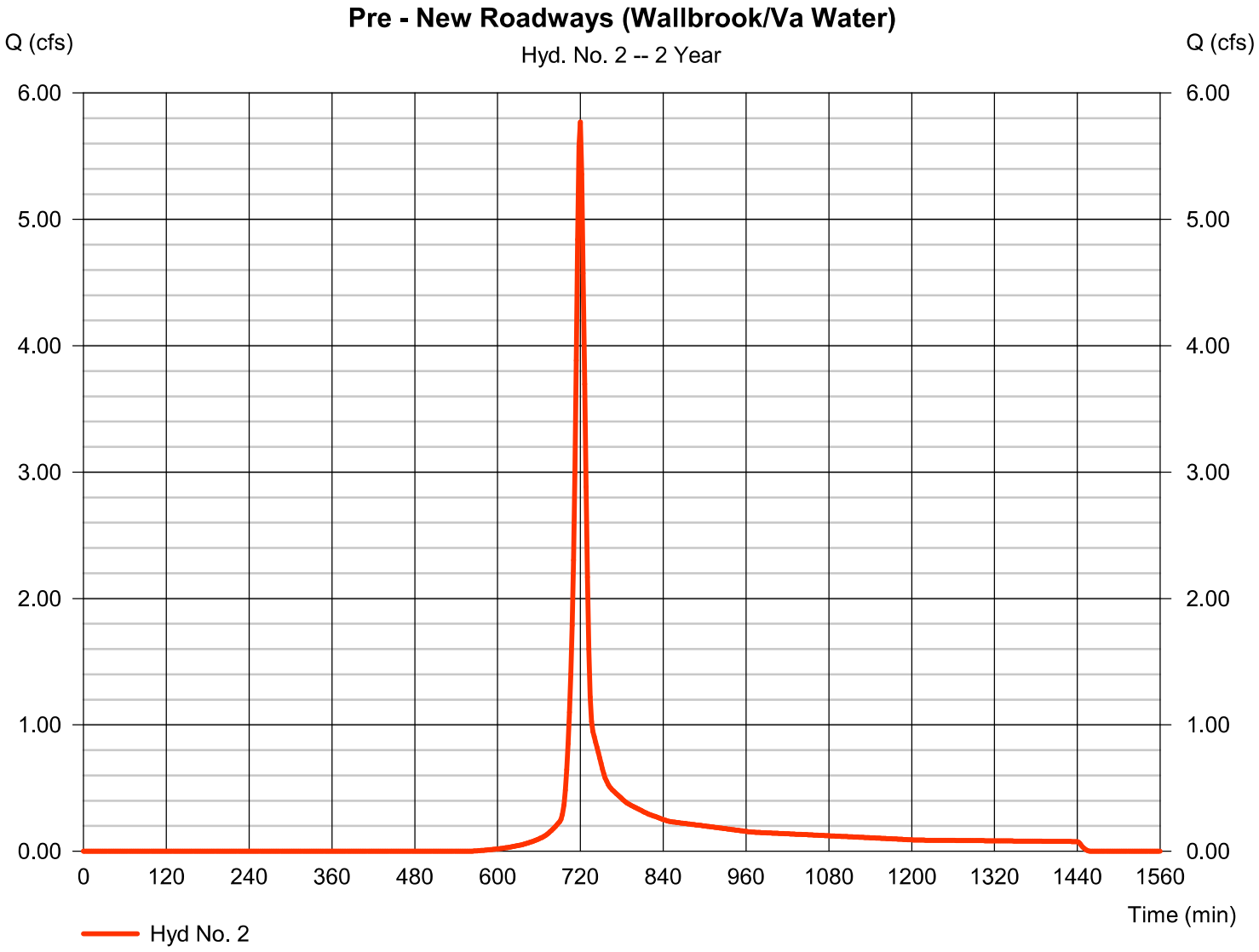
* Composite (Area/CN) = [(10.970 x 79) + (1.970 x 79)] / 12.940



Hyd. No. 2

Pre - New Roadways (Wallbrook/Va Water)

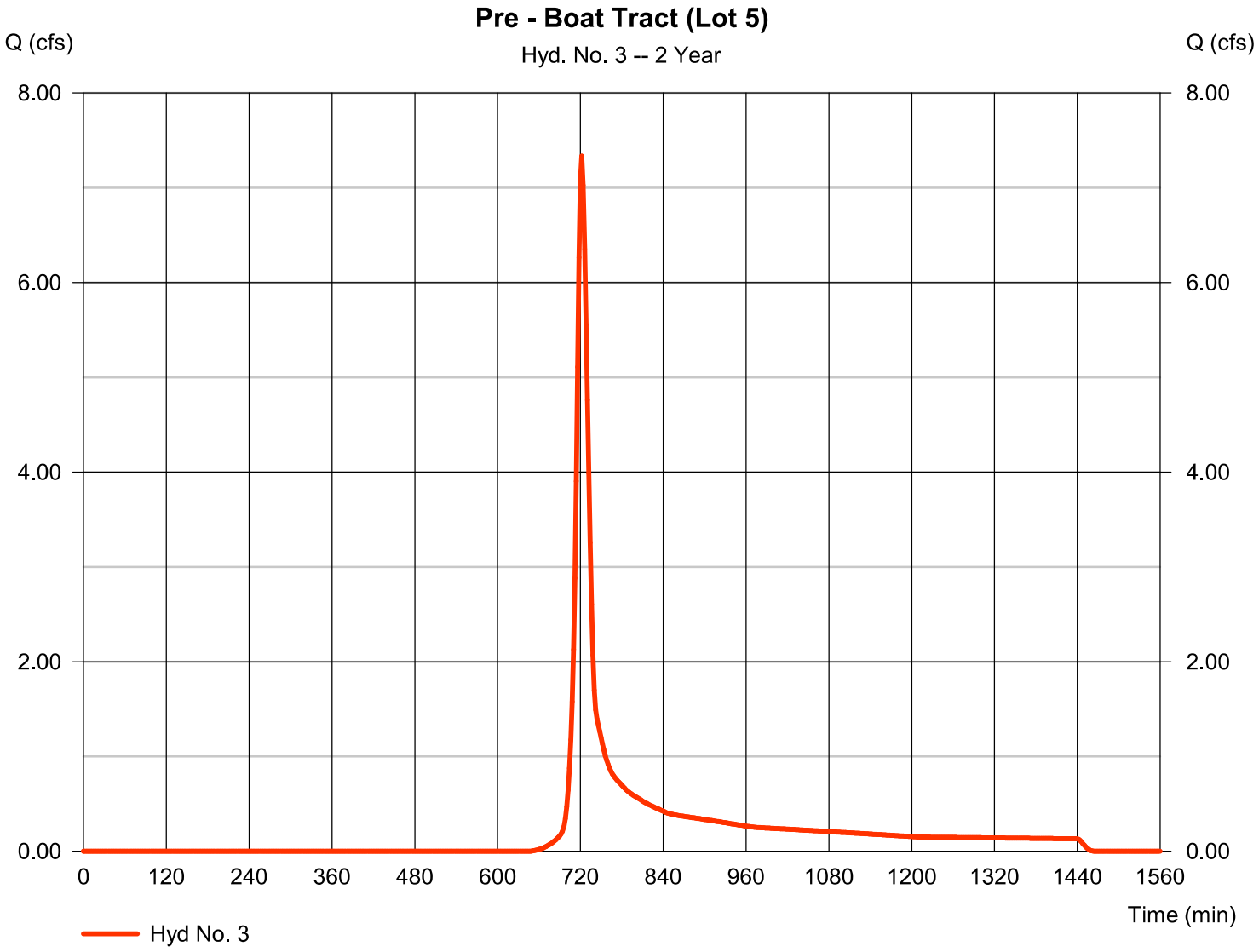
Hydrograph type	= SCS Runoff	Peak discharge	= 5.770 cfs
Storm frequency	= 2 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 14,261 cuft
Drainage area	= 2.490 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.40 min
Total precip.	= 3.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400



Hyd. No. 3

Pre - Boat Tract (Lot 5)

Hydrograph type	= SCS Runoff	Peak discharge	= 7.336 cfs
Storm frequency	= 2 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 21,246 cuft
Drainage area	= 5.070 ac	Curve number	= 73
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.50 min
Total precip.	= 3.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

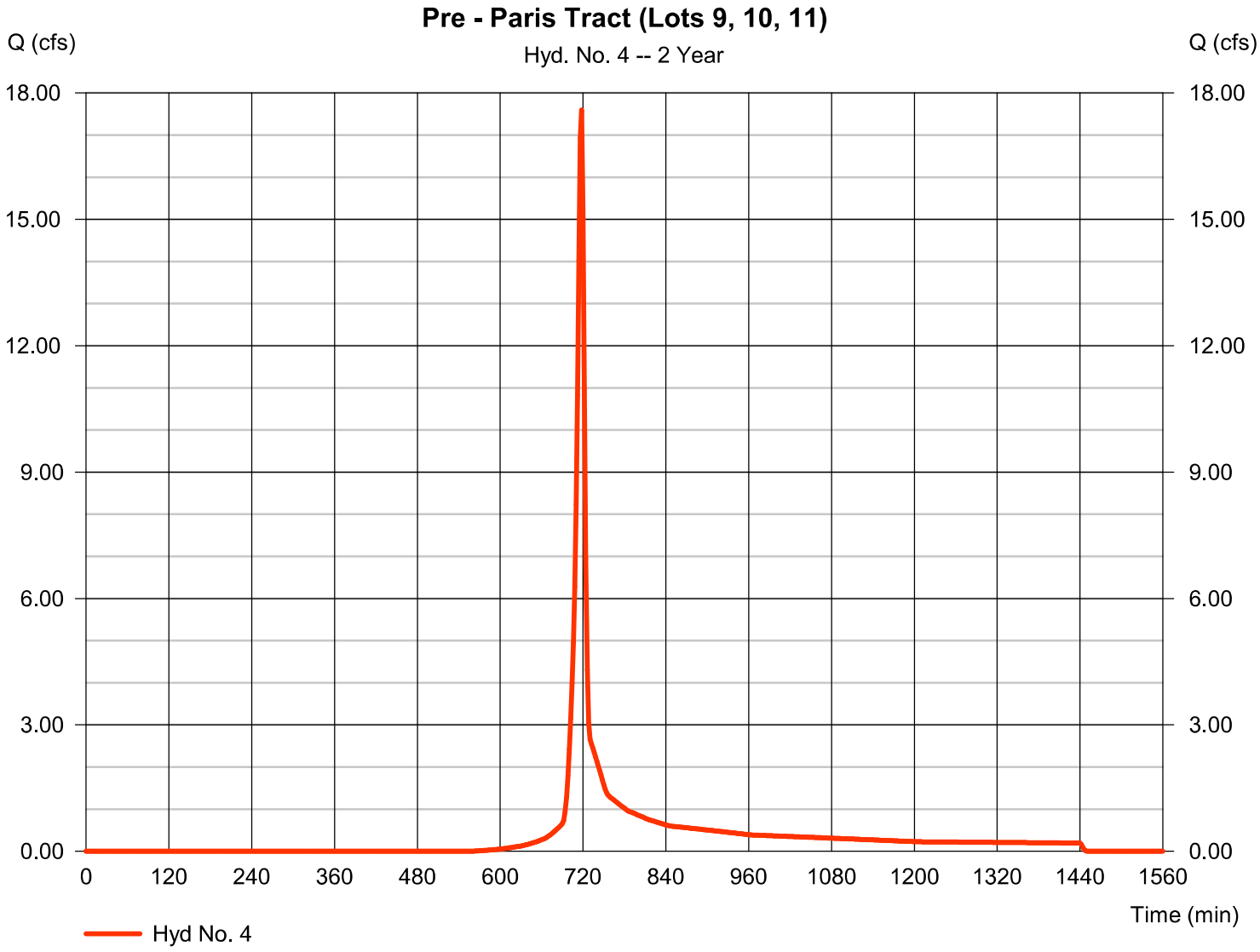


Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Sunday, 08 / 27 / 2023

Hyd. No. 4

Pre - Paris Tract (Lots 9, 10, 11)

Hydrograph type	= SCS Runoff	Peak discharge	= 17.59 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 36,390 cuft
Drainage area	= 7.060 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

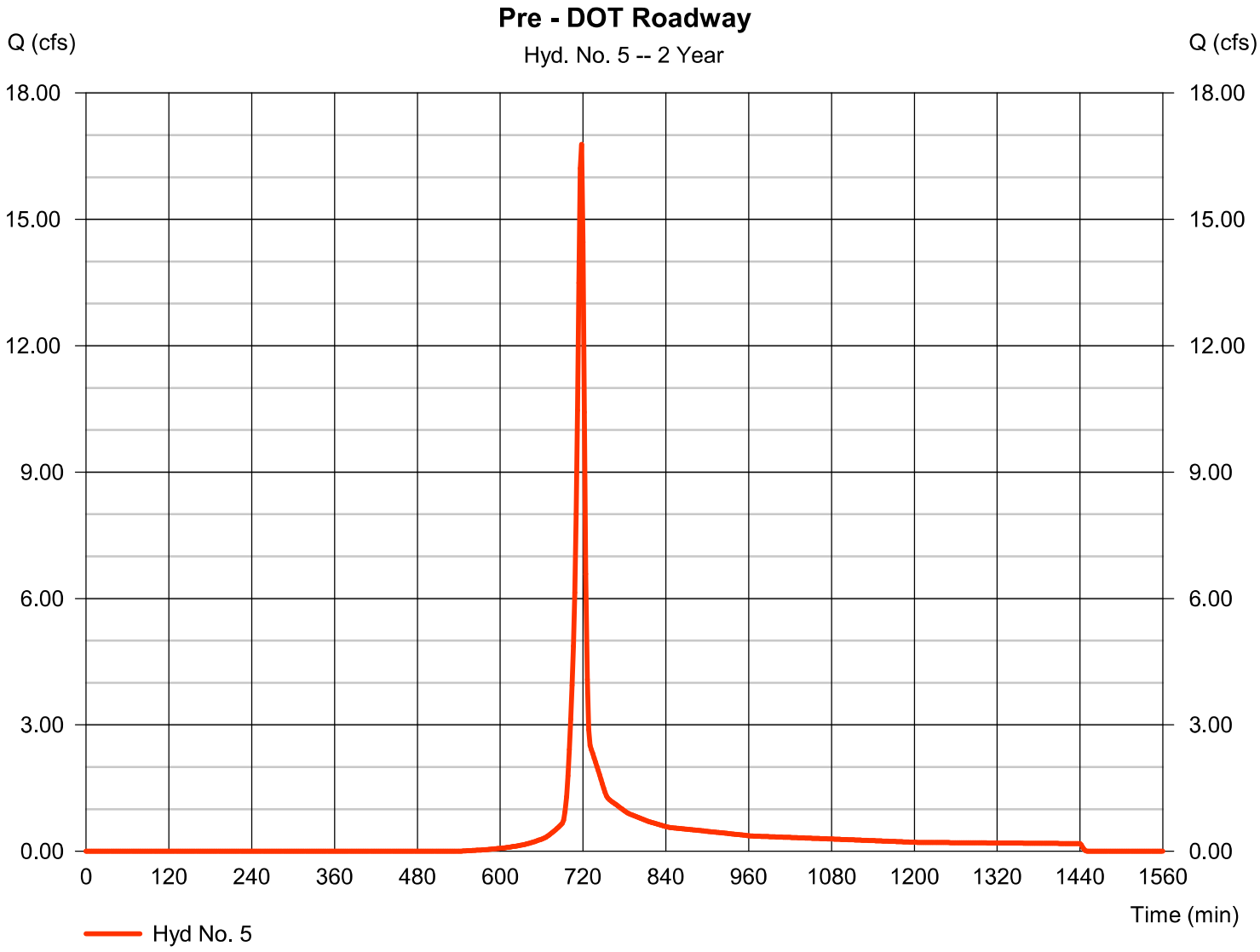


Hydrograph Report

Hyd. No. 5

Pre - DOT Roadway

Hydrograph type	= SCS Runoff	Peak discharge	= 16.78 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 34,760 cuft
Drainage area	= 6.450 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

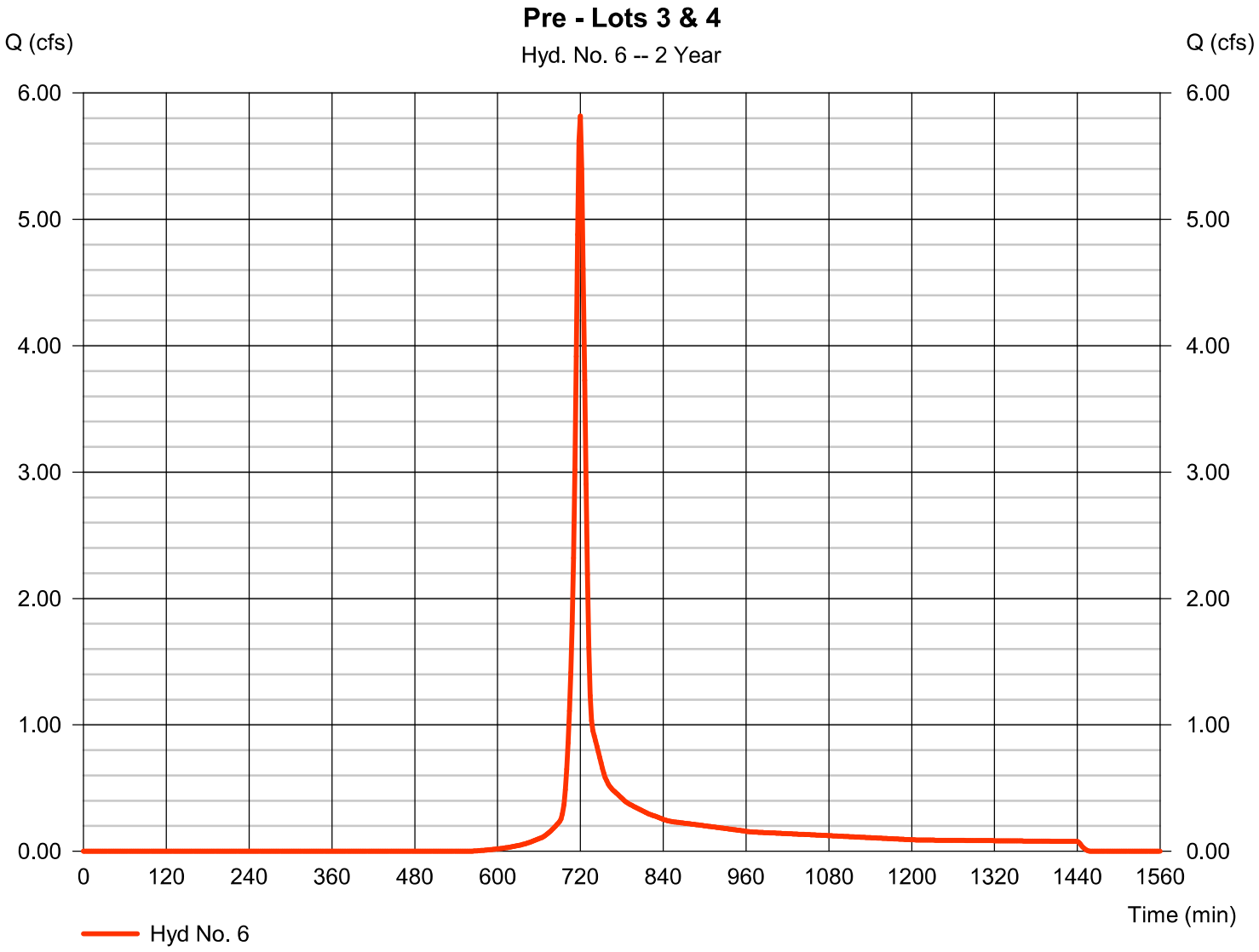


Hydrograph Report

Hyd. No. 6

Pre - Lots 3 & 4

Hydrograph type	= SCS Runoff	Peak discharge	= 5.817 cfs
Storm frequency	= 2 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 14,375 cuft
Drainage area	= 2.510 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 3.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

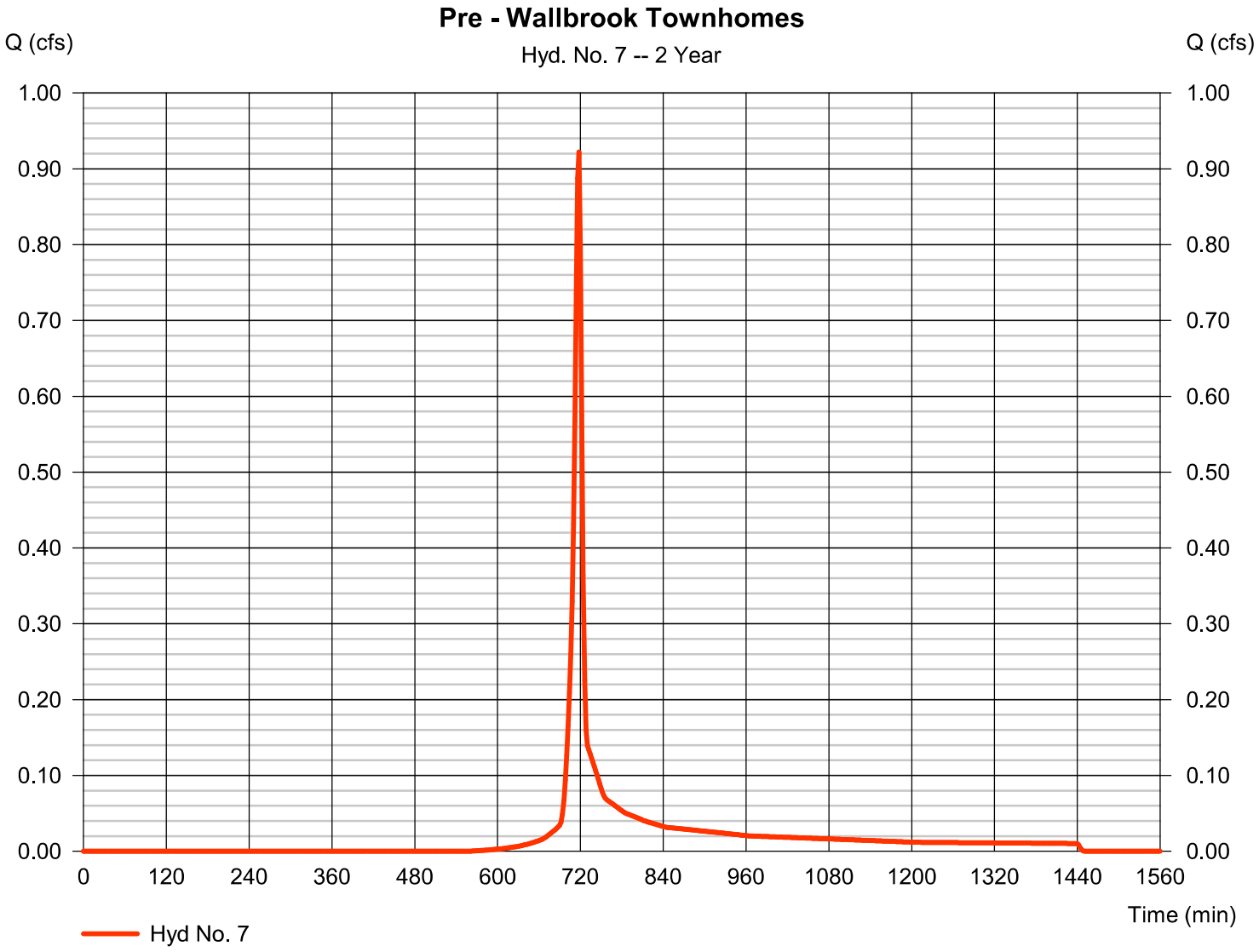


Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Sunday, 08 / 27 / 2023

Hyd. No. 7

Pre - Wallbrook Townhomes

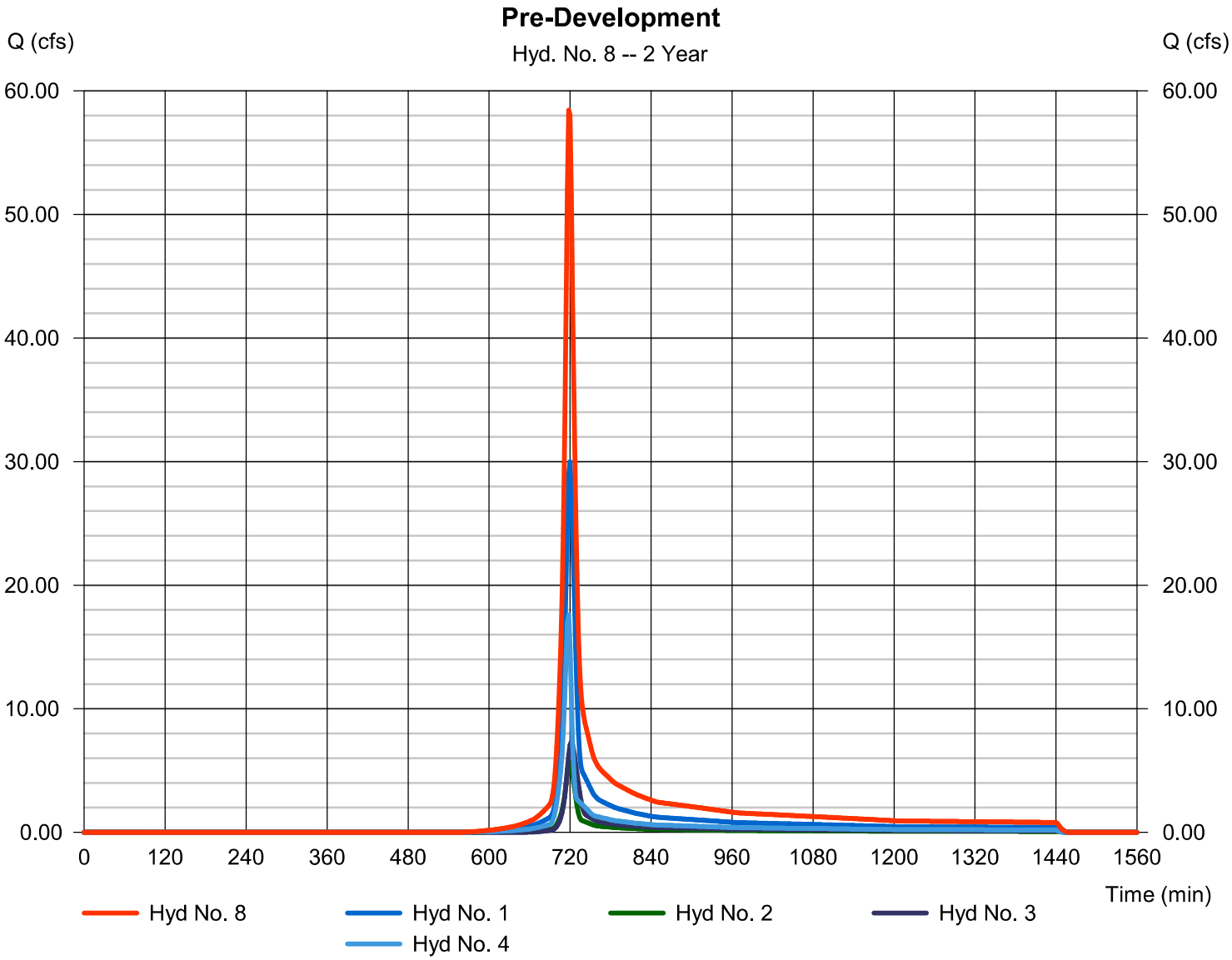
Hydrograph type	= SCS Runoff	Peak discharge	= 0.922 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 1,907 cuft
Drainage area	= 0.370 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400



Hyd. No. 8

Pre-Development

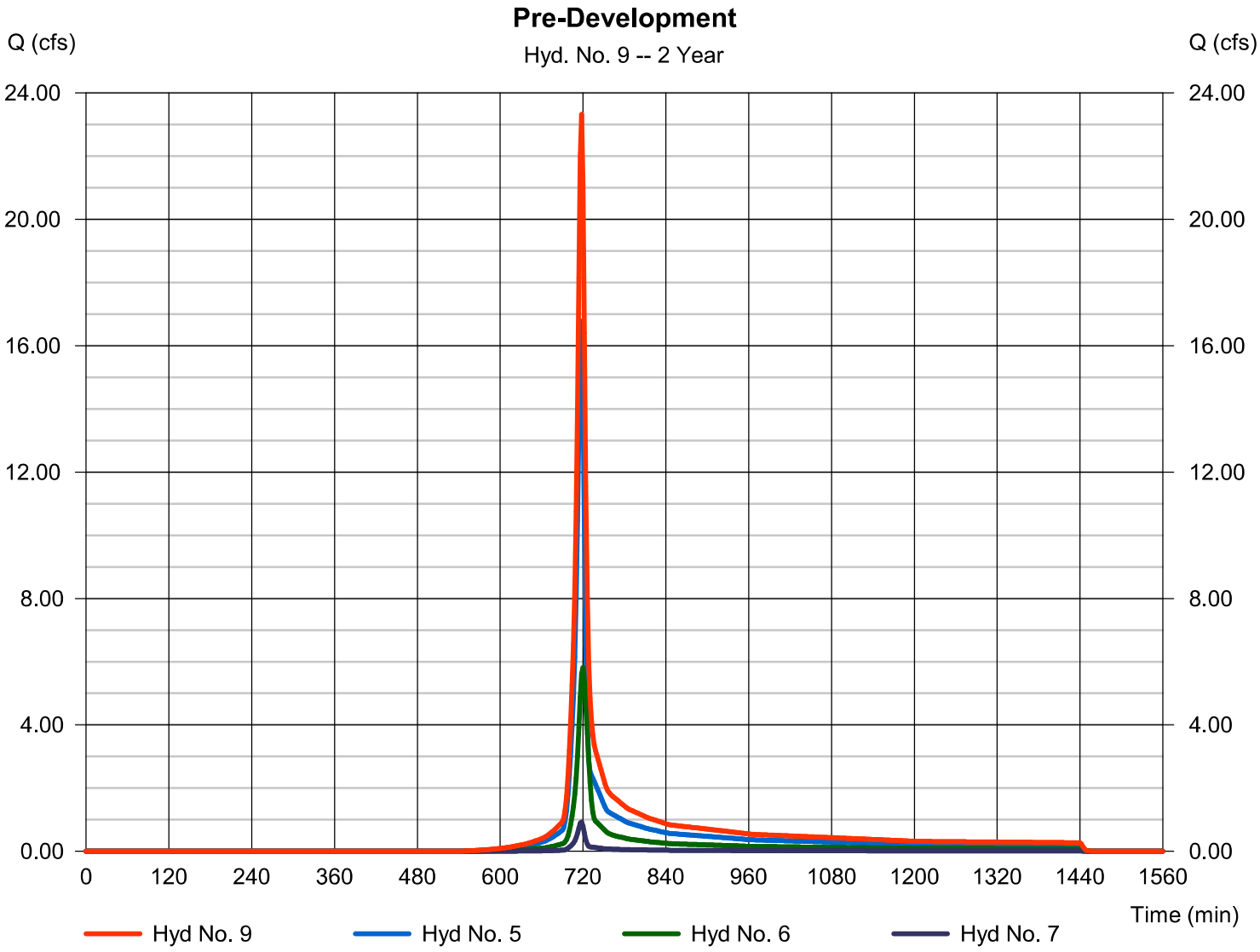
Hydrograph type	= Combine	Peak discharge	= 58.43 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 146,007 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 27.560 ac



Hyd. No. 9

Pre-Development

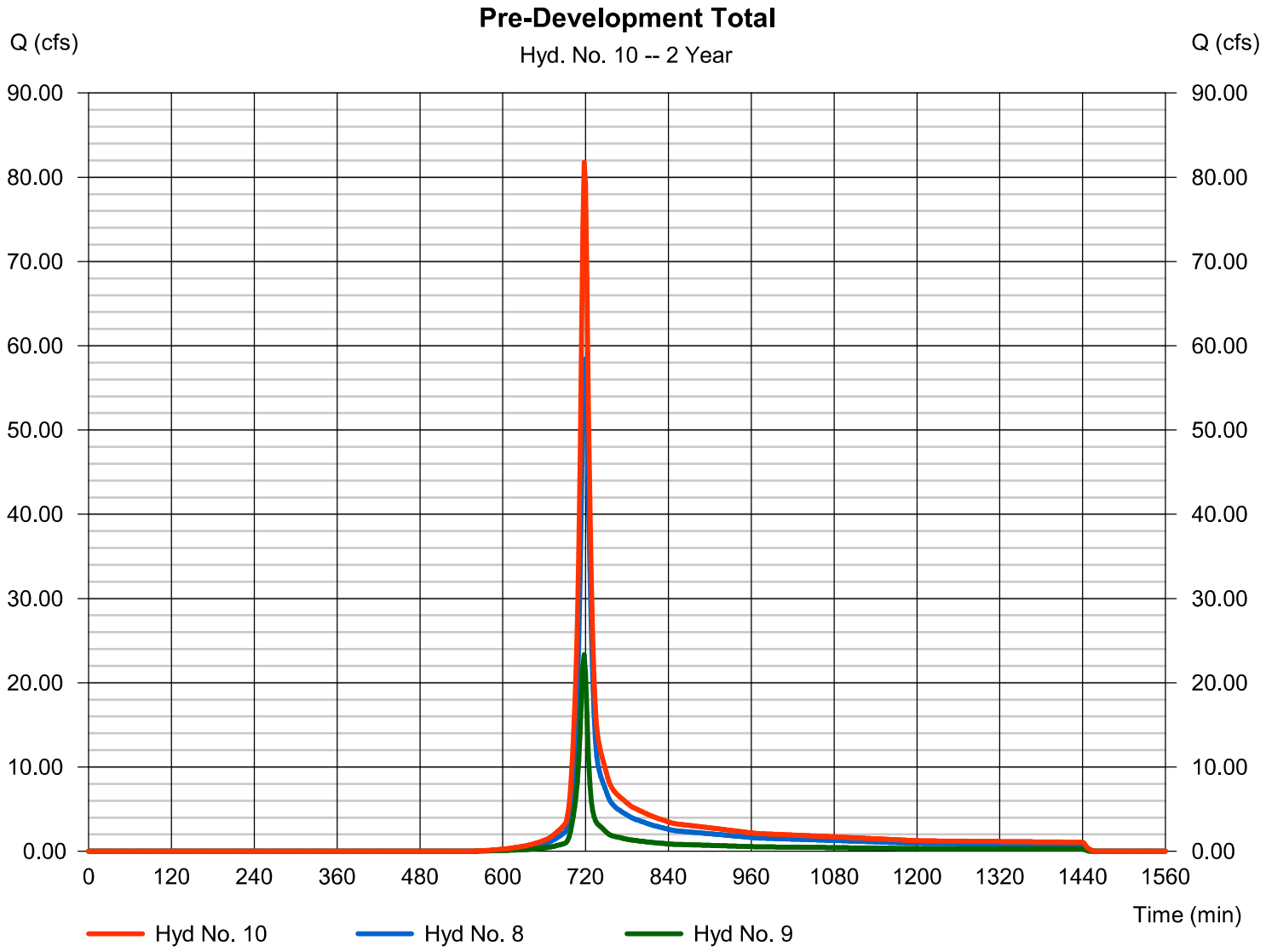
Hydrograph type	= Combine	Peak discharge	= 23.33 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 51,042 cuft
Inflow hyds.	= 5, 6, 7	Contrib. drain. area	= 9.330 ac



Hyd. No. 10

Pre-Development Total

Hydrograph type	= Combine	Peak discharge	= 81.75 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 197,049 cuft
Inflow hyds.	= 8, 9	Contrib. drain. area	= 0.000 ac



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	SCS Runoff	54.97	2	720	136,368	------	------	------	Pre - Wallbrook Lots 1 & 2
2	SCS Runoff	10.58	2	720	26,241	------	------	------	Pre - New Roadways (Wallbrook/Va
3	SCS Runoff	15.12	2	722	42,419	------	------	------	Pre - Boat Tract (Lot 5)
4	SCS Runoff	31.85	2	718	66,961	------	------	------	Pre - Paris Tract (Lots 9, 10, 11)
5	SCS Runoff	29.93	2	718	63,164	------	------	------	Pre - DOT Roadway
6	SCS Runoff	10.66	2	720	26,452	------	------	------	Pre - Lots 3 & 4
7	SCS Runoff	1.669	2	718	3,509	------	------	------	Pre - Wallbrook Townhomes
8	Combine	109.58	2	718	271,989	1, 2, 3, 4,	------	------	Pre-Development
9	Combine	42.05	2	718	93,125	5, 6, 7,	------	------	Pre-Development
10	Combine	151.63	2	718	365,113	8, 9	------	------	Pre-Development Total

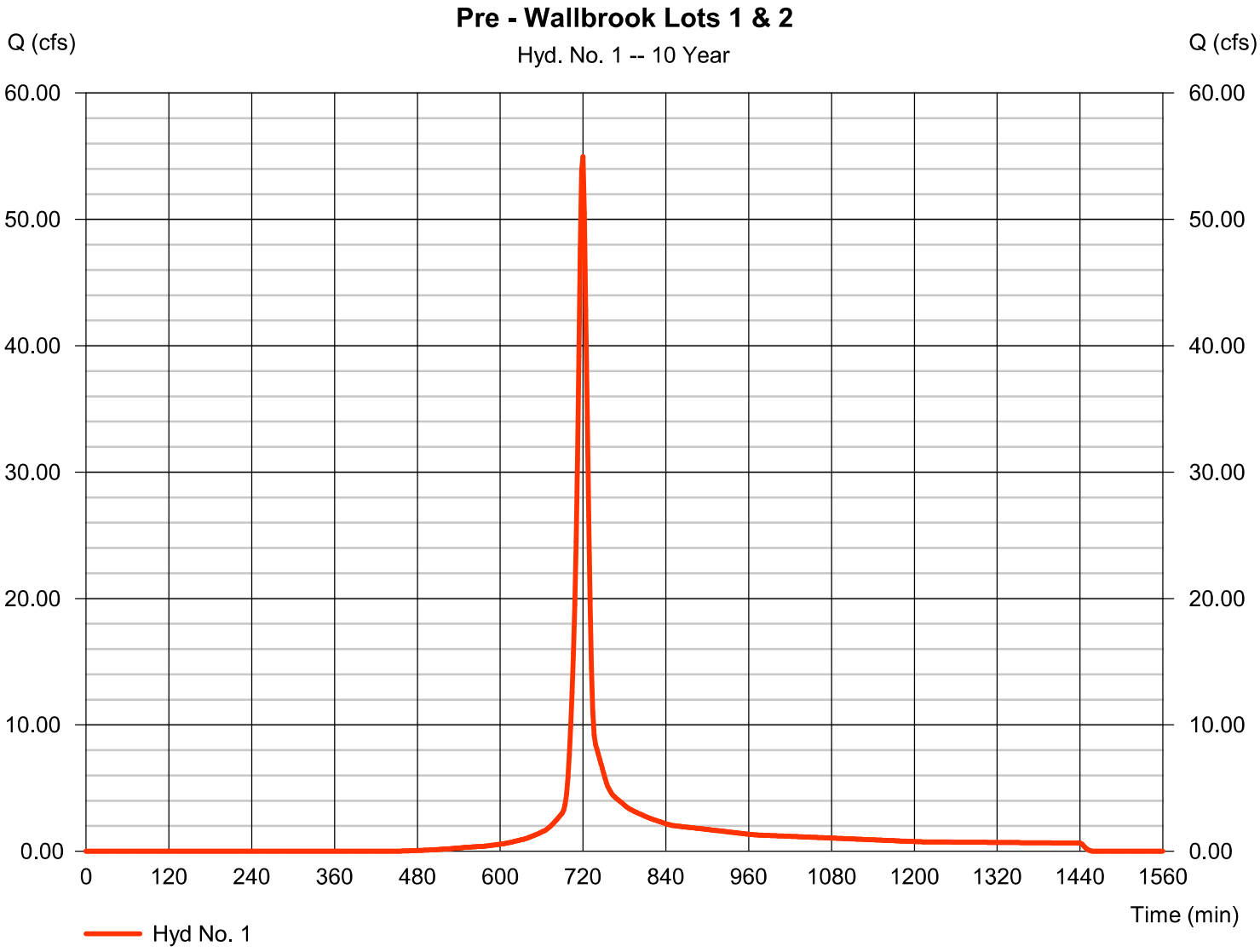
Hydrograph Report

Hyd. No. 1

Pre - Wallbrook Lots 1 & 2

Hydrograph type	= SCS Runoff	Peak discharge	= 54.97 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 136,368 cuft
Drainage area	= 12.940 ac	Curve number	= 79*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.70 min
Total precip.	= 5.01 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

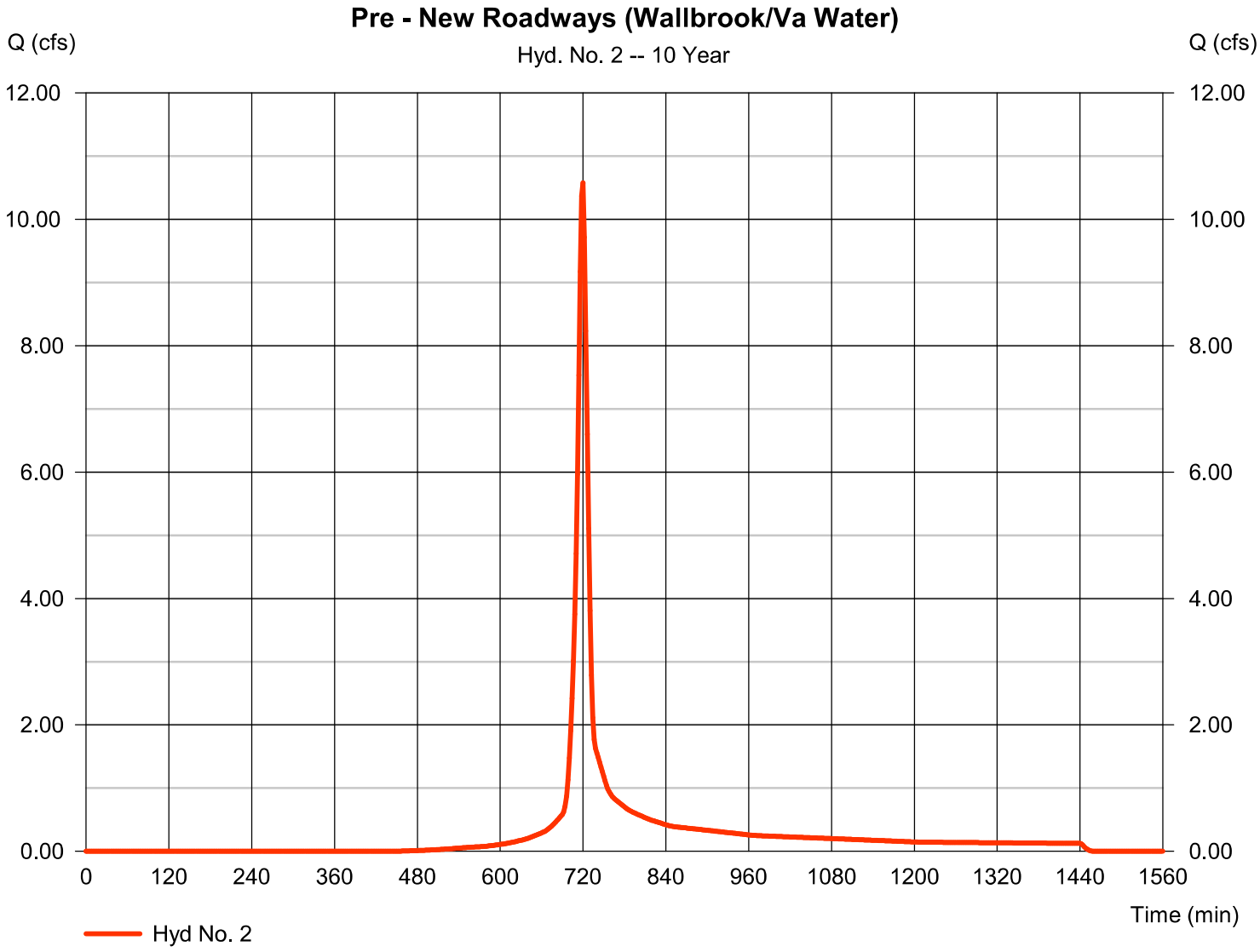
* Composite (Area/CN) = [(10.970 x 79) + (1.970 x 79)] / 12.940



Hyd. No. 2

Pre - New Roadways (Wallbrook/Va Water)

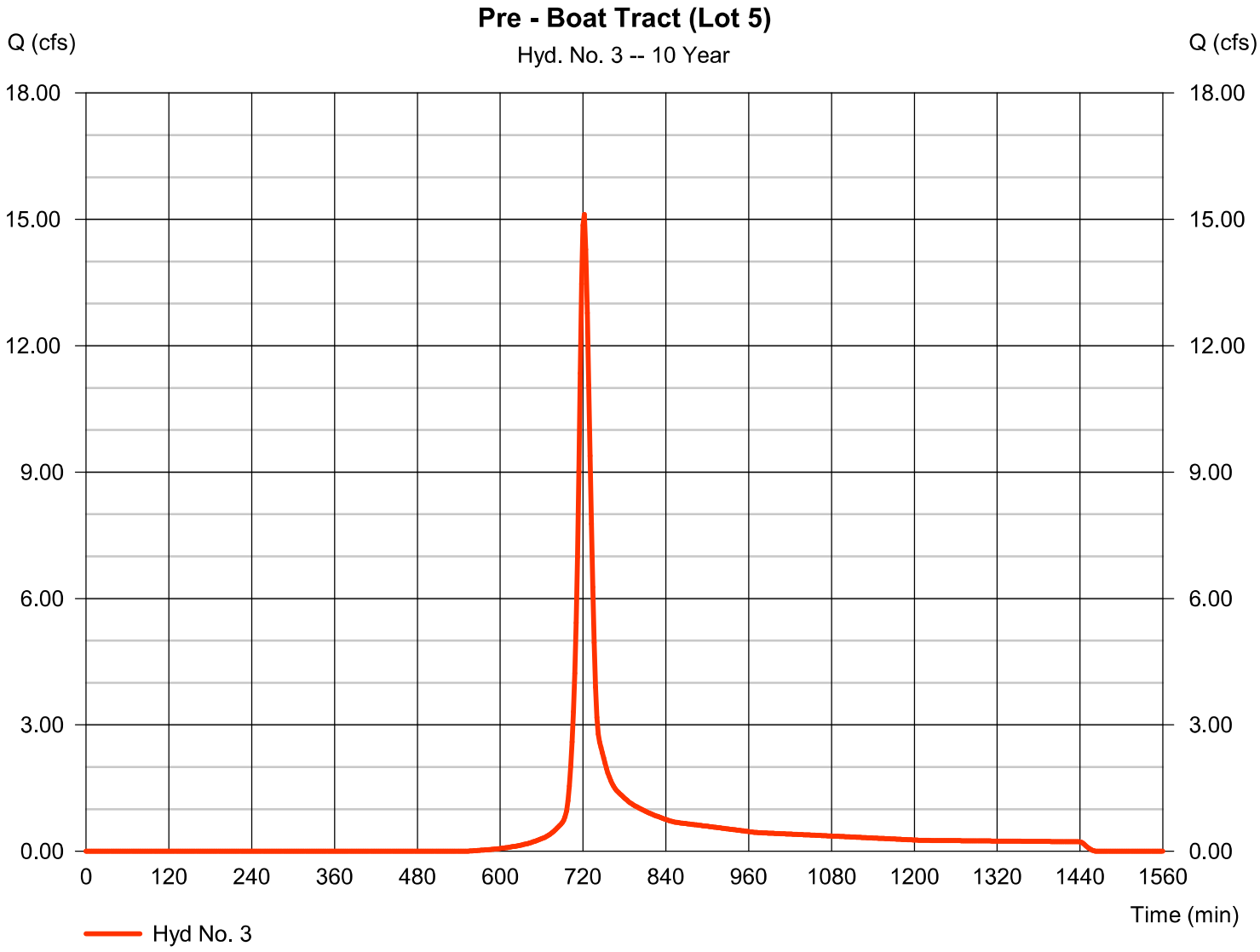
Hydrograph type	= SCS Runoff	Peak discharge	= 10.58 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 26,241 cuft
Drainage area	= 2.490 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.40 min
Total precip.	= 5.01 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400



Hyd. No. 3

Pre - Boat Tract (Lot 5)

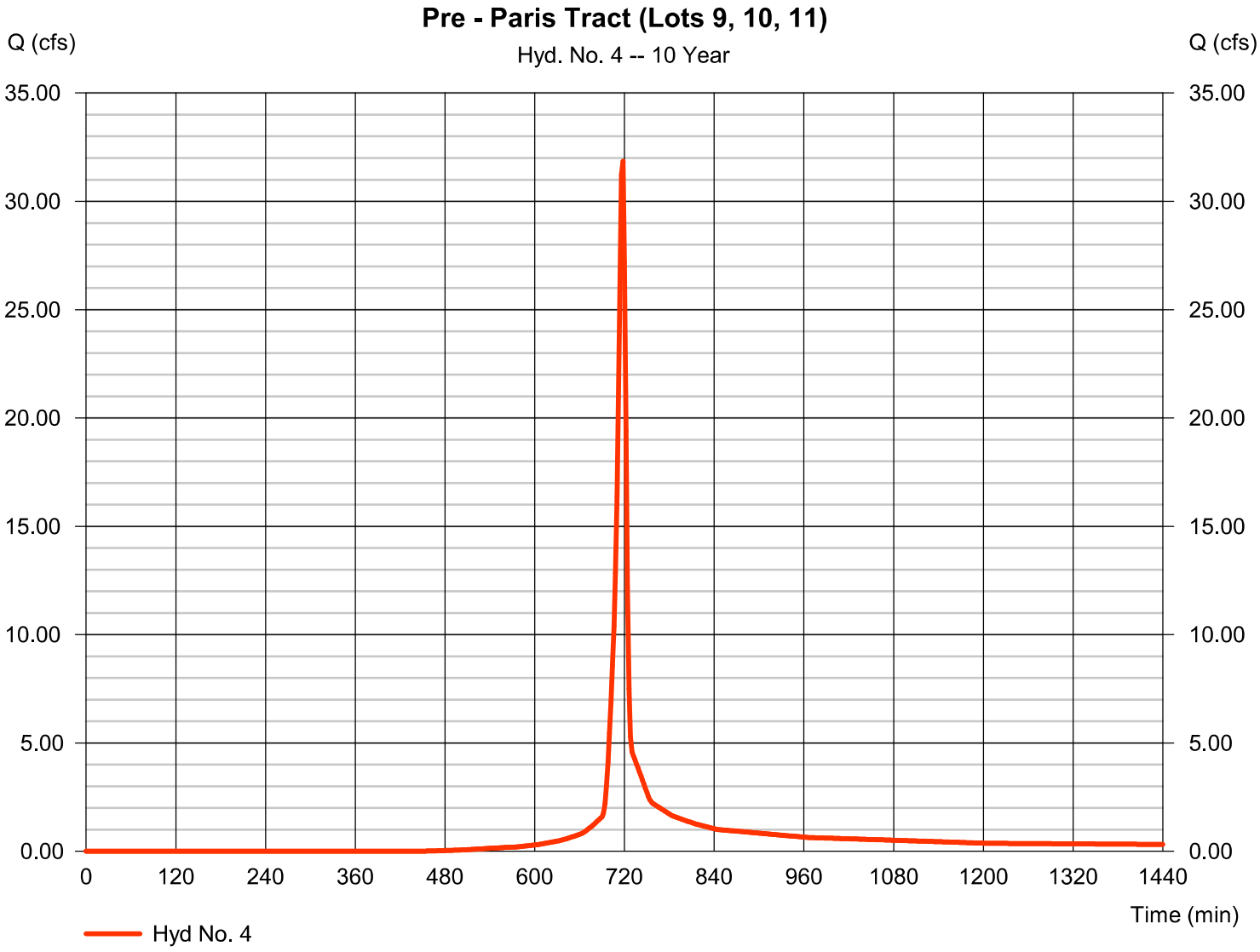
Hydrograph type	= SCS Runoff	Peak discharge	= 15.12 cfs
Storm frequency	= 10 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 42,419 cuft
Drainage area	= 5.070 ac	Curve number	= 73
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.50 min
Total precip.	= 5.01 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400



Hyd. No. 4

Pre - Paris Tract (Lots 9, 10, 11)

Hydrograph type	= SCS Runoff	Peak discharge	= 31.85 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 66,961 cuft
Drainage area	= 7.060 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.01 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

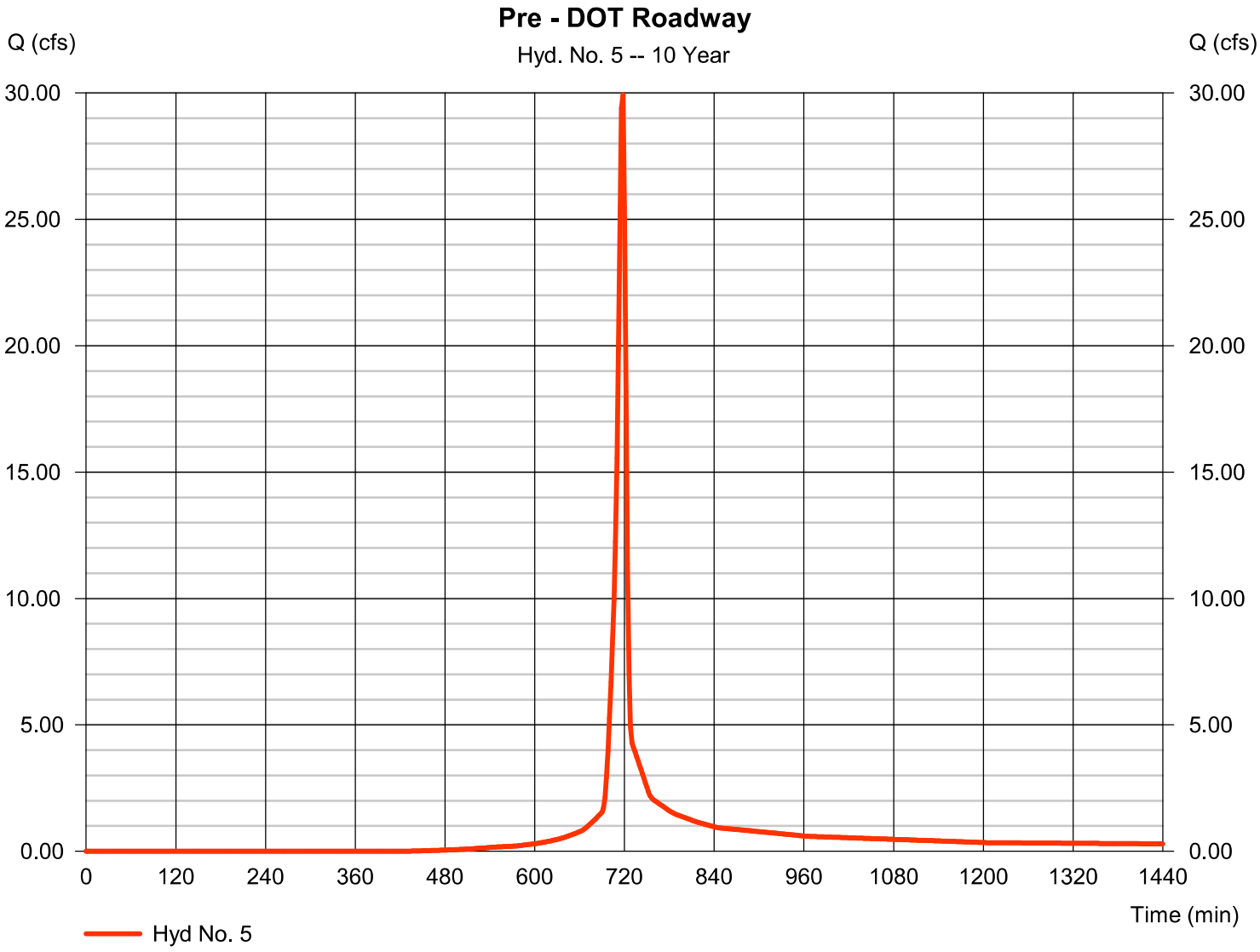


Hydrograph Report

Hyd. No. 5

Pre - DOT Roadway

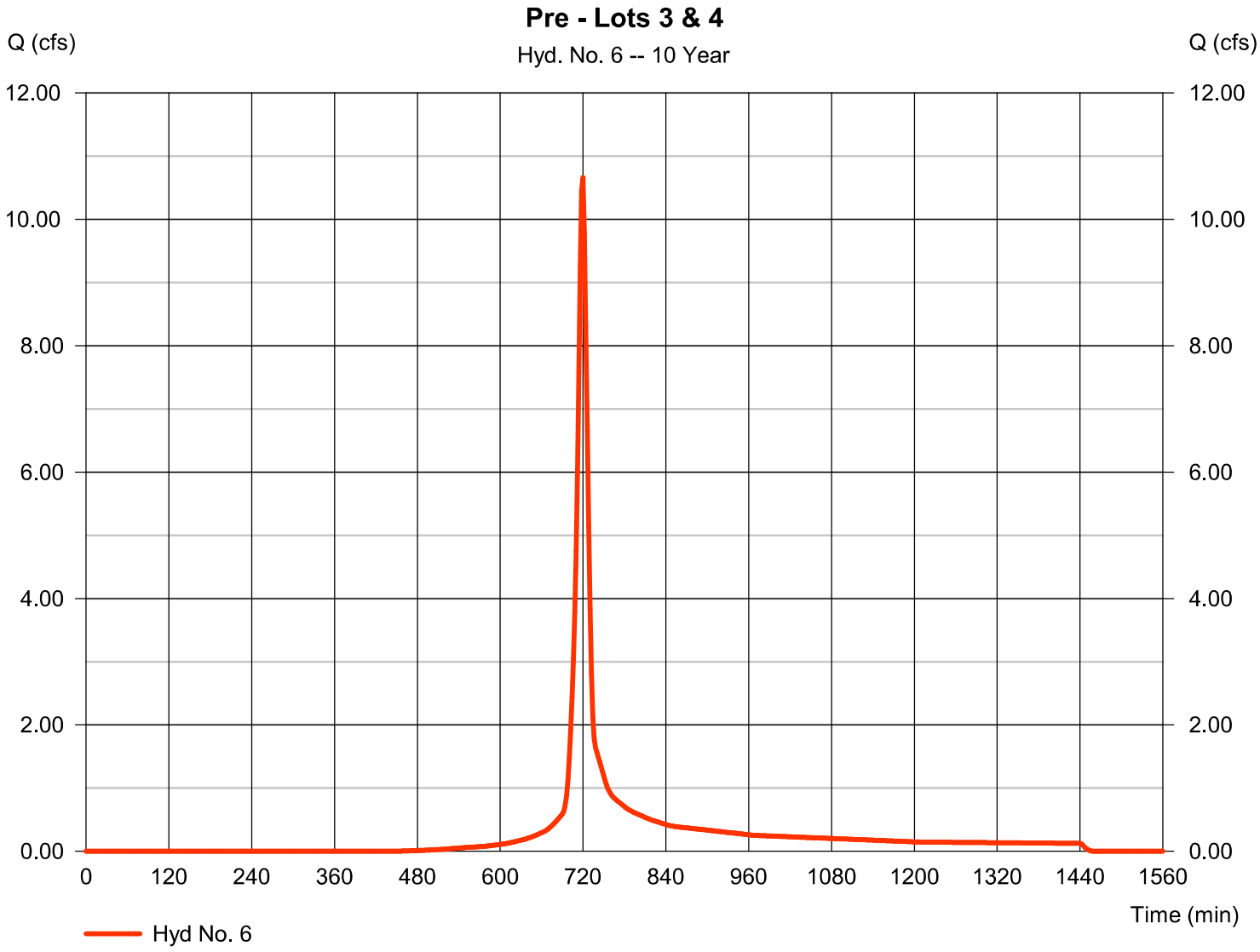
Hydrograph type	= SCS Runoff	Peak discharge	= 29.93 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 63,164 cuft
Drainage area	= 6.450 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.01 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400



Hyd. No. 6

Pre - Lots 3 & 4

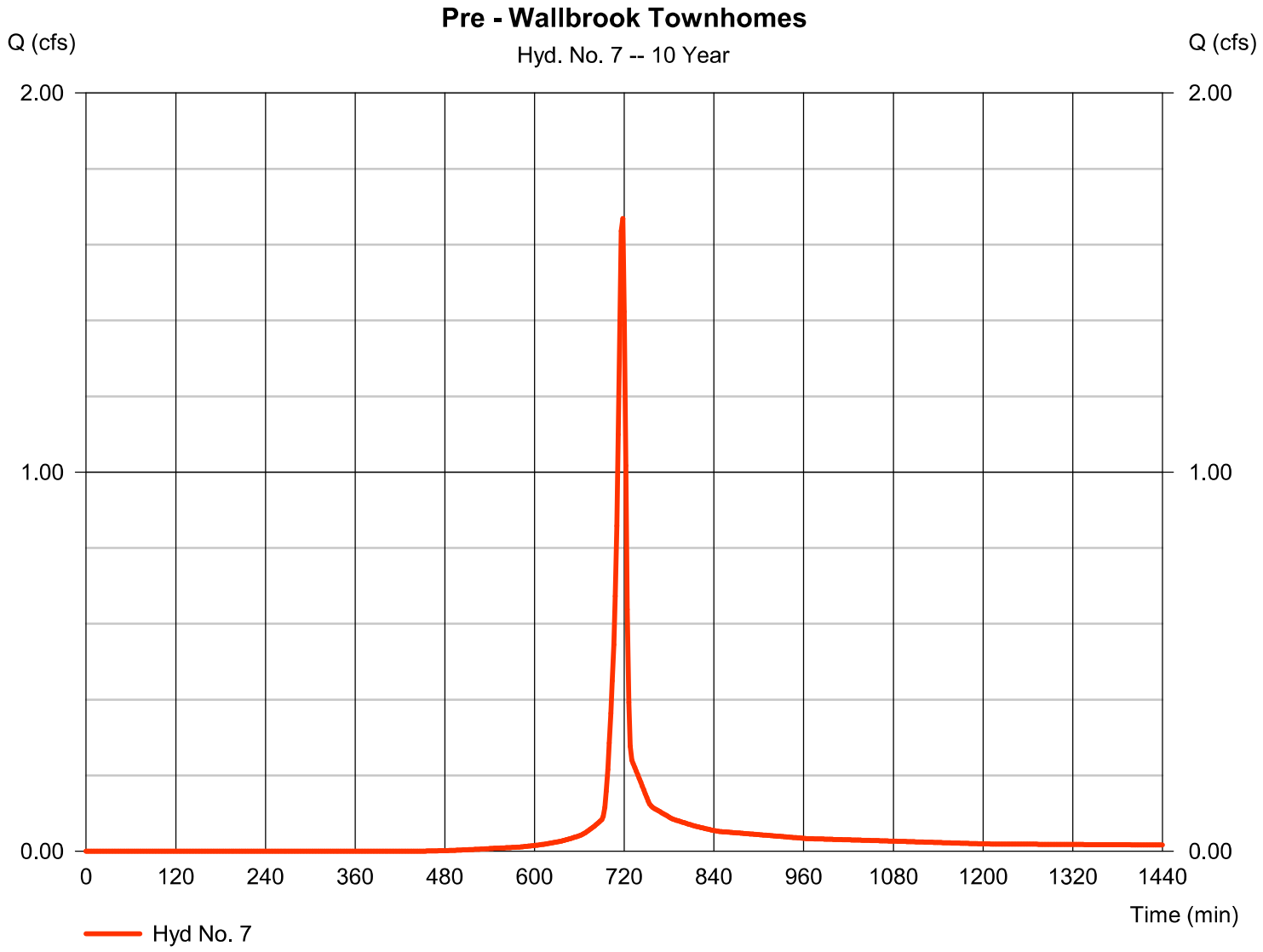
Hydrograph type	= SCS Runoff	Peak discharge	= 10.66 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 26,452 cuft
Drainage area	= 2.510 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 5.01 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400



Hyd. No. 7

Pre - Wallbrook Townhomes

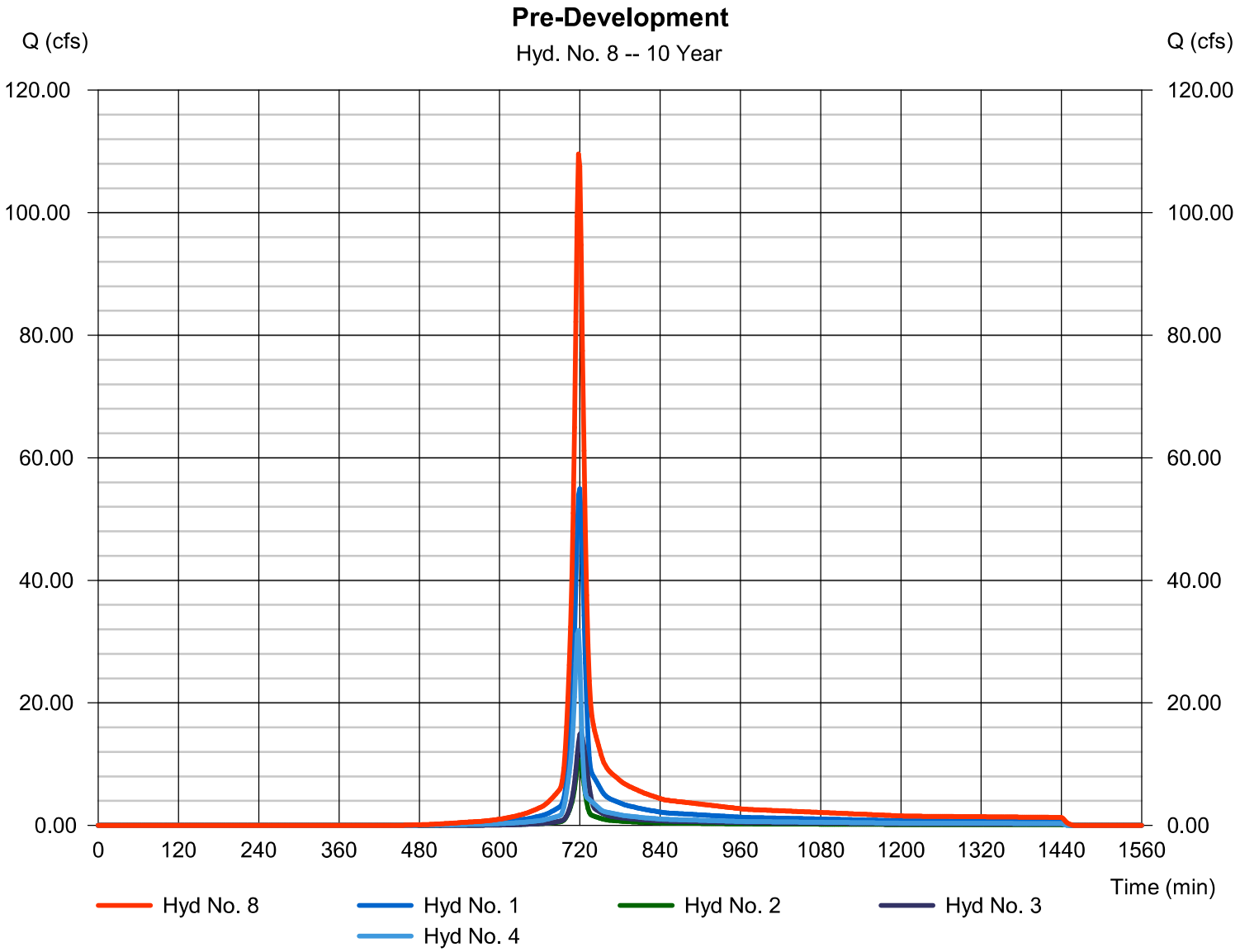
Hydrograph type	= SCS Runoff	Peak discharge	= 1.669 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 3,509 cuft
Drainage area	= 0.370 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.01 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400



Hyd. No. 8

Pre-Development

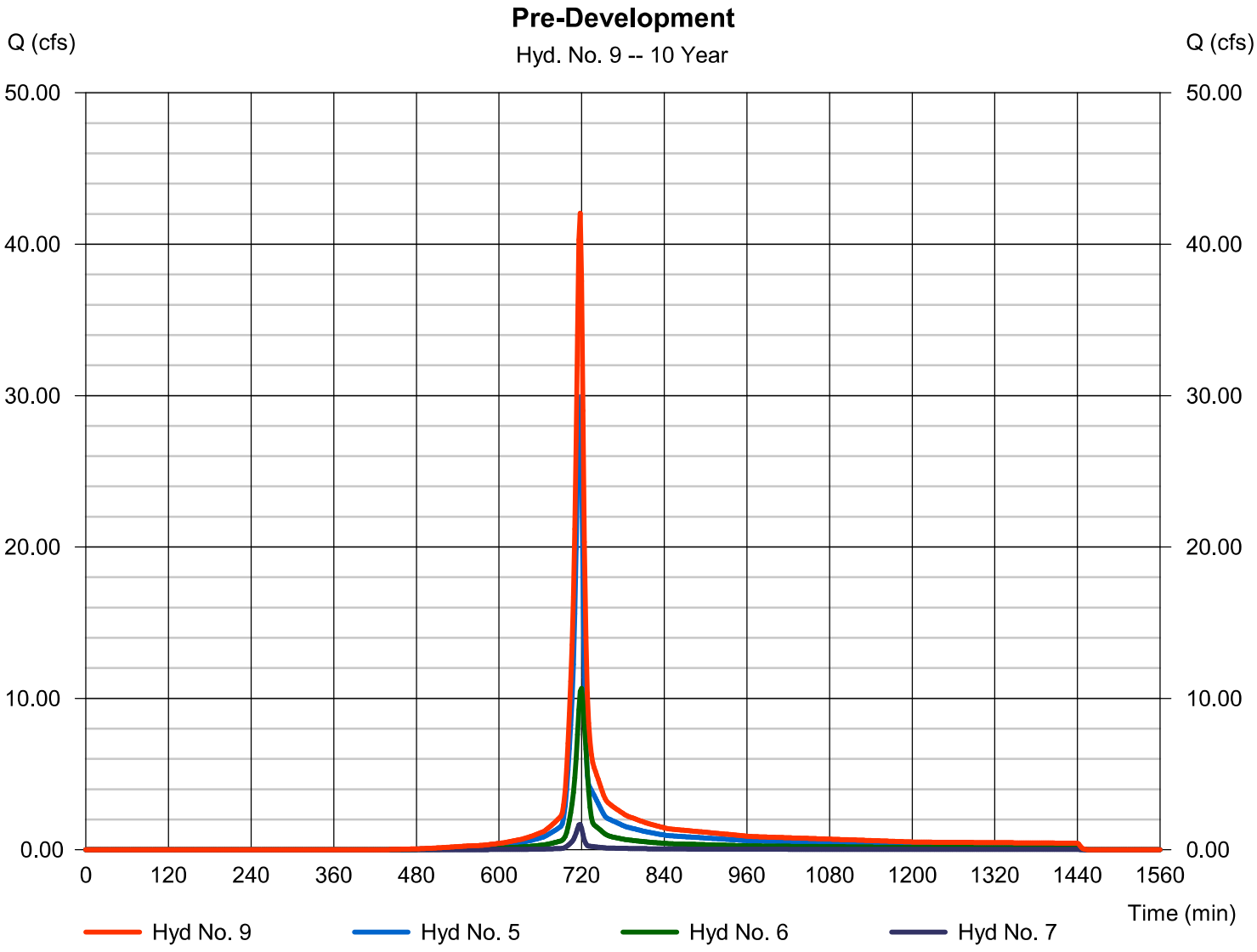
Hydrograph type	= Combine	Peak discharge	= 109.58 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 271,989 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 27.560 ac



Hyd. No. 9

Pre-Development

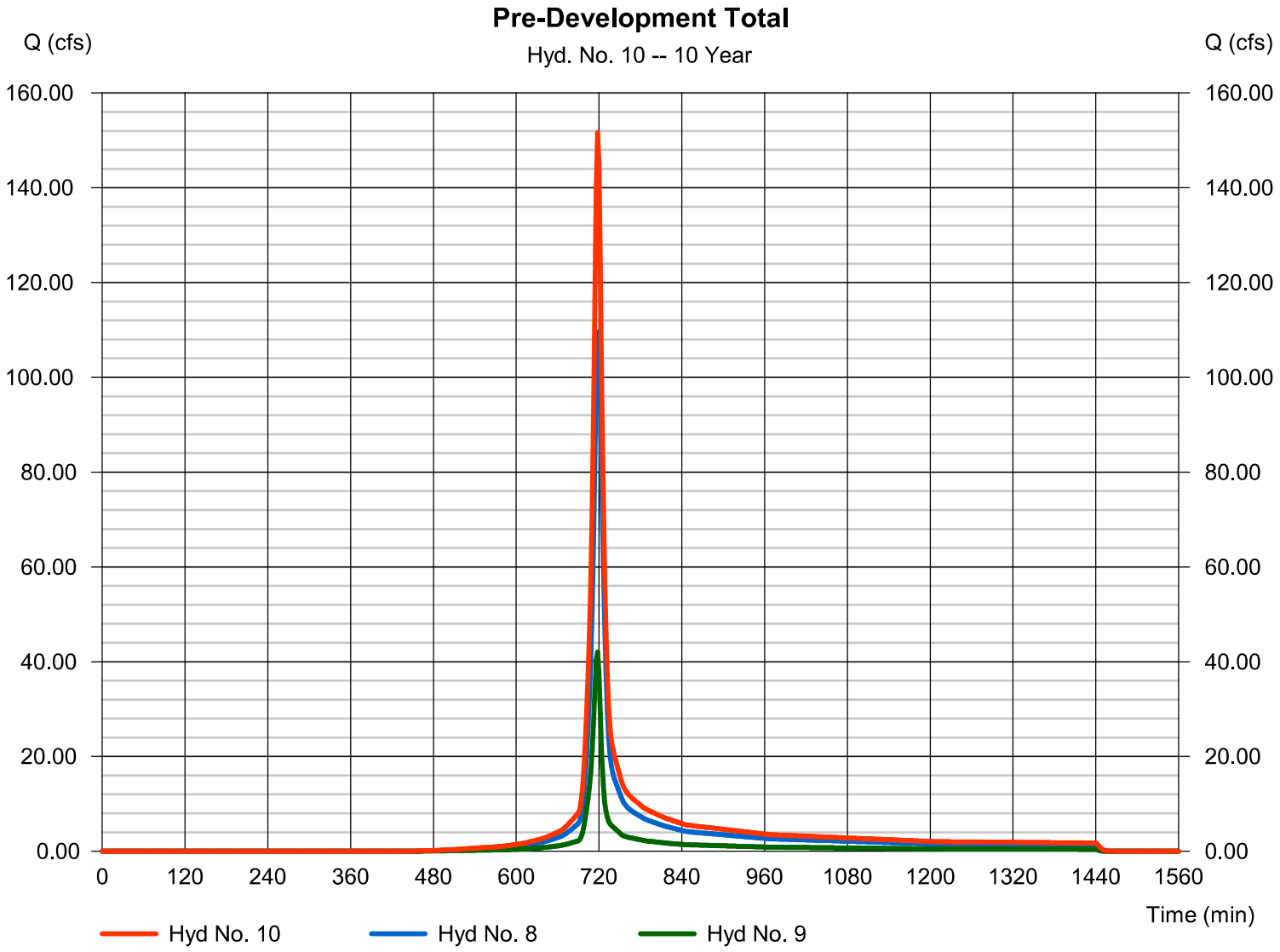
Hydrograph type	= Combine	Peak discharge	= 42.05 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 93,125 cuft
Inflow hyds.	= 5, 6, 7	Contrib. drain. area	= 9.330 ac



Hyd. No. 10

Pre-Development Total

Hydrograph type	= Combine	Peak discharge	= 151.63 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 365,113 cuft
Inflow hyds.	= 8, 9	Contrib. drain. area	= 0.000 ac



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	SCS Runoff	70.42	2	720	175,957	------	------	------	Pre - Wallbrook Lots 1 & 2
2	SCS Runoff	13.55	2	720	33,859	------	------	------	Pre - New Roadways (Wallbrook/Va
3	SCS Runoff	20.12	2	722	56,333	------	------	------	Pre - Boat Tract (Lot 5)
4	SCS Runoff	40.62	2	718	86,401	------	------	------	Pre - Paris Tract (Lots 9, 10, 11)
5	SCS Runoff	37.97	2	718	81,135	------	------	------	Pre - DOT Roadway
6	SCS Runoff	13.66	2	720	34,131	------	------	------	Pre - Lots 3 & 4
7	SCS Runoff	2.129	2	718	4,528	------	------	------	Pre - Wallbrook Townhomes
8	Combine	141.52	2	718	352,550	1, 2, 3, 4,	------	------	Pre-Development
9	Combine	53.56	2	718	119,794	5, 6, 7,	------	------	Pre-Development
10	Combine	195.08	2	718	472,344	8, 9	------	------	Pre-Development Total

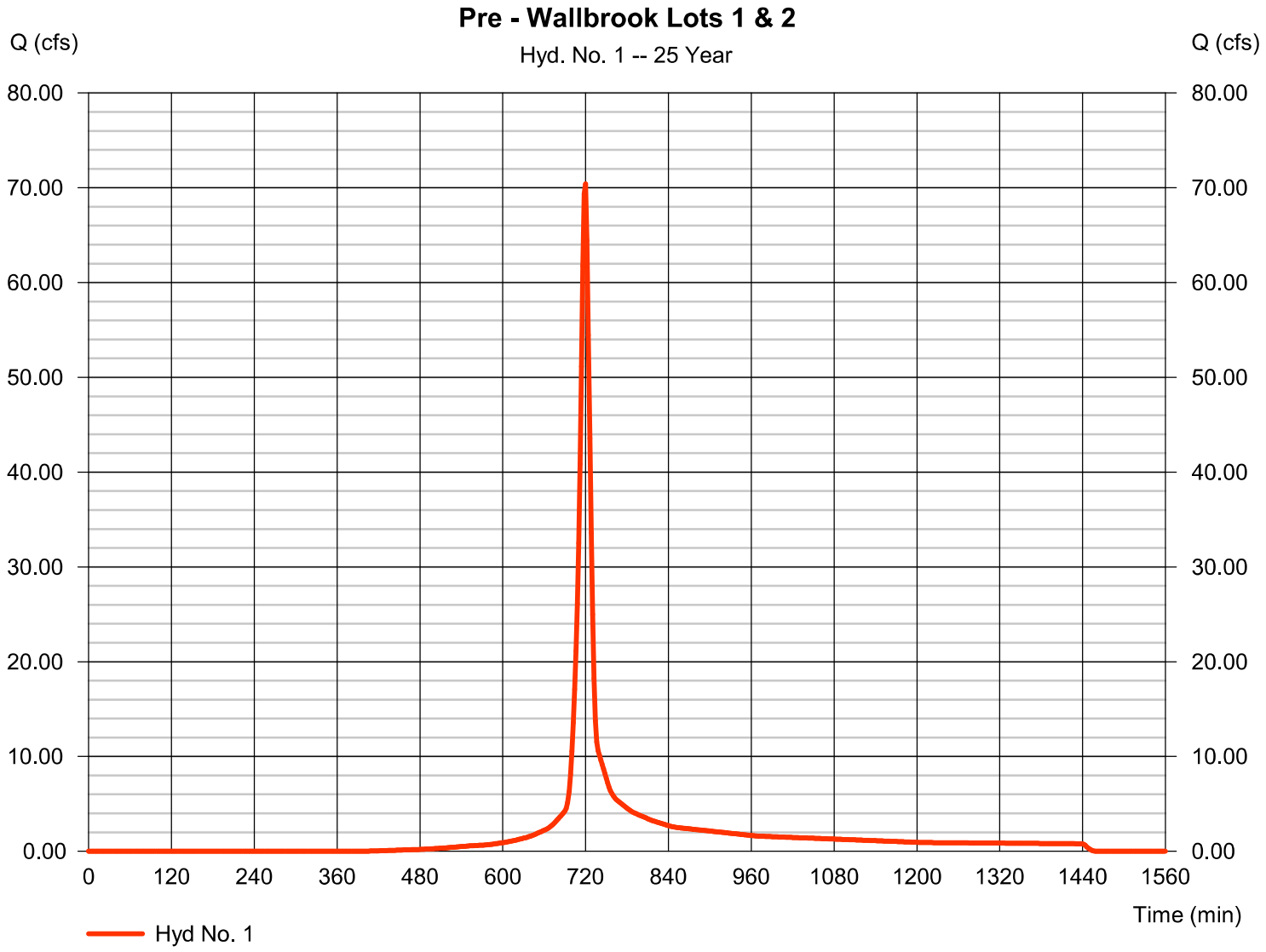
Hydrograph Report

Hyd. No. 1

Pre - Wallbrook Lots 1 & 2

Hydrograph type	= SCS Runoff	Peak discharge	= 70.42 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 175,957 cuft
Drainage area	= 12.940 ac	Curve number	= 79*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.70 min
Total precip.	= 5.94 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

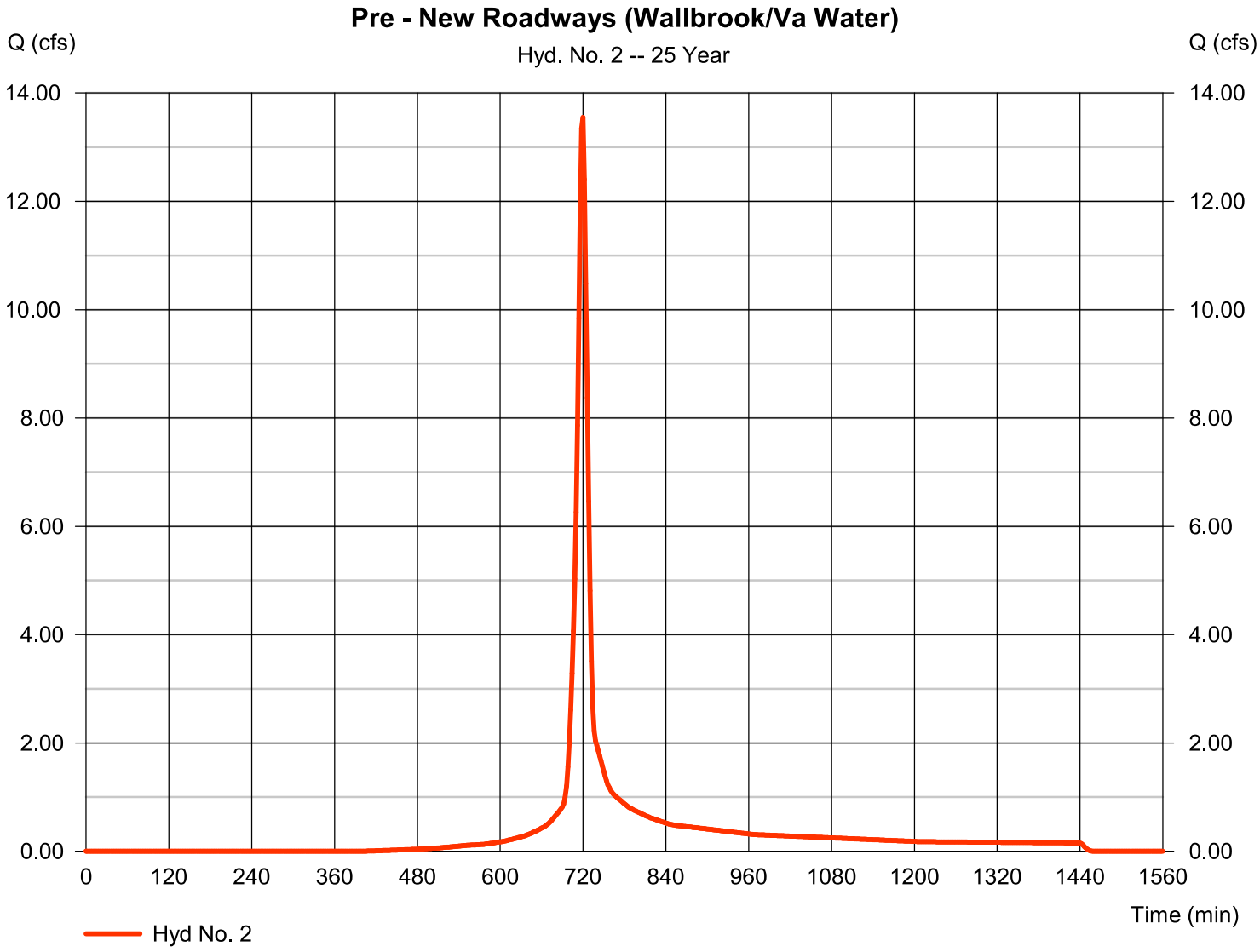
* Composite (Area/CN) = [(10.970 x 79) + (1.970 x 79)] / 12.940



Hyd. No. 2

Pre - New Roadways (Wallbrook/Va Water)

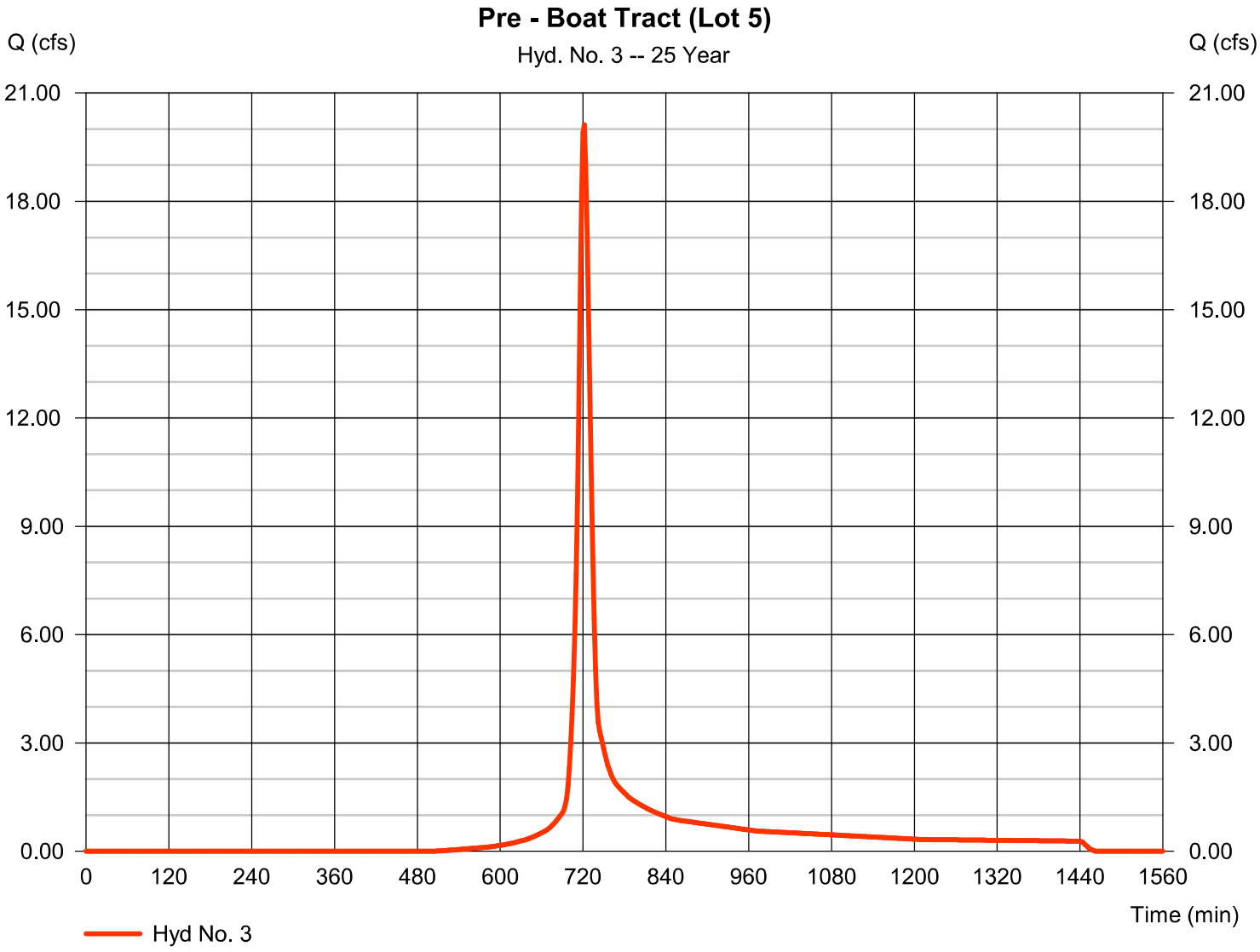
Hydrograph type	= SCS Runoff	Peak discharge	= 13.55 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 33,859 cuft
Drainage area	= 2.490 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.40 min
Total precip.	= 5.94 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400



Hyd. No. 3

Pre - Boat Tract (Lot 5)

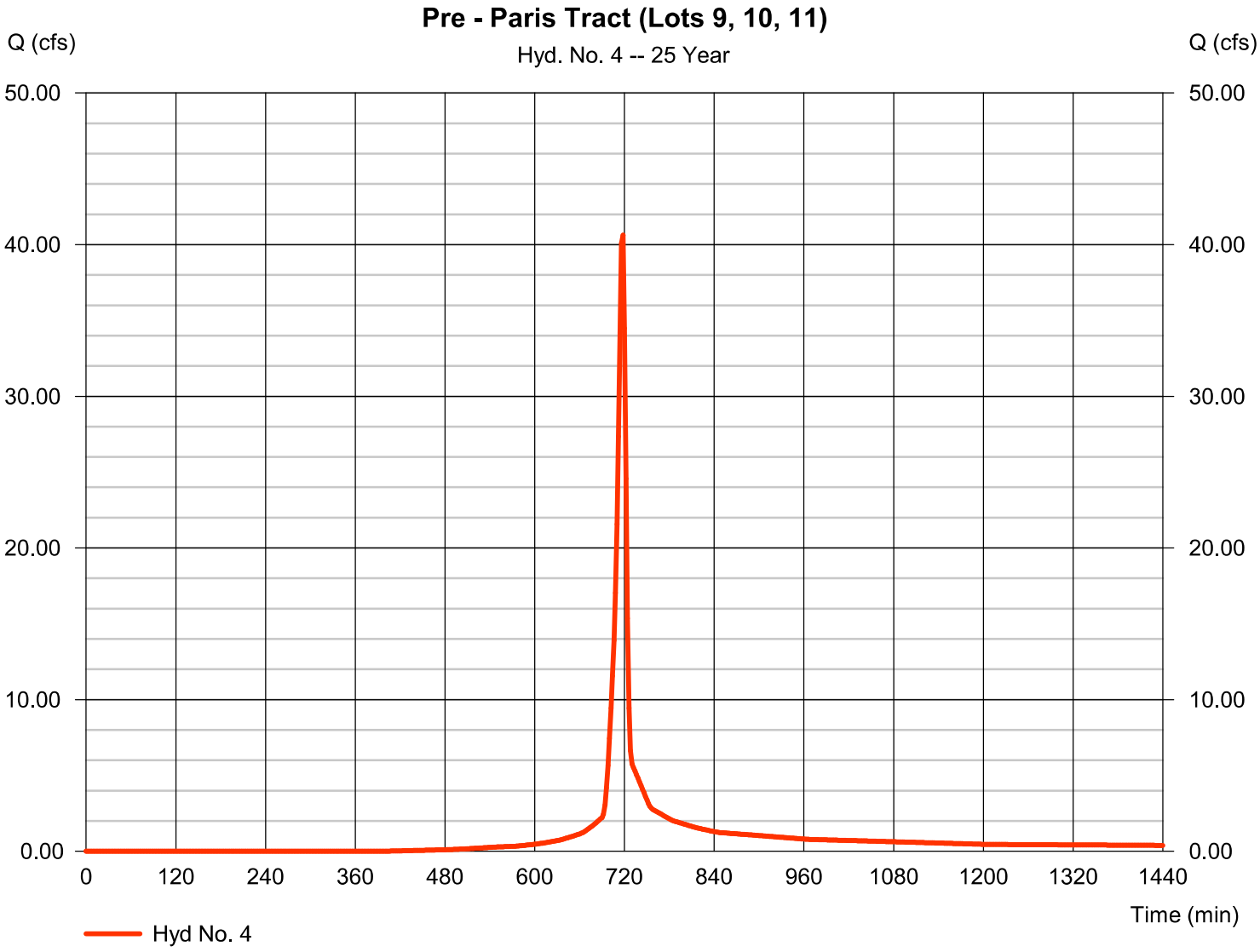
Hydrograph type	= SCS Runoff	Peak discharge	= 20.12 cfs
Storm frequency	= 25 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 56,333 cuft
Drainage area	= 5.070 ac	Curve number	= 73
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.50 min
Total precip.	= 5.94 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400



Hyd. No. 4

Pre - Paris Tract (Lots 9, 10, 11)

Hydrograph type	= SCS Runoff	Peak discharge	= 40.62 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 86,401 cuft
Drainage area	= 7.060 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.94 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

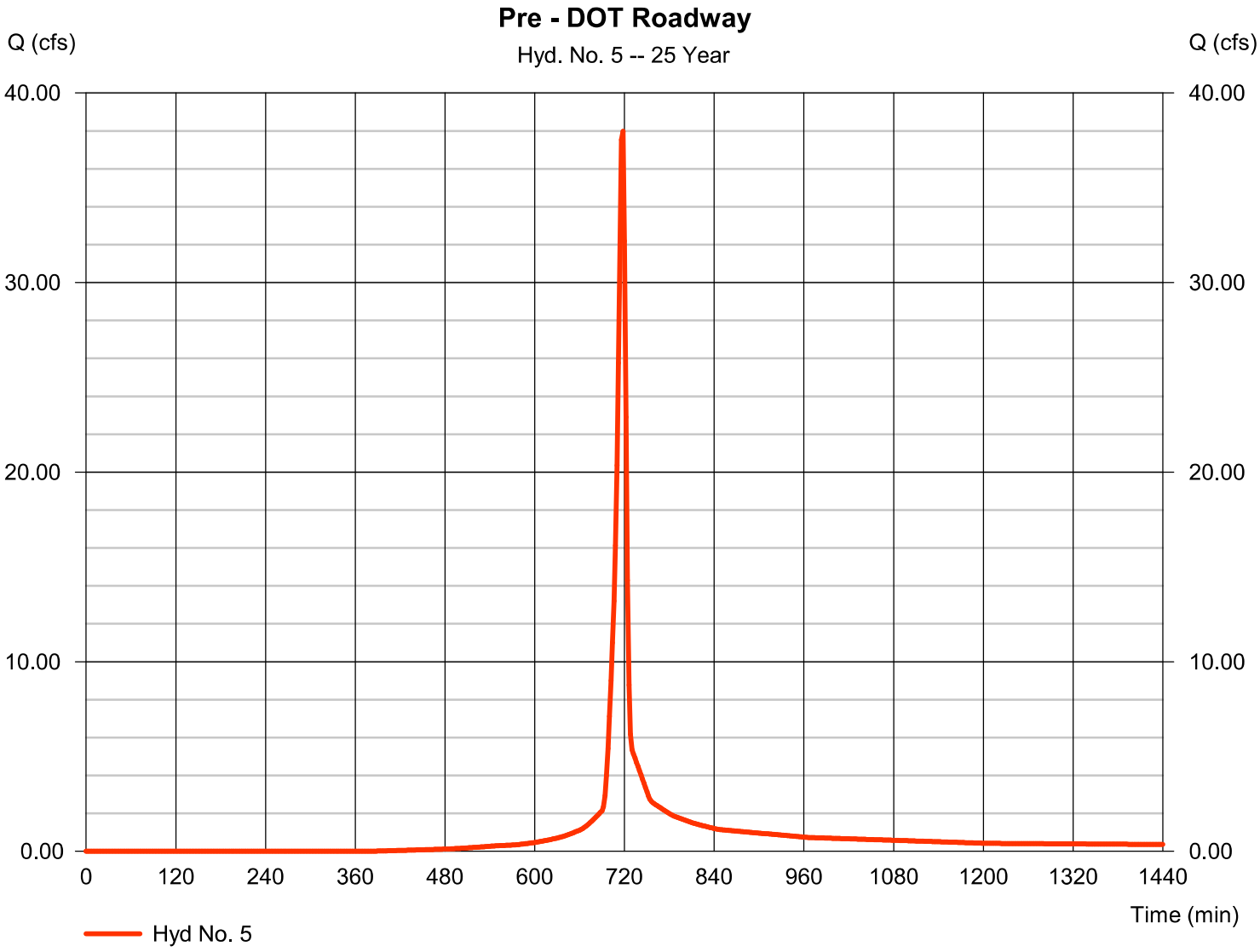


Hydrograph Report

Hyd. No. 5

Pre - DOT Roadway

Hydrograph type	= SCS Runoff	Peak discharge	= 37.97 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 81,135 cuft
Drainage area	= 6.450 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.94 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

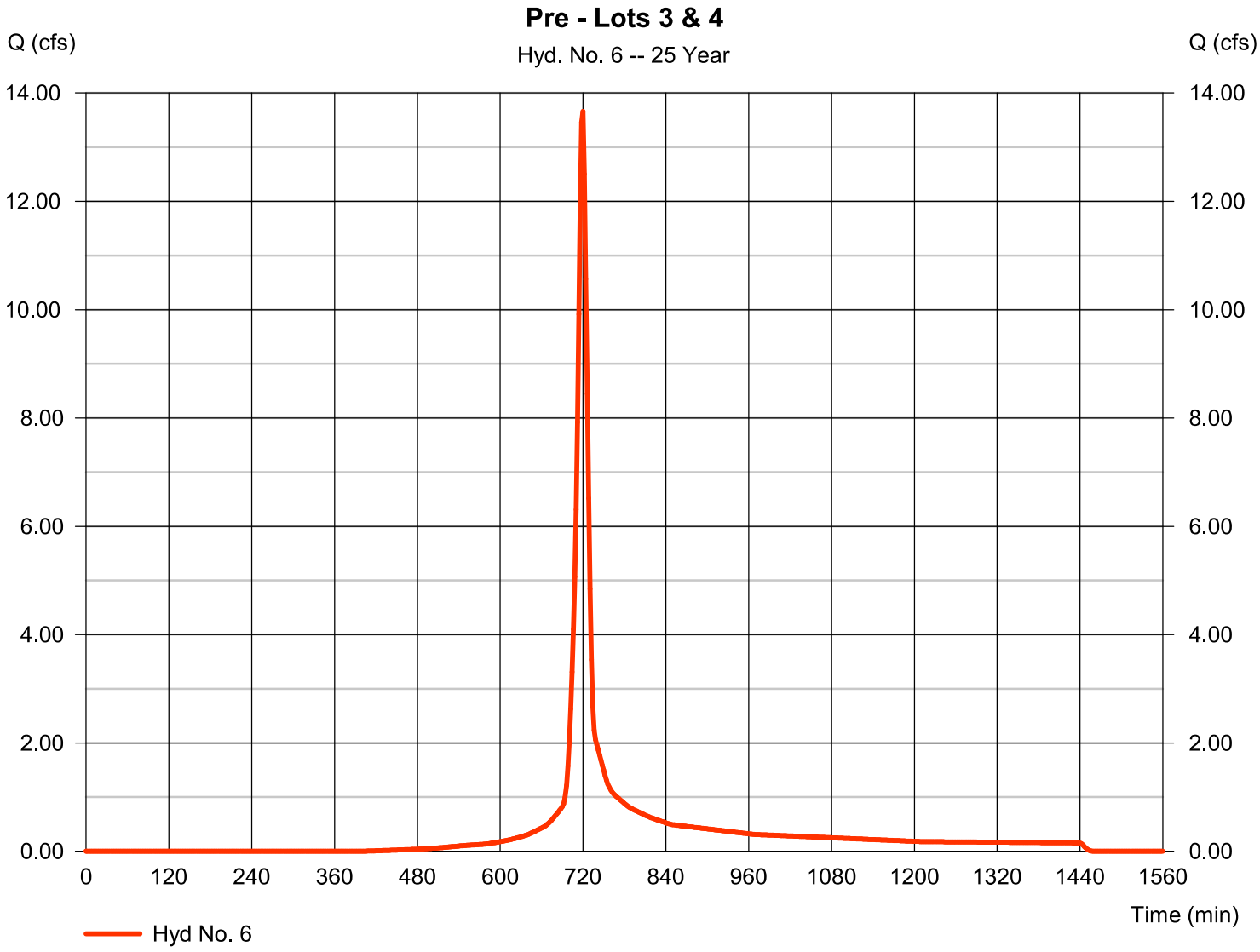


Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Sunday, 08 / 27 / 2023

Hyd. No. 6

Pre - Lots 3 & 4

Hydrograph type	= SCS Runoff	Peak discharge	= 13.66 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 34,131 cuft
Drainage area	= 2.510 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 5.94 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

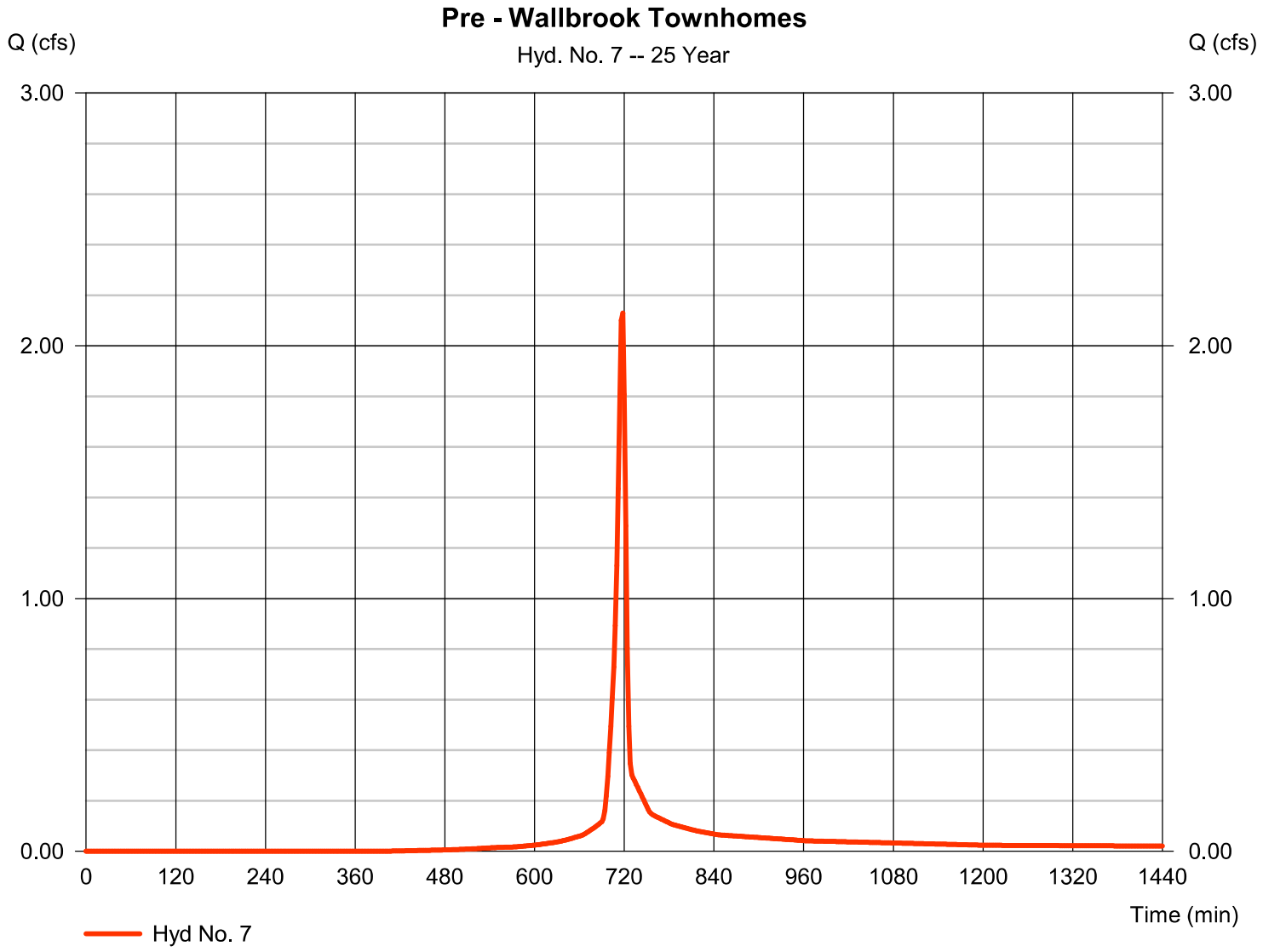


Hydrograph Report

Hyd. No. 7

Pre - Wallbrook Townhomes

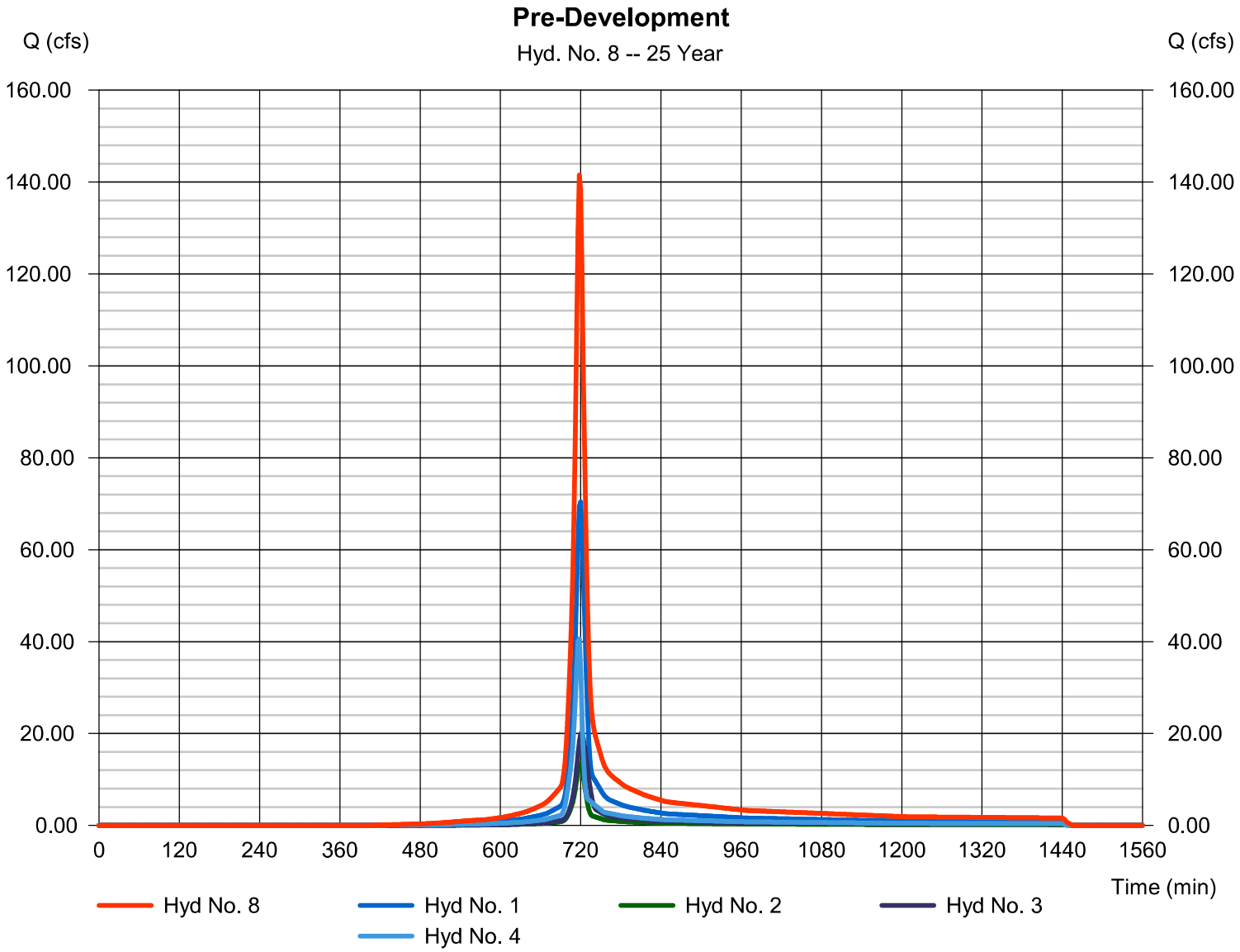
Hydrograph type	= SCS Runoff	Peak discharge	= 2.129 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 4,528 cuft
Drainage area	= 0.370 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.94 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400



Hyd. No. 8

Pre-Development

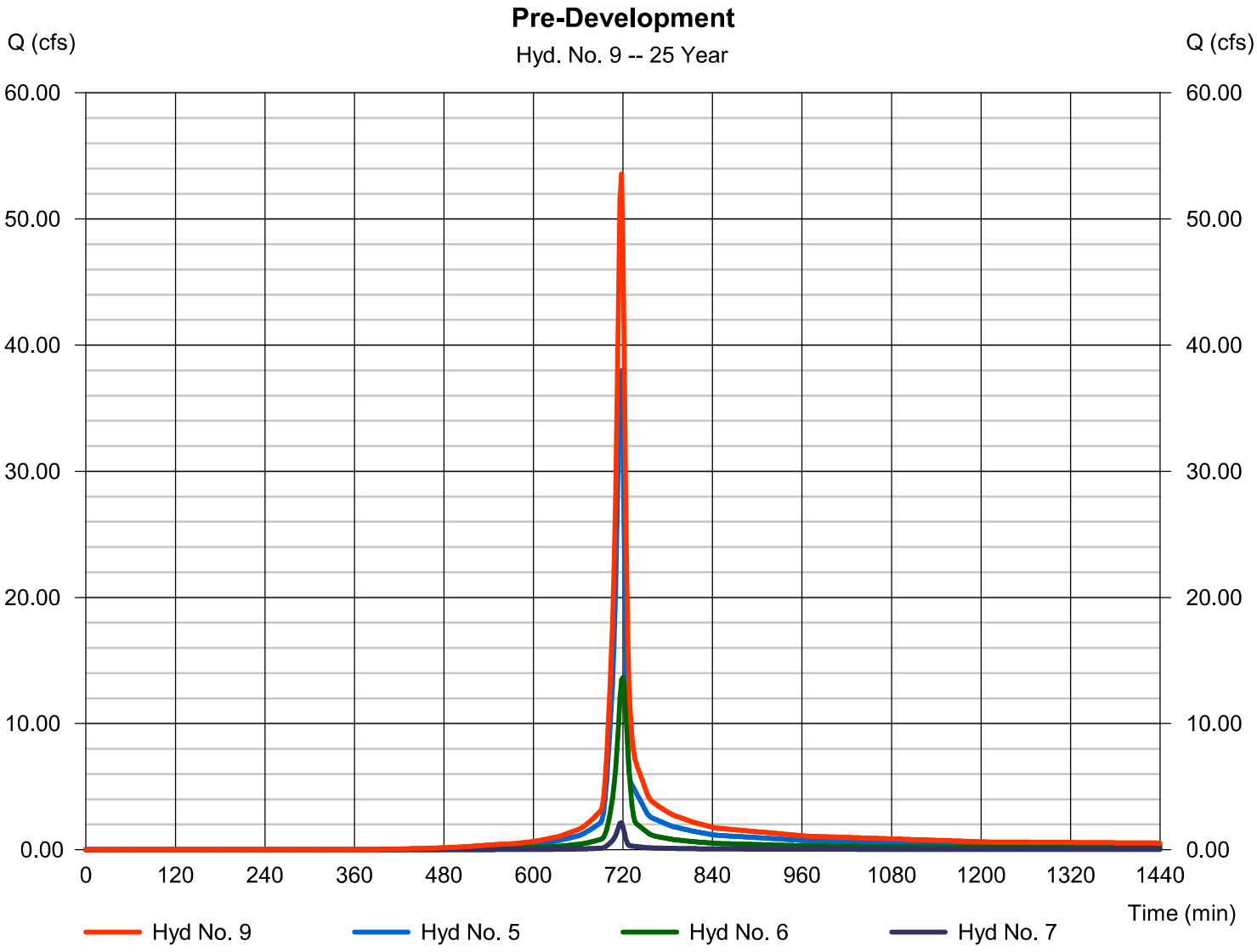
Hydrograph type	= Combine	Peak discharge	= 141.52 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 352,550 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 27.560 ac



Hyd. No. 9

Pre-Development

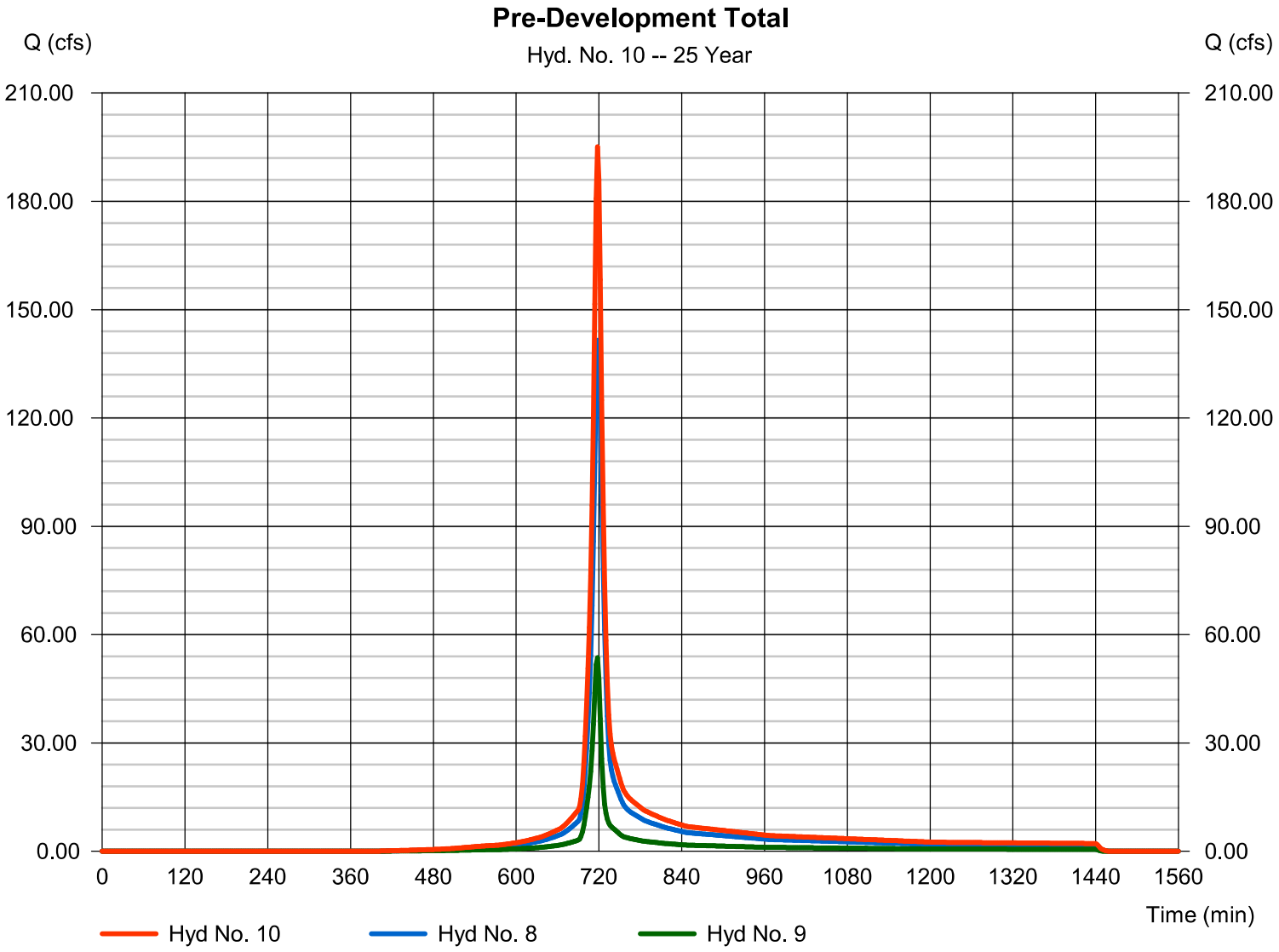
Hydrograph type	= Combine	Peak discharge	= 53.56 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 119,794 cuft
Inflow hyds.	= 5, 6, 7	Contrib. drain. area	= 9.330 ac



Hyd. No. 10

Pre-Development Total

Hydrograph type	= Combine	Peak discharge	= 195.08 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 472,344 cuft
Inflow hyds.	= 8, 9	Contrib. drain. area	= 0.000 ac



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	95.65	2	720	242,079	------	------	------	Pre - Wallbrook Lots 1 & 2
2	SCS Runoff	18.40	2	720	46,583	------	------	------	Pre - New Roadways (Wallbrook/Va
3	SCS Runoff	28.49	2	722	80,028	------	------	------	Pre - Boat Tract (Lot 5)
4	SCS Runoff	54.91	2	718	118,870	------	------	------	Pre - Paris Tract (Lots 9, 10, 11)
5	SCS Runoff	51.04	2	718	111,066	------	------	------	Pre - DOT Roadway
6	SCS Runoff	18.55	2	720	46,957	------	------	------	Pre - Lots 3 & 4
7	SCS Runoff	2.878	2	718	6,230	------	------	------	Pre - Wallbrook Townhomes
8	Combine	193.95	2	718	487,560	1, 2, 3, 4,	------	------	Pre-Development
9	Combine	72.30	2	718	164,252	5, 6, 7,	------	------	Pre-Development
10	Combine	266.24	2	718	651,812	8, 9	------	------	Pre-Development Total

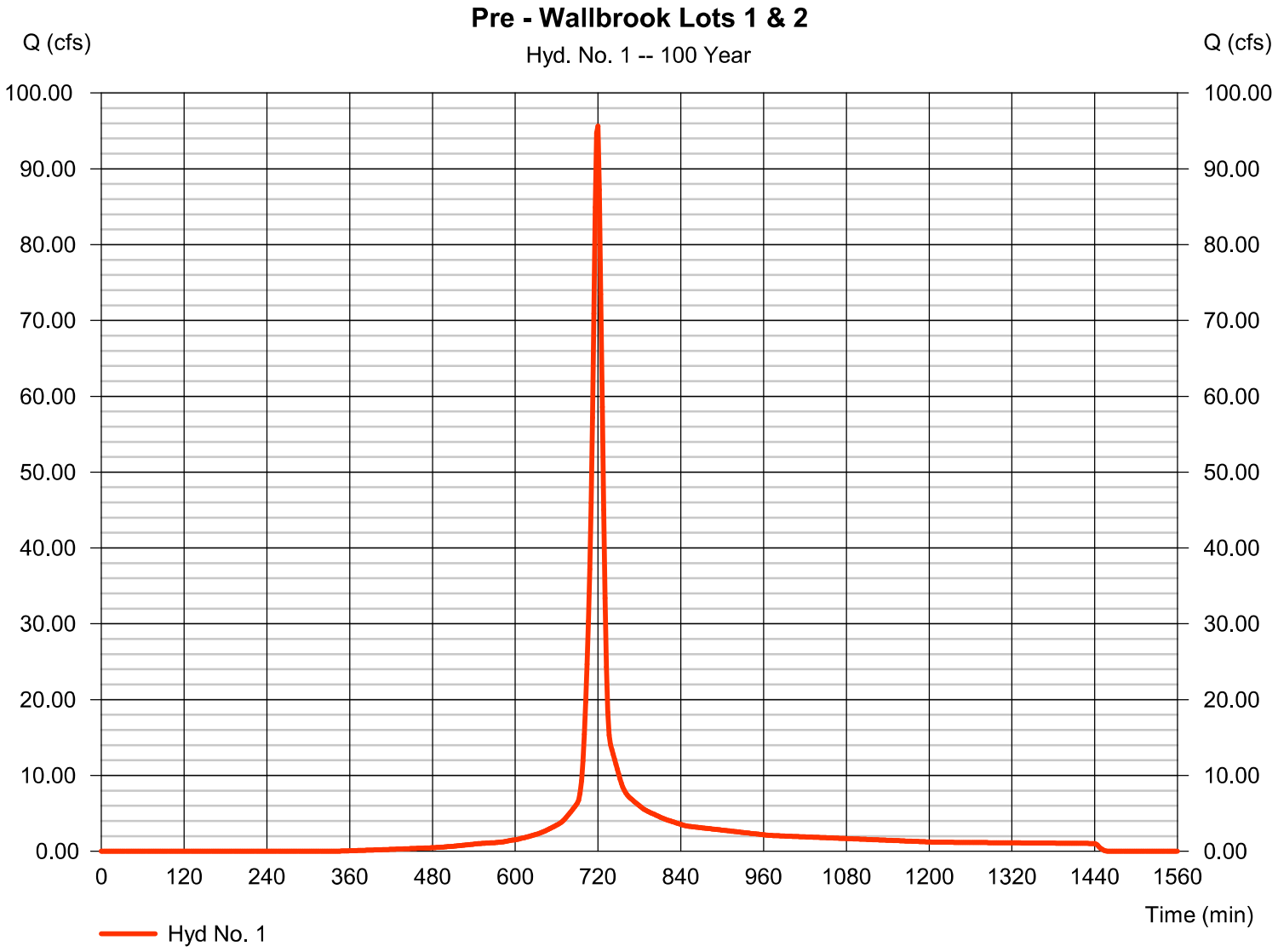
Hydrograph Report

Hyd. No. 1

Pre - Wallbrook Lots 1 & 2

Hydrograph type	= SCS Runoff	Peak discharge	= 95.65 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 242,079 cuft
Drainage area	= 12.940 ac	Curve number	= 79*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.70 min
Total precip.	= 7.44 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(10.970 x 79) + (1.970 x 79)] / 12.940

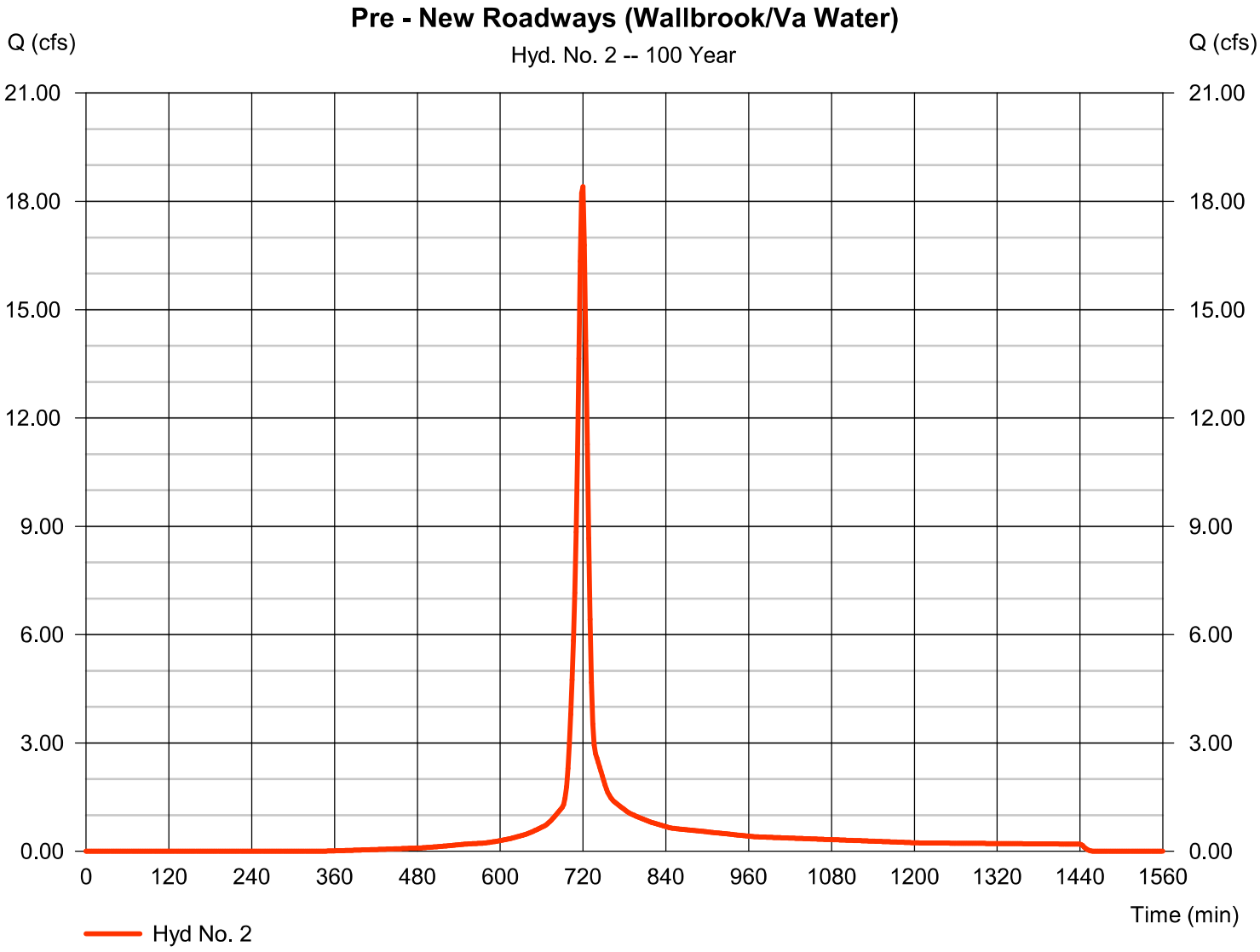


Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Sunday, 08 / 27 / 2023

Hyd. No. 2

Pre - New Roadways (Wallbrook/Va Water)

Hydrograph type	= SCS Runoff	Peak discharge	= 18.40 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 46,583 cuft
Drainage area	= 2.490 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.40 min
Total precip.	= 7.44 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

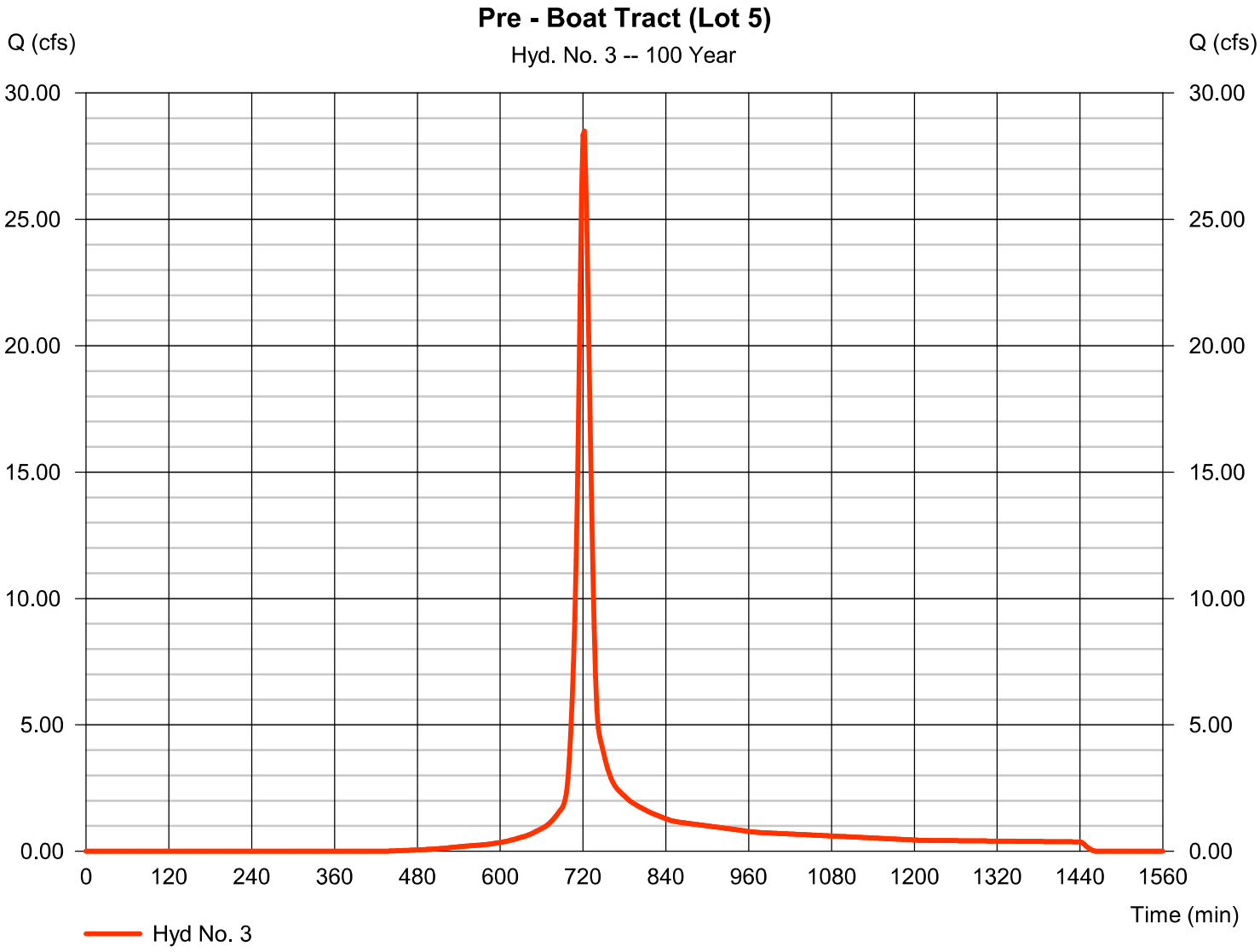


Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Sunday, 08 / 27 / 2023

Hyd. No. 3

Pre - Boat Tract (Lot 5)

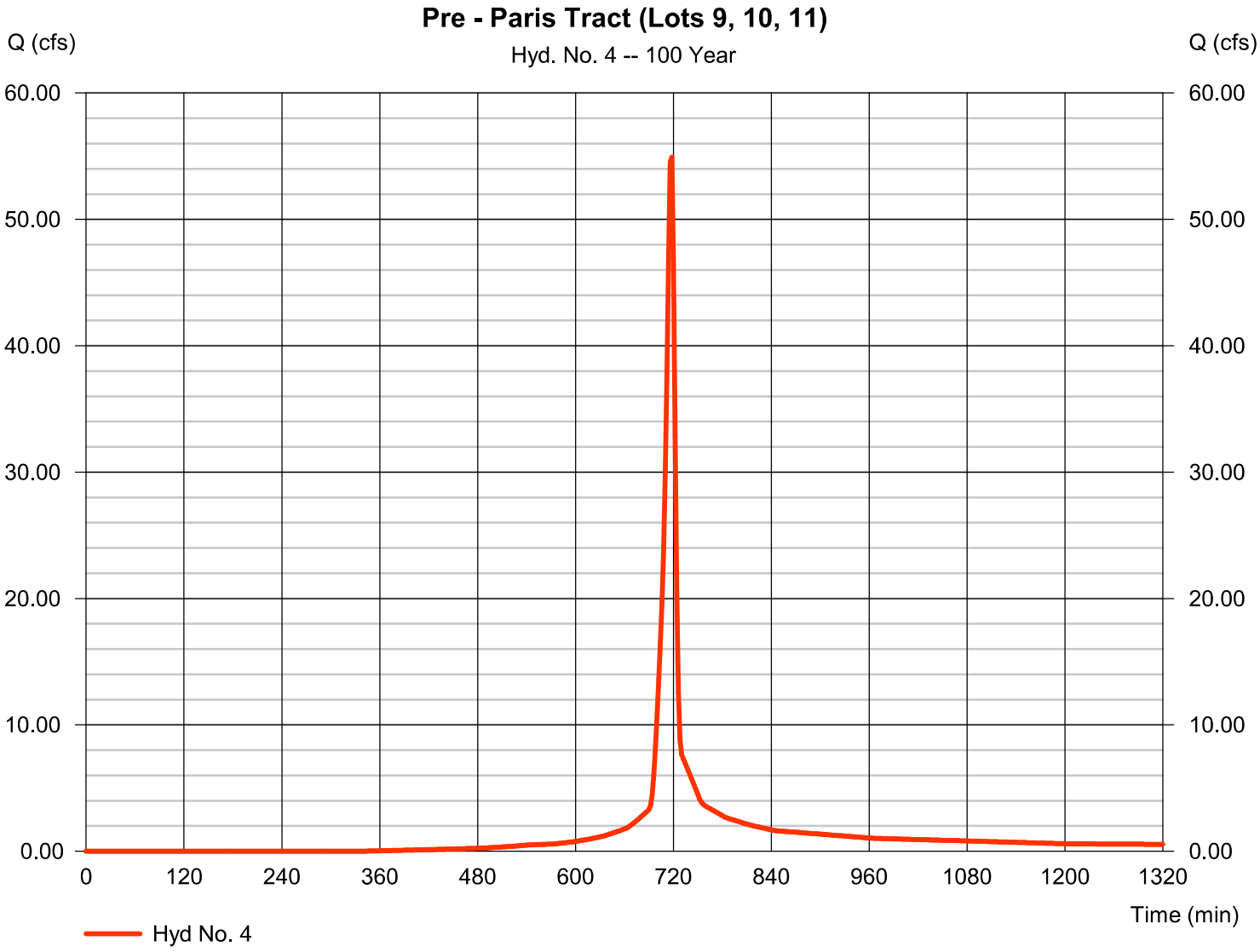
Hydrograph type	= SCS Runoff	Peak discharge	= 28.49 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 80,028 cuft
Drainage area	= 5.070 ac	Curve number	= 73
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.50 min
Total precip.	= 7.44 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400



Hyd. No. 4

Pre - Paris Tract (Lots 9, 10, 11)

Hydrograph type	= SCS Runoff	Peak discharge	= 54.91 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 118,870 cuft
Drainage area	= 7.060 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.44 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

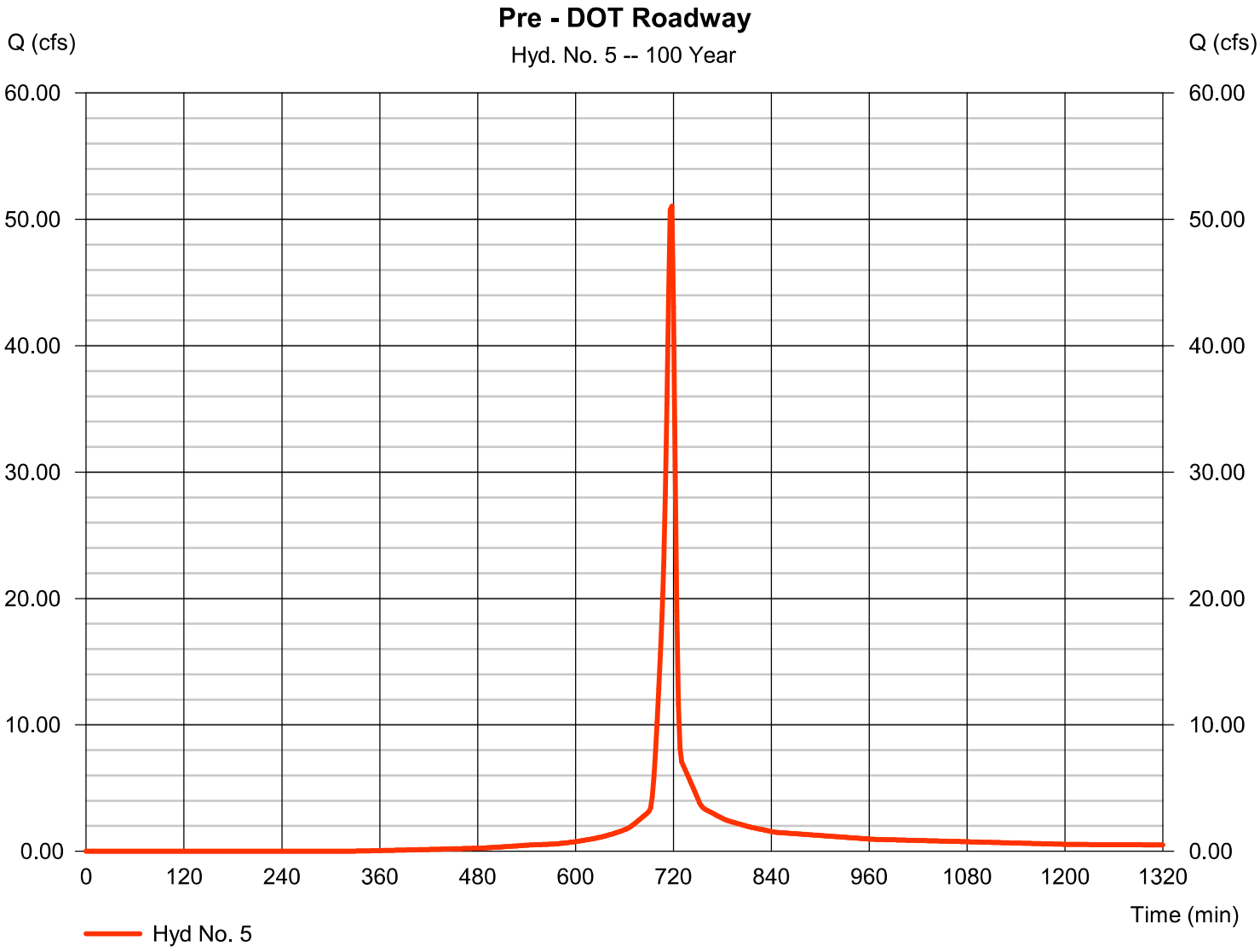


Hydrograph Report

Hyd. No. 5

Pre - DOT Roadway

Hydrograph type	= SCS Runoff	Peak discharge	= 51.04 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 111,066 cuft
Drainage area	= 6.450 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.44 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

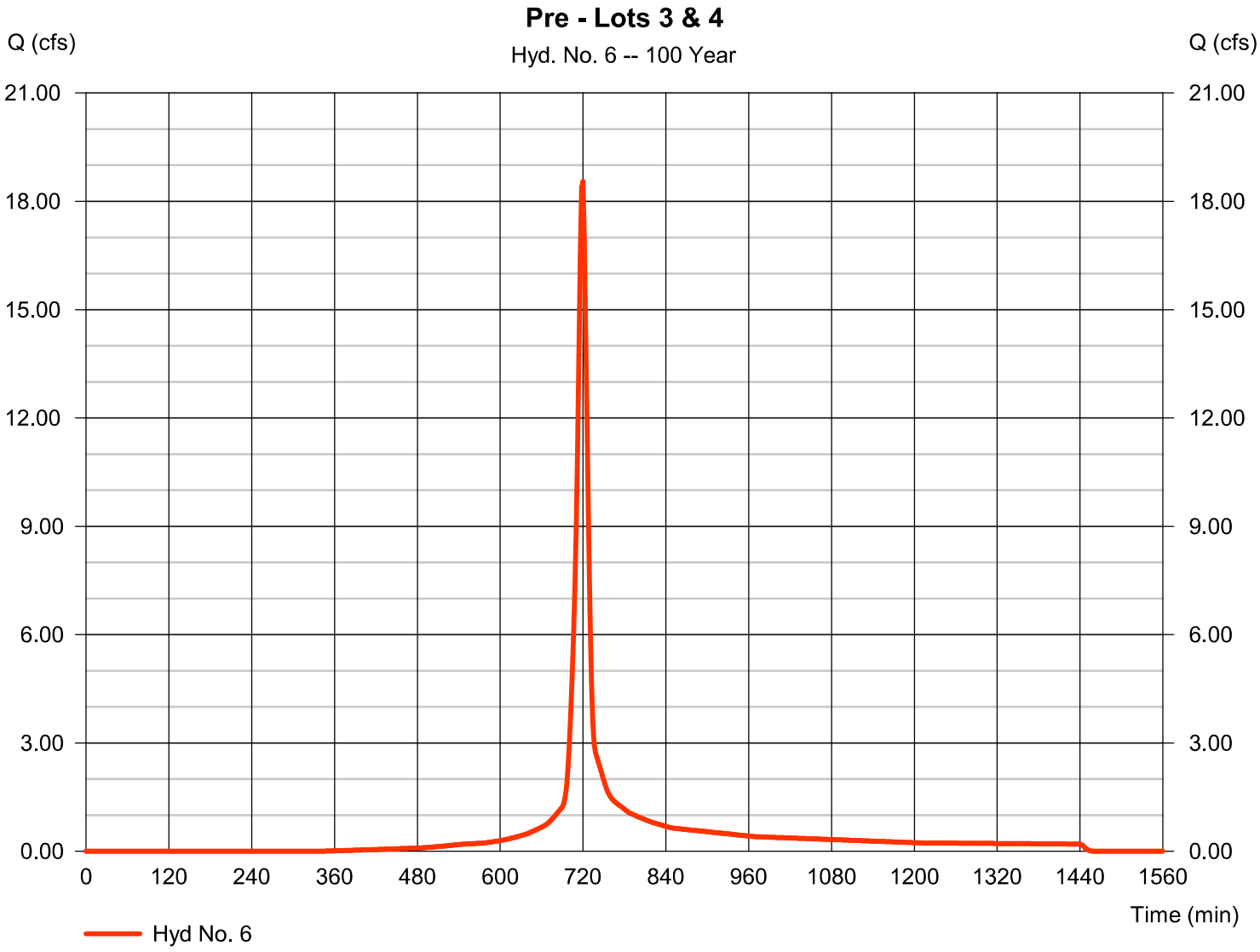


Hydrograph Report

Hyd. No. 6

Pre - Lots 3 & 4

Hydrograph type	= SCS Runoff	Peak discharge	= 18.55 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 46,957 cuft
Drainage area	= 2.510 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 7.44 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

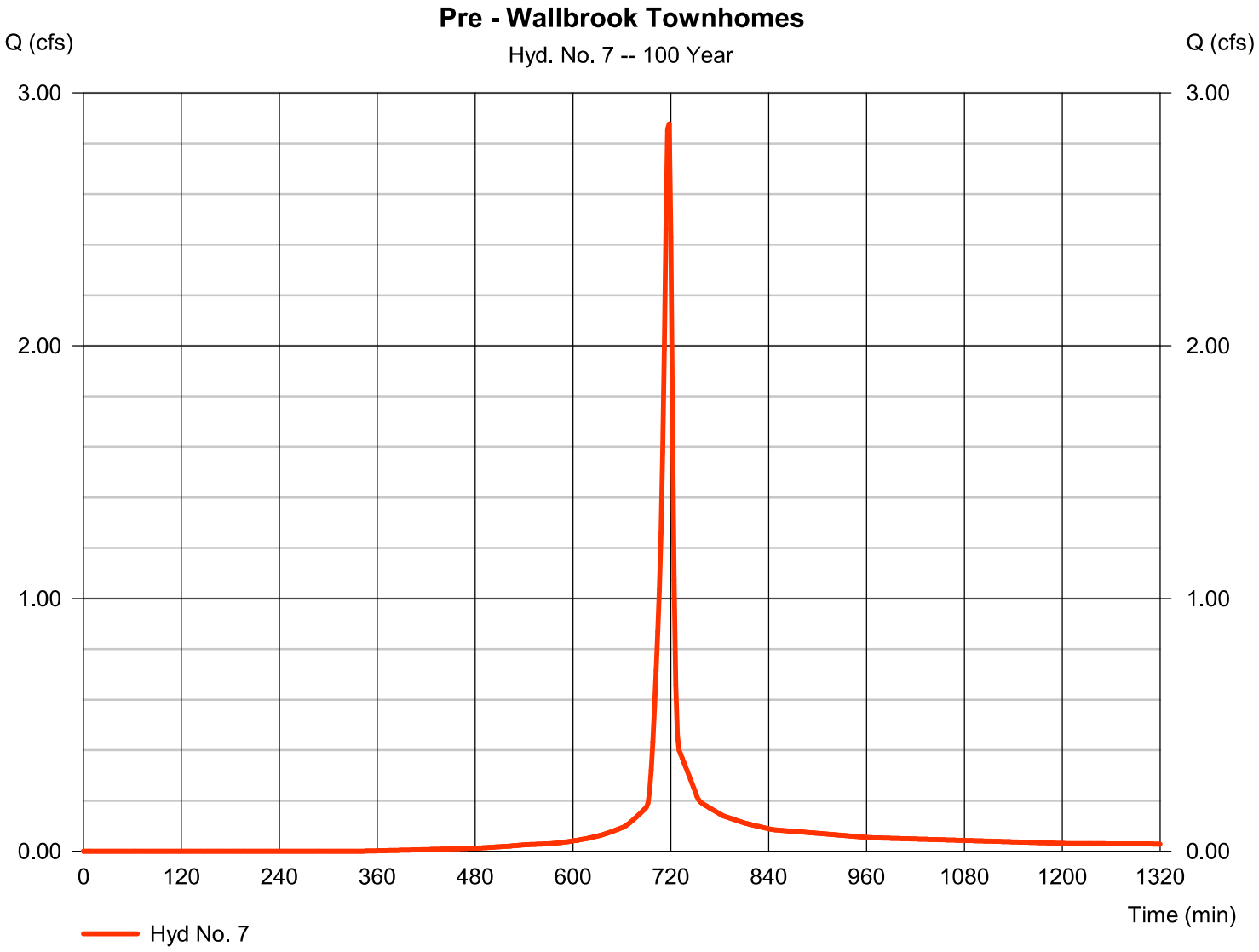


Hydrograph Report

Hyd. No. 7

Pre - Wallbrook Townhomes

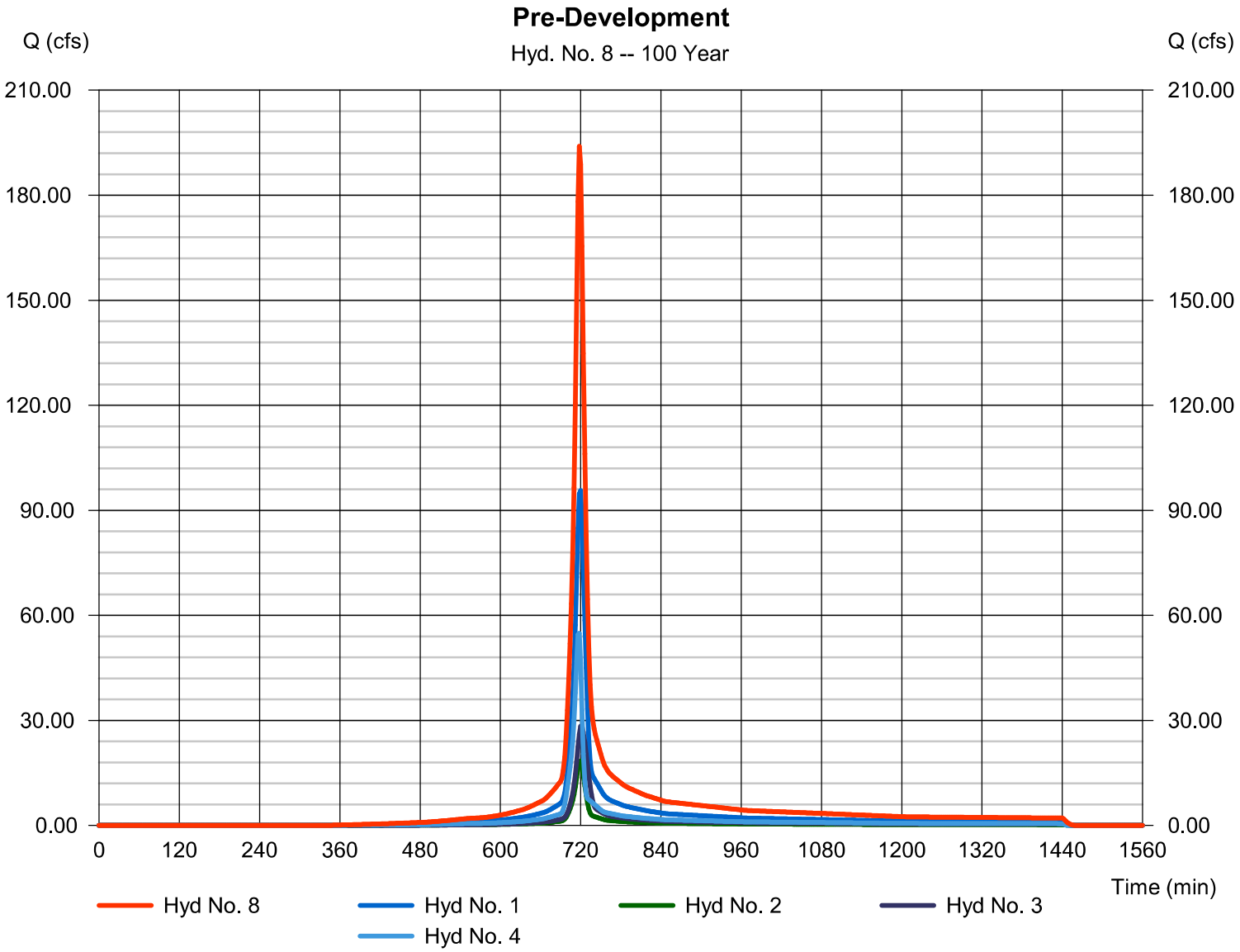
Hydrograph type	= SCS Runoff	Peak discharge	= 2.878 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 6,230 cuft
Drainage area	= 0.370 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.44 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400



Hyd. No. 8

Pre-Development

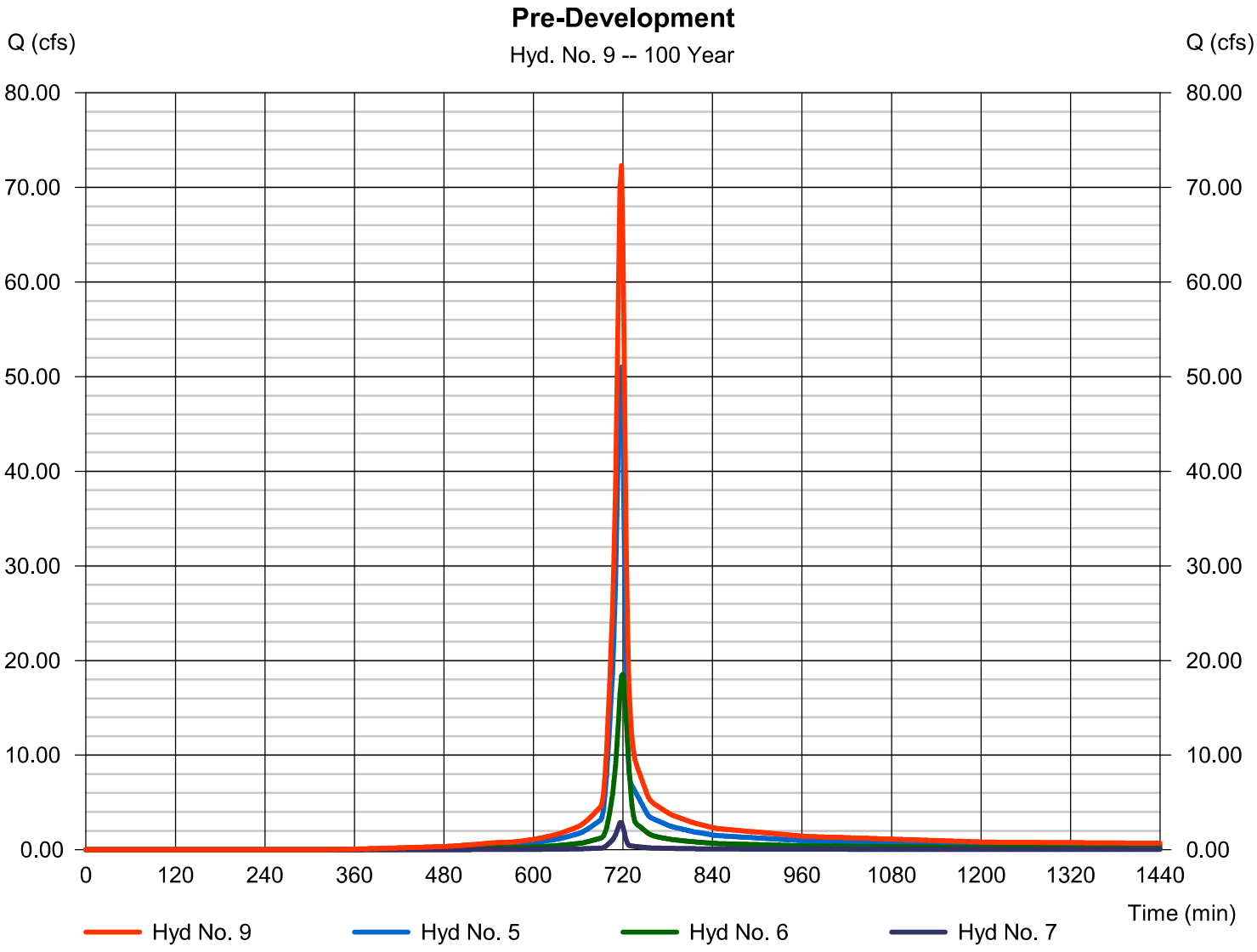
Hydrograph type	= Combine	Peak discharge	= 193.95 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 487,560 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 27.560 ac



Hyd. No. 9

Pre-Development

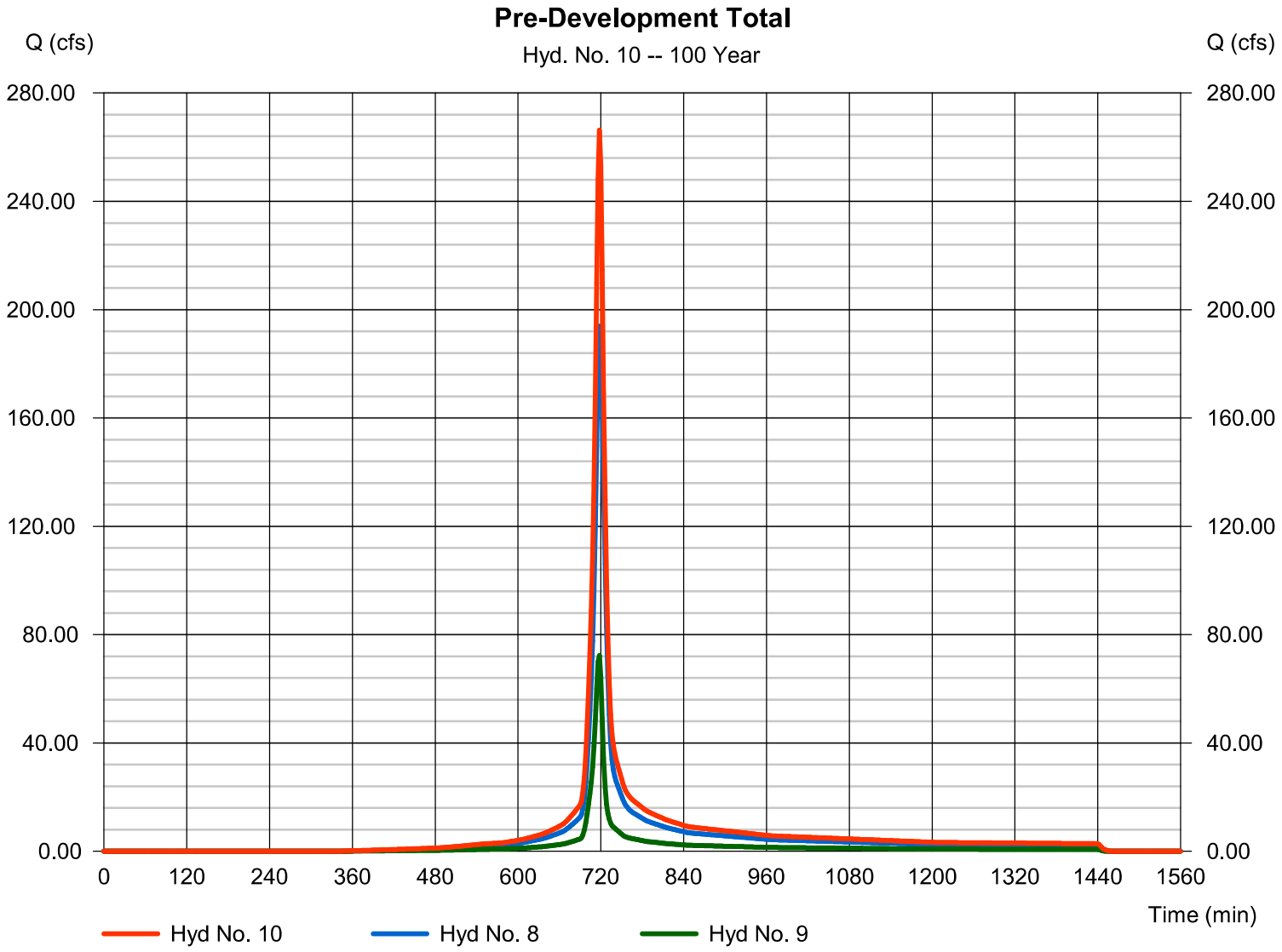
Hydrograph type	= Combine	Peak discharge	= 72.30 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 164,252 cuft
Inflow hyds.	= 5, 6, 7	Contrib. drain. area	= 9.330 ac



Hyd. No. 10

Pre-Development Total

Hydrograph type	= Combine	Peak discharge	= 266.24 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 651,812 cuft
Inflow hyds.	= 8, 9	Contrib. drain. area	= 0.000 ac



Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	62.1764	12.7000	0.8901	--------
2	71.2172	12.9000	0.8806	--------
3	0.0000	0.0000	0.0000	--------
5	68.4975	12.5000	0.8273	--------
10	73.1091	12.6000	0.8093	--------
25	2164.2561	37.3000	1.4976	--------
50	56.2148	10.1000	0.6951	--------
100	50.1117	8.9000	0.6500	--------

File name: Rolesville.IDF

Intensity = B / (Tc + D)^E

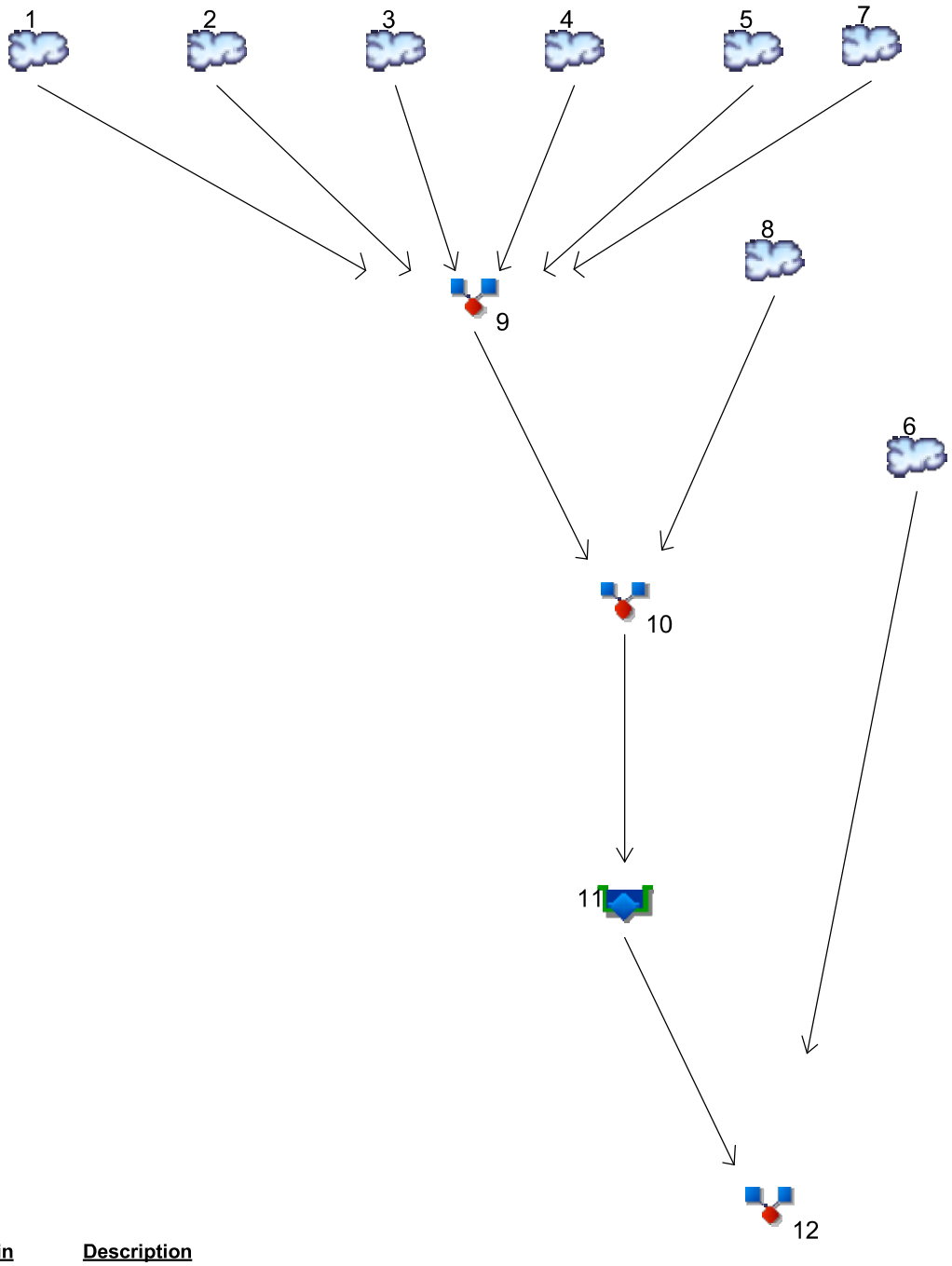
Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	4.82	3.86	3.23	2.79	2.46	2.20	1.99	1.82	1.68	1.56	1.46	1.37
2	5.61	4.52	3.80	3.28	2.90	2.60	2.36	2.16	2.00	1.86	1.74	1.63
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.42	5.21	4.42	3.85	3.42	3.08	2.81	2.59	2.40	2.24	2.10	1.98
10	7.18	5.86	4.99	4.36	3.88	3.51	3.21	2.96	2.75	2.57	2.42	2.28
25	7.94	6.72	5.78	5.04	4.45	3.96	3.56	3.22	2.93	2.68	2.47	2.28
50	8.52	6.98	5.98	5.27	4.74	4.32	3.98	3.70	3.46	3.26	3.08	2.93
100	9.06	7.42	6.37	5.63	5.07	4.64	4.29	4.00	3.75	3.54	3.36	3.20

Tc = time in minutes. Values may exceed 60.

Precip. file name: D:\Ark Dropbox\03 - Support\Software\Hydraflow\Rolesville.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	2.86	3.45	0.00	4.32	5.01	5.94	6.69	7.44
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	SCS Runoff	Post - Wallbrook Lots 1 & 2
2	SCS Runoff	Post - New Roadways (Wallbrook/Va Water)
3	SCS Runoff	Post - Boat Tract (Lot 5)
4	SCS Runoff	Post - Paris Tract (Lots 9, 10, 11)
5	SCS Runoff	Post - DOT Roadway
6	SCS Runoff	Post - Direct Release
7	SCS Runoff	Post - Lots 3 & 4
8	SCS Runoff	Post - Wallbrook Townhomes
9	Combine	Post-Total
10	Combine	Post-Total with Townhomes
11	Reservoir	Post-Total Route
12	Combine	Post-Development Total

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	38.84	47.87	-------	61.08	71.49	85.46	96.69	107.88	Post - Wallbrook Lots 1 & 2
2	SCS Runoff	------	7.199	8.816	-------	11.18	13.05	15.56	17.58	19.59	Post - New Roadways (Wallbrook/Va
3	SCS Runoff	------	16.85	20.91	-------	26.86	31.54	37.82	42.86	47.88	Post - Boat Tract (Lot 5)
4	SCS Runoff	------	24.16	29.78	-------	37.99	44.47	53.16	60.14	67.11	Post - Paris Tract (Lots 9, 10, 11)
5	SCS Runoff	------	21.44	26.61	-------	34.17	40.13	48.11	54.52	60.91	Post - DOT Roadway
6	SCS Runoff	------	4.859	6.446	-------	8.827	10.73	13.29	15.36	17.45	Post - Direct Release
7	SCS Runoff	------	8.589	10.59	-------	13.51	15.81	18.90	21.38	23.86	Post - Lots 3 & 4
8	SCS Runoff	------	1.230	1.526	-------	1.960	2.302	2.760	3.128	3.494	Post - Wallbrook Townhomes
9	Combine	1, 2, 3, 4, 5, 7,	117.08	144.57	-------	184.80	216.49	259.01	293.16	327.23	Post-Total
10	Combine	8, 9	118.31	146.10	-------	186.76	218.80	261.77	296.29	330.72	Post-Total with Townhomes
11	Reservoir	10	42.22	58.93	-------	72.73	80.89	89.79	95.91	101.43	Post-Total Route
12	Combine	6, 11	44.09	62.28	-------	77.50	86.96	97.45	104.79	111.72	Post-Development Total

Hydrograph Summary Report

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

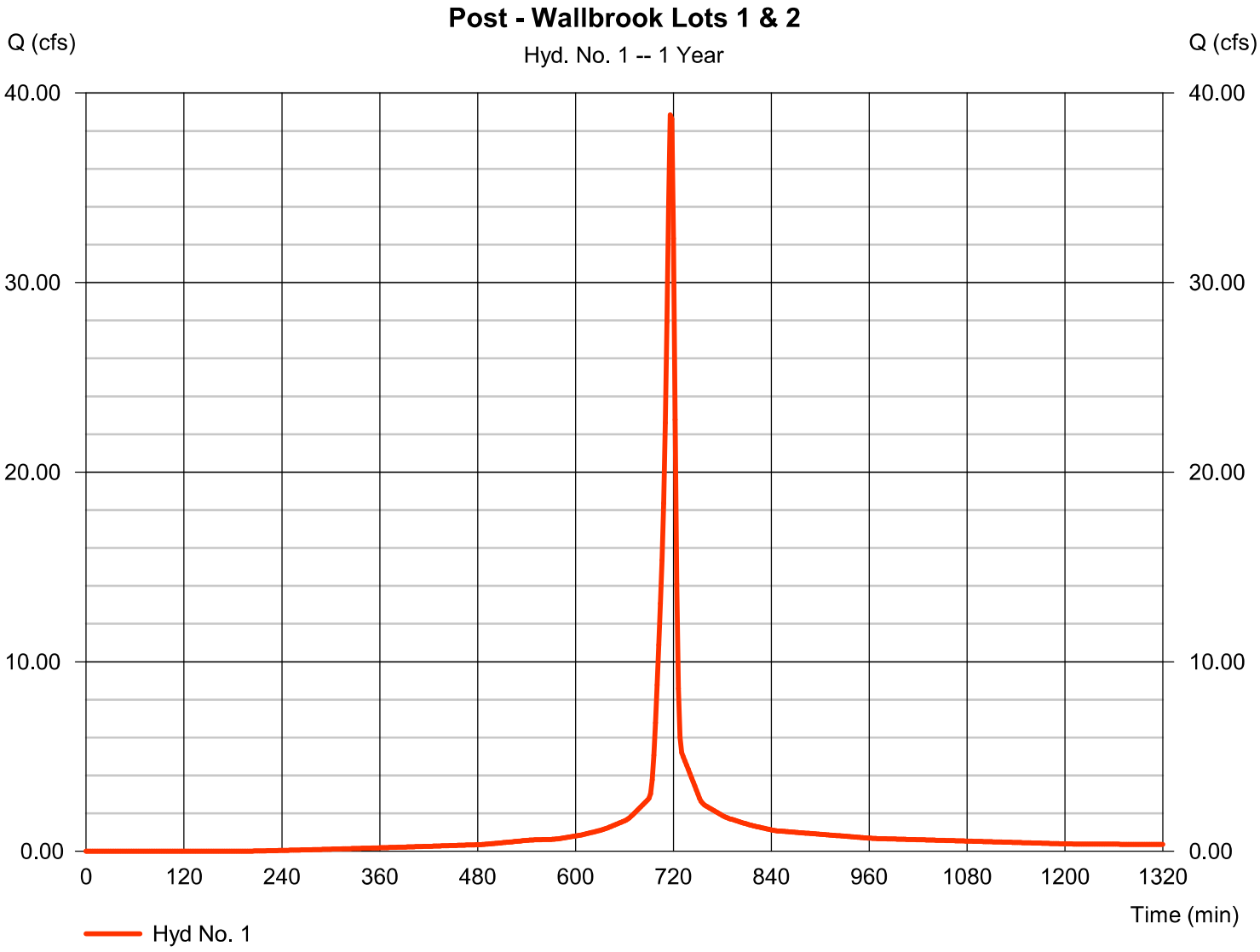
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	38.84	2	716	88,597	------	------	------	Post - Wallbrook Lots 1 & 2
2	SCS Runoff	7.199	2	716	16,704	------	------	------	Post - New Roadways (Wallbrook/Va
3	SCS Runoff	16.85	2	716	37,900	------	------	------	Post - Boat Tract (Lot 5)
4	SCS Runoff	24.16	2	716	55,109	------	------	------	Post - Paris Tract (Lots 9, 10, 11)
5	SCS Runoff	21.44	2	716	48,216	------	------	------	Post - DOT Roadway
6	SCS Runoff	4.859	2	718	10,130	------	------	------	Post - Direct Release
7	SCS Runoff	8.589	2	716	19,593	------	------	------	Post - Lots 3 & 4
8	SCS Runoff	1.230	2	716	2,766	------	------	------	Post - Wallbrook Townhomes
9	Combine	117.08	2	716	266,119	1, 2, 3,	------	------	Post-Total
10	Combine	118.31	2	716	268,885	4, 5, 7, 8, 9	------	------	Post-Total with Townhomes
11	Reservoir	42.22	2	724	263,336	10	364.61	138,900	Post-Total Route
12	Combine	44.09	2	724	273,466	6, 11	------	------	Post-Development Total

Hyd. No. 1

Post - Wallbrook Lots 1 & 2

Hydrograph type	= SCS Runoff	Peak discharge	= 38.84 cfs
Storm frequency	= 1 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 88,597 cuft
Drainage area	= 11.350 ac	Curve number	= 95*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.86 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(1.790 x 98) + (6.260 x 98) + (1.990 x 80) + (0.270 x 98) + (0.890 x 98) + (0.150 x 80)] / 11.350

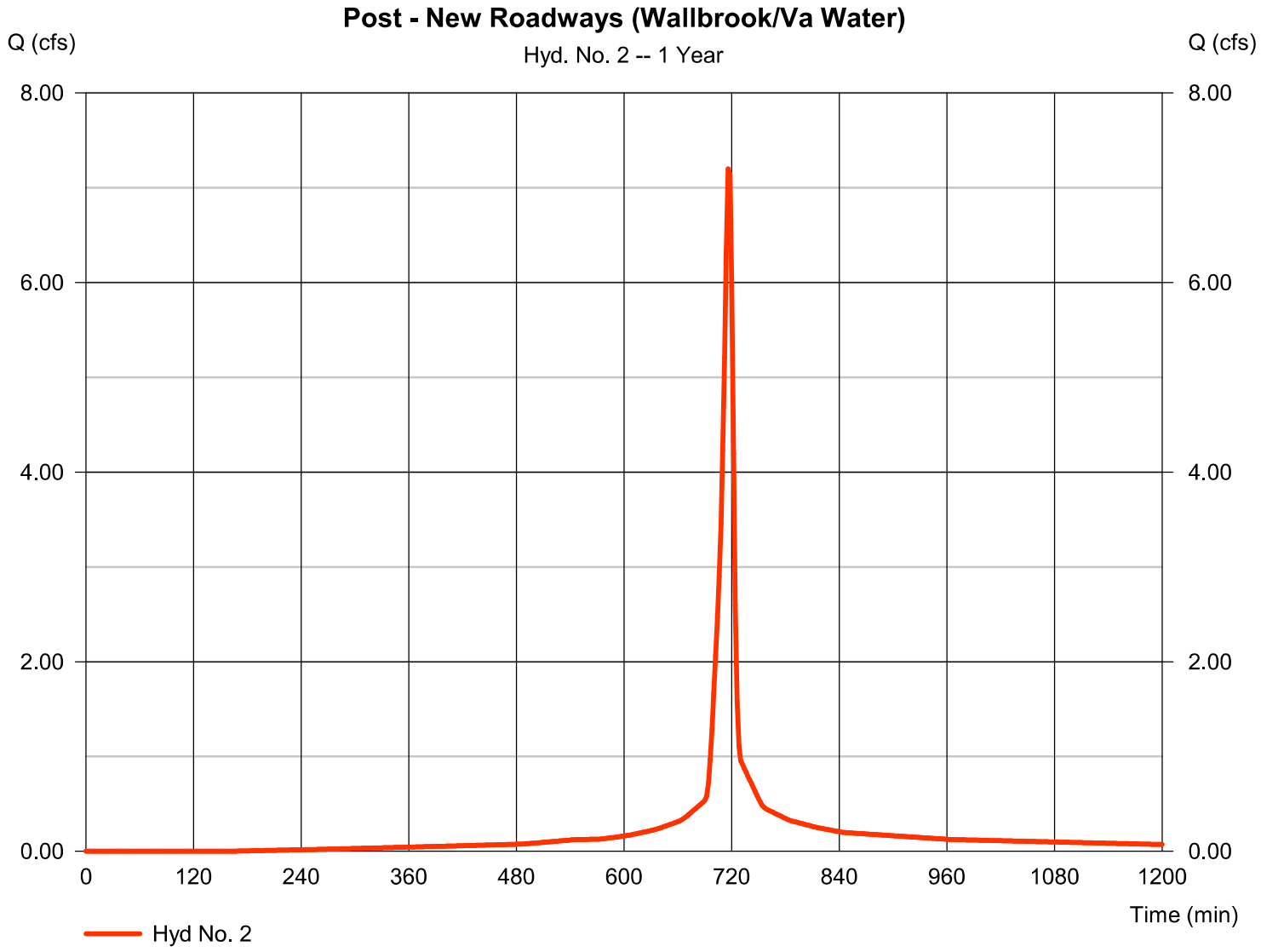


Hyd. No. 2

Post - New Roadways (Wallbrook/Va Water)

Hydrograph type	= SCS Runoff	Peak discharge	= 7.199 cfs
Storm frequency	= 1 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 16,704 cuft
Drainage area	= 2.050 ac	Curve number	= 96*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.86 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(1.820 x 98) + (0.230 x 80)] / 2.050

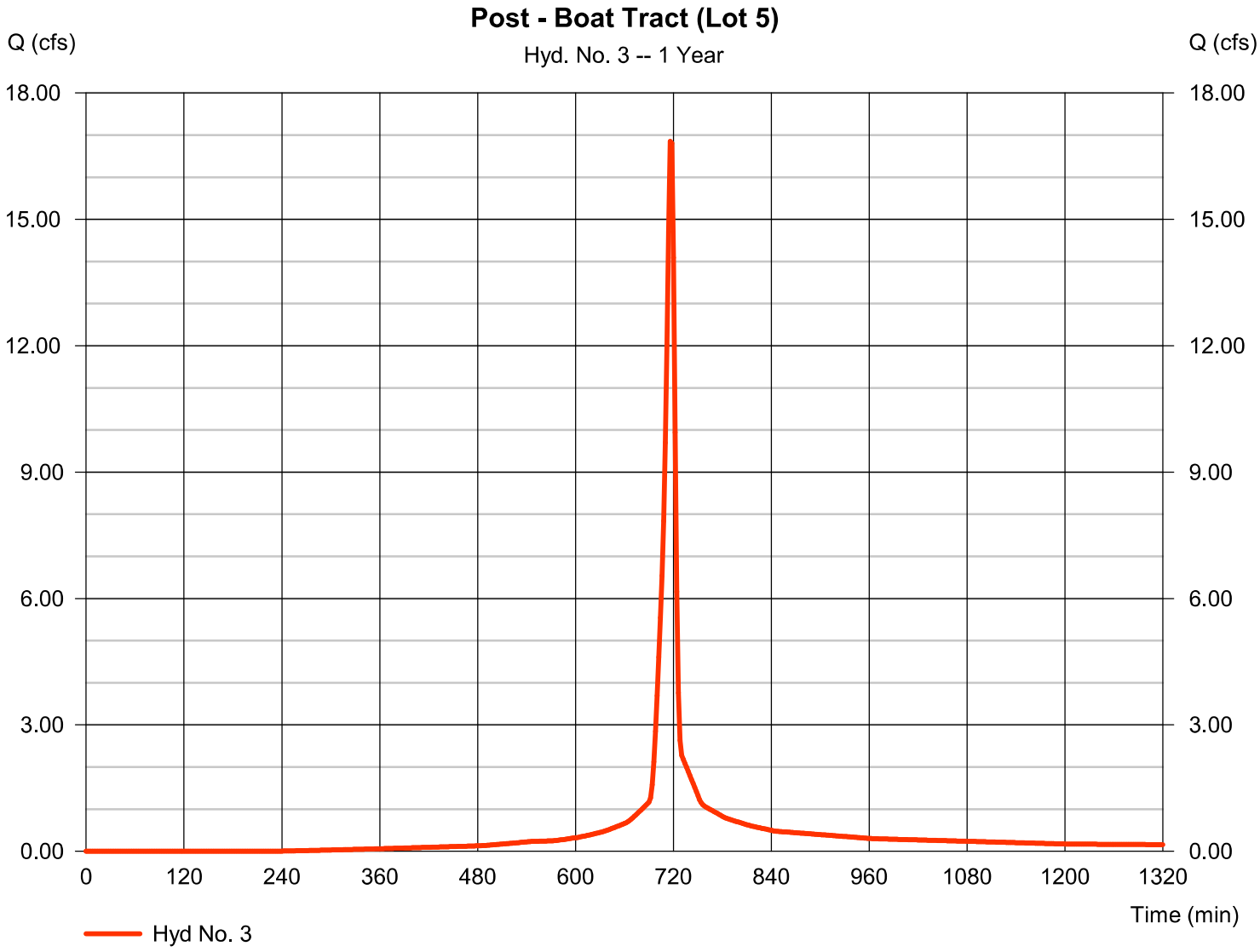


Hyd. No. 3

Post - Boat Tract (Lot 5)

Hydrograph type	=	SCS Runoff	Peak discharge	=	16.85 cfs
Storm frequency	=	1 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	37,900 cuft
Drainage area	=	5.070 ac	Curve number	=	94*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	2.86 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	400

* Composite (Area/CN) = [(0.860 x 98) + (3.450 x 98) + (0.760 x 74)] / 5.070

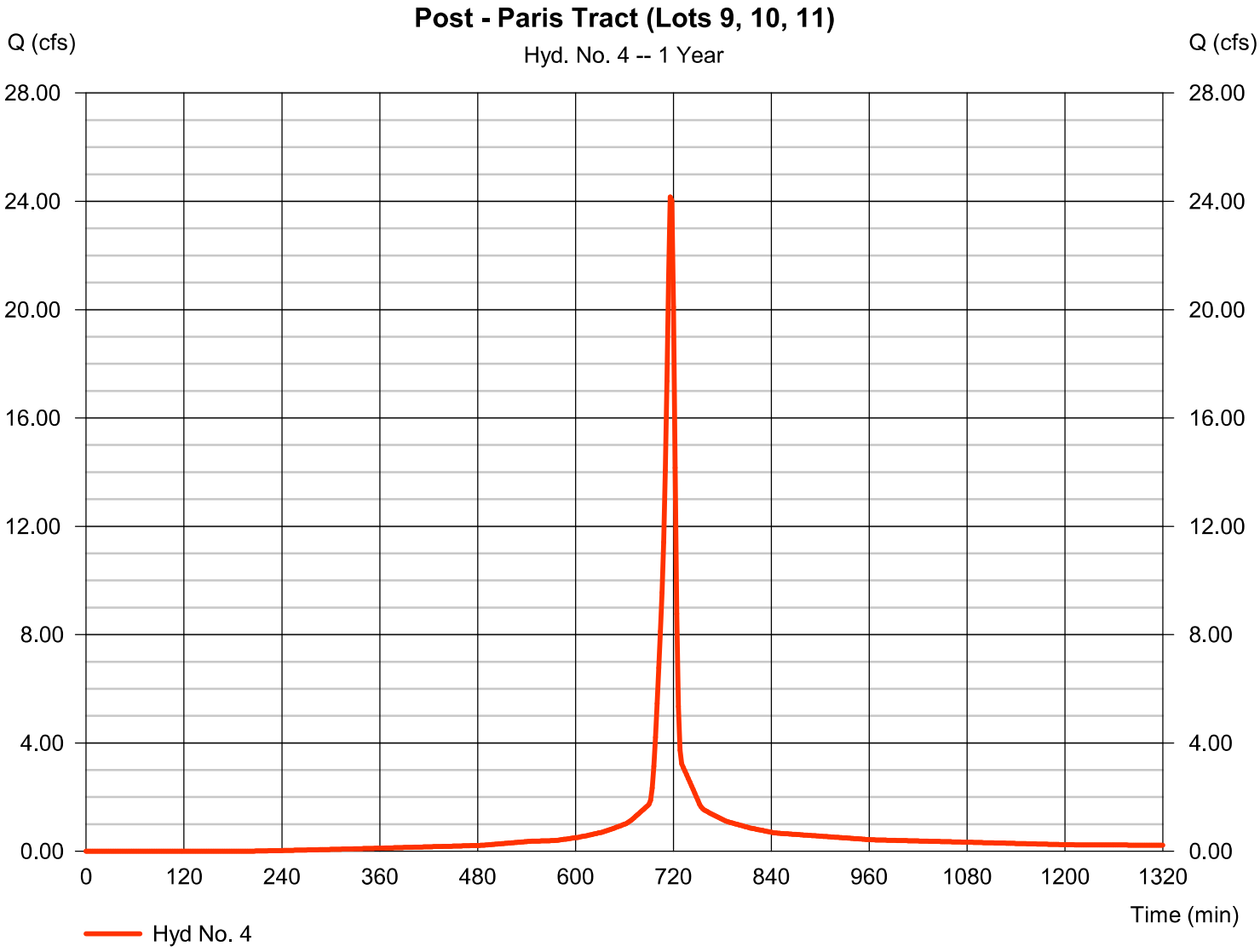


Hyd. No. 4

Post - Paris Tract (Lots 9, 10, 11)

Hydrograph type	= SCS Runoff	Peak discharge	= 24.16 cfs
Storm frequency	= 1 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 55,109 cuft
Drainage area	= 7.060 ac	Curve number	= 95*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.86 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(1.200 x 98) + (4.800 x 98) + (1.060 x 80)] / 7.060

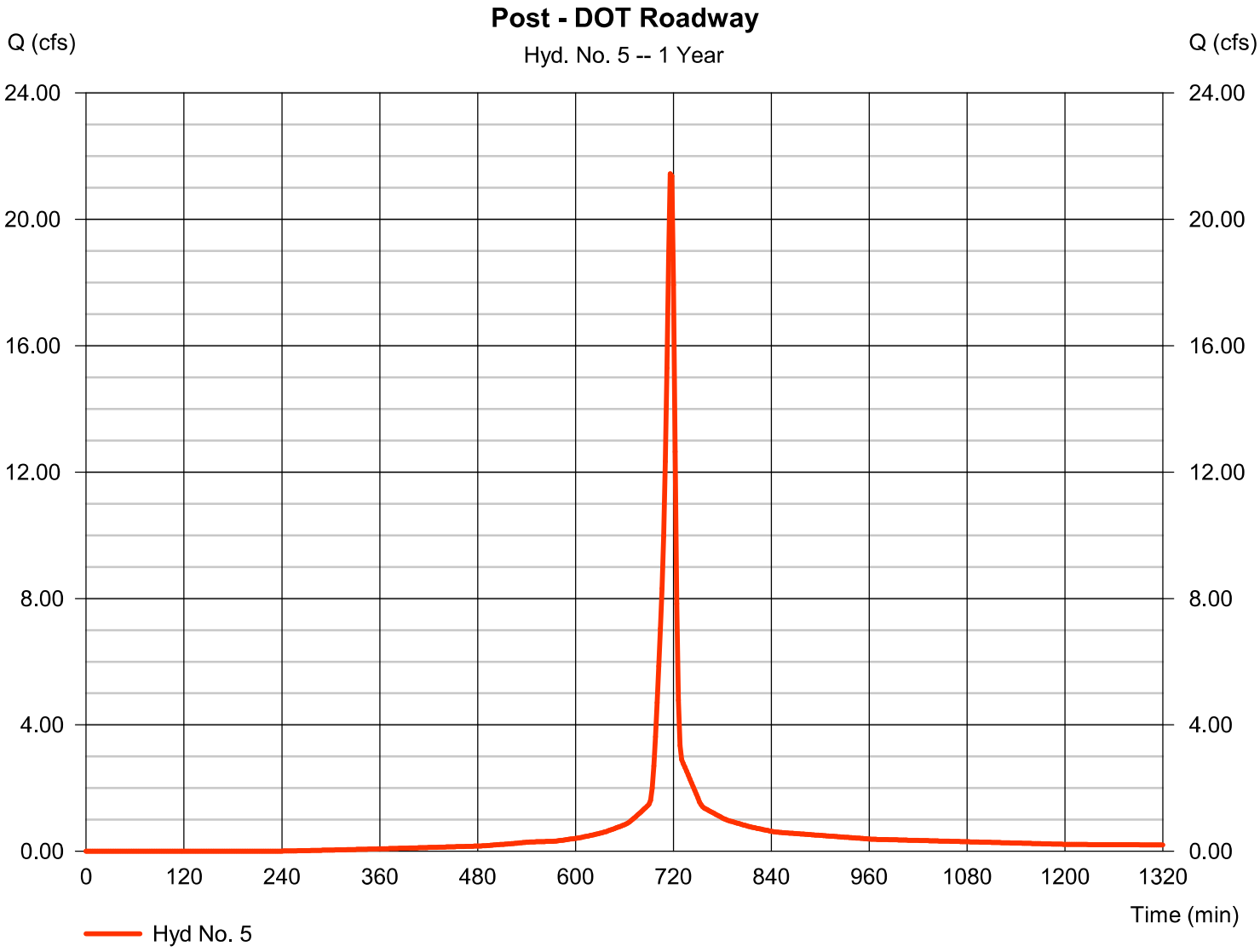


Hyd. No. 5

Post - DOT Roadway

Hydrograph type	= SCS Runoff	Peak discharge	= 21.44 cfs
Storm frequency	= 1 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 48,216 cuft
Drainage area	= 6.450 ac	Curve number	= 94*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.86 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(4.960 x 98) + (1.490 x 80)] / 6.450



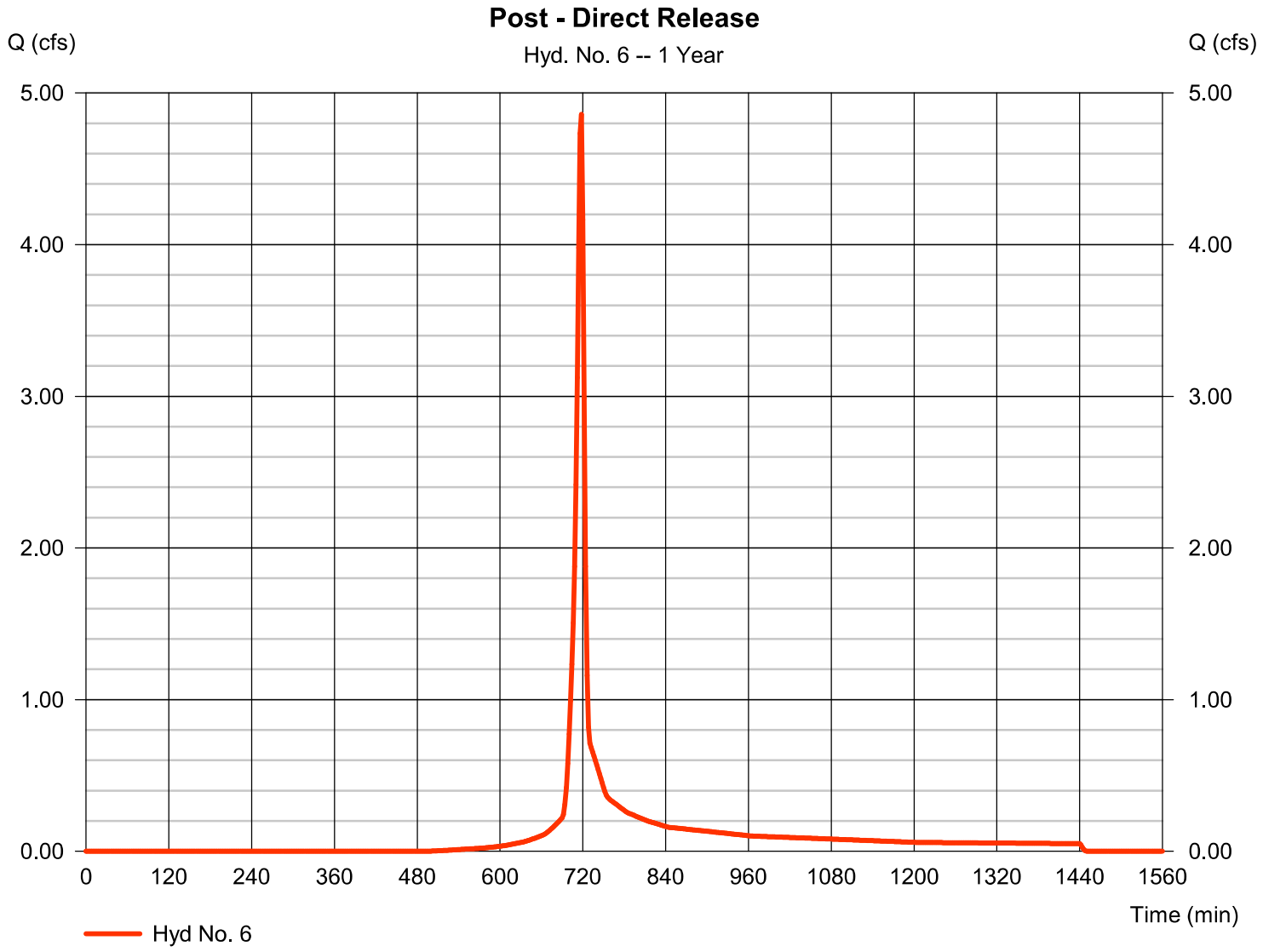
Hydrograph Report

Hyd. No. 6

Post - Direct Release

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.859 cfs
Storm frequency	=	1 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	10,130 cuft
Drainage area	=	2.040 ac	Curve number	=	85*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	2.86 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	400

* Composite (Area/CN) = [(1.480 x 80) + (0.560 x 98)] / 2.040

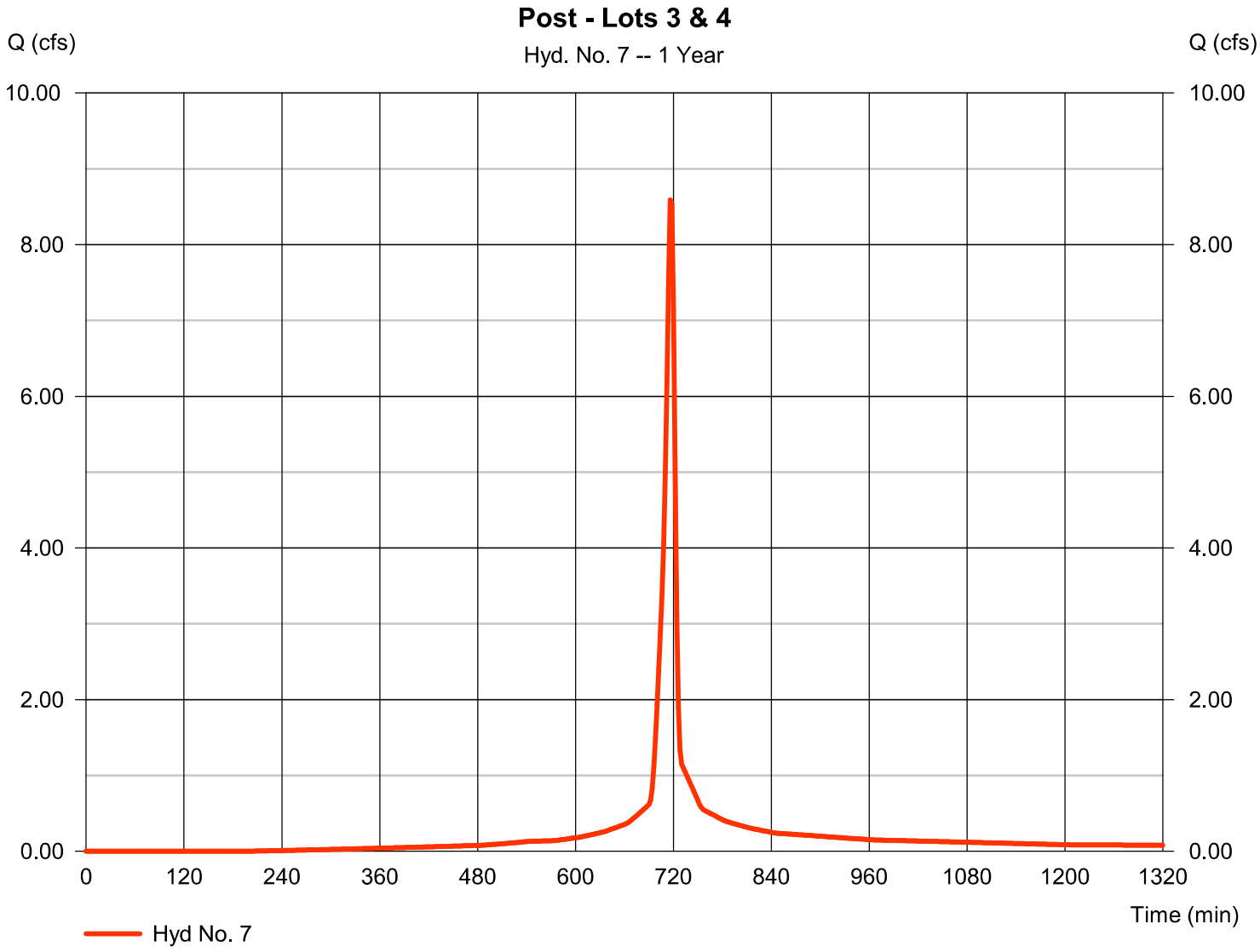


Hyd. No. 7

Post - Lots 3 & 4

Hydrograph type	= SCS Runoff	Peak discharge	= 8.589 cfs
Storm frequency	= 1 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 19,593 cuft
Drainage area	= 2.510 ac	Curve number	= 95*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.86 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(0.320 x 98) + (1.810 x 98) + (0.380 x 80)] / 2.510



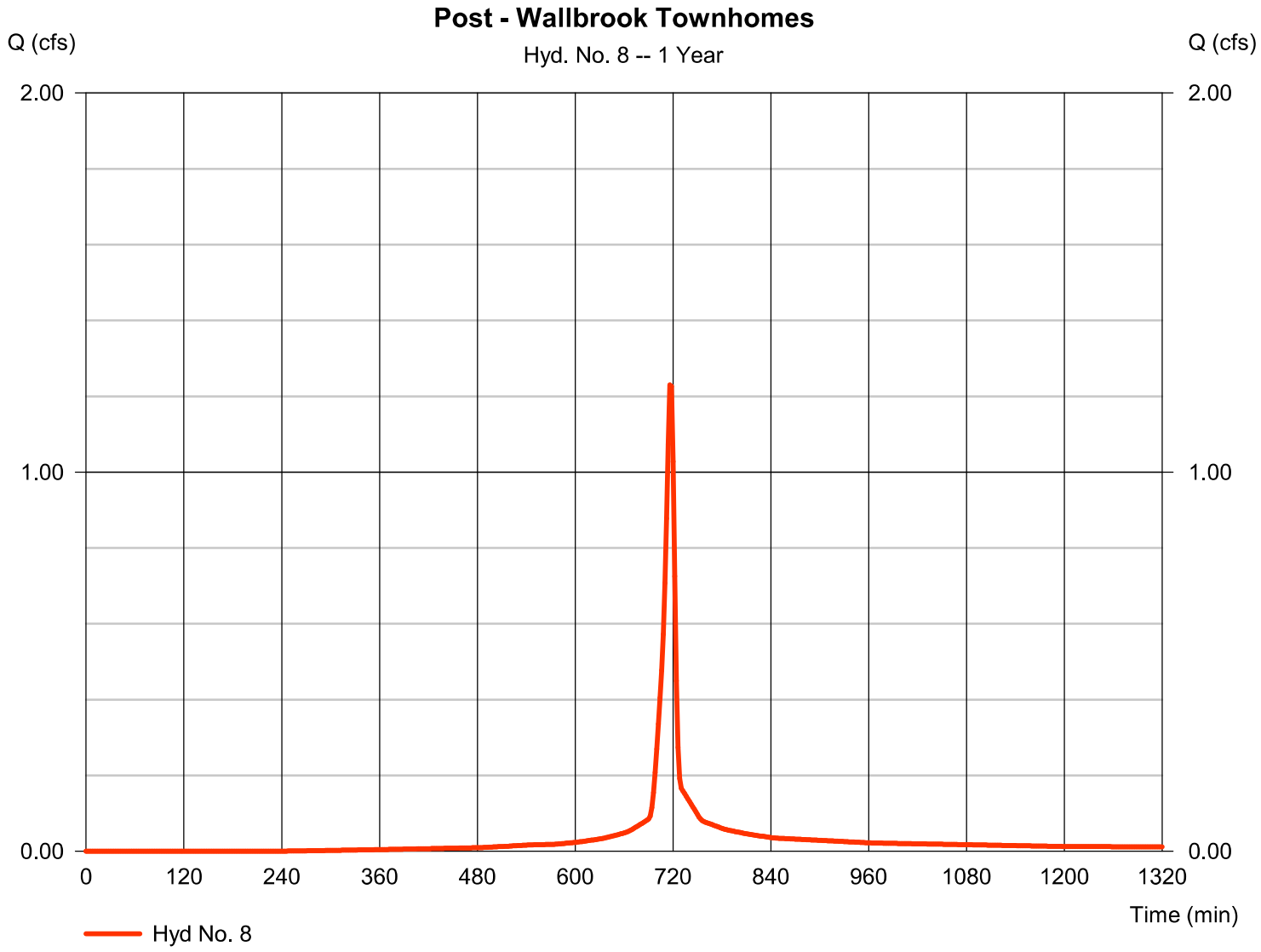
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Thursday, 09 / 21 / 2023

Hyd. No. 8

Post - Wallbrook Townhomes

Hydrograph type	= SCS Runoff	Peak discharge	= 1.230 cfs
Storm frequency	= 1 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 2,766 cuft
Drainage area	= 0.370 ac	Curve number	= 94*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.86 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

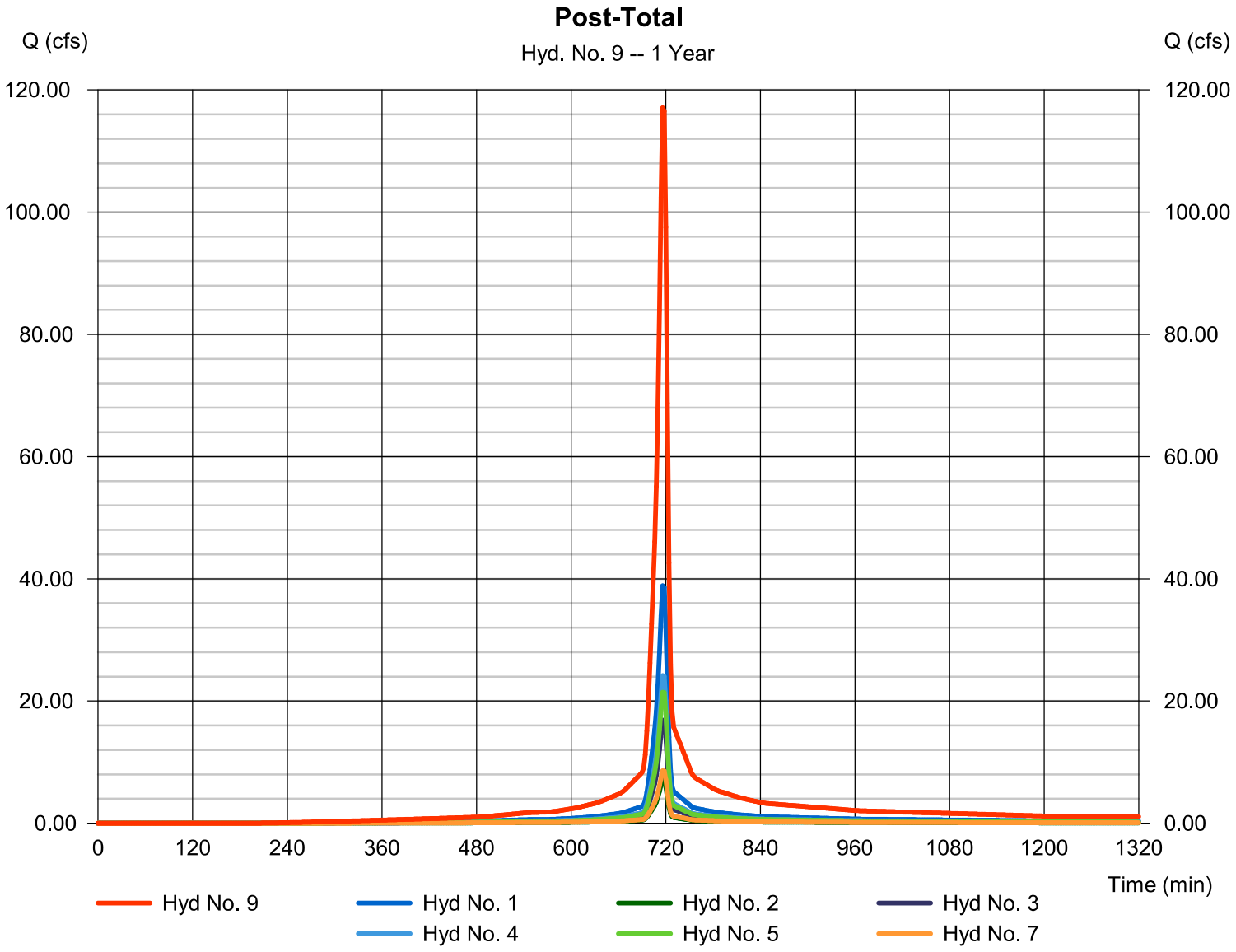
* Composite (Area/CN) = [(0.280 x 98) + (0.090 x 80)] / 0.370



Hyd. No. 9

Post-Total

Hydrograph type	= Combine	Peak discharge	= 117.08 cfs
Storm frequency	= 1 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 266,119 cuft
Inflow hyds.	= 1, 2, 3, 4, 5, 7	Contrib. drain. area	= 34.490 ac



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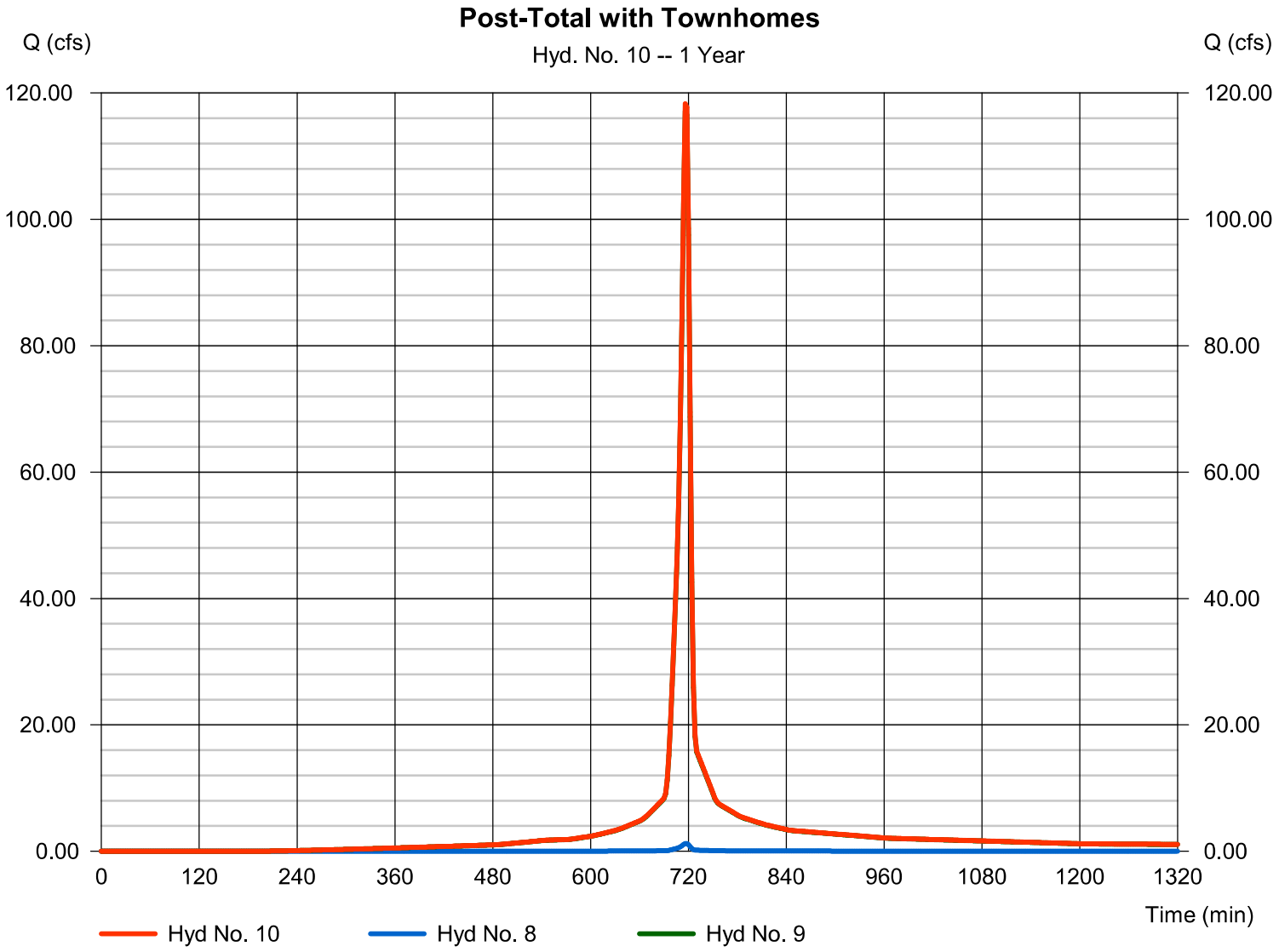
Hyd. No. 10

Post-Total with Townhomes

Hydrograph type	= Combine	Peak discharge	= 118.31 cfs
Storm frequency	= 1 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 268,885 cuft
Inflow hyds.	= 8, 9	Contrib. drain. area	= 0.370 ac



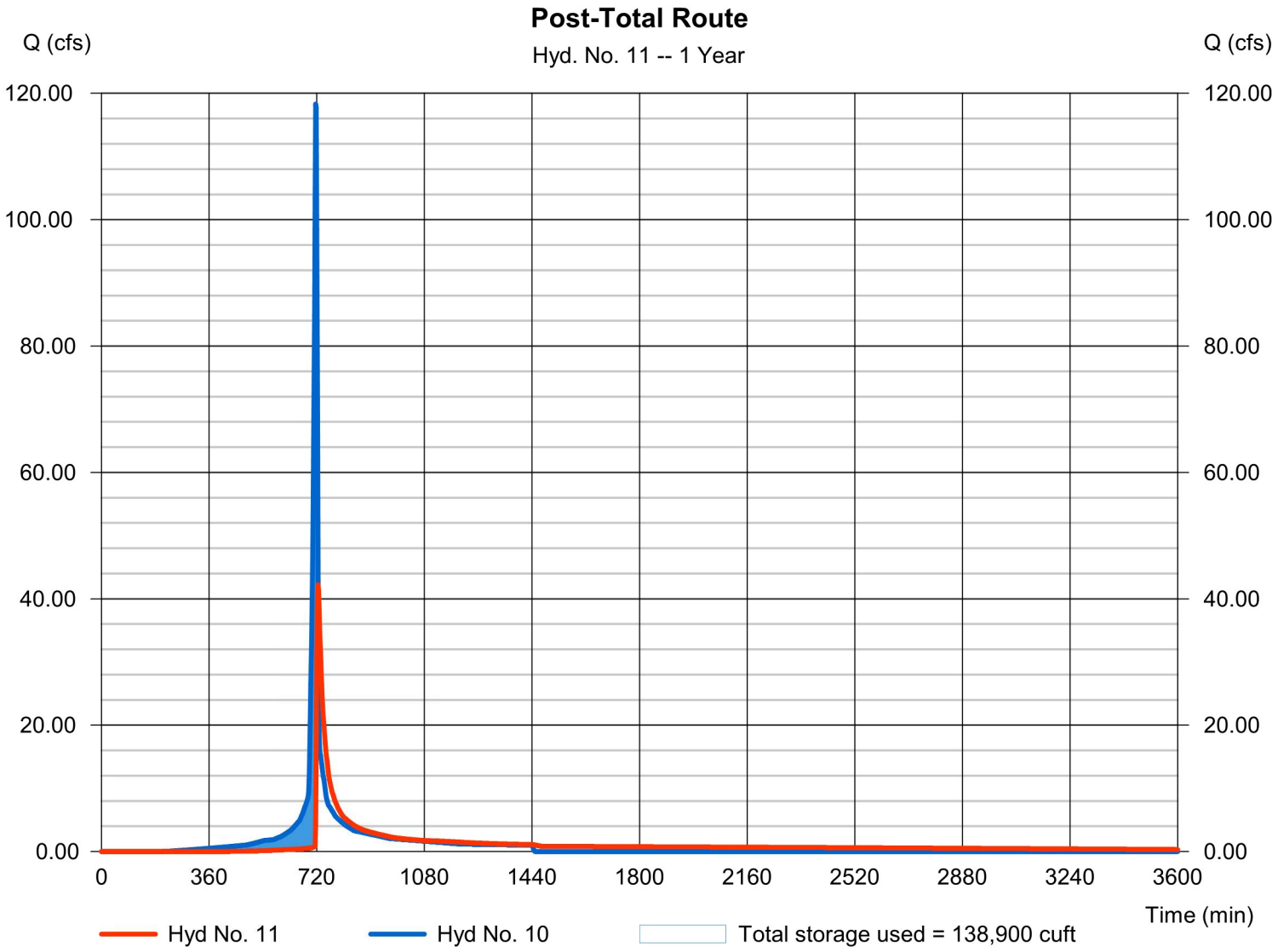
Hydrograph Report

Hyd. No. 11

Post-Total Route

Hydrograph type	= Reservoir	Peak discharge	= 42.22 cfs
Storm frequency	= 1 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 263,336 cuft
Inflow hyd. No.	= 10 - Post-Total with Townhomes	Max. Elevation	= 364.61 ft
Reservoir name	= Wet Pond 1	Max. Storage	= 138,900 cuft

Storage Indication method used.



Pond No. 1 - Wet Pond 1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 362.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	362.00	42,672	0	0
1.00	363.00	55,150	48,773	48,773
2.00	364.00	56,091	55,614	104,387
3.00	365.00	57,040	56,559	160,946
4.00	366.00	57,500	57,264	218,211
5.00	367.00	57,700	57,594	275,805
6.00	368.00	57,900	57,794	333,599
7.00	369.00	58,100	57,994	391,593

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 30.00	5.00	0.00	0.00
Span (in)	= 30.00	5.00	0.00	0.00
No. Barrels	= 2	1	0	0
Invert El. (ft)	= 362.00	362.00	0.00	0.00
Length (ft)	= 124.00	2.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

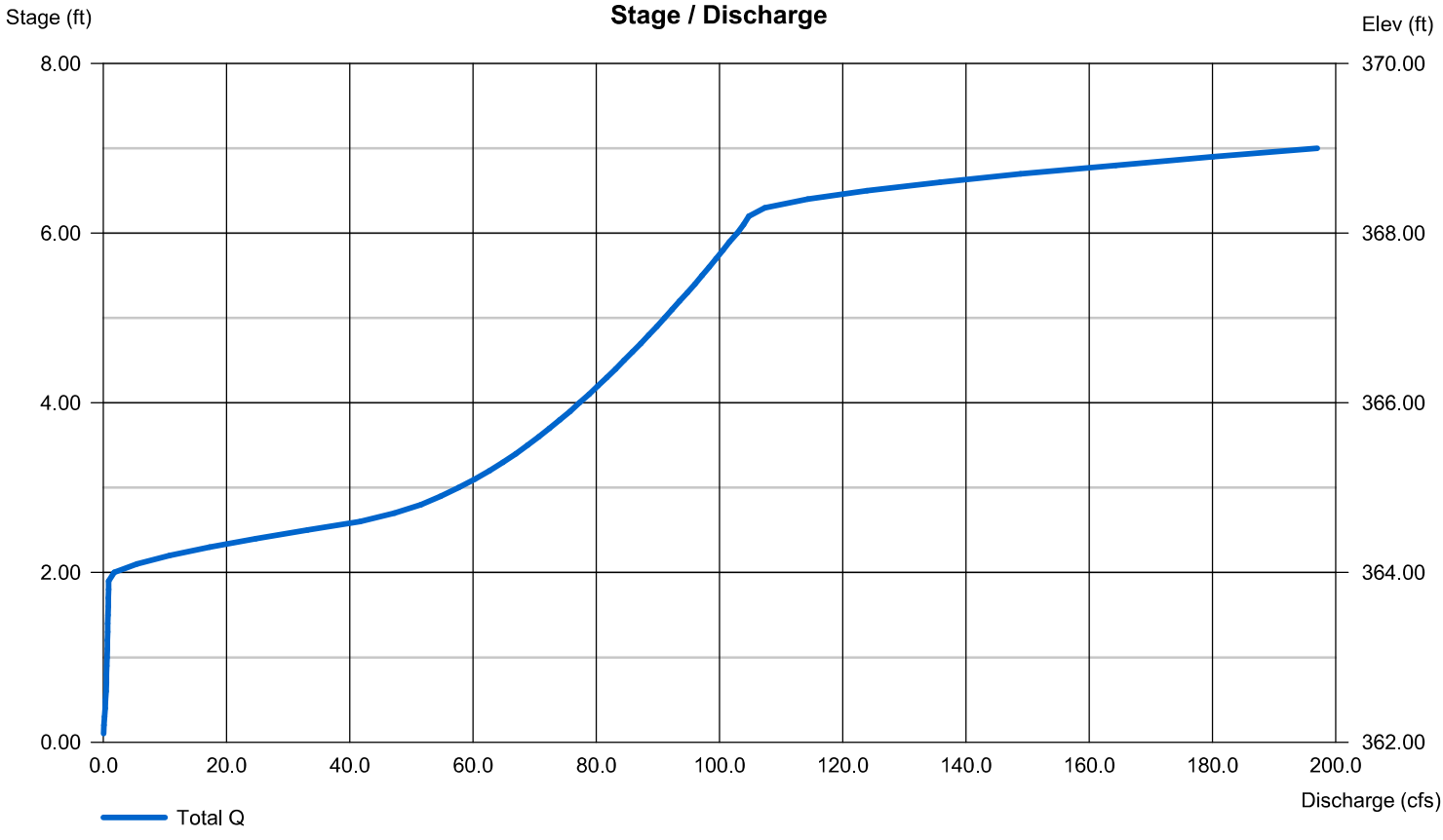
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 35.33	24.00	0.00	50.00
Crest El. (ft)	= 367.00	363.95	0.00	368.25
Weir Coeff.	= 3.33	3.33	3.33	2.60
Weir Type	= 1	Rect	---	Broad
Multi-Stage	= Yes	Yes	No	No

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

TW Elev. (ft) = 0.00

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

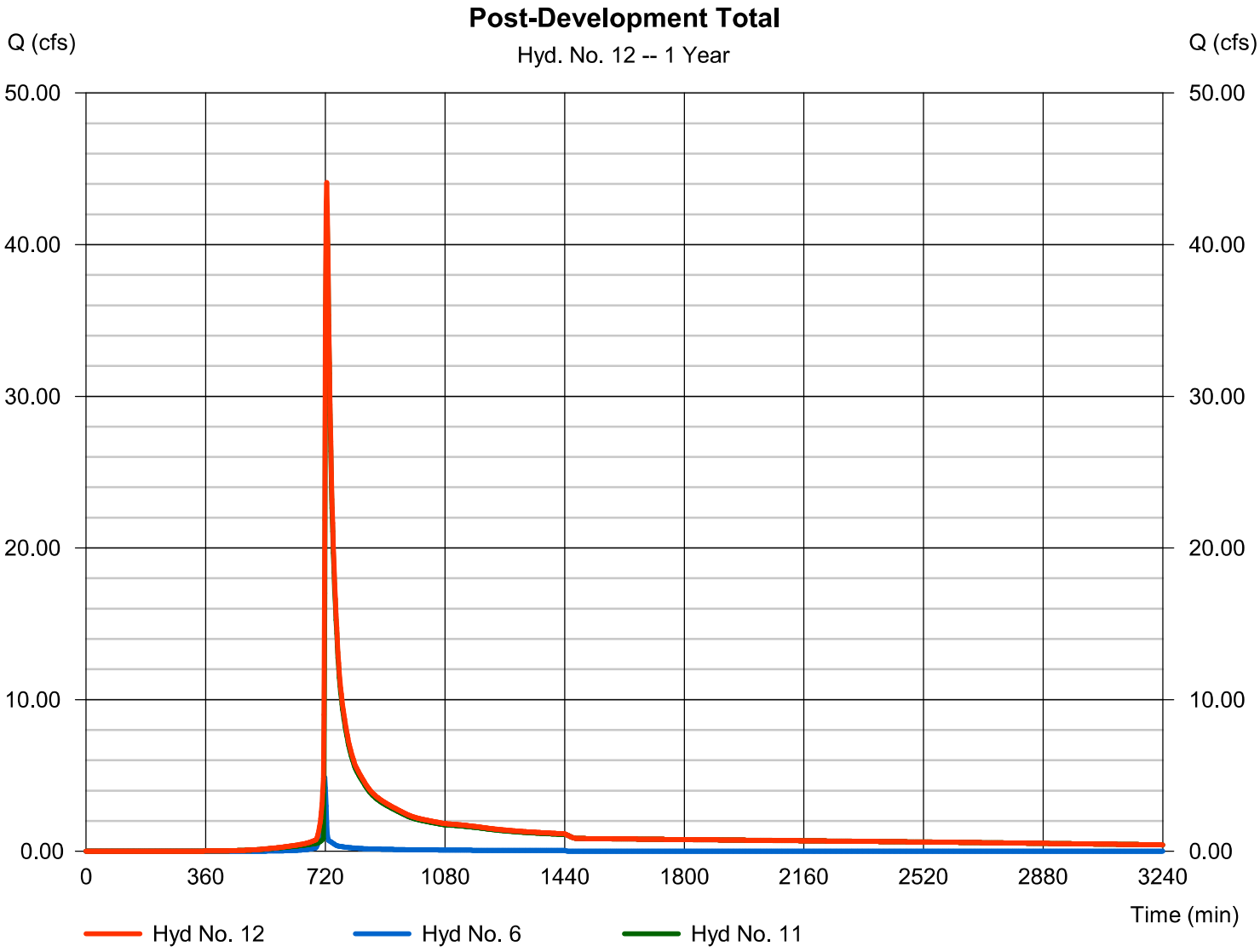


Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Thursday, 09 / 21 / 2023

Hyd. No. 12

Post-Development Total

Hydrograph type	= Combine	Peak discharge	= 44.09 cfs
Storm frequency	= 1 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 273,466 cuft
Inflow hyds.	= 6, 11	Contrib. drain. area	= 2.040 ac



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	SCS Runoff	47.87	2	716	110,704	------	------	------	Post - Wallbrook Lots 1 & 2
2	SCS Runoff	8.816	2	716	20,728	------	------	------	Post - New Roadways (Wallbrook/Va
3	SCS Runoff	20.91	2	716	47,688	------	------	------	Post - Boat Tract (Lot 5)
4	SCS Runoff	29.78	2	716	68,861	------	------	------	Post - Paris Tract (Lots 9, 10, 11)
5	SCS Runoff	26.61	2	716	60,668	------	------	------	Post - DOT Roadway
6	SCS Runoff	6.446	2	718	13,583	------	------	------	Post - Direct Release
7	SCS Runoff	10.59	2	716	24,482	------	------	------	Post - Lots 3 & 4
8	SCS Runoff	1.526	2	716	3,480	------	------	------	Post - Wallbrook Townhomes
9	Combine	144.57	2	716	333,130	1, 2, 3, 4, 5, 7, 8, 9	------	------	Post-Total
10	Combine	146.10	2	716	336,610	------	------	------	Post-Total with Townhomes
11	Reservoir	58.93	2	724	331,017	10	365.05	163,707	Post-Total Route
12	Combine	62.28	2	722	344,601	6, 11	------	------	Post-Development Total

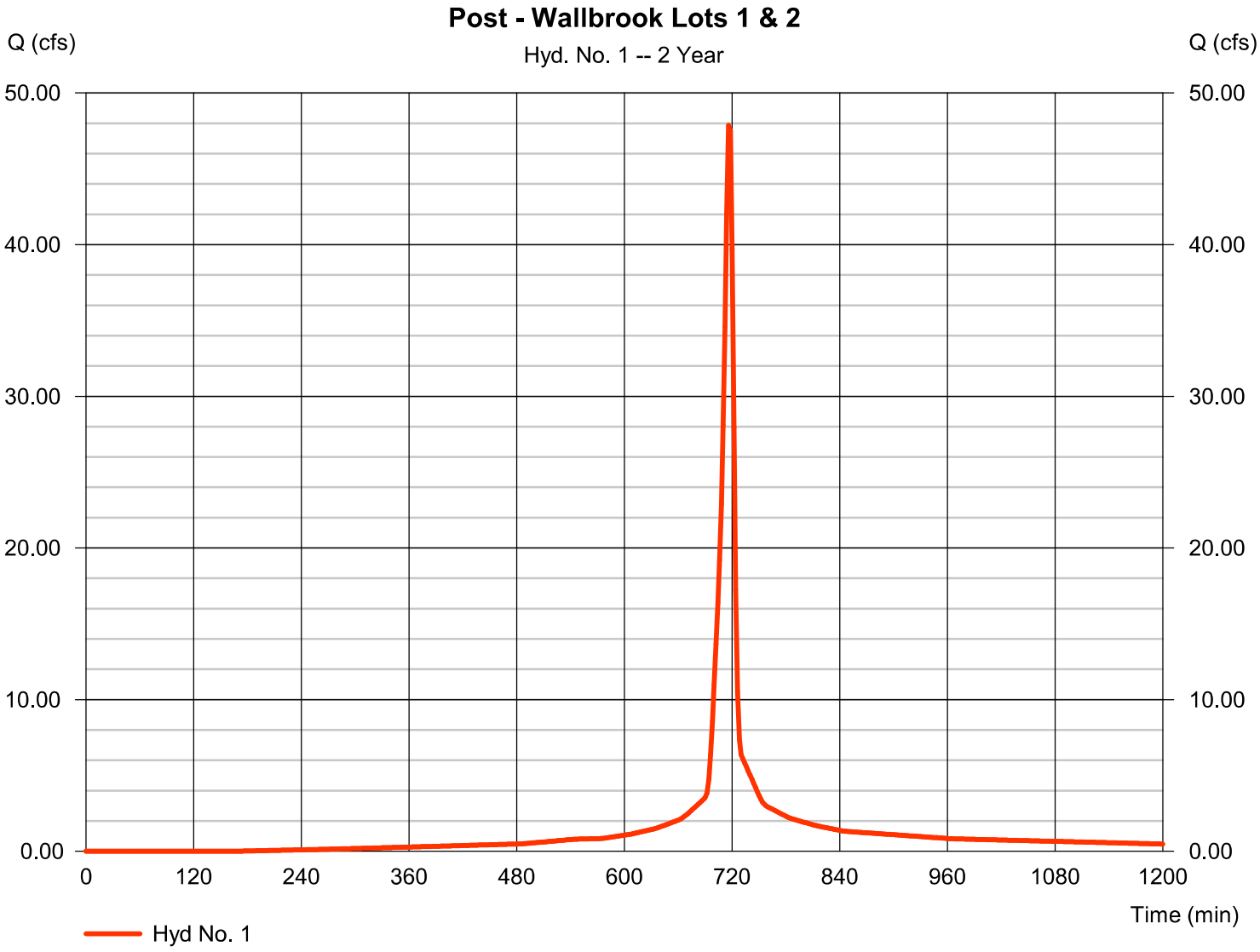
Hydrograph Report

Hyd. No. 1

Post - Wallbrook Lots 1 & 2

Hydrograph type	= SCS Runoff	Peak discharge	= 47.87 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 110,704 cuft
Drainage area	= 11.350 ac	Curve number	= 95*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(1.790 x 98) + (6.260 x 98) + (1.990 x 80) + (0.270 x 98) + (0.890 x 98) + (0.150 x 80)] / 11.350

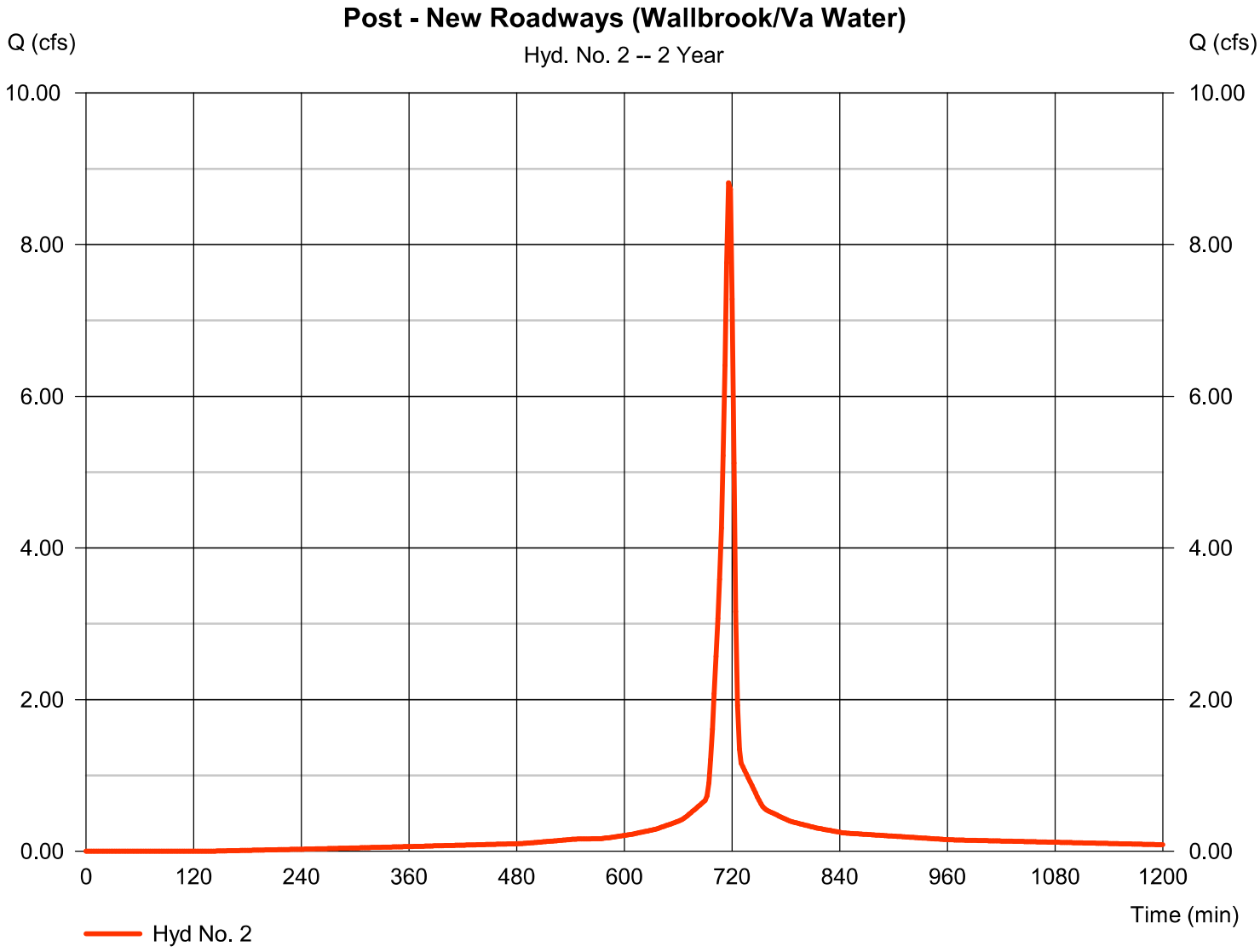


Hyd. No. 2

Post - New Roadways (Wallbrook/Va Water)

Hydrograph type	= SCS Runoff	Peak discharge	= 8.816 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 20,728 cuft
Drainage area	= 2.050 ac	Curve number	= 96*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(1.820 x 98) + (0.230 x 80)] / 2.050



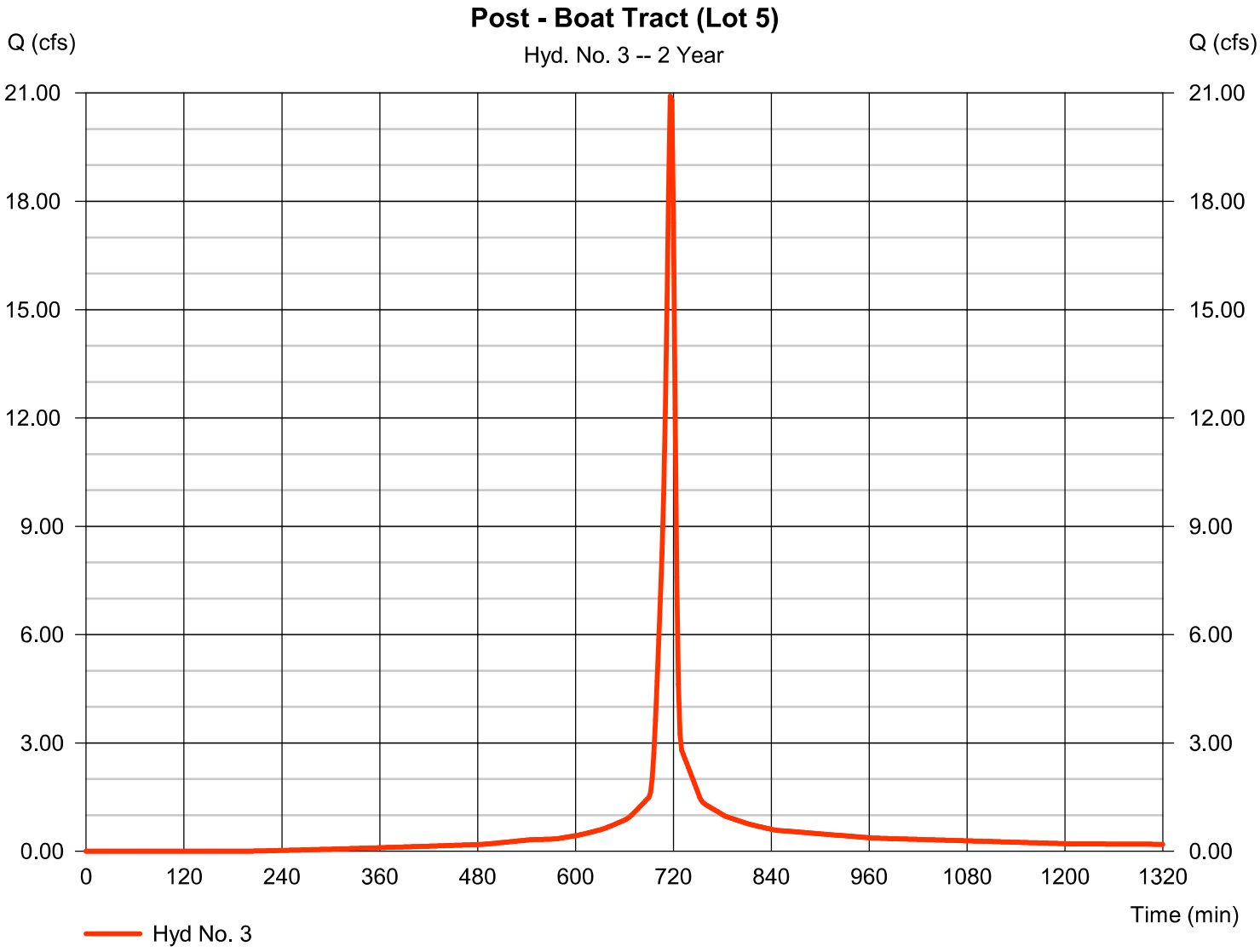
Hydrograph Report

Hyd. No. 3

Post - Boat Tract (Lot 5)

Hydrograph type	= SCS Runoff	Peak discharge	= 20.91 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 47,688 cuft
Drainage area	= 5.070 ac	Curve number	= 94*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(0.860 x 98) + (3.450 x 98) + (0.760 x 74)] / 5.070

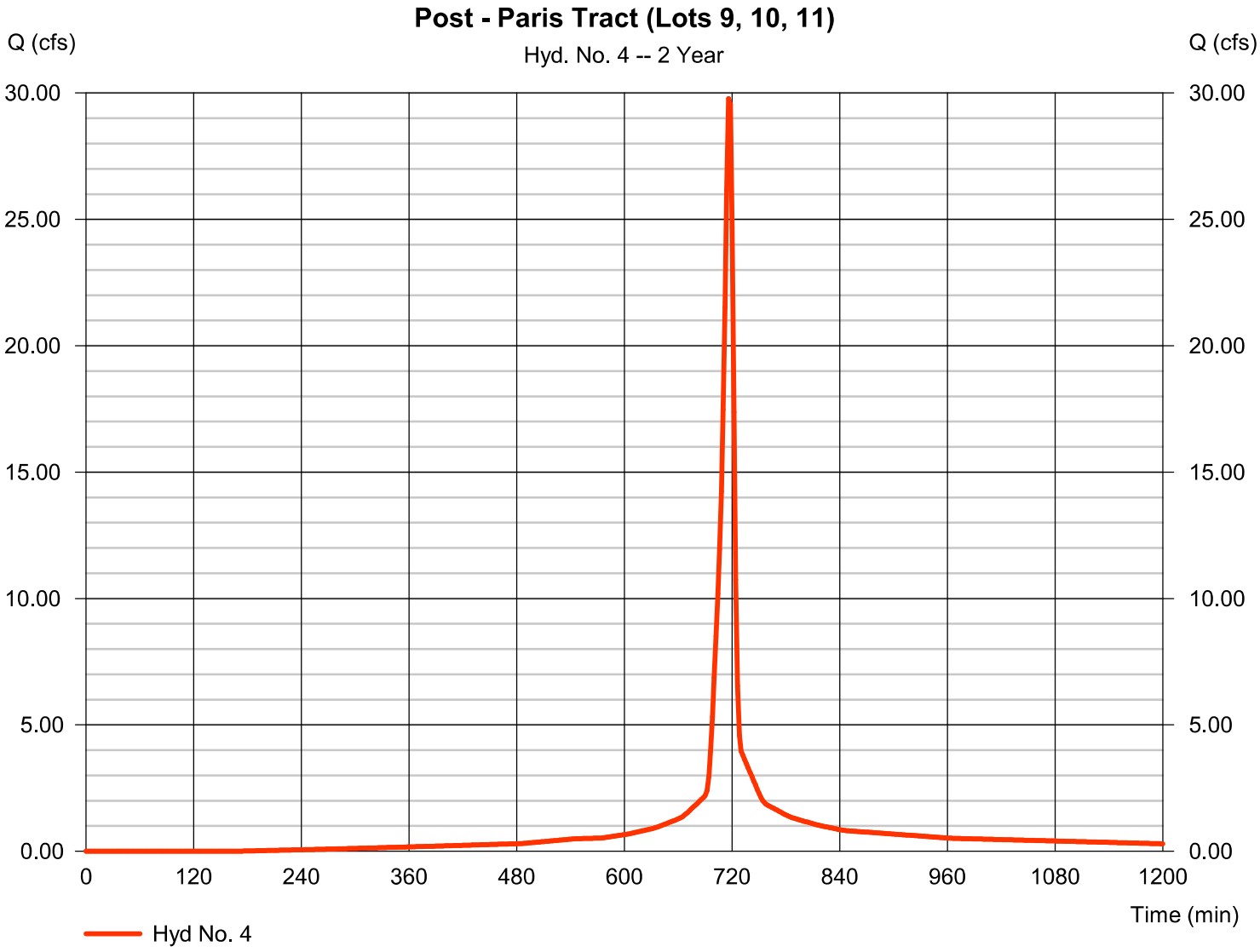


Hyd. No. 4

Post - Paris Tract (Lots 9, 10, 11)

Hydrograph type	= SCS Runoff	Peak discharge	= 29.78 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 68,861 cuft
Drainage area	= 7.060 ac	Curve number	= 95*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(1.200 x 98) + (4.800 x 98) + (1.060 x 80)] / 7.060

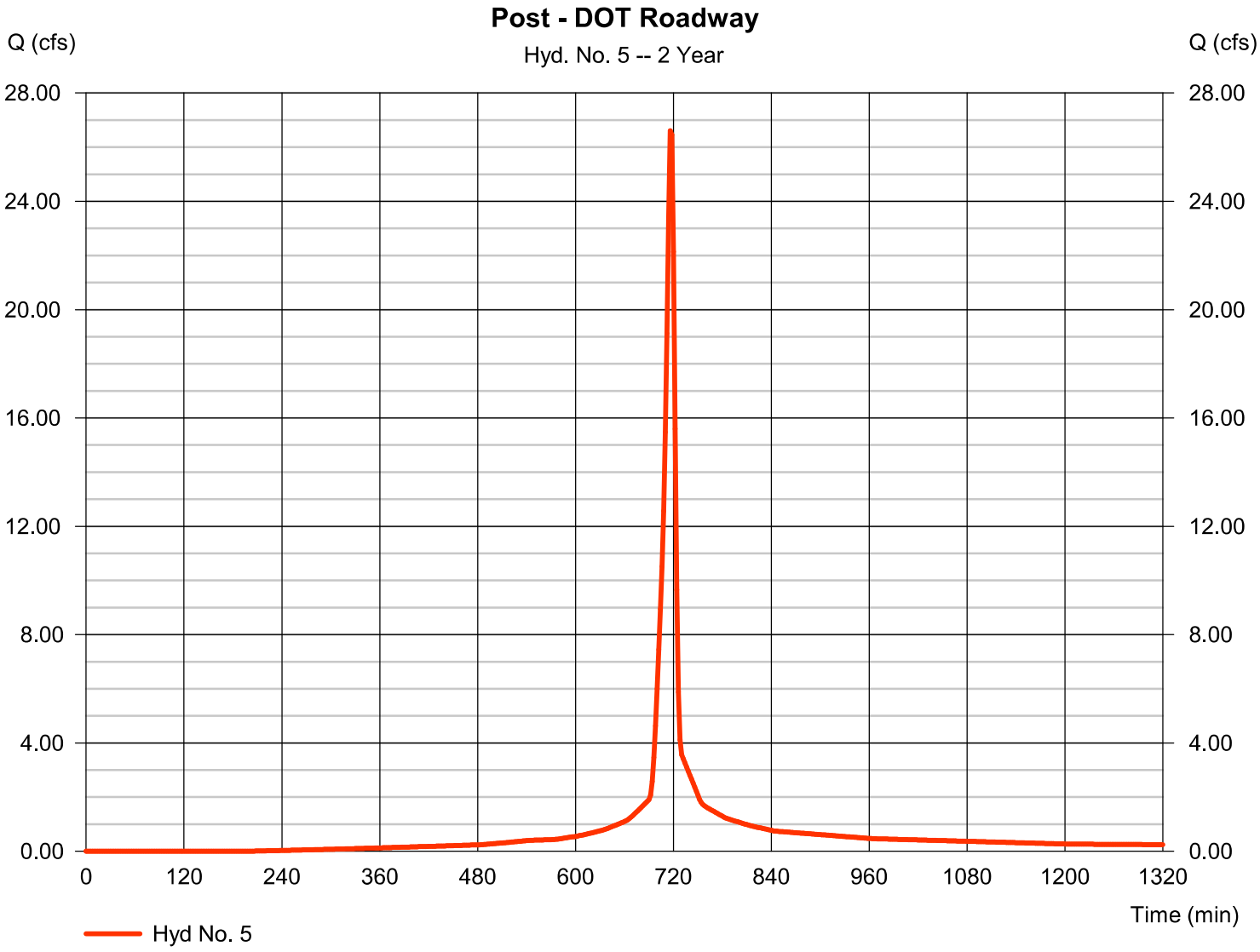


Hyd. No. 5

Post - DOT Roadway

Hydrograph type	= SCS Runoff	Peak discharge	= 26.61 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 60,668 cuft
Drainage area	= 6.450 ac	Curve number	= 94*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(4.960 x 98) + (1.490 x 80)] / 6.450



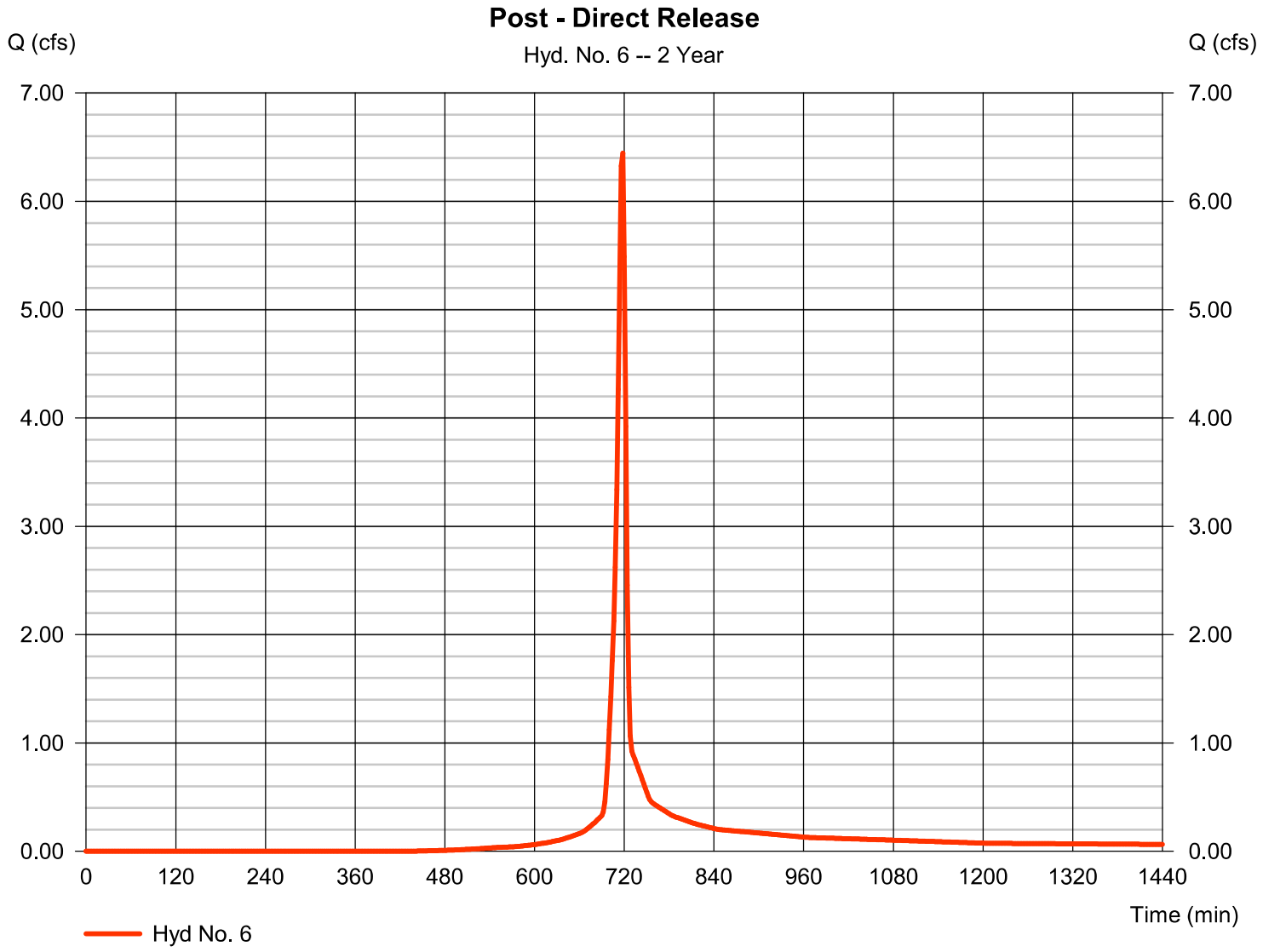
Hydrograph Report

Hyd. No. 6

Post - Direct Release

Hydrograph type	= SCS Runoff	Peak discharge	= 6.446 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 13,583 cuft
Drainage area	= 2.040 ac	Curve number	= 85*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(1.480 x 80) + (0.560 x 98)] / 2.040



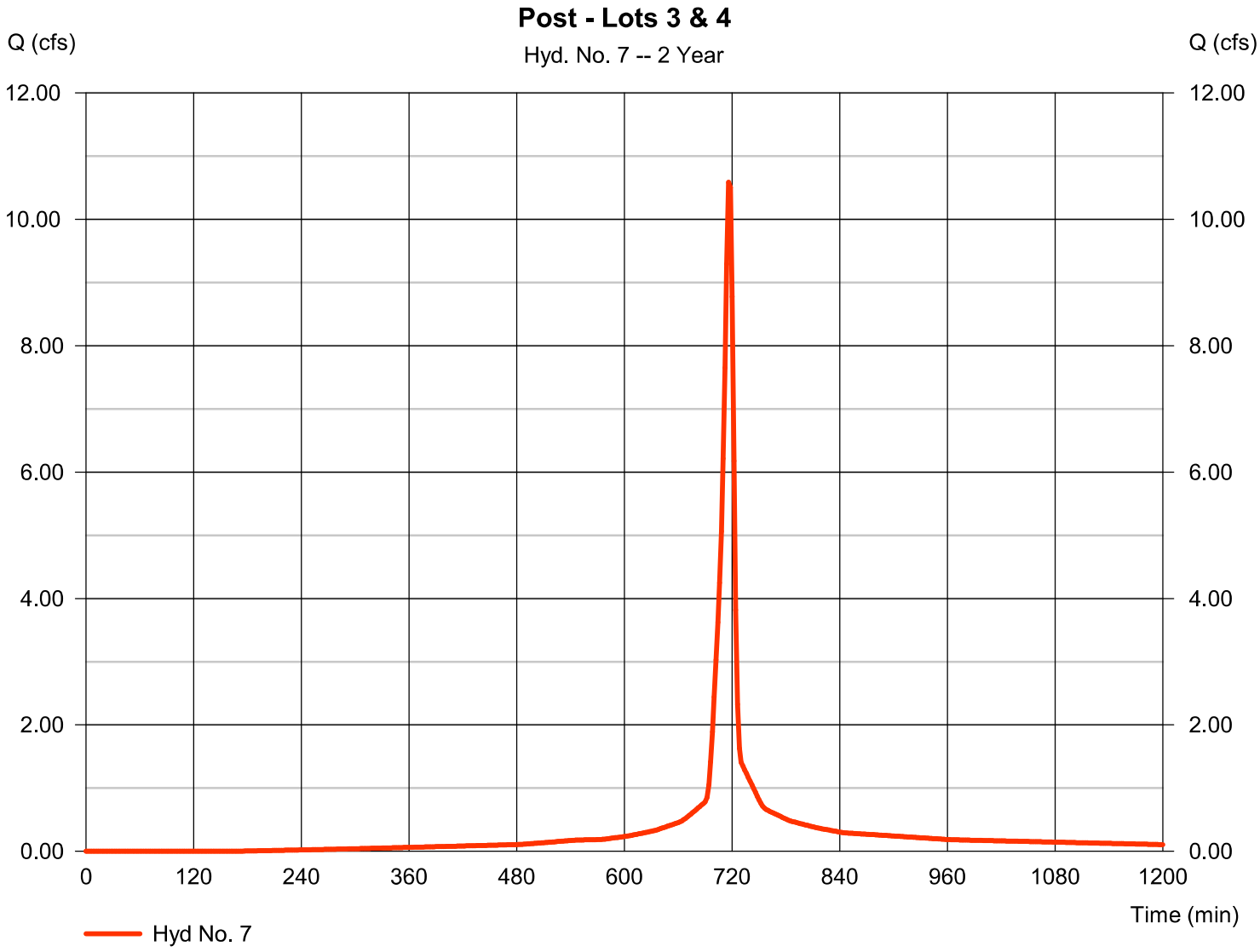
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Thursday, 09 / 21 / 2023

Hyd. No. 7

Post - Lots 3 & 4

Hydrograph type	= SCS Runoff	Peak discharge	= 10.59 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 24,482 cuft
Drainage area	= 2.510 ac	Curve number	= 95*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(0.320 x 98) + (1.810 x 98) + (0.380 x 80)] / 2.510



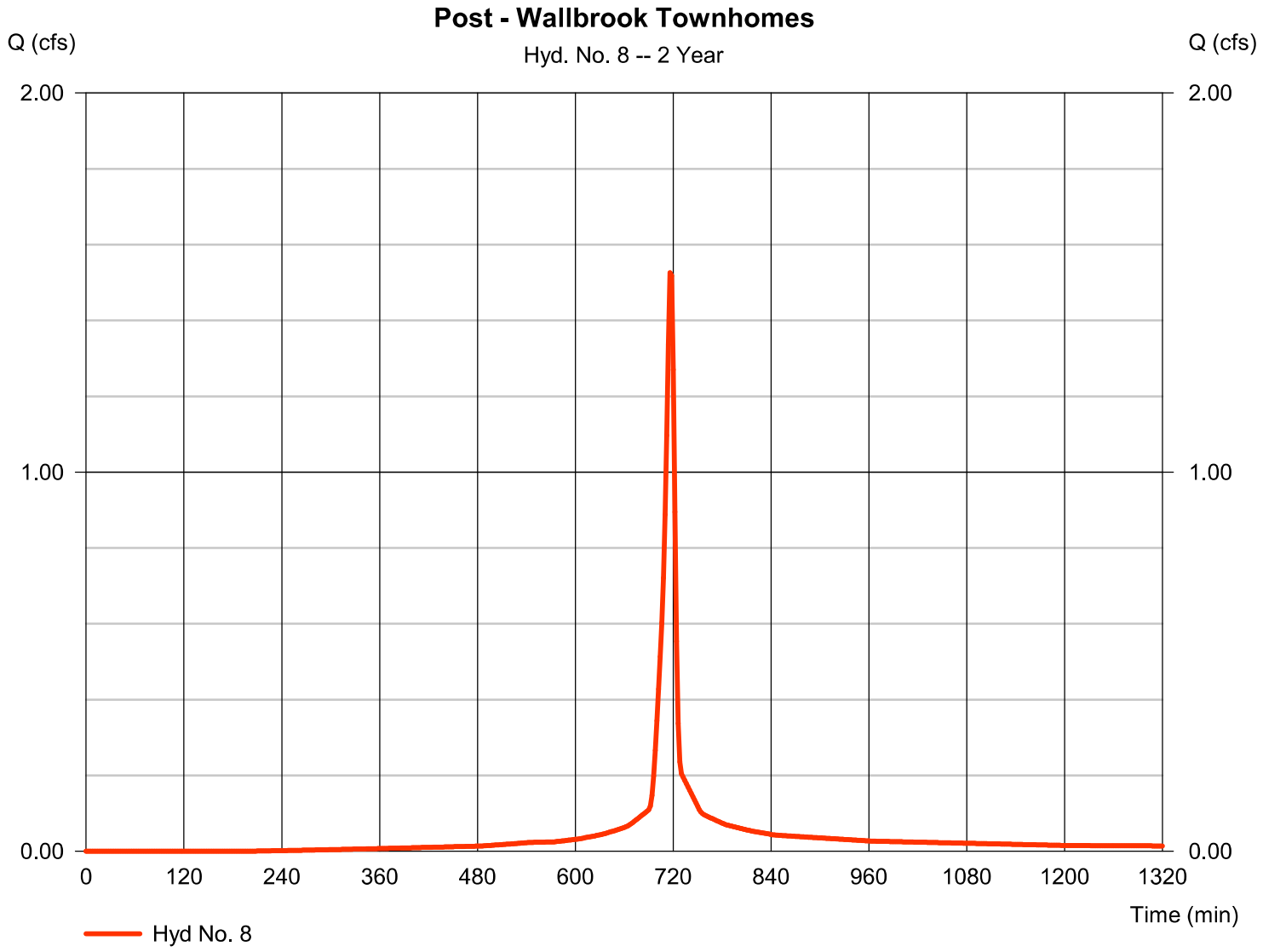
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Thursday, 09 / 21 / 2023

Hyd. No. 8

Post - Wallbrook Townhomes

Hydrograph type	= SCS Runoff	Peak discharge	= 1.526 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 3,480 cuft
Drainage area	= 0.370 ac	Curve number	= 94*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

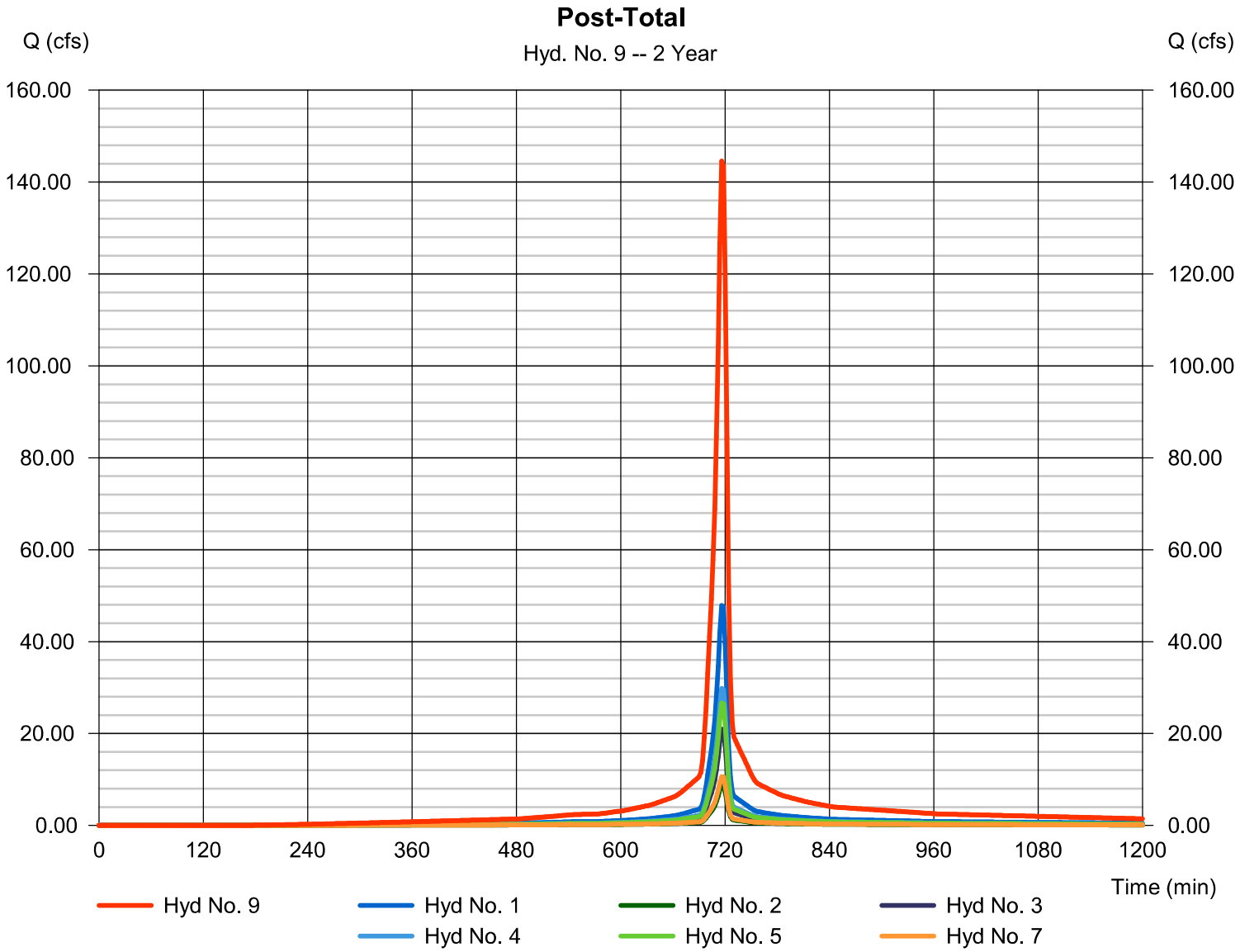
* Composite (Area/CN) = [(0.280 x 98) + (0.090 x 80)] / 0.370



Hyd. No. 9

Post-Total

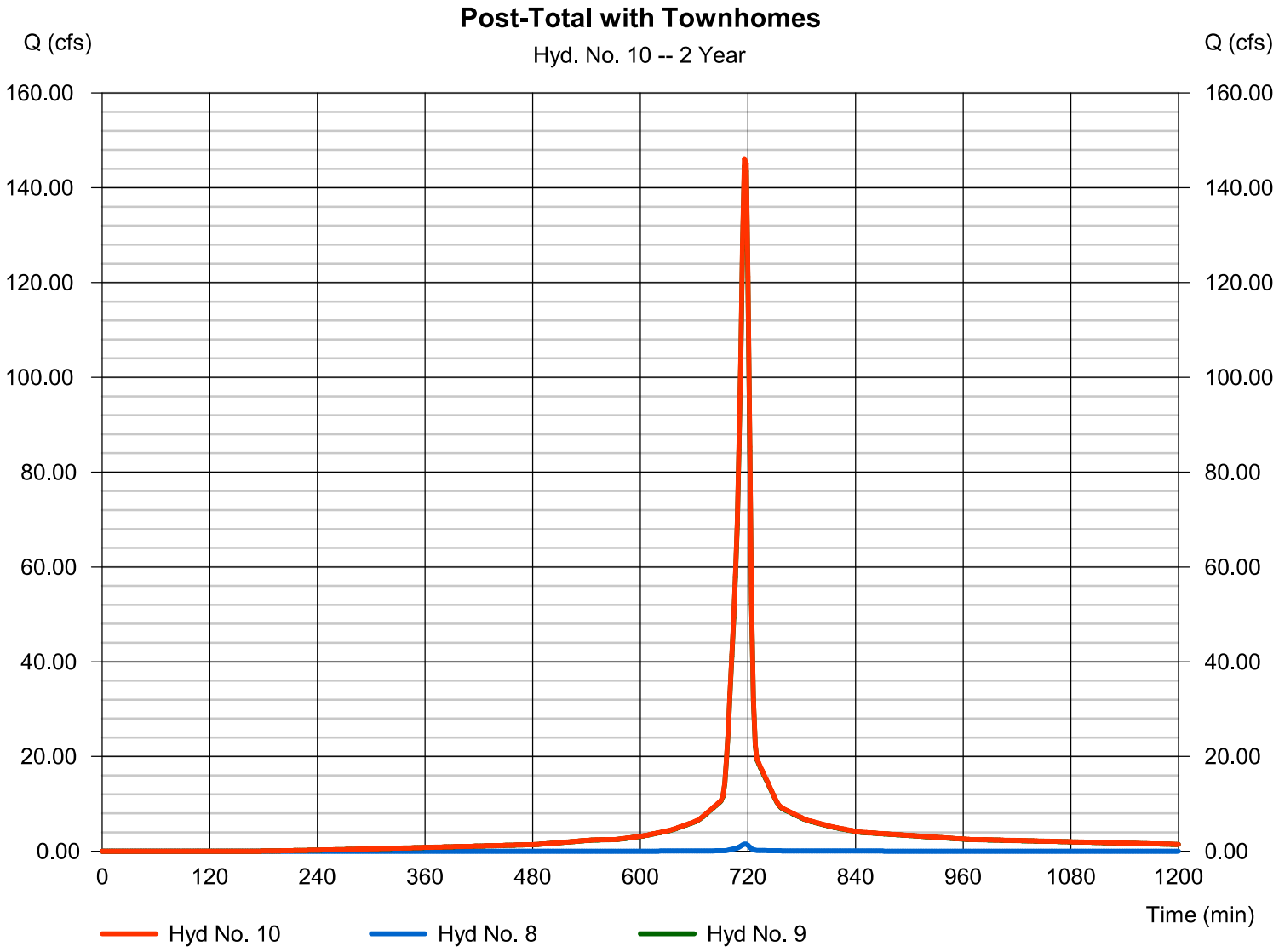
Hydrograph type	=	Combine	Peak discharge	=	144.57 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	333,130 cuft
Inflow hyds.	=	1, 2, 3, 4, 5, 7	Contrib. drain. area	=	34.490 ac



Hyd. No. 10

Post-Total with Townhomes

Hydrograph type	=	Combine	Peak discharge	=	146.10 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	336,610 cuft
Inflow hyds.	=	8, 9	Contrib. drain. area	=	0.370 ac

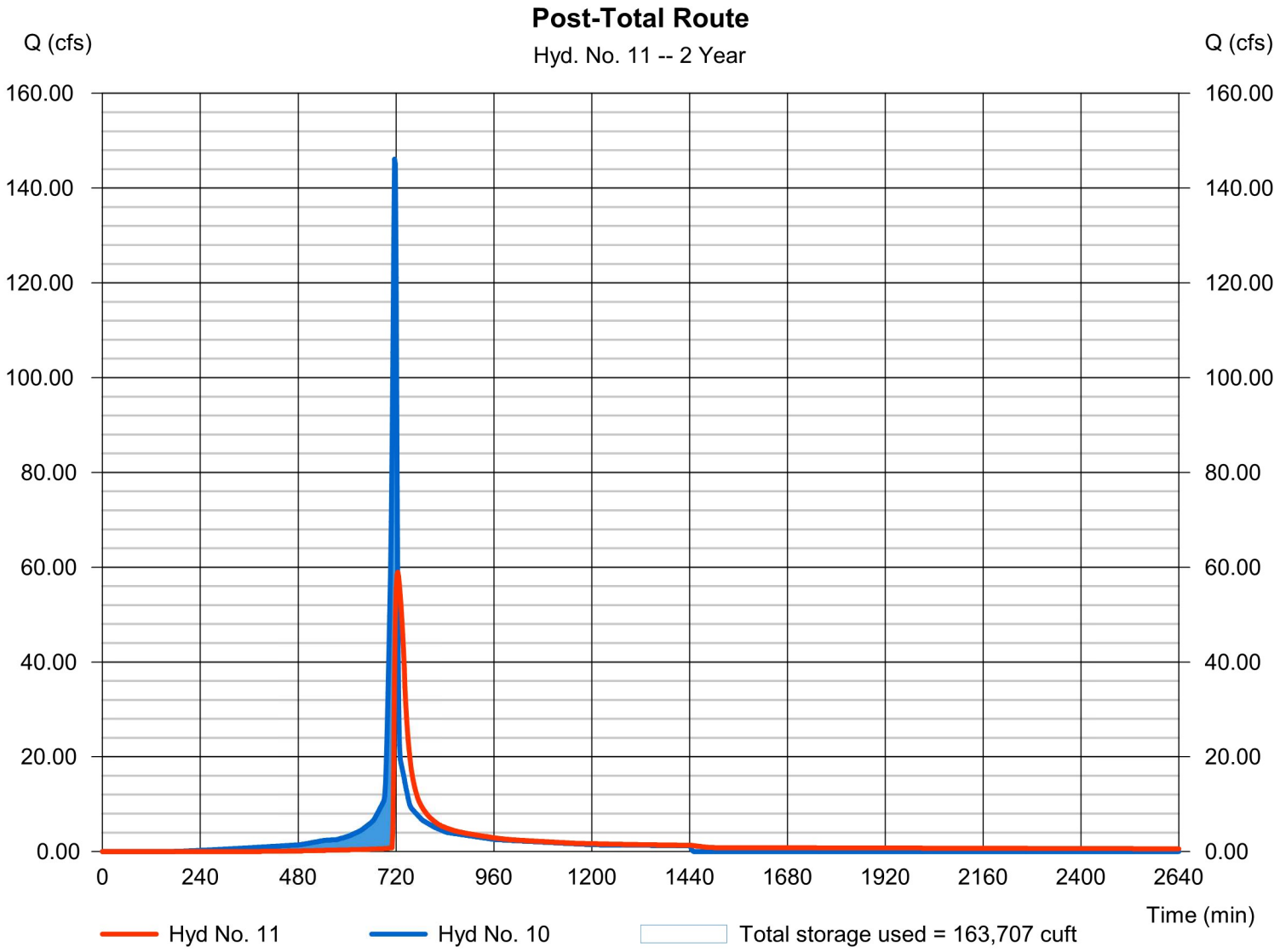


Hyd. No. 11

Post-Total Route

Hydrograph type	= Reservoir	Peak discharge	= 58.93 cfs
Storm frequency	= 2 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 331,017 cuft
Inflow hyd. No.	= 10 - Post-Total with Townhomes	Max. Elevation	= 365.05 ft
Reservoir name	= Wet Pond 1	Max. Storage	= 163,707 cuft

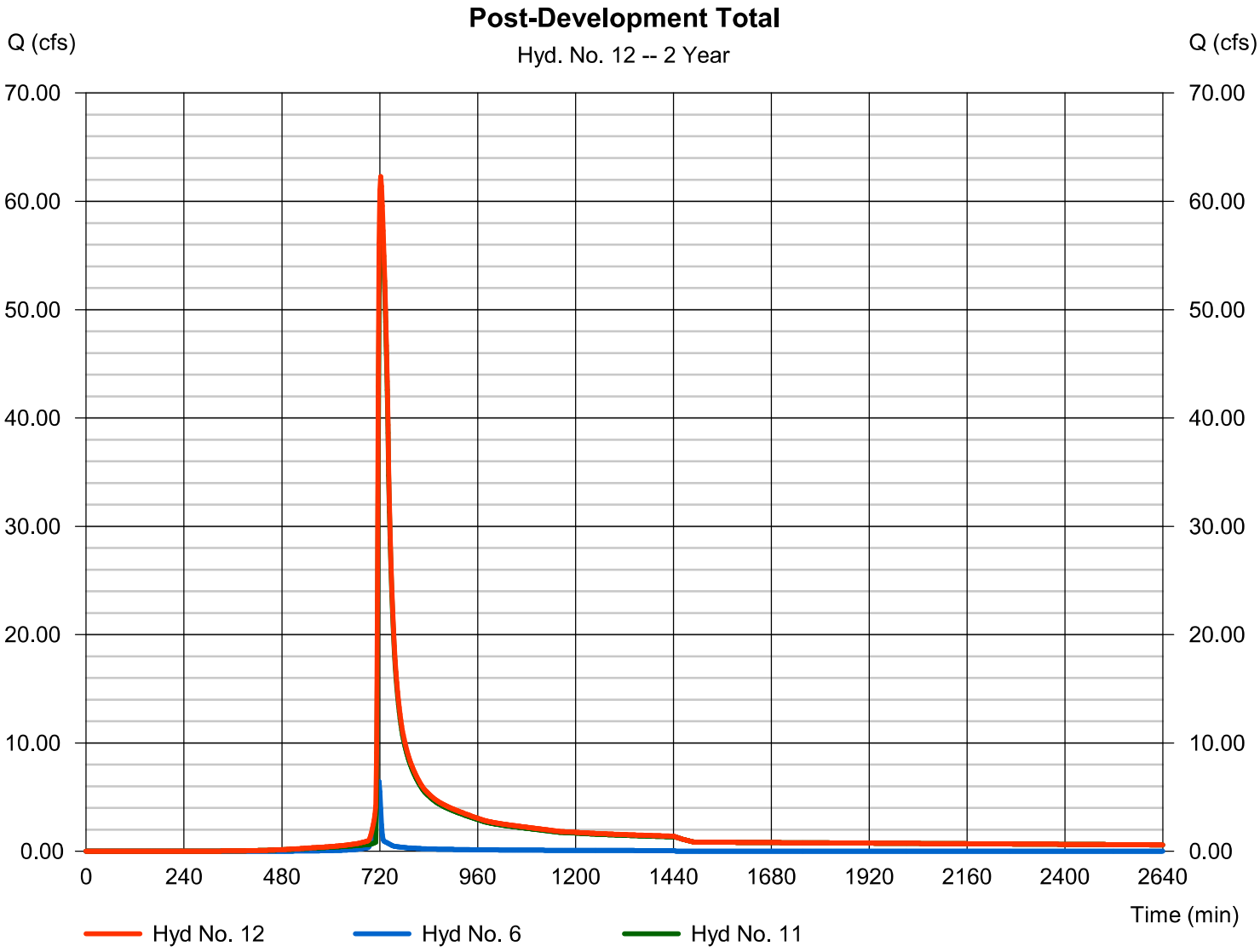
Storage Indication method used.



Hyd. No. 12

Post-Development Total

Hydrograph type	= Combine	Peak discharge	= 62.28 cfs
Storm frequency	= 2 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 344,601 cuft
Inflow hyds.	= 6, 11	Contrib. drain. area	= 2.040 ac



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	SCS Runoff	71.49	2	716	169,675	------	------	------	Post - Wallbrook Lots 1 & 2
2	SCS Runoff	13.05	2	716	31,428	------	------	------	Post - New Roadways (Wallbrook/Va
3	SCS Runoff	31.54	2	716	73,884	------	------	------	Post - Boat Tract (Lot 5)
4	SCS Runoff	44.47	2	716	105,542	------	------	------	Post - Paris Tract (Lots 9, 10, 11)
5	SCS Runoff	40.13	2	716	93,994	------	------	------	Post - DOT Roadway
6	SCS Runoff	10.73	2	718	23,253	------	------	------	Post - Direct Release
7	SCS Runoff	15.81	2	716	37,523	------	------	------	Post - Lots 3 & 4
8	SCS Runoff	2.302	2	716	5,392	------	------	------	Post - Wallbrook Townhomes
9	Combine	216.49	2	716	512,045	1, 2, 3, 4, 5, 7,	------	------	Post-Total
10	Combine	218.80	2	716	517,438	8, 9	------	------	Post-Total with Townhomes
11	Reservoir	80.89	2	724	511,776	10	366.24	232,240	Post-Total Route
12	Combine	86.96	2	720	535,029	6, 11	------	------	Post-Development Total

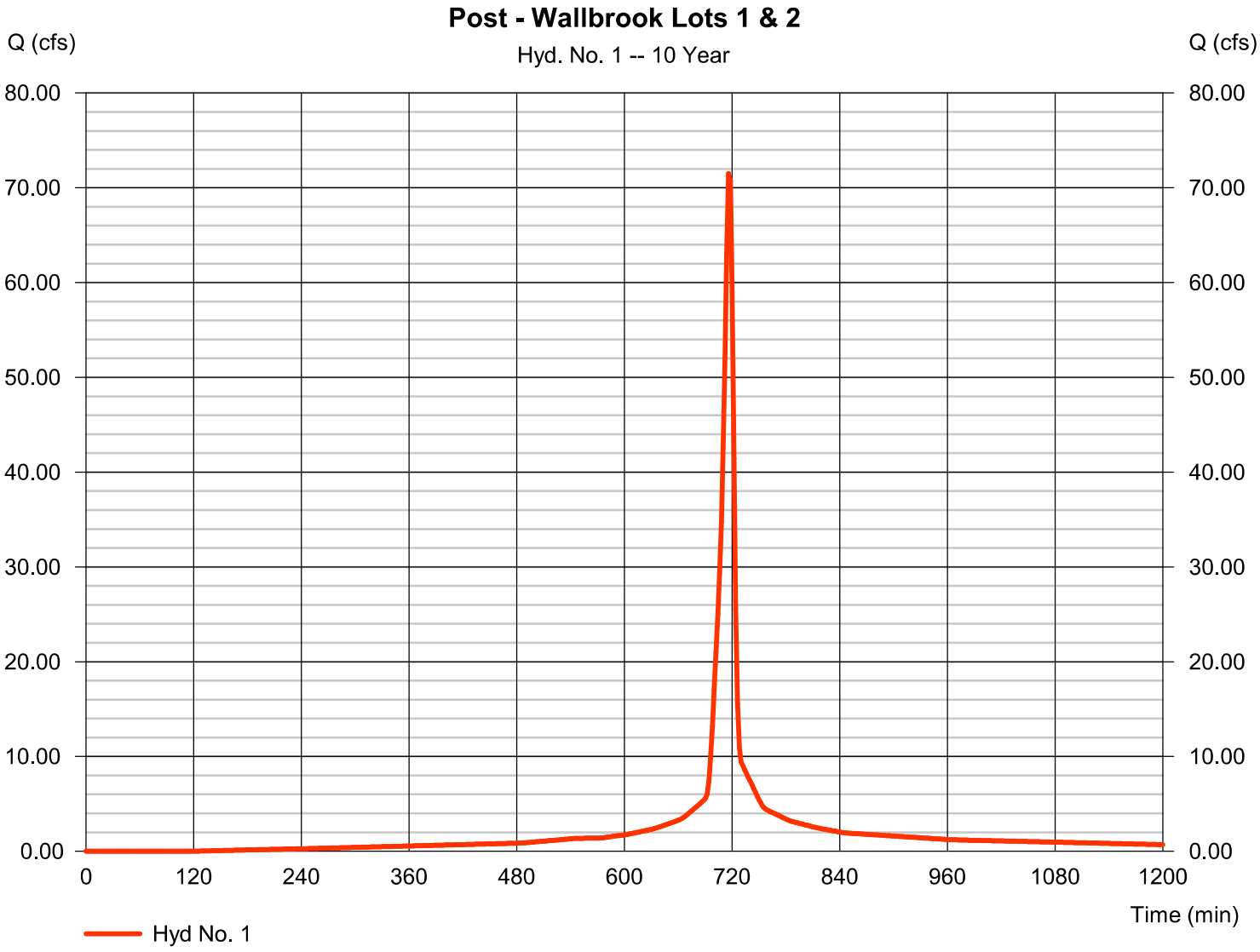
Hydrograph Report

Hyd. No. 1

Post - Wallbrook Lots 1 & 2

Hydrograph type	=	SCS Runoff	Peak discharge	=	71.49 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	169,675 cuft
Drainage area	=	11.350 ac	Curve number	=	95*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	5.01 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	400

* Composite (Area/CN) = [(1.790 x 98) + (6.260 x 98) + (1.990 x 80) + (0.270 x 98) + (0.890 x 98) + (0.150 x 80)] / 11.350



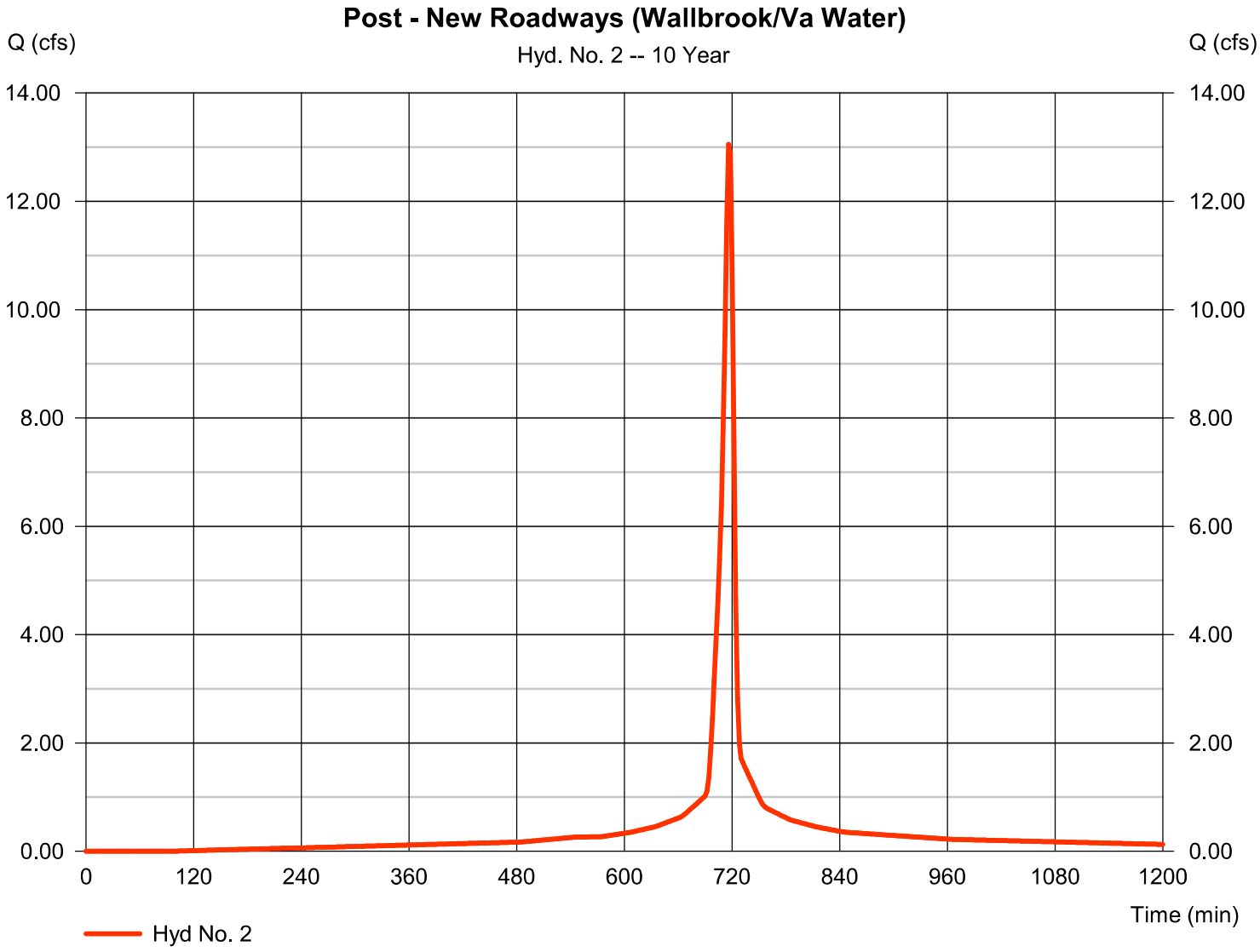
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Thursday, 09 / 21 / 2023

Hyd. No. 2

Post - New Roadways (Wallbrook/Va Water)

Hydrograph type	= SCS Runoff	Peak discharge	= 13.05 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 31,428 cuft
Drainage area	= 2.050 ac	Curve number	= 96*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.01 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(1.820 x 98) + (0.230 x 80)] / 2.050

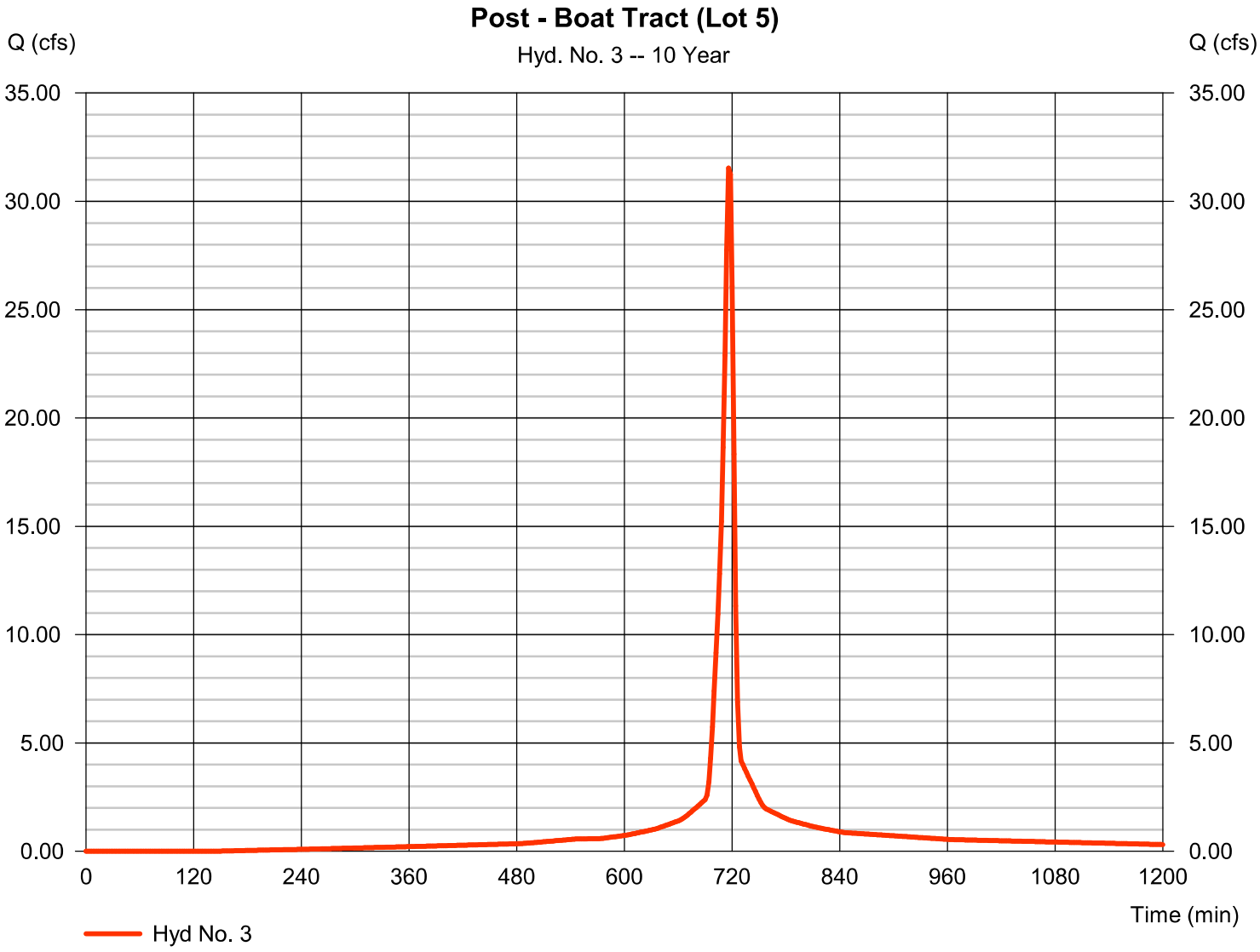


Hyd. No. 3

Post - Boat Tract (Lot 5)

Hydrograph type	= SCS Runoff	Peak discharge	= 31.54 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 73,884 cuft
Drainage area	= 5.070 ac	Curve number	= 94*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.01 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(0.860 x 98) + (3.450 x 98) + (0.760 x 74)] / 5.070



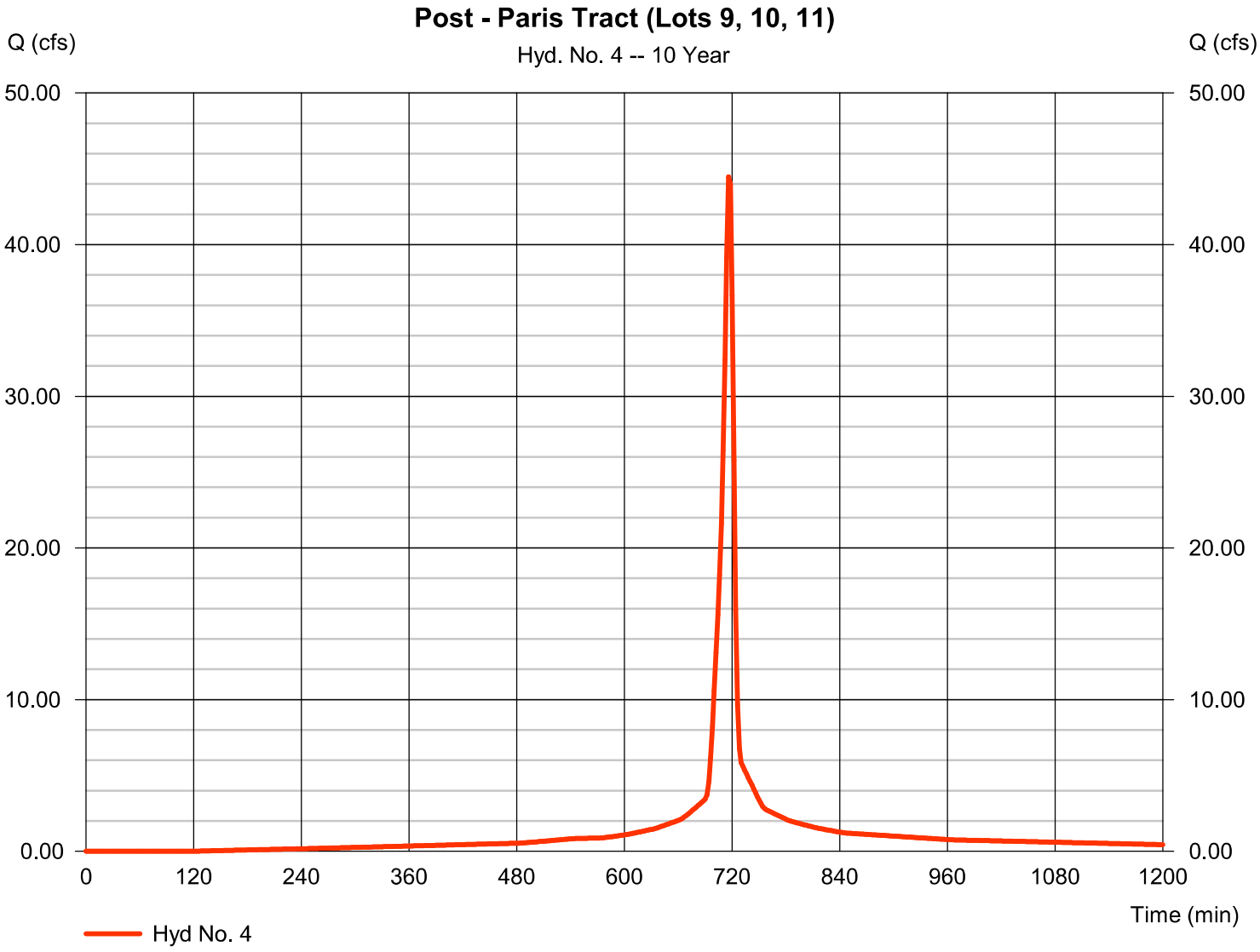
Hydrograph Report

Hyd. No. 4

Post - Paris Tract (Lots 9, 10, 11)

Hydrograph type	= SCS Runoff	Peak discharge	= 44.47 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 105,542 cuft
Drainage area	= 7.060 ac	Curve number	= 95*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.01 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(1.200 x 98) + (4.800 x 98) + (1.060 x 80)] / 7.060

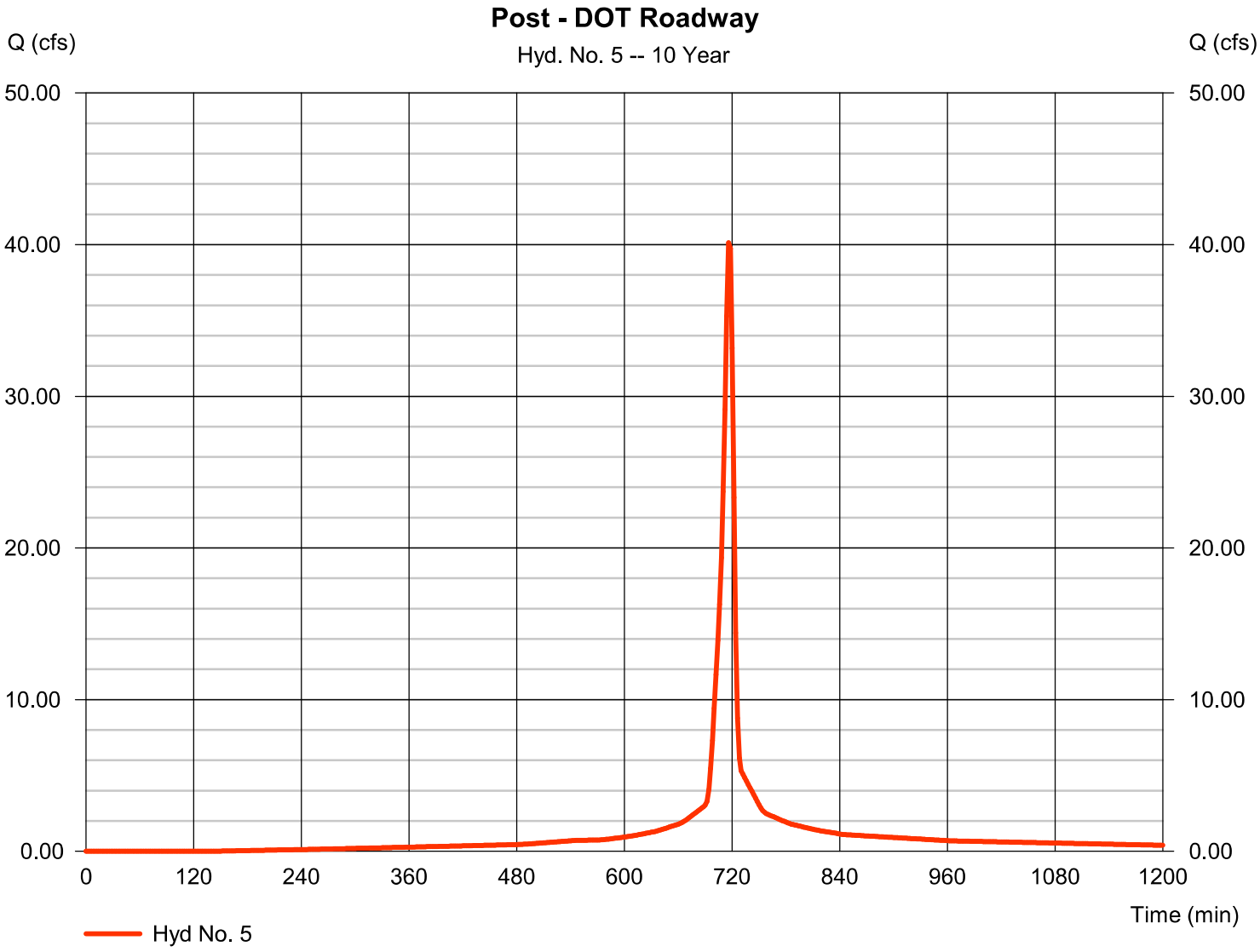


Hyd. No. 5

Post - DOT Roadway

Hydrograph type	= SCS Runoff	Peak discharge	= 40.13 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 93,994 cuft
Drainage area	= 6.450 ac	Curve number	= 94*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.01 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(4.960 x 98) + (1.490 x 80)] / 6.450



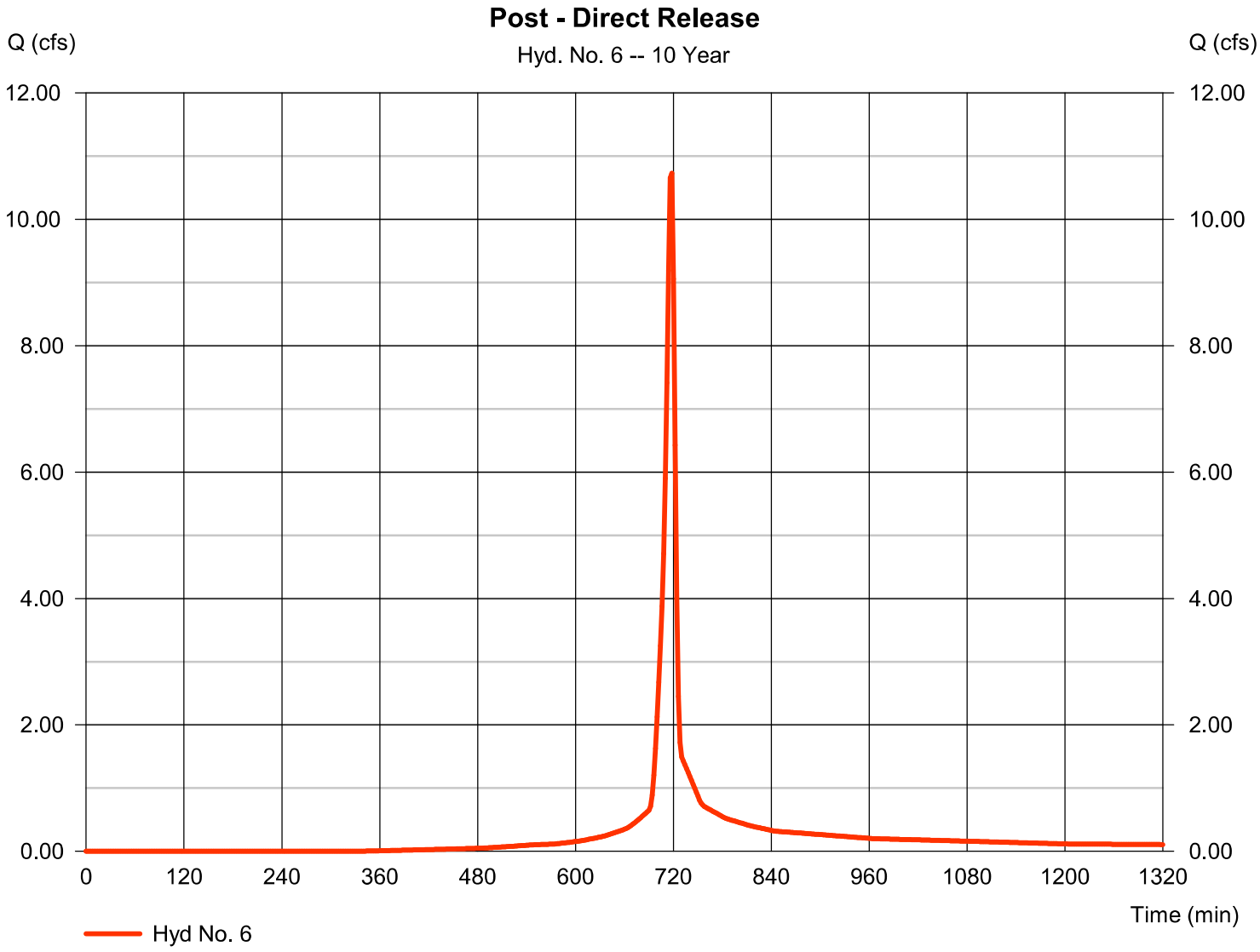
Hydrograph Report

Hyd. No. 6

Post - Direct Release

Hydrograph type	= SCS Runoff	Peak discharge	= 10.73 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 23,253 cuft
Drainage area	= 2.040 ac	Curve number	= 85*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.01 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(1.480 x 80) + (0.560 x 98)] / 2.040

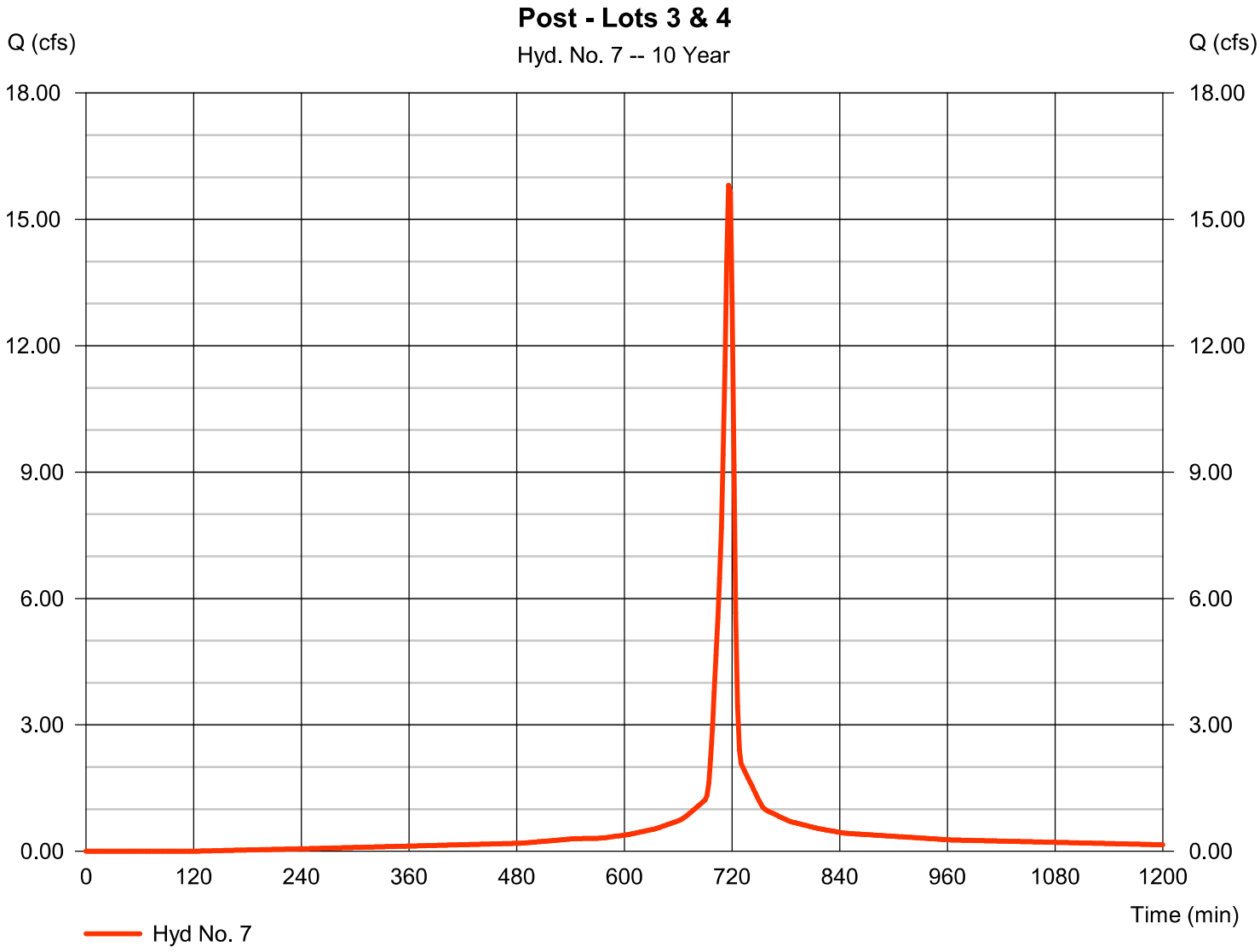


Hyd. No. 7

Post - Lots 3 & 4

Hydrograph type	= SCS Runoff	Peak discharge	= 15.81 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 37,523 cuft
Drainage area	= 2.510 ac	Curve number	= 95*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.01 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(0.320 x 98) + (1.810 x 98) + (0.380 x 80)] / 2.510



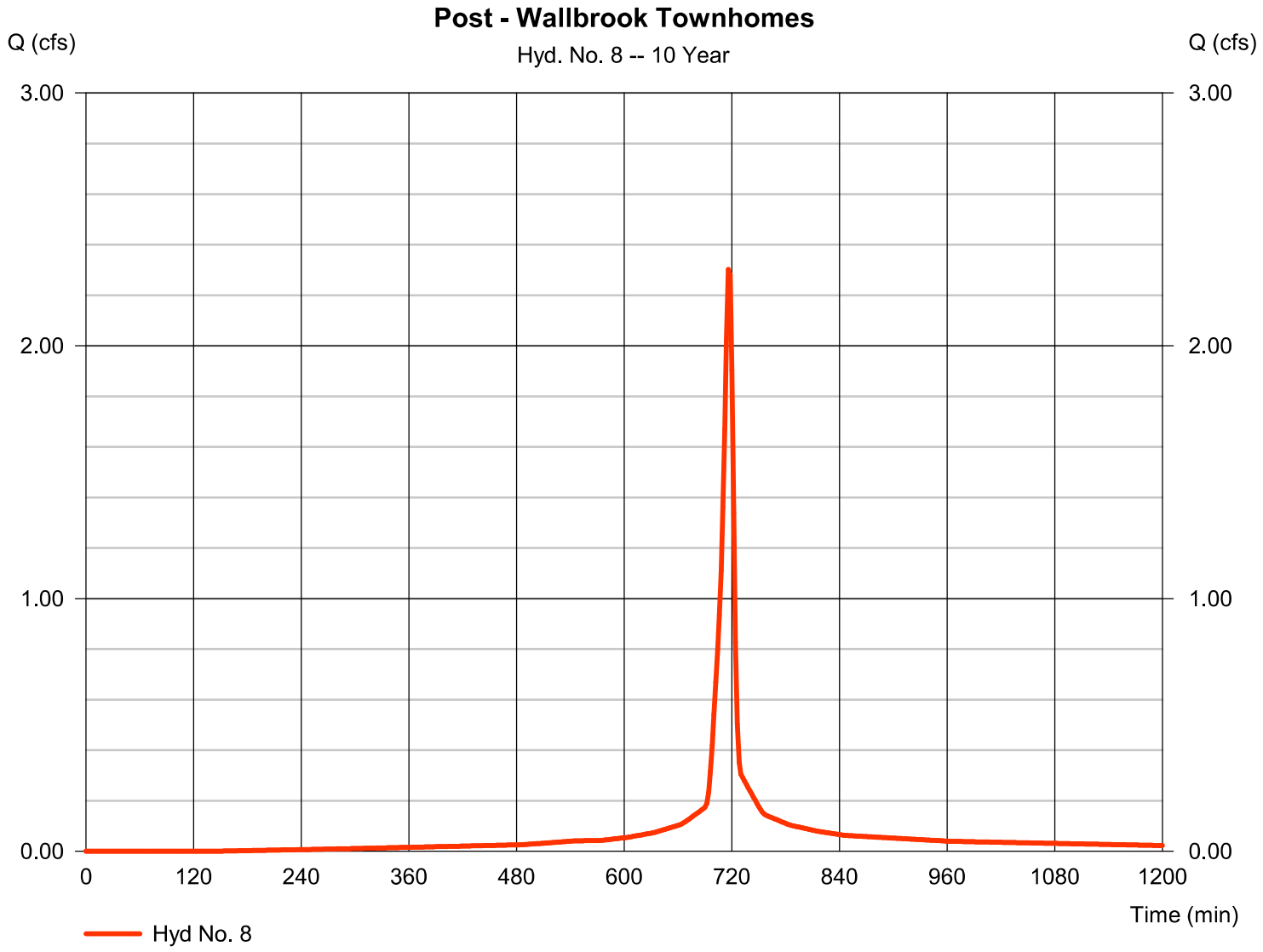
Hydrograph Report

Hyd. No. 8

Post - Wallbrook Townhomes

Hydrograph type	= SCS Runoff	Peak discharge	= 2.302 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 5,392 cuft
Drainage area	= 0.370 ac	Curve number	= 94*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.01 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

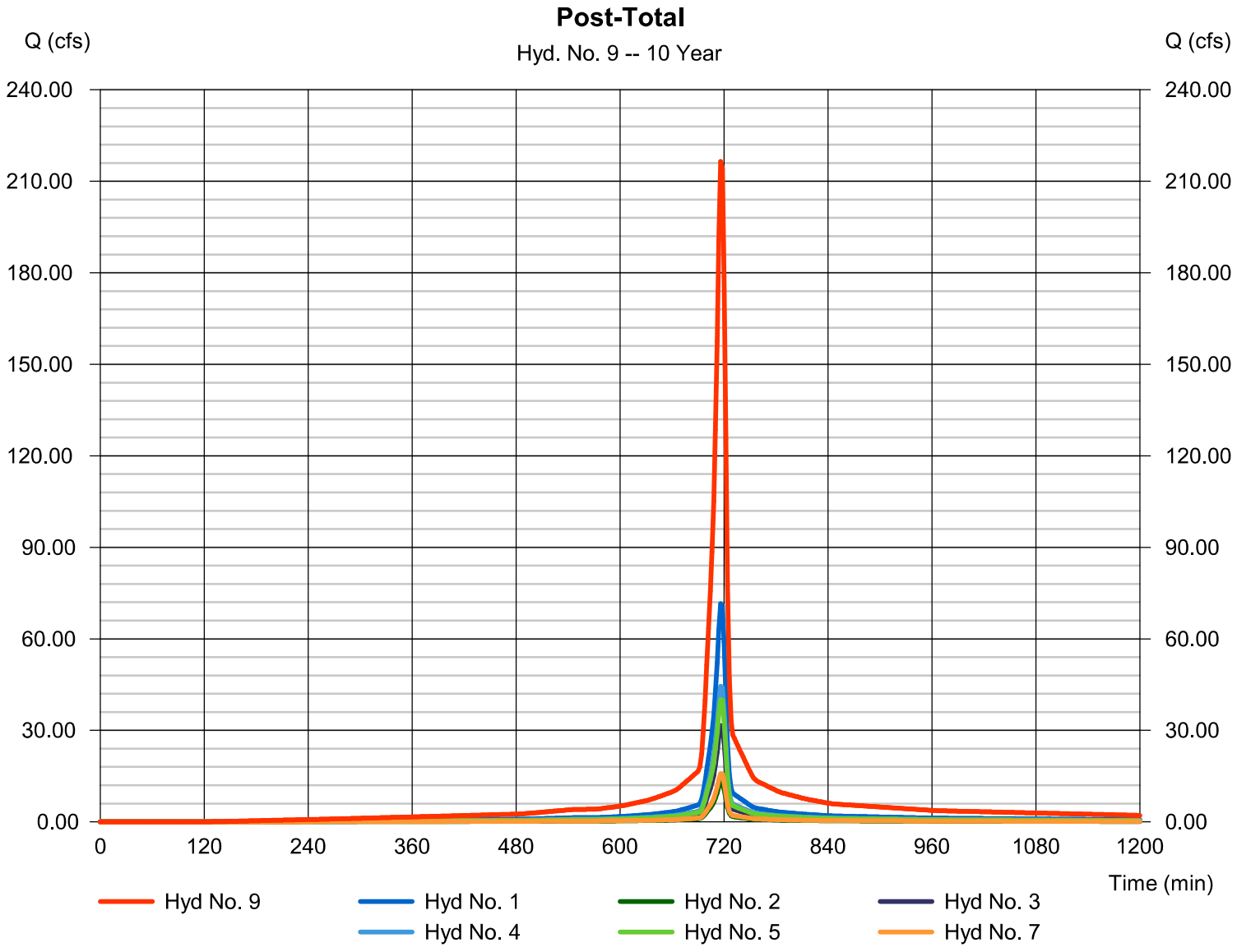
* Composite (Area/CN) = [(0.280 x 98) + (0.090 x 80)] / 0.370



Hyd. No. 9

Post-Total

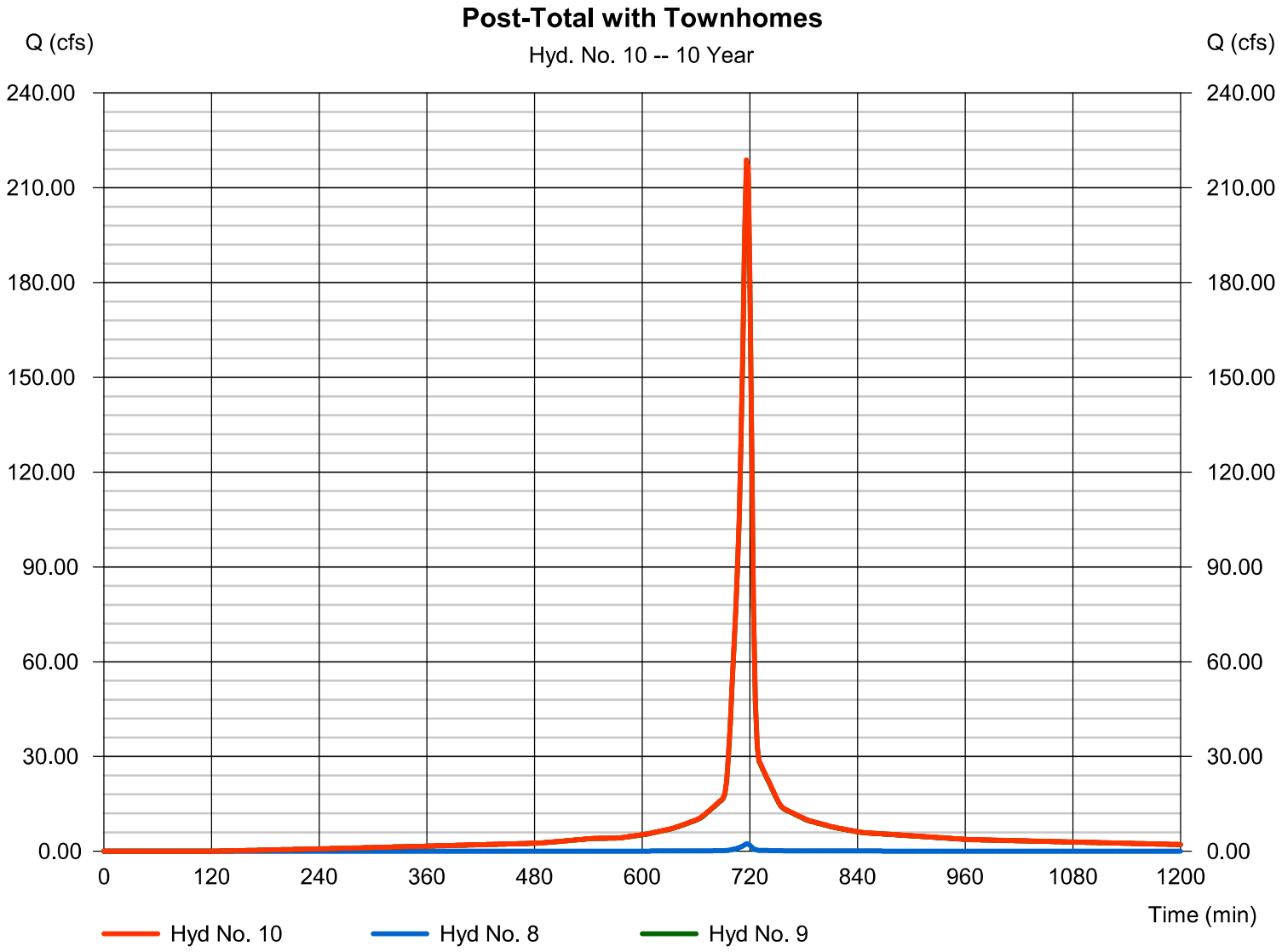
Hydrograph type	= Combine	Peak discharge	= 216.49 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 512,045 cuft
Inflow hyds.	= 1, 2, 3, 4, 5, 7	Contrib. drain. area	= 34.490 ac



Hyd. No. 10

Post-Total with Townhomes

Hydrograph type	=	Combine	Peak discharge	=	218.80 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	517,438 cuft
Inflow hyds.	=	8, 9	Contrib. drain. area	=	0.370 ac



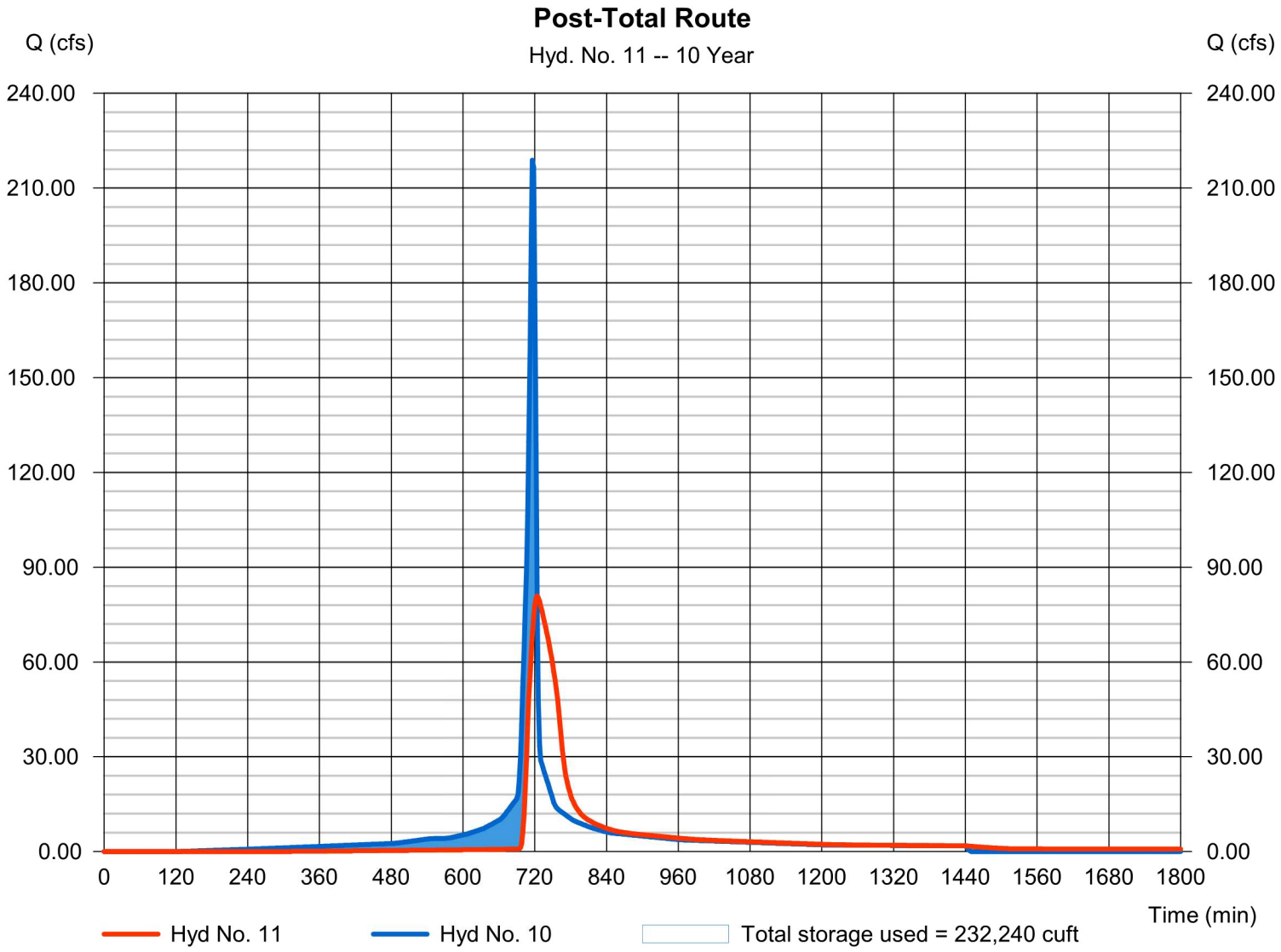
Hydrograph Report

Hyd. No. 11

Post-Total Route

Hydrograph type	= Reservoir	Peak discharge	= 80.89 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 511,776 cuft
Inflow hyd. No.	= 10 - Post-Total with Townhomes	Max. Elevation	= 366.24 ft
Reservoir name	= Wet Pond 1	Max. Storage	= 232,240 cuft

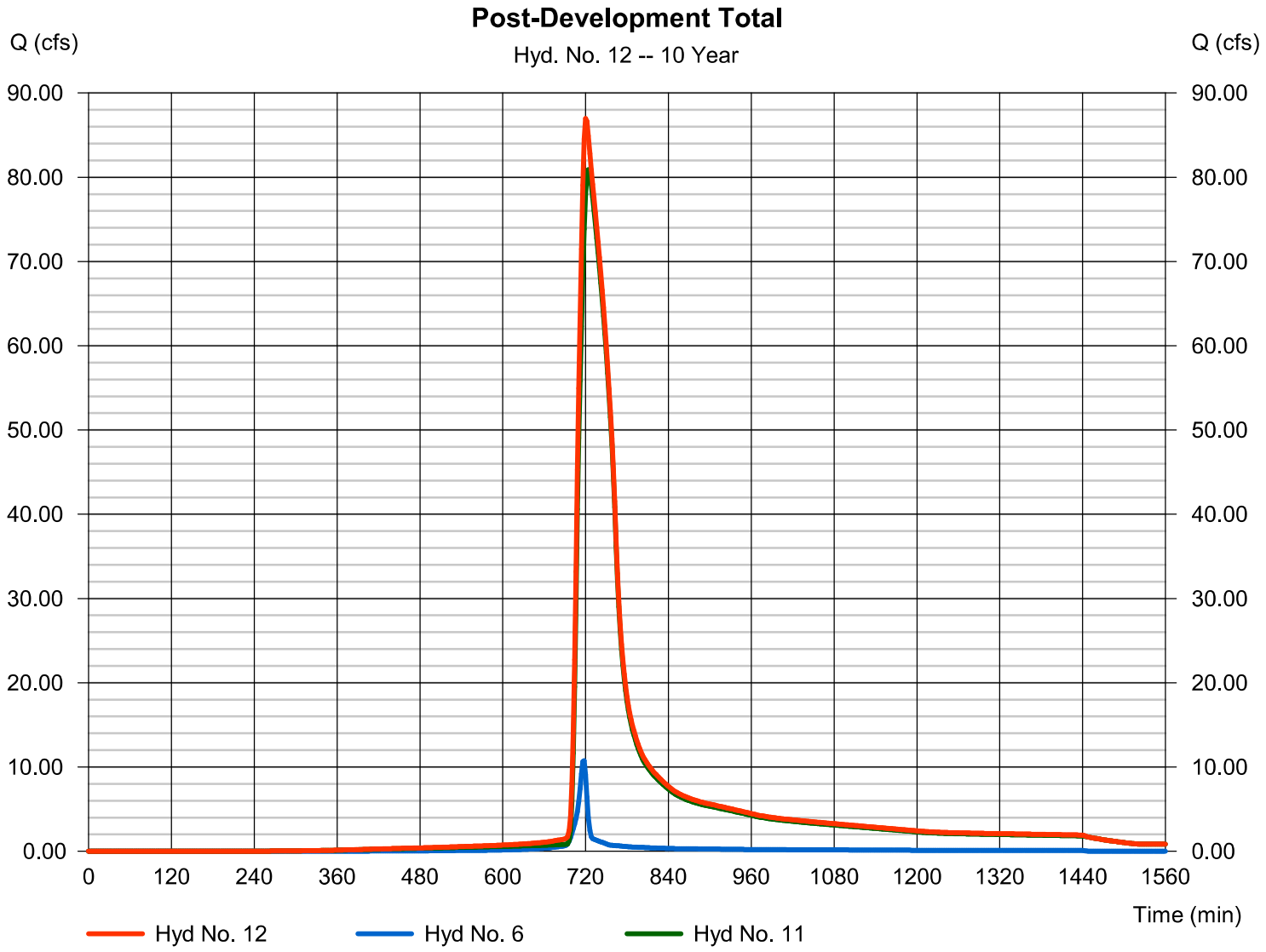
Storage Indication method used.



Hyd. No. 12

Post-Development Total

Hydrograph type	= Combine	Peak discharge	= 86.96 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 535,029 cuft
Inflow hyds.	= 6, 11	Contrib. drain. area	= 2.040 ac



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	SCS Runoff	85.46	2	716	205,014	------	------	------	Post - Wallbrook Lots 1 & 2
2	SCS Runoff	15.56	2	716	37,829	------	------	------	Post - New Roadways (Wallbrook/Va
3	SCS Runoff	37.82	2	716	89,615	------	------	------	Post - Boat Tract (Lot 5)
4	SCS Runoff	53.16	2	716	127,524	------	------	------	Post - Paris Tract (Lots 9, 10, 11)
5	SCS Runoff	48.11	2	716	114,007	------	------	------	Post - DOT Roadway
6	SCS Runoff	13.29	2	718	29,233	------	------	------	Post - Direct Release
7	SCS Runoff	18.90	2	716	45,338	------	------	------	Post - Lots 3 & 4
8	SCS Runoff	2.760	2	716	6,540	------	------	------	Post - Wallbrook Townhomes
9	Combine	259.01	2	716	619,328	1, 2, 3, 4, 5, 7, 8, 9	------	------	Post-Total
10	Combine	261.77	2	716	625,868	------	------	------	Post-Total with Townhomes
11	Reservoir	89.79	2	724	620,195	10	366.90	269,989	Post-Total Route
12	Combine	97.45	2	720	649,428	6, 11	------	------	Post-Development Total

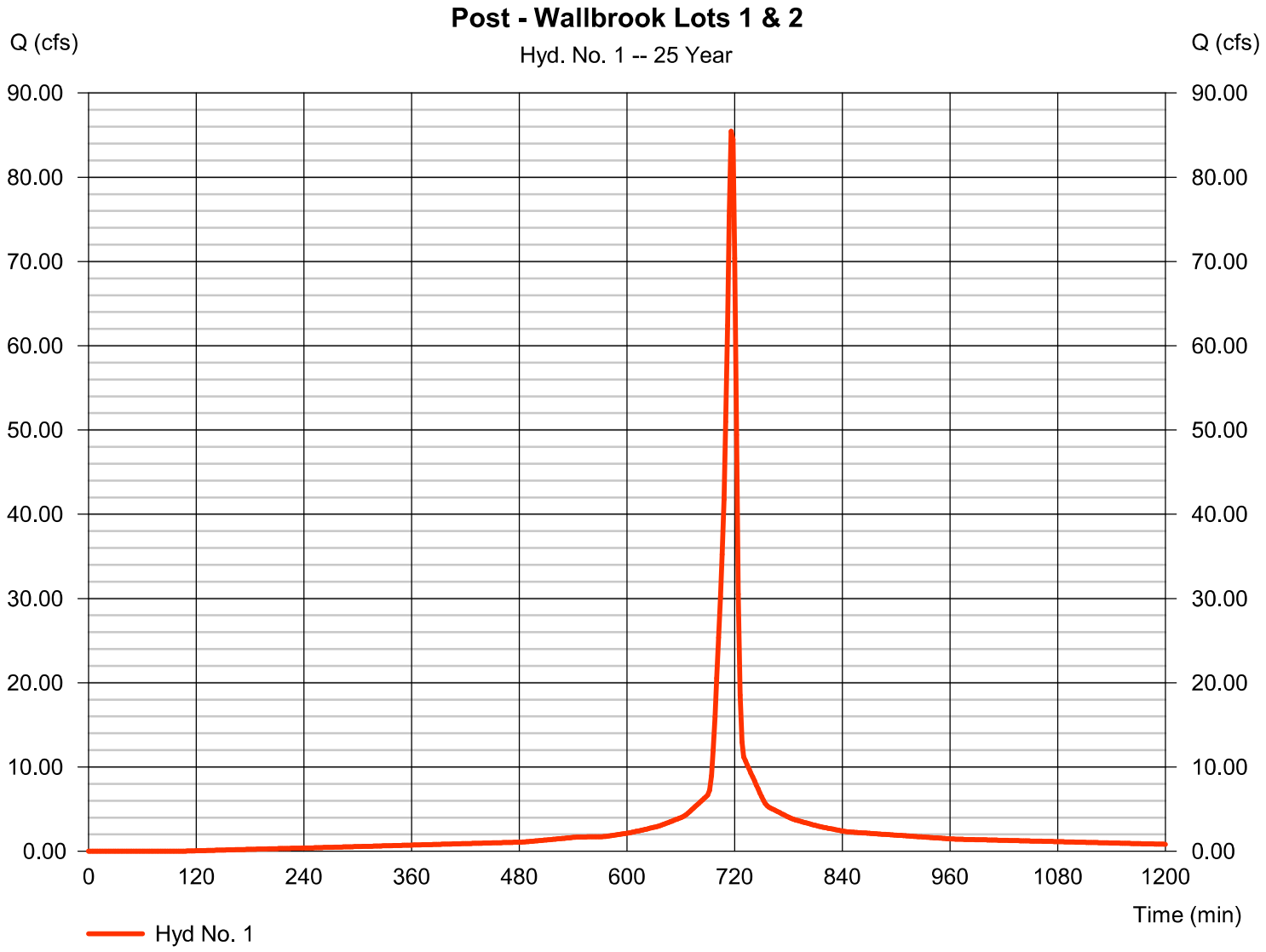
Hydrograph Report

Hyd. No. 1

Post - Wallbrook Lots 1 & 2

Hydrograph type	= SCS Runoff	Peak discharge	= 85.46 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 205,014 cuft
Drainage area	= 11.350 ac	Curve number	= 95*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.94 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(1.790 x 98) + (6.260 x 98) + (1.990 x 80) + (0.270 x 98) + (0.890 x 98) + (0.150 x 80)] / 11.350



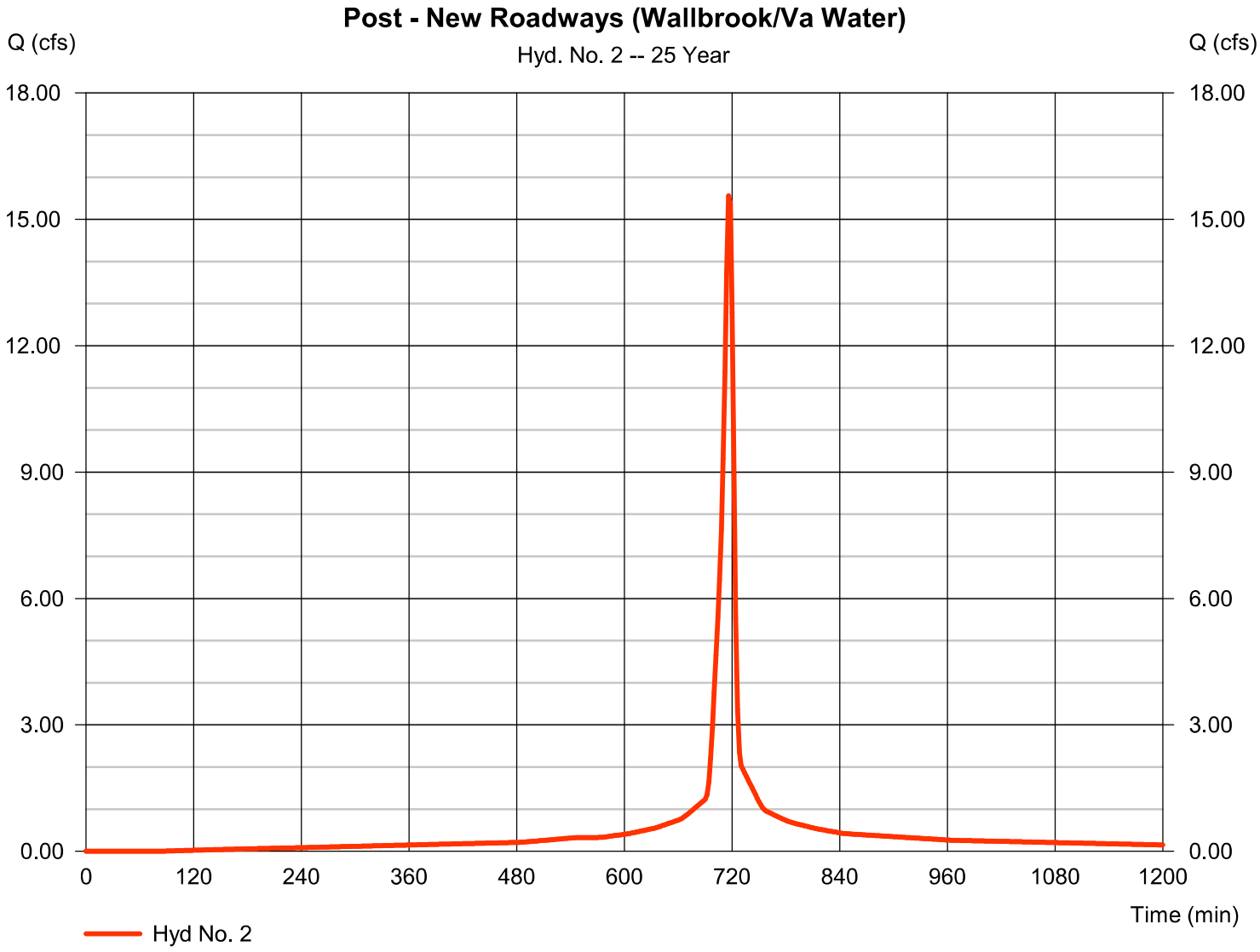
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Thursday, 09 / 21 / 2023

Hyd. No. 2

Post - New Roadways (Wallbrook/Va Water)

Hydrograph type	= SCS Runoff	Peak discharge	= 15.56 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 37,829 cuft
Drainage area	= 2.050 ac	Curve number	= 96*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.94 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(1.820 x 98) + (0.230 x 80)] / 2.050

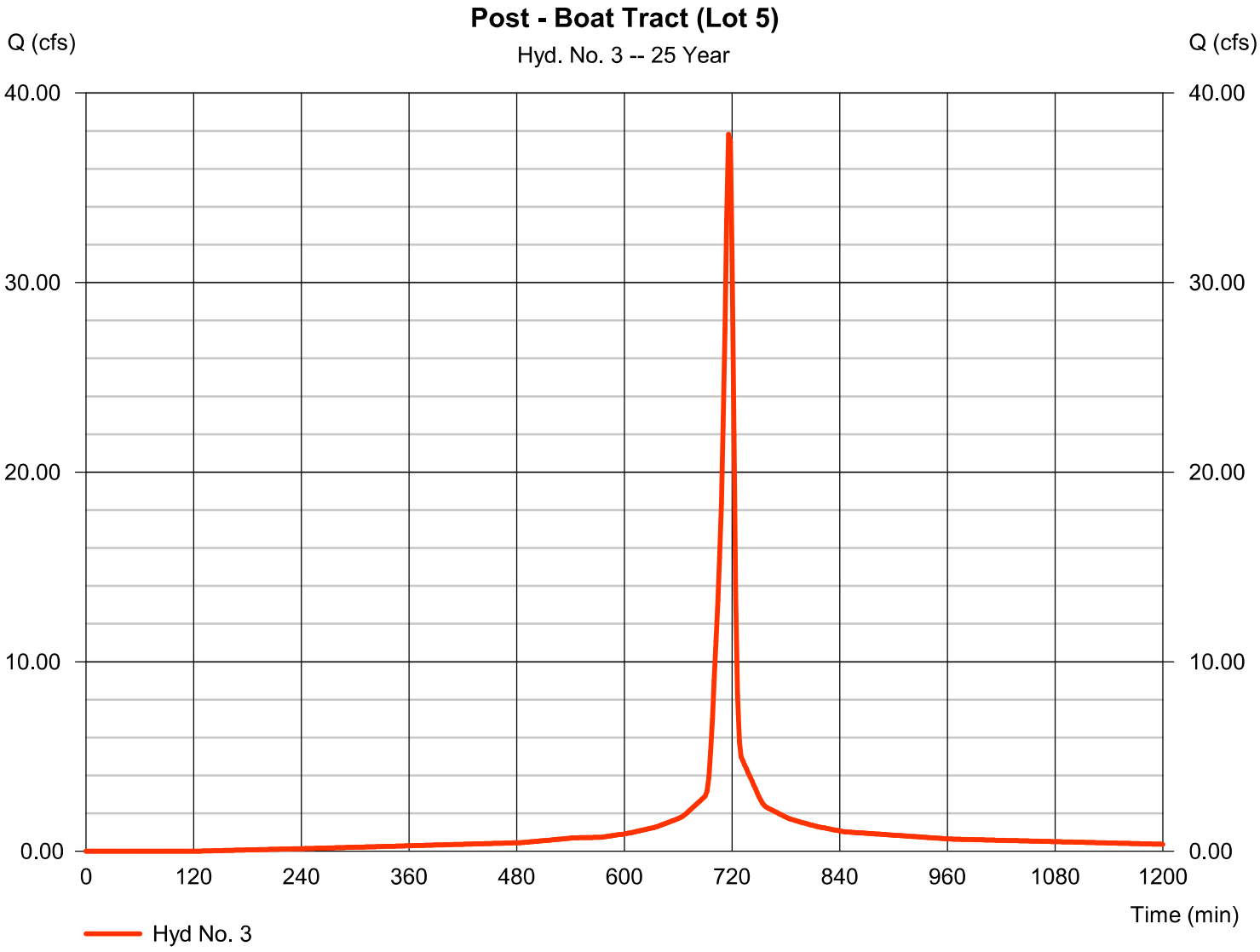


Hyd. No. 3

Post - Boat Tract (Lot 5)

Hydrograph type	= SCS Runoff	Peak discharge	= 37.82 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 89,615 cuft
Drainage area	= 5.070 ac	Curve number	= 94*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.94 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(0.860 x 98) + (3.450 x 98) + (0.760 x 74)] / 5.070

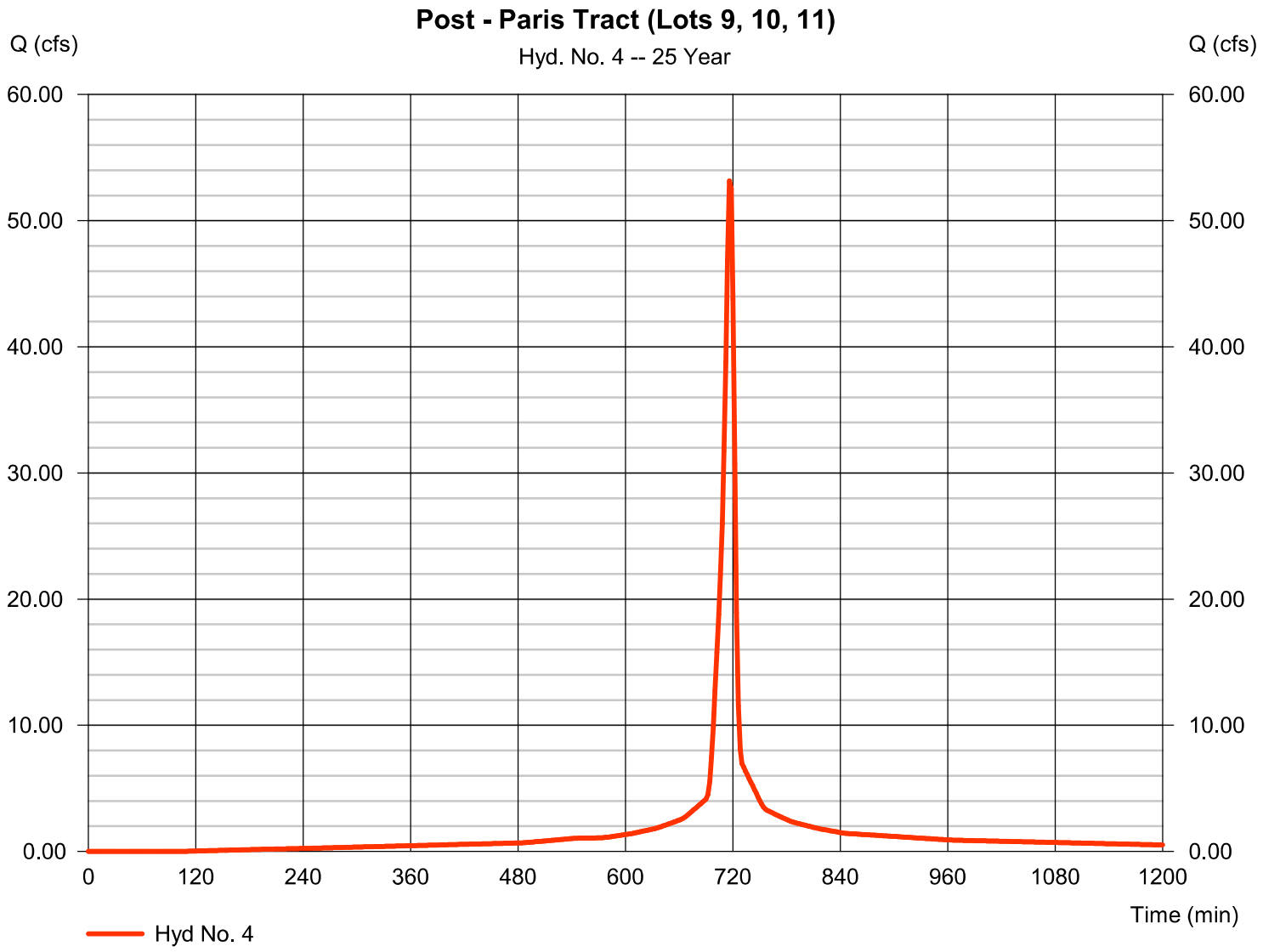


Hyd. No. 4

Post - Paris Tract (Lots 9, 10, 11)

Hydrograph type	= SCS Runoff	Peak discharge	= 53.16 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 127,524 cuft
Drainage area	= 7.060 ac	Curve number	= 95*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.94 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(1.200 x 98) + (4.800 x 98) + (1.060 x 80)] / 7.060



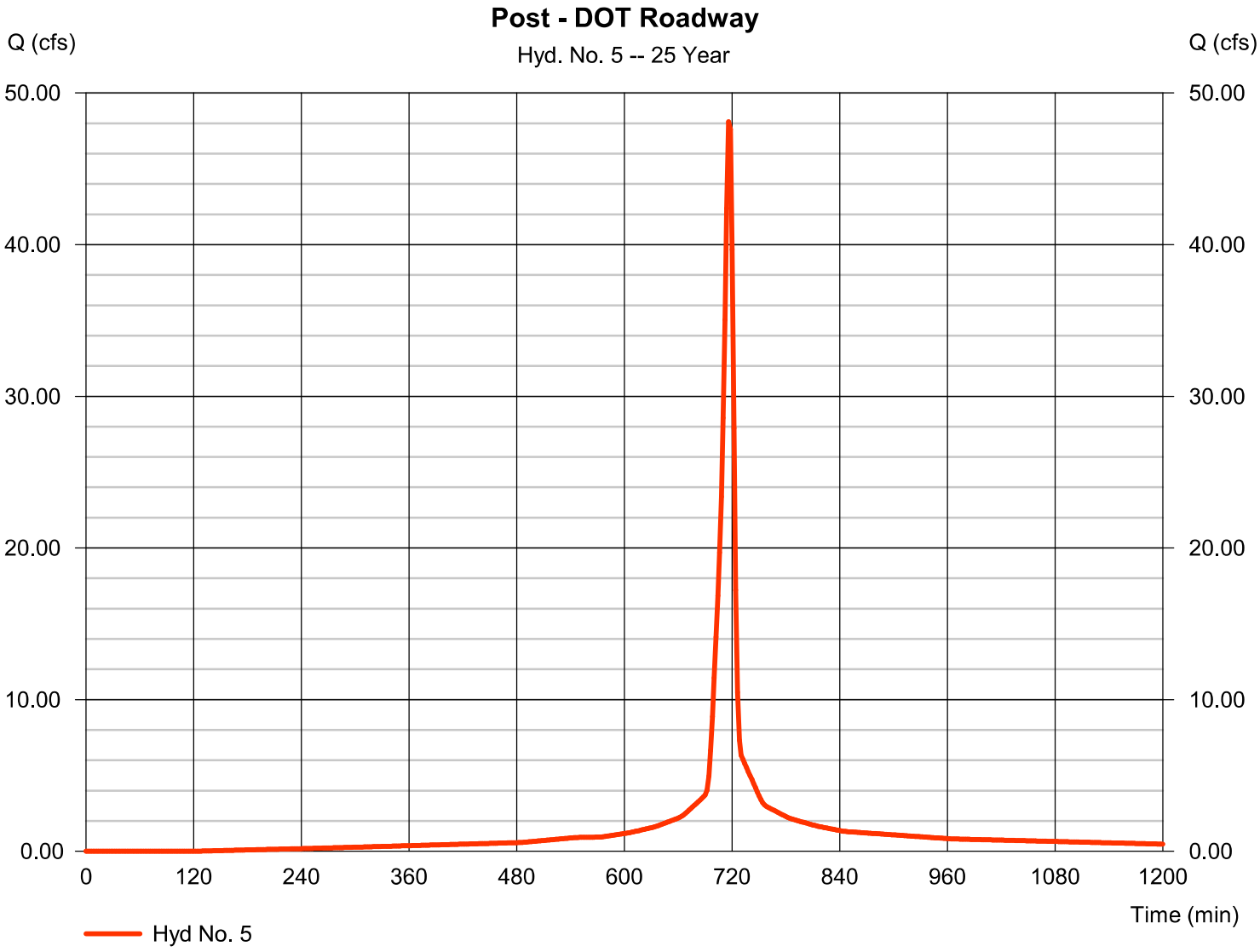
Hydrograph Report

Hyd. No. 5

Post - DOT Roadway

Hydrograph type	= SCS Runoff	Peak discharge	= 48.11 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 114,007 cuft
Drainage area	= 6.450 ac	Curve number	= 94*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.94 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(4.960 x 98) + (1.490 x 80)] / 6.450



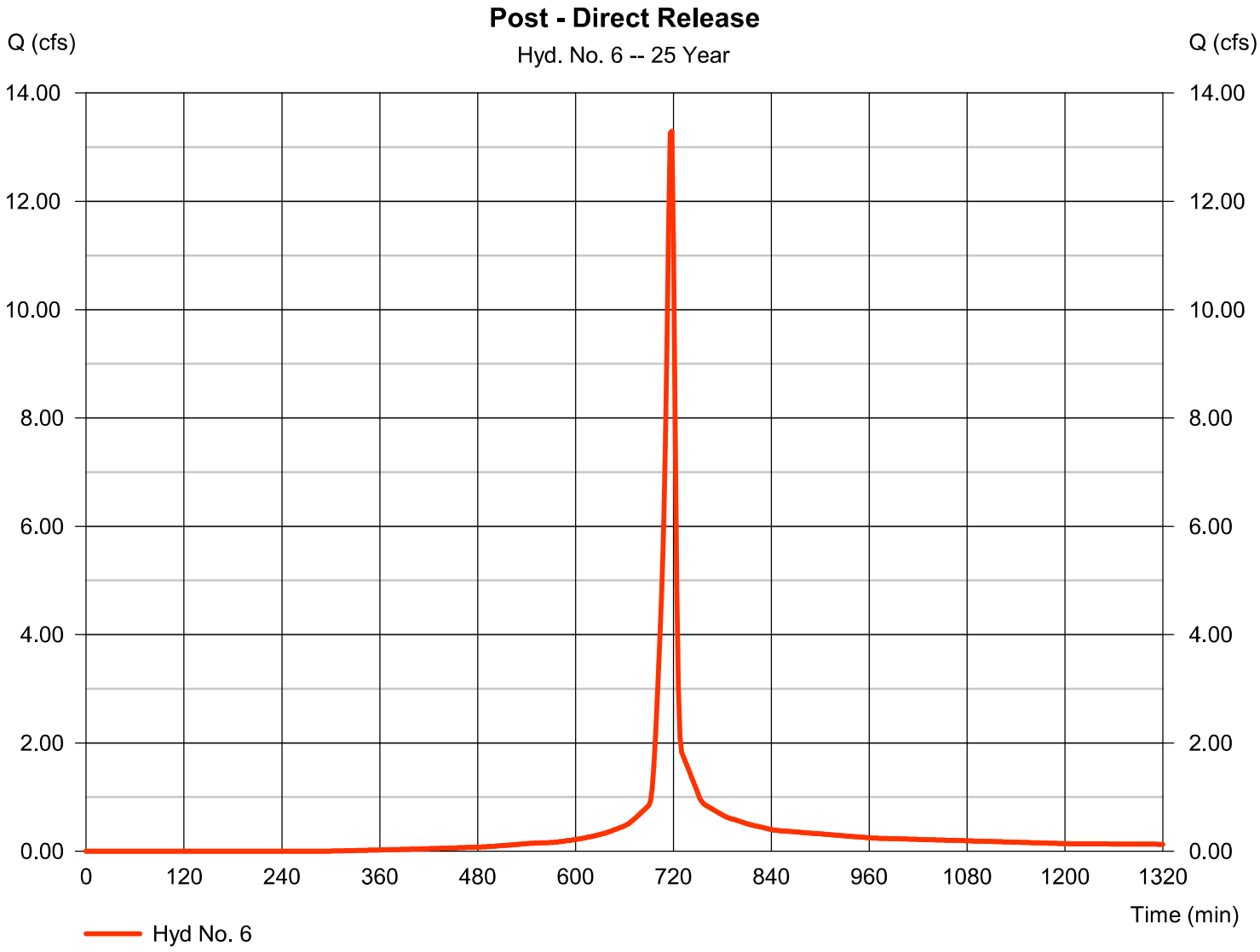
Hydrograph Report

Hyd. No. 6

Post - Direct Release

Hydrograph type	= SCS Runoff	Peak discharge	= 13.29 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 29,233 cuft
Drainage area	= 2.040 ac	Curve number	= 85*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.94 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(1.480 x 80) + (0.560 x 98)] / 2.040



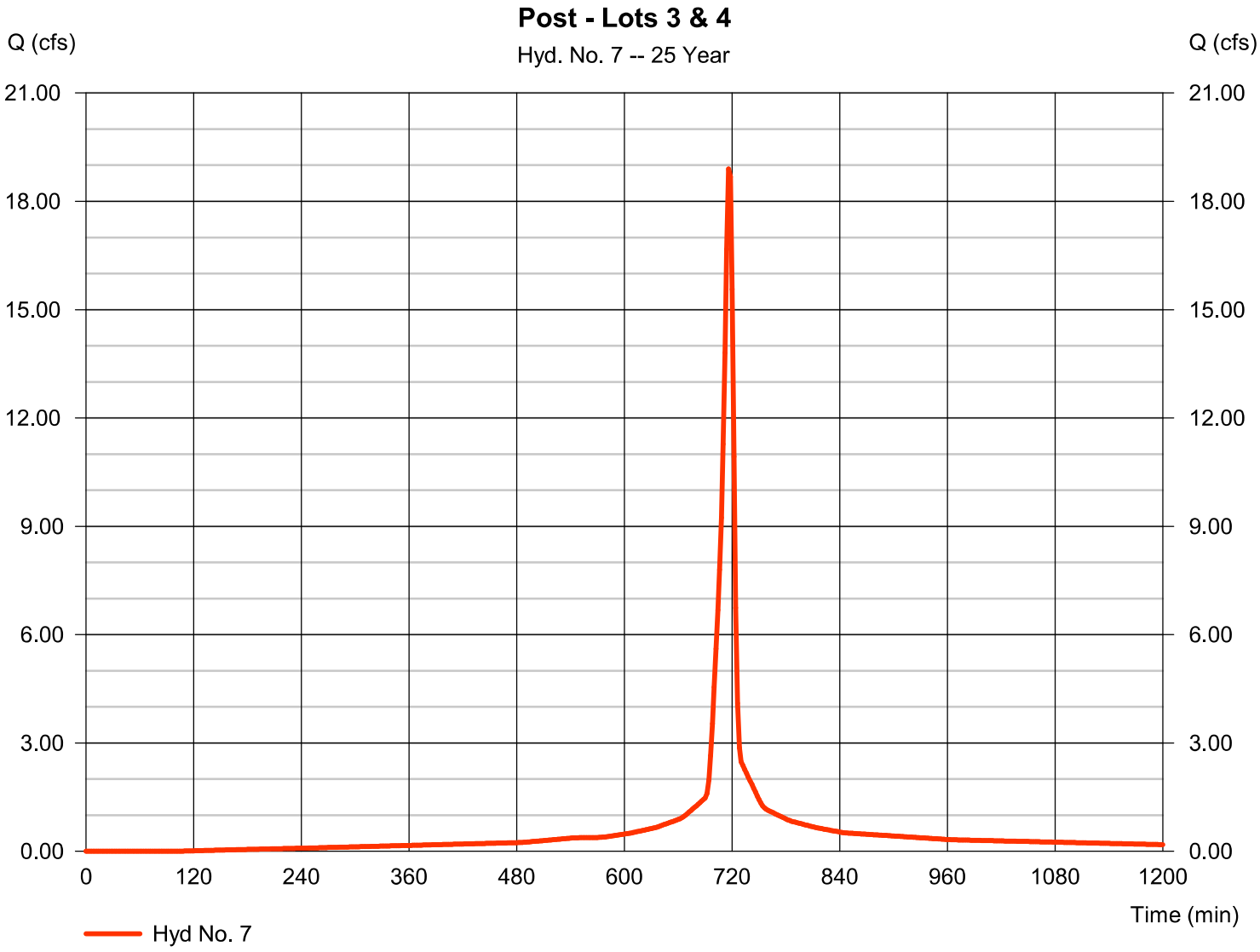
Hydrograph Report

Hyd. No. 7

Post - Lots 3 & 4

Hydrograph type	= SCS Runoff	Peak discharge	= 18.90 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 45,338 cuft
Drainage area	= 2.510 ac	Curve number	= 95*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.94 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(0.320 x 98) + (1.810 x 98) + (0.380 x 80)] / 2.510

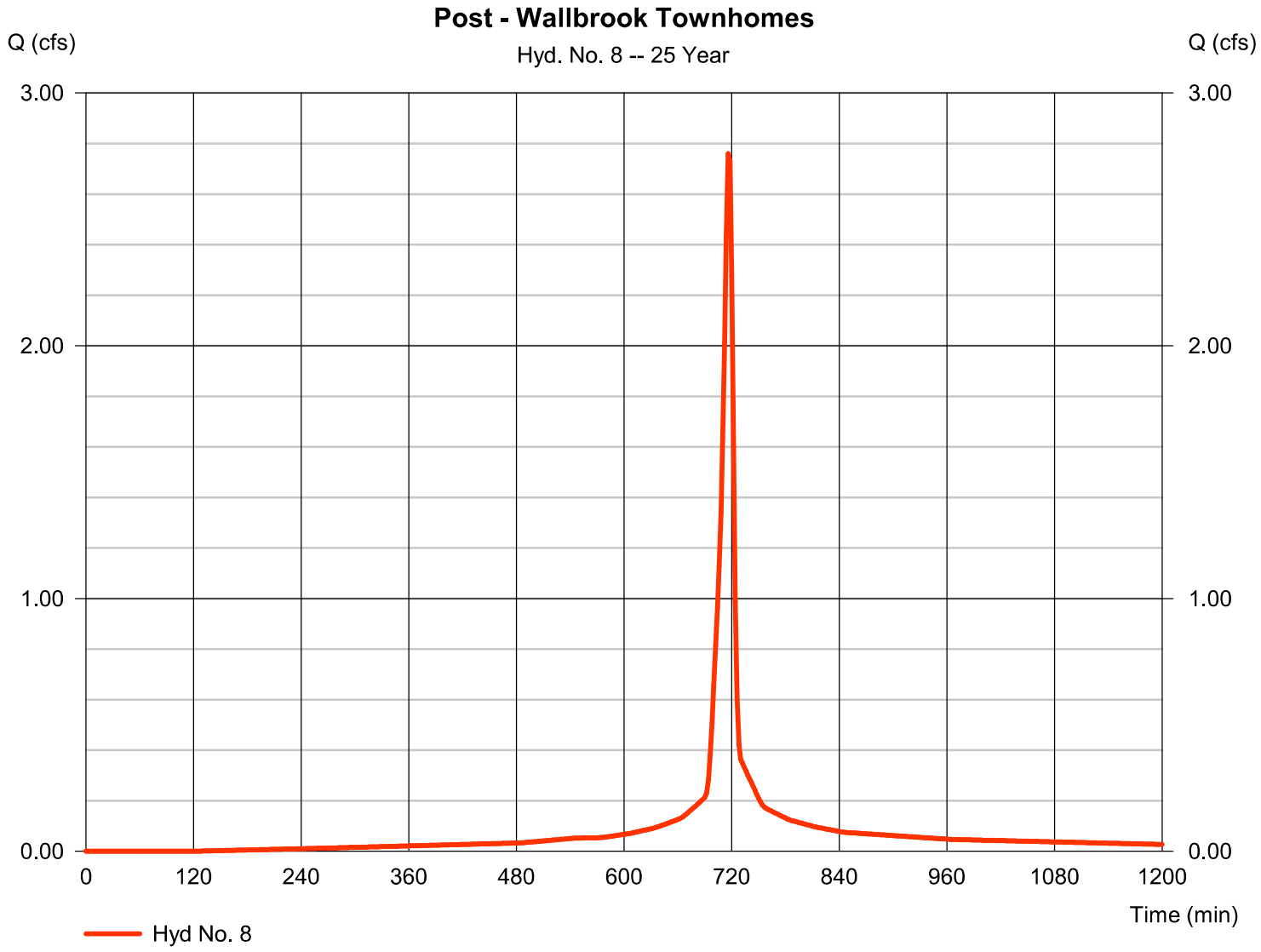


Hyd. No. 8

Post - Wallbrook Townhomes

Hydrograph type	= SCS Runoff	Peak discharge	= 2.760 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 6,540 cuft
Drainage area	= 0.370 ac	Curve number	= 94*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.94 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

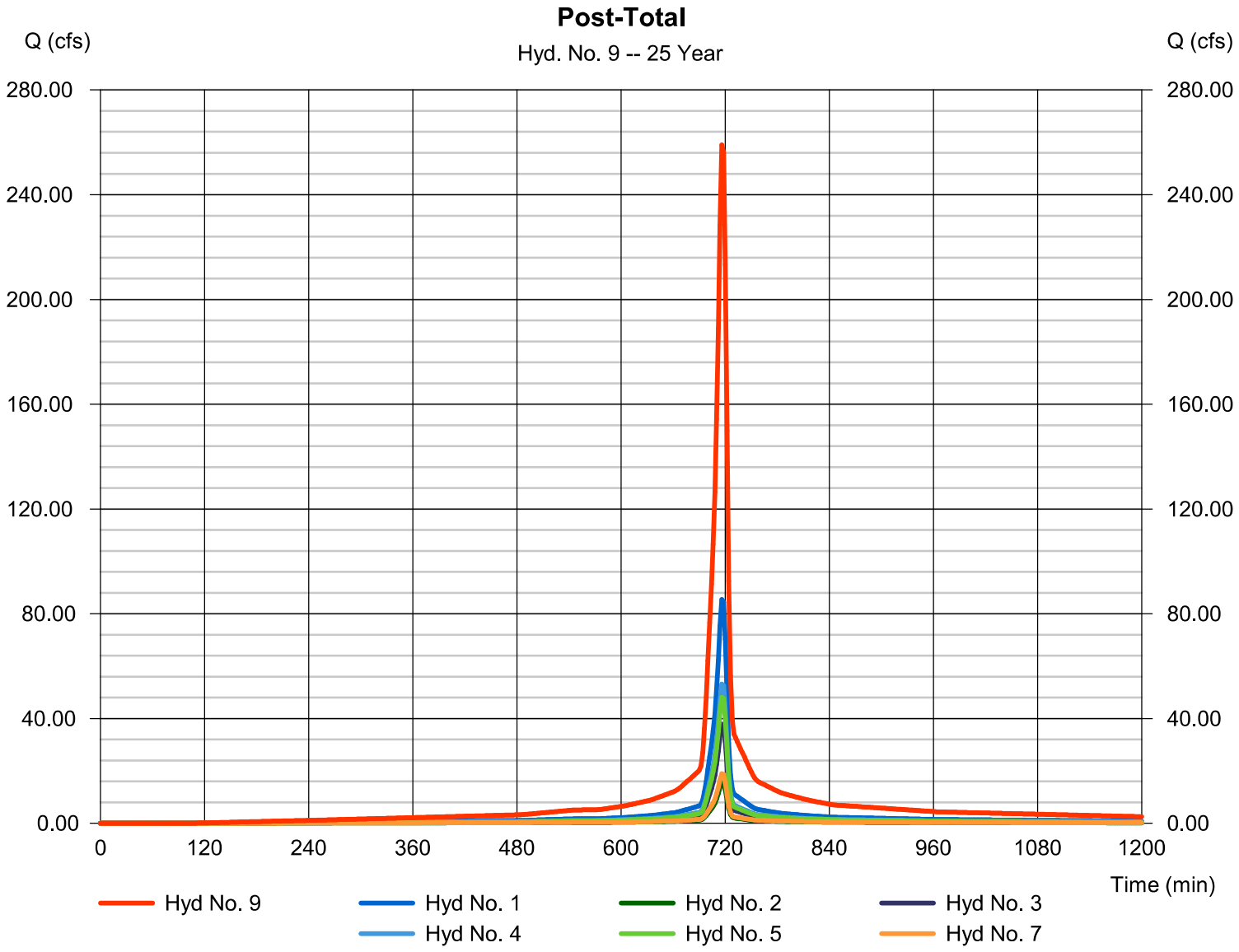
* Composite (Area/CN) = [(0.280 x 98) + (0.090 x 80)] / 0.370



Hyd. No. 9

Post-Total

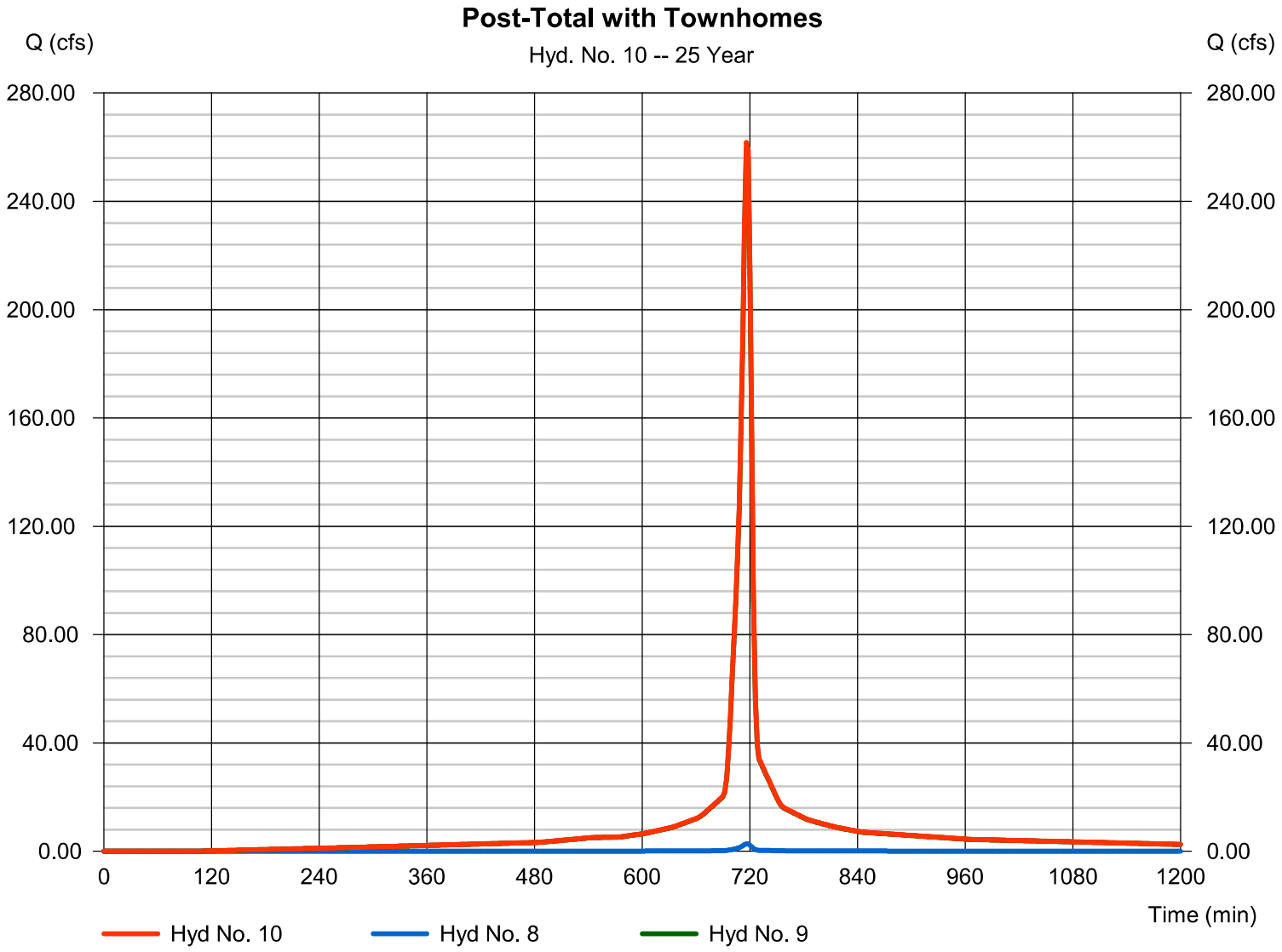
Hydrograph type	= Combine	Peak discharge	= 259.01 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 619,328 cuft
Inflow hyds.	= 1, 2, 3, 4, 5, 7	Contrib. drain. area	= 34.490 ac



Hyd. No. 10

Post-Total with Townhomes

Hydrograph type	= Combine	Peak discharge	= 261.77 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 625,868 cuft
Inflow hyds.	= 8, 9	Contrib. drain. area	= 0.370 ac



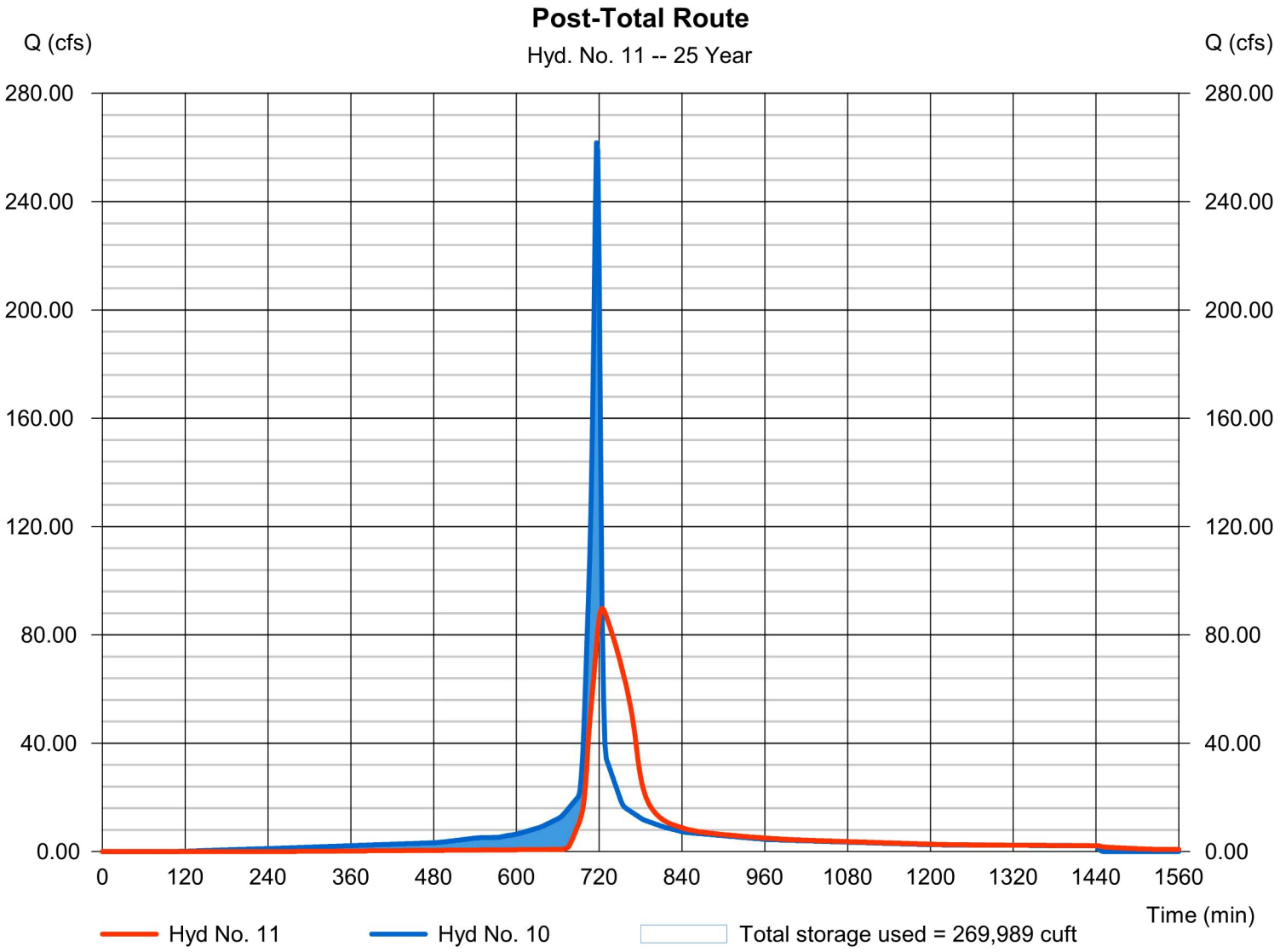
Hydrograph Report

Hyd. No. 11

Post-Total Route

Hydrograph type	= Reservoir	Peak discharge	= 89.79 cfs
Storm frequency	= 25 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 620,195 cuft
Inflow hyd. No.	= 10 - Post-Total with Townhomes	Max. Elevation	= 366.90 ft
Reservoir name	= Wet Pond 1	Max. Storage	= 269,989 cuft

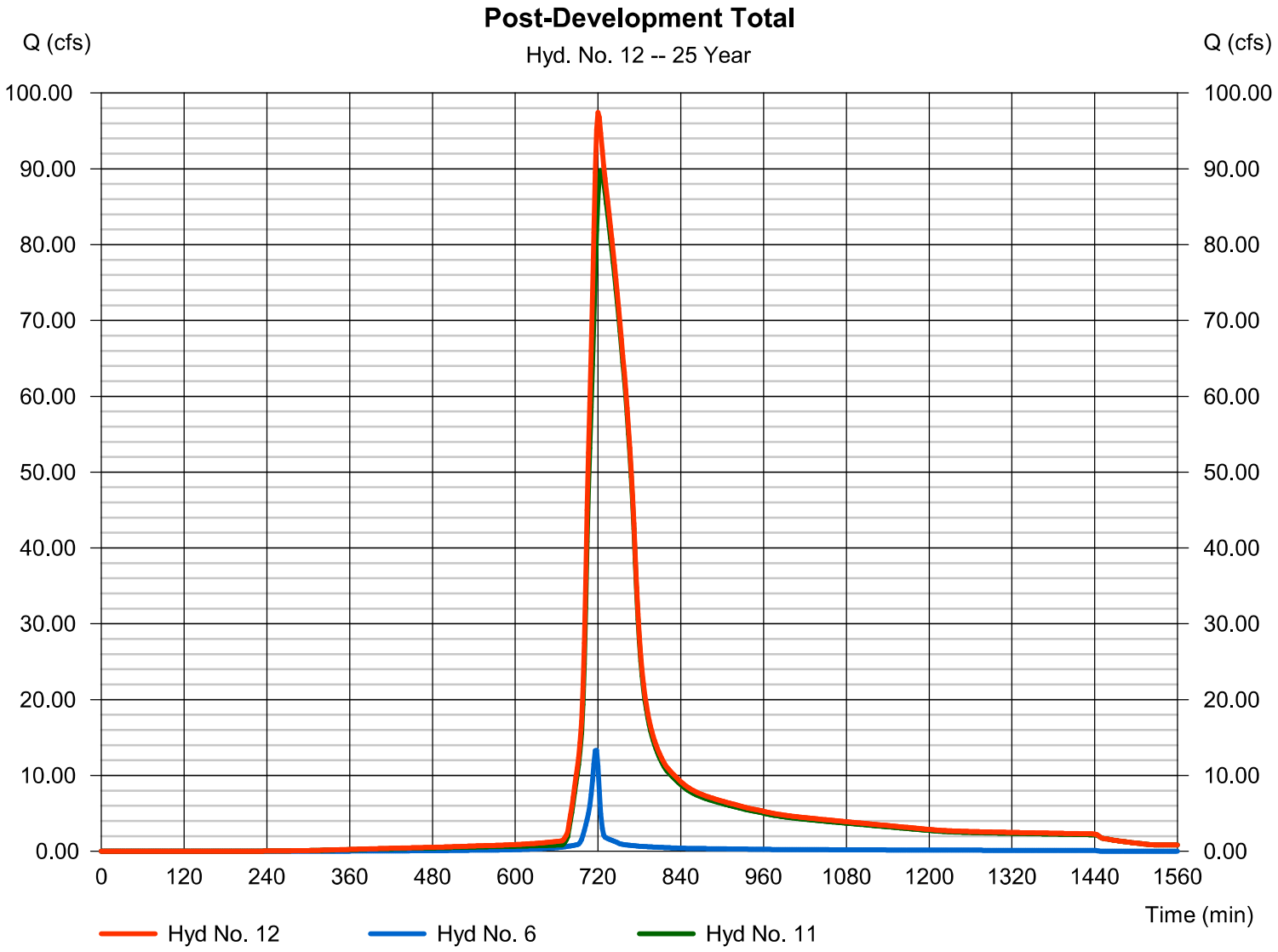
Storage Indication method used.



Hyd. No. 12

Post-Development Total

Hydrograph type	= Combine	Peak discharge	= 97.45 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 649,428 cuft
Inflow hyds.	= 6, 11	Contrib. drain. area	= 2.040 ac



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	SCS Runoff	107.88	2	716	262,155	------	------	------	Post - Wallbrook Lots 1 & 2
2	SCS Runoff	19.59	2	716	48,171	------	------	------	Post - New Roadways (Wallbrook/Va
3	SCS Runoff	47.88	2	716	115,078	------	------	------	Post - Boat Tract (Lot 5)
4	SCS Runoff	67.11	2	716	163,067	------	------	------	Post - Paris Tract (Lots 9, 10, 11)
5	SCS Runoff	60.91	2	716	146,401	------	------	------	Post - DOT Roadway
6	SCS Runoff	17.45	2	716	39,067	------	------	------	Post - Direct Release
7	SCS Runoff	23.86	2	716	57,974	------	------	------	Post - Lots 3 & 4
8	SCS Runoff	3.494	2	716	8,398	------	------	------	Post - Wallbrook Townhomes
9	Combine	327.23	2	716	792,846	1, 2, 3, 4, 5, 7,	------	------	Post-Total
10	Combine	330.72	2	716	801,244	8, 9	------	------	Post-Total with Townhomes
11	Reservoir	101.43	2	724	795,559	10	367.88	326,744	Post-Total Route
12	Combine	111.72	2	720	834,626	6, 11	------	------	Post-Development Total

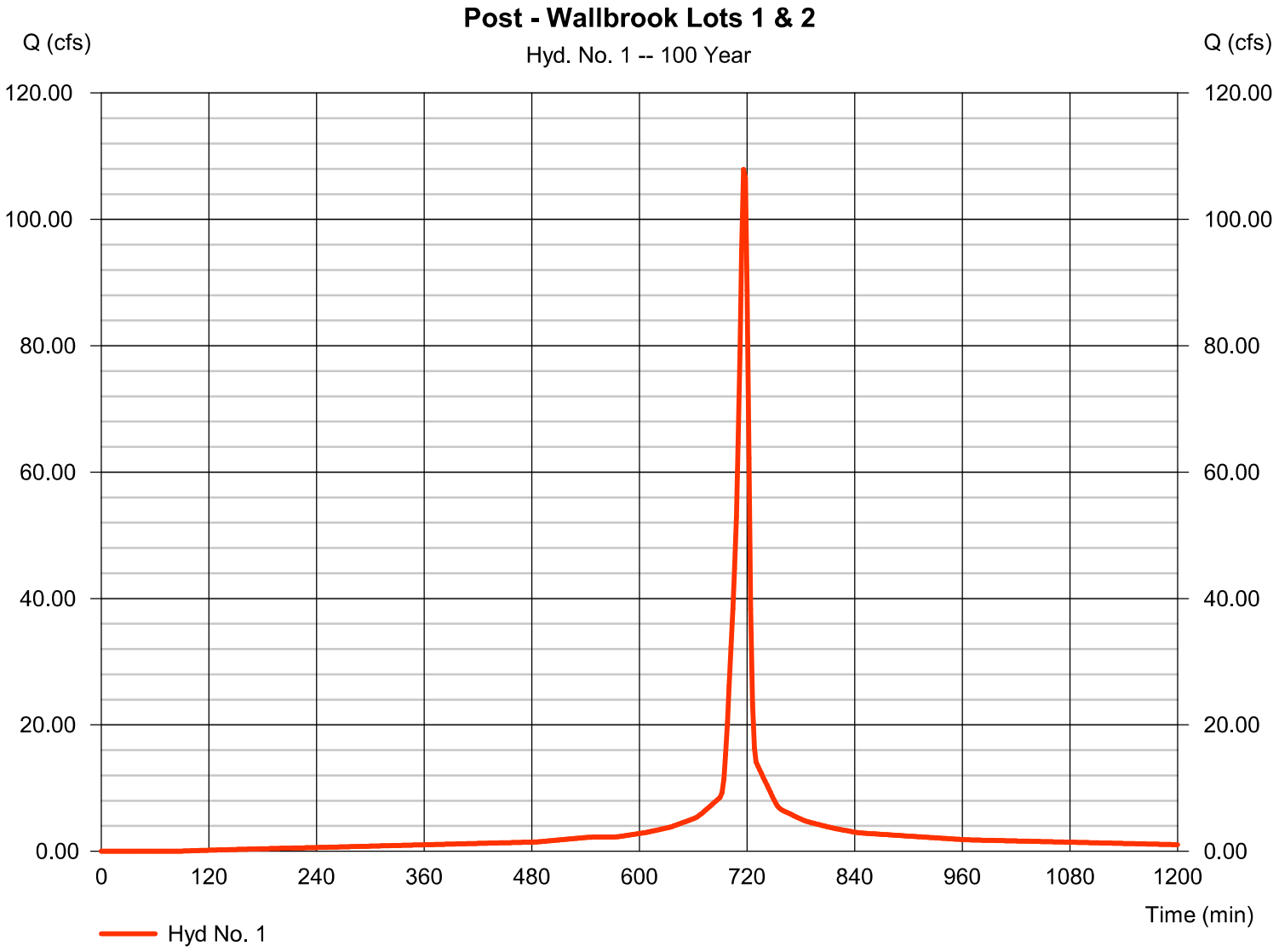
Hydrograph Report

Hyd. No. 1

Post - Wallbrook Lots 1 & 2

Hydrograph type	= SCS Runoff	Peak discharge	= 107.88 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 262,155 cuft
Drainage area	= 11.350 ac	Curve number	= 95*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.44 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(1.790 x 98) + (6.260 x 98) + (1.990 x 80) + (0.270 x 98) + (0.890 x 98) + (0.150 x 80)] / 11.350

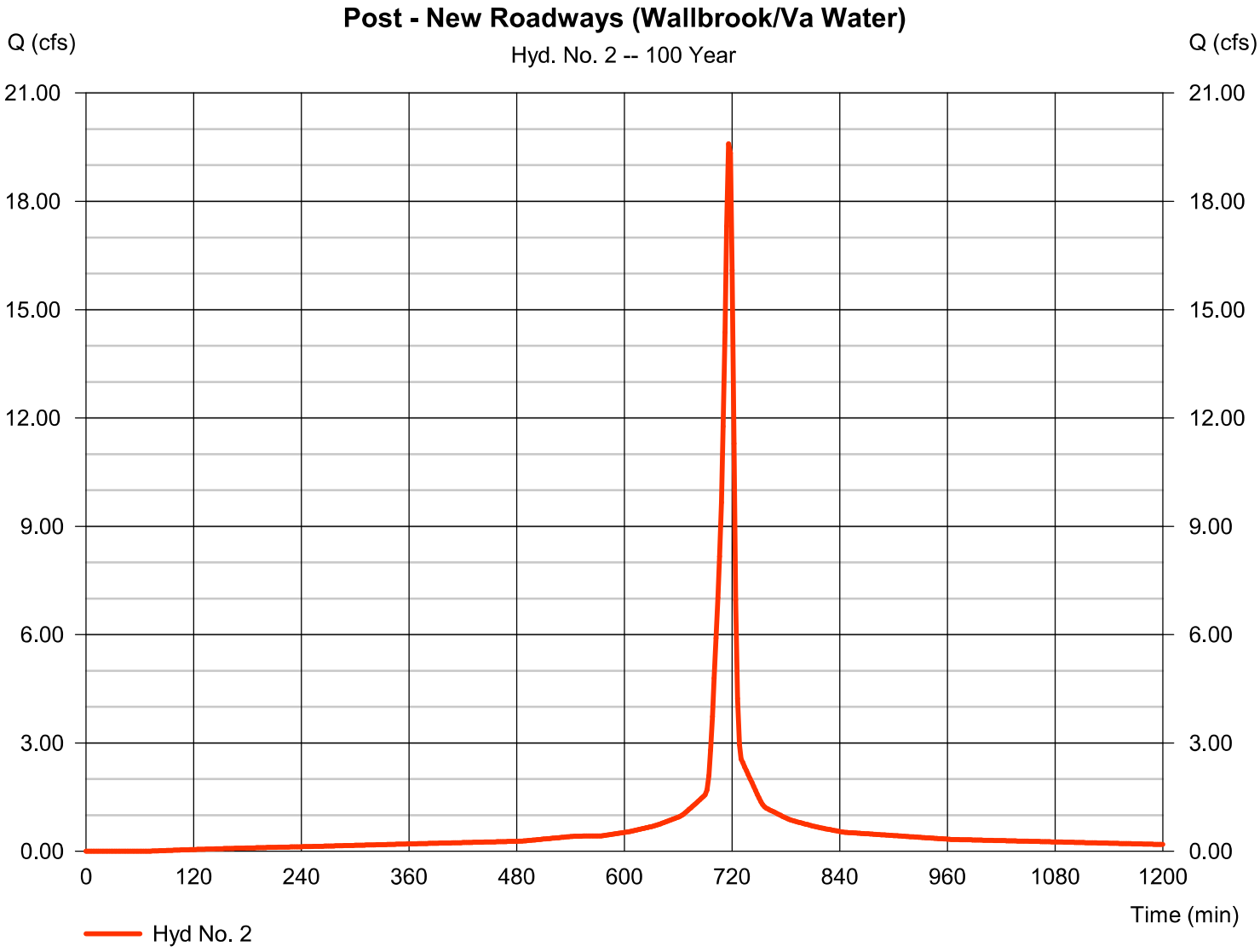


Hyd. No. 2

Post - New Roadways (Wallbrook/Va Water)

Hydrograph type	= SCS Runoff	Peak discharge	= 19.59 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 48,171 cuft
Drainage area	= 2.050 ac	Curve number	= 96*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.44 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(1.820 x 98) + (0.230 x 80)] / 2.050

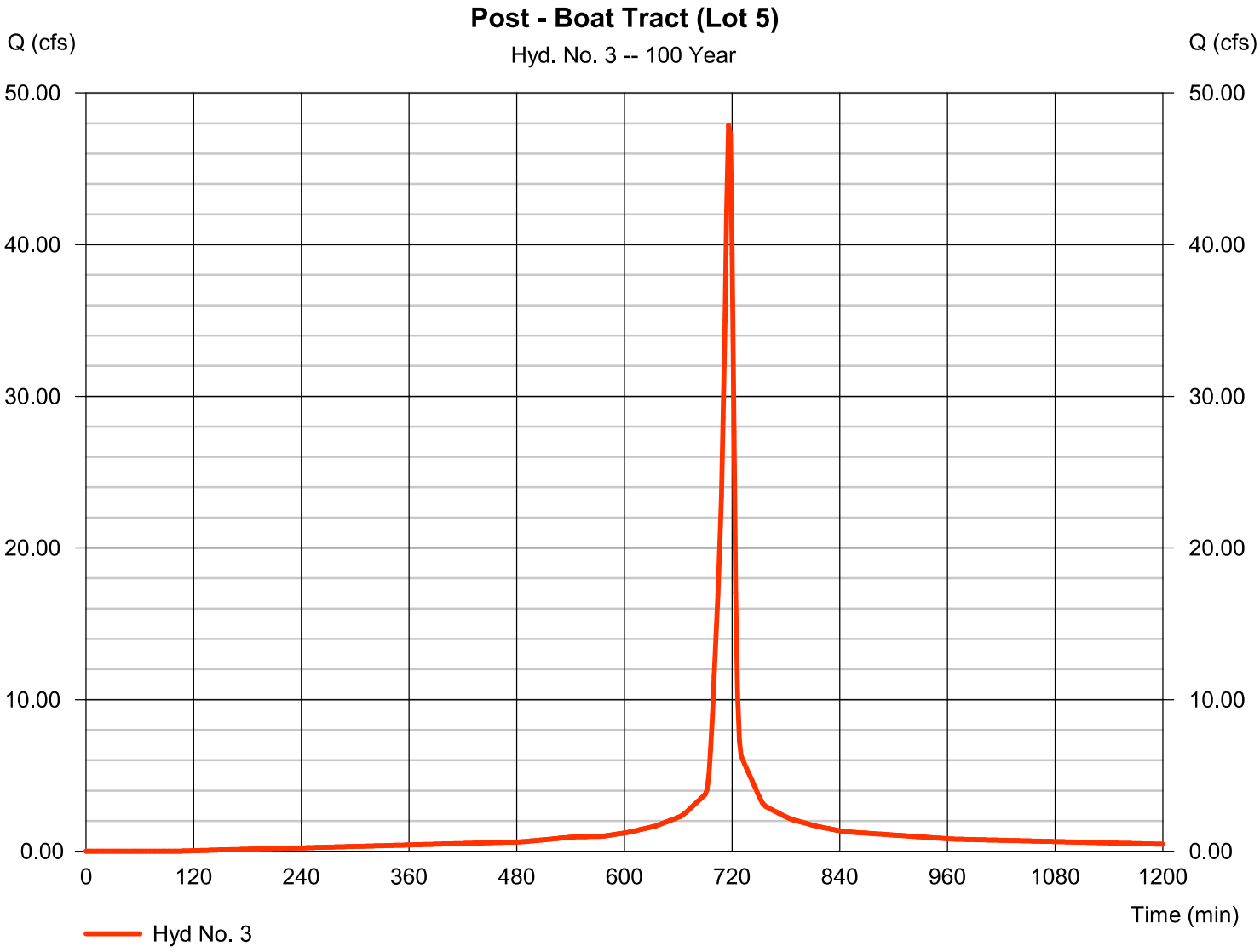


Hyd. No. 3

Post - Boat Tract (Lot 5)

Hydrograph type	= SCS Runoff	Peak discharge	= 47.88 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 115,078 cuft
Drainage area	= 5.070 ac	Curve number	= 94*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.44 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(0.860 x 98) + (3.450 x 98) + (0.760 x 74)] / 5.070



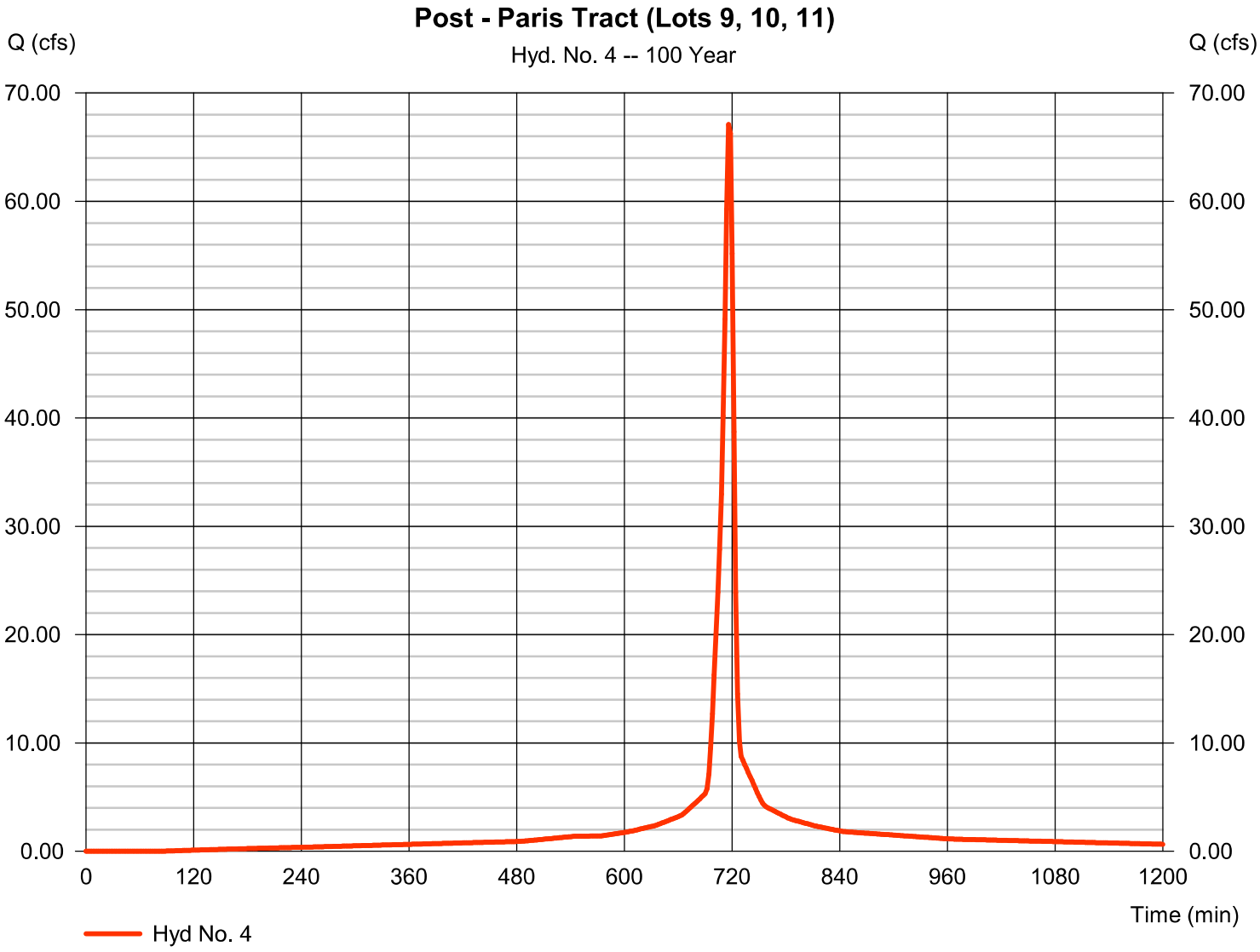
Hydrograph Report

Hyd. No. 4

Post - Paris Tract (Lots 9, 10, 11)

Hydrograph type	= SCS Runoff	Peak discharge	= 67.11 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 163,067 cuft
Drainage area	= 7.060 ac	Curve number	= 95*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.44 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(1.200 x 98) + (4.800 x 98) + (1.060 x 80)] / 7.060

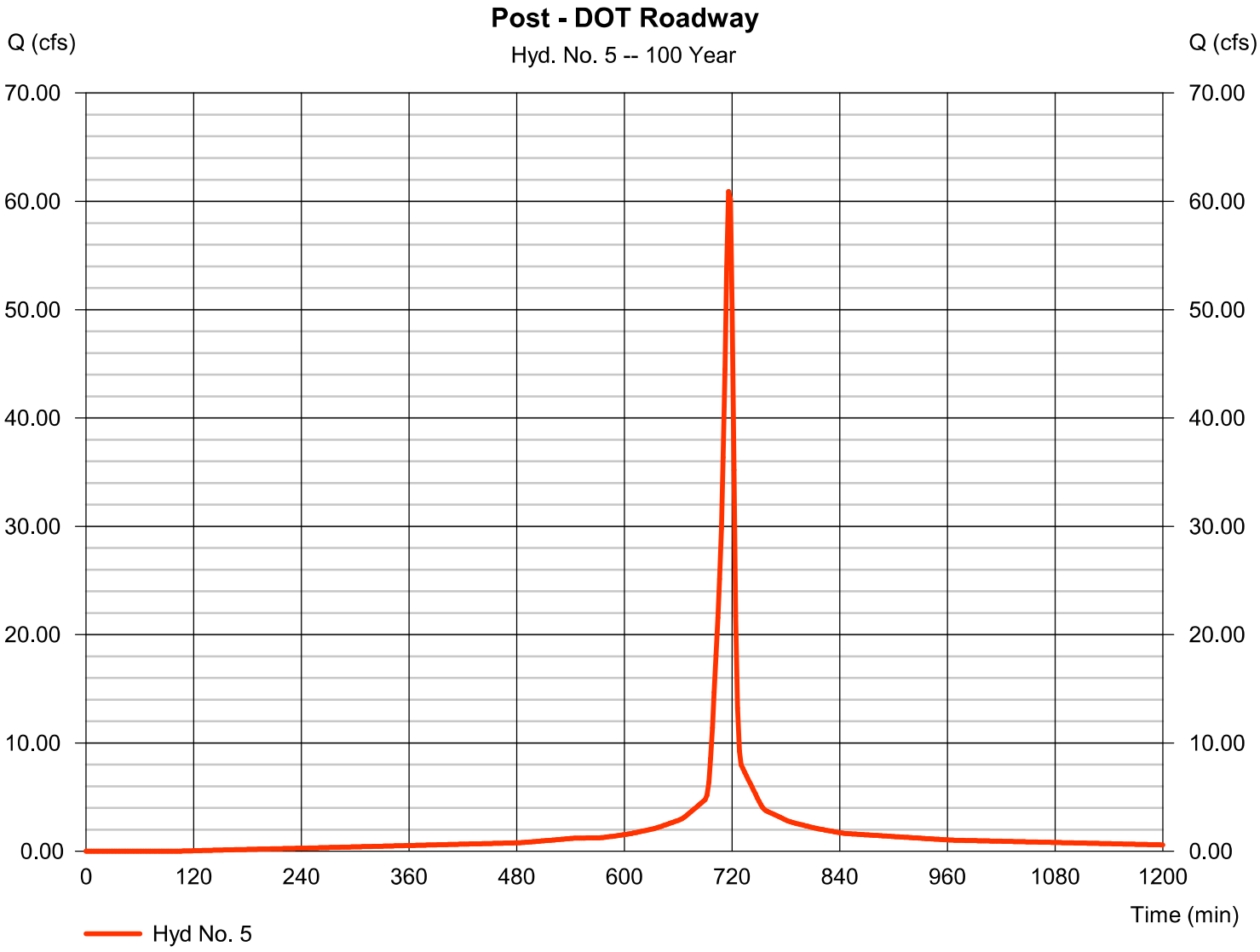


Hyd. No. 5

Post - DOT Roadway

Hydrograph type	=	SCS Runoff	Peak discharge	=	60.91 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	146,401 cuft
Drainage area	=	6.450 ac	Curve number	=	94*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	7.44 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	400

* Composite (Area/CN) = [(4.960 x 98) + (1.490 x 80)] / 6.450



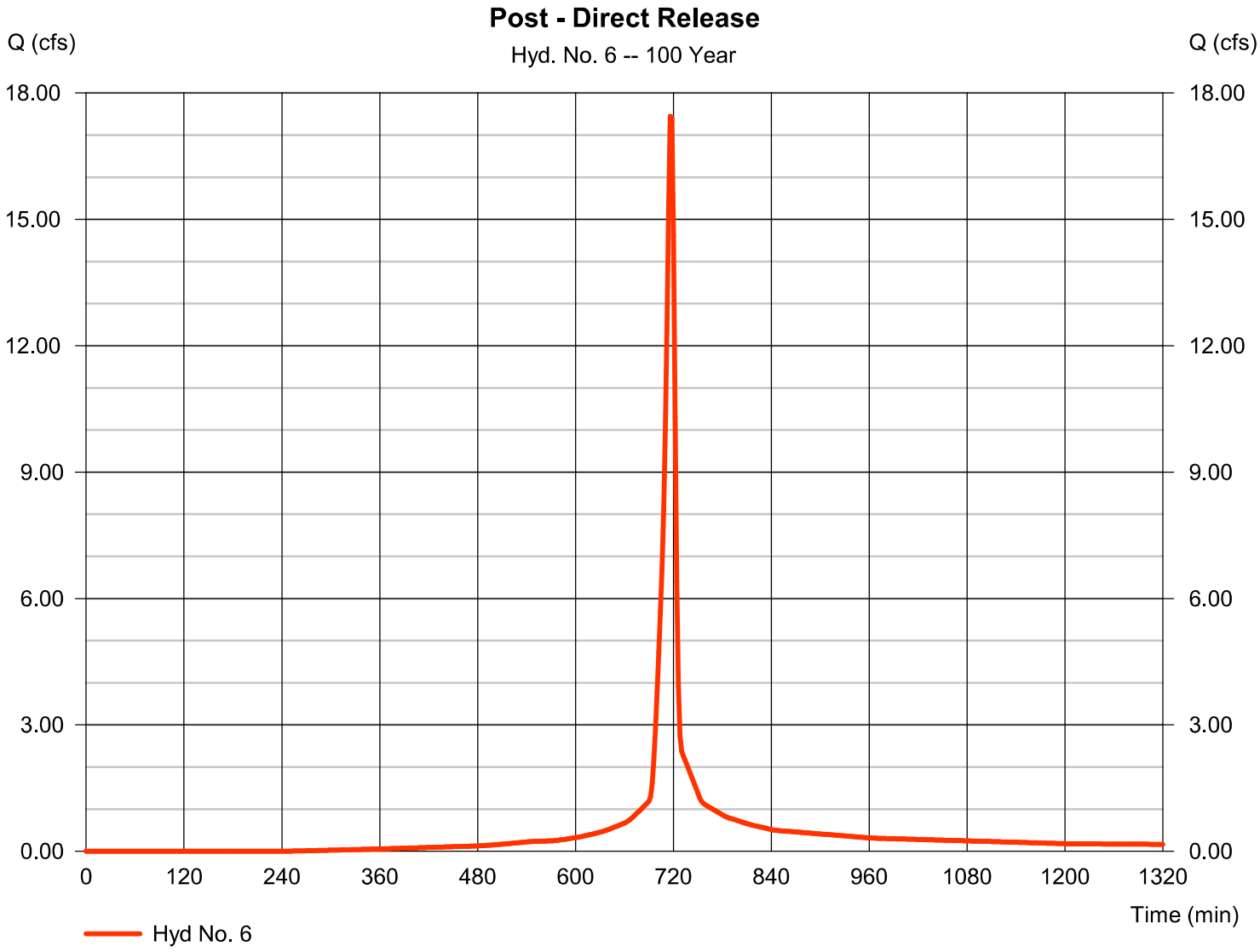
Hydrograph Report

Hyd. No. 6

Post - Direct Release

Hydrograph type	= SCS Runoff	Peak discharge	= 17.45 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 39,067 cuft
Drainage area	= 2.040 ac	Curve number	= 85*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.44 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(1.480 x 80) + (0.560 x 98)] / 2.040



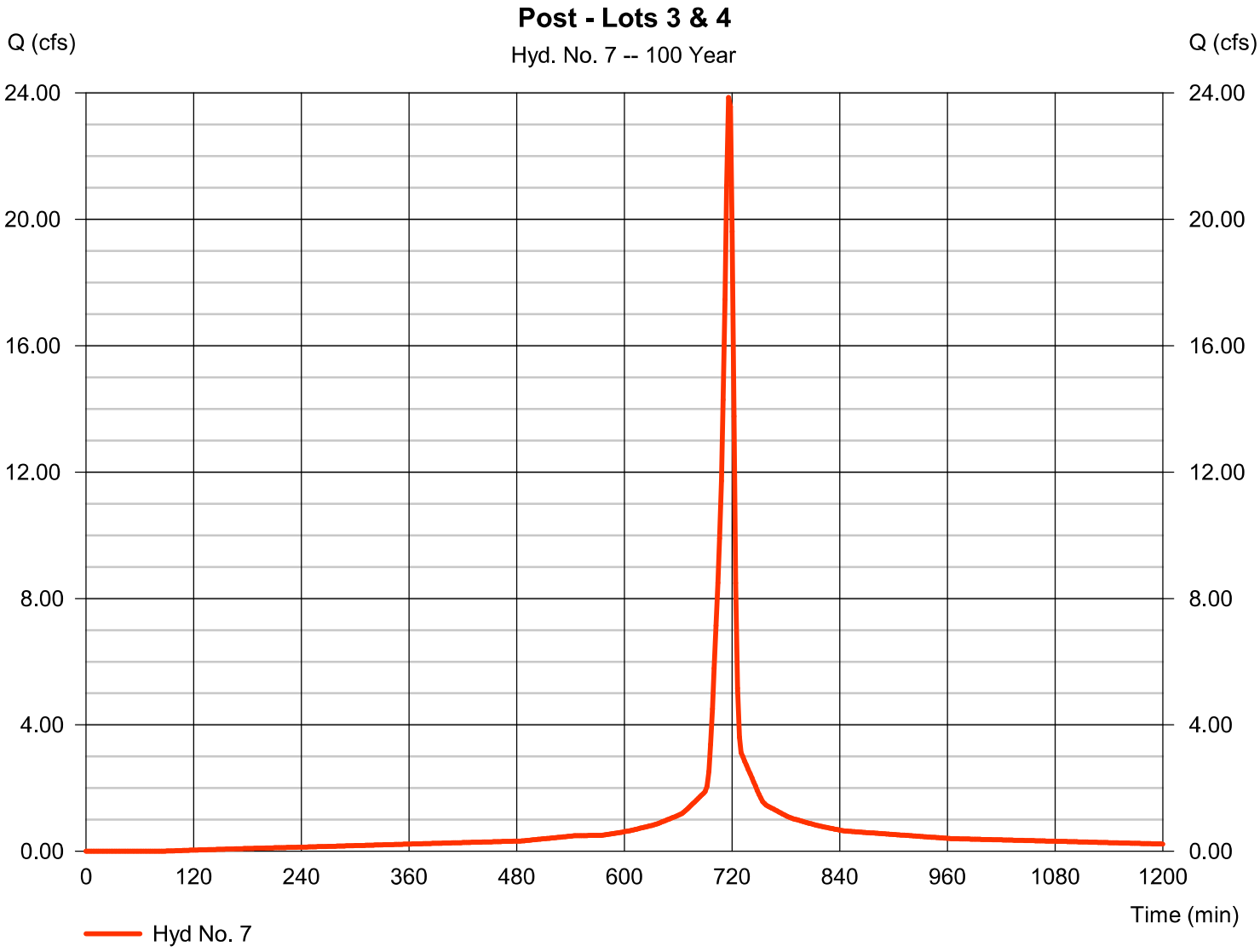
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Thursday, 09 / 21 / 2023

Hyd. No. 7

Post - Lots 3 & 4

Hydrograph type	= SCS Runoff	Peak discharge	= 23.86 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 57,974 cuft
Drainage area	= 2.510 ac	Curve number	= 95*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.44 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

* Composite (Area/CN) = [(0.320 x 98) + (1.810 x 98) + (0.380 x 80)] / 2.510



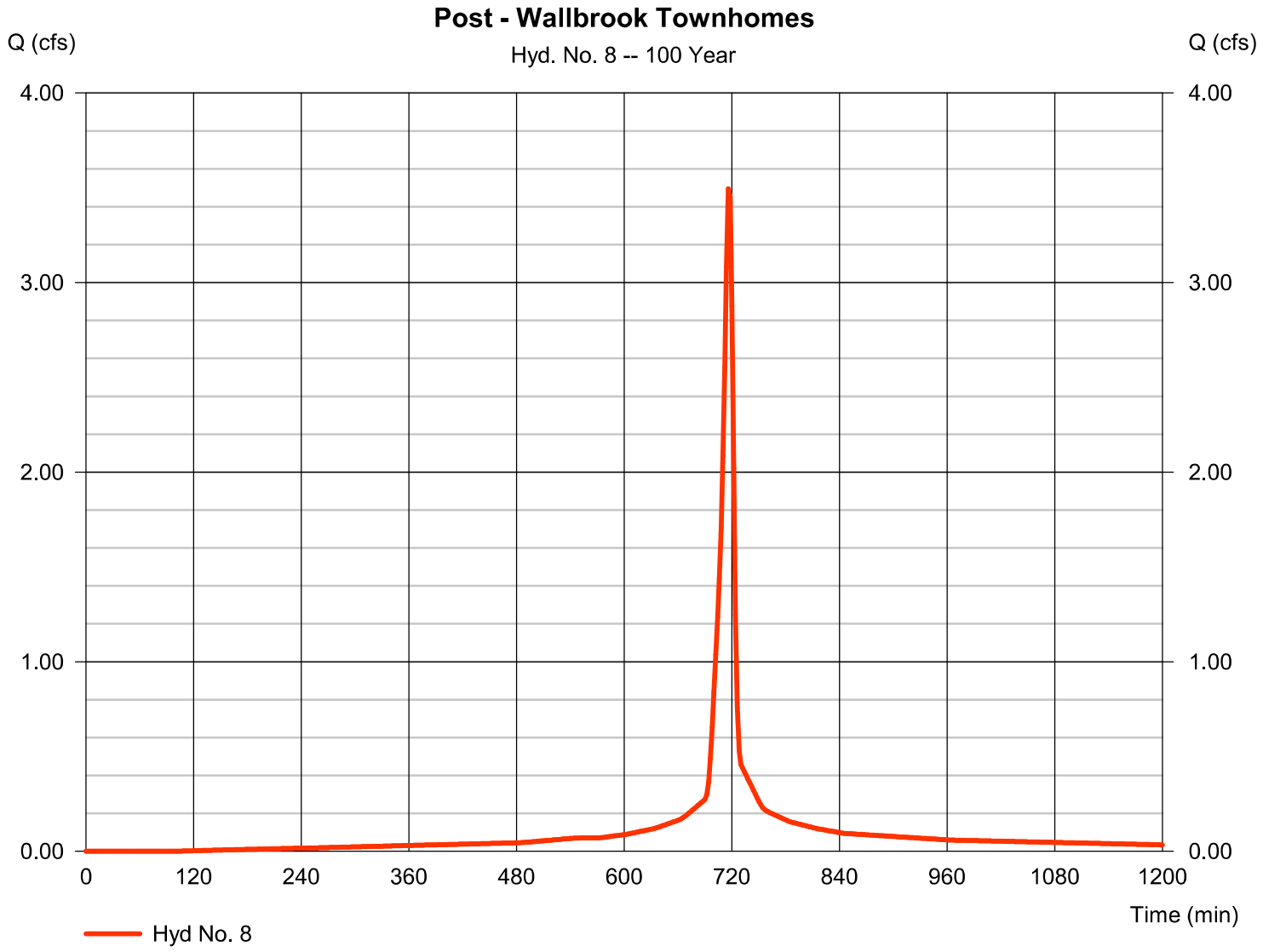
Hydrograph Report

Hyd. No. 8

Post - Wallbrook Townhomes

Hydrograph type	= SCS Runoff	Peak discharge	= 3.494 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 8,398 cuft
Drainage area	= 0.370 ac	Curve number	= 94*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.44 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

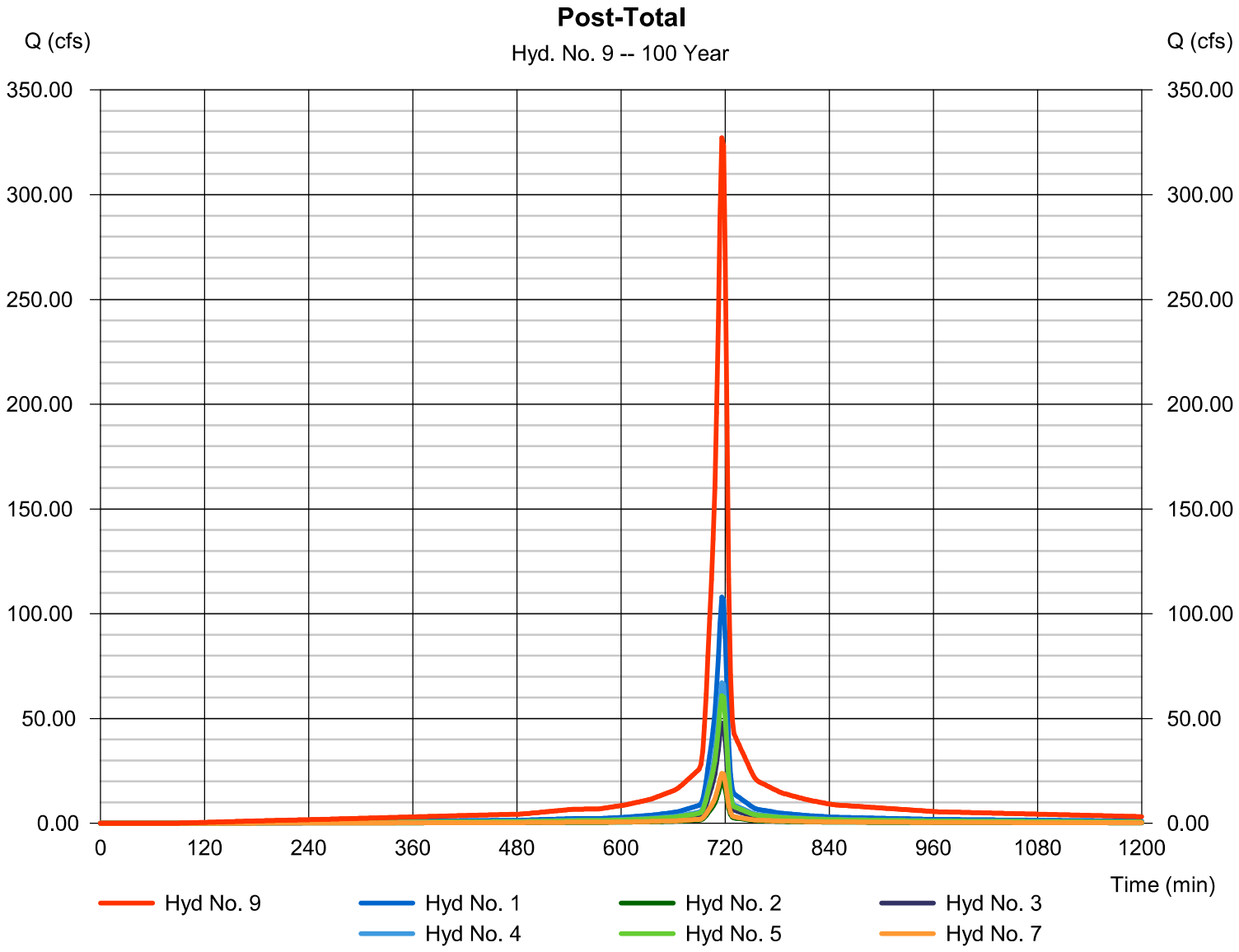
* Composite (Area/CN) = [(0.280 x 98) + (0.090 x 80)] / 0.370



Hyd. No. 9

Post-Total

Hydrograph type	=	Combine	Peak discharge	=	327.23 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	792,846 cuft
Inflow hyds.	=	1, 2, 3, 4, 5, 7	Contrib. drain. area	=	34.490 ac

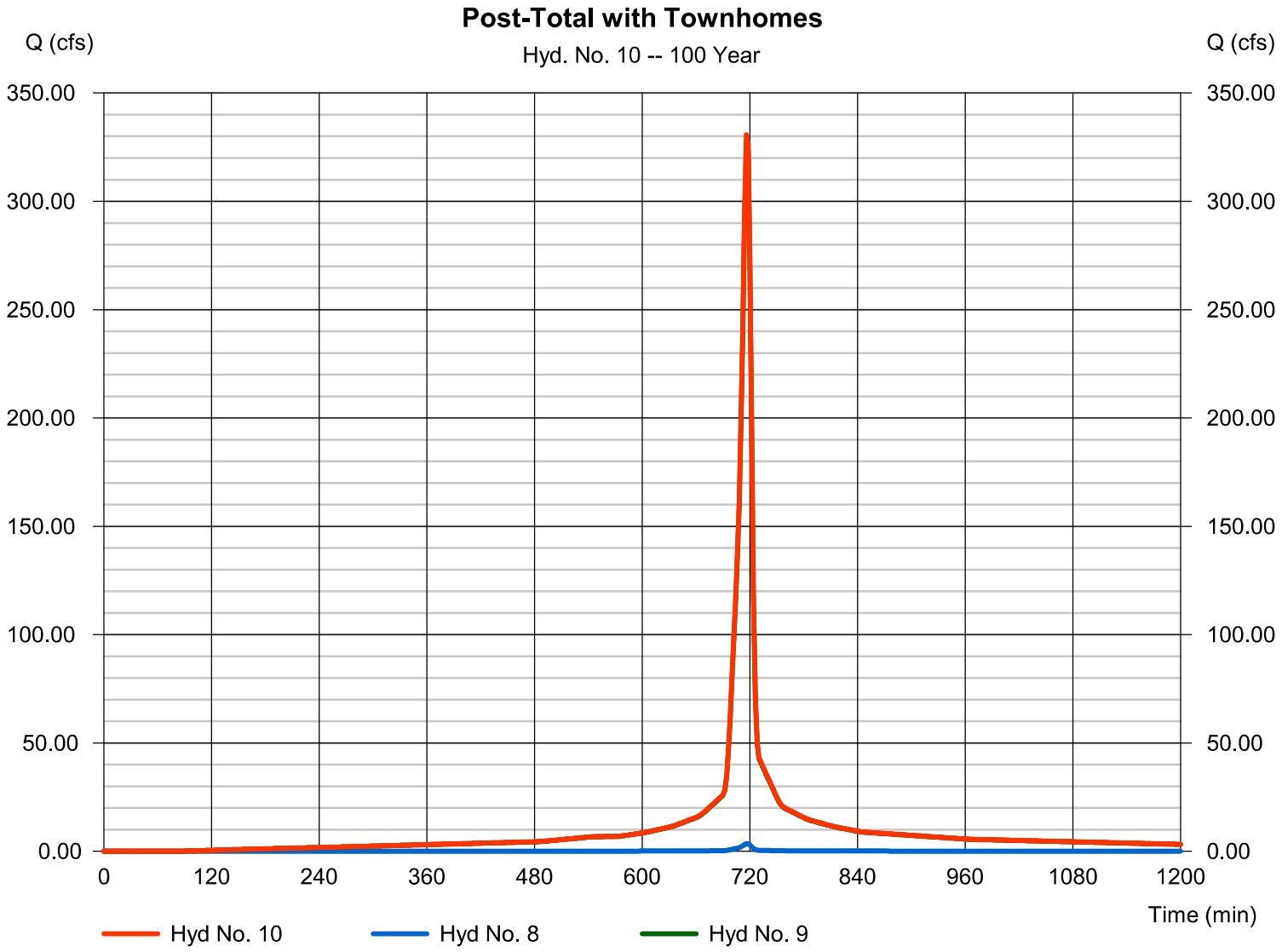


Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Thursday, 09 / 21 / 2023

Hyd. No. 10

Post-Total with Townhomes

Hydrograph type	= Combine	Peak discharge	= 330.72 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 801,244 cuft
Inflow hyds.	= 8, 9	Contrib. drain. area	= 0.370 ac



Hydrograph Report

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

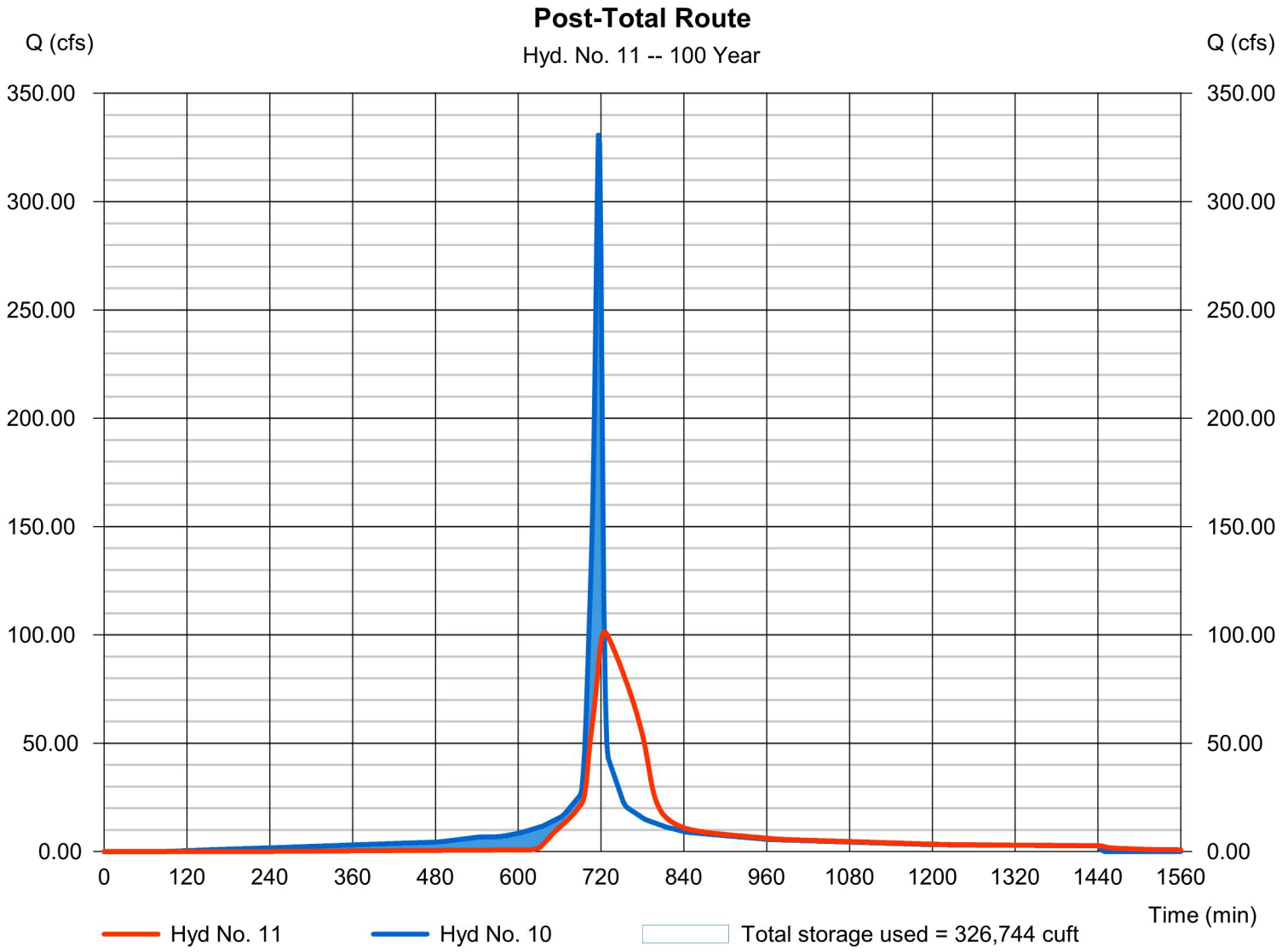
Thursday, 09 / 21 / 2023

Hyd. No. 11

Post-Total Route

Hydrograph type	= Reservoir	Peak discharge	= 101.43 cfs
Storm frequency	= 100 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 795,559 cuft
Inflow hyd. No.	= 10 - Post-Total with Townhomes	Max. Elevation	= 367.88 ft
Reservoir name	= Wet Pond 1	Max. Storage	= 326,744 cuft

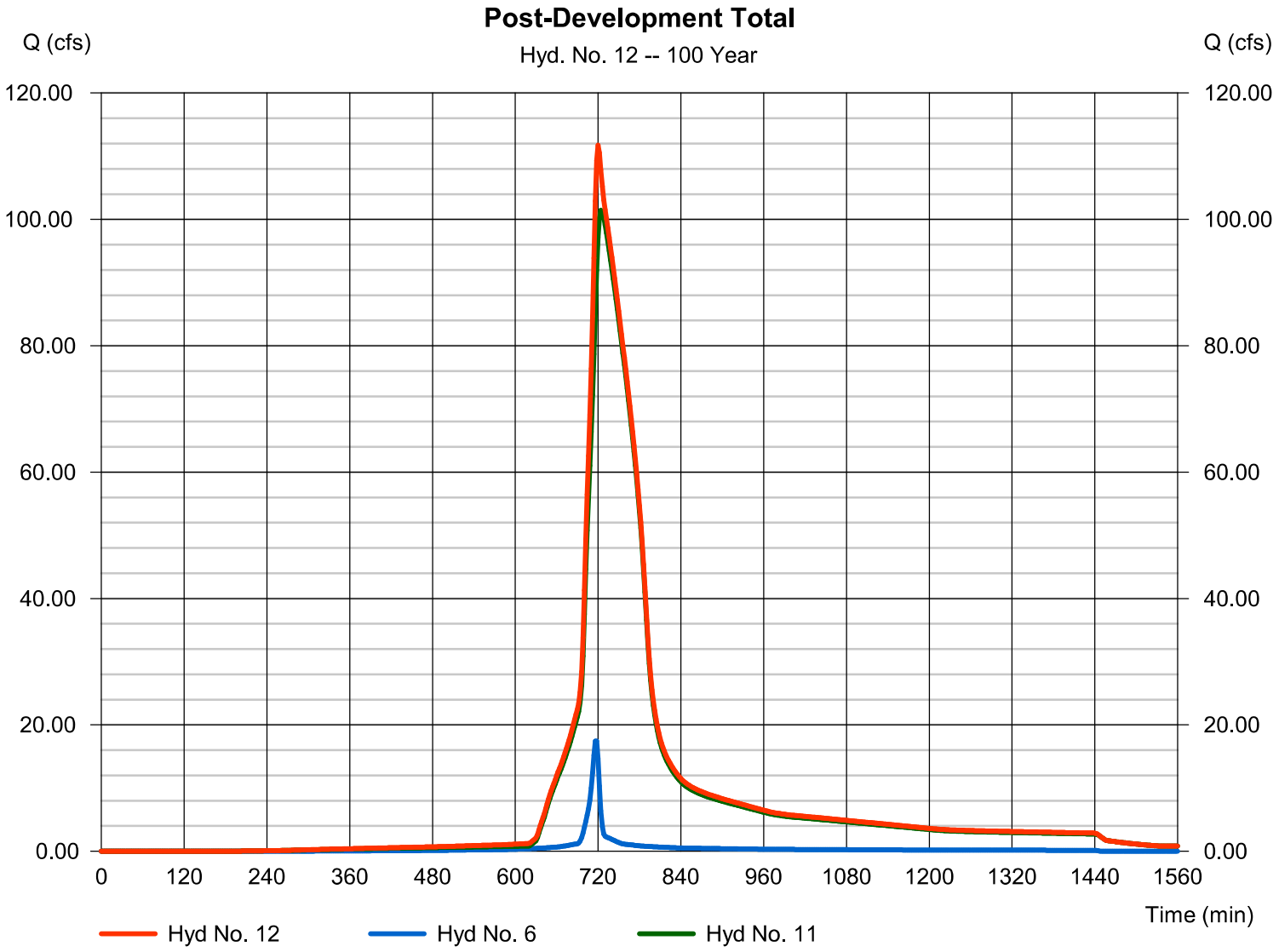
Storage Indication method used.



Hyd. No. 12

Post-Development Total

Hydrograph type	= Combine	Peak discharge	= 111.72 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 834,626 cuft
Inflow hyds.	= 6, 11	Contrib. drain. area	= 2.040 ac



Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	62.1764	12.7000	0.8901	--------
2	71.2172	12.9000	0.8806	--------
3	0.0000	0.0000	0.0000	--------
5	68.4975	12.5000	0.8273	--------
10	73.1091	12.6000	0.8093	--------
25	2164.2561	37.3000	1.4976	--------
50	56.2148	10.1000	0.6951	--------
100	50.1117	8.9000	0.6500	--------

File name: Rolesville.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	4.82	3.86	3.23	2.79	2.46	2.20	1.99	1.82	1.68	1.56	1.46	1.37
2	5.61	4.52	3.80	3.28	2.90	2.60	2.36	2.16	2.00	1.86	1.74	1.63
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.42	5.21	4.42	3.85	3.42	3.08	2.81	2.59	2.40	2.24	2.10	1.98
10	7.18	5.86	4.99	4.36	3.88	3.51	3.21	2.96	2.75	2.57	2.42	2.28
25	7.94	6.72	5.78	5.04	4.45	3.96	3.56	3.22	2.93	2.68	2.47	2.28
50	8.52	6.98	5.98	5.27	4.74	4.32	3.98	3.70	3.46	3.26	3.08	2.93
100	9.06	7.42	6.37	5.63	5.07	4.64	4.29	4.00	3.75	3.54	3.36	3.20

Tc = time in minutes. Values may exceed 60.

Precip. file name: D:\Ark Dropbox\03 - Support\Software\Hydraflow\Rolesville.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	2.86	3.45	0.00	4.32	5.01	5.94	6.69	7.44
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Watershed Model Schematic

Legend

Hyd.	Origin	Description
1	SCS Runoff	Pre-Dev Lots 3 & 4
2	SCS Runoff	Post-Dev Lots 3 & 4

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	5.679	8.235	-------	12.27	15.60	20.21	23.99	27.79	Pre-Dev Lots 3 & 4
2	SCS Runoff	------	4.051	5.675	-------	8.188	10.24	13.05	15.33	17.62	Post-Dev Lots 3 & 4

Hydrograph Summary Report

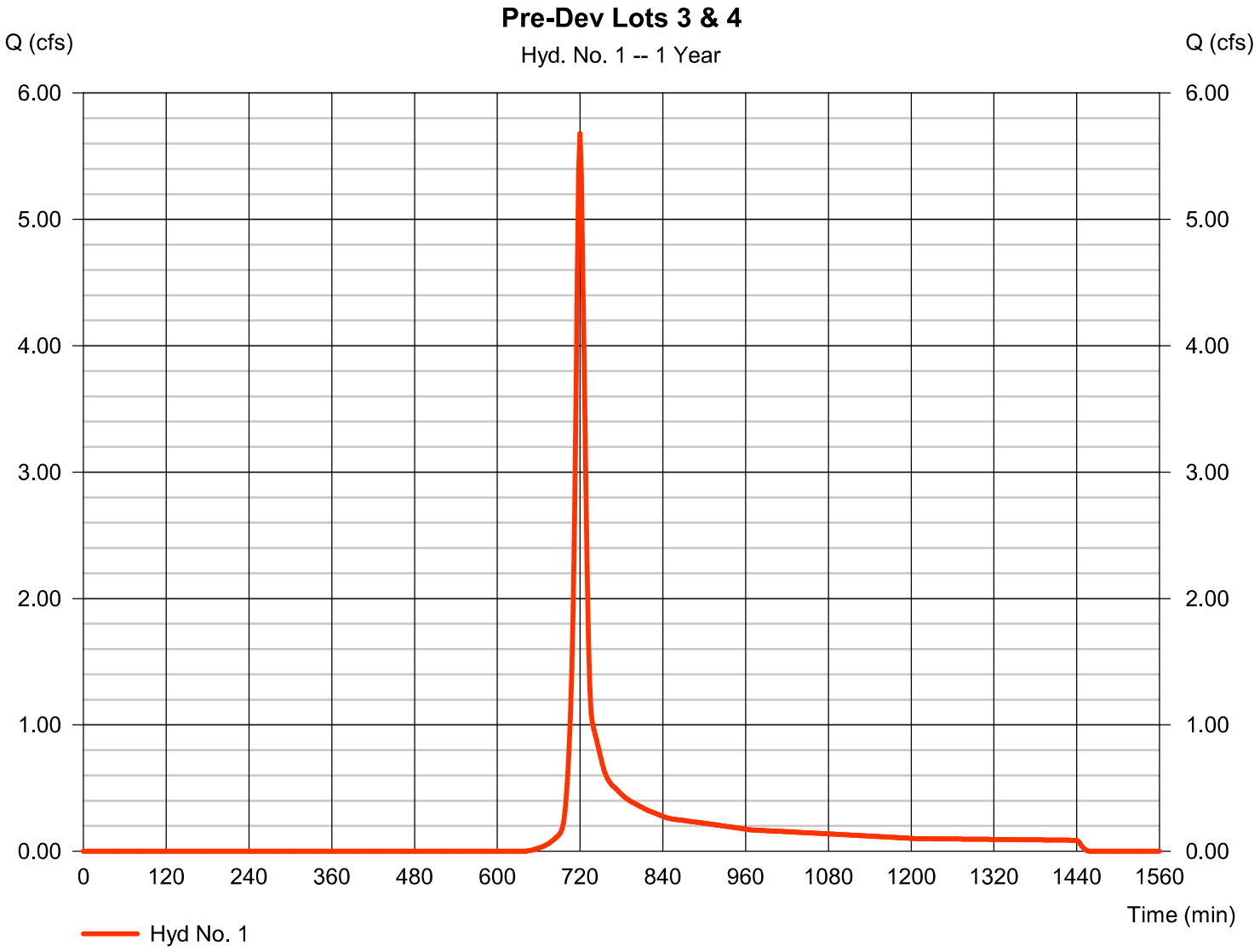
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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	SCS Runoff	5.679	2	720	14,299	------	------	------	Pre-Dev Lots 3 & 4
2	SCS Runoff	4.051	2	720	10,056	------	------	------	Post-Dev Lots 3 & 4

Hyd. No. 1

Pre-Dev Lots 3 & 4

Hydrograph type	= SCS Runoff	Peak discharge	= 5.679 cfs
Storm frequency	= 1 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 14,299 cuft
Drainage area	= 3.910 ac	Curve number	= 77
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 2.86 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

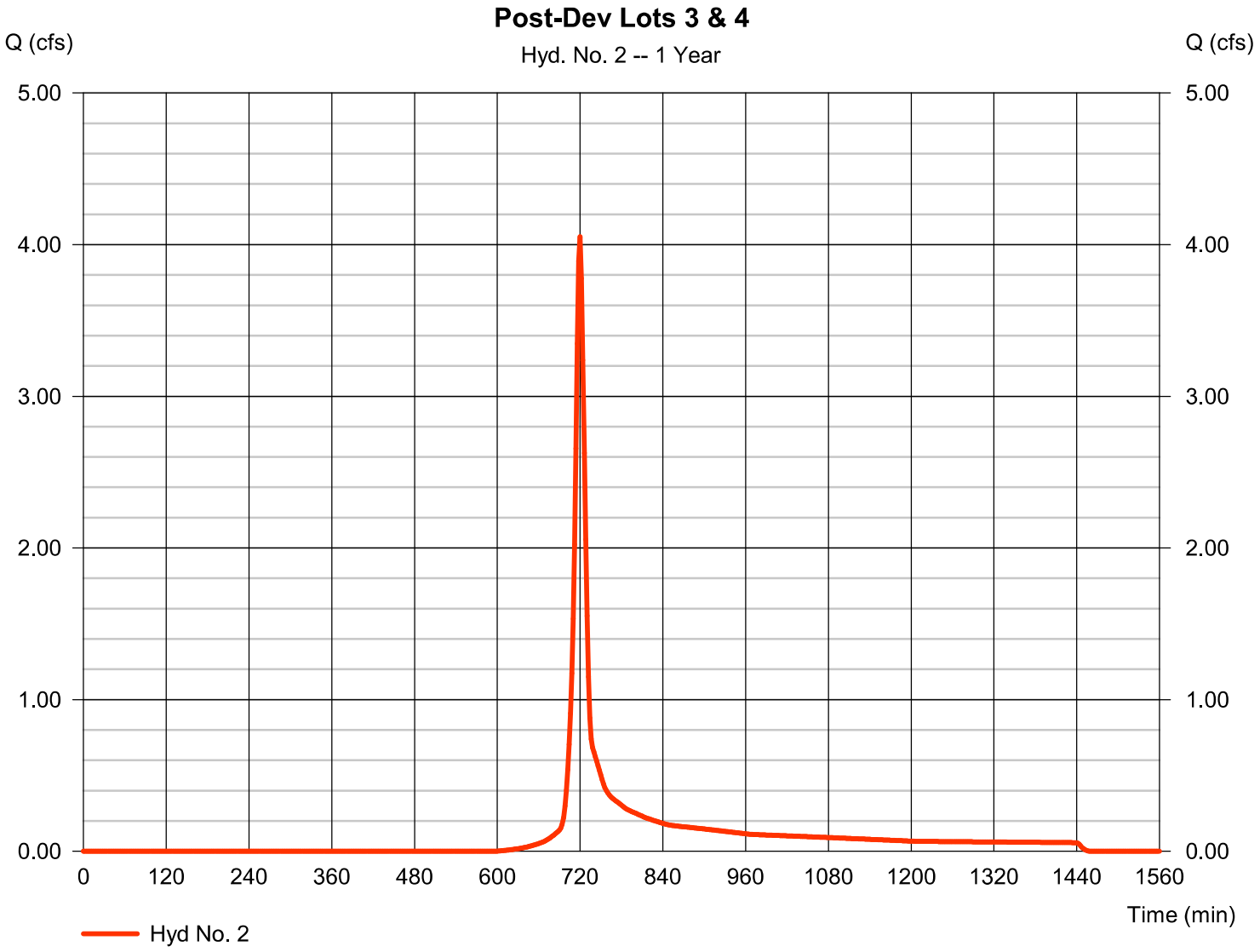


Hydrograph Report

Hyd. No. 2

Post-Dev Lots 3 & 4

Hydrograph type	= SCS Runoff	Peak discharge	= 4.051 cfs
Storm frequency	= 1 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 10,056 cuft
Drainage area	= 2.340 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.30 min
Total precip.	= 2.86 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400



Hydrograph Summary Report

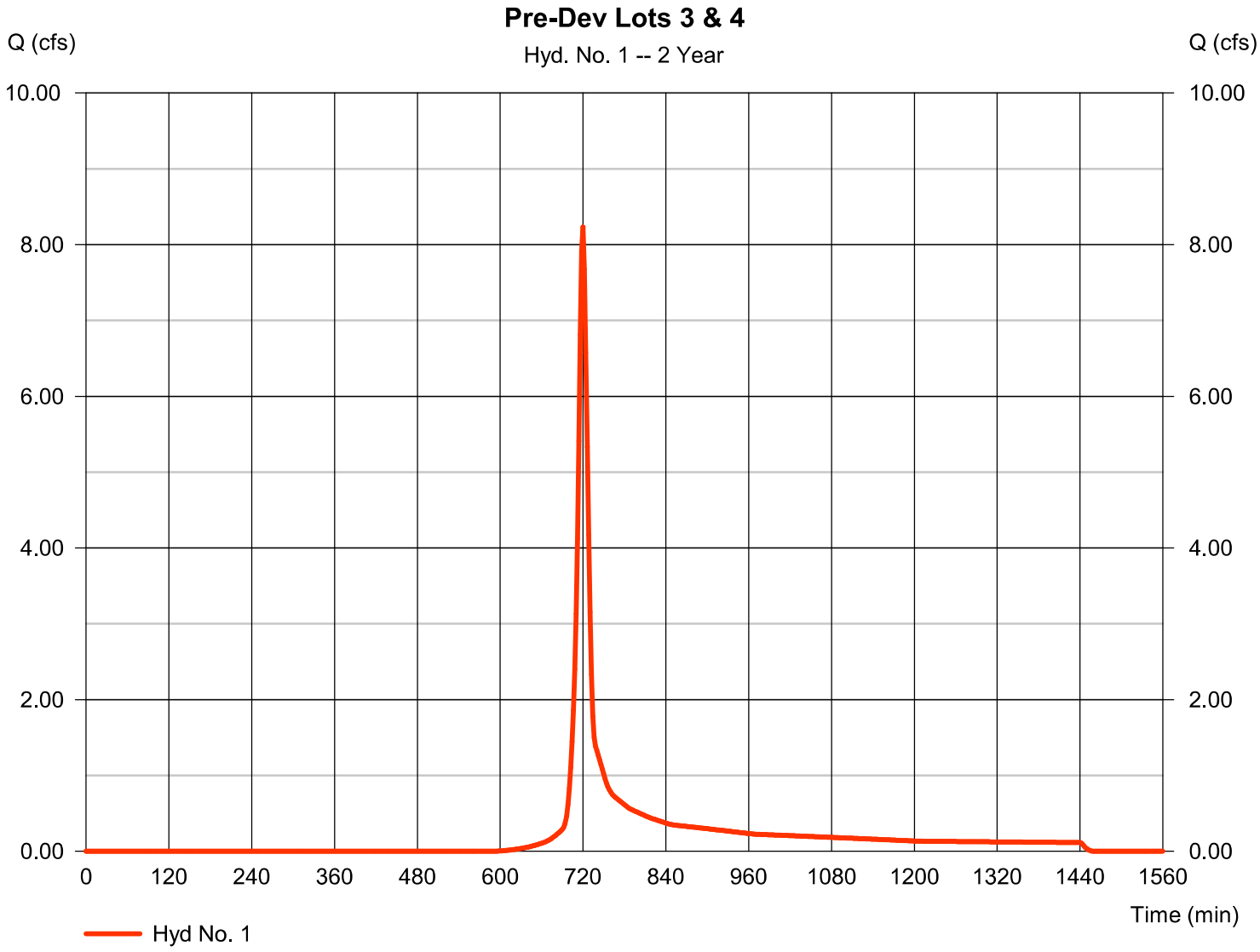
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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	SCS Runoff	8.235	2	720	20,432	------	------	------	Pre-Dev Lots 3 & 4
2	SCS Runoff	5.675	2	720	14,012	------	------	------	Post-Dev Lots 3 & 4

Hyd. No. 1

Pre-Dev Lots 3 & 4

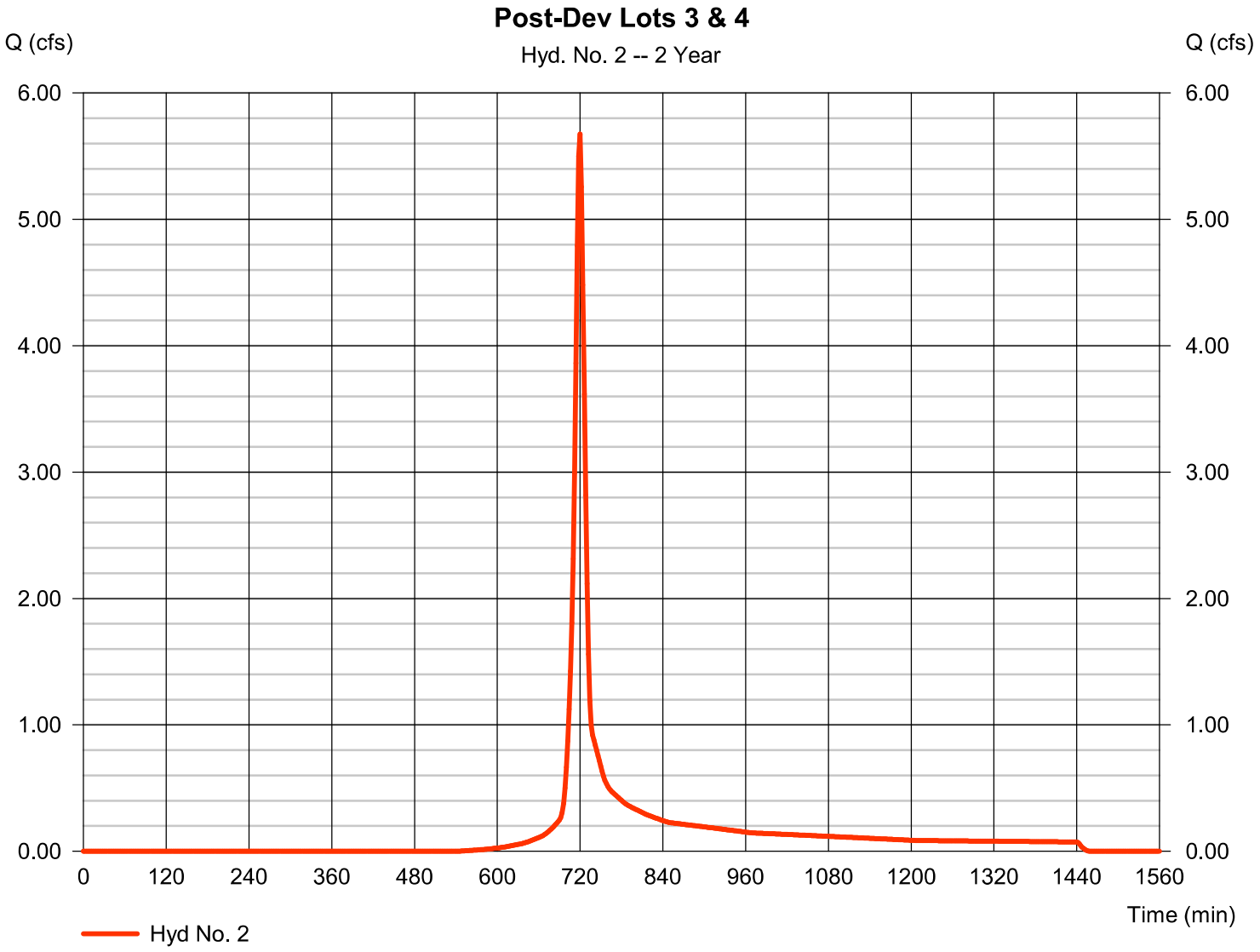
Hydrograph type	=	SCS Runoff	Peak discharge	=	8.235 cfs
Storm frequency	=	2 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	20,432 cuft
Drainage area	=	3.910 ac	Curve number	=	77
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.50 min
Total precip.	=	3.45 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	400



Hyd. No. 2

Post-Dev Lots 3 & 4

Hydrograph type	= SCS Runoff	Peak discharge	= 5.675 cfs
Storm frequency	= 2 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 14,012 cuft
Drainage area	= 2.340 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.30 min
Total precip.	= 3.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400



Hydrograph Summary Report

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

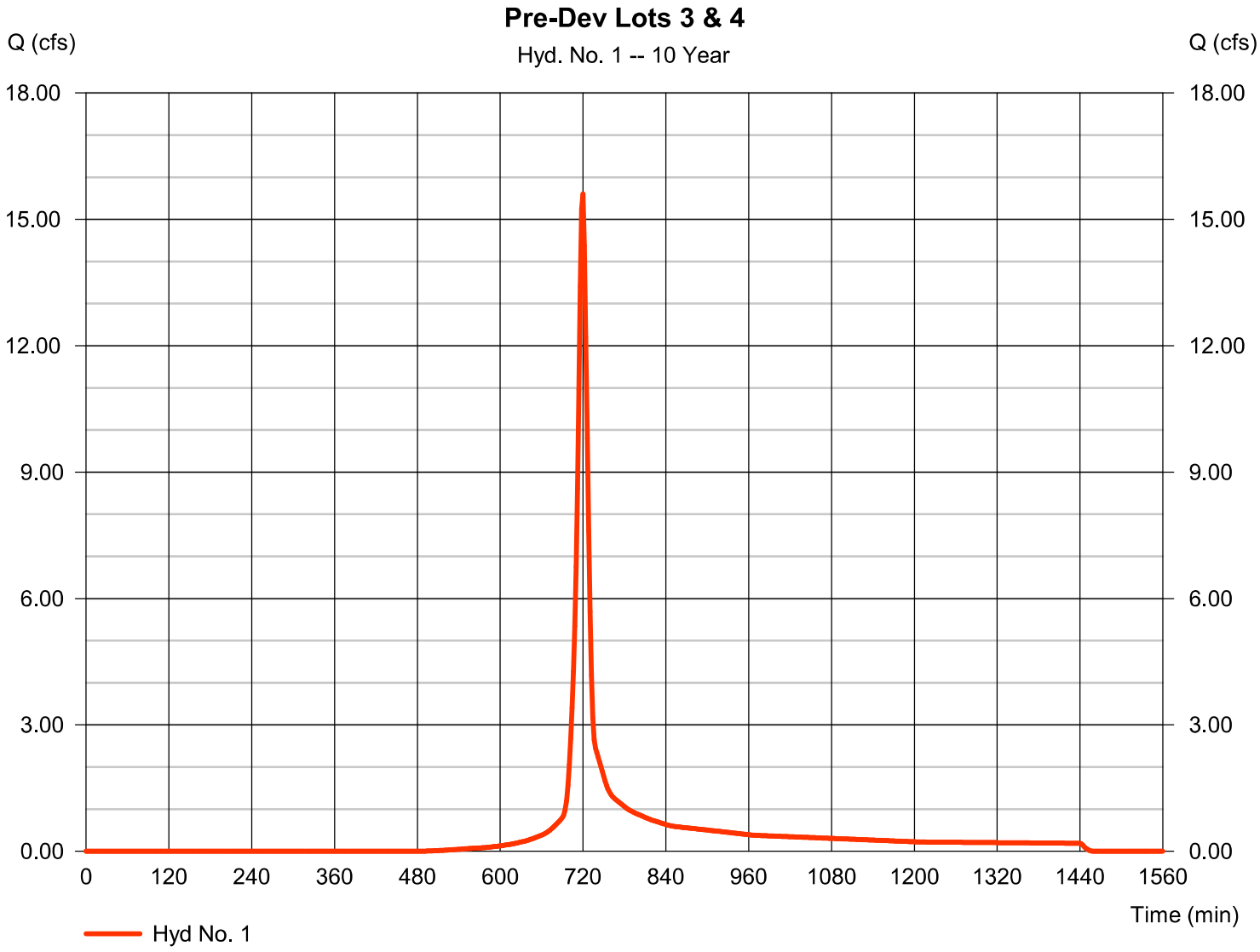
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	15.60	2	720	38,582	------	------	------	Pre-Dev Lots 3 & 4
2	SCS Runoff	10.24	2	720	25,461	------	------	------	Post-Dev Lots 3 & 4

Hydrograph Report

Hyd. No. 1

Pre-Dev Lots 3 & 4

Hydrograph type	= SCS Runoff	Peak discharge	= 15.60 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 38,582 cuft
Drainage area	= 3.910 ac	Curve number	= 77
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 5.01 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

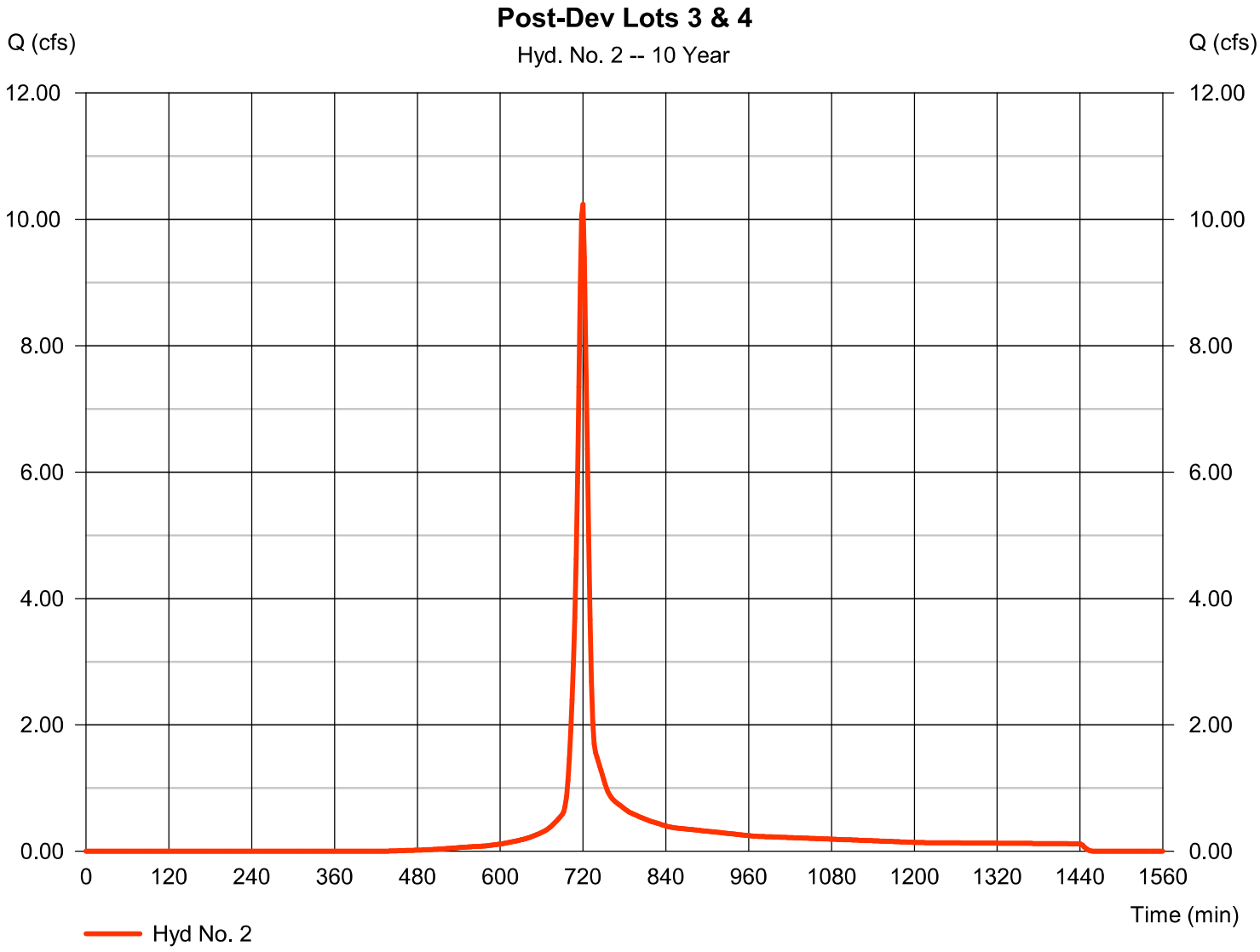


Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Sunday, 09 / 24 / 2023

Hyd. No. 2

Post-Dev Lots 3 & 4

Hydrograph type	= SCS Runoff	Peak discharge	= 10.24 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 25,461 cuft
Drainage area	= 2.340 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.30 min
Total precip.	= 5.01 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400



Hydrograph Summary Report

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

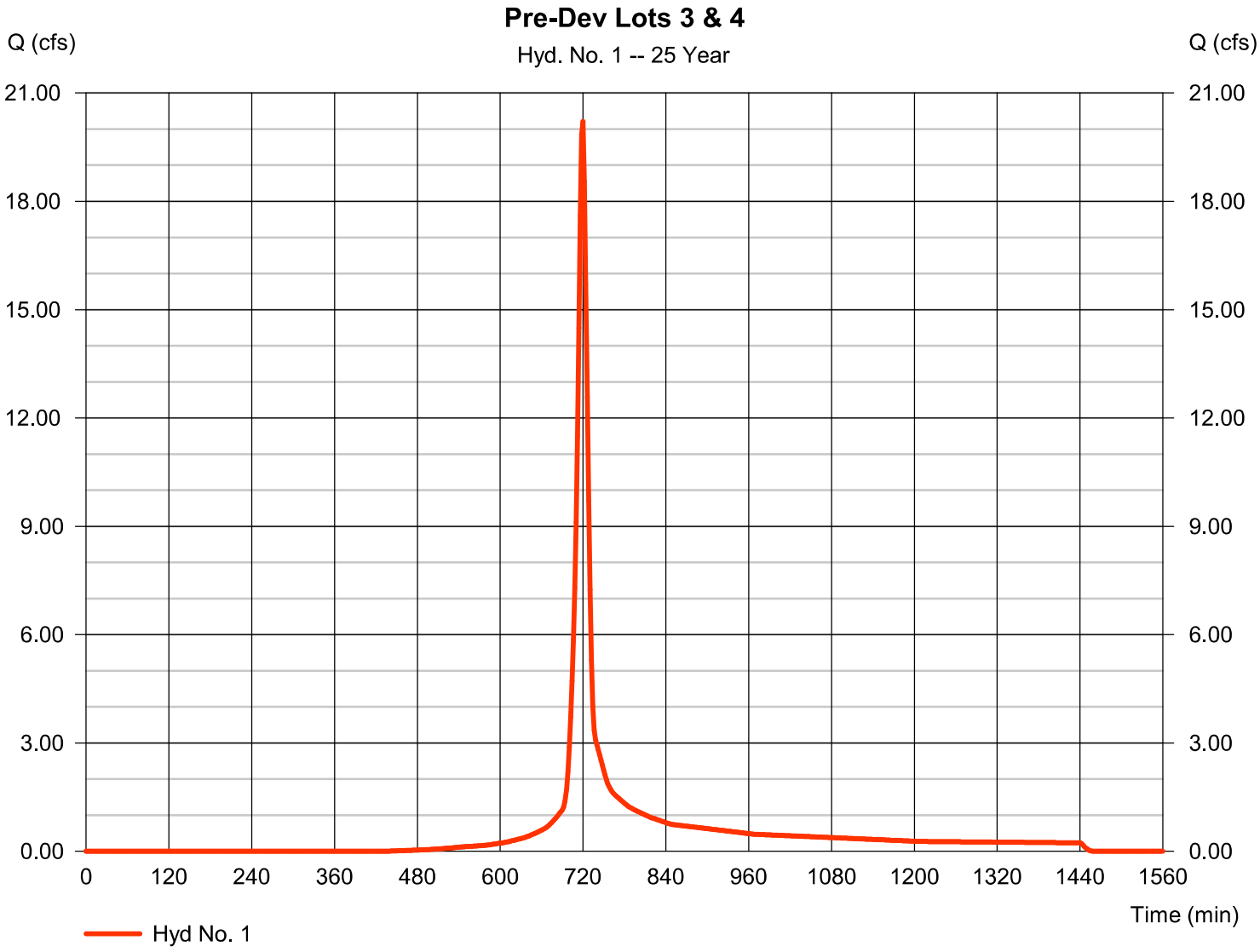
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	20.21	2	720	50,244	------	------	------	Pre-Dev Lots 3 & 4
2	SCS Runoff	13.05	2	720	32,706	------	------	------	Post-Dev Lots 3 & 4

Hydrograph Report

Hyd. No. 1

Pre-Dev Lots 3 & 4

Hydrograph type	= SCS Runoff	Peak discharge	= 20.21 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 50,244 cuft
Drainage area	= 3.910 ac	Curve number	= 77
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 5.94 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

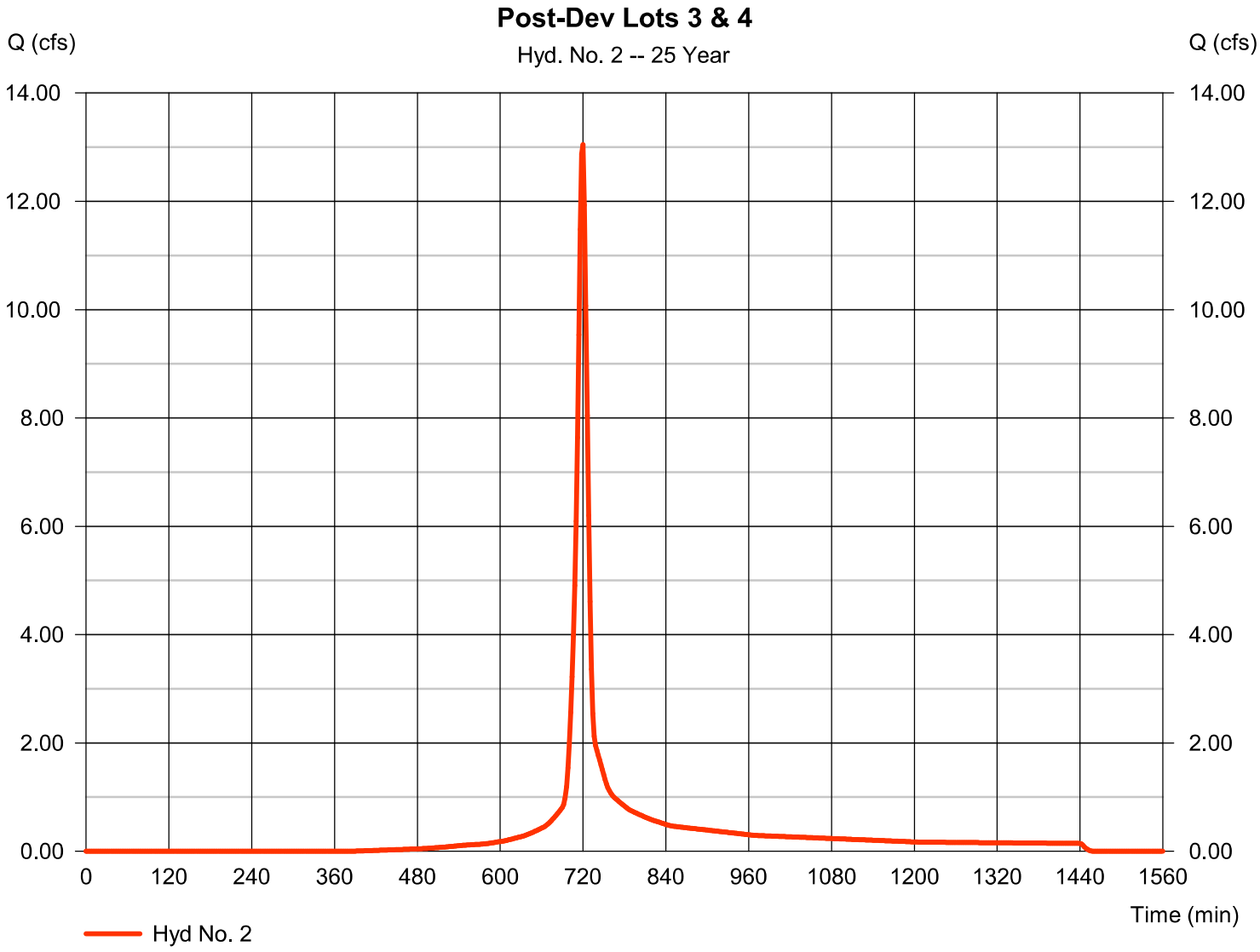


Hydrograph Report

Hyd. No. 2

Post-Dev Lots 3 & 4

Hydrograph type	= SCS Runoff	Peak discharge	= 13.05 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 32,706 cuft
Drainage area	= 2.340 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.30 min
Total precip.	= 5.94 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400



Hydrograph Summary Report

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

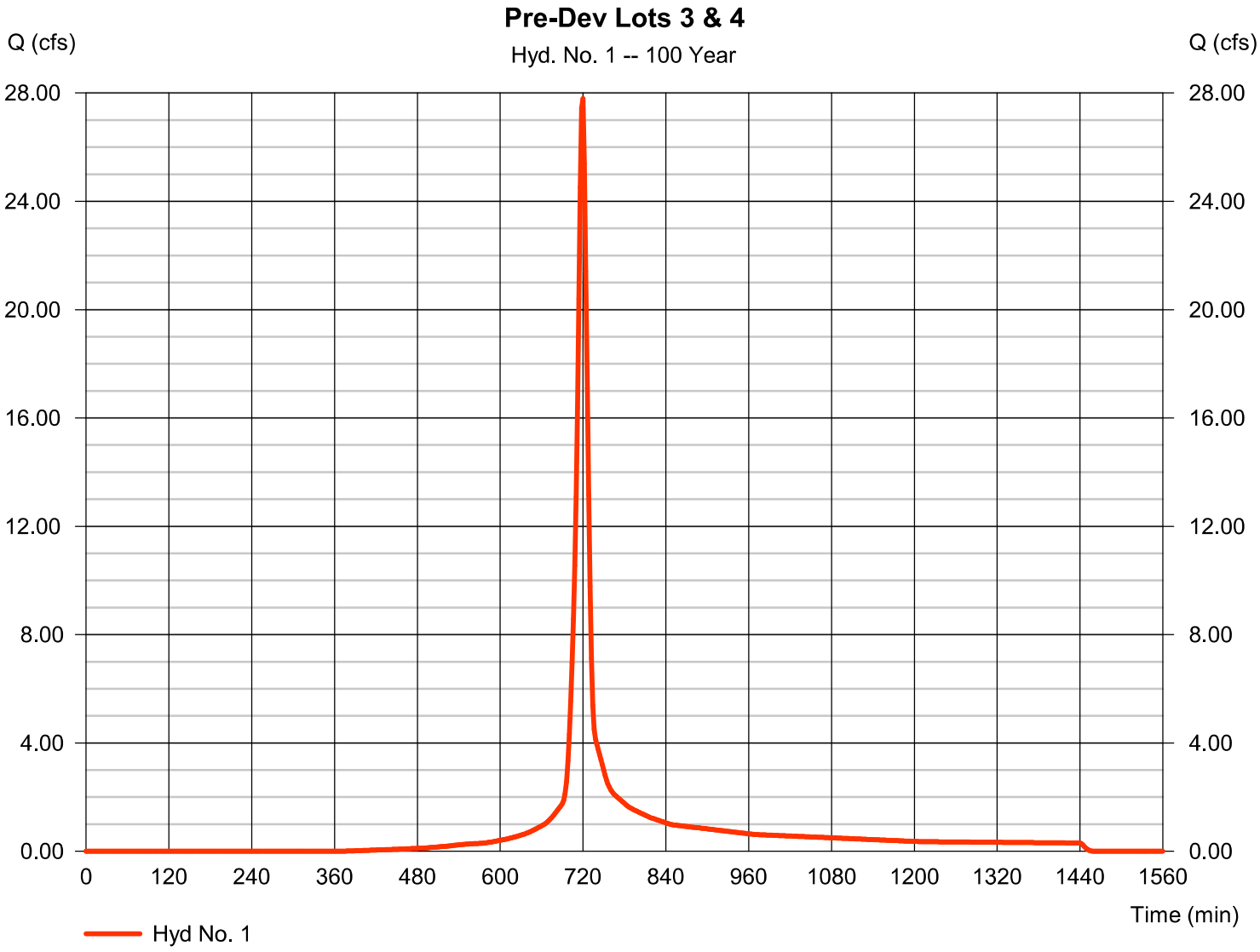
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	27.79	2	720	69,842	------	------	------	Pre-Dev Lots 3 & 4
2	SCS Runoff	17.62	2	720	44,771	------	------	------	Post-Dev Lots 3 & 4

Hydrograph Report

Hyd. No. 1

Pre-Dev Lots 3 & 4

Hydrograph type	= SCS Runoff	Peak discharge	= 27.79 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 69,842 cuft
Drainage area	= 3.910 ac	Curve number	= 77
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.50 min
Total precip.	= 7.44 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400

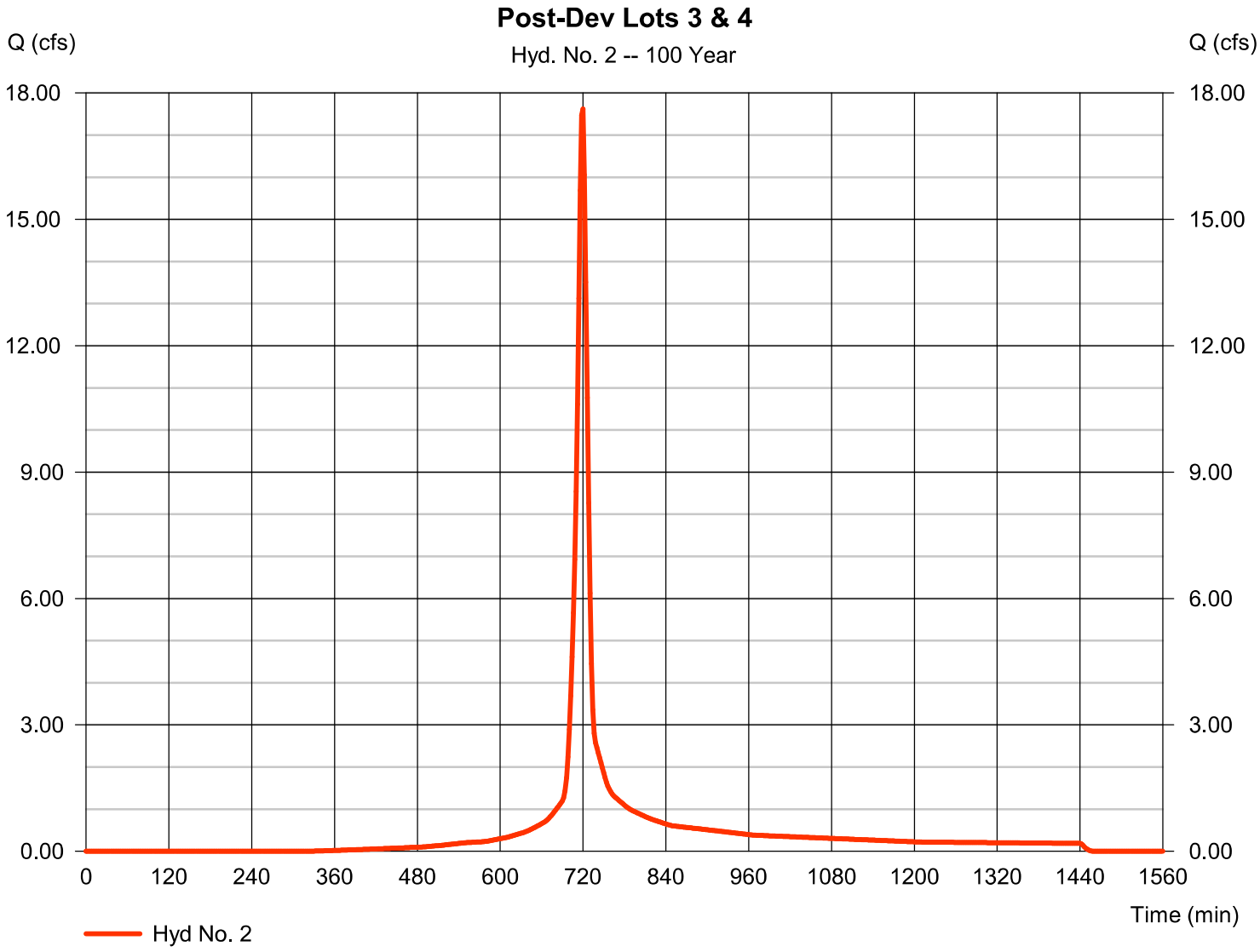


Hydrograph Report

Hyd. No. 2

Post-Dev Lots 3 & 4

Hydrograph type	= SCS Runoff	Peak discharge	= 17.62 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 44,771 cuft
Drainage area	= 2.340 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.30 min
Total precip.	= 7.44 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 400



Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	62.1764	12.7000	0.8901	--------
2	71.2172	12.9000	0.8806	--------
3	0.0000	0.0000	0.0000	--------
5	68.4975	12.5000	0.8273	--------
10	73.1091	12.6000	0.8093	--------
25	2164.2561	37.3000	1.4976	--------
50	56.2148	10.1000	0.6951	--------
100	50.1117	8.9000	0.6500	--------

File name: Rolesville.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	4.82	3.86	3.23	2.79	2.46	2.20	1.99	1.82	1.68	1.56	1.46	1.37
2	5.61	4.52	3.80	3.28	2.90	2.60	2.36	2.16	2.00	1.86	1.74	1.63
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.42	5.21	4.42	3.85	3.42	3.08	2.81	2.59	2.40	2.24	2.10	1.98
10	7.18	5.86	4.99	4.36	3.88	3.51	3.21	2.96	2.75	2.57	2.42	2.28
25	7.94	6.72	5.78	5.04	4.45	3.96	3.56	3.22	2.93	2.68	2.47	2.28
50	8.52	6.98	5.98	5.27	4.74	4.32	3.98	3.70	3.46	3.26	3.08	2.93
100	9.06	7.42	6.37	5.63	5.07	4.64	4.29	4.00	3.75	3.54	3.36	3.20

Tc = time in minutes. Values may exceed 60.

Precip. file name: D:\Ark Dropbox\03 - Support\Software\Hydraflow\Rolesville.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	2.86	3.45	0.00	4.32	5.01	5.94	6.69	7.44
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

WALLBROOK

ROLESVILLE, WAKE COUNTY, NORTH CAROLINA

STORMWATER MANAGEMENT PLAN

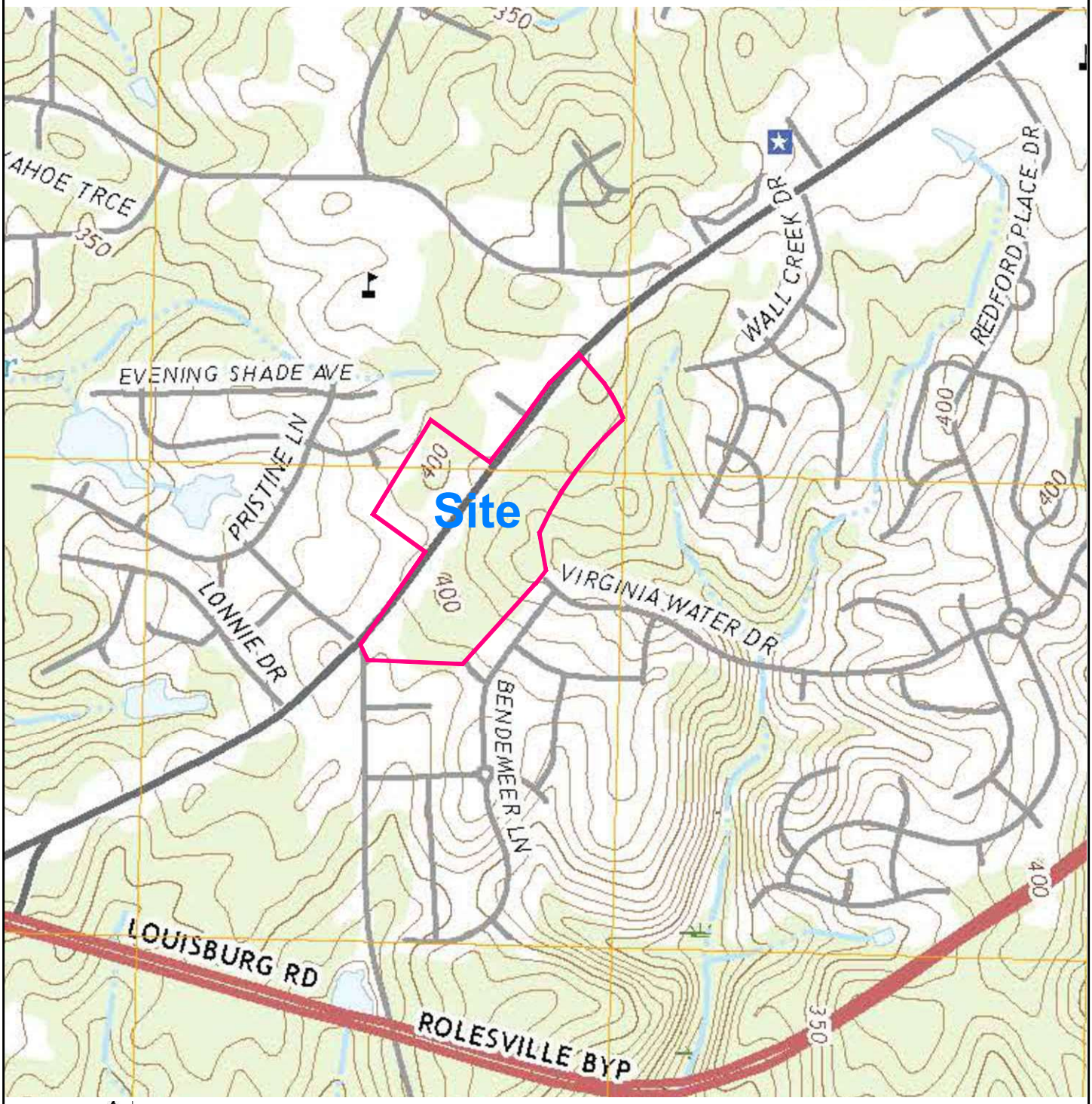
DRAWING NO. D-1219

MAPS

USGS
science for a changing world

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

ROLESVILLE QUADRANGLE
NORTH CAROLINA
7.5-MINUTE SERIES



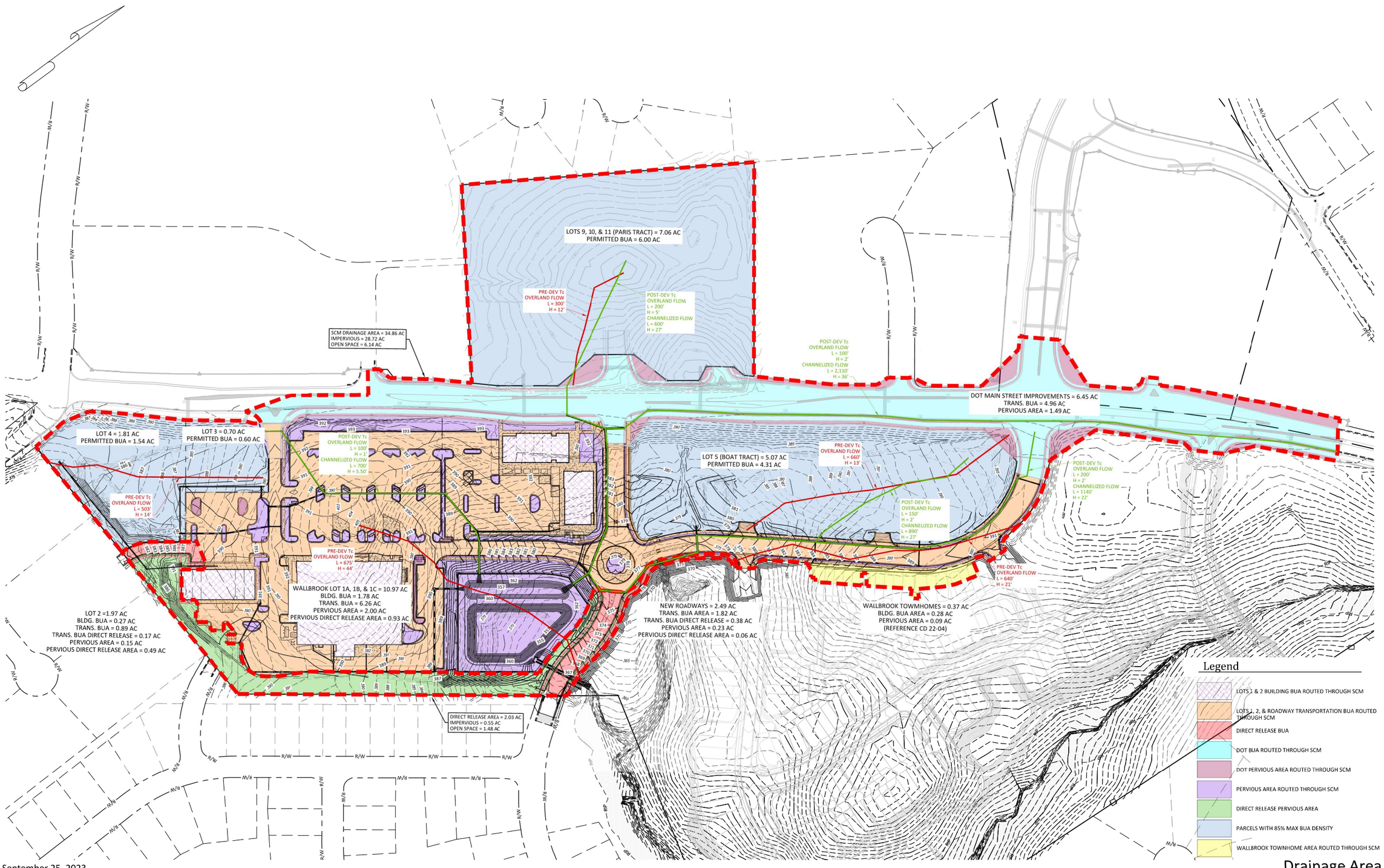
GN
9°28'
168 MILS
1½°
27 MILS
UTM GRID AND 2019 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

0 500 1000 2000 Feet
1:12000.000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

ROLESVILLE, NC
2019

Project Mgr.: BCF	Project No.: 21089	NC License: P-1199	SITE LOCATION PLAN	EXHIBIT
Drawn By: KLG	Scale: AS SHOWN	ARK CONSULTING GROUP, PLLC Engineers & Planners	**WALLBROOK**	A-1
Checked By: TGN	Date: 03/24/2022	2755-B Charles Blvd. | Greenville, NC 27858	**EROSION CONTROL PLAN**	
			TOWN OF ROLESVILLE, WAKE COUNTY, NC	



September 25, 2023

Drainage Area Map

2755-B Charles Blvd.
Greenville, NC 27858
(252) 558-0888
www.arkconsultinggroup.com

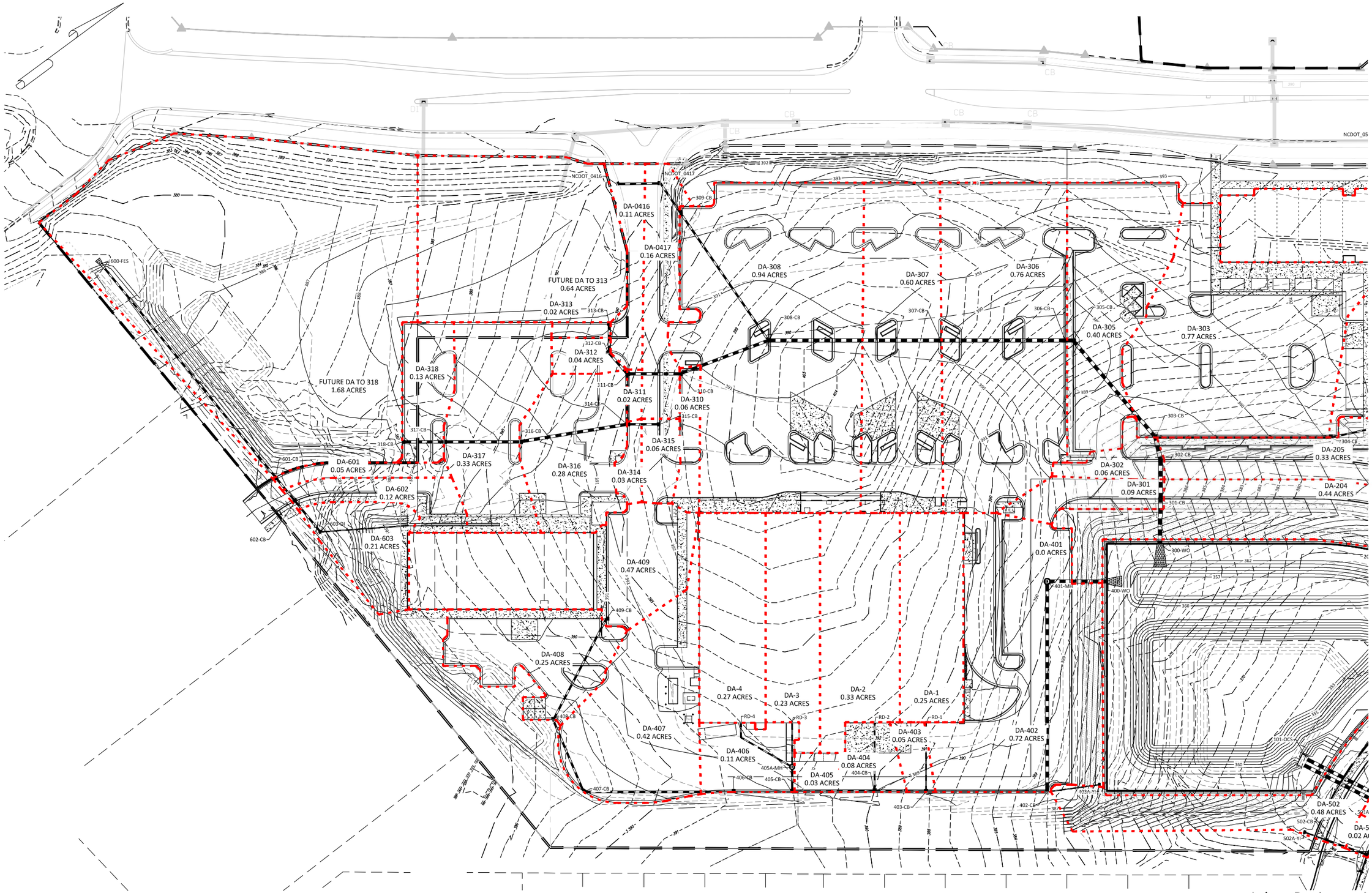
ARK CONSULTING GROUP, PLLC
ENGINEERS & PLANNERS
NC License: P-1199

100' 0 50' 100'
SCALE 1 inch = 100 ft

Wallbrook

US 401 / S. Main Street & Virginia Water Drive | Rolesville, NC

CROSLAND SOUTHEAST



September 25, 2023

Inlets Drainage Area Map

2755-B Charles Blvd.
Greenville, NC 27858
(252) 558-0888
www.arkconsultinggroup.com

NC License: P-1199
ARK CONSULTING GROUP, PLLC
ENGINEERS & PLANNERS

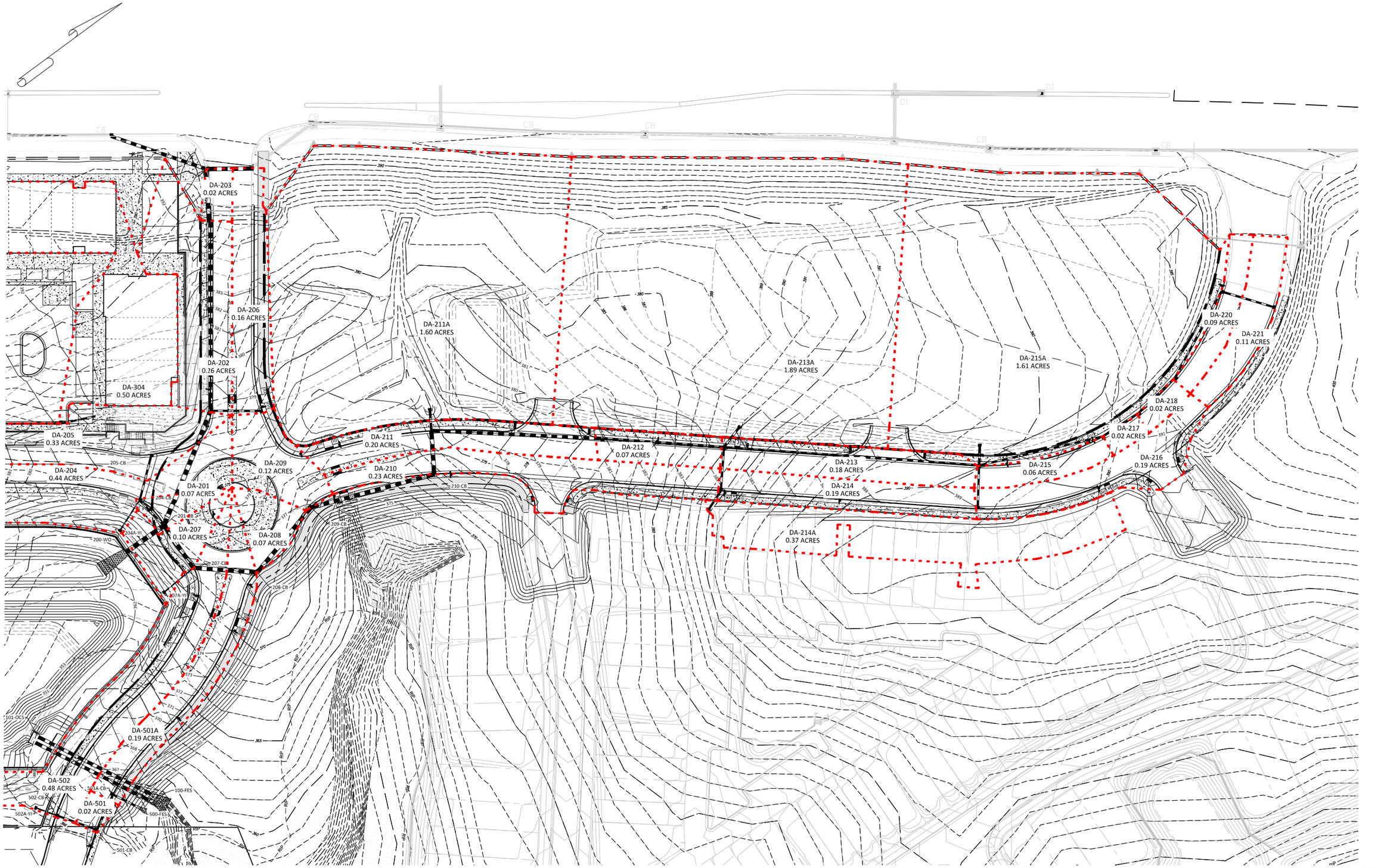
40' 0 20' 40'
SCALE 1 inch = 40 ft

Wallbrook

US 401 / S. Main Street & Virginia Water Drive | Rolesville, NC

CROSLAND SOUTHEAST

D:\ARK DROPBOX\01 - PROJECTS\ACTIVE\CROSLAND SE\21089 - WALLBROOK SHOP CTR\0 - DWG\03 - FINAL_XREF\DA_BMP.DWG, DA Map (2), Tim Nining, Tue, Sep 26, 2023 @ 3:41 PM



September 25, 2023

Inlets Drainage Area Map

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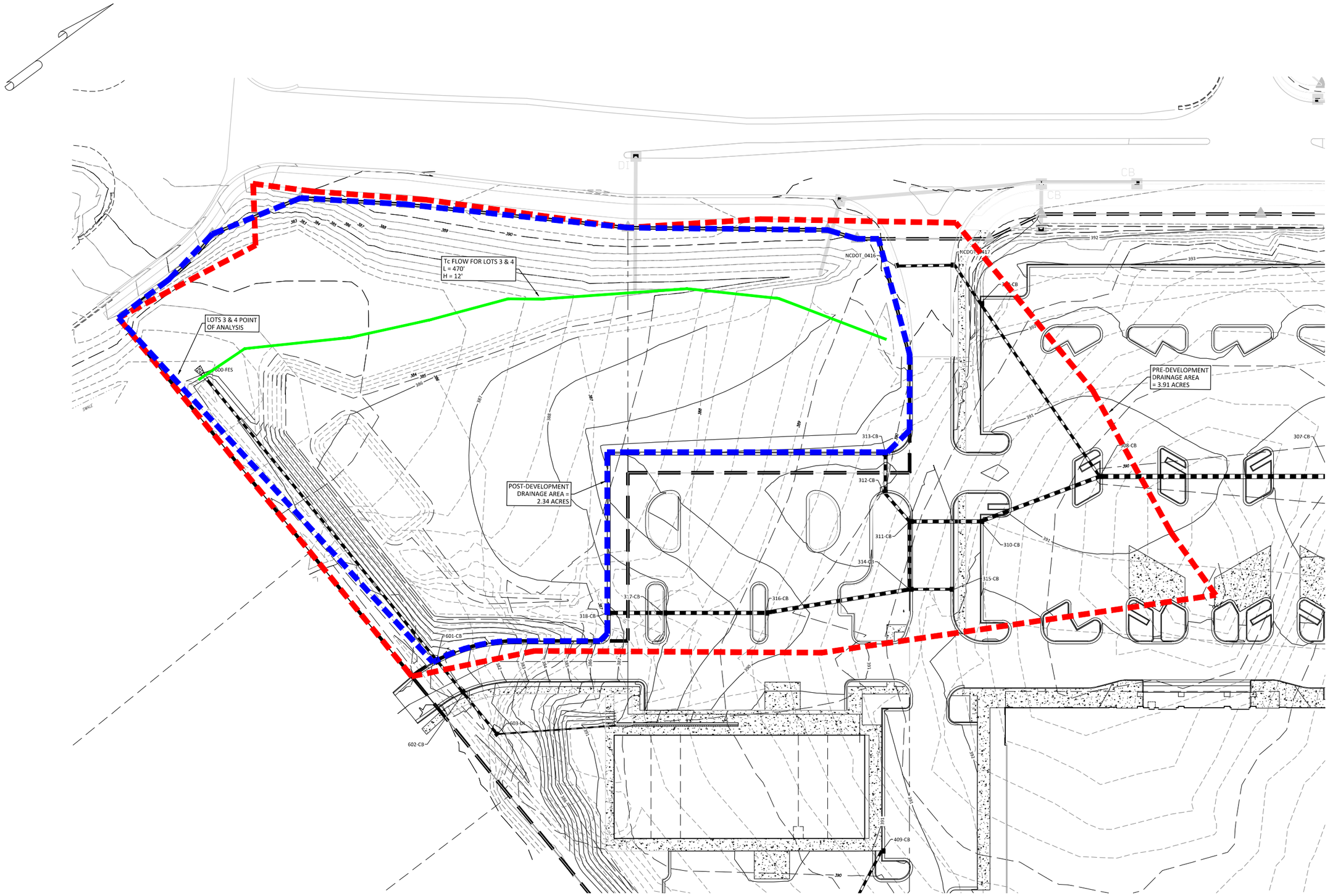
ENGINEERS & PLANNERS

40' 0 20' 40'
SCALE 1 inch = 40 ft

Wallbrook

US 401 / S. Main Street & Virginia Water Drive | Rolesville, NC

CROSLAND SOUTHEAST



September 25, 2023

Drainage Area Map - Lots 3 & 4

2755-B Charles Blvd.
Greenville, NC 27858
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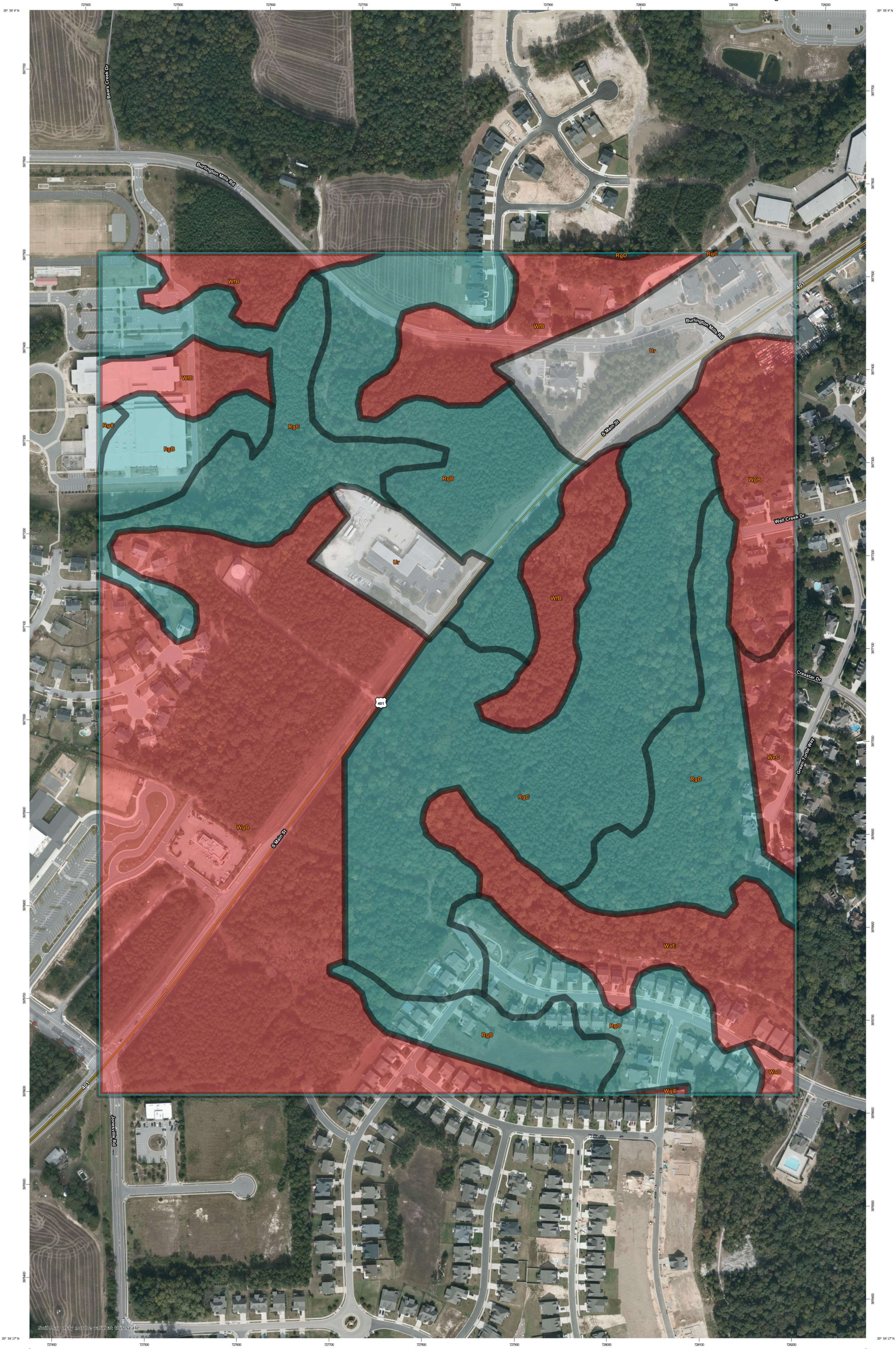
ARK CONSULTING GROUP, PLLC
ENGINEERS & PLANNERS

30' 0 15' 30'
SCALE 1 inch = 30 ft

Wallbrook

US 401 / S. Main Street & Virginia Water Drive | Rolesville, NC

CROSLAND SOUTHEAST



Map Scale: 1:1,810 if printed on D portrait (22" x 34") sheet.

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Wake County, North Carolina
Survey Area Data: Version 18, Sep 16, 2019

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 11, 2019—Oct 19, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
RgB	Rawlings-Rion complex, 2 to 6 percent slopes	C	21.8	12.9%
RgC	Rawlings-Rion complex, 6 to 10 percent slopes	C	38.3	22.7%
RgD	Rawlings-Rion complex, 10 to 15 percent slopes	C	16.7	9.9%
Ur	Urban land		12.7	7.5%
WaD	Wake-Rolesville complex, 10 to 15 percent slopes, very rocky	D	0.5	0.3%
WaE	Wake-Rolesville complex, 15 to 25 percent slopes, very rocky	D	9.3	5.5%
WeC	Wedowee sandy loam, 6 to 10 percent slopes	D	2.8	1.7%
WfB	Wedowee-Saw complex, 2 to 6 percent slopes	D	16.1	9.5%
WgB	Wedowee-Urban land complex, 2 to 6 percent slopes	D	50.6	30.0%
WgC	Wedowee-Urban land complex, 6 to 15 percent slopes	D	0.1	0.1%
Totals for Area of Interest			**168.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher


WAKE COUNTY, NORTH CAROLINA — SHEET NUMBER 22
22
N
Scale 1:15840
1 Mile
5000 Feet
(Joins sheet 15)
(Joins sheet 21)
(Joins sheet 23)
(Joins sheet 31)
Walkers Crossroads
Rolesville
Rolesville Church