STORMWATER REPORT

Bernardi Toyota
1624 Worcester Road
Framingham, MA

Prepared for: ***Bernardi Auto Group***
1626 Worcester Road
Framingham, MA 01702

Prepared by: ***MetroWest Engineering, Inc.***
75 Franklin Street
Framingham, MA 01702
(508) 626-0063

September, 2015

STORMWATER REPORT INDEX:

CHAPTER 1: HYDROLOGIC ANALYSIS

Hydrologic Analysis:
Proposed Site Development
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Introduction

The project site is located on the southerly side of Worcester Road (Route 9) in Framingham, MA adjacent to the Massachusetts Turnpike Framingham exit eastbound ramp. The project site is shown on Figure One, entitled *Locus Map: 1624 Worcester Road, Framingham MA*. The property abuts the easterly side of the existing Bernardi Toyota dealership.

The project site is shown on Framingham Assessors Map 461, Block 2, Lot 3A and has an area of approximately 74,591square feet (1.71 acres). The southerly portion of the property is currently improved with a paved and gravel parking area. A paved driveway crosses the central portion of the property from west to east. The northerly portion of the lot is presently undeveloped with large trees located between the northerly edge of the driveway and the southerly sideline of Worcester Road. Total impervious area on the site, including pavement is approximately 34,141 square feet. The site slopes downhill in a northerly direction from a high point at the southwesterly lot corner to Worcester Road with approximately 26-feet of vertical relief across the site.

According to the NRCS Soil Survey, soils on and around the site belong to the Charlton-Urban-Hollis land complex (631C) and are not classified within a hydrologic soil group. Abutting soil groups are classified within hydrologic group B. For the purposes of a conservative hydrologic analysis, soils on the site are assumed to exhibit B hydrologic soil group characteristics. On June 5, 2015 MetroWest Engineering Inc., performed an on-site soil evaluation consisting of six deep test holes, DTH-1 through DTH-6. DTH-1 and DTH-2 are located near the northwest corner of the site and revealed similar soil characteristics. A and B horizons extended to a depth of approximately two-feet. The C horizons consisted of loamy sand and sandy soils to depths between six and ten-feet. Refusal was encounterd in DTH-2 at a depth of approximately six-feet. DTH-3 and DTH-4 are located near the approximate center of the property. They both revealed A and B horizons to a depth of approximately two-feet. The underlying C-horizons consisted of a shallow layer of loamy sand followed by layers of coarse sand. No redoximorphic features, standing water or refusal were encountered in DTH-3 and DTH-4. DTH-5 and DTH-6 were excavated within the gravel parking area on the southerly portion of the site. Both test pits contained a layer of fill approximately four-feet deep. Refusal was encountered a depth of approximately four-feet in DTH-5. No refusal was encountered in DTH-6 but disturbed soils were encountered throughout the soil profile. Detailed soil information can be found on the grading plan that is part of the civil site plans submitted with this report.

The proposed site development includes the regrading and paving of the existing gravel parking area on the south side of the property and construction of new paved parking area on the northerly portion of the site. Both parking areas will provide additional vehicle

Figure One:

Locus Map: 1624 Worcester Road, Framingham MA

storage and parking for the adjacent Bernardi Toyota facility. Total proposed impervious footprint is 55,001 square feet, an increase of 20,860 square feet compared to the existing impervious coverage of 34,141 square feet.

Drainage Approach

At present, site contains minimal stormwater controls. One catch basin is located along the westerly boundary line. This structure collects runoff from a small portion of the gravel parking area and connects to the existing stormwater management system located on the property of the existing Bernardi Toyota facility. The majority of runoff flows off the site on to abutting properties or Worcester Road. In general, the site slopes from south to north.

A stormwater management system is proposed to reduce runoff rates and volumes to all stormwater design points compared to existing conditions. This will be achieved through the use of a subsurface infiltration system located under the proposed northerly parking area. The system will be comprised of a series of pre-cast, concrete leaching chambers surrounded with double-washed, crushed stone. It is designed to contain all storms up to and including a 25-year rainfall event with small overflows coming from storms greater than the 25-year storm. The proposed stormwater management system will provide treatment of runoff, significantly increase the amount of stormwater recharge and reduce the flow of water to Worcester Road and abutting properties.

Hydrologic Analysis

A hydrologic analysis of the project has been performed to establish pre-development conditions, assess post-development impacts and evaluate the effectiveness of the proposed drainage infiltration systems. The analysis employs an SCS TR-55 hydrologic computer model and analyzes design storms with return periods of 2, 10, 25 and 100-years. An SCS Type 3 24-hour rainfall distribution pattern is used for the theoretical design storm. Times of concentration values were computed by the LAG short method and manually entered at six minutes for watersheds containing small areas or hydraulic length to allow for the use of a three-minute time interval for all hydrograph computations. Longest flow path segment properties for both pre and post-development models are shown on Figures Two and Three respectively.

Existing Conditions

The existing conditions model analyzes the site as four drainage basins; Existing Conditions Basins One through Four. Existing Conditions Basin 1 (E.C.B.-1) contains 36,072 square feet of surface area and flows in an easterly direction to design point A, located at the northeast edge of the property along the sideline of Worcester Road.

Existing Conditions Basin 2 (E.C.B.-2) contains 6,088 square feet of surface area and flows in a westerly direction to design point B, located along the westerly boundary line.

Existing Conditions Basin 3 (E.C.B.-3) contains 24,635 square feet of surface area and flows in an easterly direction to design point C, located along the westerly boundary line.

Existing Conditions Basin 4 (E.C.B.-4) contains 9,719 square feet of surface area and flows in an easterly direction to Design Point D, located along the easterly boundary line.

The Existing Conditions Basins are shown on Figure Two, *The Existing Conditions Watershed Delineation Plan* and information for all Existing Conditions Basins is listed below.

Existing Conditions Basin 1 (E.C.B.-1)

Area = 36,072 square feet
Impervious area = 566 square feet; curve number = 98.0
Lawn area (good condition) = 7,015 square feet; curve number = 61.0
Wooded/Landscaped area = 28,490 square feet; curve number = 55.0
Hydrologic soil group B
Weighted Curve Number = 56.8
Basin slope = 10.6%
Hydraulic length = 186 feet
Time of concentration = 5.0 minutes (LAG Method)

Existing Conditions Basin 2 (E.C.B.-2)

Area = 6,088 square feet
Impervious area = 5,041 square feet; curve number = 98.0
Lawn area (good condition) = 1,047 square feet; curve number = 61.0
Hydrologic soil group B
Weighted Curve Number = 91.7
Basin slope = 5.3%
Hydraulic length = 224 feet
Time of concentration = 5.0 minutes (Manually Entered)

Existing Conditions Basin 3 (E.C.B.-3)

Area = 24,635 square feet
Impervious area = 22,419 square feet; curve number = 98.0
Lawn area (good condition) = 2,215 square feet; curve number = 61.0
Hydrologic soil group B
Weighted Curve Number = 94.7
Basin slope = 3.6%
Hydraulic length = 181 feet
Time of concentration = 5.0 minutes (Manually Entered)

Existing Conditions Basin 4 (E.C.B.-4)

Area = 9,719 square feet
Impervious area = 6,115 square feet; curve number = 98.0
Lawn area (good condition) = 3,604 square feet; curve number = 61.0
Hydrologic soil group B
Weighted Curve Number = 84.2
Basin slope = 4.9%
Hydraulic length = 164 feet
Time of concentration = 5.0 minutes (Manually Entered)

Proposed Conditions

The proposed condition model analyzes the site as five drainage basins, Post-Development basins One through Five. Post-Development Basin 1 (P.D.B.-1) contains 8,931 square feet of land and flows in a northerly to design point A located along the southerly sideline of Worcester Road.

Post-Development Basin 2 (P.D.B.-2) contains 6,641 square feet of surface area and flows in a westerly direction to design point B, located along the westerly boundary line.

Post-Development Basin 3 (P.D.B.-3) contains 18,855 square feet of surface area and flows in an easterly direction to design point C, located along the westerly boundary line.

Post-Development Basin 4 (P.D.B.-4) contains 9,554 square feet of surface area and flows in an easterly direction to Design Point D, located along the easterly boundary line.

Post-Development Basin 5 (P.D.B.-5) includes the 32,533 square feet, which is the entirety of the northerly parking area. Runoff from this basin is contained in recharged in proposed subsurface infiltration system 1.

The Proposed Conditions Basins are shown on Figure Three, *The Post Development Watershed Delineation Plan* and information for all Post Development Basins is listed hereafter.

Post-Development Basin 1 (P.D.B.-1)

Area = 8,931 square feet
Lawn area (good condition) = 7,134 square feet; curve number = 61.0
Wooded/Landscaped area = 1,797 square feet; curve number = 55.0
Hydrologic soil group B
Weighted Curve Number = 59.8
Basin slope = 9.8%
Hydraulic length = 123 feet
Time of concentration = 5.0 minutes (Manually Entered)

NOTES:

1. SUBJECT PARCEL IS SHOWN AS ASSESSORS MAP 17, LOT 21. RECORD TITLE FROM BOOK 62290, PAGE 274.
2. THIS PLAN IS THE RESULT OF AN ON-GROUND SURVEY PERFORMED BY METROWEST ENGINEERING, INC. UTILITY LOCATIONS ARE BASED ON FIELD OBSERVATIONS, AVAILABLE RECORDS AND INFORMATION. METROWEST ENGINEERING, INC. DOES NOT WARRANT LOCATION, CHARACTER NOR ELEVATIONS OF ALL UNDERGROUND UTILITIES NOR THE LOCATION NOR CHARACTER OF SURFACE IMPROVEMENTS THE OBSERVATION OF WHICH WAS OBSCURED AT THE TIME OF THE SURVEY.
3. THE PROPERTY DESCRIBED ON THIS SURVEY DOES NOT LIE WITHIN A SPECIAL FLOOD HAZARD AREA AS DEFINED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY; THE PROPERTY LIES WITHIN ZONE "X" OF THE FLOOD INSURANCE RATE MAP IDENTIFIED AS MAP NUMBER 25017C0393E, BEARING AN EFFECTIVE DATE OF JUNE 4, 2010.

LEGEND

TBM 1	ELEVATION BENCH MARK
⊠	DEEP TEST HOLE
E	ELECTRIC LINE
G	GAS LINE
⊠	GAS GATE
	CAPE COD BERM
⊠	HYDRANT
	NOW OR FORMERLY
	PAVEMENT EDGE
S	SEWER LINE
⊠	WATER GATE
W	WATER LINE
	UTILITY POLE
	STONE WALL
TOB-4 ⊗	TOP OF BANK FLAG

DC. #673532

DESIGN POINT A

DESIGN POINT B

DESIGN POINT C

DESIGN POINT D

POST DEVELOPMENT BASIN 1 (P.D.B.-1) 8,931 S.F. 0.206 ACRES

POST DEVELOPMENT BASIN 2 (P.D.B.-2) 6,641 S.F. 0.152 ACRES

POST DEVELOPMENT BASIN 3 (P.D.B.-3) 18,855 S.F. 0.433 ACRES

POST DEVELOPMENT BASIN 4 (P.D.B.-4) 9,554 S.F. 0.219 ACRES

POST DEVELOPMENT BASIN 5 (P.D.B.-5) 32,533 S.F. 0.747 ACRES

DTH-1 DTH-2 DTH-3 DTH-4 DTH-5 DTH-6

INNER RIPARIAN ZONE

LONGEST FLOW PATH L=169'

LONGEST FLOW PATH L=238'

LONGEST FLOW PATH L=228'

LONGEST FLOW PATH L=227

LONGEST FLOW PATH L=123'

LEDGE

N/F GS JEFFERSON HILLS, LLC MAP 461, BLOCK 2, LOT 4A LAND REG. BOOK 1408, PAGE 112

USDA SOIL CLASSIFICATION

SOIL NUMBER	SOIL SERIES	HYDROLOGIC SOIL GROUP
631C	CHARLTON-URBAN LAND-HOLLIS COMPLEX	N/A*

* RUNOFF VALUES FOR B-GROUP SOILS USED FOR ANALYSIS.

/F
N HILLS, LLC

SOIL TEST RESULTS

SOIL LOGS Nos

DTH-1 (ELEV=195.8')

0"-8"	A	SANDY LOAM	10YR 3/2
8"-22"	B	SANDY LOAM	10YR 5/6
24"-40"	C1	FINE SAND	2.5Y 4/3
40"-102"	C2	LOAMY SAND	2.5Y 5/3

WATER WEEPING @82"
NO REFUSAL, MANY LARGE ROCKS
MOTTLING@ 66", 7.5YR 5/8 (5%)
ESTIMATED HIGH WATER=190.3'

DTH-2 (ELEV=196.6')

0"-8"	A	SANDY LOAM	10YR 3/2
8"-20"	B	SANDY LOAM	10YR 5/6
20"-32"	C1	FINE SAND	2.5Y 5/6
35"-58"	C2	MED. SAND	2.5Y 5/3
58"-76"	C3	MED. SAND	2.5Y 4/2

NO WEEPING OR STANDING WATER
REFUSAL @ 76"
NO MOTTLING
ESTIMATED HIGH WATER=190.3'

DTH-3 (ELEV=203.5')

0"-6"	A	SANDY LOAM	10YR 3/2
6"-24"	B	SANDY LOAM	10YR 5/6
24"-54"	C1	SANDY LOAM	2.5Y 6/4
54"-112"	C2	COARSE SAND	2.5Y 5/2

NO WEEPING OR STANDING WATER
NO REFUSAL
NO MOTTLING
ESTIMATED HIGH WATER=194.2'

DTH-4 (ELEV=201.6')

0"-6"	A	SANDY LOAM	10YR 3/2
6"-24"	B	SANDY LOAM	10YR 5/6
24"-54"	C1	SANDY LOAM	2.5Y 6/4
54"-112"	C2	COARSE SAND	2.5Y 5/2

NO WEEPING OR STANDING WATER
NO REFUSAL
NO MOTTLING
ESTIMATED HIGH WATER=192.3'

DTH-5 (ELEV=214.3')

0"-44" FILL

NO STANDING OR WEEPING WATER
REFUSAL @ 44" (LEDGE)

ESTIMATED HIGH WATER=210.6'

DTH-6 (ELEV=208.6')

0"-40"	FILL	
40"-96"	C1	SANDY LOAM 2.5Y 5/3

WATER WEEPING @96"
NO REFUSAL
NO MOTTLING SEEN
OLD FOUNDATION REMNANTS IN PIT
ESTIMATED HIGH WATER=200.6'

DATE: JUNE 5, 2015
BY: BRIAN NELSON, SOIL EVALUATOR
NO INSPECTOR

POST-DEVELOPMENT BASIN PROPERTIES:

POST-DEVELOPMENT BASIN 1 (P.D.B.-1)

TOTAL BASIN AREA = 8,931 S.F. (0.205 ACRES)
HYDRAULIC LENGTH = 123 FEET
CHANGE IN ELEVATION = 12 FEET
BASIN SLOPE = 0.098 (9.8%)

	Cn	AREA (ACRES)	PRODUCT
LAWN AREA (GOOD COND.) = 7,134 S.F. (0.164 ACRES)	61	0.164	10.004
WOODED AREA (GOOD COND.) = 1,797 S.F. (0.041 ACRES)	55	0.041	2.255
	SUM	0.205	SUM 12.259

WEIGHTED CURVE NUMBER (C_N) = (12.259/0.205) = 59.8

POST-DEVELOPMENT BASIN 2 (P.D..B.-2)

TOTAL BASIN AREA = 6,641 S.F. (0.152 ACRES)
HYDRAULIC LENGTH = 238 FEET
CHANGE IN ELEVATION = 11 FEET
BASIN SLOPE = 0.046 (4.6%)

	Cn	AREA (ACRES)	PRODUCT
IMPERVIOUS AREA = 5,409 S.F. (0.124 ACRES)	98	0.124	12.152
WOODS AREA (GOOD COND.) = 1,232 S.F. (0.028 ACRES)	55	0.028	1.540
	SUM	0.152	SUM 13.692

WEIGHTED CURVE NUMBER (C_N) = (13.692/0.152 = 90.1

POST-DEVELOPMENT BASIN 3 (P.D.B.-3)

TOTAL BASIN AREA = 18,855 S.F. (0.432 ACRES)
HYDRAULIC LENGTH = 228 FEET
CHANGE IN ELEVATION = 8 FEET
BASIN SLOPE = .035 (3.5%)

	Cn	AREA (ACRES)	PRODUCT
IMPERVIOUS AREA = 16,298 S.F. (0.374 ACRES)	98	0.374	36.652
LAWN AREA (GOOD COND.) = 2,557 S.F. (0.059 ACRES)	61	0.059	3.599
	SUM	0.432	SUM 40.251

WEIGHTED CURVE NUMBER (C_N) = (40.251/0.432) = 93.2

POST-DEVELOPMENT BASIN 4 (P.D.B.-4)

TOTAL BASIN AREA = 9,554 S.F. (0.219 ACRES)
HYDRAULIC LENGTH = 227 FEET
CHANGE IN ELEVATION = 8 FEET
BASIN SLOPE = .035 (3.5%)

	Cn	AREA (ACRES)	PRODUCT
IMPERVIOUS AREA = 5,559 S.F. (0.128 ACRES)	98	0.128	12.544
LAWN AREA (GOOD COND.) = 3,995 S.F. (0.092 ACRES)	61	0.092	5.612
	SUM	0.219	SUM 18.156

WEIGHTED CURVE NUMBER (C_N) = (18.156/0.219) = 82.9

POST-DEVELOPMENT BASIN 5 (P.D.B.-5)

TOTAL BASIN AREA = 32,533 S.F. (0.747 ACRES)
HYDRAULIC LENGTH = 170 FEET
CHANGE IN ELEVATION = 14 FEET
BASIN SLOPE = .082 (8.2%)

	Cn	AREA (ACRES)	PRODUCT
IMPERVIOUS AREA = 27,735 S.F. (0.637 ACRES)	98	0.637	62.426
WOODED AREA (GOOD COND.) = 4,798 S.F. (0.110 ACRES)	55	0.110	6.050
	SUM	0.747	SUM 68.476

WEIGHTED CURVE NUMBER (C_N) = (68.476/0.747) = 91.7

FOR METROWEST ENGINEERING, INC. DATE
ROBERT A. GEMMA, P.E. # 31967 (CIVIL)
P.L.S. # 37046

GRAPHIC SCALE
1 inch = 20 ft.
20 0 10 20 40 (FEET) 80
0 4 10 20 (METERS) 30

FIGURE THREE

POST-DEVELOPMENT WATERSHED DELINEATION PLAN #1626 WORCESTER ROAD IN FRAMINGHAM, MASS

PREPARED FOR:
JAMES P. CARNEY & AMY D. ROSSI, TRUSTEES OF VOLADOR REALTY TRUST
1626 WORCESTER ROAD
FRAMINGHAM, MA 01702

PROPERTY OF:
JAMES P. CAREY & AMY D. ROSSI
TRUSTEES OF VOLADOR REALTY TRUST
1626 WORCESTER ROAD
FRAMINGHAM, MA 01702

ENGINEERS & SURVEYORS:
MWE
METROWEST ENGINEERING, INC.
75 FRANKLIN STREET
FRAMINGHAM, MA 01702
TEL.: (508)626-0063
FAX: (508)875-6440

SHEET 1 OF 1		DATE: JUNE 19, 2015
CALC'D BY: BTN	FIELD BK: 684	CAD FILE: PD_HYDRO.dwg
DRAFTER: BTN	PROJECT: FRM_WOR3	DWG FILE: SK081915.dwg

Post-Development Basin 2 (P.D.B.-2)

Area = 6,641 square feet
Impervious area = 5,409 square feet; curve number = 98.0
Wooded/Landscaped area = 1,232 square feet; curve number = 55.0
Hydrologic soil group B
Weighted Curve Number = 90.1
Basin slope = 4.6%
Hydraulic length = 238 feet
Time of concentration = 5.0 minutes (Manually Entered)

Post-Development Basin 3 (P.D.B.-3)

Area = 18,855 square feet
Impervious area = 16,298 square feet; curve number = 98.0
Lawn area (good condition) = 2,557 square feet; curve number = 61.0
Hydrologic soil group B
Weighted Curve Number = 93.2
Basin slope = 3.5%
Hydraulic length = 228 feet
Time of concentration = 5.0 minutes (Manually Entered)

Post-Development Basin 4 (P.D.B.-4)

Area = 9,554 square feet
Impervious area = 5,559 square feet; curve number = 98.0
Lawn area (good condition) = 3,995 square feet; curve number = 61.0
Hydrologic soil group B
Weighted Curve Number = 82.9
Basin slope = 3.5%
Hydraulic length = 227 feet
Time of concentration = 5.0 minutes (Manually Entered)

Post-Development Basin 5 (P.D.B.-5)

Area = 32,533 square feet
Impervious area = 27,735 square feet; curve number = 98.0.
Wooded/Landscaped area = 4,798 square feet; curve number = 55.0
Hydrologic soil group B
Weighted Curve Number = 91.7
Basin slope = 8.2%
Hydraulic length = 170 feet
Time of concentration = 5.0 minutes (Manually Entered)

Drain Infiltration System

Proposed Infiltration System 1
Basic geometry: 76.0-foot long by 26.0-foot wide bed
System type: Rotondo G444 leaching galleys; 360 gallons each
Use 80 Galleys; 4-feet long by 4.5 feet wide by 4-feet high
Infiltration rate: 8.27 inches per hour over 1,976 square foot bed

The proposed condition model analyzes the infiltration systems using a reservoir-analysis method. Consistent with DEP stormwater management standards, a value of 8.27-inches per hour (sandy soils) was used as the design infiltration rate for the proposed infiltration system. Design infiltration rates are based on the Rawls table for soils with sandy compositions.

Model Results

The model results for the design points A through C are shown in Tables One through Eight below:

Table One: Comparison of Pre and Post-Development Peak Runoff Rates at Design Point A

Drainage Basin	2-year storm	10-year storm	25-year storm	100-year storm
E.C.B.-1+ Overflow	0.11 CFS	0.59 CFS	1.02 CFS	1.56 CFS
P.D.B.-1	0.05 CFS	0.19 CFS	0.31 CFS	1.06 CFS
Difference	-0.06 CFS	-0.40 CFS	-0.71 CFS	-0.50 CFS

Table Two: Comparison of Pre and Post-Development Runoff Volumes at Design Point A

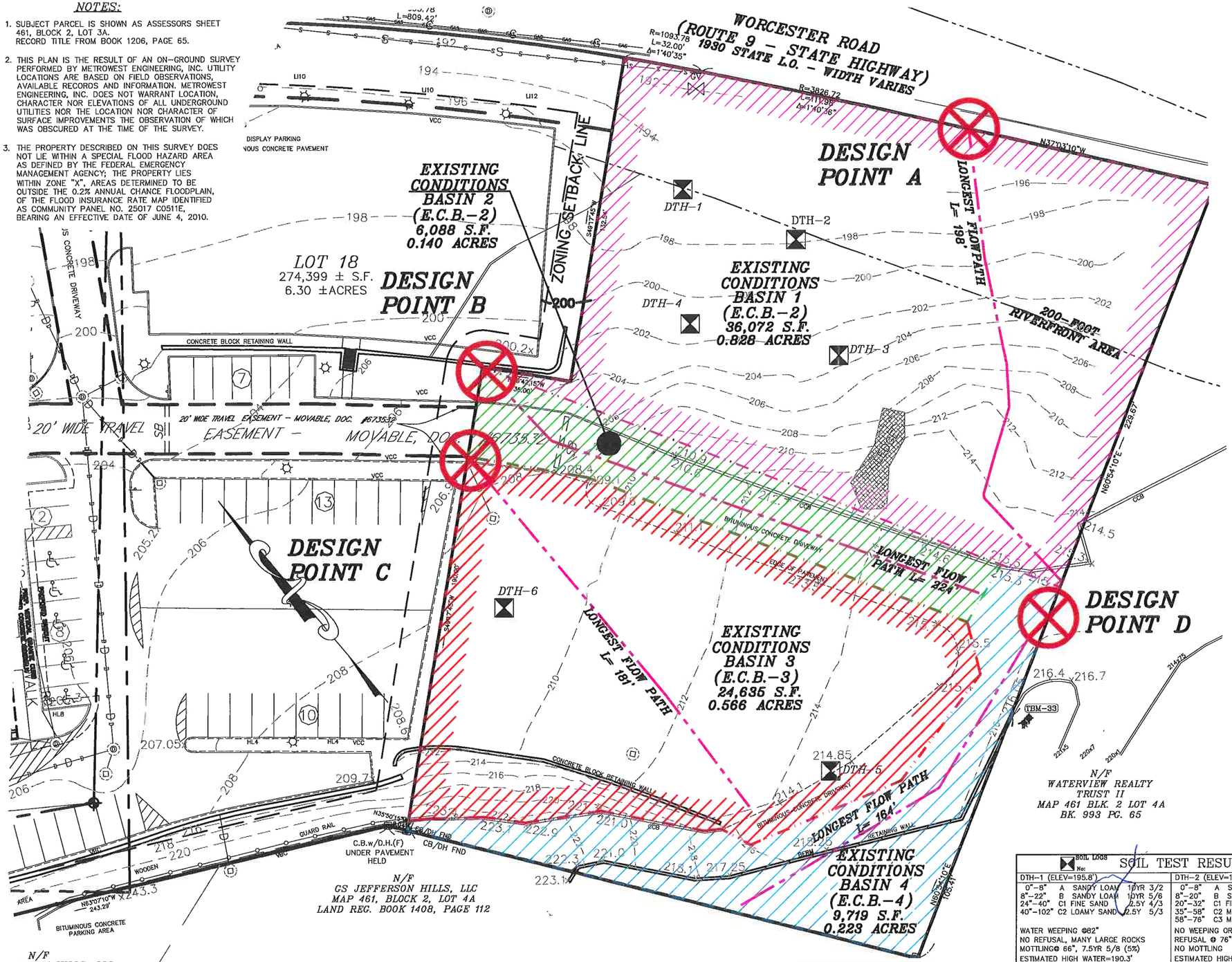
Drainage Basin	2-year storm	10-year storm	25-year storm	100-year storm
E.C.B.-1+ Overflow	853 CF	2,500 CF	3,851 CF	5,550 CF
P.D.B.-1	280 CF	741 CF	1,107 CF	2,161 CF
Difference	-573 CF	-1,759 CF	-2,744 CF	-3,389 CF

Table Three: Comparison of Pre and Post Development Peak Runoff Rates at Design Point B

Drainage Basin	2-year storm	10-year storm	25-year storm	100-year storm
E.C.B.-2	0.32 CFS	0.50 CFS	0.61 CFS	0.74 CFS
P.D.B.-2	0.33 CFS	0.53 CFS	0.65 CFS	0.78 CFS
Difference	0.01 CFS	0.03 CFS	0.04 CFS	0.04 CFS

NOTES:

1. SUBJECT PARCEL IS SHOWN AS ASSESSORS SHEET 461, BLOCK 2, LOT 3A. RECORD TITLE FROM BOOK 1206, PAGE 65.
2. THIS PLAN IS THE RESULT OF AN ON-GROUND SURVEY PERFORMED BY METROWEST ENGINEERING, INC. UTILITY LOCATIONS ARE BASED ON FIELD OBSERVATIONS, AVAILABLE RECORDS AND INFORMATION. METROWEST ENGINEERING, INC. DOES NOT WARRANT LOCATION, CHARACTER NOR ELEVATIONS OF ALL UNDERGROUND UTILITIES NOR THE LOCATION NOR CHARACTER OF SURFACE IMPROVEMENTS THE OBSERVATION OF WHICH WAS OBSCURED AT THE TIME OF THE SURVEY.
3. THE PROPERTY DESCRIBED ON THIS SURVEY DOES NOT LIE WITHIN A SPECIAL FLOOD HAZARD AREA AS DEFINED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY; THE PROPERTY LIES WITHIN ZONE "X", AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN, OF THE FLOOD INSURANCE RATE MAP IDENTIFIED AS COMMUNITY PANEL NO. 25017 C0511E, BEARING AN EFFECTIVE DATE OF JUNE 4, 2010.



EXISTING CONDITIONS BASIN PROPERTIES:

EXISTING CONDITIONS BASIN 1 (E.C.B.-1)

TOTAL BASIN AREA = 36,072 S.F. (0.828 ACRES)
HYDRAULIC LENGTH = 186 FEET
CHANGE IN ELEVATION = 21 FEET
BASIN SLOPE = 0.106 (10.6%)

	Cn	AREA (ACRES)	PRODUCT
IMPERVIOUS AREA = 566 S.F. (0.013 ACRES)	98	0.013	1.274
LAWN AREA (GOOD COND.) = 7,015 S.F. (0.161 ACRES)	61	0.161	9.821
WOODED AREA (GOOD COND.) = 28,490 S.F. (0.654 ACRES)	55	0.654	35.970
	SUM	0.828	SUM 47.065

WEIGHTED CURVE NUMBER (C_N) = (47.065/0.828) = 56.8

EXISTING CONDITIONS BASIN 2 (E.C.B.-2)

TOTAL BASIN AREA = 6,088 S.F. (0.140 ACRES)
HYDRAULIC LENGTH = 224 FEET
CHANGE IN ELEVATION = 12 FEET
BASIN SLOPE = 0.050 (5.3%)

	Cn	AREA (ACRES)	PRODUCT
IMPERVIOUS AREA = 5,041 S.F. (0.116 ACRES)	98	0.116	11.368
LAWN AREA (GOOD COND.) = 1,047 S.F. (0.024 ACRES)	61	0.024	1.464
	SUM	0.140	SUM 12.832

WEIGHTED CURVE NUMBER (C_N) = (12.832/0.140) = 91.7

EXISTING CONDITIONS BASIN 3 (E.C.B.-3)

TOTAL BASIN AREA = 24,635 S.F. (0.566 ACRES)
HYDRAULIC LENGTH = 181 FEET
CHANGE IN ELEVATION = 6.5 FEET
BASIN SLOPE = 0.036 (3.6%)

	Cn	AREA (ACRES)	PRODUCT
IMPERVIOUS AREA = 22,419 S.F. (0.515 ACRES)	98	0.515	50.470
LAWN AREA (GOOD COND.) = 2,215 S.F. (0.051 ACRES)	61	0.051	3.111
	SUM	0.566	SUM 53.581

WEIGHTED CURVE NUMBER (C_N) = (53.581/0.566) = 94.7

EXISTING CONDITIONS BASIN 4 (E.C.B.-4)

TOTAL BASIN AREA = 9,719 S.F. (0.223 ACRES)
HYDRAULIC LENGTH = 164 FEET
CHANGE IN ELEVATION = 8.0 FEET
BASIN SLOPE = 0.049 (4.9%)

	Cn	AREA (ACRES)	PRODUCT
IMPERVIOUS AREA = 6,115 S.F. (0.140 ACRES)	98	0.140	13.720
LAWN AREA (GOOD COND.) = 3,604 S.F. (0.083 ACRES)	61	0.083	5.063
	SUM	0.223	SUM 18.783

WEIGHTED CURVE NUMBER (C_N) = (18.783/0.223) = 84.2

FOR METROWEST ENGINEERING, INC. DATE
ROBERT A. GEMMA, P.E. # 31967 (CIVIL)
P.L.S. # 37046

GRAPHIC SCALE
1 inch = 20 ft.
20 0 10 20 40 (FEET) 80
0 5 10 20 (METERS) 30

FIGURE TWO

SOIL TEST RESULTS

SOIL LOGS No:

DTH-1 (ELEV=195.8')	DTH-2 (ELEV=196.6')
0"-8" A SANDY LOAM 10YR 3/2 8"-22" B SANDY LOAM 10YR 5/6 24"-40" C1 FINE SAND 2.5Y 4/3 40"-102" C2 LOAMY SAND 2.5Y 5/3 WATER WEEPING @82" NO REFUSAL, MANY LARGE ROCKS MOTTLING@ 66", 7.5YR 5/8 (5%) ESTIMATED HIGH WATER=190.3'	0"-8" A SANDY LOAM 10YR 3/2 8"-20" B SANDY LOAM 10YR 5/6 20"-32" C1 FINE SAND 2.5Y 5/6 35"-58" C2 MED. SAND 2.5Y 5/3 58"-76" C3 MED. SAND 2.5Y 4/2 NO WEEPING OR STANDING WATER REFUSAL @ 76" NO MOTTLING ESTIMATED HIGH WATER=190.3'
DTH-3 (ELEV=203.5')	**DTH-4 (ELEV=201.6')**
0"-6" A SANDY LOAM 10YR 3/2 6"-24" B SANDY LOAM 10YR 5/6 24"-54" C1 SANDY LOAM 2.5Y 6/4 54"-112" C2 COARSE SAND 2.5Y 5/2 NO WEEPING OR STANDING WATER NO REFUSAL NO MOTTLING ESTIMATED HIGH WATER=194.2'	0"-6" A SANDY LOAM 10YR 3/2 6"-24" B SANDY LOAM 10YR 5/6 24"-54" C1 SANDY LOAM 2.5Y 6/4 54"-112" C2 COARSE SAND 2.5Y 5/2 NO WEEPING OR STANDING WATER NO REFUSAL NO MOTTLING ESTIMATED HIGH WATER=192.3'
DTH-5 (ELEV=214.3')	**DTH-6 (ELEV=208.6')**
0"-44" FILL NO STANDING OR WEEPING WATER REFUSAL @ 44" (LEDGE) ESTIMATED HIGH WATER=210.6'	0"-40" FILL 40"-96" C1 SANDY LOAM 2.5Y 5/3 WATER WEEPING @96" NO REFUSAL NO MOTTLING SEEN OLD FOUNDATION REMNANTS IN PIT ESTIMATED HIGH WATER=200.6'

DATE: JUNE 5, 2015
BY: BRIAN NELSON, SOIL EVALUATOR
NO INSPECTOR

USDA SOIL CLASSIFICATION

SOIL NUMBER	SOIL SERIES	HYDROLOGIC SOIL GROUP
631C	CHARLTON-URBAN LAND-HOLLIS COMPLEX	N/A*

* RUNOFF VALUES FOR B-GROUP SOILS USED FOR ANALYSIS.

EXISTING CONDITIONS WATERSHED DELINEATION PLAN
#1624 WORCESTER ROAD
IN
FRAMINGHAM, MA

PREPARED FOR:
JAMES P. CARNEY & AMY D. ROSSI,
TRUSTEES OF VOLADOR REALTY TRUST
1626 WORCESTER ROAD
FRAMINGHAM, MA 01702

PROPERTY OF:
JAMES P. CAREY & AMY D. ROSSI
TRUSTEES OF VOLADOR REALTY TRUST
1626 WORCESTER ROAD
FRAMINGHAM, MA 01702

ENGINEERS & SURVEYORS:
MWE
METROWEST ENGINEERING, INC.
75 FRANKLIN STREET
FRAMINGHAM, MA 01702
TEL.: (508)626-0063
FAX: (508)875-6440

SHEET 1 OF 1		DATE: JULY 6, 2015
CALC'D BY: BTN	FIELD BK: 584	CAD FILE: VACANT LOT_HYDRO_2016.dwg
DRAFTER: BTN	PROJECT: FRM_WOR3	DWG FILE: SK070815.dwg

Table Four: Comparison of Pre and Post-Development Runoff Volumes at Design Point B

Drainage Basin	2-year storm	10-year storm	25-year storm	100-year storm
E.C.B.-2	1,107 CF	1,747 CF	2,166 CF	2,633 CF
P.D.B.-2	1,126 CF	1,811 CF	2,261 CF	2,765 CF
Difference	19 CF	97 CF	95 CF	132 CF

Table Five: Comparison of Pre and Post Development Peak Runoff Rates at Design Point C

Drainage Basin	2-year storm	10-year storm	25-year storm	100-year storm
E.C.B.-3	1.43 CFS	2.13 CFS	2.57 CFS	3.06 CFS
P.D.B.-3	1.05 CFS	1.59 CFS	1.93 CFS	2.31 CFS
Difference	-0.38 CFS	-0.57 CFS	-0.64 CFS	-0.75 CFS

Table Six: Comparison of Pre and Post Development Peak Runoff Volumes at Design Point C

Drainage Basin	2-year storm	10-year storm	25-year storm	100-year storm
E.C.B.-3	5,036 CF	7,686 CF	9,402 CF	11,313 CF
P.D.B.-3	3,624 CF	5,626 CF	6,927 CF	8,379 CF
Difference	-1,412 CF	-2,060 CF	-2,475 CF	-2,934 CF

Table Seven: Comparison of Pre and Post Development Peak Runoff Rates at Design Point D

Drainage Basin	2-year storm	10-year storm	25-year storm	100-year storm
E.C.B.-4	0.39 CFS	0.66 CFS	0.84 CFS	1.04 CFS
P.D.B.-4	0.36 CFS	0.63 CFS	0.80 CFS	1.00 CFS
Difference	-0.03 CFS	-0.03 CFS	-0.04 CFS	-0.04 CFS

Table Eight: Comparison of Pre and Post Development Peak Runoff Volumes at Design Point D

Drainage Basin	2-year storm	10-year storm	25-year storm	100-year storm
E.C.B.-4	1,288 CF	2,220 CF	2,847 CF	3,558 CF
P.D.B.-4	1,194 CF	2,091 CF	2,698 CF	3,389 CF
Difference	-94 CF	-129 CF	-149 CF	-169 CF

Conclusion

The results provided in Tables One through Eight demonstrate that the project, with the stormwater controls in place, will result in a decrease both in peak runoff rates and total runoff volume discharged from the project site. The project will impact neither the municipal stormwater drainage system nor abutting properties.

Additionally, the majority of runoff from the proposed parking lot and roof surfaces will be collected and recharged. The stormwater management system as designed is consistent with MADEP Stormwater Management Policy and accepted design practice.

Appendix A:
Hydrologic Assessment

Table of Contents

2 - Year

10 - Year

25 - Year

2-Year Storm, Pre and Post-Development

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	0.11	3	735	853	----	------	------	E.C.B.-1
2	SCS Runoff	0.32	3	726	1,107	----	------	------	E.C.B.-2
3	SCS Runoff	1.43	3	726	5,036	----	------	------	E.C.B.-3
4	SCS Runoff	0.39	3	726	1,288	----	------	------	E.C.B.-4
6	SCS Runoff	0.05	3	729	280	----	------	------	P.D.B.-1
7	SCS Runoff	0.33	3	726	1,126	----	------	------	P.D.B.-2
8	SCS Runoff	1.05	3	726	3,624	----	------	------	P.D.B.-3
9	SCS Runoff	0.36	3	726	1,194	----	------	------	P.D.B.-4
11	SCS Runoff	1.73	3	726	5,904	----	------	------	P.D.B.-5
12	Reservoir	0.40	3	750	5,904	11	195.40	1,620	Runoff to Infiltration
13	Diversion1	0.40	3	750	5,904	12	------	------	Infiltration
14	Diversion2	0.00	3	876	0	12	------	------	Overflow
16	Combine	0.05	3	729	280	6, 14,	------	------	Post-Dev. Flow to D.P. A

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

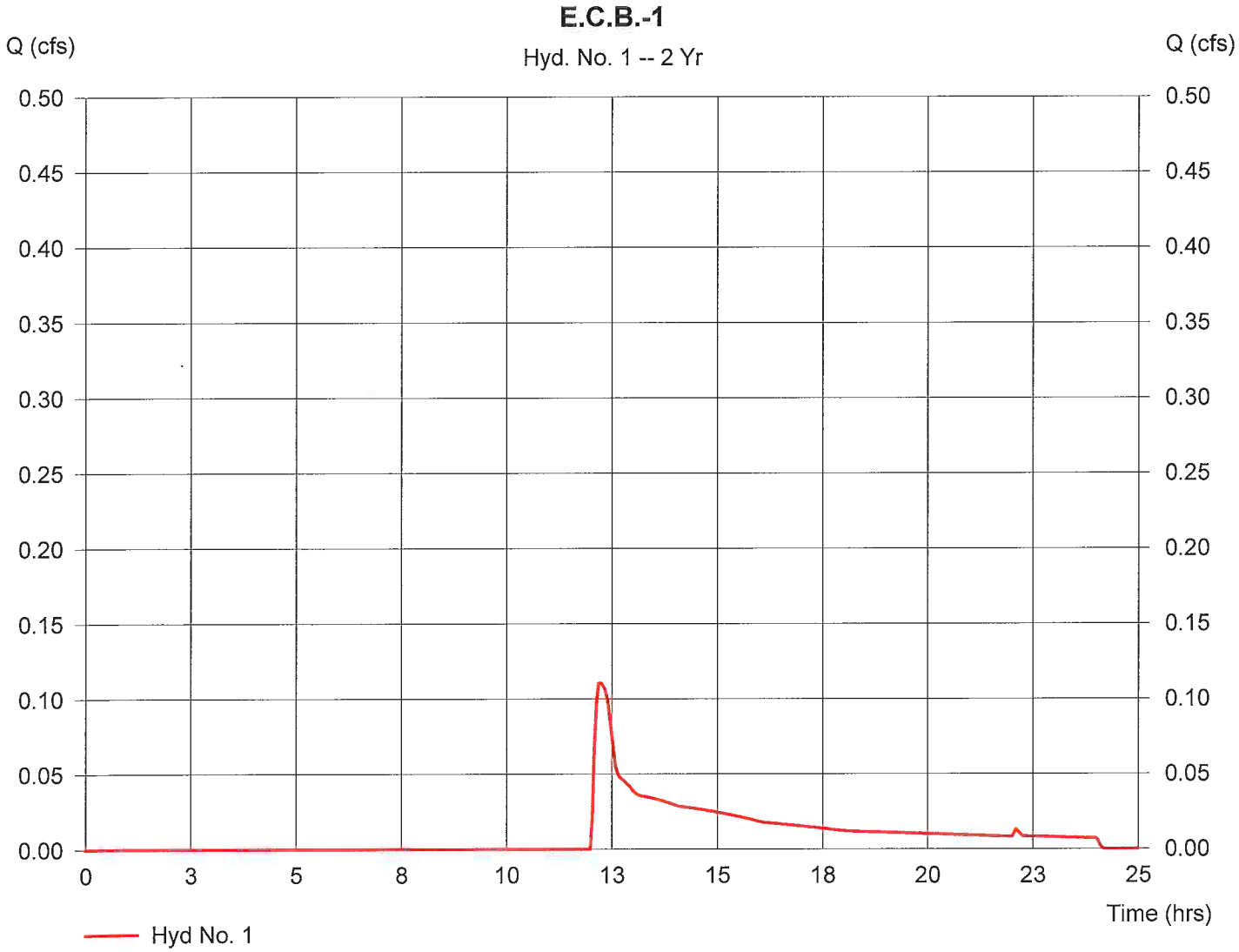
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 1

E.C.B.-1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.11 cfs
Storm frequency	= 2 yrs	Time interval	= 3 min
Drainage area	= 0.83 ac	Curve number	= 56.8
Basin Slope	= 10.6 %	Hydraulic length	= 186 ft
Tc method	= LAG	Time of conc. (Tc)	= 4.779908 min
Total precip.	= 3.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 853 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

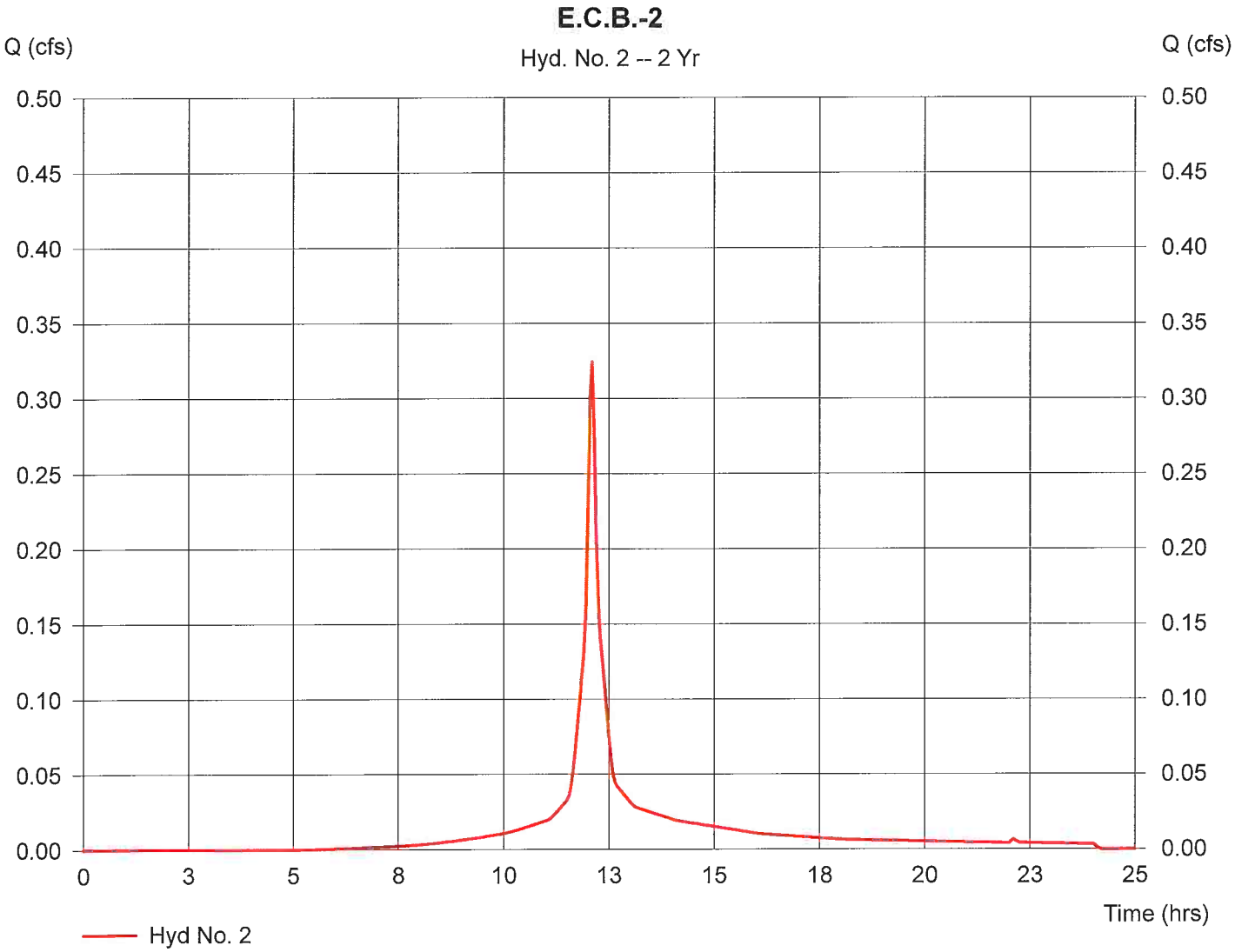
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 2

E.C.B.-2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.32 cfs
Storm frequency	= 2 yrs	Time interval	= 3 min
Drainage area	= 0.14 ac	Curve number	= 91.7
Basin Slope	= 5.3 %	Hydraulic length	= 224 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 3.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 1,107 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

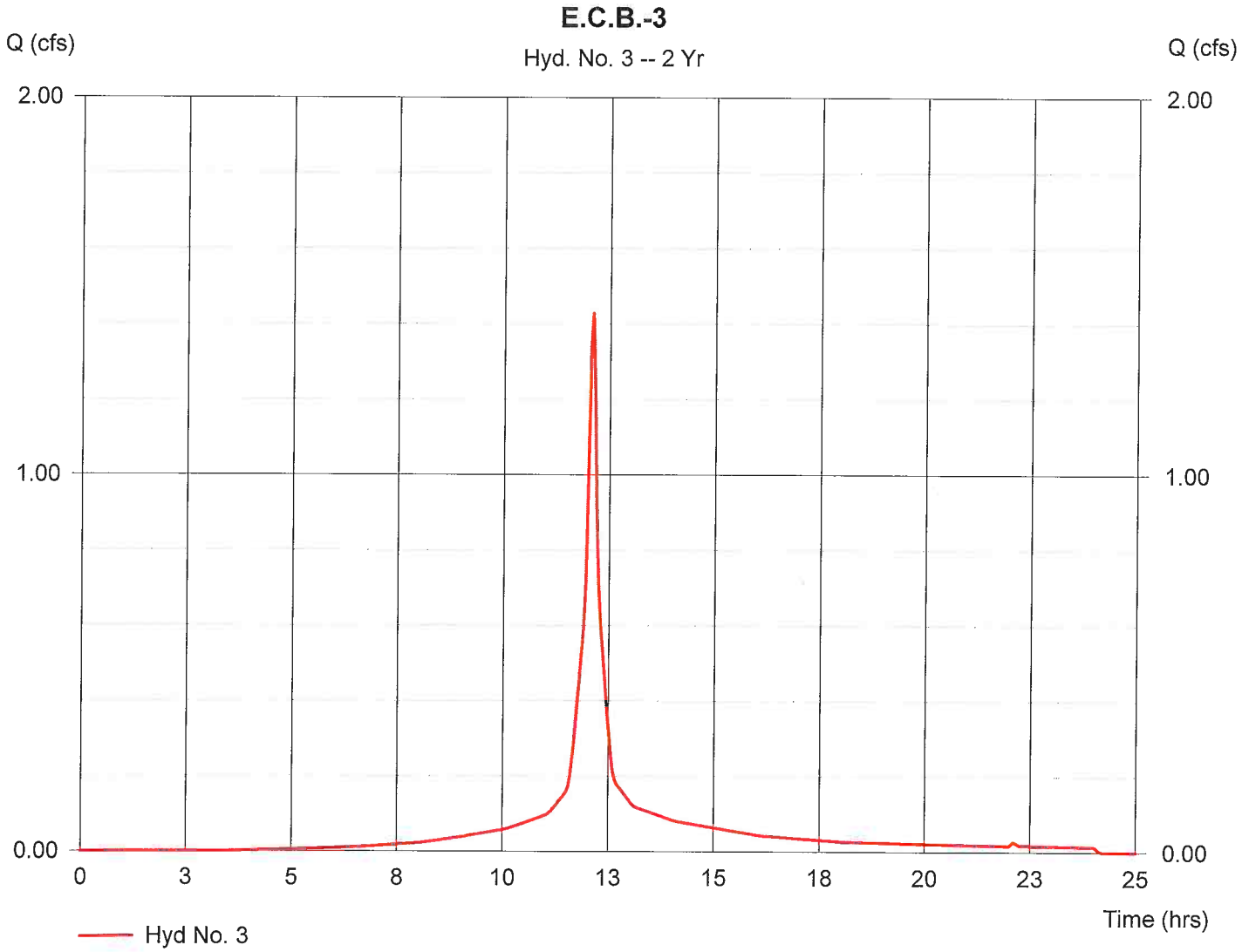
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 3

E.C.B.-3

Hydrograph type	= SCS Runoff	Peak discharge	= 1.43 cfs
Storm frequency	= 2 yrs	Time interval	= 3 min
Drainage area	= 0.57 ac	Curve number	= 94.7
Basin Slope	= 3.6 %	Hydraulic length	= 181 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 3.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 5,036 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

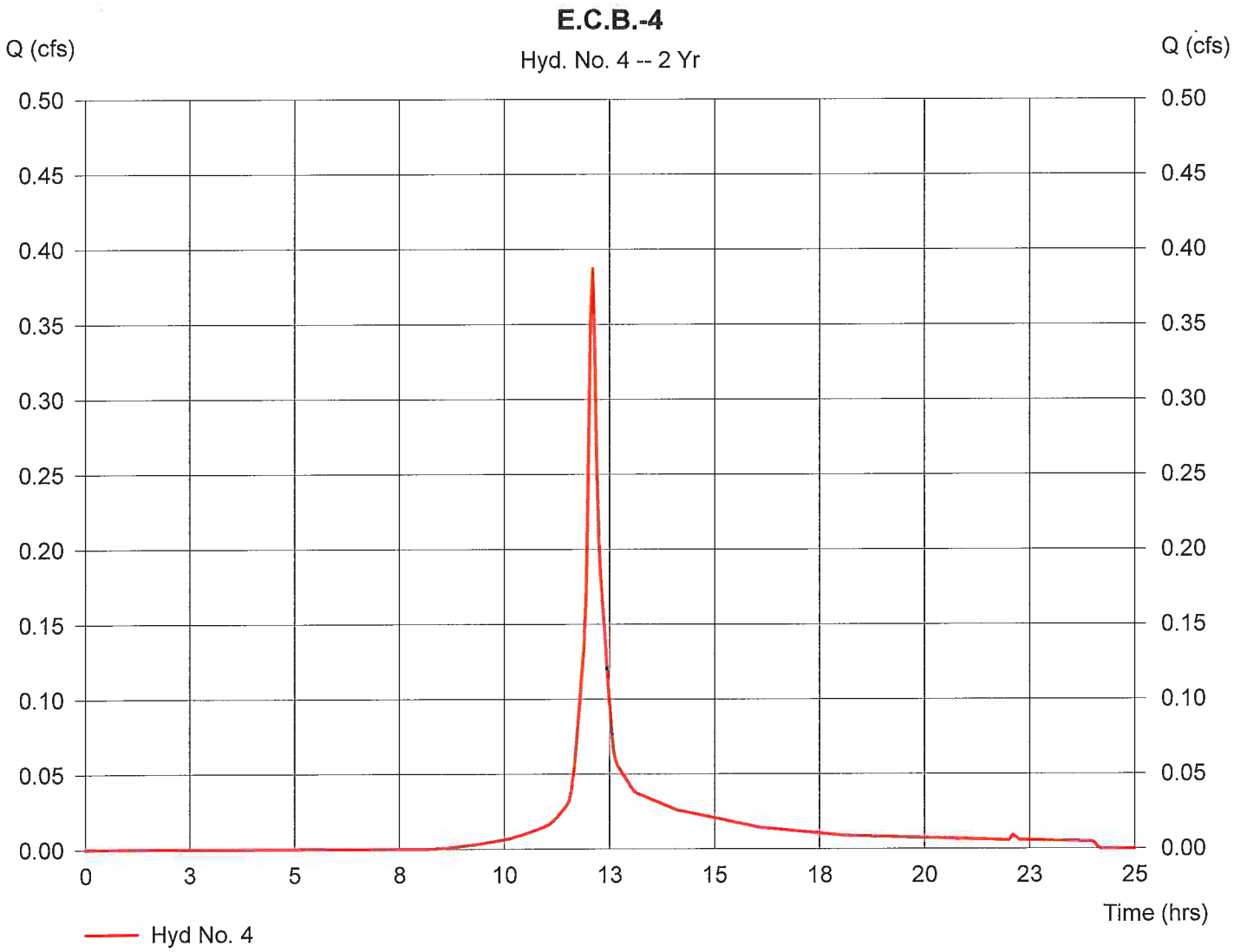
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 4

E.C.B.-4

Hydrograph type	= SCS Runoff	Peak discharge	= 0.39 cfs
Storm frequency	= 2 yrs	Time interval	= 3 min
Drainage area	= 0.22 ac	Curve number	= 84.2
Basin Slope	= 4.9 %	Hydraulic length	= 164 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 3.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 1,288 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Monday, Sep 14 2015, 2:37 PM

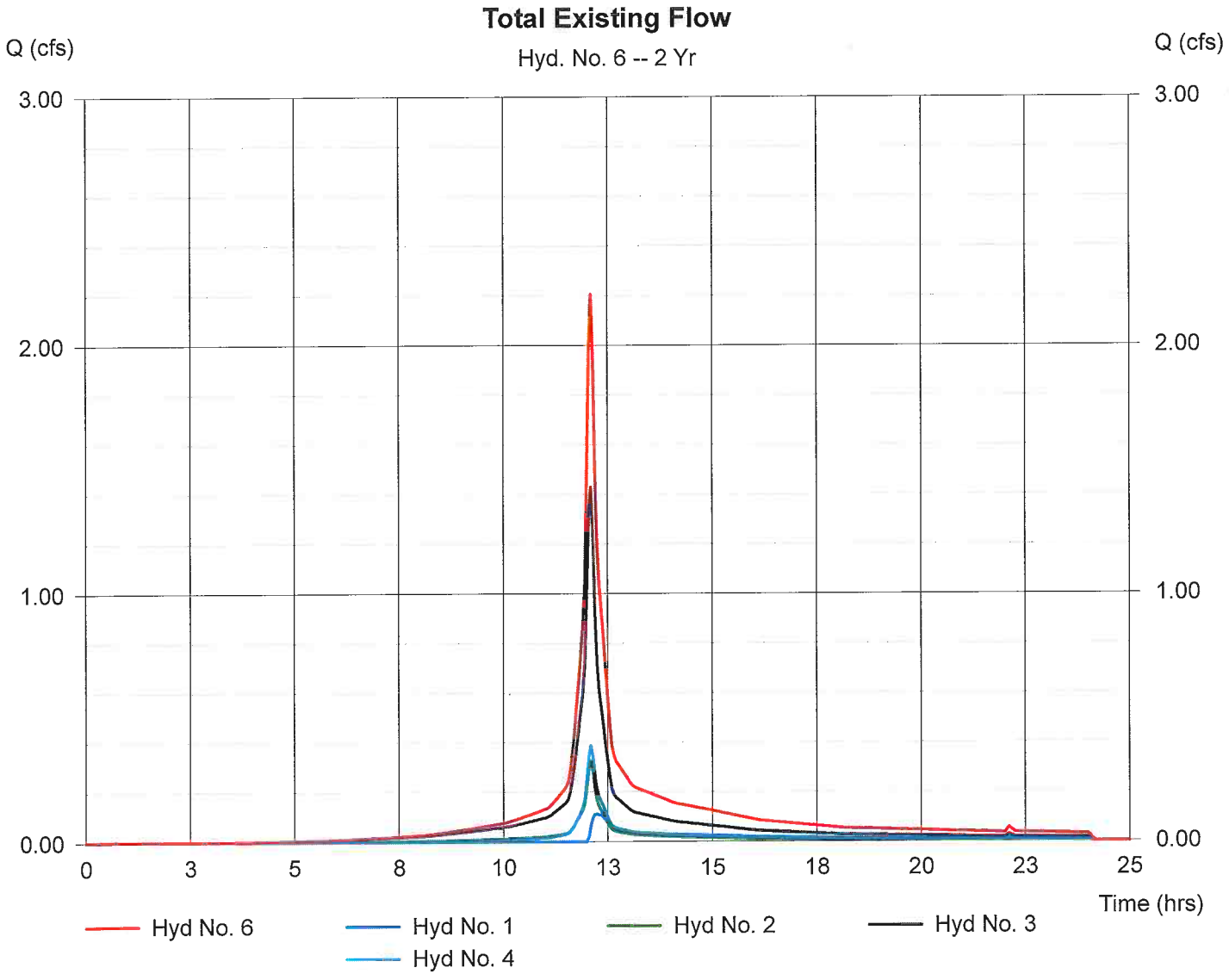
Hyd. No. 6

Total Existing Flow

Hydrograph type = Combine
Storm frequency = 2 yrs
Inflow hyds. = 1, 2, 3, 4

Peak discharge = 2.21 cfs
Time interval = 3 min

Hydrograph Volume = 8,283 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

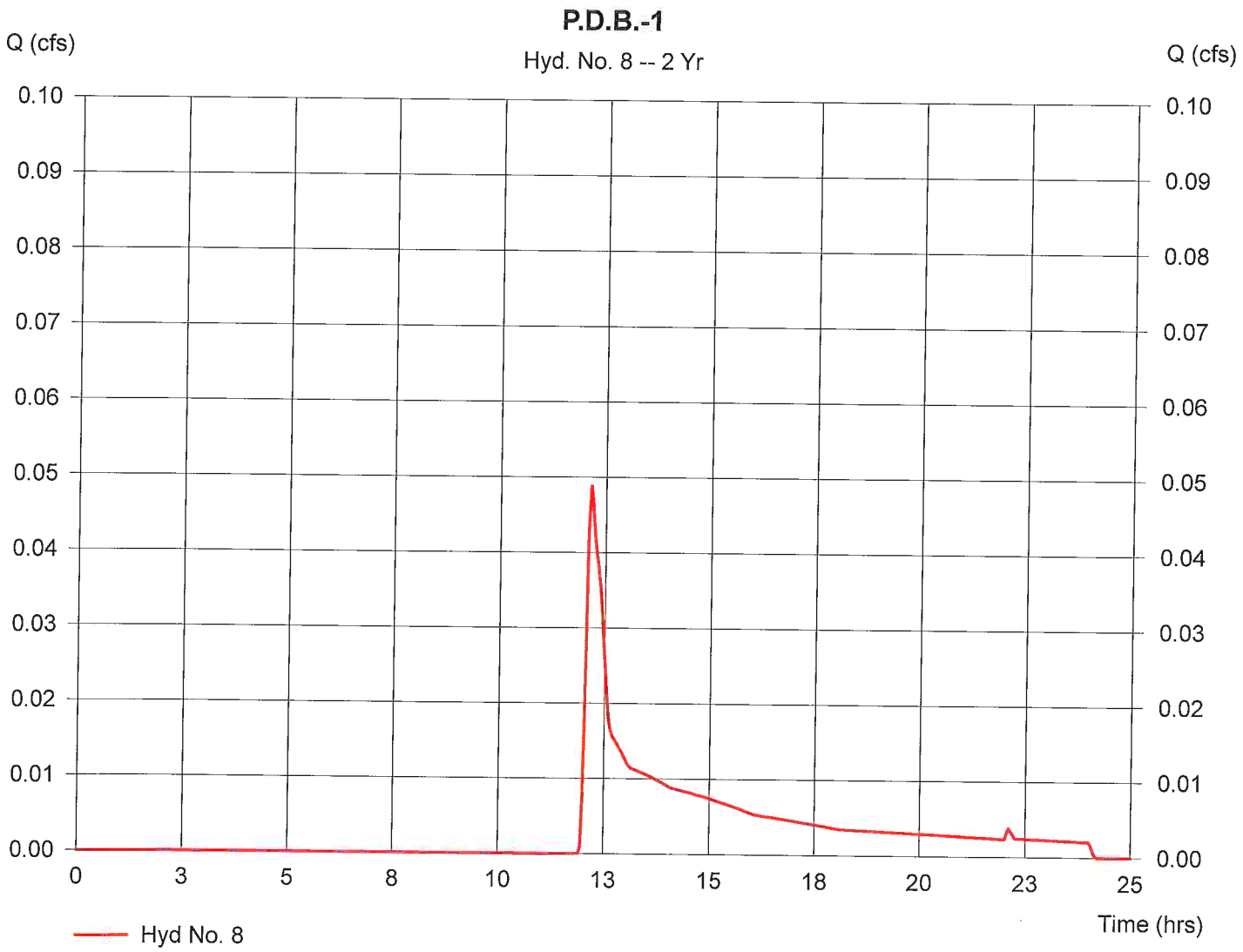
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 8

P.D.B.-1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.05 cfs
Storm frequency	= 2 yrs	Time interval	= 3 min
Drainage area	= 0.21 ac	Curve number	= 59.8
Basin Slope	= 9.8 %	Hydraulic length	= 123 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 3.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 280 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

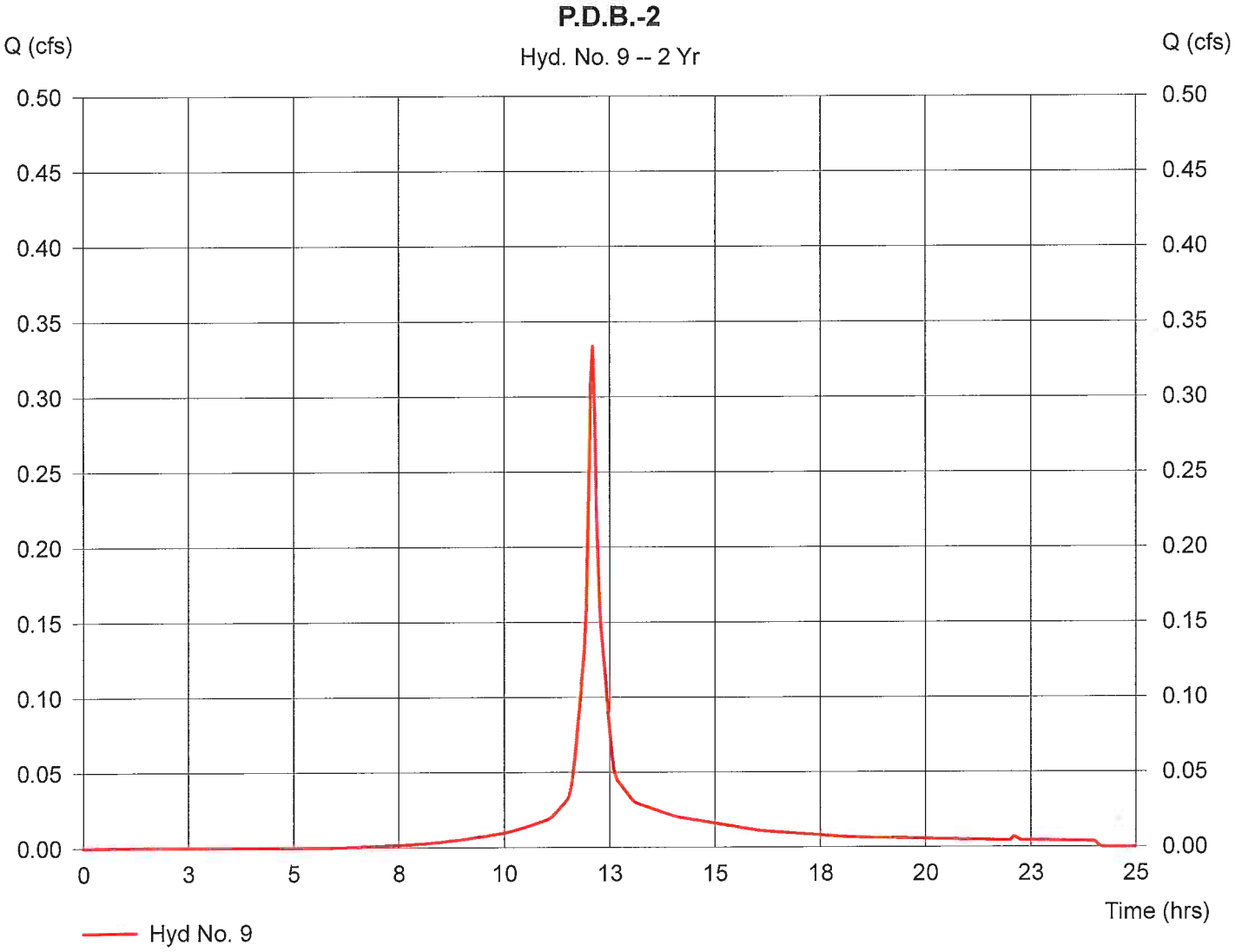
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 9

P.D.B.-2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.33 cfs
Storm frequency	= 2 yrs	Time interval	= 3 min
Drainage area	= 0.15 ac	Curve number	= 90.1
Basin Slope	= 4.6 %	Hydraulic length	= 238 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 3.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 1,126 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

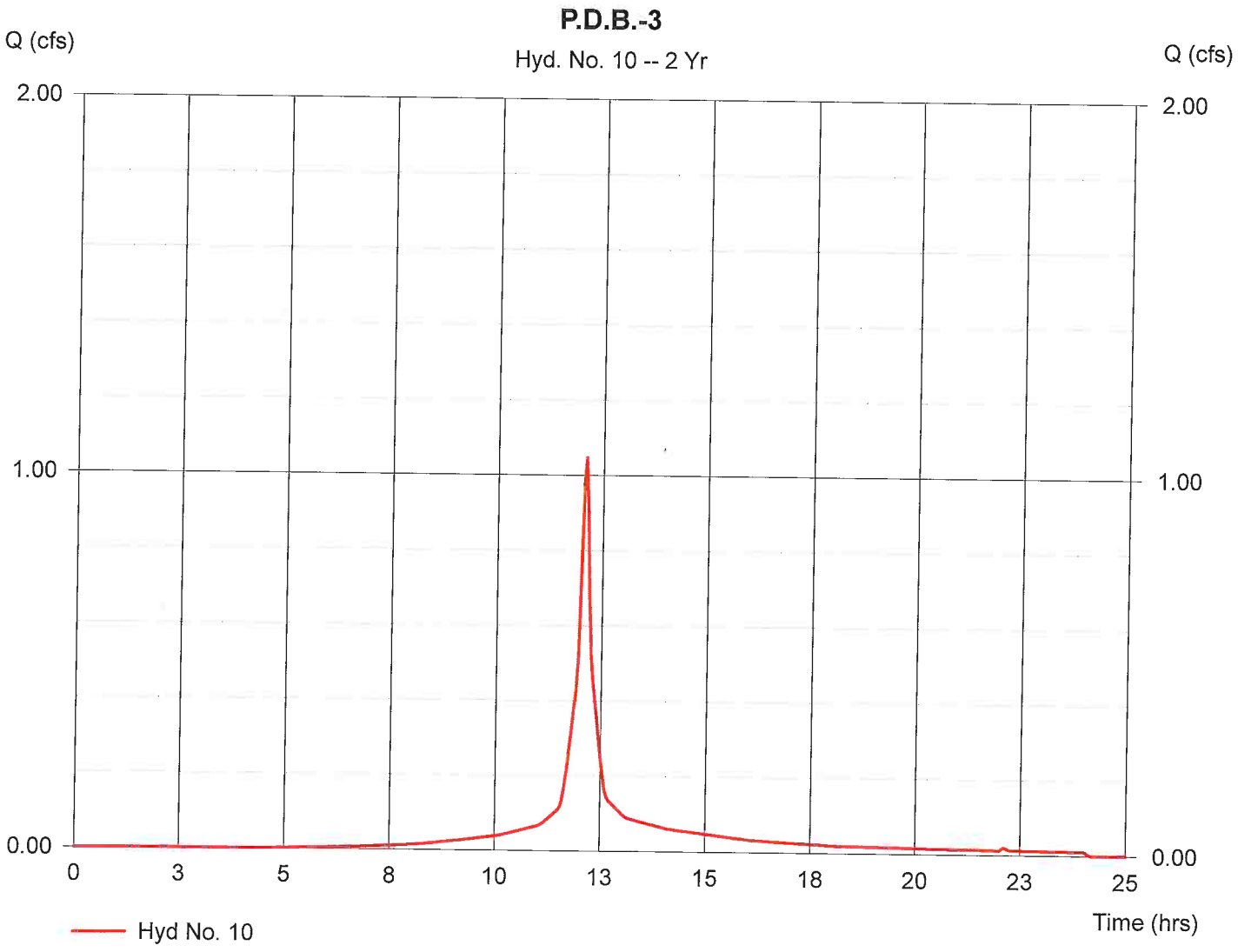
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 10

P.D.B.-3

Hydrograph type	= SCS Runoff	Peak discharge	= 1.05 cfs
Storm frequency	= 2 yrs	Time interval	= 3 min
Drainage area	= 0.43 ac	Curve number	= 93.2
Basin Slope	= 3.5 %	Hydraulic length	= 228 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 3.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 3,624 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

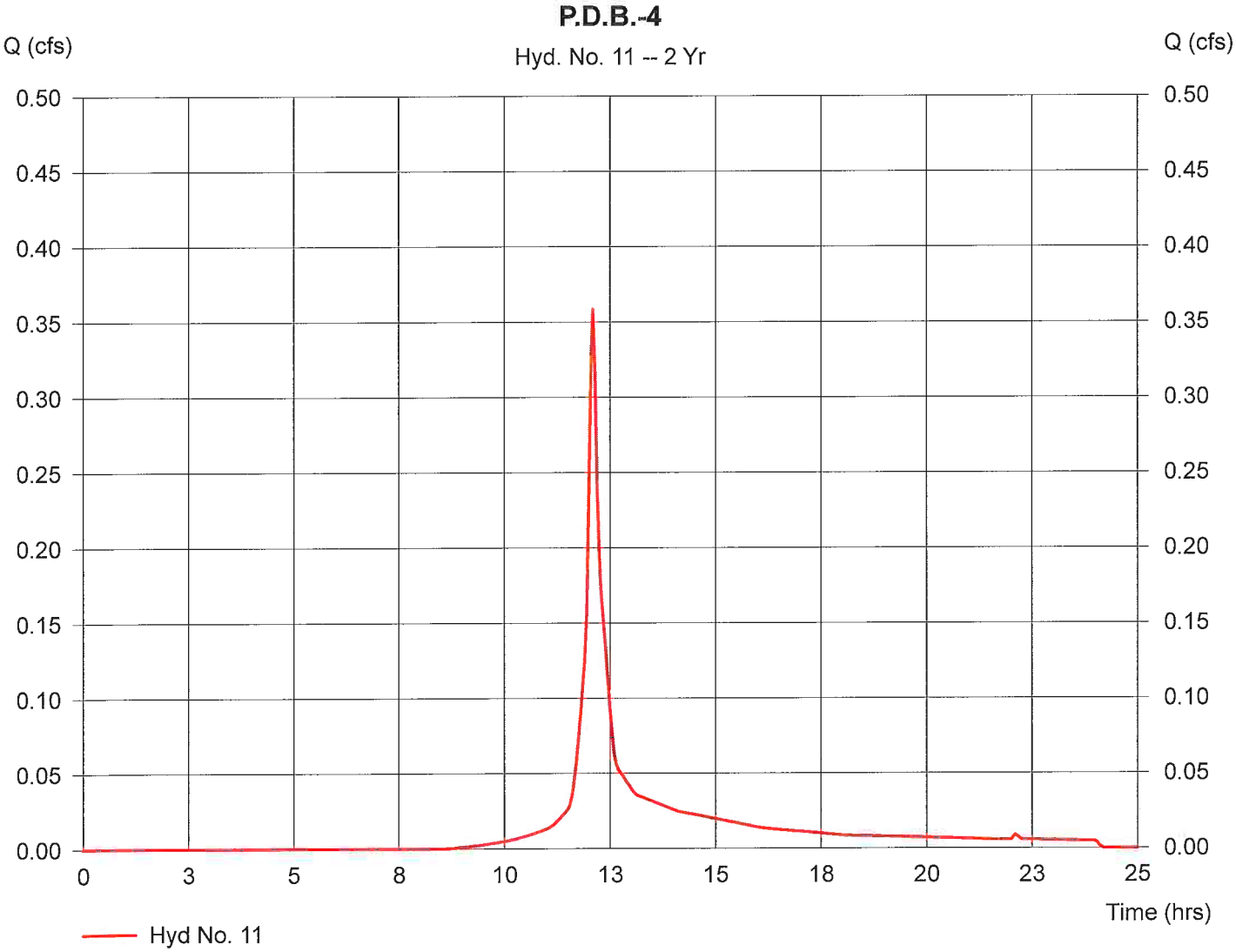
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 11

P.D.B.-4

Hydrograph type	= SCS Runoff	Peak discharge	= 0.36 cfs
Storm frequency	= 2 yrs	Time interval	= 3 min
Drainage area	= 0.22 ac	Curve number	= 82.9
Basin Slope	= 3.5 %	Hydraulic length	= 227 ft
Tc method	= LAG	Time of conc. (Tc)	= 4.733436 min
Total precip.	= 3.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 1,194 cuft



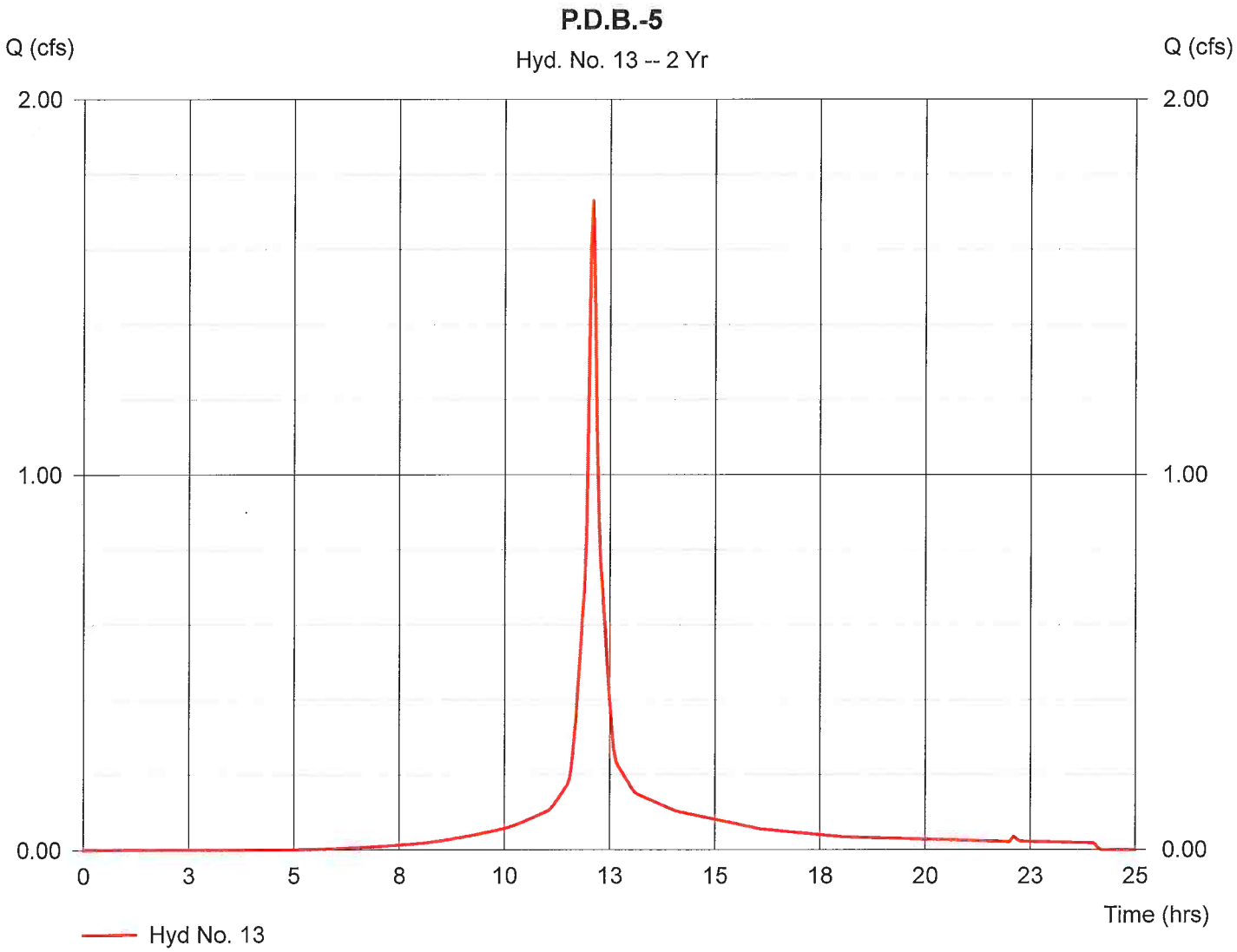
Hydrograph Plot

Hyd. No. 13

P.D.B.-5

Hydrograph type	= SCS Runoff	Peak discharge	= 1.73 cfs
Storm frequency	= 2 yrs	Time interval	= 3 min
Drainage area	= 0.75 ac	Curve number	= 91.7
Basin Slope	= 8.2 %	Hydraulic length	= 170 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 3.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 5,904 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Monday, Sep 14 2015, 2:37 PM

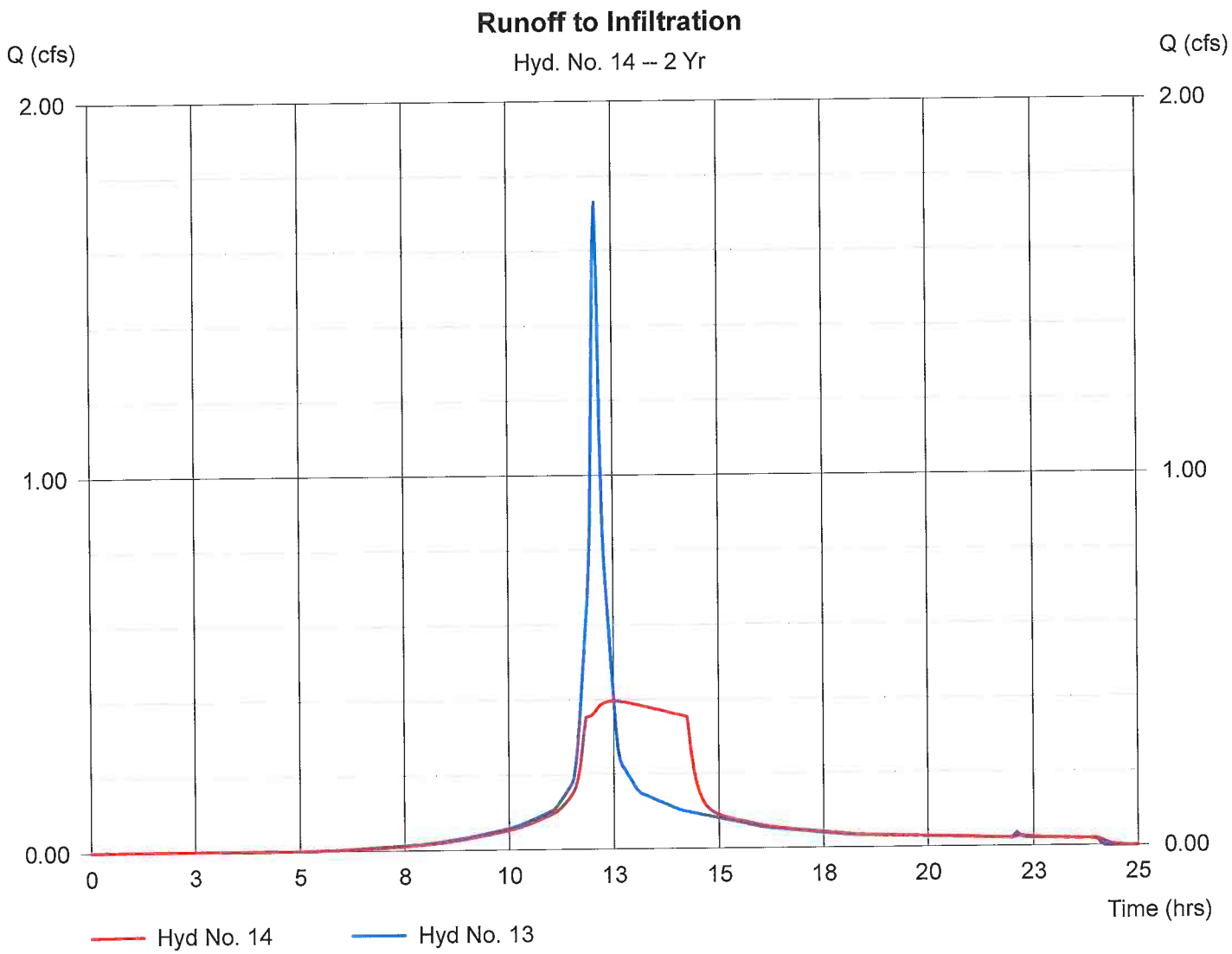
Hyd. No. 14

Runoff to Infiltration

Hydrograph type	= Reservoir	Peak discharge	= 0.40 cfs
Storm frequency	= 2 yrs	Time interval	= 3 min
Inflow hyd. No.	= 13	Max. Elevation	= 195.40 ft
Reservoir name	= Infiltration System	Max. Storage	= 1,620 cuft

Storage Indication method used.

Hydrograph Volume = 5,904 cuft



Pond Report

Pond No. 1 - Infiltration System

Pond Data

Bottom LxW = 68.0 x 26.5 ft Side slope = 0.0:1 Bottom elev. = 194.00 ft Depth = 4.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)*	Total storage (cuft)*
0.00	194.00	1,802	0	0
0.20	194.20	1,802	231	231
0.40	194.40	1,802	231	461
0.60	194.60	1,802	231	692
0.80	194.80	1,802	231	923
1.00	195.00	1,802	231	1,153
1.20	195.20	1,802	231	1,384
1.40	195.40	1,802	231	1,615
1.60	195.60	1,802	231	1,845
1.80	195.80	1,802	231	2,076
2.00	196.00	1,802	231	2,307
2.20	196.20	1,802	231	2,537
2.40	196.40	1,802	231	2,768
2.60	196.60	1,802	231	2,999
2.80	196.80	1,802	231	3,229
3.00	197.00	1,802	231	3,460
3.20	197.20	1,802	231	3,690
3.40	197.40	1,802	231	3,921
3.60	197.60	1,802	231	4,152
3.80	197.80	1,802	231	4,382
4.00	198.00	1,802	231	4,613

(*64.00% voids applied)

Culvert / Orifice Structures

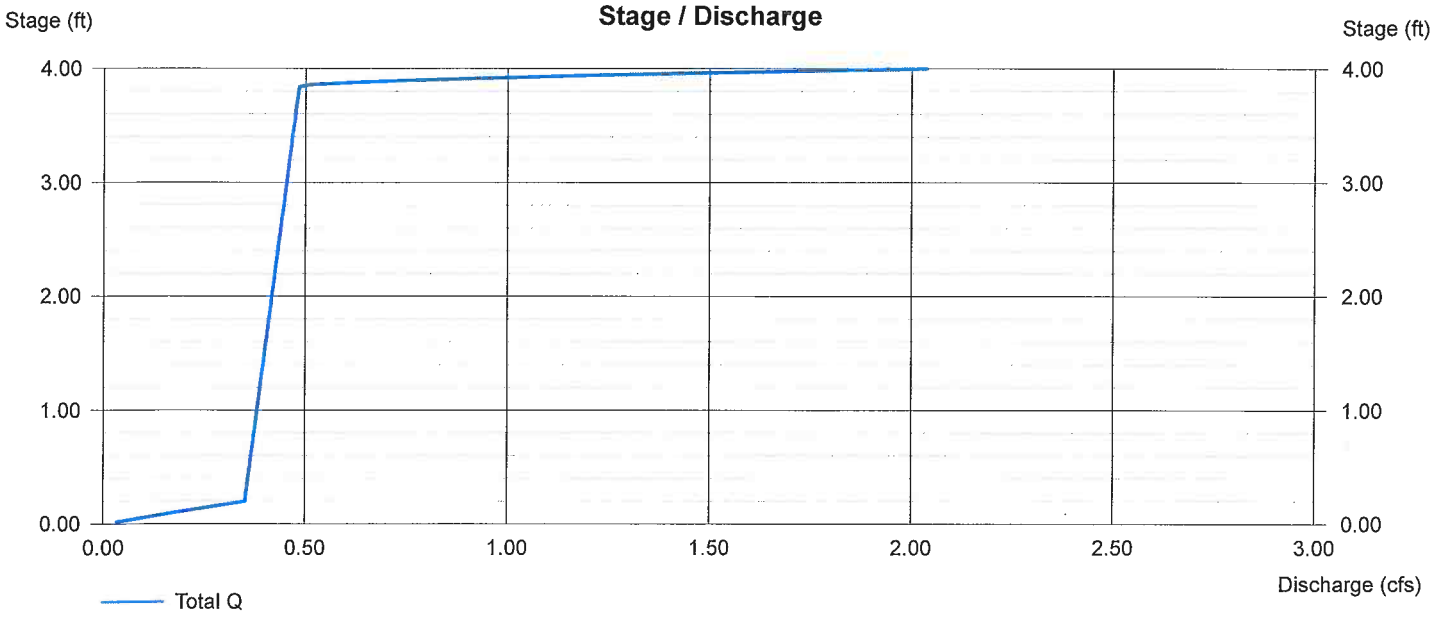
	[A]	[B]	[C]	[D]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 8.00	0.00	0.00	0.00
Crest El. (ft)	= 197.85	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration = 8.270 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

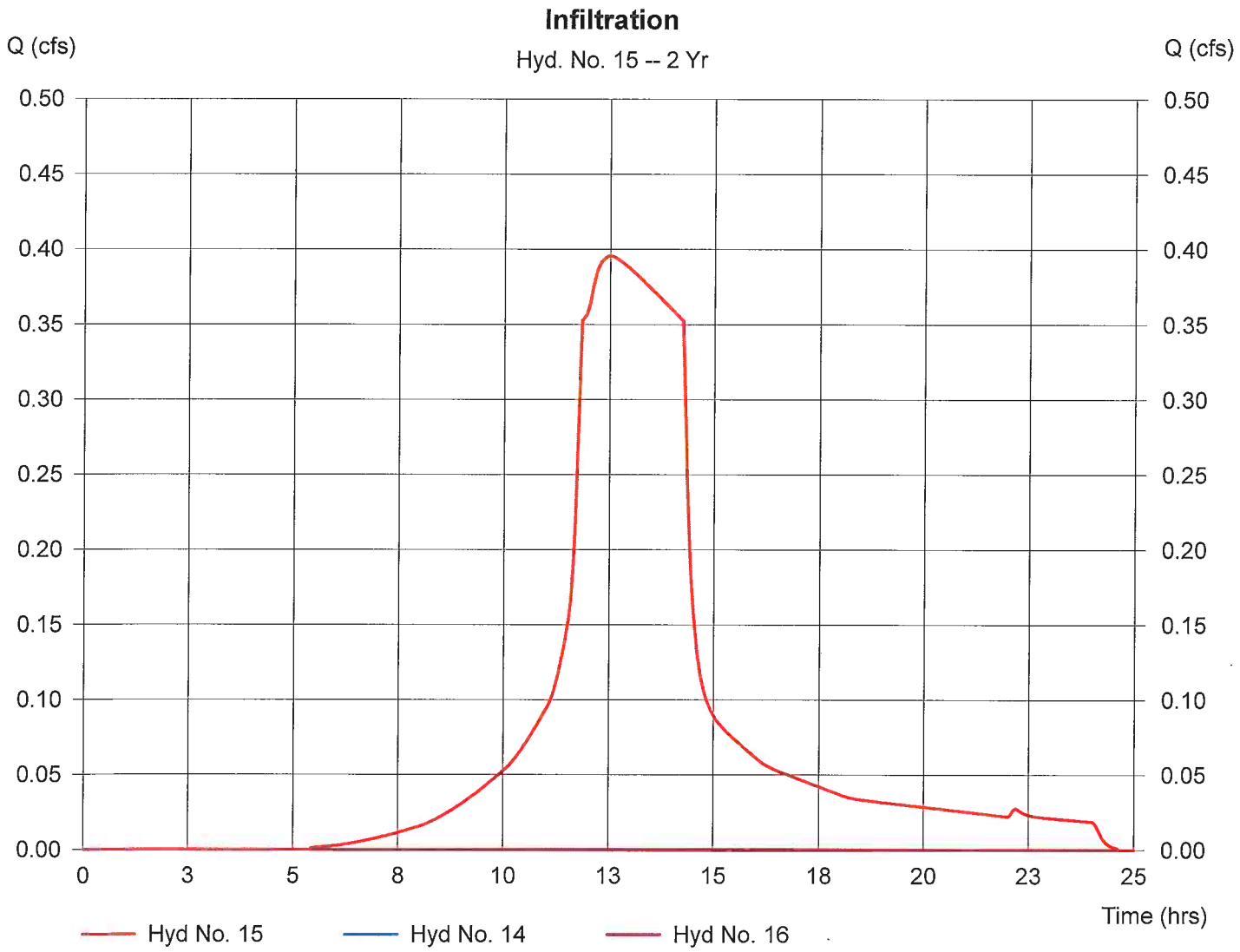
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 15

Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.40 cfs
Storm frequency	= 2 yrs	Time interval	= 3 min
Inflow hydrograph	= 14	2nd diverted hyd.	= 16
Diversion method	= Pond - Infiltration System	Pond structure	= Exfiltration

Hydrograph Volume = 5,904 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

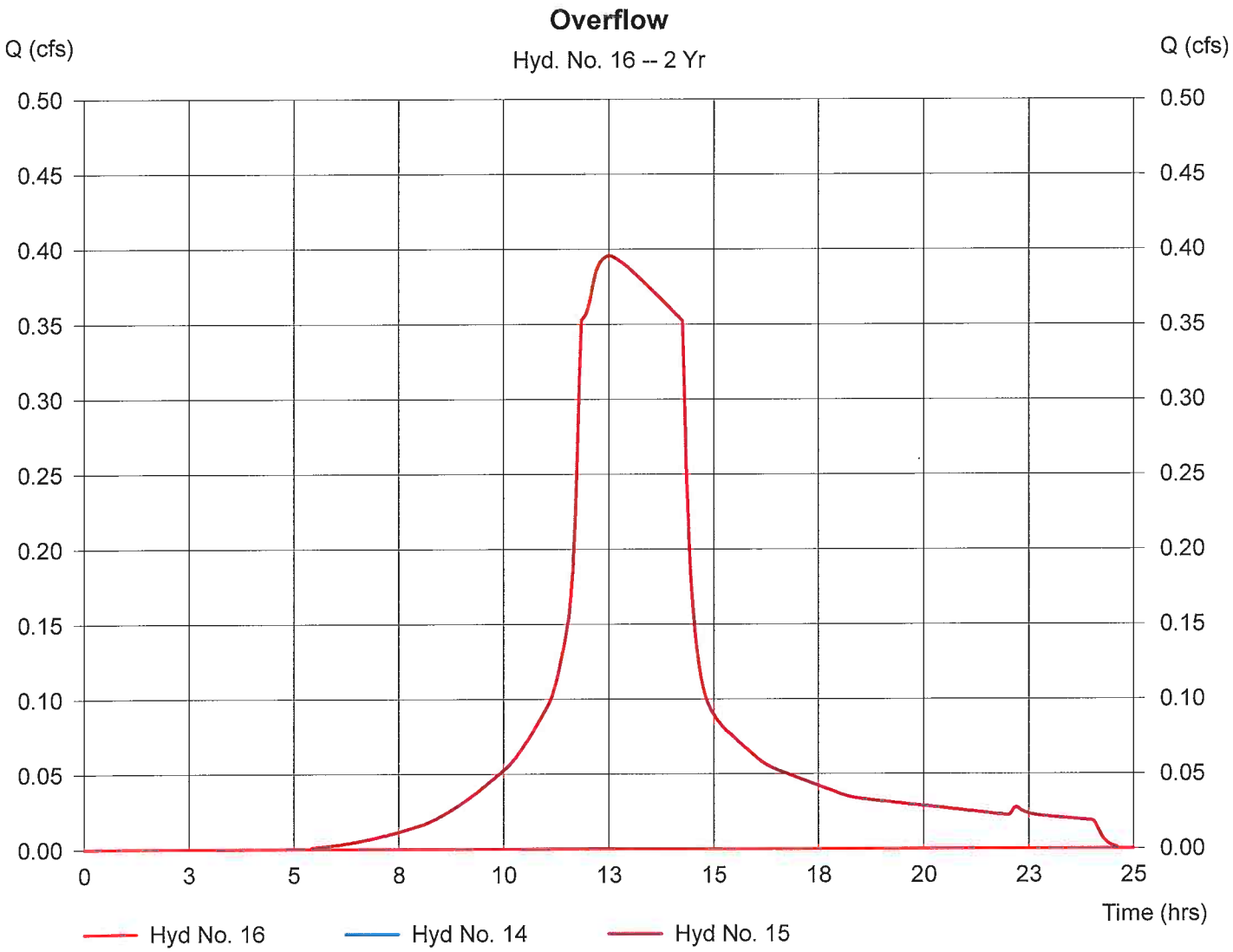
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 16

Overflow

Hydrograph type	= Diversion2	Peak discharge	= 0.00 cfs
Storm frequency	= 2 yrs	Time interval	= 3 min
Inflow hydrograph	= 14	2nd diverted hyd.	= 15
Diversion method	= Pond - Infiltration System	Pond structure	= Exfiltration

Hydrograph Volume = 0 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

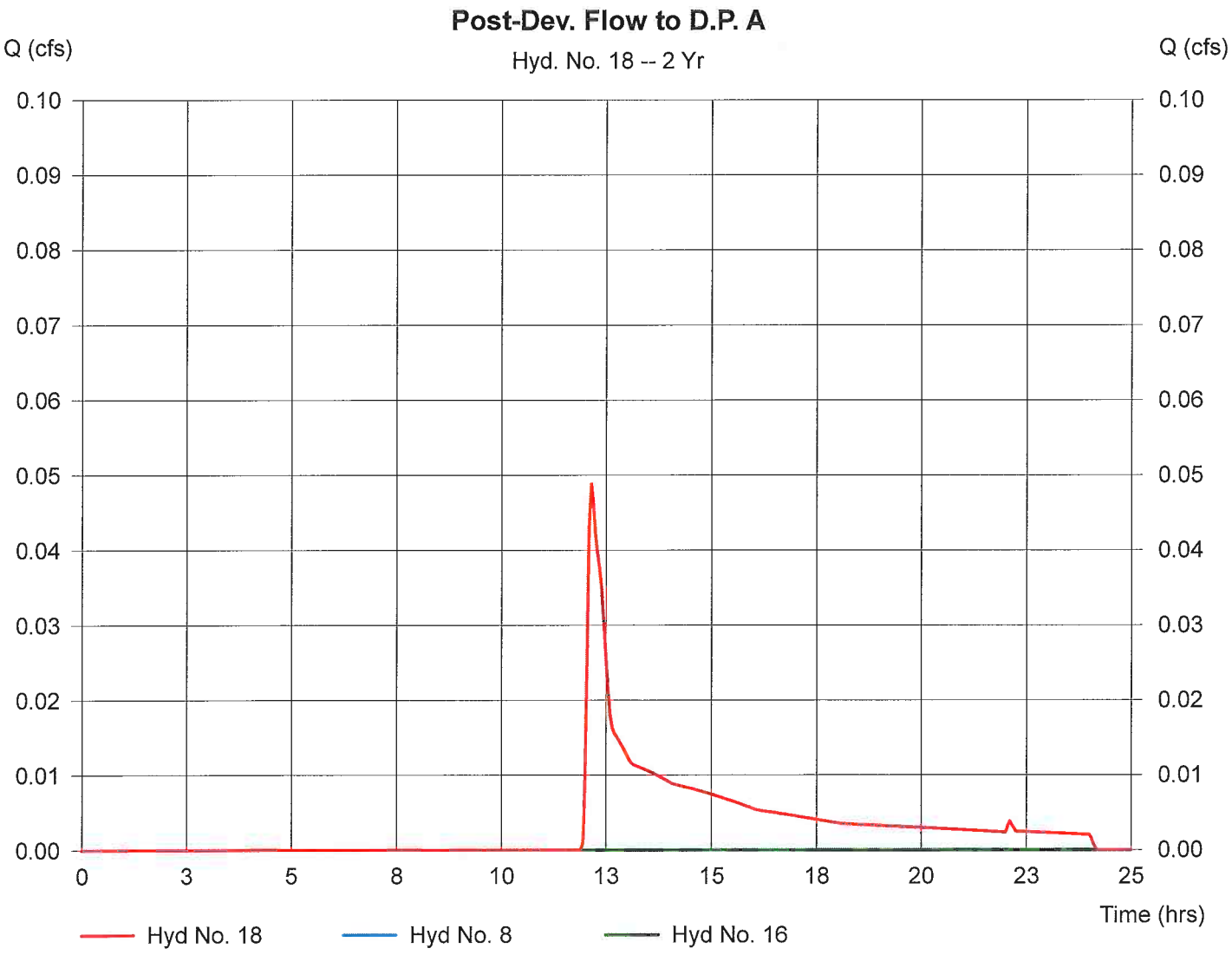
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 18

Post-Dev. Flow to D.P. A

Hydrograph type	= Combine	Peak discharge	= 0.05 cfs
Storm frequency	= 2 yrs	Time interval	= 3 min
Inflow hyds.	= 8, 16		

Hydrograph Volume = 280 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

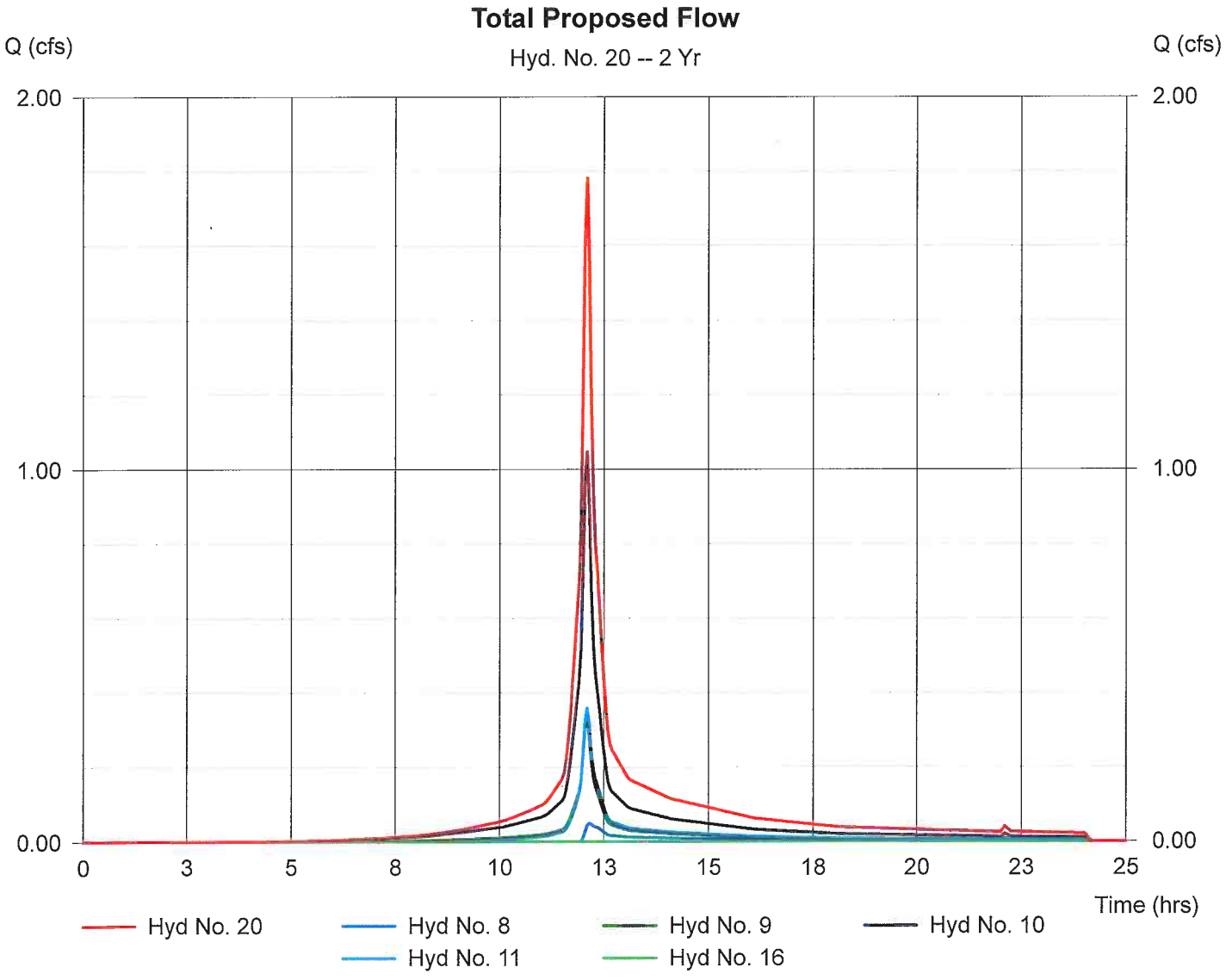
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 20

Total Proposed Flow

Hydrograph type	= Combine	Peak discharge	= 1.78 cfs
Storm frequency	= 2 yrs	Time interval	= 3 min
Inflow hyds.	= 8, 9, 10, 11, 16		

Hydrograph Volume = 6,224 cuft



10-Year Storm, Pre and Post-Development

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	0.59	3	726	2,500	----	------	------	E.C.B.-1
2	SCS Runoff	0.50	3	726	1,747	----	------	------	E.C.B.-2
3	SCS Runoff	2.13	3	726	7,686	----	------	------	E.C.B.-3
4	SCS Runoff	0.66	3	726	2,220	----	------	------	E.C.B.-4
6	SCS Runoff	0.19	3	726	741	----	------	------	P.D.B.-1
7	SCS Runoff	0.53	3	726	1,811	----	------	------	P.D.B.-2
8	SCS Runoff	1.59	3	726	5,626	----	------	------	P.D.B.-3
9	SCS Runoff	0.63	3	726	2,091	----	------	------	P.D.B.-4
11	SCS Runoff	2.67	3	726	9,324	----	------	------	P.D.B.-5
12	Reservoir	0.44	3	756	9,323	11	196.61	3,014	Runoff to Infiltration
13	Diversion1	0.44	3	756	9,323	12	------	------	Infiltration
14	Diversion2	0.00	3	684	0	12	------	------	Overflow
16	Combine	0.19	3	726	741	6, 14,	------	------	Post-Dev. Flow to D.P. A

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

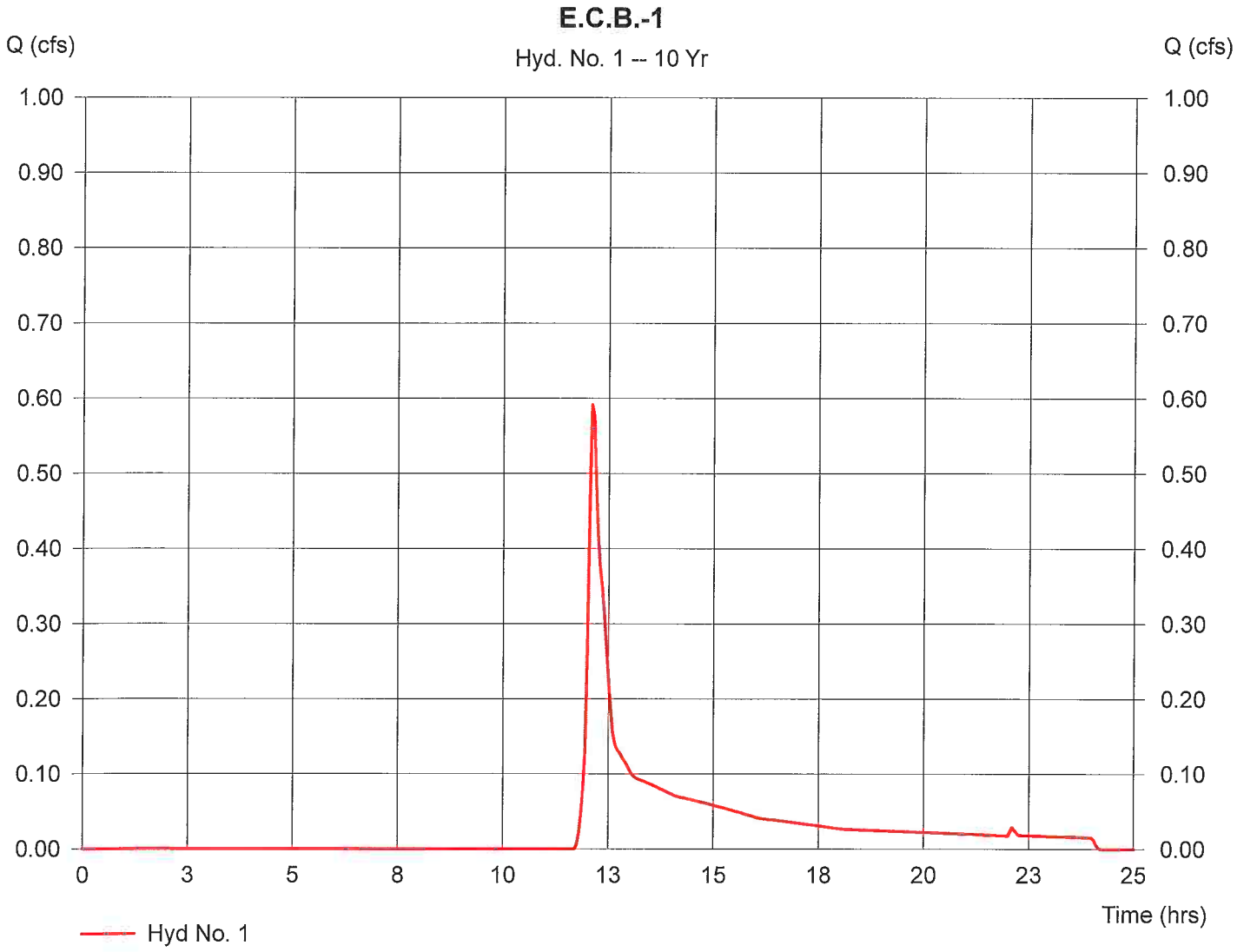
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 1

E.C.B.-1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.59 cfs
Storm frequency	= 10 yrs	Time interval	= 3 min
Drainage area	= 0.83 ac	Curve number	= 56.8
Basin Slope	= 10.6 %	Hydraulic length	= 186 ft
Tc method	= LAG	Time of conc. (Tc)	= 4.779908 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 2,500 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

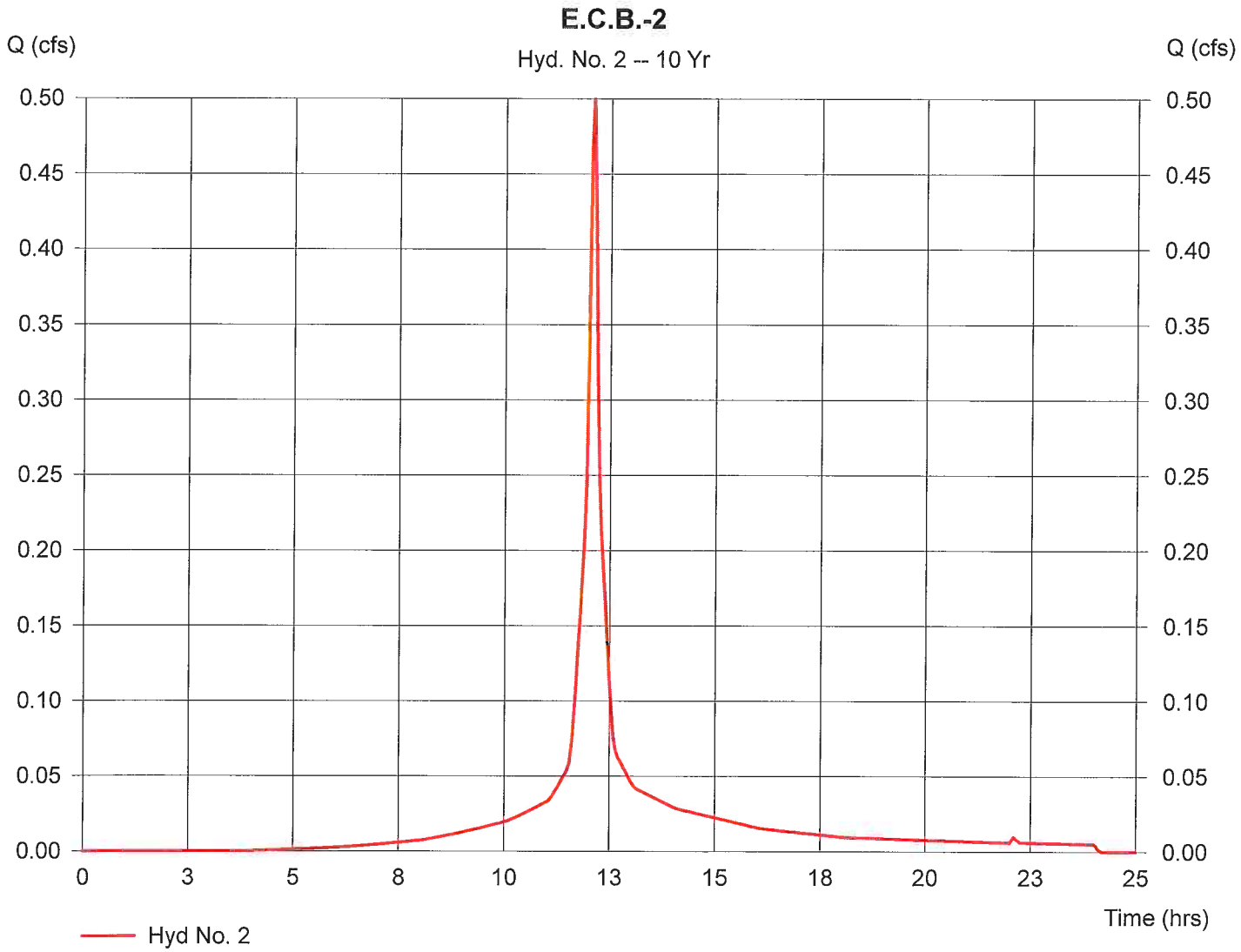
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 2

E.C.B.-2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.50 cfs
Storm frequency	= 10 yrs	Time interval	= 3 min
Drainage area	= 0.14 ac	Curve number	= 91.7
Basin Slope	= 5.3 %	Hydraulic length	= 224 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 1,747 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

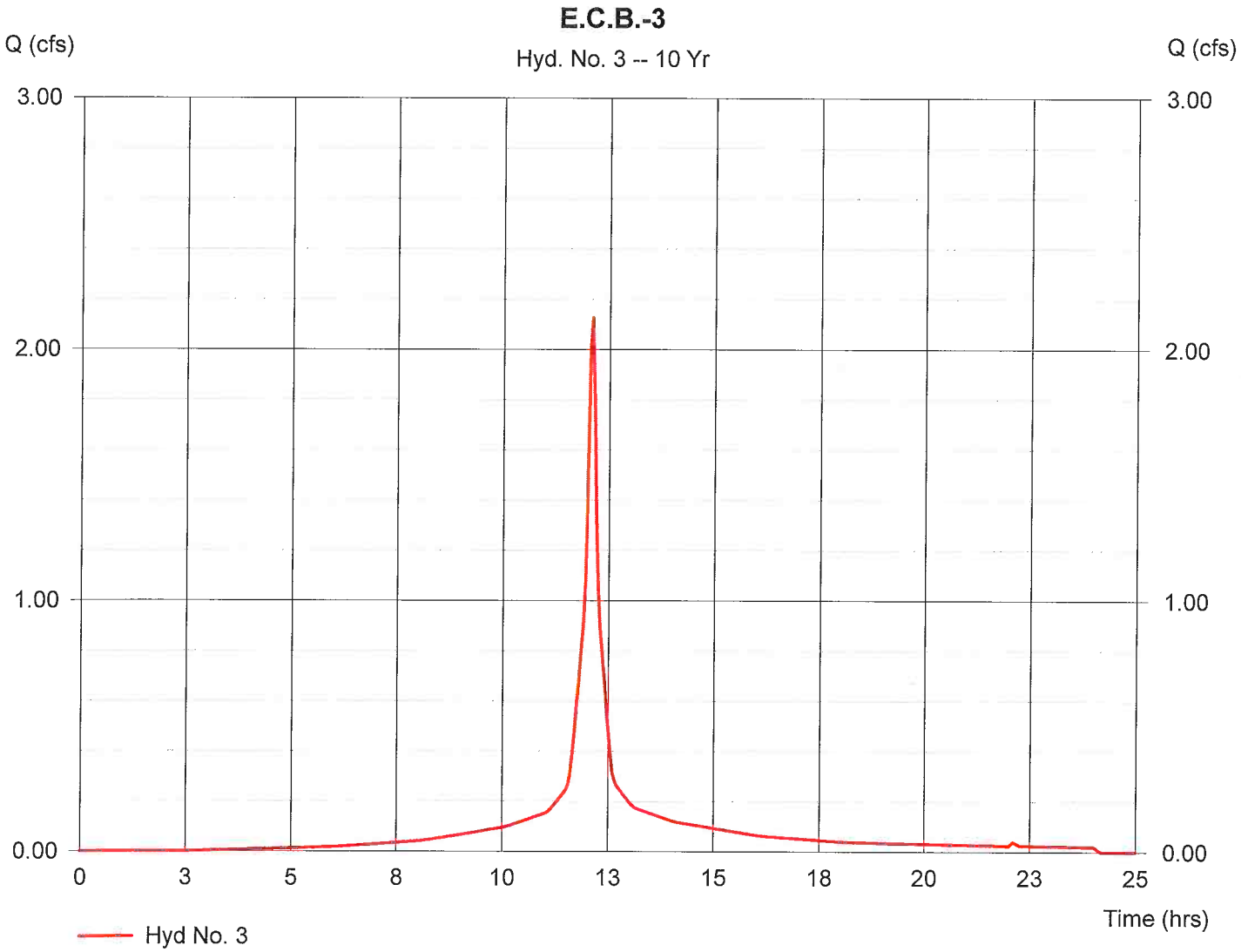
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 3

E.C.B.-3

Hydrograph type	= SCS Runoff	Peak discharge	= 2.13 cfs
Storm frequency	= 10 yrs	Time interval	= 3 min
Drainage area	= 0.57 ac	Curve number	= 94.7
Basin Slope	= 3.6 %	Hydraulic length	= 181 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 7,686 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

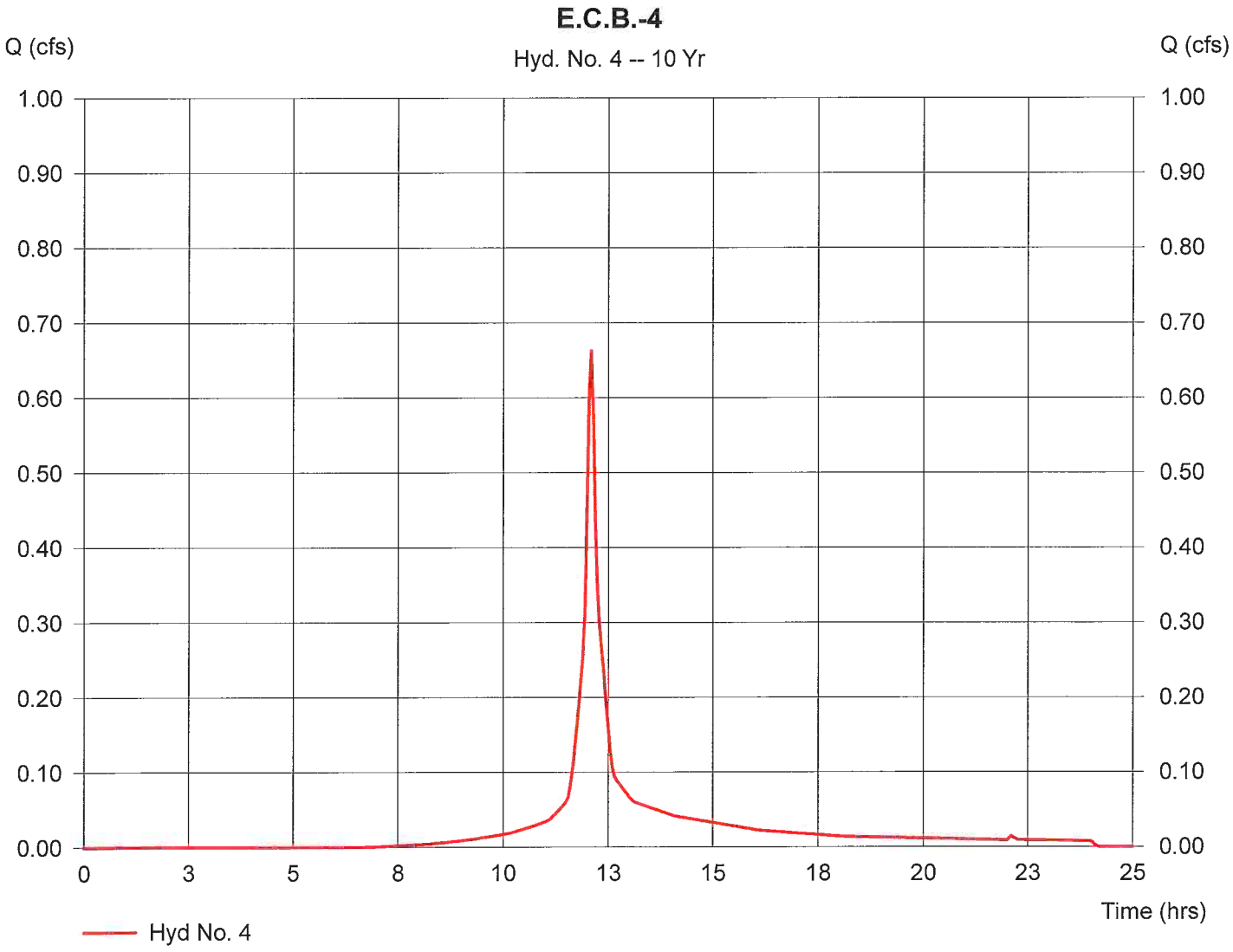
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 4

E.C.B.-4

Hydrograph type	= SCS Runoff	Peak discharge	= 0.66 cfs
Storm frequency	= 10 yrs	Time interval	= 3 min
Drainage area	= 0.22 ac	Curve number	= 84.2
Basin Slope	= 4.9 %	Hydraulic length	= 164 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 2,220 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

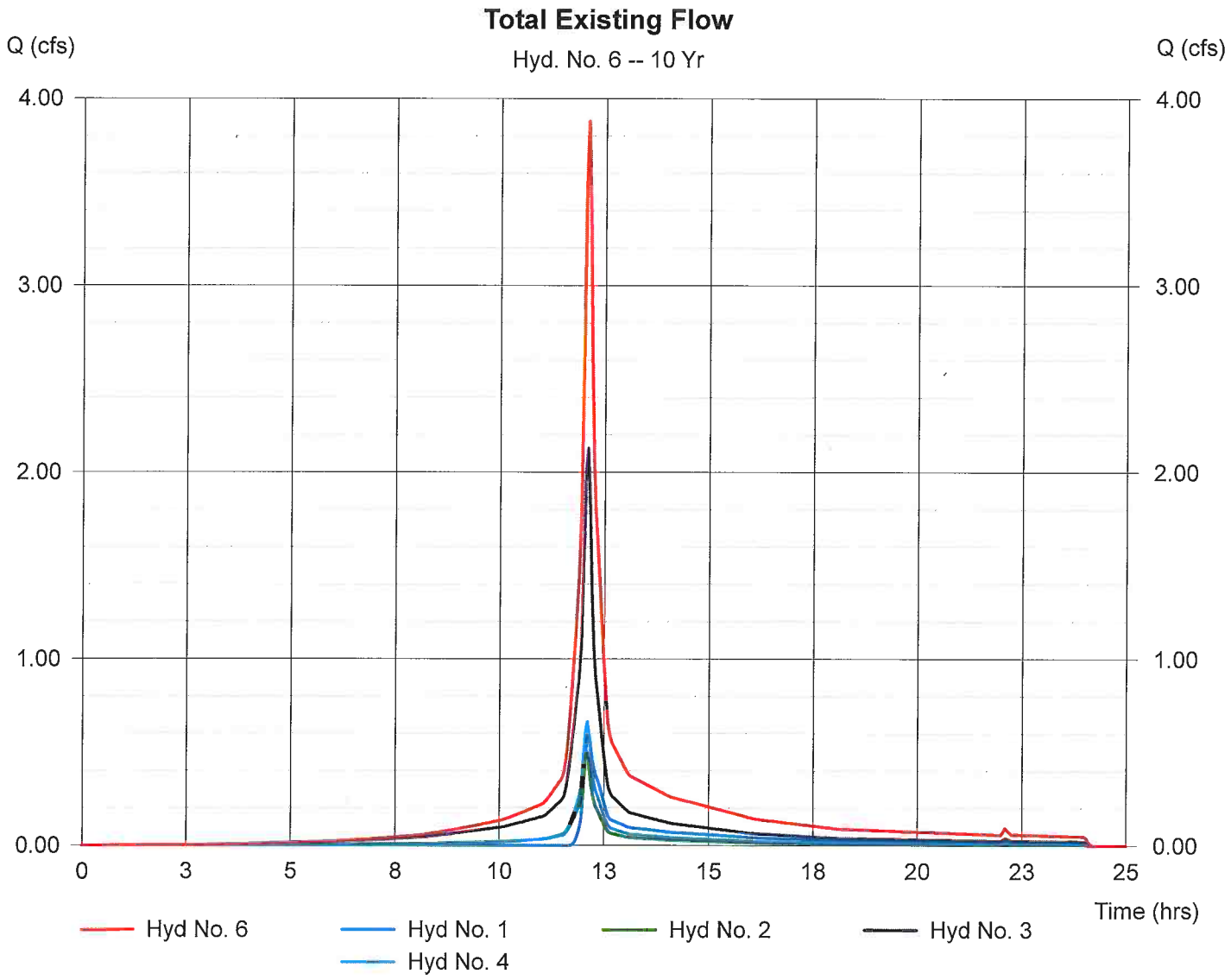
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 6

Total Existing Flow

Hydrograph type	= Combine	Peak discharge	= 3.88 cfs
Storm frequency	= 10 yrs	Time interval	= 3 min
Inflow hyds.	= 1, 2, 3, 4		

Hydrograph Volume = 14,154 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

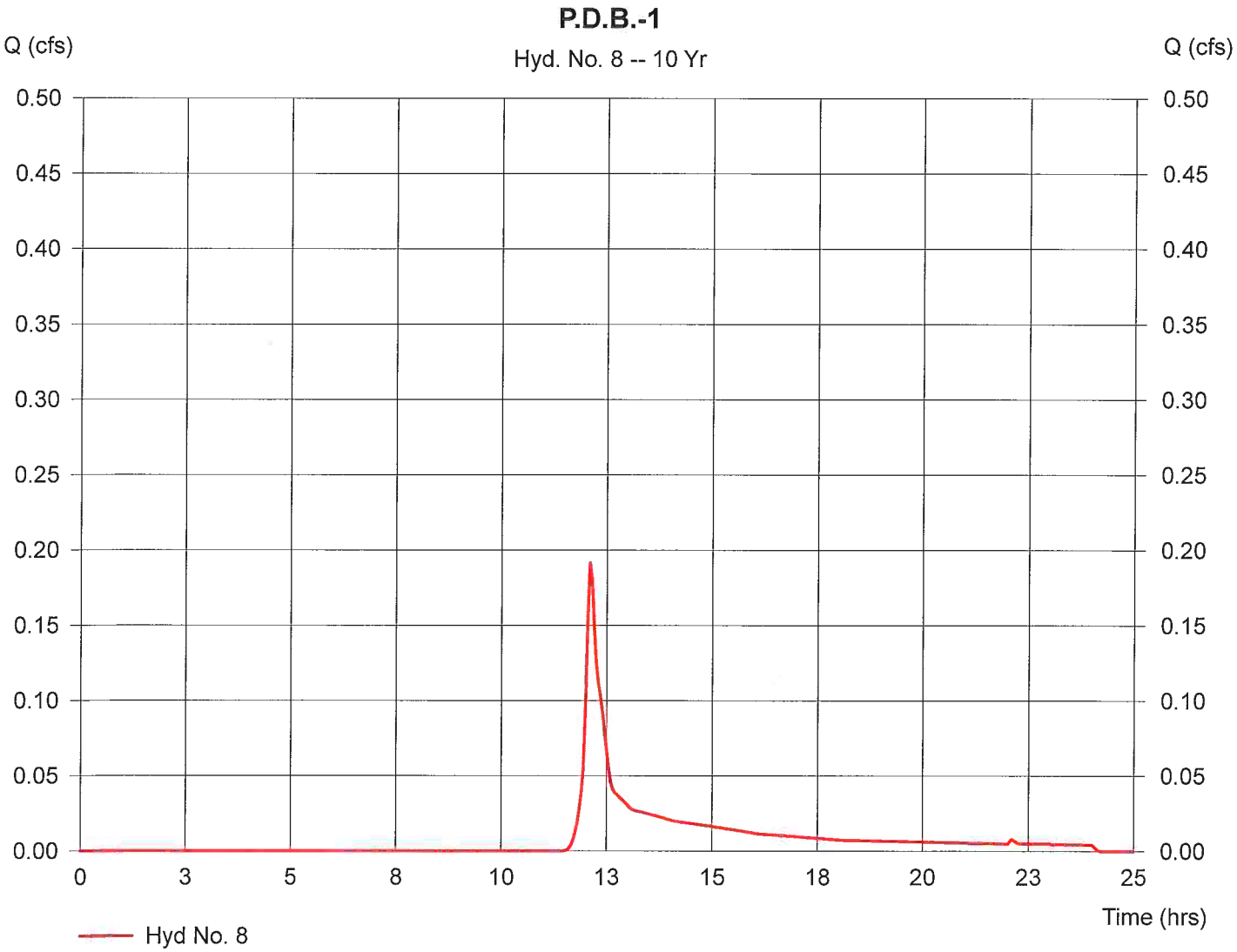
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 8

P.D.B.-1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.19 cfs
Storm frequency	= 10 yrs	Time interval	= 3 min
Drainage area	= 0.21 ac	Curve number	= 59.8
Basin Slope	= 9.8 %	Hydraulic length	= 123 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 741 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

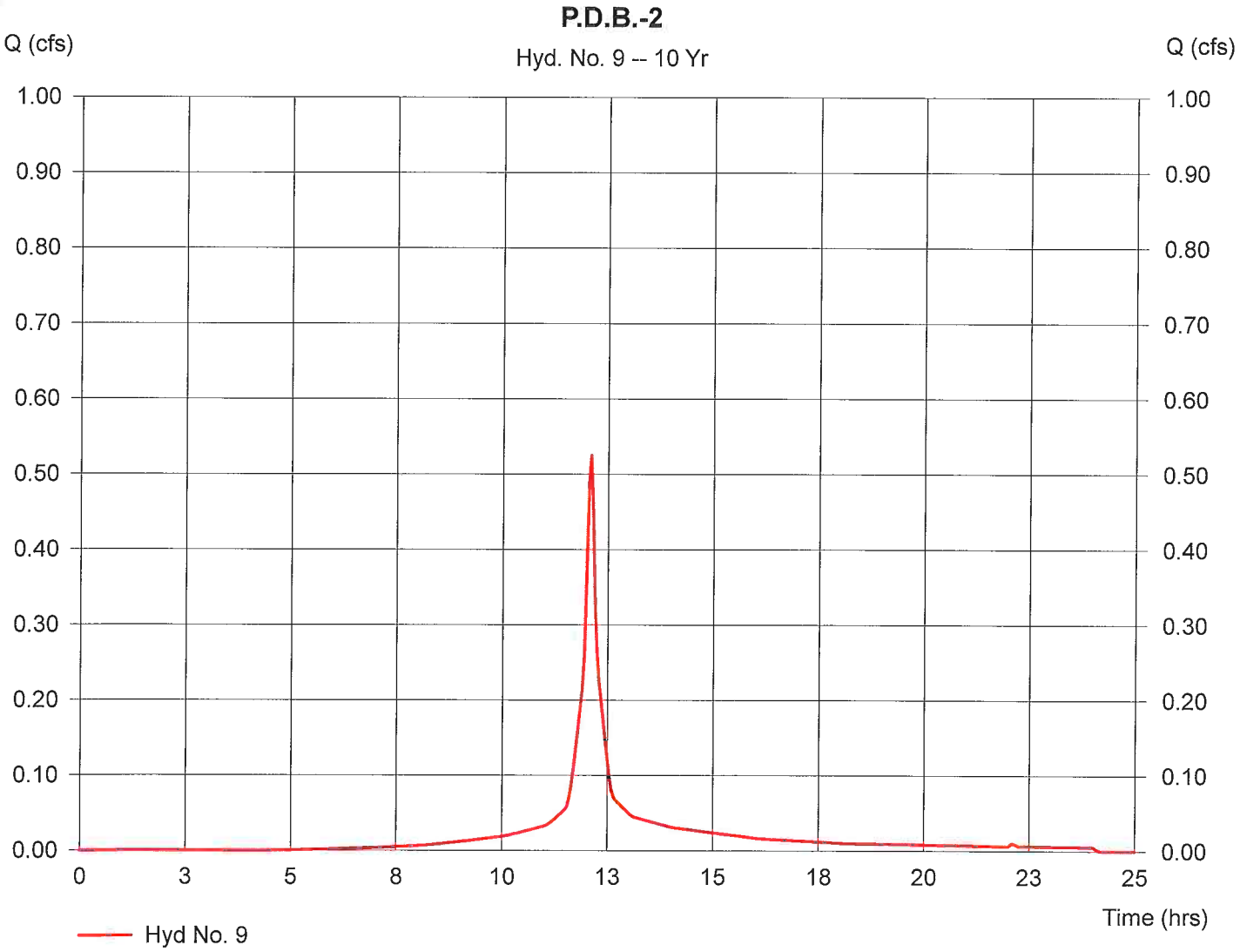
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 9

P.D.B.-2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.53 cfs
Storm frequency	= 10 yrs	Time interval	= 3 min
Drainage area	= 0.15 ac	Curve number	= 90.1
Basin Slope	= 4.6 %	Hydraulic length	= 238 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 1,811 cuft



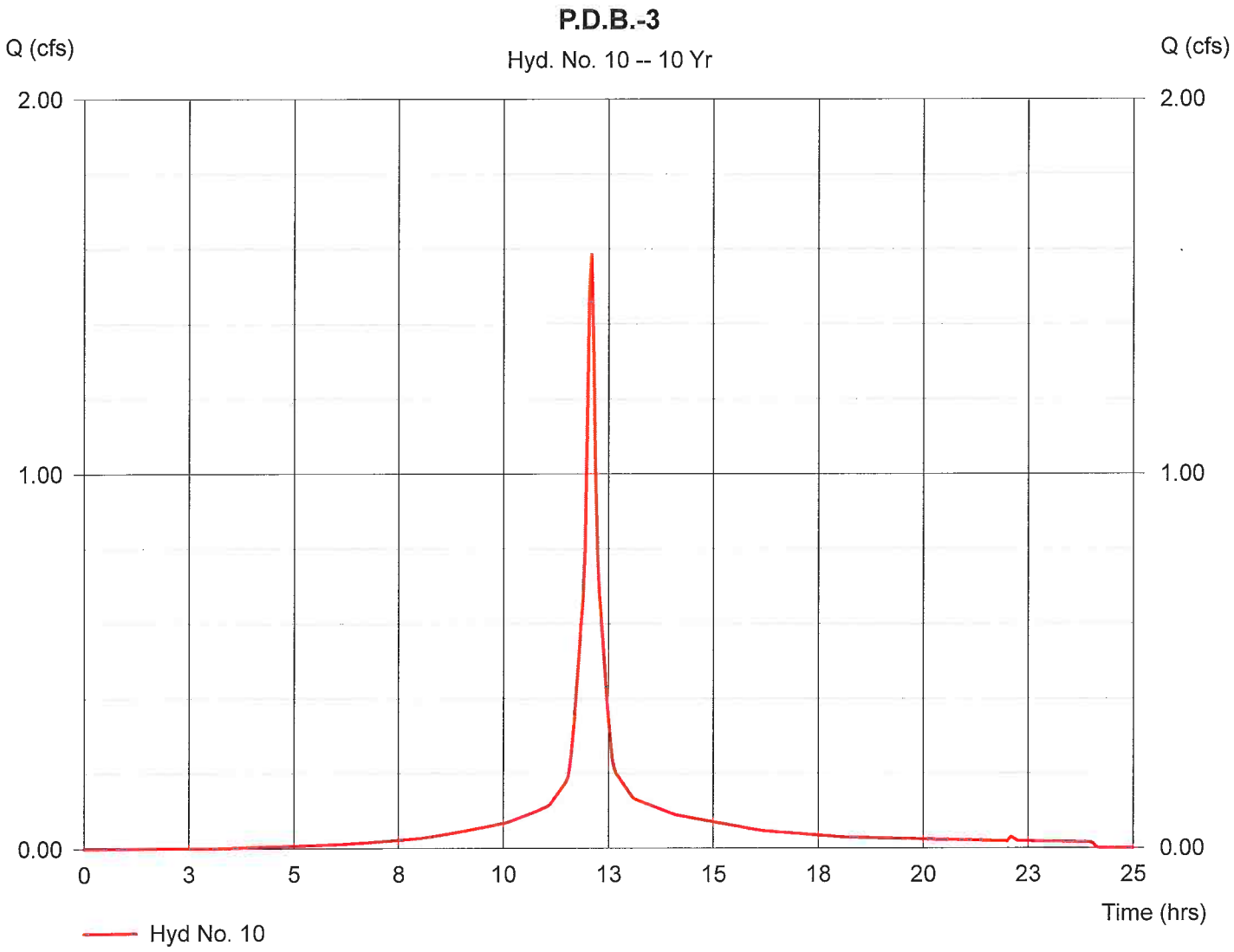
Hydrograph Plot

Hyd. No. 10

P.D.B.-3

Hydrograph type	= SCS Runoff	Peak discharge	= 1.59 cfs
Storm frequency	= 10 yrs	Time interval	= 3 min
Drainage area	= 0.43 ac	Curve number	= 93.2
Basin Slope	= 3.5 %	Hydraulic length	= 228 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 5,626 cuft



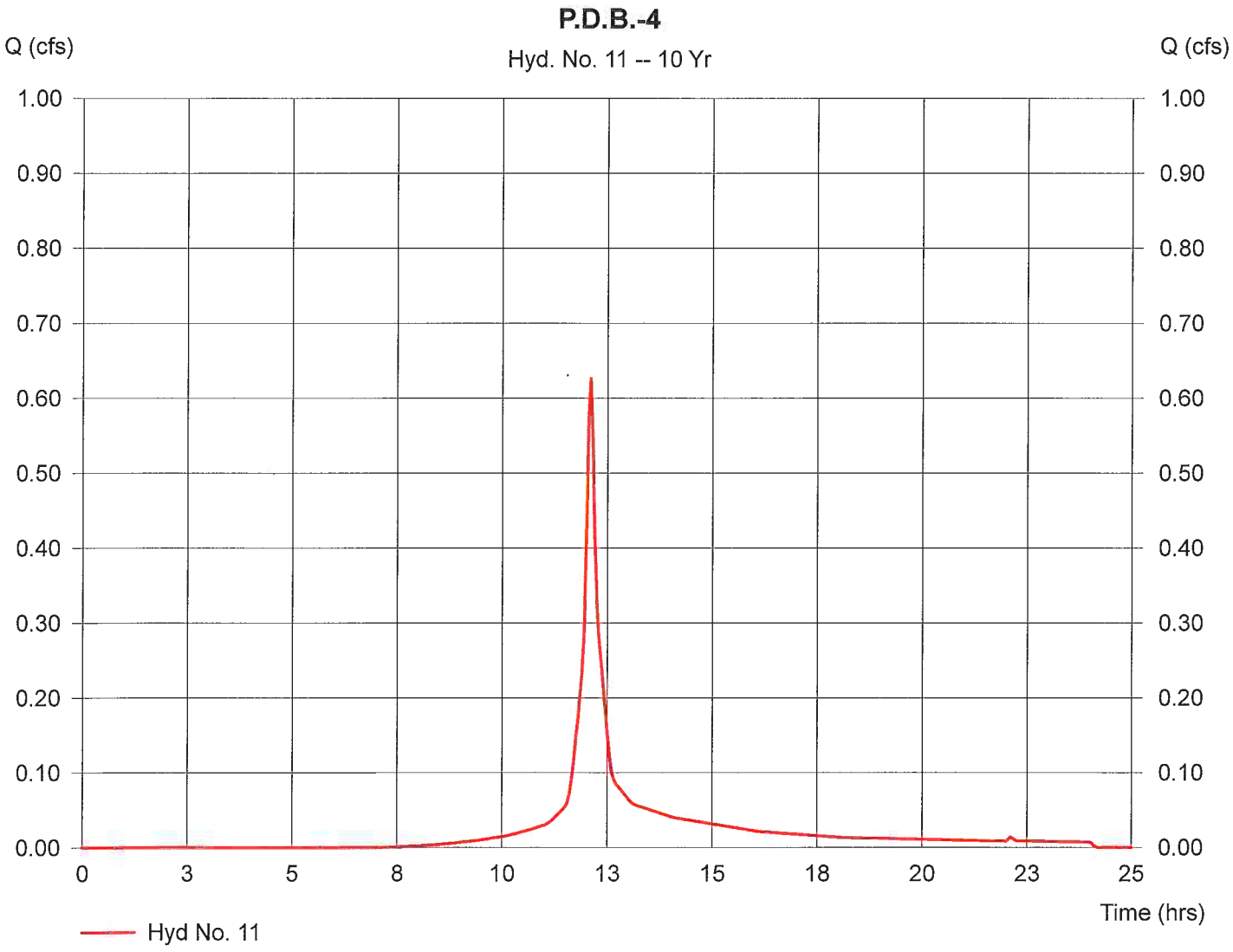
Hydrograph Plot

Hyd. No. 11

P.D.B.-4

Hydrograph type	= SCS Runoff	Peak discharge	= 0.63 cfs
Storm frequency	= 10 yrs	Time interval	= 3 min
Drainage area	= 0.22 ac	Curve number	= 82.9
Basin Slope	= 3.5 %	Hydraulic length	= 227 ft
Tc method	= LAG	Time of conc. (Tc)	= 4.733436 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 2,091 cuft



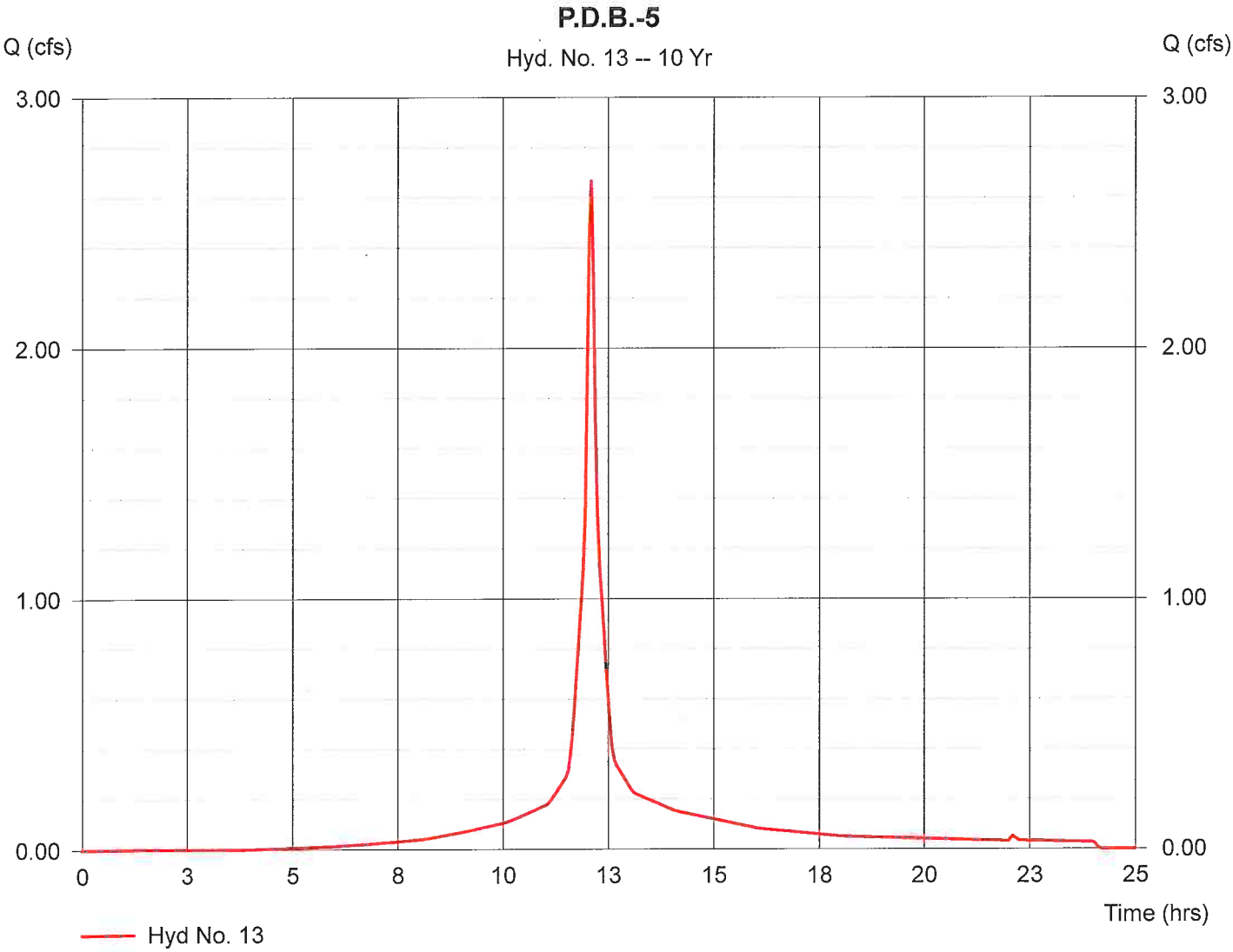
Hydrograph Plot

Hyd. No. 13

P.D.B.-5

Hydrograph type	= SCS Runoff	Peak discharge	= 2.67 cfs
Storm frequency	= 10 yrs	Time interval	= 3 min
Drainage area	= 0.75 ac	Curve number	= 91.7
Basin Slope	= 8.2 %	Hydraulic length	= 170 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 4.60 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 9,324 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Monday, Sep 14 2015, 2:37 PM

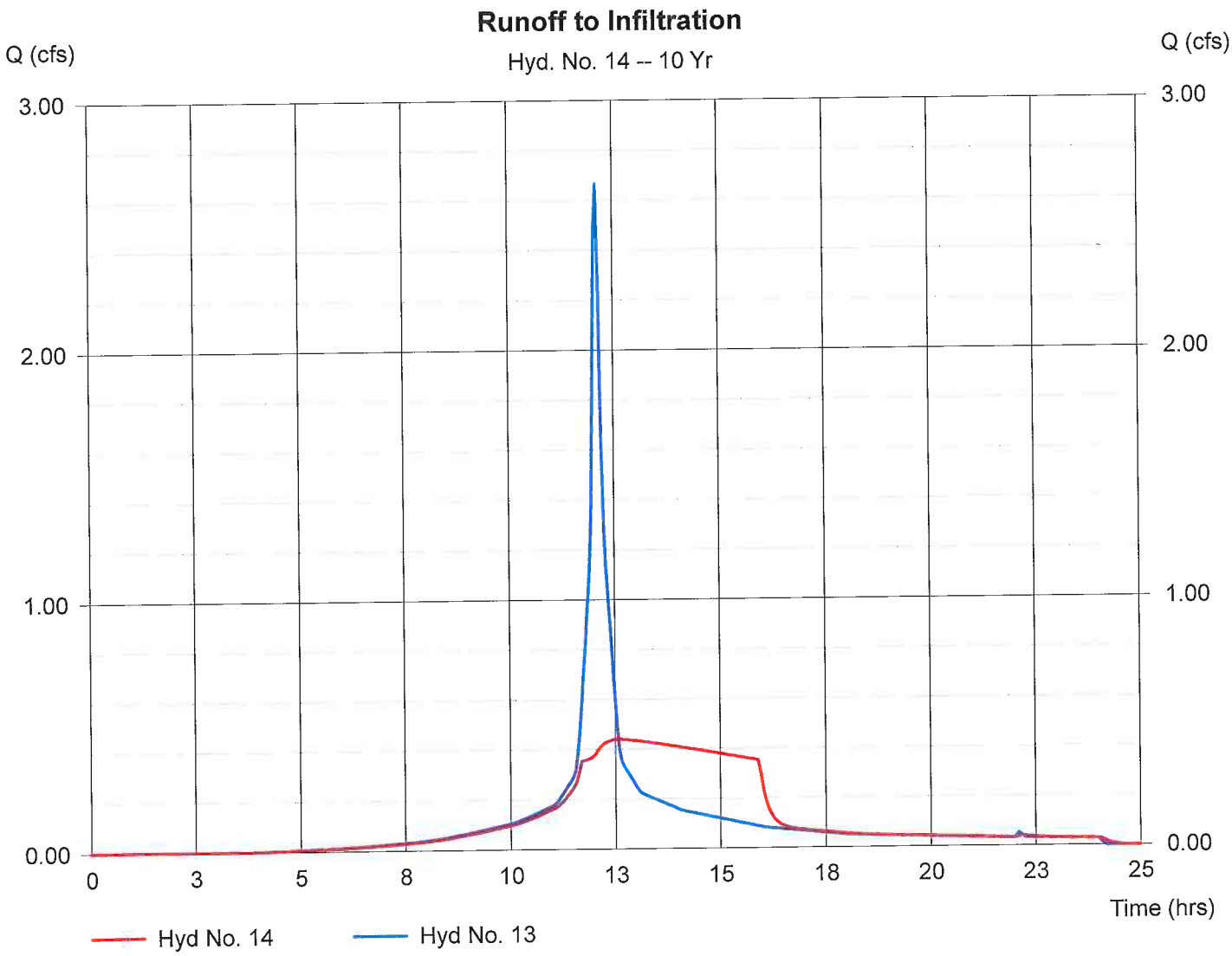
Hyd. No. 14

Runoff to Infiltration

Hydrograph type	= Reservoir	Peak discharge	= 0.44 cfs
Storm frequency	= 10 yrs	Time interval	= 3 min
Inflow hyd. No.	= 13	Max. Elevation	= 196.61 ft
Reservoir name	= Infiltration System	Max. Storage	= 3,014 cuft

Storage Indication method used.

Hydrograph Volume = 9,323 cuft



Pond Report

Hydraflow Hydrographs by Intelisolve

Monday, Sep 14 2015, 2:37 PM

Pond No. 1 - Infiltration System

Pond Data

Bottom LxW = 68.0 x 26.5 ft Side slope = 0.0:1 Bottom elev. = 194.00 ft Depth = 4.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)*	Total storage (cuft)*
0.00	194.00	1,802	0	0
0.20	194.20	1,802	231	231
0.40	194.40	1,802	231	461
0.60	194.60	1,802	231	692
0.80	194.80	1,802	231	923
1.00	195.00	1,802	231	1,153
1.20	195.20	1,802	231	1,384
1.40	195.40	1,802	231	1,615
1.60	195.60	1,802	231	1,845
1.80	195.80	1,802	231	2,076
2.00	196.00	1,802	231	2,307
2.20	196.20	1,802	231	2,537
2.40	196.40	1,802	231	2,768
2.60	196.60	1,802	231	2,999
2.80	196.80	1,802	231	3,229
3.00	197.00	1,802	231	3,460
3.20	197.20	1,802	231	3,690
3.40	197.40	1,802	231	3,921
3.60	197.60	1,802	231	4,152
3.80	197.80	1,802	231	4,382
4.00	198.00	1,802	231	4,613

(*64.00% voids applied)

Culvert / Orifice Structures

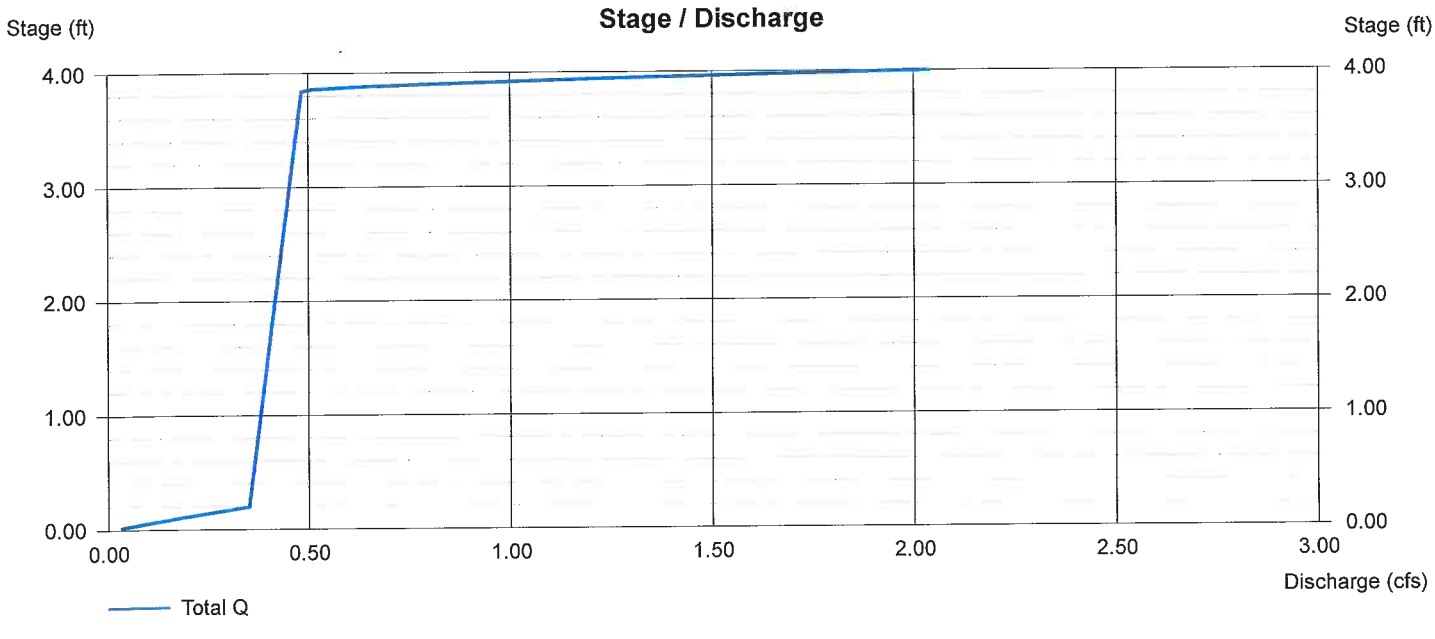
	[A]	[B]	[C]	[D]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 8.00	0.00	0.00	0.00
Crest El. (ft)	= 197.85	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration = 8.270 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

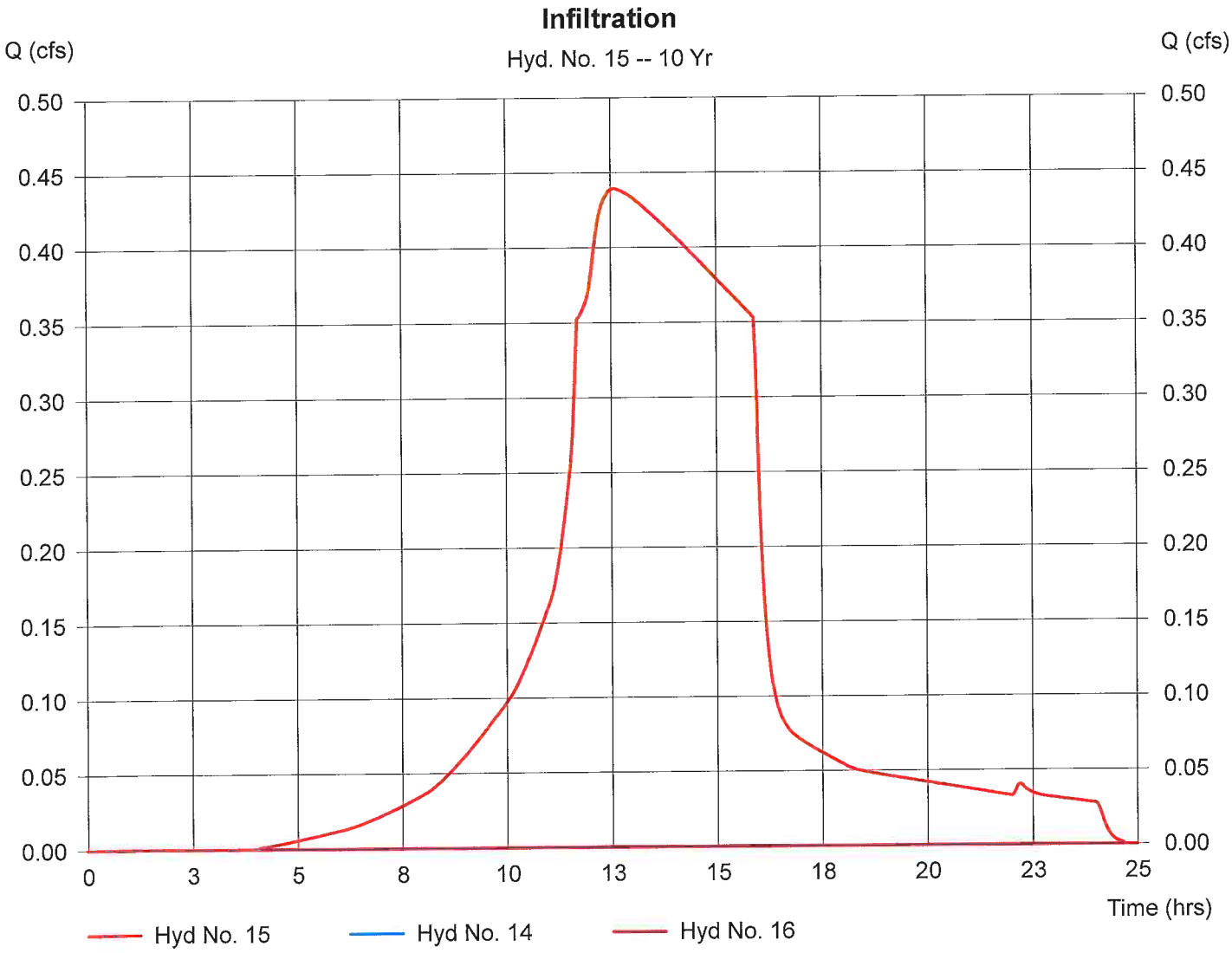
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 15

Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.44 cfs
Storm frequency	= 10 yrs	Time interval	= 3 min
Inflow hydrograph	= 14	2nd diverted hyd.	= 16
Diversion method	= Pond - Infiltration System	Pond structure	= Exfiltration

Hydrograph Volume = 9,323 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

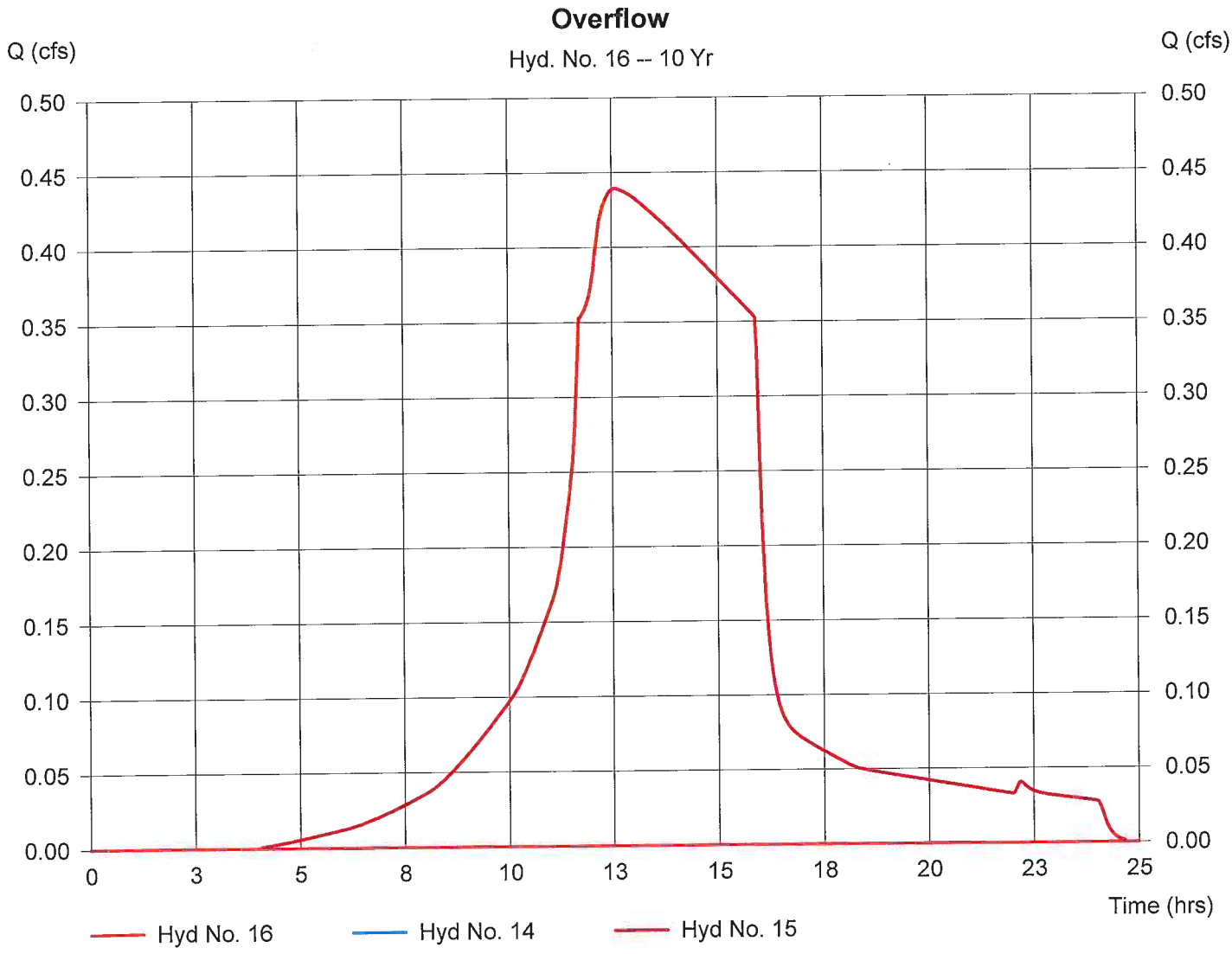
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 16

Overflow

Hydrograph type	= Diversion2	Peak discharge	= 0.00 cfs
Storm frequency	= 10 yrs	Time interval	= 3 min
Inflow hydrograph	= 14	2nd diverted hyd.	= 15
Diversion method	= Pond - Infiltration System	Pond structure	= Exfiltration

Hydrograph Volume = 0 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Monday, Sep 14 2015, 2:37 PM

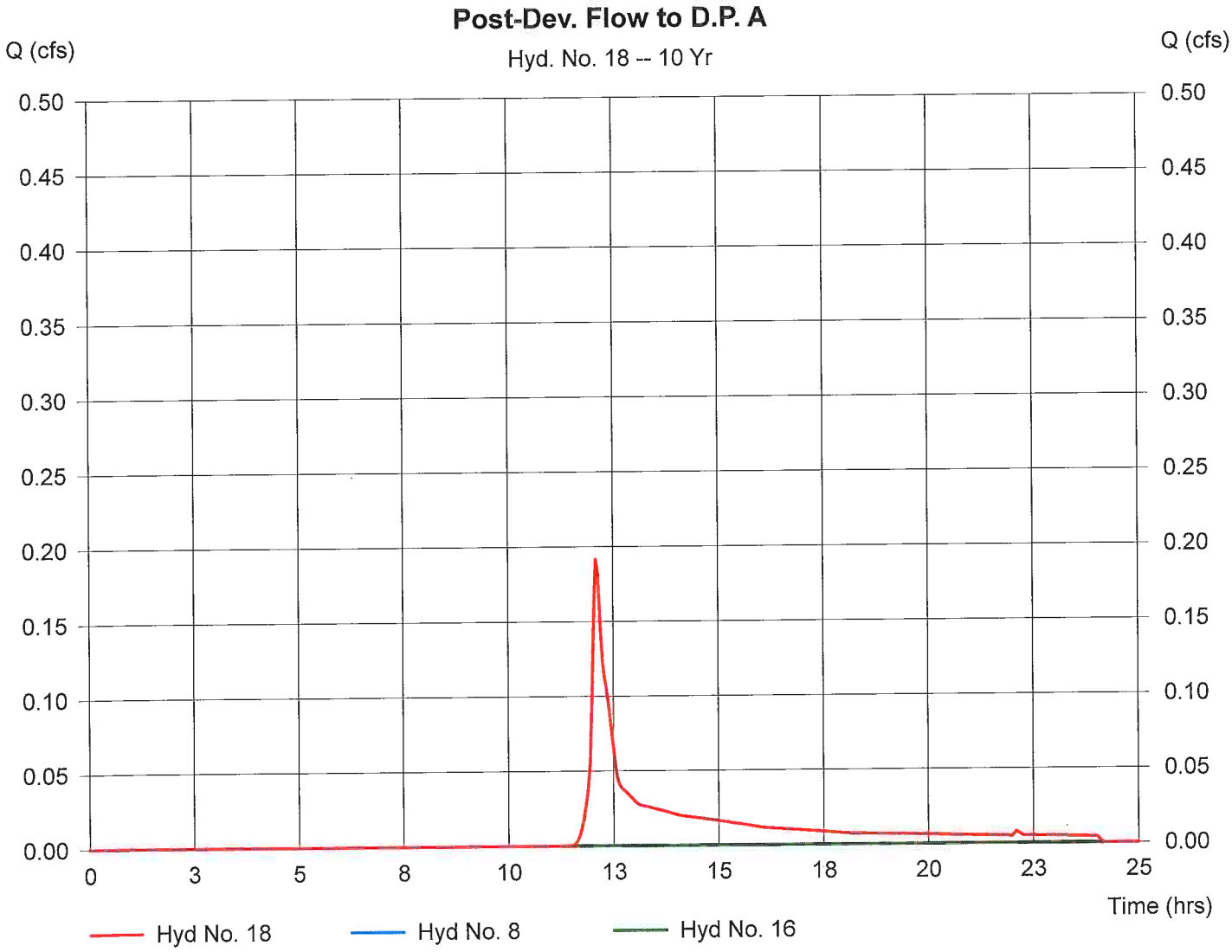
Hyd. No. 18

Post-Dev. Flow to D.P. A

Hydrograph type = Combine
Storm frequency = 10 yrs
Inflow hyds. = 8, 16

Peak discharge = 0.19 cfs
Time interval = 3 min

Hydrograph Volume = 741 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

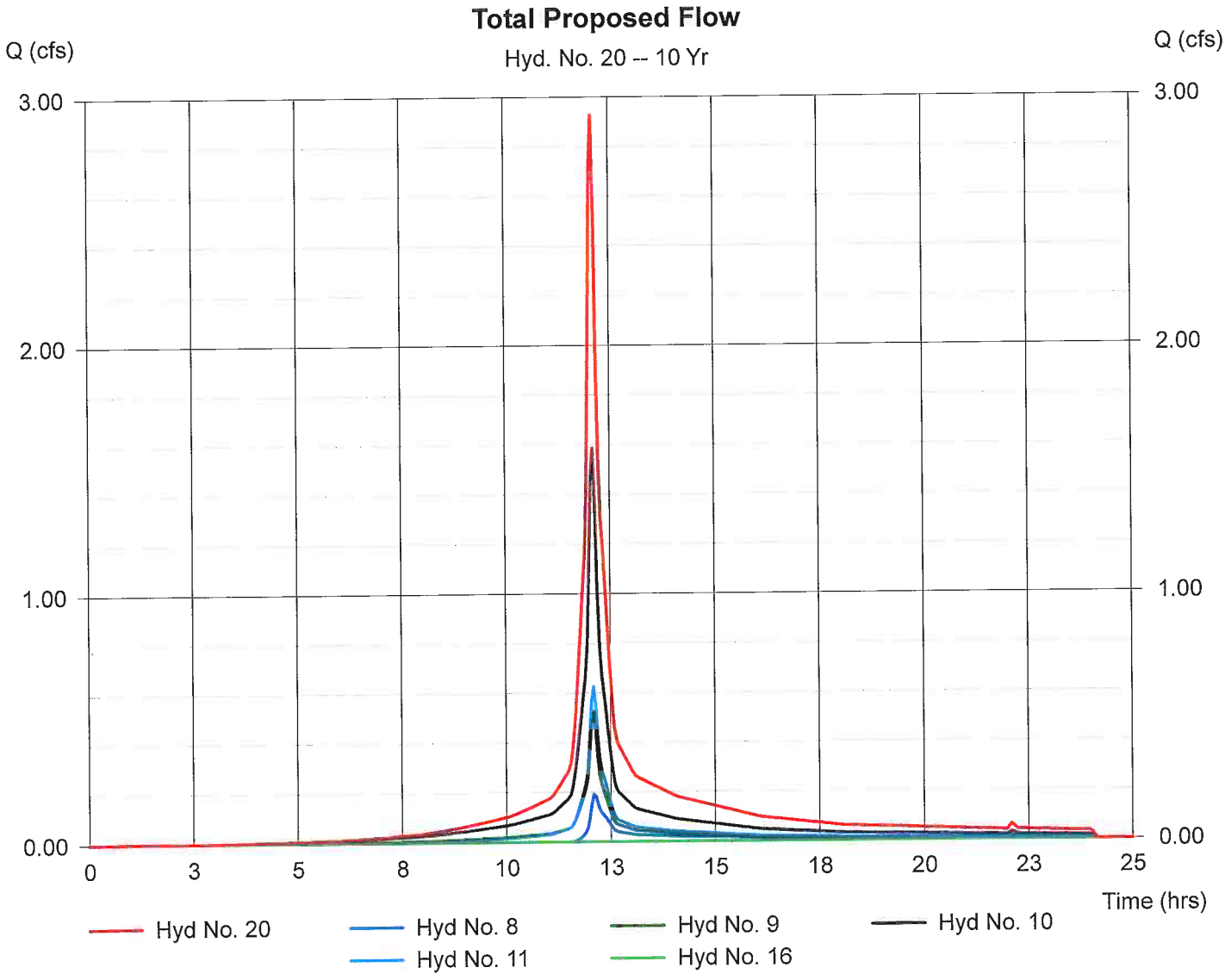
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 20

Total Proposed Flow

Hydrograph type	= Combine	Peak discharge	= 2.93 cfs
Storm frequency	= 10 yrs	Time interval	= 3 min
Inflow hyds.	= 8, 9, 10, 11, 16		

Hydrograph Volume = 10,270 cuft



25-Year Storm, Pre and Post-Development

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	1.02	3	726	3,851	----	------	------	E.C.B.-1
2	SCS Runoff	0.61	3	726	2,166	----	------	------	E.C.B.-2
3	SCS Runoff	2.57	3	726	9,402	----	------	------	E.C.B.-3
4	SCS Runoff	0.84	3	726	2,847	----	------	------	E.C.B.-4
6	SCS Runoff	0.31	3	726	1,107	----	------	------	P.D.B.-1
7	SCS Runoff	0.65	3	726	2,261	----	------	------	P.D.B.-2
8	SCS Runoff	1.93	3	726	6,927	----	------	------	P.D.B.-3
9	SCS Runoff	0.80	3	726	2,698	----	------	------	P.D.B.-4
11	SCS Runoff	3.26	3	726	11,555	----	------	------	P.D.B.-5
12	Reservoir	0.47	3	756	11,555	11	197.43	3,952	Runoff to Infiltration
13	Diversion1	0.47	3	756	11,555	12	------	------	Infiltration
14	Diversion2	0.00	3	603	0	12	------	------	Overflow
16	Combine	0.31	3	726	1,107	6, 14,	------	------	Post-Dev. Flow to D.P. A

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

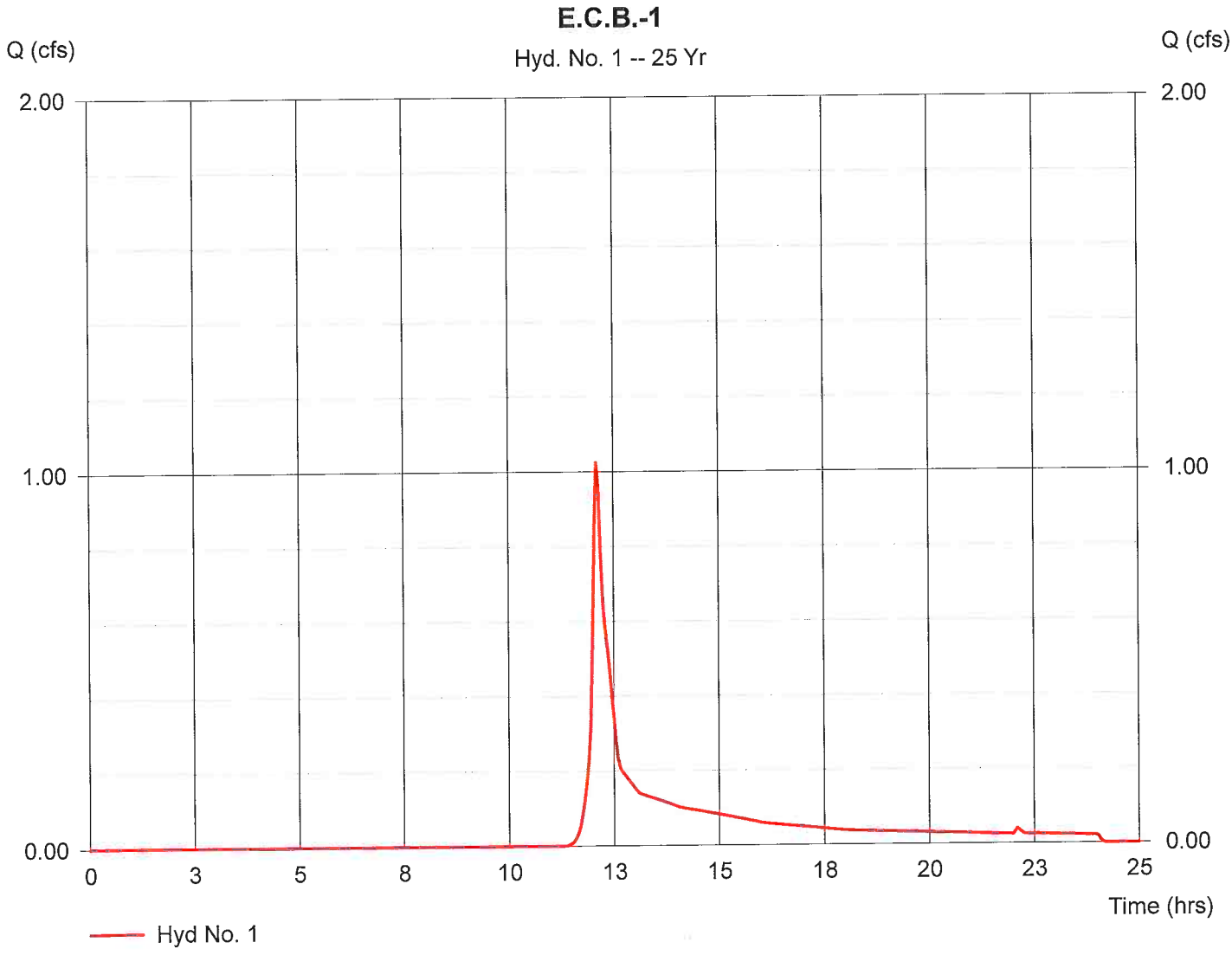
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 1

E.C.B.-1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.02 cfs
Storm frequency	= 25 yrs	Time interval	= 3 min
Drainage area	= 0.83 ac	Curve number	= 56.8
Basin Slope	= 10.6 %	Hydraulic length	= 186 ft
Tc method	= LAG	Time of conc. (Tc)	= 4.779908 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 3,851 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

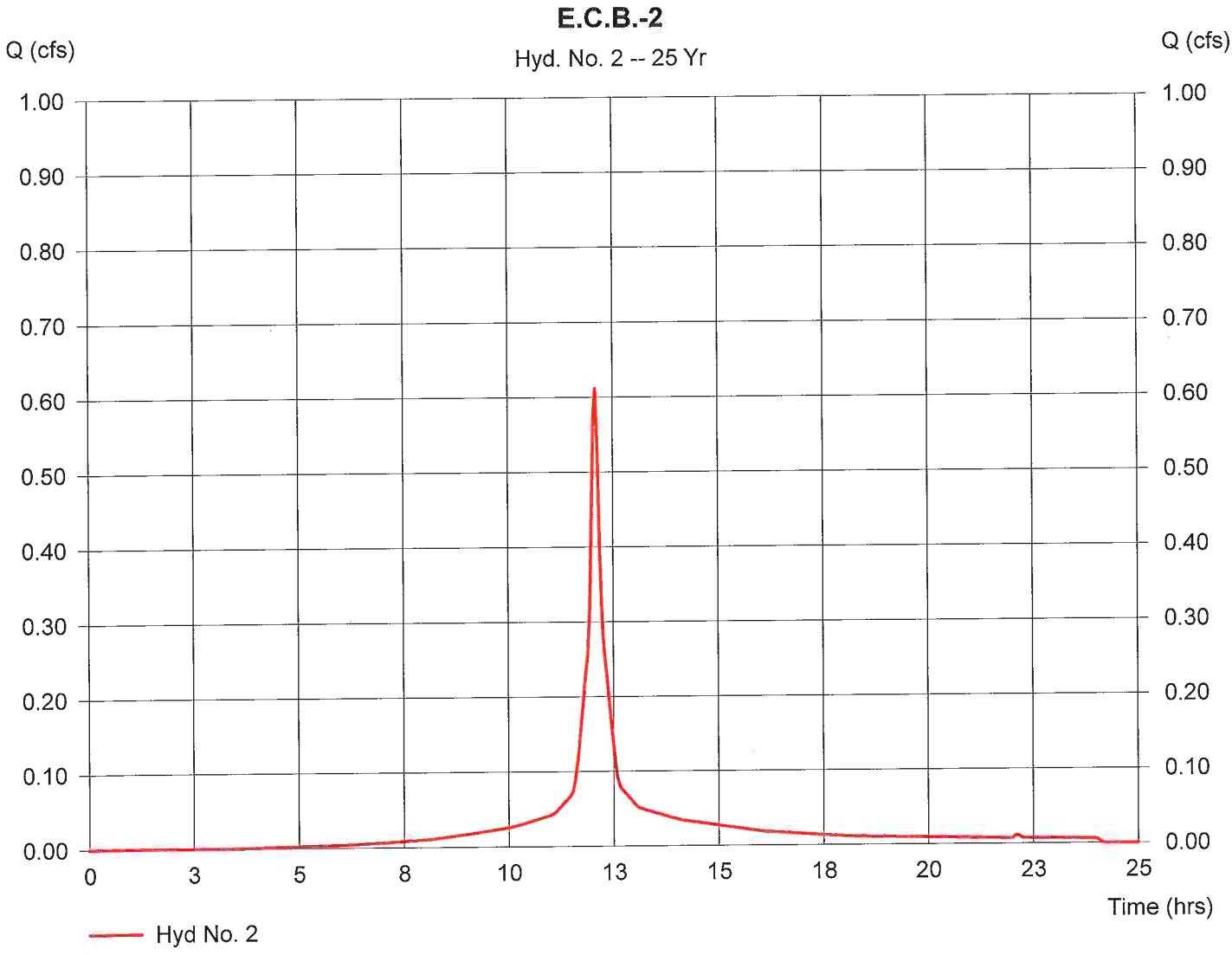
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 2

E.C.B.-2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.61 cfs
Storm frequency	= 25 yrs	Time interval	= 3 min
Drainage area	= 0.14 ac	Curve number	= 91.7
Basin Slope	= 5.3 %	Hydraulic length	= 224 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 2,166 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

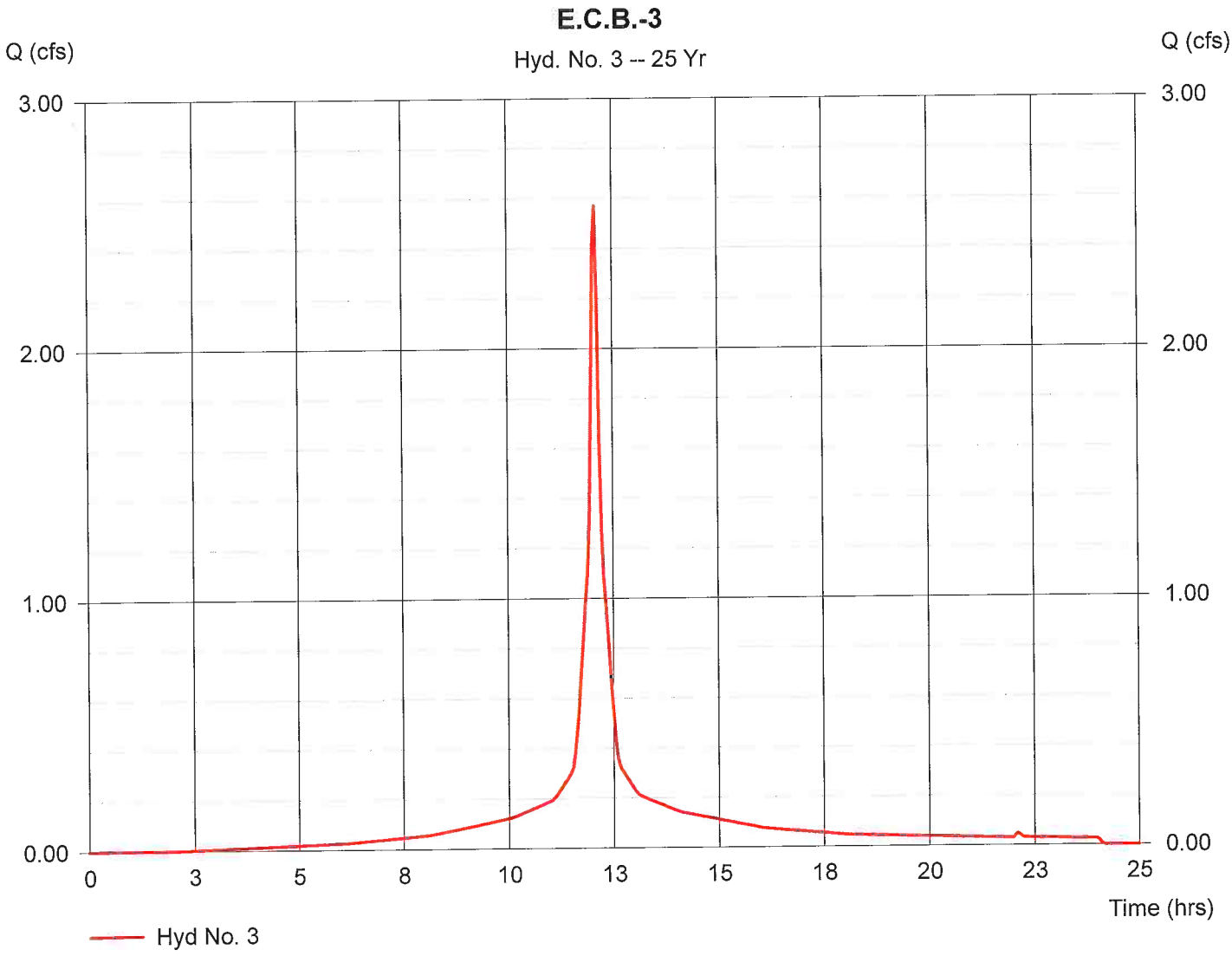
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 3

E.C.B.-3

Hydrograph type	= SCS Runoff	Peak discharge	= 2.57 cfs
Storm frequency	= 25 yrs	Time interval	= 3 min
Drainage area	= 0.57 ac	Curve number	= 94.7
Basin Slope	= 3.6 %	Hydraulic length	= 181 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 9,402 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

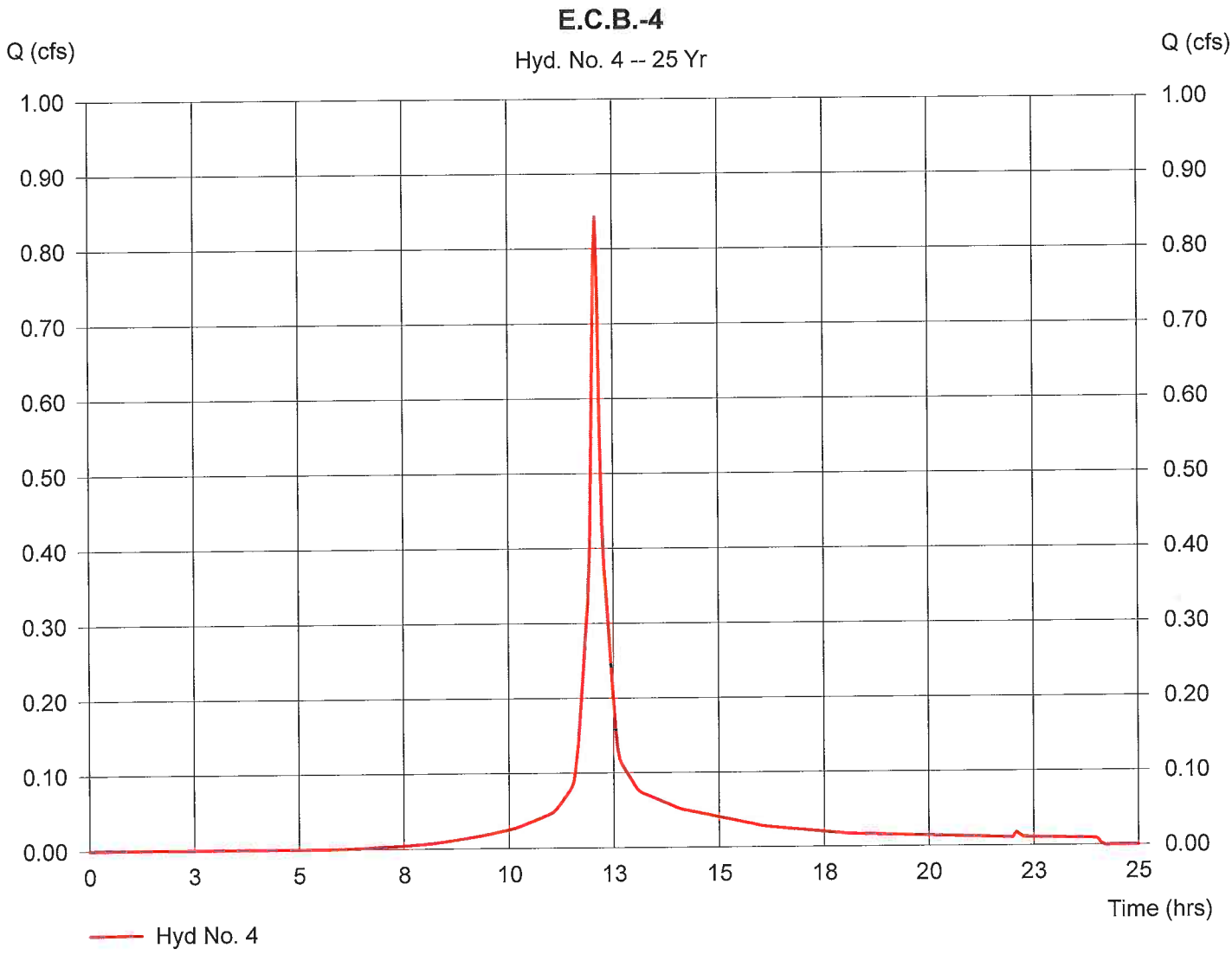
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 4

E.C.B.-4

Hydrograph type	= SCS Runoff	Peak discharge	= 0.84 cfs
Storm frequency	= 25 yrs	Time interval	= 3 min
Drainage area	= 0.22 ac	Curve number	= 84.2
Basin Slope	= 4.9 %	Hydraulic length	= 164 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 2,847 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

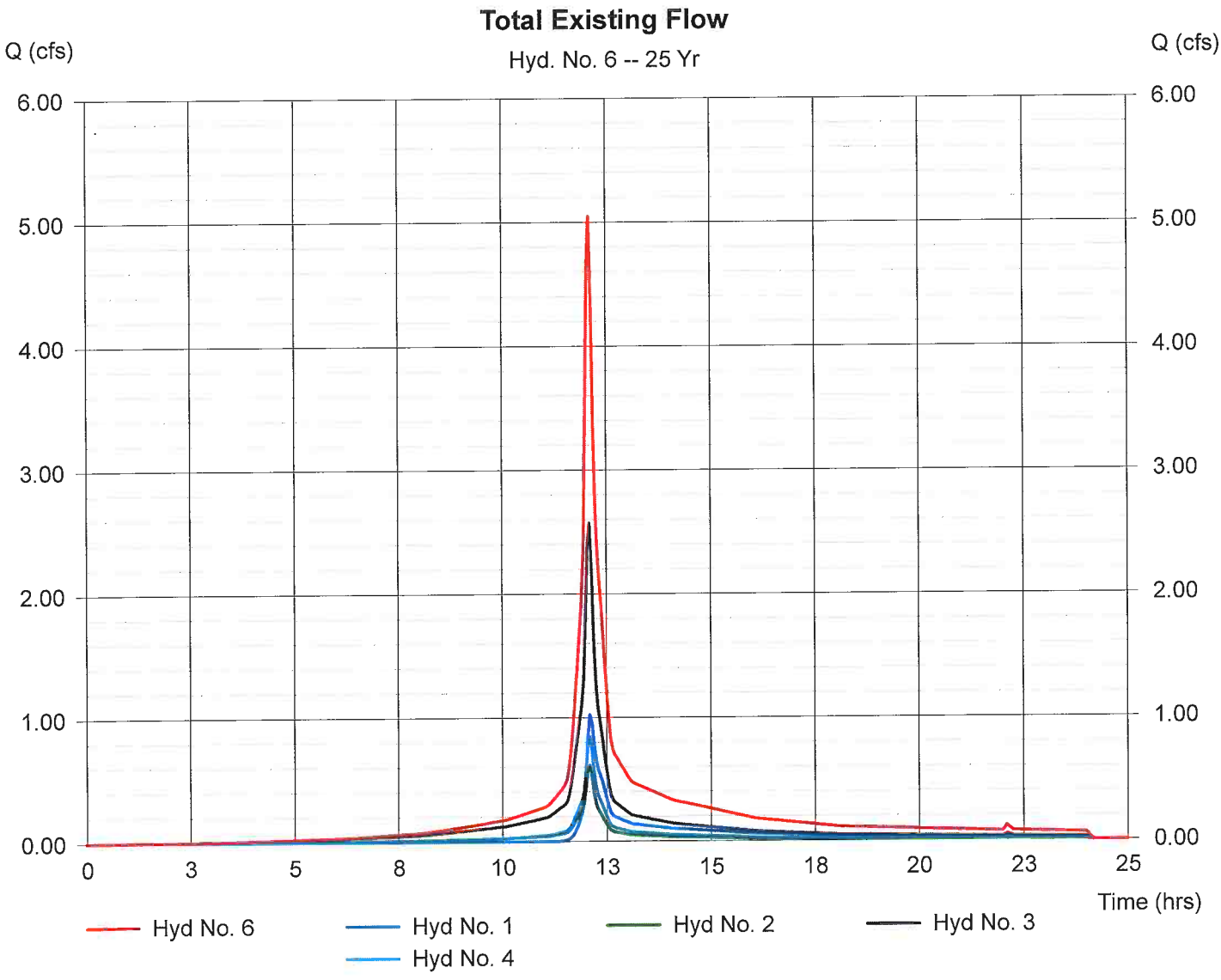
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 6

Total Existing Flow

Hydrograph type	= Combine	Peak discharge	= 5.05 cfs
Storm frequency	= 25 yrs	Time interval	= 3 min
Inflow hyds.	= 1, 2, 3, 4		

Hydrograph Volume = 18,265 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

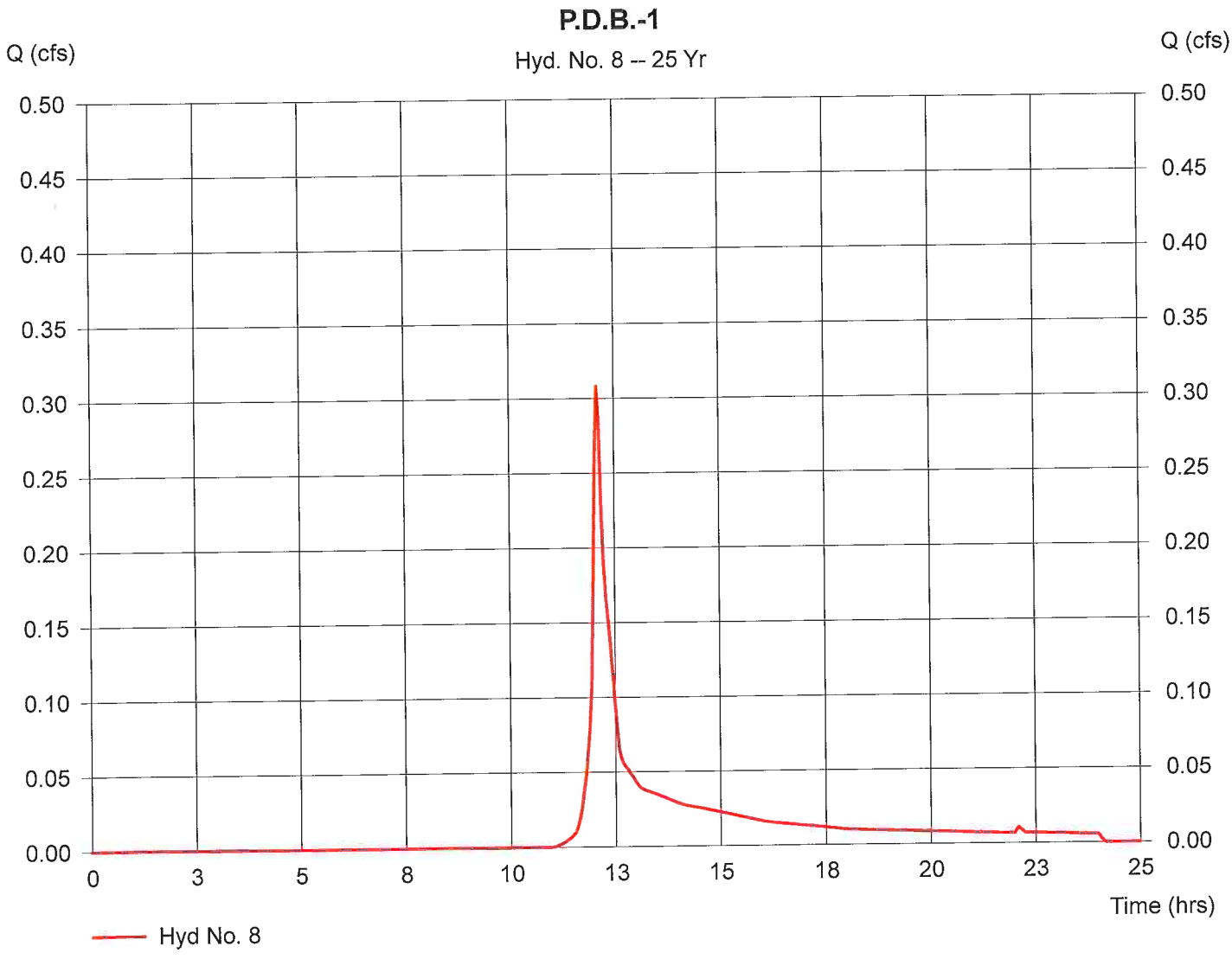
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 8

P.D.B.-1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.31 cfs
Storm frequency	= 25 yrs	Time interval	= 3 min
Drainage area	= 0.21 ac	Curve number	= 59.8
Basin Slope	= 9.8 %	Hydraulic length	= 123 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 1,107 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

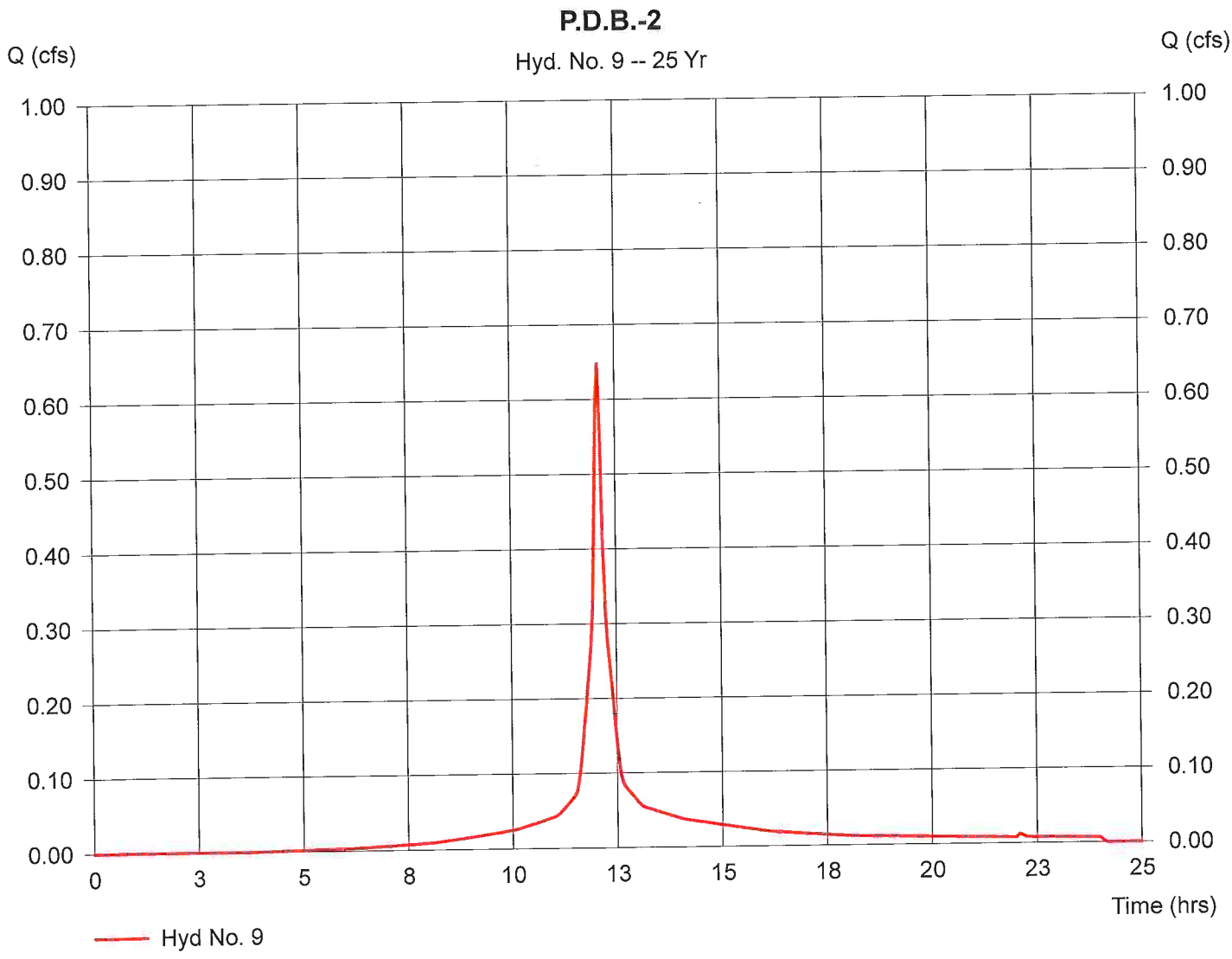
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 9

P.D.B.-2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.65 cfs
Storm frequency	= 25 yrs	Time interval	= 3 min
Drainage area	= 0.15 ac	Curve number	= 90.1
Basin Slope	= 4.6 %	Hydraulic length	= 238 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 2,261 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

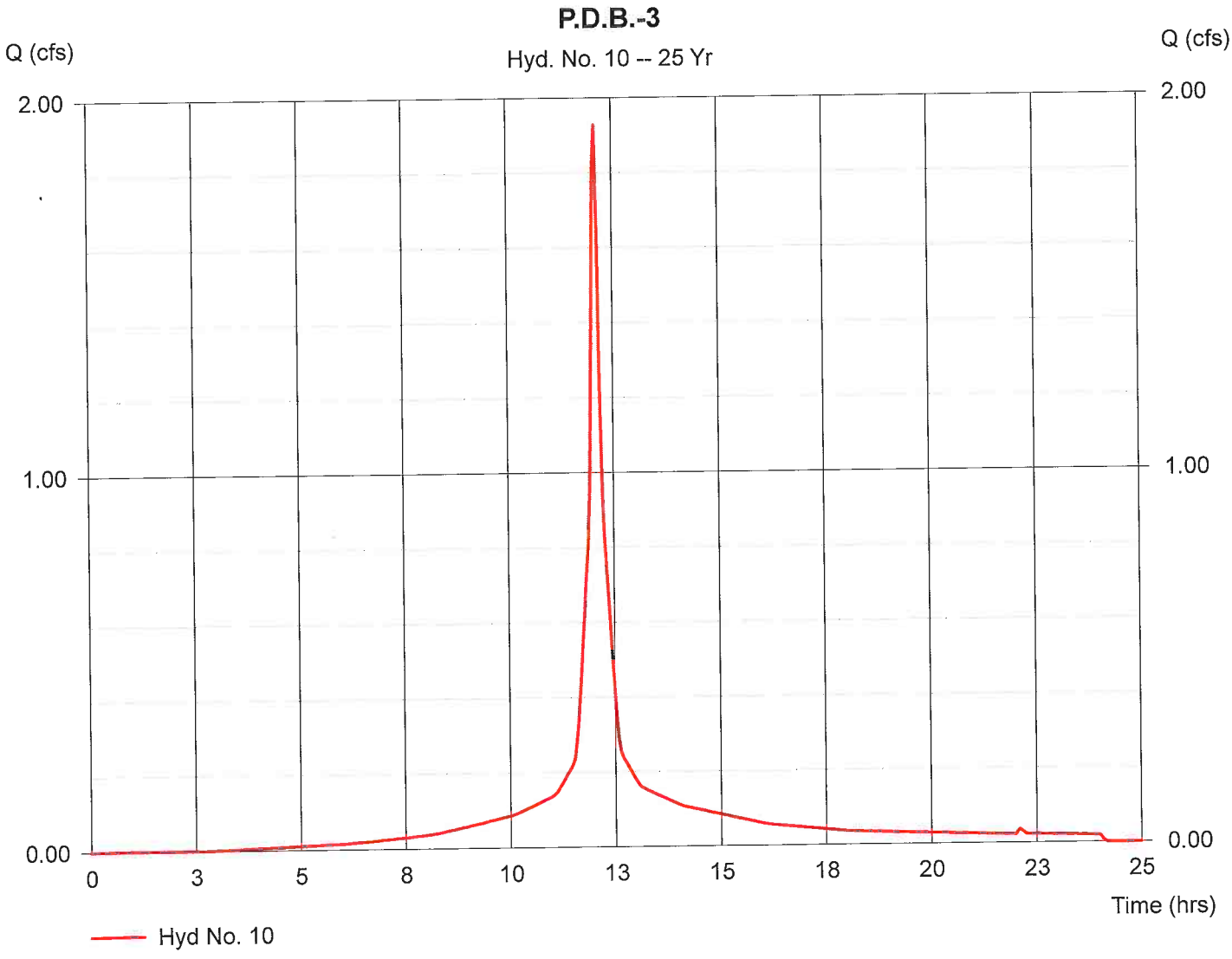
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 10

P.D.B.-3

Hydrograph type	= SCS Runoff	Peak discharge	= 1.93 cfs
Storm frequency	= 25 yrs	Time interval	= 3 min
Drainage area	= 0.43 ac	Curve number	= 93.2
Basin Slope	= 3.5 %	Hydraulic length	= 228 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 6,927 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

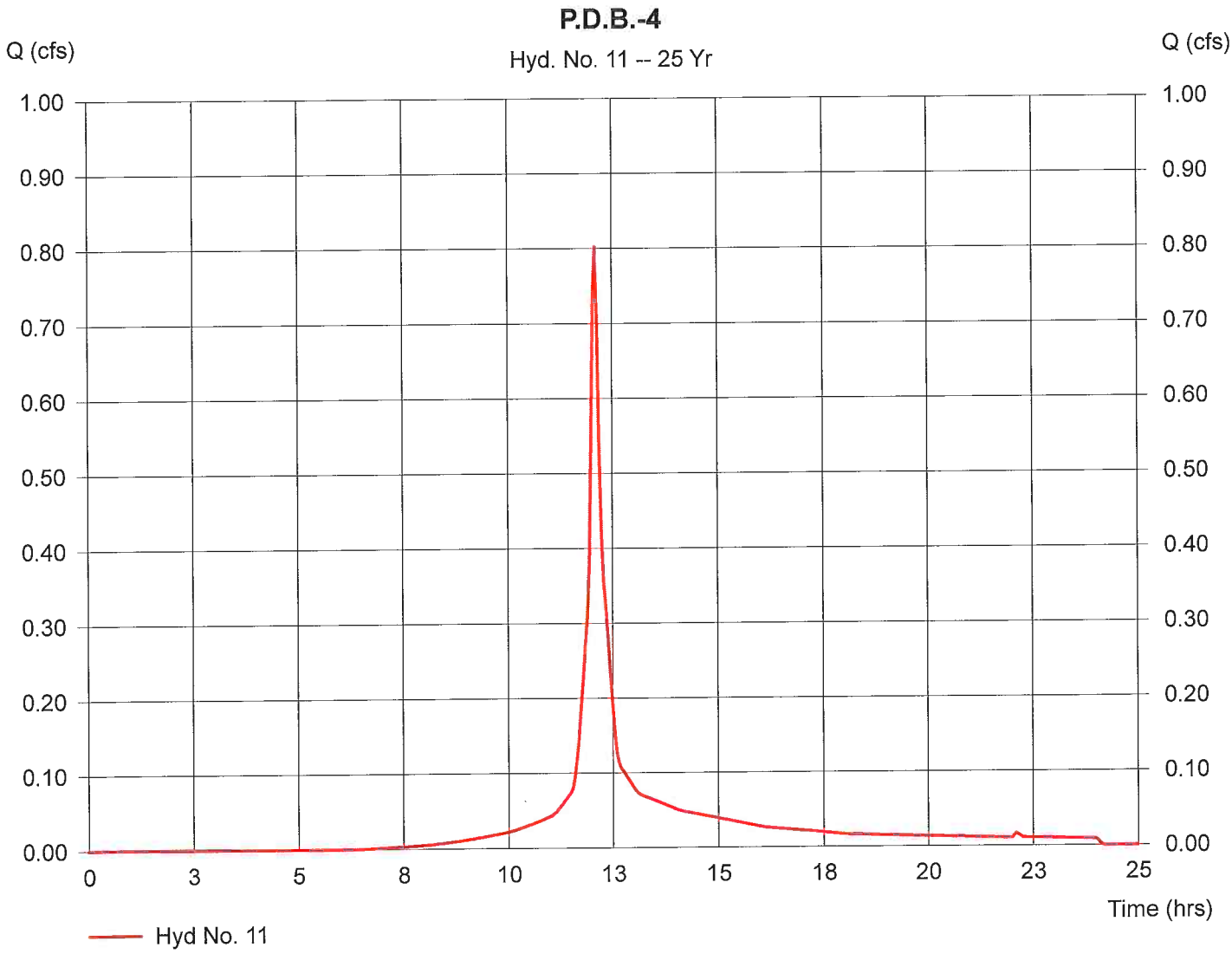
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 11

P.D.B.-4

Hydrograph type	= SCS Runoff	Peak discharge	= 0.80 cfs
Storm frequency	= 25 yrs	Time interval	= 3 min
Drainage area	= 0.22 ac	Curve number	= 82.9
Basin Slope	= 3.5 %	Hydraulic length	= 227 ft
Tc method	= LAG	Time of conc. (Tc)	= 4.733436 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 2,698 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

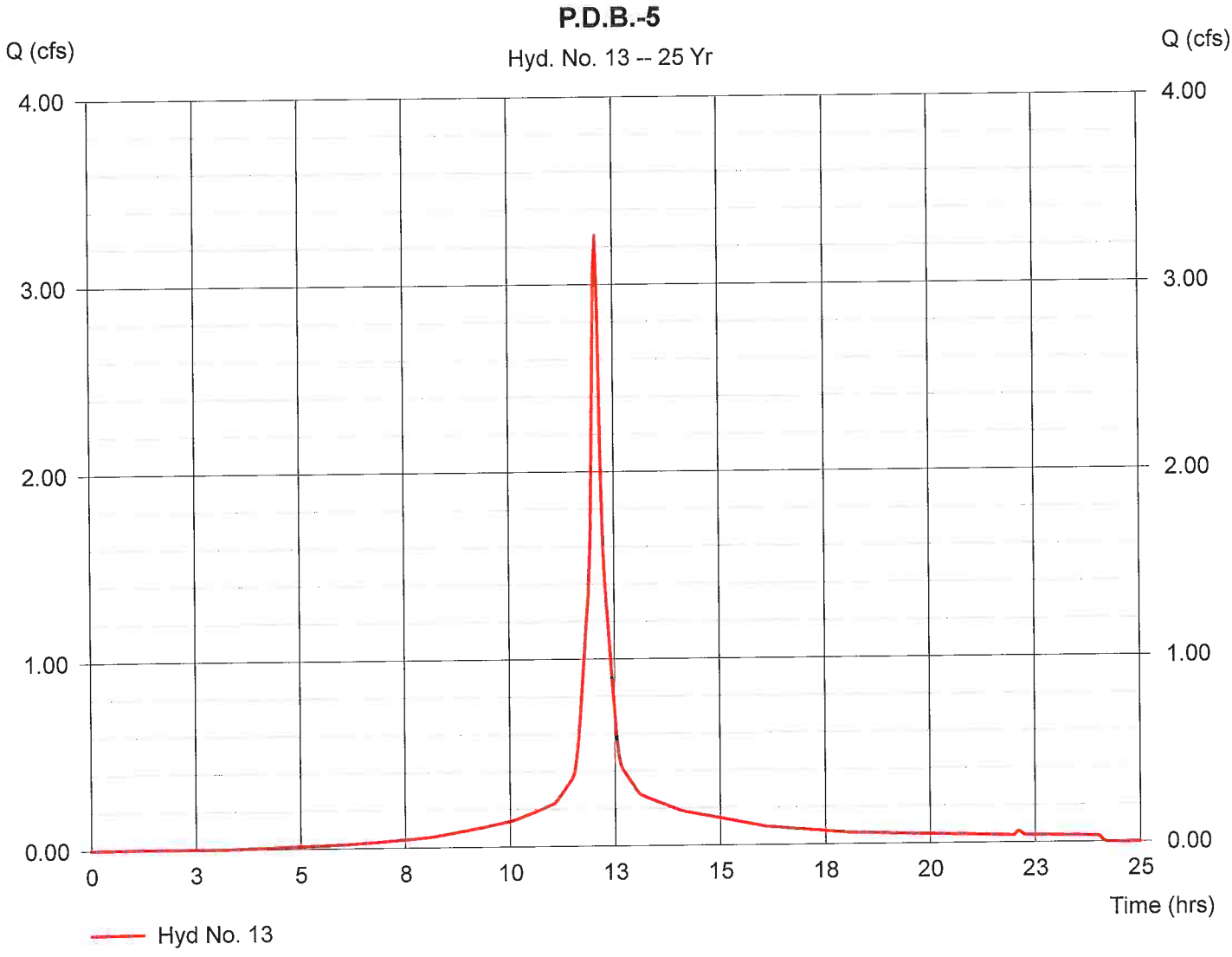
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 13

P.D.B.-5

Hydrograph type	= SCS Runoff	Peak discharge	= 3.26 cfs
Storm frequency	= 25 yrs	Time interval	= 3 min
Drainage area	= 0.75 ac	Curve number	= 91.7
Basin Slope	= 8.2 %	Hydraulic length	= 170 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 11,555 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Monday, Sep 14 2015, 2:37 PM

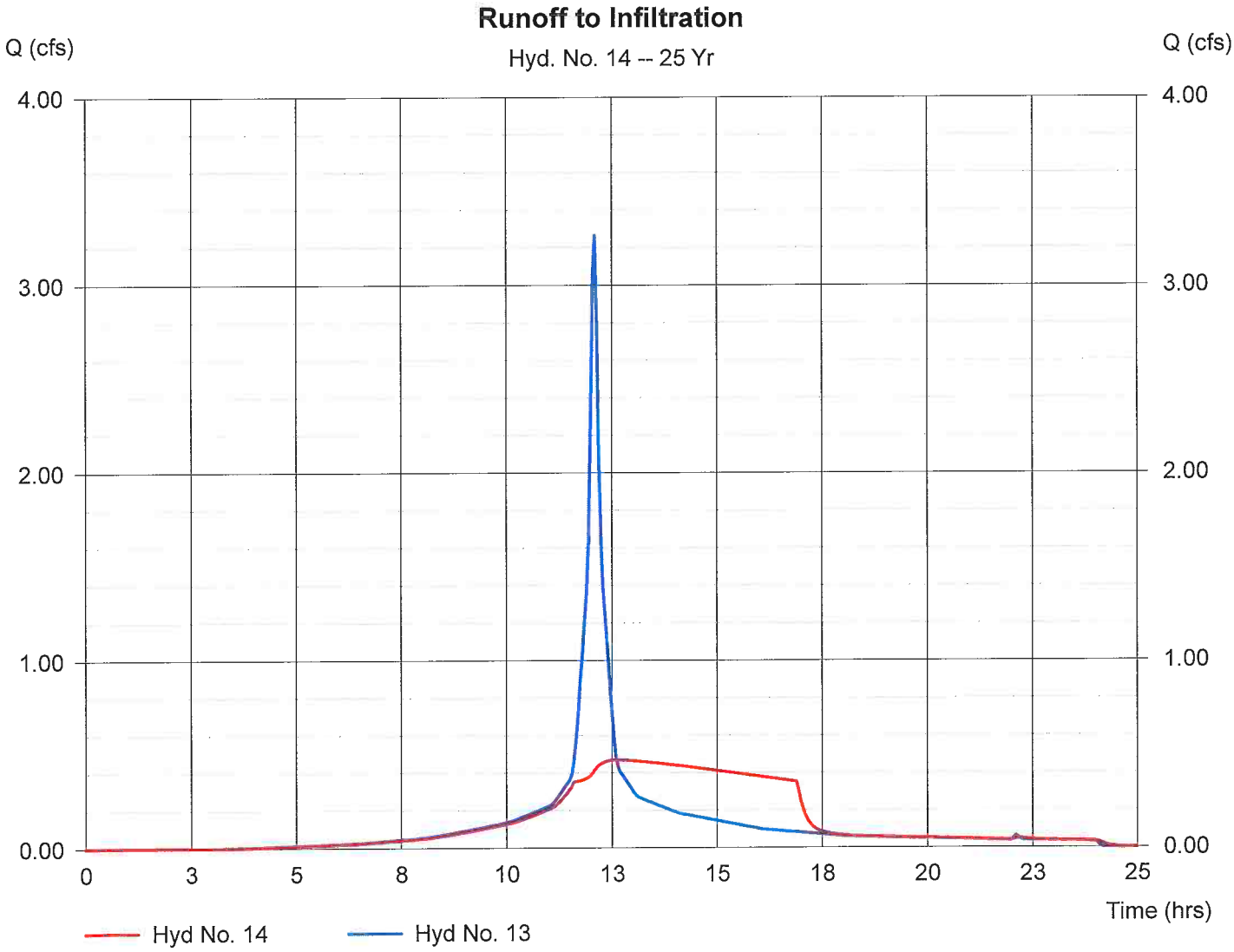
Hyd. No. 14

Runoff to Infiltration

Hydrograph type	= Reservoir	Peak discharge	= 0.47 cfs
Storm frequency	= 25 yrs	Time interval	= 3 min
Inflow hyd. No.	= 13	Max. Elevation	= 197.43 ft
Reservoir name	= Infiltration System	Max. Storage	= 3,952 cuft

Storage Indication method used.

Hydrograph Volume = 11,555 cuft



Pond Report

Hydraflow Hydrographs by Intelisolve

Monday, Sep 14 2015, 2:37 PM

Pond No. 1 - Infiltration System

Pond Data

Bottom LxW = 68.0 x 26.5 ft Side slope = 0.0:1 Bottom elev. = 194.00 ft Depth = 4.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)*	Total storage (cuft)*
0.00	194.00	1,802	0	0
0.20	194.20	1,802	231	231
0.40	194.40	1,802	231	461
0.60	194.60	1,802	231	692
0.80	194.80	1,802	231	923
1.00	195.00	1,802	231	1,153
1.20	195.20	1,802	231	1,384
1.40	195.40	1,802	231	1,615
1.60	195.60	1,802	231	1,845
1.80	195.80	1,802	231	2,076
2.00	196.00	1,802	231	2,307
2.20	196.20	1,802	231	2,537
2.40	196.40	1,802	231	2,768
2.60	196.60	1,802	231	2,999
2.80	196.80	1,802	231	3,229
3.00	197.00	1,802	231	3,460
3.20	197.20	1,802	231	3,690
3.40	197.40	1,802	231	3,921
3.60	197.60	1,802	231	4,152
3.80	197.80	1,802	231	4,382
4.00	198.00	1,802	231	4,613

(*64.00% voids applied)

Culvert / Orifice Structures

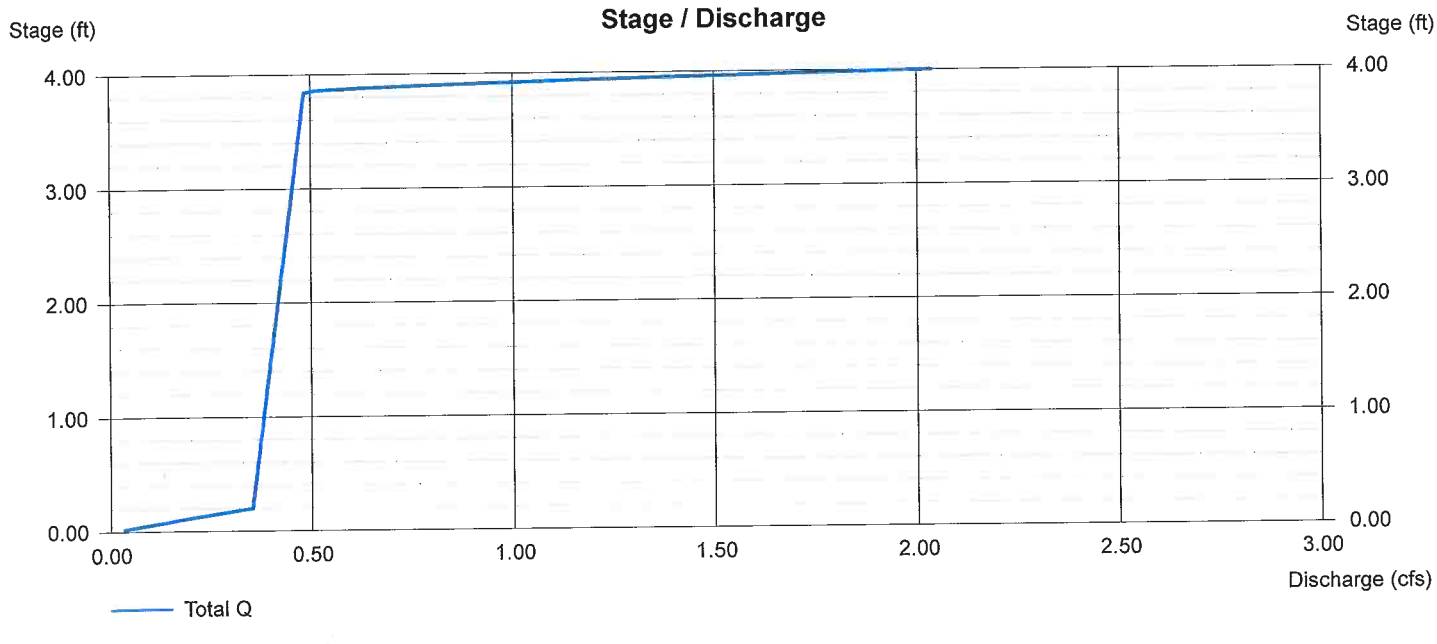
	[A]	[B]	[C]	[D]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 8.00	0.00	0.00	0.00
Crest El. (ft)	= 197.85	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration = 8.270 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

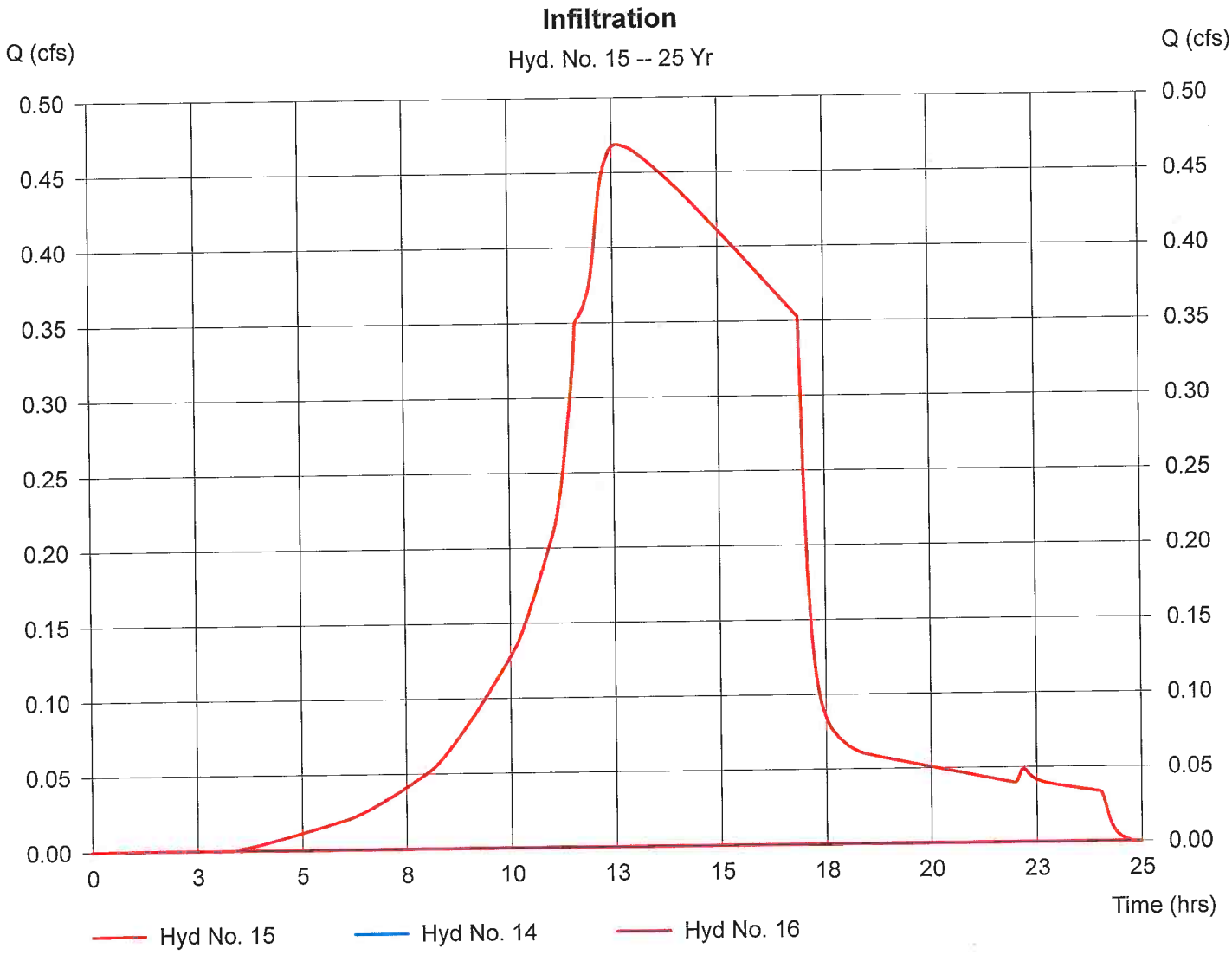
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 15

Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.47 cfs
Storm frequency	= 25 yrs	Time interval	= 3 min
Inflow hydrograph	= 14	2nd diverted hyd.	= 16
Diversion method	= Pond - Infiltration System	Pond structure	= Exfiltration

Hydrograph Volume = 11,555 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

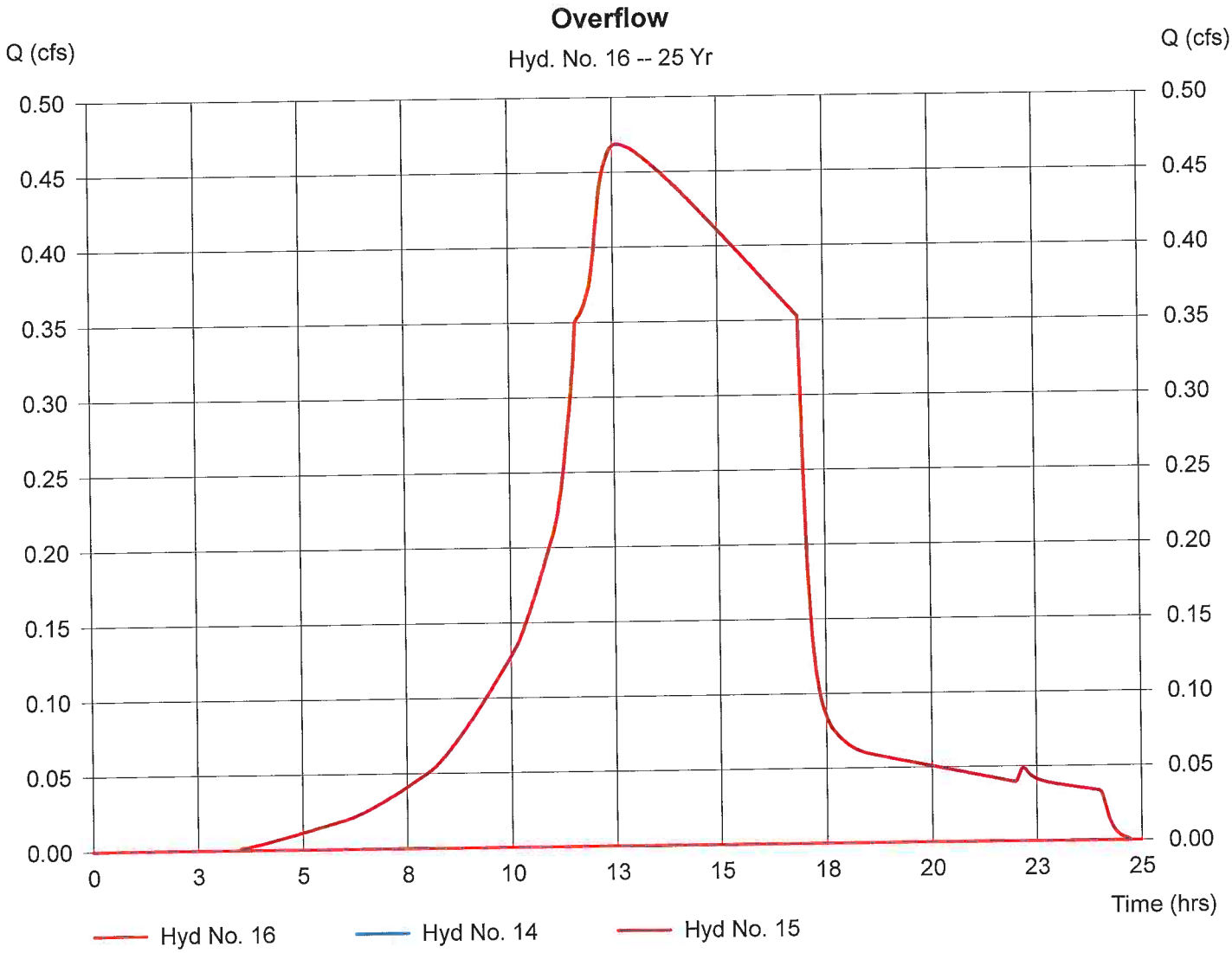
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 16

Overflow

Hydrograph type	= Diversion2	Peak discharge	= 0.00 cfs
Storm frequency	= 25 yrs	Time interval	= 3 min
Inflow hydrograph	= 14	2nd diverted hyd.	= 15
Diversion method	= Pond - Infiltration System	Pond structure	= Exfiltration

Hydrograph Volume = 0 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Monday, Sep 14 2015, 2:37 PM

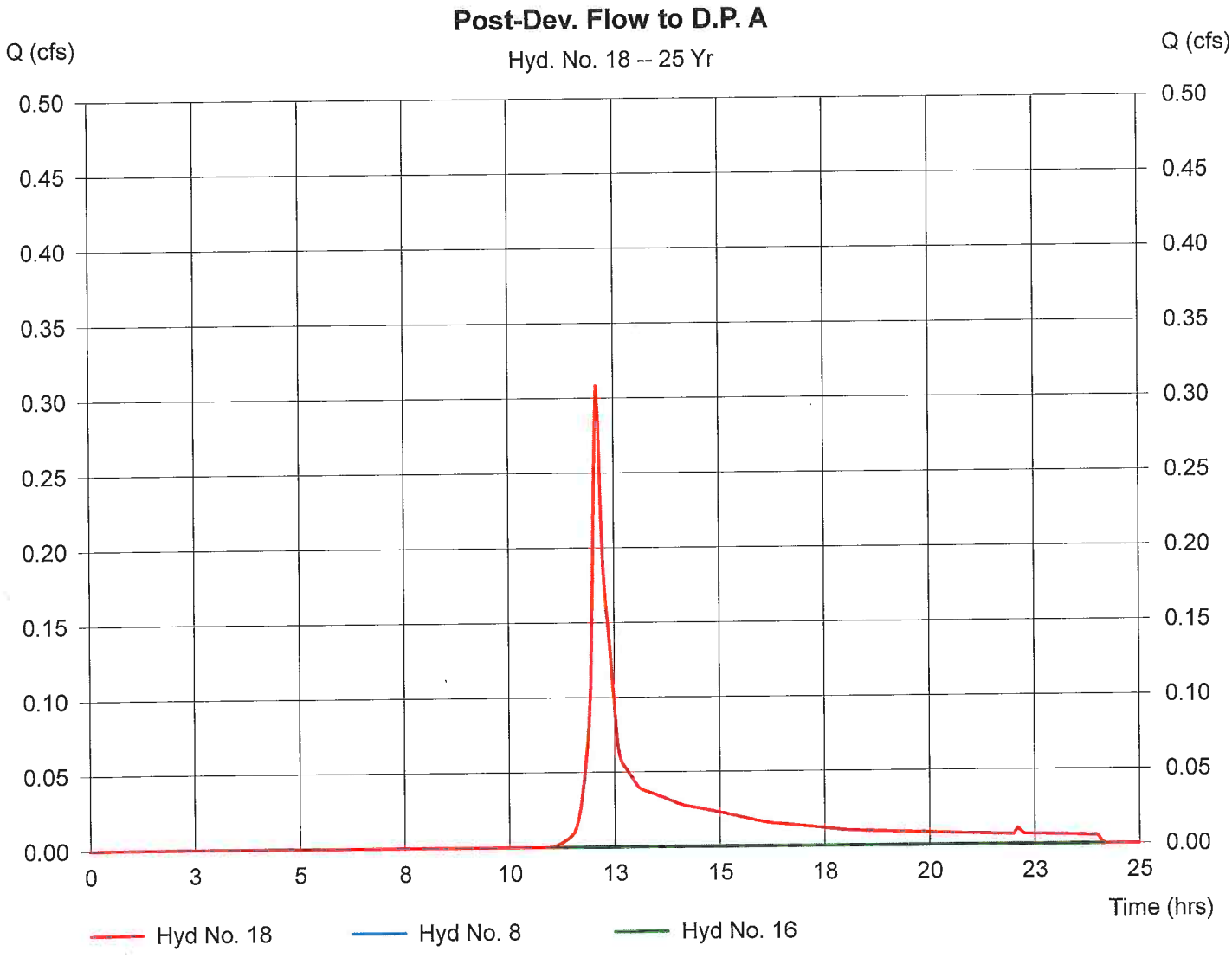
Hyd. No. 18

Post-Dev. Flow to D.P. A

Hydrograph type = Combine
Storm frequency = 25 yrs
Inflow hyds. = 8, 16

Peak discharge = 0.31 cfs
Time interval = 3 min

Hydrograph Volume = 1,107 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Monday, Sep 14 2015, 2:37 PM

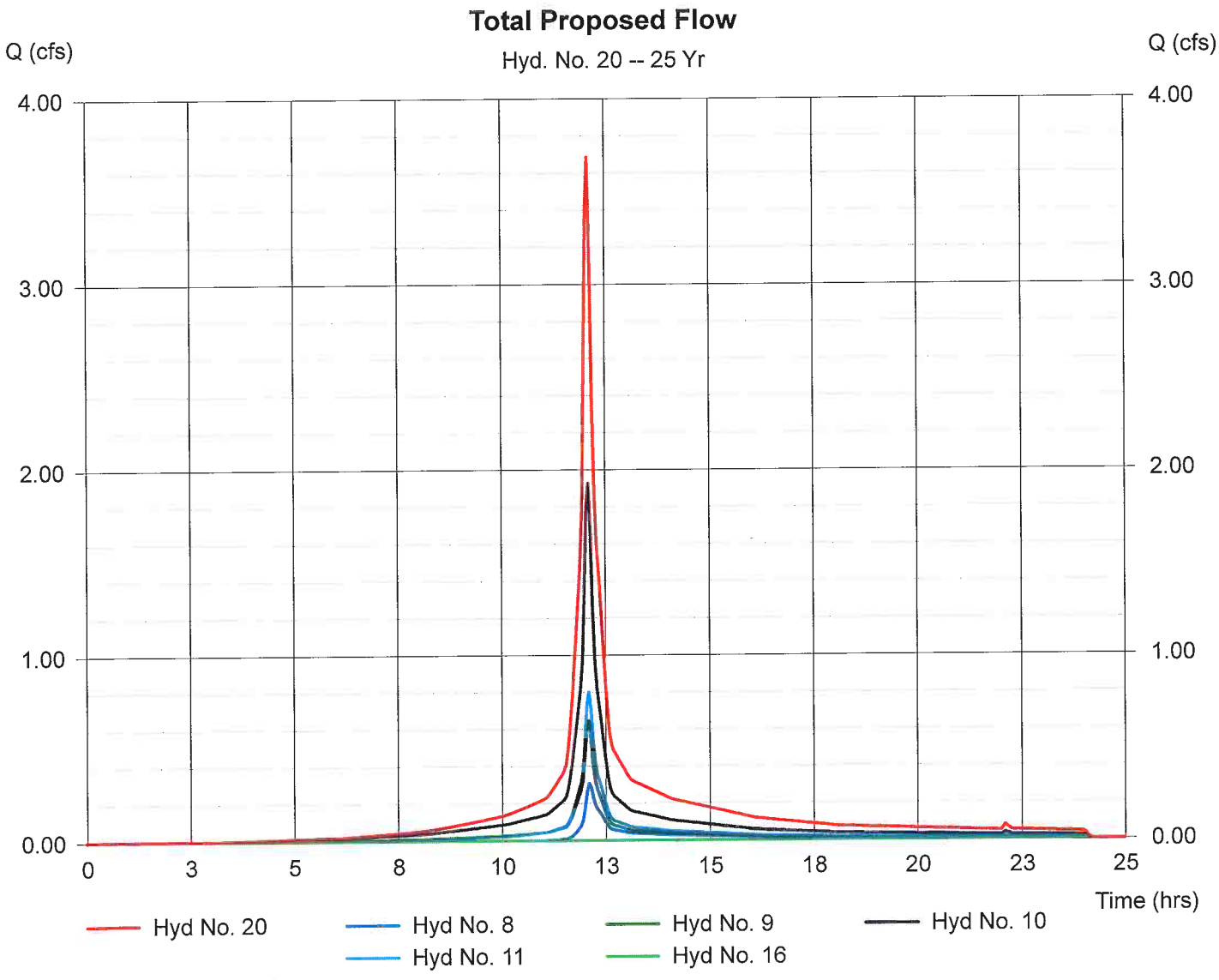
Hyd. No. 20

Total Proposed Flow

Hydrograph type = Combine
Storm frequency = 25 yrs
Inflow hyds. = 8, 9, 10, 11, 16

Peak discharge = 3.69 cfs
Time interval = 3 min

Hydrograph Volume = 12,993 cuft



100-Year Storm, Pre and Post-Development

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	1.56	3	726	5,550	----	------	------	E.C.B.-1
2	SCS Runoff	0.74	3	726	2,633	----	------	------	E.C.B.-2
3	SCS Runoff	3.06	3	726	11,313	----	------	------	E.C.B.-3
4	SCS Runoff	1.04	3	726	3,558	----	------	------	E.C.B.-4
6	SCS Runoff	0.45	3	726	1,561	----	------	------	P.D.B.-1
7	SCS Runoff	0.78	3	726	2,765	----	------	------	P.D.B.-2
8	SCS Runoff	2.31	3	726	8,379	----	------	------	P.D.B.-3
9	SCS Runoff	1.00	3	726	3,389	----	------	------	P.D.B.-4
11	SCS Runoff	3.92	3	726	14,051	----	------	------	P.D.B.-5
12	Reservoir	1.36	3	744	14,050	11	197.95	4,558	Runoff to Infiltration
13	Diversion1	0.49	3	744	13,451	12	------	------	Infiltration
14	Diversion2	0.87	3	744	600	12	------	------	Overflow
16	Combine	1.06	3	744	2,161	6, 14,	------	------	Post-Dev. Flow to D.P. A

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

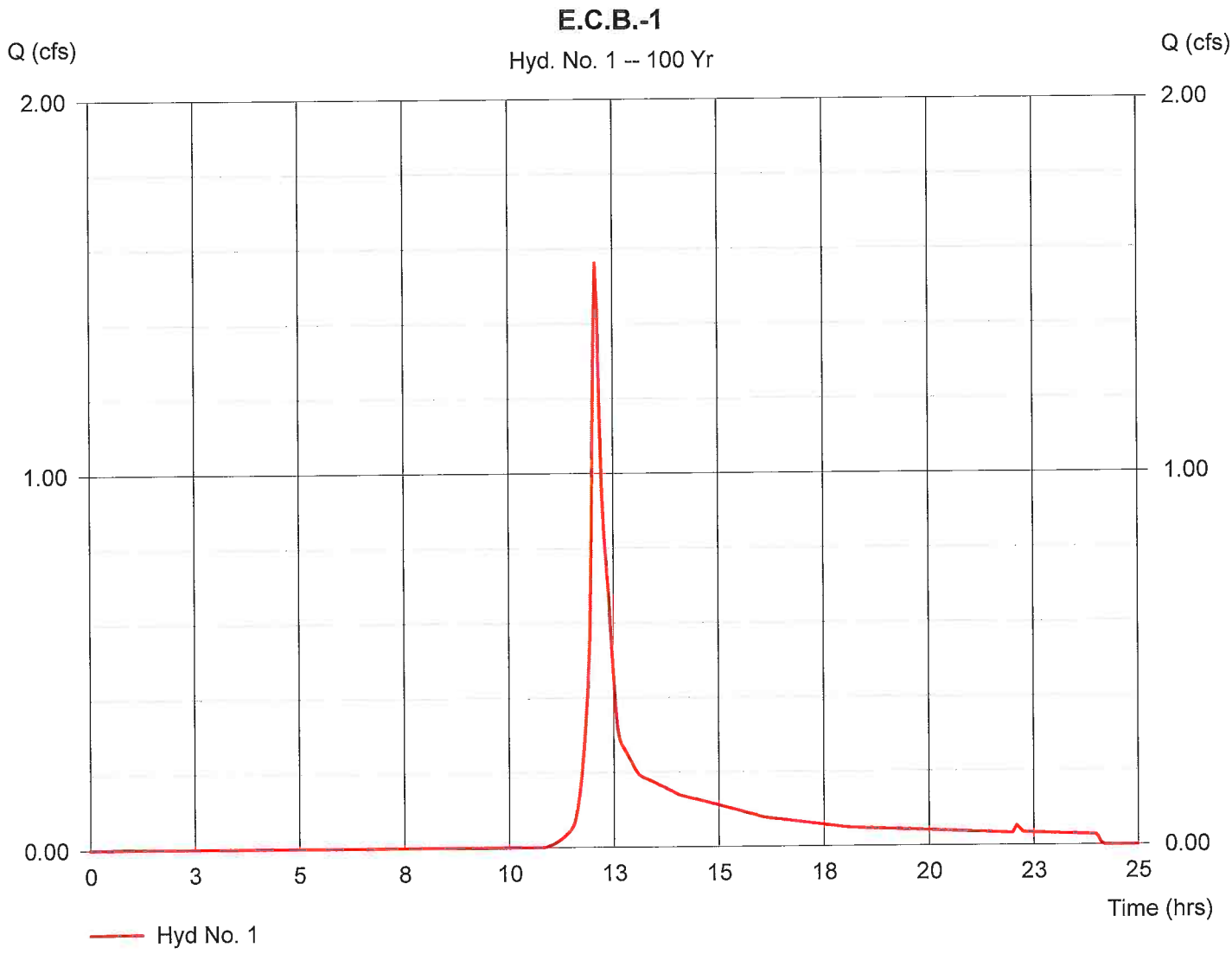
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 1

E.C.B.-1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.56 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Drainage area	= 0.83 ac	Curve number	= 56.8
Basin Slope	= 10.6 %	Hydraulic length	= 186 ft
Tc method	= LAG	Time of conc. (Tc)	= 4.779908 min
Total precip.	= 6.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 5,550 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

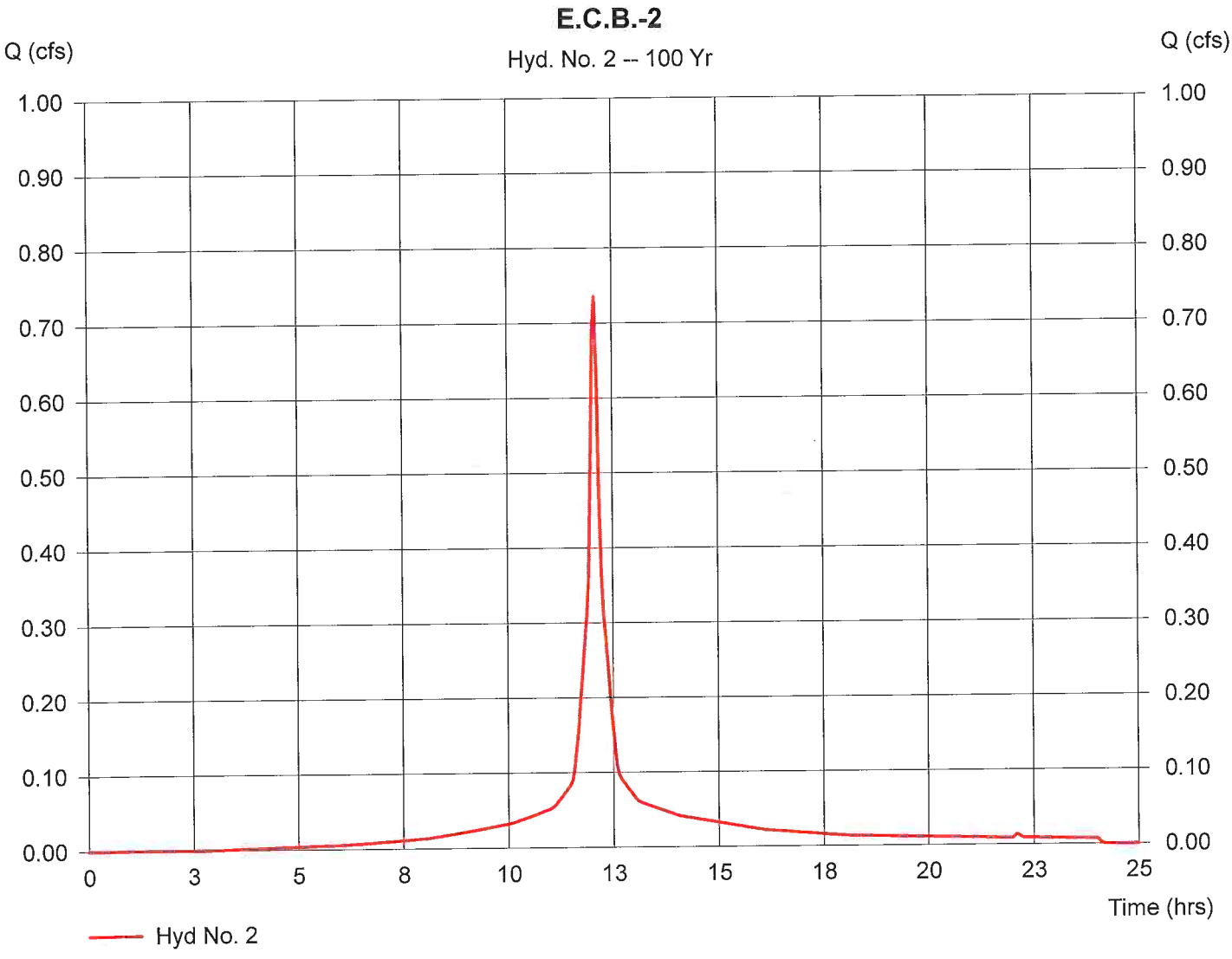
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 2

E.C.B.-2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.74 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Drainage area	= 0.14 ac	Curve number	= 91.7
Basin Slope	= 5.3 %	Hydraulic length	= 224 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 6.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 2,633 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

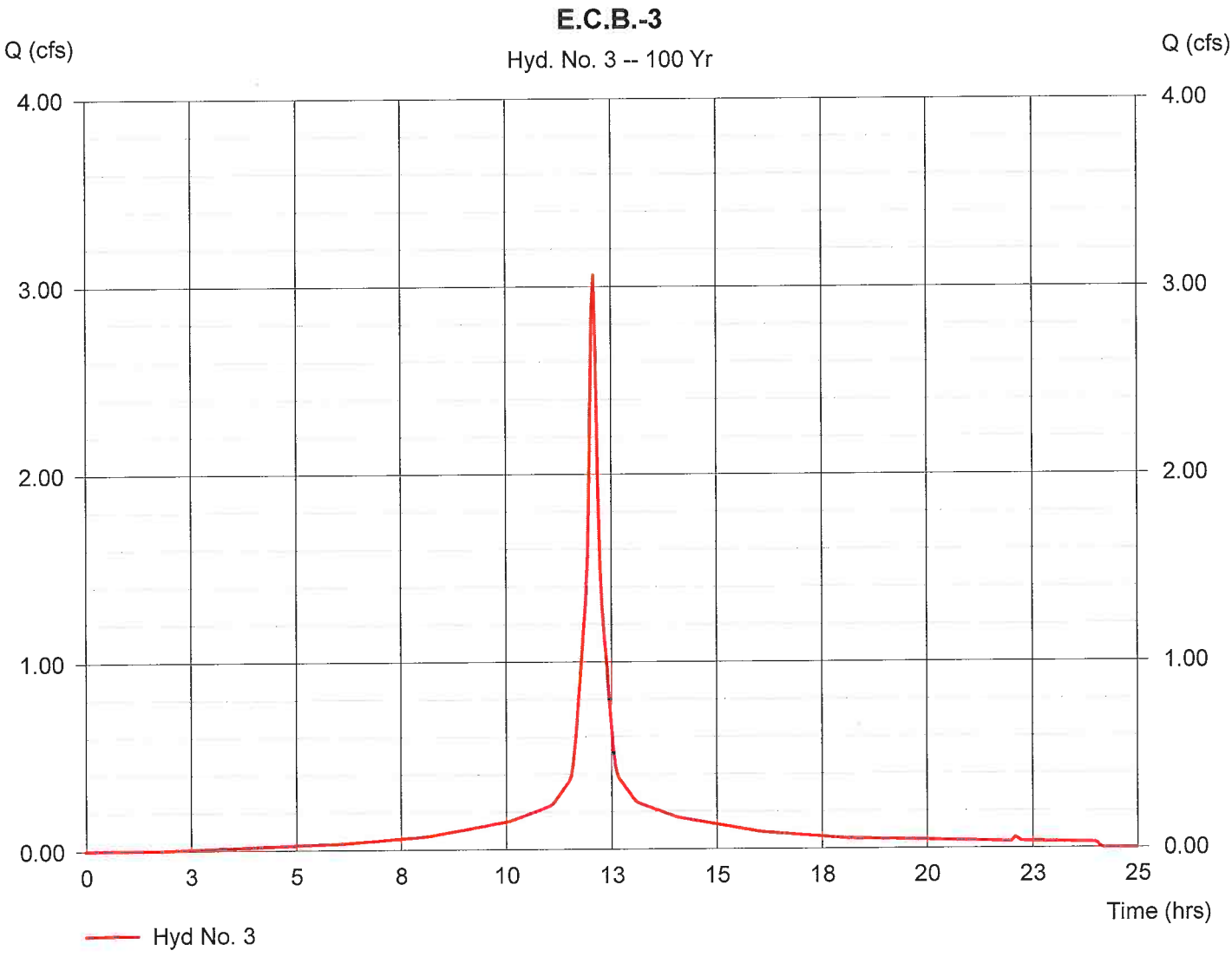
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 3

E.C.B.-3

Hydrograph type	= SCS Runoff	Peak discharge	= 3.06 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Drainage area	= 0.57 ac	Curve number	= 94.7
Basin Slope	= 3.6 %	Hydraulic length	= 181 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 6.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 11,313 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

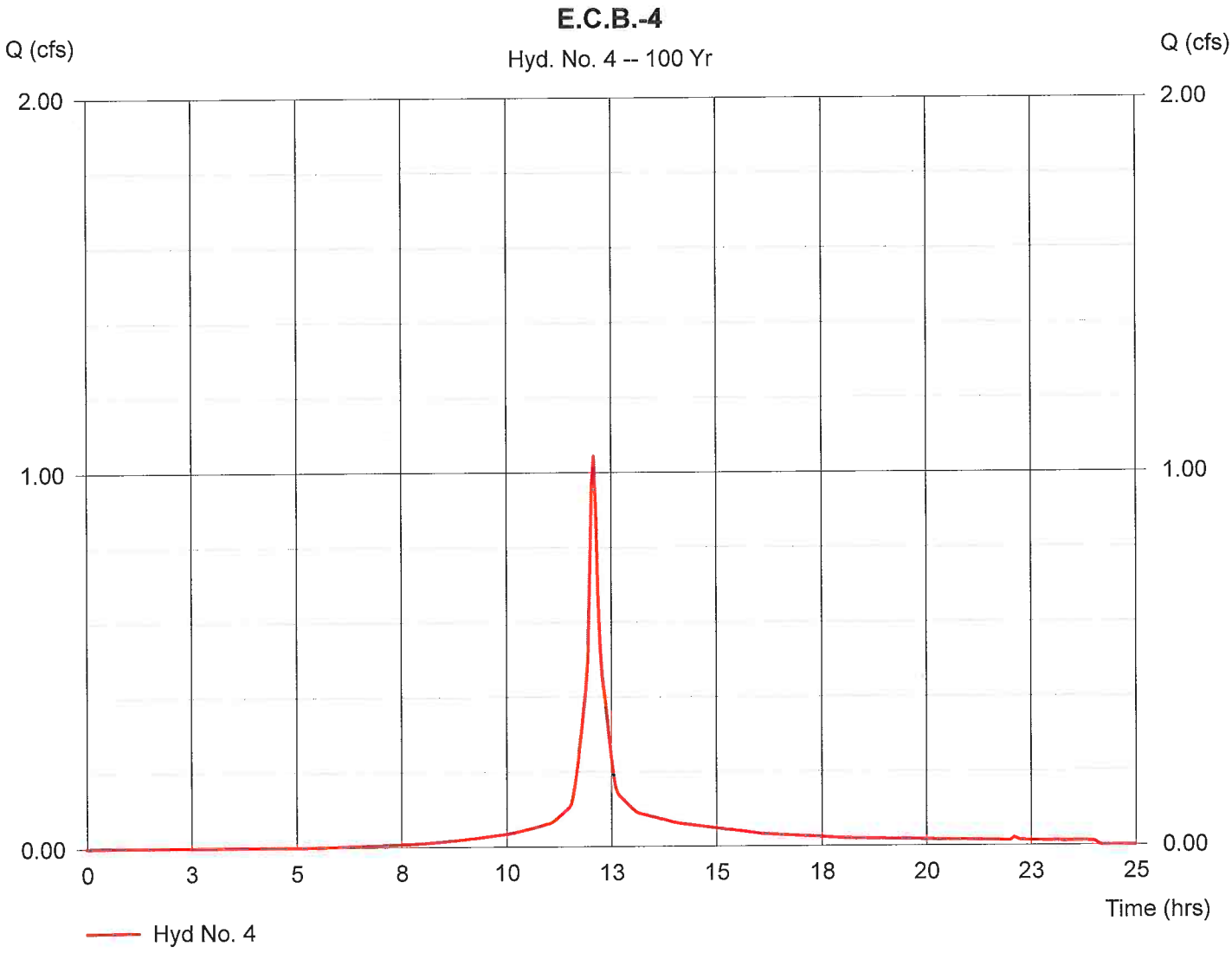
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 4

E.C.B.-4

Hydrograph type	= SCS Runoff	Peak discharge	= 1.04 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Drainage area	= 0.22 ac	Curve number	= 84.2
Basin Slope	= 4.9 %	Hydraulic length	= 164 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 6.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 3,558 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

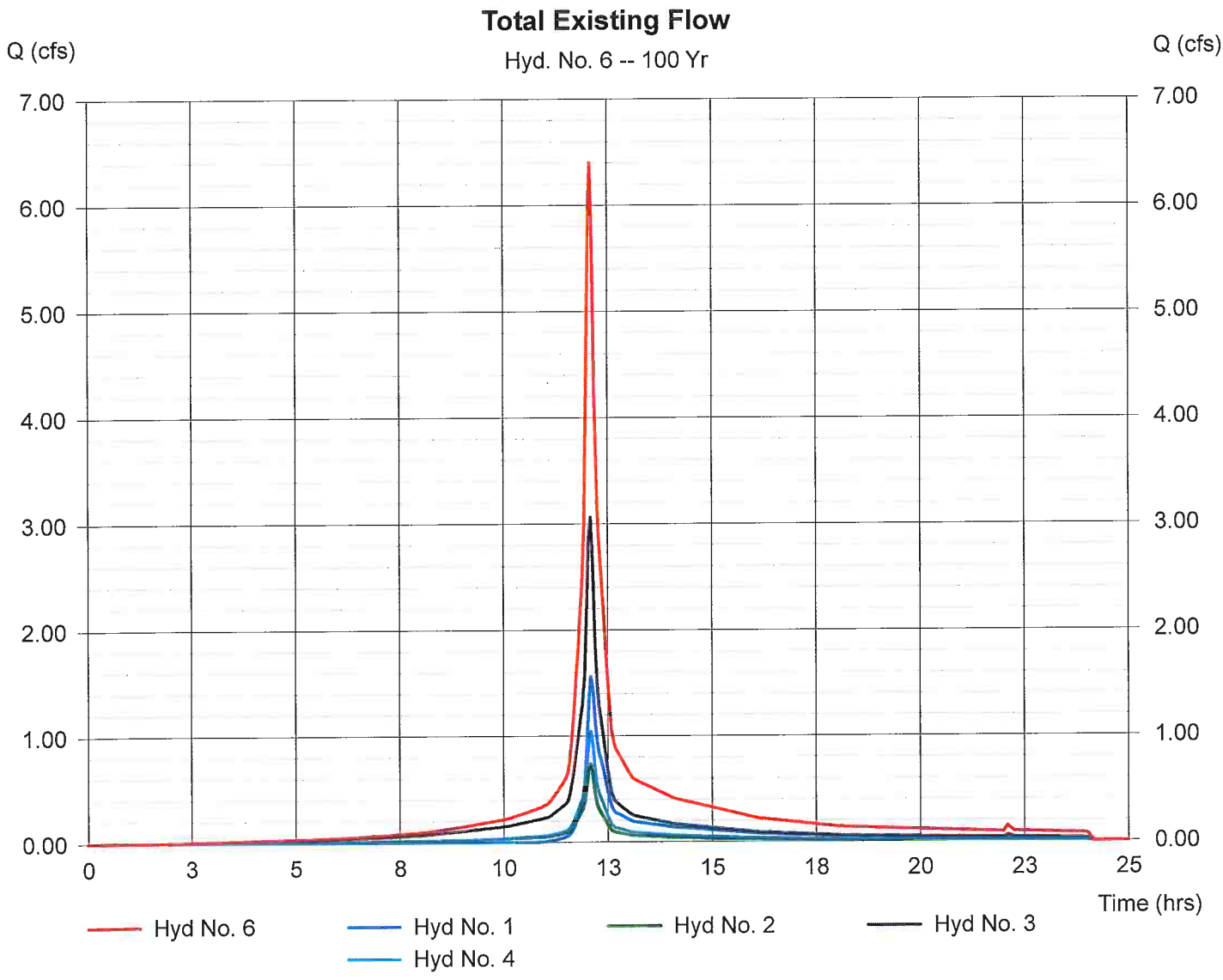
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 6

Total Existing Flow

Hydrograph type	= Combine	Peak discharge	= 6.41 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Inflow hyds.	= 1, 2, 3, 4		

Hydrograph Volume = 23,055 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

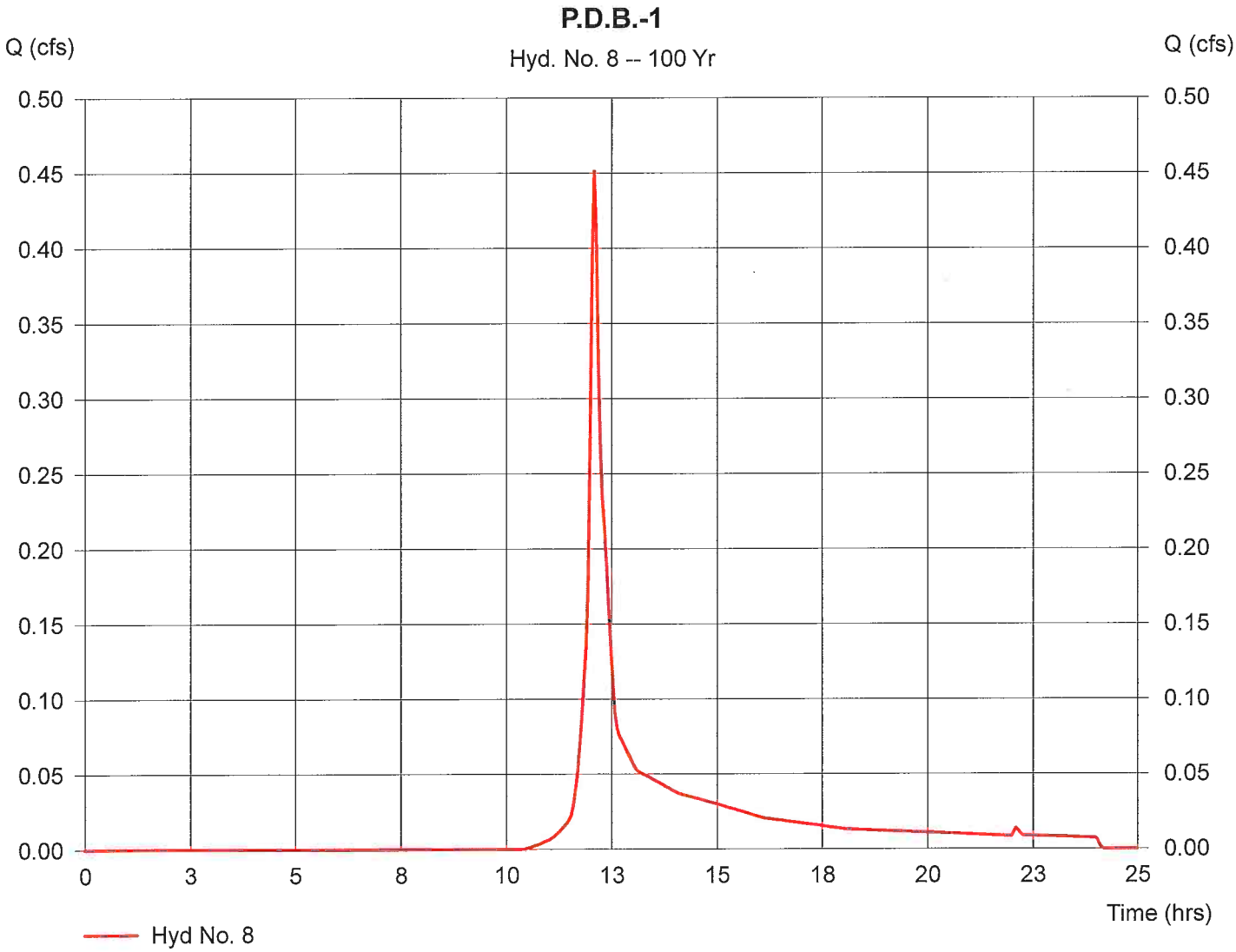
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 8

P.D.B.-1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.45 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Drainage area	= 0.21 ac	Curve number	= 59.8
Basin Slope	= 9.8 %	Hydraulic length	= 123 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 6.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 1,561 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

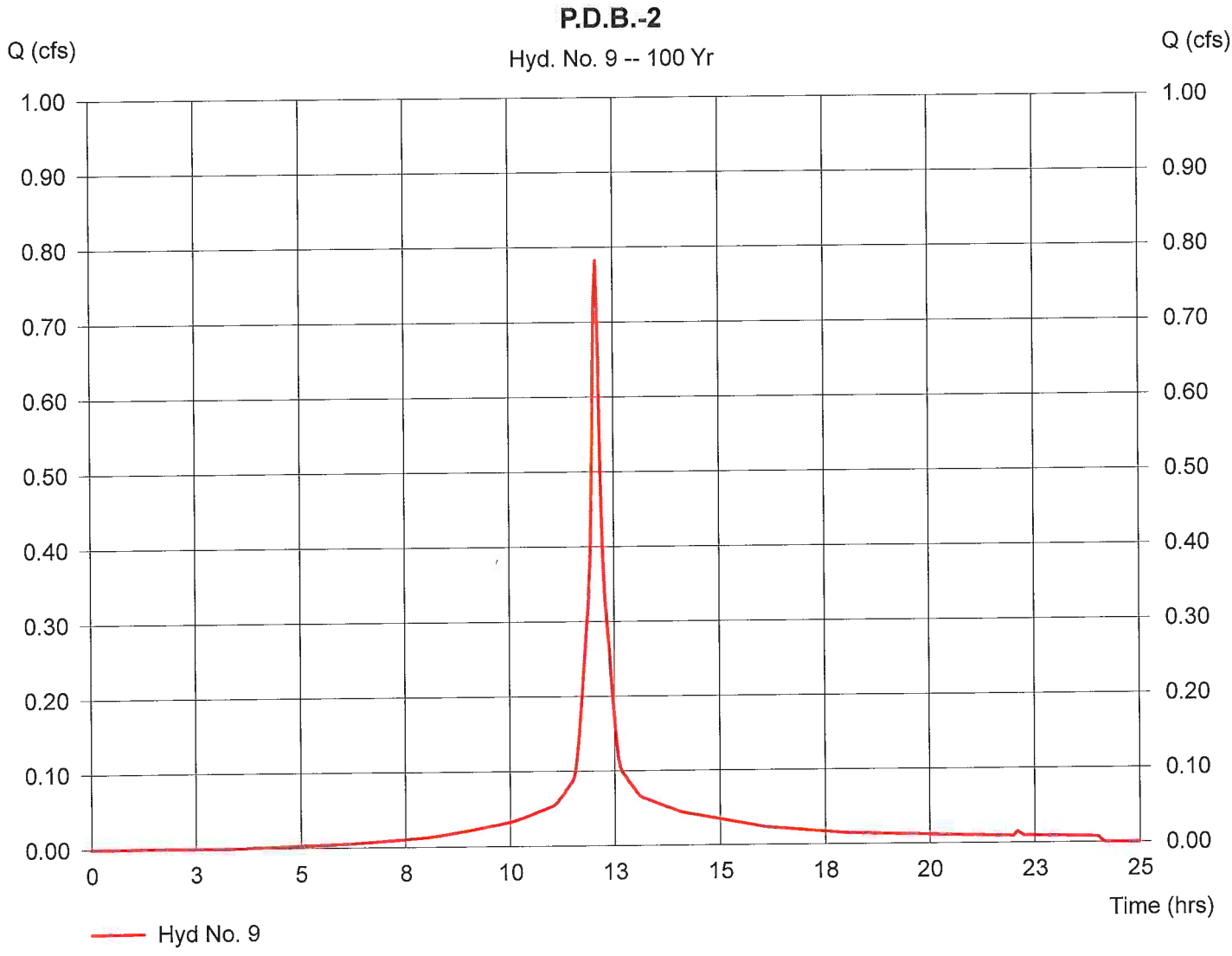
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 9

P.D.B.-2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.78 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Drainage area	= 0.15 ac	Curve number	= 90.1
Basin Slope	= 4.6 %	Hydraulic length	= 238 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 6.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 2,765 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

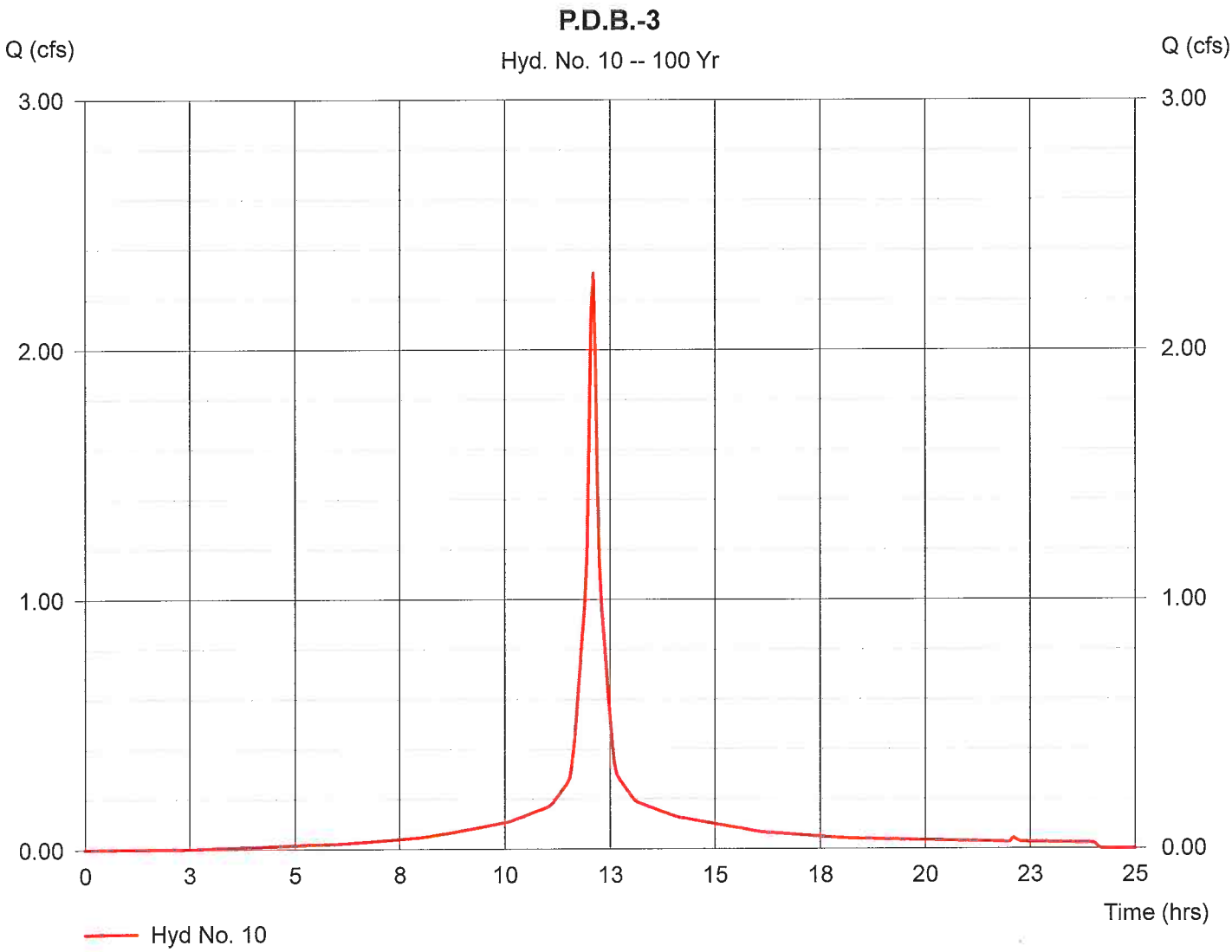
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 10

P.D.B.-3

Hydrograph type	= SCS Runoff	Peak discharge	= 2.31 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Drainage area	= 0.43 ac	Curve number	= 93.2
Basin Slope	= 3.5 %	Hydraulic length	= 228 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 6.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 8,379 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

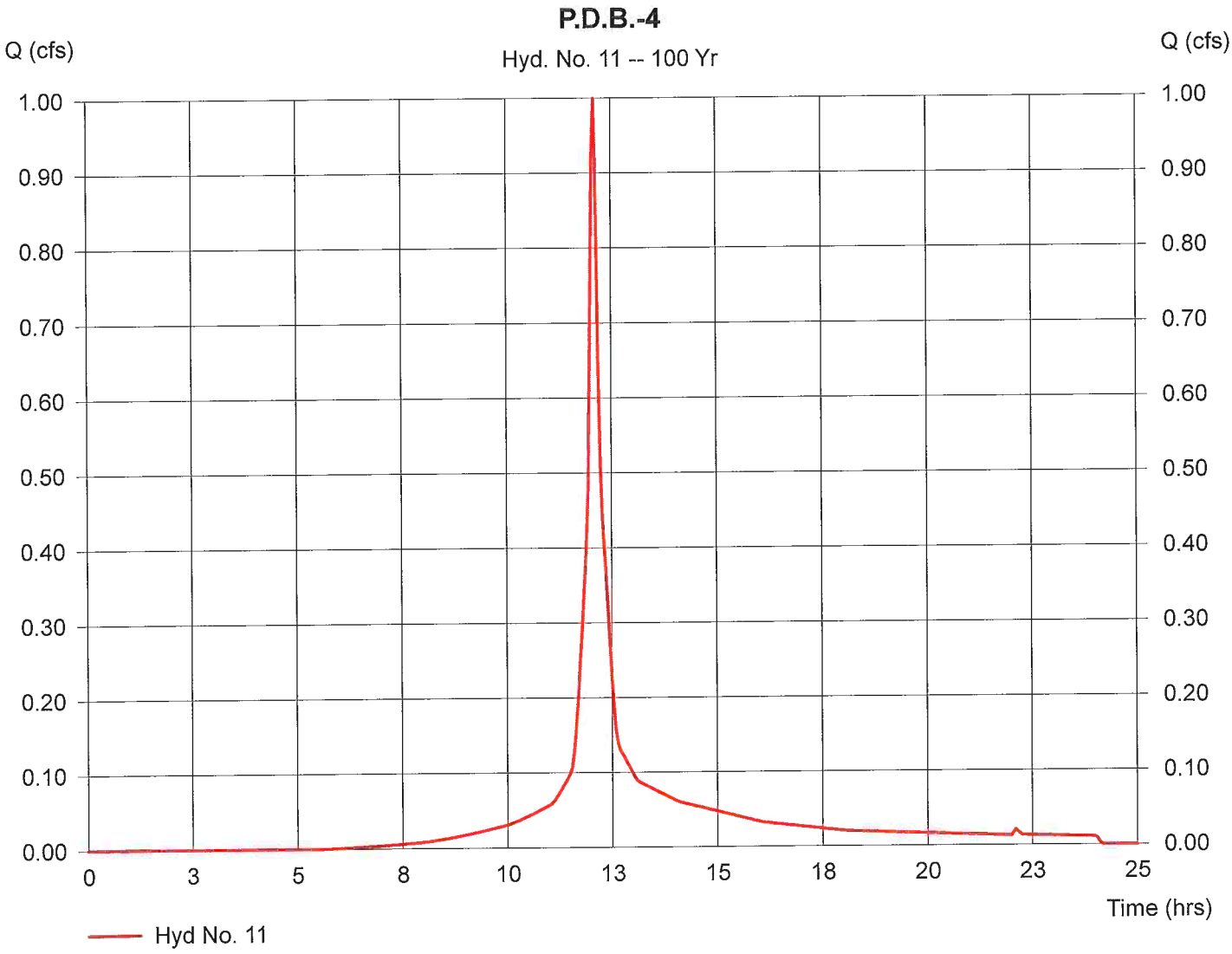
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 11

P.D.B.-4

Hydrograph type	= SCS Runoff	Peak discharge	= 1.00 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Drainage area	= 0.22 ac	Curve number	= 82.9
Basin Slope	= 3.5 %	Hydraulic length	= 227 ft
Tc method	= LAG	Time of conc. (Tc)	= 4.733436 min
Total precip.	= 6.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 3,389 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

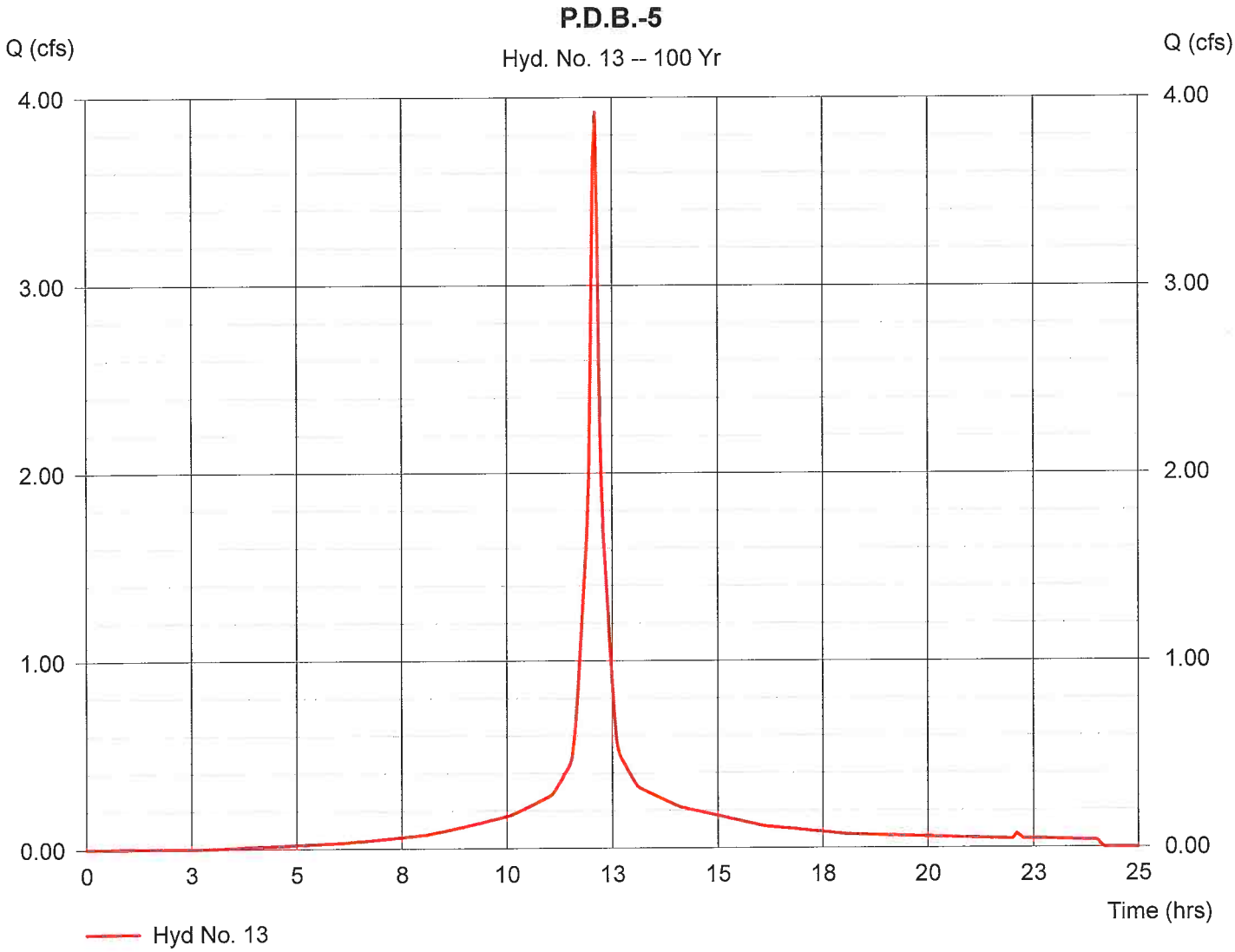
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 13

P.D.B.-5

Hydrograph type	= SCS Runoff	Peak discharge	= 3.92 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Drainage area	= 0.75 ac	Curve number	= 91.7
Basin Slope	= 8.2 %	Hydraulic length	= 170 ft
Tc method	= USER	Time of conc. (Tc)	= 5 min
Total precip.	= 6.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 14,051 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Monday, Sep 14 2015, 2:37 PM

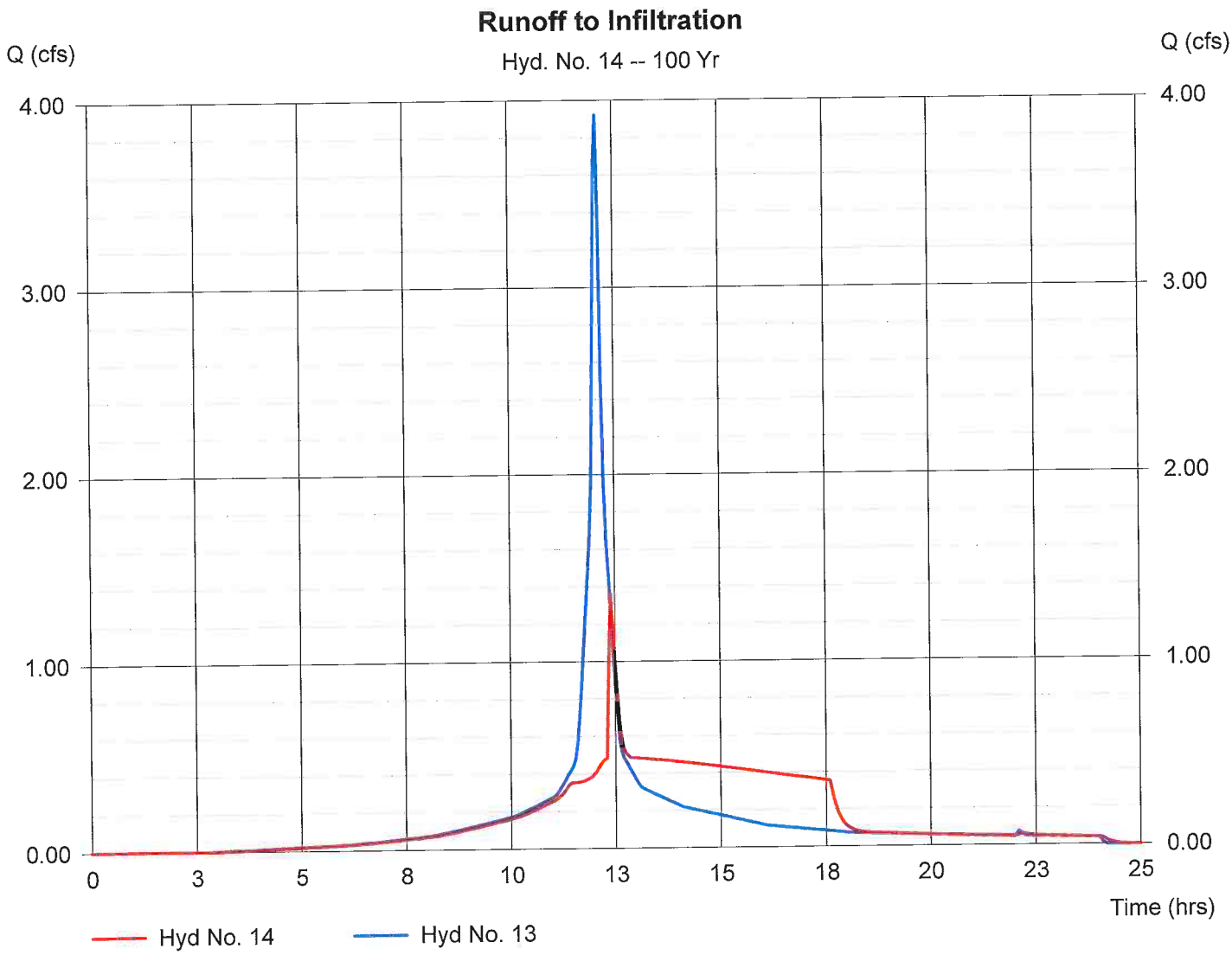
Hyd. No. 14

Runoff to Infiltration

Hydrograph type	= Reservoir	Peak discharge	= 1.36 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Inflow hyd. No.	= 13	Max. Elevation	= 197.95 ft
Reservoir name	= Infiltration System	Max. Storage	= 4,558 cuft

Storage Indication method used.

Hydrograph Volume = 14,050 cuft



Pond Report

Hydraflow Hydrographs by Intelisolve

Monday, Sep 14 2015, 2:37 PM

Pond No. 1 - Infiltration System

Pond Data

Bottom LxW = 68.0 x 26.5 ft Side slope = 0.0:1 Bottom elev. = 194.00 ft Depth = 4.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)*	Total storage (cuft)* (*64.00% voids applied)
0.00	194.00	1,802	0	0
0.20	194.20	1,802	231	231
0.40	194.40	1,802	231	461
0.60	194.60	1,802	231	692
0.80	194.80	1,802	231	923
1.00	195.00	1,802	231	1,153
1.20	195.20	1,802	231	1,384
1.40	195.40	1,802	231	1,615
1.60	195.60	1,802	231	1,845
1.80	195.80	1,802	231	2,076
2.00	196.00	1,802	231	2,307
2.20	196.20	1,802	231	2,537
2.40	196.40	1,802	231	2,768
2.60	196.60	1,802	231	2,999
2.80	196.80	1,802	231	3,229
3.00	197.00	1,802	231	3,460
3.20	197.20	1,802	231	3,690
3.40	197.40	1,802	231	3,921
3.60	197.60	1,802	231	4,152
3.80	197.80	1,802	231	4,382
4.00	198.00	1,802	231	4,613

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

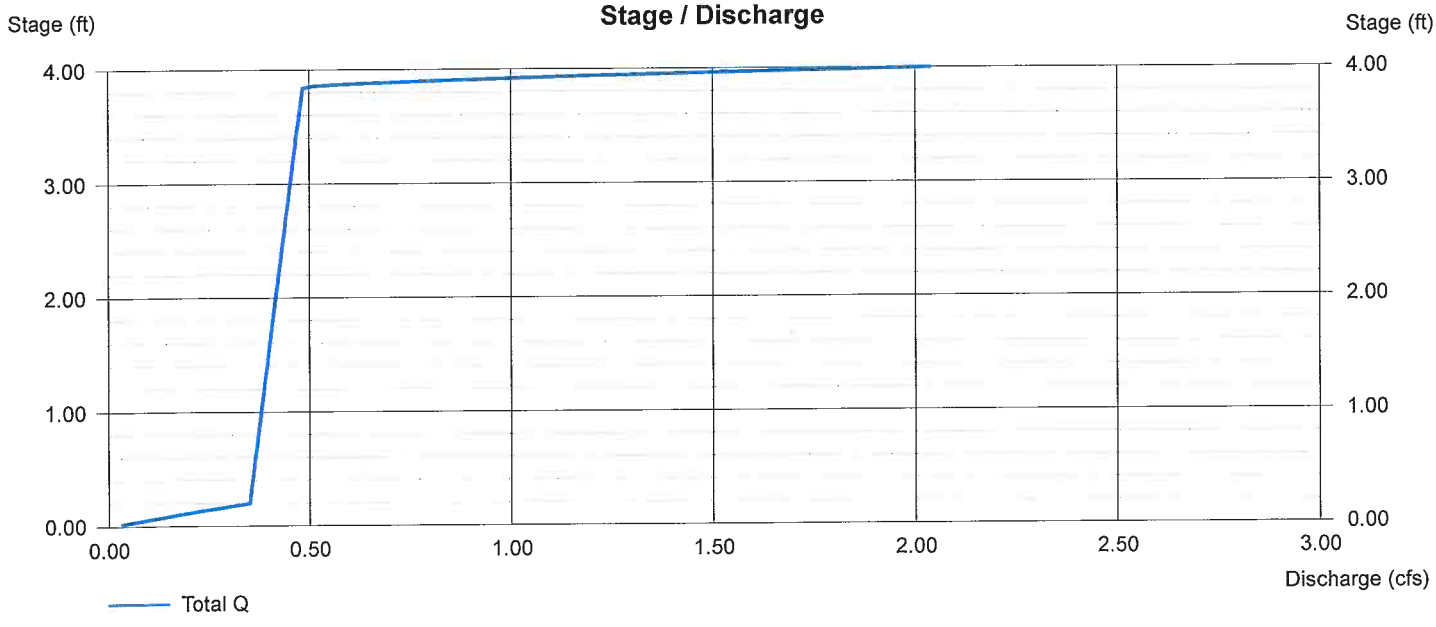
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 8.00	0.00	0.00	0.00
Crest El. (ft)	= 197.85	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration = 8.270 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.

Stage / Discharge



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

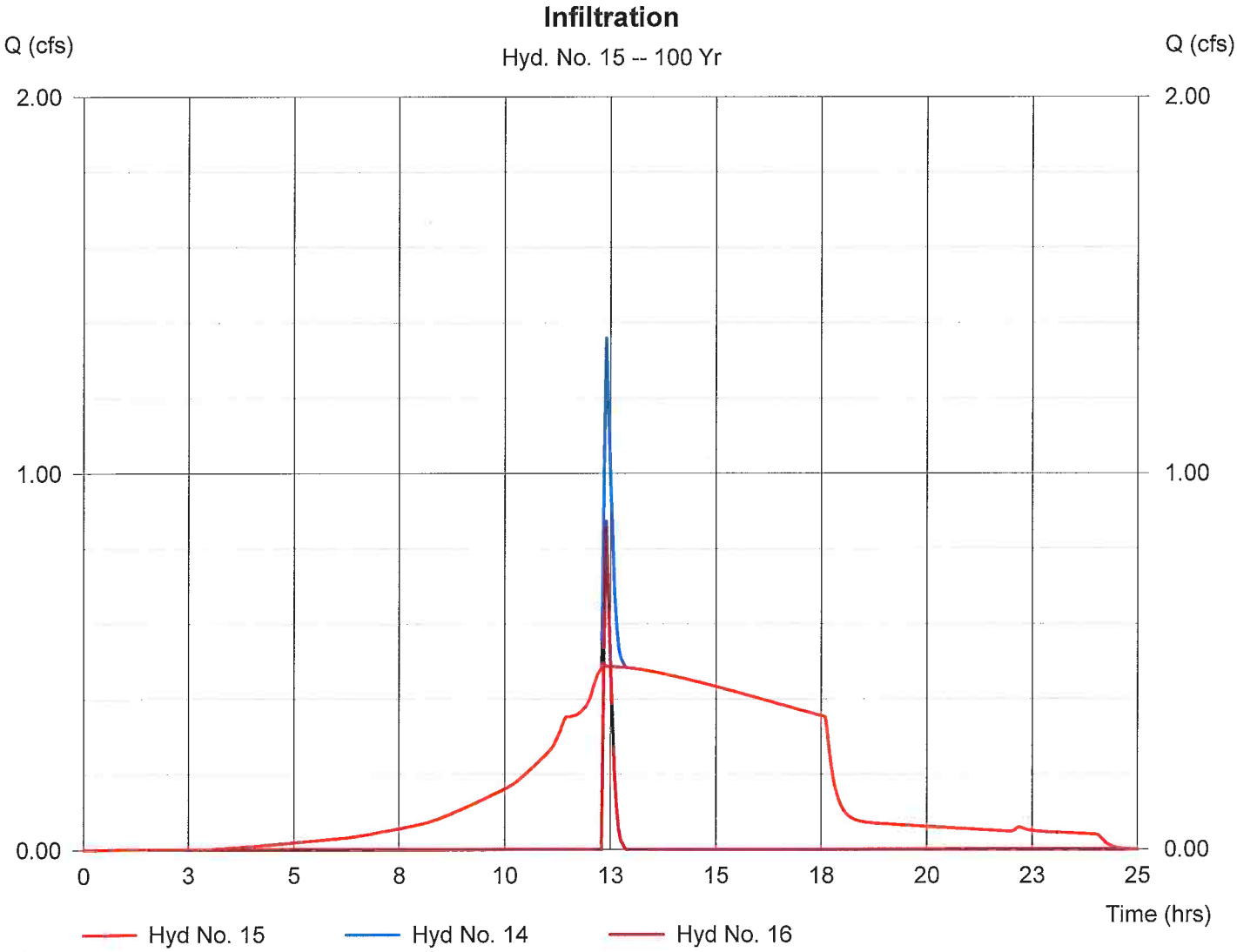
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 15

Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.49 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Inflow hydrograph	= 14	2nd diverted hyd.	= 16
Diversion method	= Pond - Infiltration System	Pond structure	= Exfiltration

Hydrograph Volume = 13,451 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

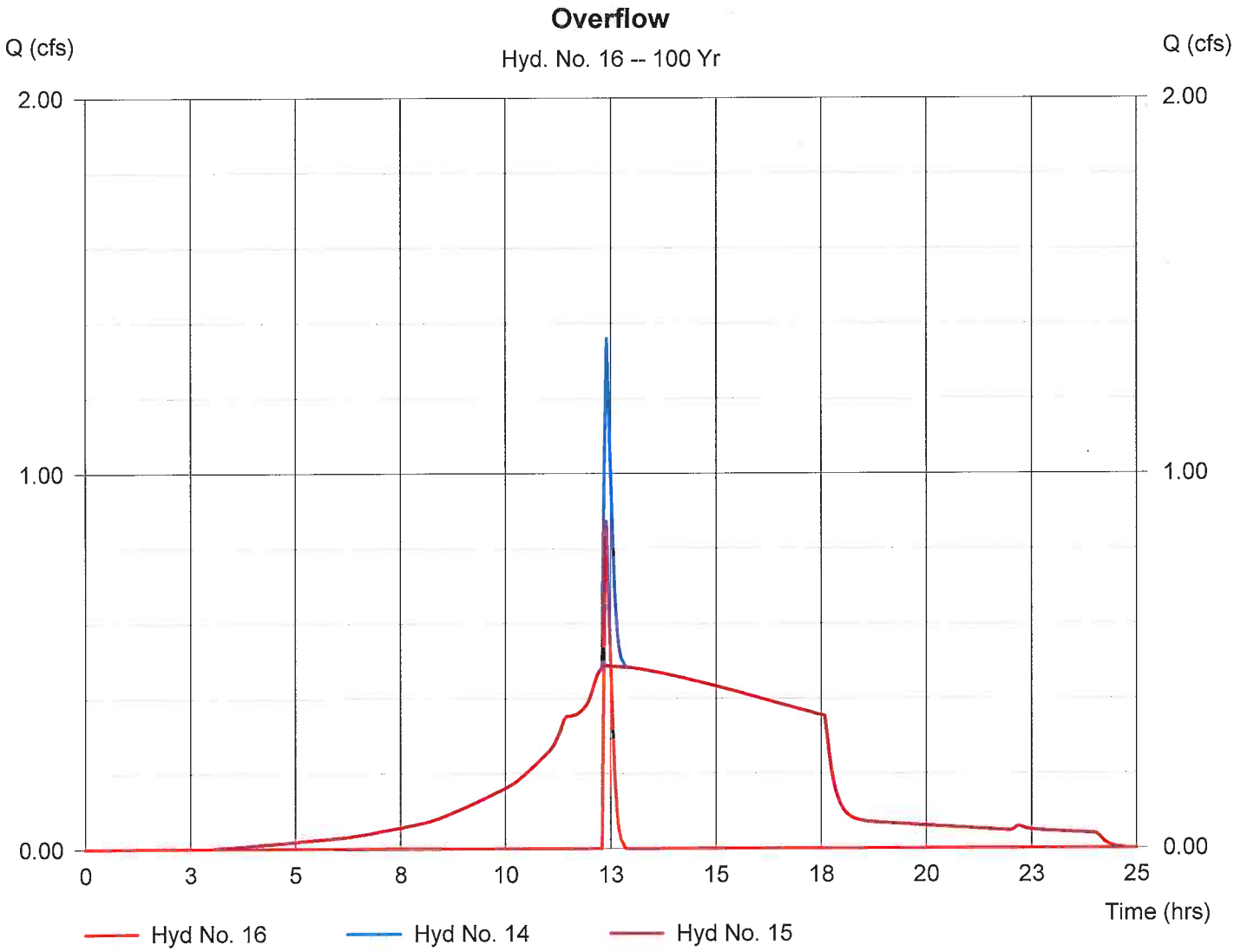
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 16

Overflow

Hydrograph type	= Diversion2	Peak discharge	= 0.87 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Inflow hydrograph	= 14	2nd diverted hyd.	= 15
Diversion method	= Pond - Infiltration System	Pond structure	= Exfiltration

Hydrograph Volume = 600 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

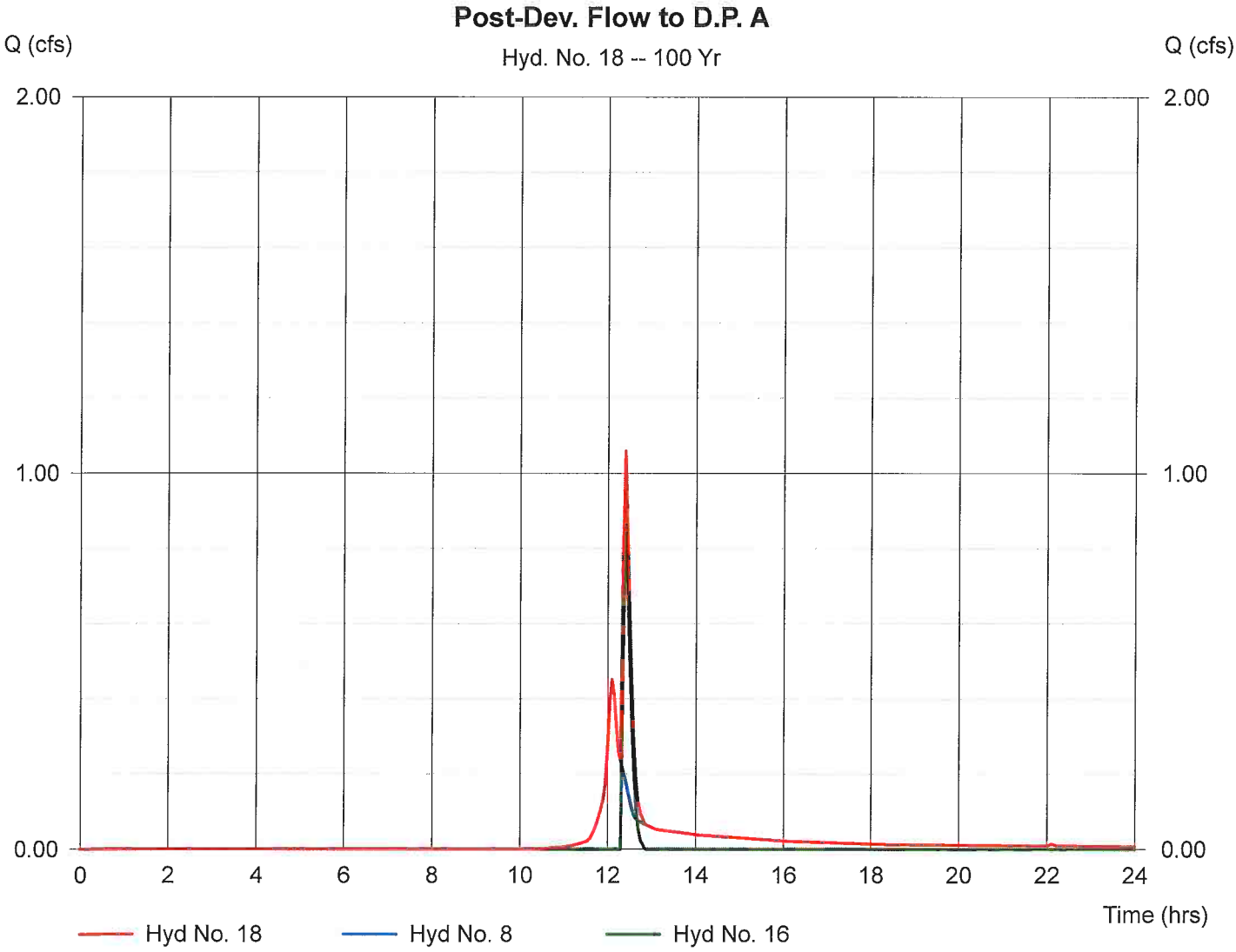
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 18

Post-Dev. Flow to D.P. A

Hydrograph type	= Combine	Peak discharge	= 1.06 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Inflow hyds.	= 8, 16		

Hydrograph Volume = 2,161 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

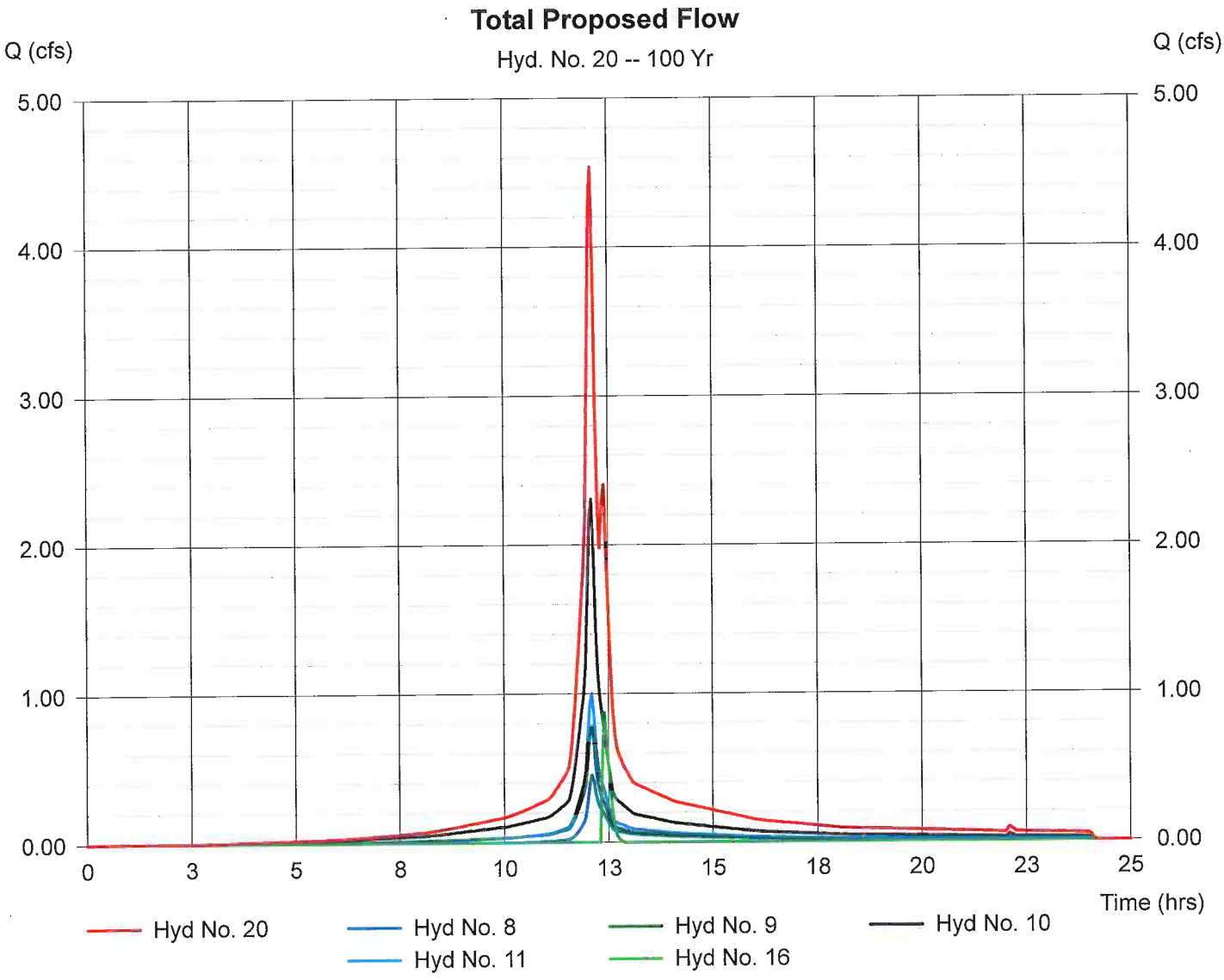
Monday, Sep 14 2015, 2:37 PM

Hyd. No. 20

Total Proposed Flow

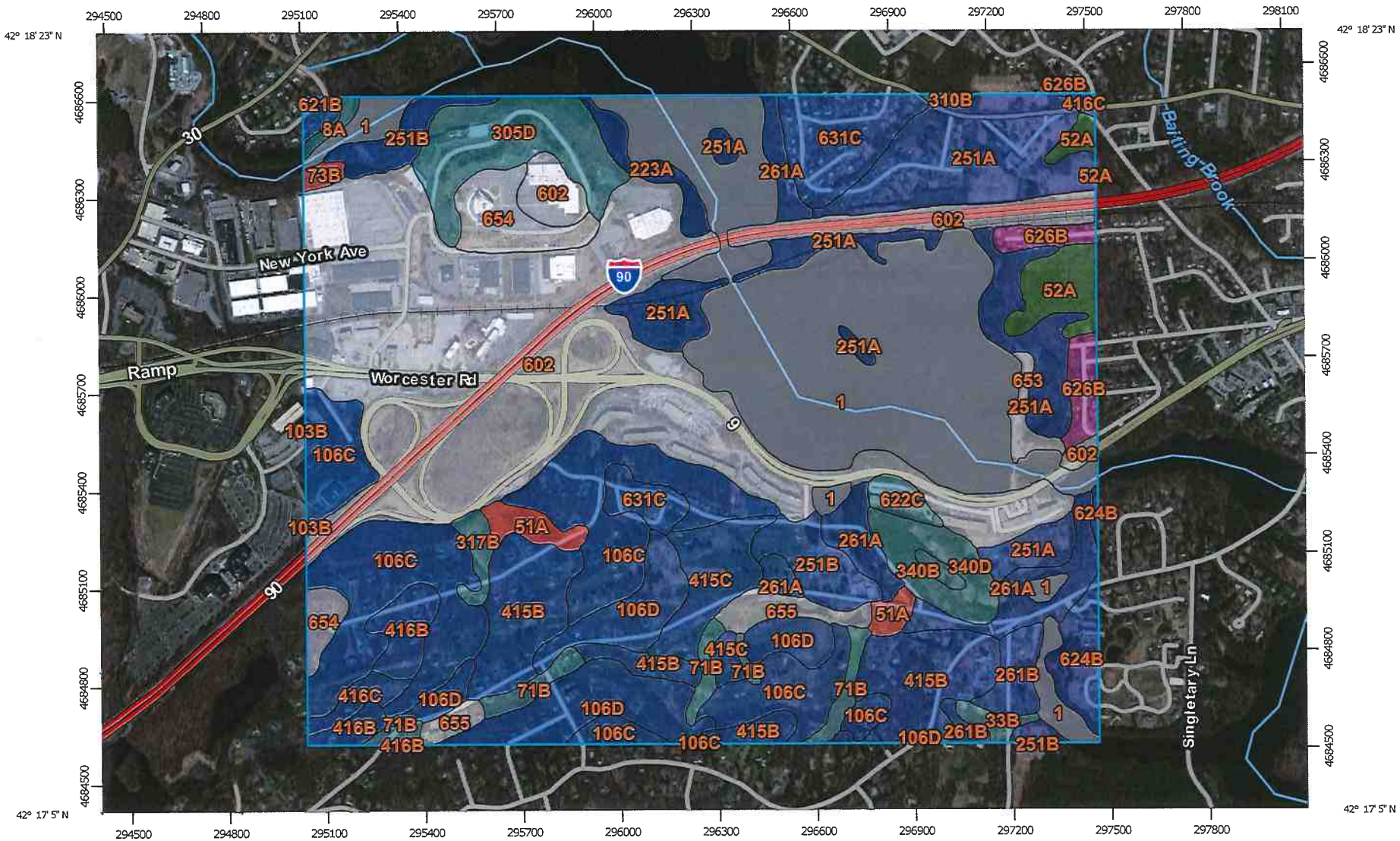
Hydrograph type	= Combine	Peak discharge	= 4.54 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Inflow hyds.	= 8, 9, 10, 11, 16		

Hydrograph Volume = 16,694 cuft



Appendix B:
NRCS Soil Survey Data

Hydrologic Soil Group—Middlesex County, Massachusetts
(NRCS Soil Survey, 1624 Worcester Road, Framingham MA)



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 1:25,000.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
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: Middlesex County, Massachusetts
Survey Area Data: Version 13, Dec 17, 2013

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

Date(s) aerial images were photographed: Mar 30, 2011—May 1, 2011

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

Hydrologic Soil Group— Summary by Map Unit — Middlesex County, Massachusetts (MA017)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Water		203.9	17.0%
8A	Limerick silt loam, 0 to 3 percent slopes	C	2.2	0.2%
33B	Raypol silt loam, 0 to 5 percent slopes	C	3.6	0.3%
51A	Swansea muck, 0 to 1 percent slopes	D	10.1	0.8%
52A	Freetown muck, 0 to 1 percent slopes	A/D	16.6	1.4%
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	C	16.8	1.4%
73B	Whitman fine sandy loam, 0 to 5 percent slopes, extremely stony	D	2.1	0.2%
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	B	0.2	0.0%
106C	Narragansett-Hollis-Rock outcrop complex, 3 to 15 percent slopes	B	132.1	11.0%
106D	Narragansett-Hollis-Rock outcrop complex, 15 to 25 percent slopes	B	58.0	4.8%
223A	Scio very fine sandy loam, 0 to 3 percent slopes	B	8.4	0.7%
251A	Haven silt loam, 0 to 3 percent slopes	B	99.7	8.3%
251B	Haven silt loam, 3 to 8 percent slopes	B	26.9	2.2%
261A	Tisbury silt loam, 0 to 3 percent slopes	B	34.5	2.9%
261B	Tisbury silt loam, 3 to 8 percent slopes	B	10.9	0.9%
305D	Paxton fine sandy loam, 15 to 25 percent slopes	C	36.3	3.0%
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	C	1.2	0.1%

Hydrologic Soil Group— Summary by Map Unit — Middlesex County, Massachusetts (MA017)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
317B	Scituate fine sandy loam, 3 to 8 percent slopes, extremely stony	C	4.9	0.4%
340B	Broadbrook very fine sandy loam, 3 to 8 percent slopes	C	2.1	0.2%
340D	Broadbrook very fine sandy loam, 8 to 25 percent slopes	C	18.0	1.5%
415B	Narragansett silt loam, 3 to 8 percent slopes	B	64.5	5.4%
415C	Narragansett silt loam, 8 to 15 percent slopes	B	22.8	1.9%
416B	Narragansett silt loam, 3 to 8 percent slopes, very stony	B	14.5	1.2%
416C	Narragansett silt loam, 8 to 15 percent slopes, very stony	B	6.6	0.6%
602	Urban land		295.0	24.6%
621B	Scio-Urban land complex, 0 to 8 percent slopes	B	2.9	0.2%
622C	Paxton-Urban land complex, 3 to 15 percent slopes	C	5.1	0.4%
624B	Haven-Urban land complex, 0 to 8 percent slopes	B	12.6	1.1%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	A	12.5	1.0%
631C	Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky	B	32.8	2.7%
653	Udorthents, sandy		4.9	0.4%
654	Udorthents, loamy		22.1	1.8%
655	Udorthents, wet substratum		12.2	1.0%
Totals for Area of Interest			**1,197.4**	**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

CHAPTER 2: TITLE V SOIL TESTING RESULTS

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

DEP has provided this form for use by on-site professionals and local Boards of Health. Other forms may be used, but the information must be substantially the same as provided here. Before using this form, check with your local Board of Health to determine the form they use.

A. Facility Information –FB630

1. Facility Information

Bernardi Toyota/James Carney & Amy Rossi
Owner Name

1624 & 1626 Worcester Road Map/Lot_____
Street Address

Framingham **MA** **01702**
City/Town State Zip Code

B. Site Information

1. (Check one) New Construction ☒ Upgrade ☐ Repair ☐

2. Published Soil Survey available? Yes ☒ No ☐ If yes: **On line**
Year Published Publication Scale Soil Map Unit

631C - Carlton - Urban Land – Hollis Complex
Soil Name Soil limitations

3. Surficial Geological Report available? Yes ☐ No ☒ If yes:
Year Published Publication Scale Map Unit

Geologic Material Landform

4. Flood Rate Insurance Map:

Above the 500 year flood boundary? Yes ☒ No ☐ Within the 100 year flood boundary? Yes ☐ No ☐

Within the 500 year flood boundary? Yes ☐ No ☒ Within a Velocity Zone? Yes ☐ No ☐

5. Wetland Area: National Wetland Inventory Map **N/A**
Map Unit Name

Wetlands Conservancy Program Map **N/A**
Map Unit Name

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

6. Current Water Resource Conditions (USGS) **June 2015** (Month/Year) Range: Above Normal ☐ Normal ☒ Below Normal ☐

7. Other references reviewed: _____

C. On-Site Review *(minimum of two holes required at every proposed disposal area)*

Deep Observation Hole Number: DTH-1 **June 05, 2015** (Date) _____ (Time) _____ (Weather)

1. Location
   Ground Elevation at Surface of Hole **195.8'**
   Location (Identify on Plan) **See Sketch**

2. Land Use: **Commercial Lot/Vacant Lot** (e.g. woodland, agricultural field, vacant lot, etc.) **Some** (Surface Stones) **3** (Slope (%))
   N/A (Vegetation) **Ice Contact Area** (Landform) **See Sketch** (Position on landscape (attach sheet))

3. Distances from: Open Water Body **>195** feet Drainage Way **N/A** feet Possible Wet Area **>150** feet
   Property Line **50'** feet Drinking Water Well **N/A** feet Other ____

4. Parent Material: **Glacial Till/Ice Contact Outwash** Unsuitable Materials Present: Yes ☐ No ☒
   If Yes: Disturbed Soil☐ Fill Material☐ Impervious Layer(s) ☐ Weathered/Fractured Rock☐ Bedrock☐

5. Groundwater Observed: Yes ☒ No ☐
   If Yes: Depth Weeping from Pit **@ 82"** Depth Standing Water in Hole **None**
   Estimated Depth to High Groundwater: **@ 66"** inches **190.3'** elevation

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: **DTH-1**

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-8	A	10yr3/2				Sandy Loam					
8-22	B	10yr5/6				Sandy Loam					
22-40	C1	2.5y4/3	@ 66"	7.5yr5/8		Fine Sand	5%				
40-102	C2	2.5y5/3				Loamy Sand					

Additional Notes **No refusal, many large rocks.**

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation – DTH-1

1. Method used:
   - ☐ Depth observed standing water in observation hole A. _____ inches B. _____ inches
   - ☐ Depth weeping from side of observation hole A. _____ inches B. _____ inches
   - ☒ Depth to soil redoximorphic features (mottles) A. **66"** inches B. _____ inches
   - ☐ Groundwater adjustment (USGS methodology) A. _____ inches B. _____ inches

2. Index Well Number _____ Reading Date _____ Index Well Level _____

   Adjustment Factor _____ Adjusted Groundwater Level _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system? Yes ☒ No ☐

   b. If yes, at what depth was it observed? Upper boundary: **24" to 40"** inches Lower boundary: **40" to 102"** inches

F. Certification

I certify that I have passed the soil evaluator examination* approved by the Department of Environmental Protection and that the above analysis was performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017.

_____ Signature of Soil Evaluator

_____ Date

Brian Nelson Typed or Printed Name of Soil Evaluator

June 2005 *Date of Soil Evaluator Exam

No Inspector Name of Board of Health Witness

N/A Board of Health

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

G. On-Site Review (Cont.)

Deep Observation Hole Number: DTH-2 June 05, 2015 _____ _____
Date Time Weather

1. Location

Ground Elevation at Surface of Hole **196.6'**

Location (Identify on Plan) **See Sketch**

2. Land Use: **Commercial Lot/Vacant Lot** **Some** **1**
(e.g. woodland, agricultural field, vacant lot, etc.) Surface Stones Slope (%)

N/A **Ice Contact Area** **See Sketch**
Vegetation Landform Position on landscape (attach sheet)

3. Distances from: Open Water Body **>205** feet Drainage Way **N/A** feet Possible Wet Area **>150** feet
Property Line **65'** feet Drinking Water Well **N/A** feet Other ___

4. Parent Material: **Glacial Till/Ice Contact Outwash** Unsuitable Materials Present: Yes ☐ No ☒

If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☐ No ☒

If Yes: Depth Weeping from Pit **None** Depth Standing Water in Hole **None**

Estimated Depth to High Groundwater: **None** Inches **190.3'** elevation

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: **DTH-2**

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-8	A	10yr3/2				Sandy Loam					
8-20	B	10yr5/6				Sandy Loam					
20-32	C1	2.5y5/6				Fine Sand					
32-58	C2	2.5y5/3				Med Sand					
58-76	C3	2.5y4/2				Med Sand					Refusal @ 76"

Additional Notes **Refusal @ 76", no mottling associated with groundwater.**

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

H. Determination of High Groundwater Elevation – DTH-2

1. Method used:
   - ☐ Depth observed standing water in observation hole A. _____ inches B. _____ inches
   - ☐ Depth weeping from side of observation hole A. _____ inches B. _____ inches
   - ☒ Depth to soil redoximorphic features (mottles) A. **No mottling associated w/ groundwater to 76"** inches
   - ☐ Groundwater adjustment (USGS methodology) A. _____ inches B. _____ inches

2. Index Well Number _____ Reading Date _____ Index Well Level _____
   Adjustment Factor _____ Adjusted Groundwater Level _____

I. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   b. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system? Yes ☒ No ☐

   b. If yes, at what depth was it observed? Upper boundary: **20" to 32"** inches Lower boundary: **58" to 76"** inches

J. Certification

I certify that I have passed the soil evaluator examination* approved by the Department of Environmental Protection and that the above analysis was performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017.

_____ _____
Signature of Soil Evaluator Date

Brian Nelson **June 2005**
Typed or Printed Name of Soil Evaluator *Date of Soil Evaluator Exam

No Inspector **N/A**
Name of Board of Health Witness Board of Health

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

K. On-Site Review (Cont.)

Deep Observation Hole Number: DTH-3 June 05, 2015 (Date) ___ ___ (Time) ___ (Weather)

1. Location

Ground Elevation at Surface of Hole 203.4'

Location (Identify on Plan) See Sketch

2. Land Use: Commercial Lot/Vacant Lot (e.g. woodland, agricultural field, vacant lot, etc.) Some (Surface Stones) 4 (Slope (%))

N/A (Vegetation) Ice Contact Area (Landform) See Sketch (Position on landscape (attach sheet))

3. Distances from: Open Water Body >200 feet Drainage Way N/A feet Possible Wet Area >150 feet

Property Line >100' feet Drinking Water Well N/A feet Other ____

4. Parent Material: Glacia Till/Ice Contact Outwash Unsuitable Materials Present: Yes ☐ No ☒

If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☐ No ☒

If Yes: Depth Weeping from Pit None Depth Standing Water in Hole None

Estimated Depth to High Groundwater: None (Inches) 194.2' (elevation)

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: **DTH-3**

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-6	A	10yr3/2				Sandy Loam					
6-24	B	10yr5/6				Sandy Loam					
24-54	C1	2.5y6/4				Sandy Loam					
54-112	C2	2.5y5/2				Coarse Sand					

Additional Notes **No water, no refusal, no mottling associated with groundwater to 194.2'**

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

L. Determination of High Groundwater Elevation – DTH-3

1. Method used:
   - ☐ Depth observed standing water in observation hole A. _____ inches B. _____ inches
   - ☐ Depth weeping from side of observation hole A. _____ inches B. _____ inches
   - ☒ Depth to soil redoximorphic features (mottles) A. No mottling associated w/ groundwater to 194.2' inches
   - ☐ Groundwater adjustment (USGS methodology) A. _____ inches B. _____ inches

2. Index Well Number _____ Reading Date _____ Index Well Level _____

   Adjustment Factor _____ Adjusted Groundwater Level _____

M. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   c. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system? Yes ☒ No ☐

   b. If yes, at what depth was it observed? Upper boundary: 24" to 54" inches Lower boundary: 54" to 112" inches

N. Certification

I certify that I have passed the soil evaluator examination* approved by the Department of Environmental Protection and that the above analysis was performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017.

Signature of Soil Evaluator _____ Date _____

Brian Nelson
Typed or Printed Name of Soil Evaluator

June 205
*Date of Soil Evaluator Exam

no Inspector
Name of Board of Health Witness

N/A
Board of Health

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed disposal area)*

Deep Observation Hole Number: DTH-4 **June 05, 2015** (Date) _____ (Time) _____ (Weather)

1. Location
   Ground Elevation at Surface of Hole **201.6'**

   Location (Identify on Plan) **See Sketch**

2. Land Use: **Commercial Lot/Vacant Lot** (e.g. woodland, agricultural field, vacant lot, etc.) **Some** (Surface Stones) **1** (Slope (%))

   N/A (Vegetation) **Ice Contact Area** (Landform) **See Sketch** (Position on landscape (attach sheet))

3. Distances from: Open Water Body **>200** feet Drainage Way **N/A** feet Possible Wet Area **>150** feet
   Property Line **25'** feet Drinking Water Well **N/A** feet Other ____

4. Parent Material: **Glacial Till/Ice Contace Outwash** Unsuitable Materials Present: Yes ☐ No ☒

   If Yes: Disturbed Soil☐ Fill Material☐ Impervious Layer(s) ☐ Weathered/Fractured Rock☐ Bedrock☐

5. Groundwater Observed: Yes ☐ No ☒

   If Yes: Depth Weeping from Pit **None** Depth Standing Water in Hole **None**

   Estimated Depth to High Groundwater: **None** Inches **192.3'** elevation

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: **DTH-4**

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-6	A	10yr3/2				Sandy Loam					
6-24	B	10yr5/6				Sandy Loam					
24-54	C1	2.5y6/4				Sandy Loam					
54-112	C2	2.5y5/2				Coarse Sand					

Additional Notes **No refusal, no water, no mottling associated with groundwater to 192.3'.**

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation – DTH-4

1. Method used:
   - ☐ Depth observed standing water in observation hole A. _____ inches B. _____ inches
   - ☐ Depth weeping from side of observation hole A. _____ inches B. _____ inches
   - ☒ Depth to soil redoximorphic features (mottles) A. No mottling associated w/ groundwater to 192.3' inches
   - ☐ Groundwater adjustment (USGS methodology) A. _____ inches B. _____ inches

2. Index Well Number _____ Reading Date _____ Index Well Level _____

   Adjustment Factor _____ Adjusted Groundwater Level _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   d. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system? Yes ☒ No ☐

   b. If yes, at what depth was it observed? Upper boundary: 58" to 106" inches Lower boundary: 106" to 120" inches

F. Certification

I certify that I have passed the soil evaluator examination* approved by the Department of Environmental Protection and that the above analysis was performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017.

_____ Signature of Soil Evaluator

_____ Date

Brian Nelson
Typed or Printed Name of Soil Evaluator

June 2005
*Date of Soil Evaluator Exam

No Inspector
Name of Board of Health Witness

N/A
Board of Health

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed disposal area)*

Deep Observation Hole Number: DTH-5 **June 05, 2015** (Date) _____ (Time) _____ (Weather)

1. Location
   Ground Elevation at Surface of Hole **214.3'**

   Location (Identify on Plan) **See Sketch**

2. Land Use: **Commercial Lot/Vacant Lot** (e.g. woodland, agricultural field, vacant lot, etc.) **some** (Surface Stones) **1** (Slope (%))

   N/A (Vegetation) **Ice Contact Area** (Landform) **See Sketch** (Position on landscape (attach sheet))

3. Distances from: Open Water Body **>200** feet Drainage Way **N/A** feet Possible Wet Area **>150** feet
   Property Line **>50'** feet Drinking Water Well **N/A** feet Other ____

4. Parent Material: **Glacial Till/Ice Contact Outwash** Unsuitable Materials Present: Yes ☐ No ☒

   If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☐ No ☒

   If Yes: Depth Weeping from Pit **None** Depth Standing Water in Hole **None**

   Estimated Depth to High Groundwater: **None** inches **210.6'** elevation

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: **DTH-5**

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-44	Fill										Refusal @ 44"

Additional Notes **Refusal @ 44" (ledge), no mottling associated with groundwater to 44"**

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation – DTH-5

1. Method used:
   - ☐ Depth observed standing water in observation hole A. _____ inches B. _____ inches
   - ☐ Depth weeping from side of observation hole A. _____ inches B. _____ inches
   - ☒ Depth to soil redoximorphic features (mottles) A. No mottling associated w/ groundwater to 44" inches
   - ☐ Groundwater adjustment (USGS methodology) A. _____ inches B. _____ inches

2. Index Well Number _____ Reading Date _____ Index Well Level _____

   Adjustment Factor _____ Adjusted Groundwater Level _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   e. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system? Yes ☐ No ☒

   b. If yes, at what depth was it observed? Upper boundary: _____ inches Lower boundary: _____ inches

F. Certification

I certify that I have passed the soil evaluator examination* approved by the Department of Environmental Protection and that the above analysis was performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017.

_____ Signature of Soil Evaluator

_____ Date

Brian Nelson Typed or Printed Name of Soil Evaluator

June 2005 *Date of Soil Evaluator Exam

No Inspector Name of Board of Health Witness

N/A Board of Health

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed disposal area)*

Deep Observation Hole Number: DTH-6 **June 05, 2015** (Date) _____ (Time) _____ (Weather)

1. Location
   Ground Elevation at Surface of Hole **208.6'**
   Location (Identify on Plan) **See Sketch**
2. Land Use: **Commercial Lot/Vacant Lot** (e.g. woodland, agricultural field, vacant lot, etc.) **Some** (Surface Stones) **1** (Slope (%))
   N/A (Vegetation) **Ice Contact Area** (Landform) **See Sketch** (Position on landscape (attach sheet))
3. Distances from: Open Water Body **>200** feet Drainage Way **N/A** feet Possible Wet Area **>150** feet
   Property Line **40'** feet Drinking Water Well **N/A** feet Other ____
4. Parent Material: **Glacial Till/Ice Contact Outwash** Unsuitable Materials Present: Yes ☐ No ☒
   If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐
5. Groundwater Observed: Yes ☐ No ☒
   If Yes: Depth Weeping from Pit **@ 96"** Depth Standing Water in Hole **None**
   Estimated Depth to High Groundwater: **None** inches **200.6'** elevation

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: **DTH-6**

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-40	Fill										
40-96	C1	2.5y5/3				Sandy Loam					

Additional Notes **No refusal, no mottling seen, old foundation remnants in pit.**

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation – DTH-6

1. Method used:
   - ☐ Depth observed standing water in observation hole A. _____ inches B. _____ inches
   - ☐ Depth weeping from side of observation hole A. _____ inches B. _____ inches
   - ☒ Depth to soil redoximorphic features (mottles) A. **No motting seen** inches
   - ☐ Groundwater adjustment (USGS methodology) A. _____ inches B. _____ inches

2. Index Well Number _____ Reading Date _____ Index Well Level _____

   Adjustment Factor _____ Adjusted Groundwater Level _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   f. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system? Yes ☒ No ☐

   b. If yes, at what depth was it observed? Upper boundary: **40" to 96"** inches Lower boundary: _____ inches

F. Certification

I certify that I have passed the soil evaluator examination* approved by the Department of Environmental Protection and that the above analysis was performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017.

_____ Signature of Soil Evaluator

_____ Date

Brian Nelson Typed or Printed Name of Soil Evaluator

June 2005 *Date of Soil Evaluator Exam

No Inspector Name of Board of Health Witness

N/A Board of Health

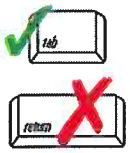
CHAPTER 3: CHECKLIST FOR STORMWATER REPORT

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☒ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☒ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☒ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☒ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☒ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

CHAPTER 4: LID MEASURES

Chapter 4:

The proposed redevelopment project will be utilizing various low impact development (LID) approaches to minimize environmental impacts and these LID measures include stormwater management aspects of the project. Stormwater from the project will be managed by two primary techniques:

1. Treatment of stormwater runoff using current design best management practices.
2. Stormwater will be managed by the extensive use of infiltration measures

LID measures:

Design of the project has utilized Low Impact Development (LID) techniques to the maximum extent practicable. The following LID approaches have been employed in the design of this project:

Subsurface Infiltration System

A proposed subsurface infiltration system is designed to store and recharge runoff from the majority of proposed impervious surfaces for the project. Subsurface infiltration system 1 is located in the northwesterly portion of the property. This system is designed to completely store and infiltrate rain events up through the 25-year storm with minor overflow from larger storm events. Runoff rates and volumes leaving the project site will be significantly reduced for all storm events.

CHAPTER 5: STORMWATER MANAGEMENT STANDARDS 1 & 2

Chapter 5:

Standard 1: No New Untreated Discharges

- No New Untreated Discharges will occur in the post-development condition.
- All discharges off site will be treated using both structural and non-structural Best Management Practices (Stormceptor® Units, deep sump catch basins, etc.) to remove TSS and other pollutants.
- A large portion of runoff from proposed impervious areas will be collected and recharged using subsurface infiltration systems, thereby decreasing discharge to resource areas from pre-development conditions.
- Supporting calculations specified in Volume 3 are attached with the Hydrologic Analysis, Chapter 1.

Standard 2: Peak Rate Attenuation

- The Hydrologic Analysis provided in Chapter 1 demonstrates that no off-site flooding will be increased in the post-development state during the 100-year 24-hour storm.
- The Hydrologic Analysis provided in Chapter 1, Tables One through Eight, demonstrate that the peak runoff rates will be reduced in the post development state during the 100-year 24 hour storm event. The table shown below shows that peak runoff rates in the post-development condition will be significantly reduced in comparison to the pre-development condition for runoff leaving the project site for all storm events.

Table One: Comparison of Pre and Post-Development Peak Runoff Rates for Total Site

Drainage Basin	2-year storm	10-year storm	25-year storm	100-year storm
Existing	2.21 CFS	3.88 CFS	5.05 CFS	6.41 CFS
Proposed	1.78 CFS	2.93 CFS	3.69 CFS	4.54 CFS
Difference	-0.43 CFS	-0.95 CFS	-1.36 CFS	-1.87 CFS
Difference	-19.5%	-24.5%	-26.9%	-29.2%

CHAPTER 6: STORMWATER MANAGEMENT STANDARD 3

Chapter 6:

Standard 3: Recharge

- **Soil Data is provided in Chapter 2 of Stormwater Report, Chapter 1, and on the Existing Conditions Plan**
- **The required recharge volume calculations:**
  The required Recharge Volume is based on loamy sand with a NRCS Hydrologic Group rating of A and a Target Depth Factor (F) of 0.60-inch. Below is the calculation for the required recharge volume for the entire site:

  Required Recharge Volume
  Rv = (F) x (Impervious Area)
  Rv = (0.60 inch / 12) x (55,001 square feet)
  Rv = 2,750 cubic feet.

- The sizing of the infiltration BMP's is based on a "Static Method."
- Runoff from the majority of the proposed parking and roof surfaces on the site are being discharged into the infiltration BMP.
- The recharge BMP's have been sized to infiltrate the required Recharge Volume:

Subusrface Infiltration System 1

System configuration:	80, 4 ft. 4 ft. by 4 ft. leaching chambers
Bottom Area	1,976 square feet
Total Storage Volume Available:	4,600 cubic feet or 34,413 gallons
Exfiltration Rate:	8.27 inches per hour
Bottom Exfiltration Capacity:	0.378 CFS

Recharge Volumes from Hydrologic Analysis, Chapter 1.

Subusrface Infiltration System 1

2-Year Recharge Volume = 5,904 cubic feet
10-Year Recharge Volume = 9,323 cubic feet
25-Year Recharge Volume = 11,555 cubic feet
100-Year Recharge Volume = 14,050 cubic feet

- A more detailed analysis of the storage and infiltration capacities for the infiltration system can be found in the Hydrologic Analysis, Chapter 1.

Chapter 6: (continued)

- Below are the calculations showing that the Infiltration BMP's will drain in 72 hours:

Subusrface Infiltration System 1 (Based on Rv)

$$Time_{drawdown} = \frac{(Rv)}{(K) \times (Bottom\ Area)}$$

$$Time_{drawdown} = \frac{(2{,}750\ cubic\ feet)}{(8.27\ inches/hour)(1\ foot/\ 12\ inches) \times (1{,}976\ square\ feet)}$$

$Time_{drawdown}$ = **2.0 hours < 72 hours**

Subusrface Infiltration System 1 (Based on System full))

$$Time_{drawdown} = \frac{(Rv)}{(K) \times (Bottom\ Area)}$$

$$Time_{drawdown} = \frac{(4{,}600\ cubic\ feet)}{(8.27\ inches/hour)(1\ foot/\ 12\ inches) \times (1{,}976\ square\ feet)}$$

$Time_{drawdown}$ = **3.4 hours < 72 hours**

- The bottom of both infiltration systems have a separation to the seasonal high water table of 4-feet or greater; therefore no mounding analysis is needed.

CHAPTER 7: LONG-TERM POLLUTION PREVENTION PLAN STORMWATER MANAGEMENT STANDARDS 4-6

Chapter 7:

Long Term Pollution Prevention Plan:

- The Stormwater Pollution Prevention Plan from Chapter 8 and the Operation and Maintenance Plan from Chapter 11 address all necessary aspects of the Long Term Pollution Prevention Plan

Standard 4: Water Quality

- Approximately 65% TSS Removal will be achieved prior to discharging to an infiltration BMP.
- Stormwater Runoff to be treated for Water Quality is based on 1-inch of runoff due to the post-development condition of exfiltrating soils with an infiltration rate greater than 2.4-inches per hour.
    - Requirement for Entire Site
      Amount of Runoff to be treated = (1.0 inch) x (impervious area)
      = (1.0 inch)/(1/12) x (55,001 square feet)
      = **4,583 cubic feet**
- Below is a sample TSS Removal calculation for a single sub basin on the post-development site:

TSS Treatment Basin 1

Driveway and parking lot sweeping - **5% (BMP1)**
Deep sump catch basins - **25% (BMP2)**
Stormceptor – **75% (BMP3)**
Infiltration System – **80% (BMP4)**

Parking Lot Sweeping:
Average Annual Load (1.00) * BMP1 Removal Rate (0.05) = **0.05**
(0.95 of the TSS load remains)

Deep Sump Catch Basin:
TSS load remaining (0.95) * BMP2 Removal Rate (0.25) = **0.24**
(0.71 of the TSS load remains)

Stormceptor 900:
TSS load remaining (0.71) * BMP3 Removal Rate (0.75) = **0.53**
(0.18 of the TSS load remains)

Infiltration System:
TSS load remaining (0.18) * BMP3 Removal Rate (0.80) = **0.14**
(0.04 of the TSS load remains)

Final TSS Removal Rate: 1.00 – 0.96= 0.04. **(96% TSS Removal)**

Chapter 7: (continued)

- TSS Removal data for sub basins 1 through 4 are attached hereafter. A weighted post-development TSS Removal was determined to be **83.1%**.

Standard 5: Land Use with Higher Potential Pollutant Loads

- The project does not include land uses with Higher Potential Pollutant Loads.

Standard 6: Critical Areas

- The project does not affect a critical area as defined by the MADEP Stormwater Handbook.

Bernardi Toyota, Worcester Street, Framingham MA — 14-Sep-15

Stormwater Management Calculations, TSS Removal

Treatment Basin 1	**Basin Area (acres)**	0.59	
BMP List	**Removal Rate (%)**	**TSS Removed (%)**	**TSS Remaining (%)**
Street Sweeping	5	5.0	95.0
Deep Sump Catch Basins	25	23.8	71.3
StormCeptor 900*	75	53.4	17.8
Infiltration System	80	14.3	3.6
		TSS Removal	**96.4**

Treatment Basin 2	**Basin Area (acres)**	0.178	
BMP List	**Removal Rate (%)**	**TSS Removed (%)**	**TSS Remaining (%)**
Street Sweeping	5	5.0	95.0
Deep Sump Catch Basins	25	23.8	71.3
StormCeptor 450*	80	57.0	14.3
Infiltration System	80	11.4	2.9
		TSS Removal	**97.2**

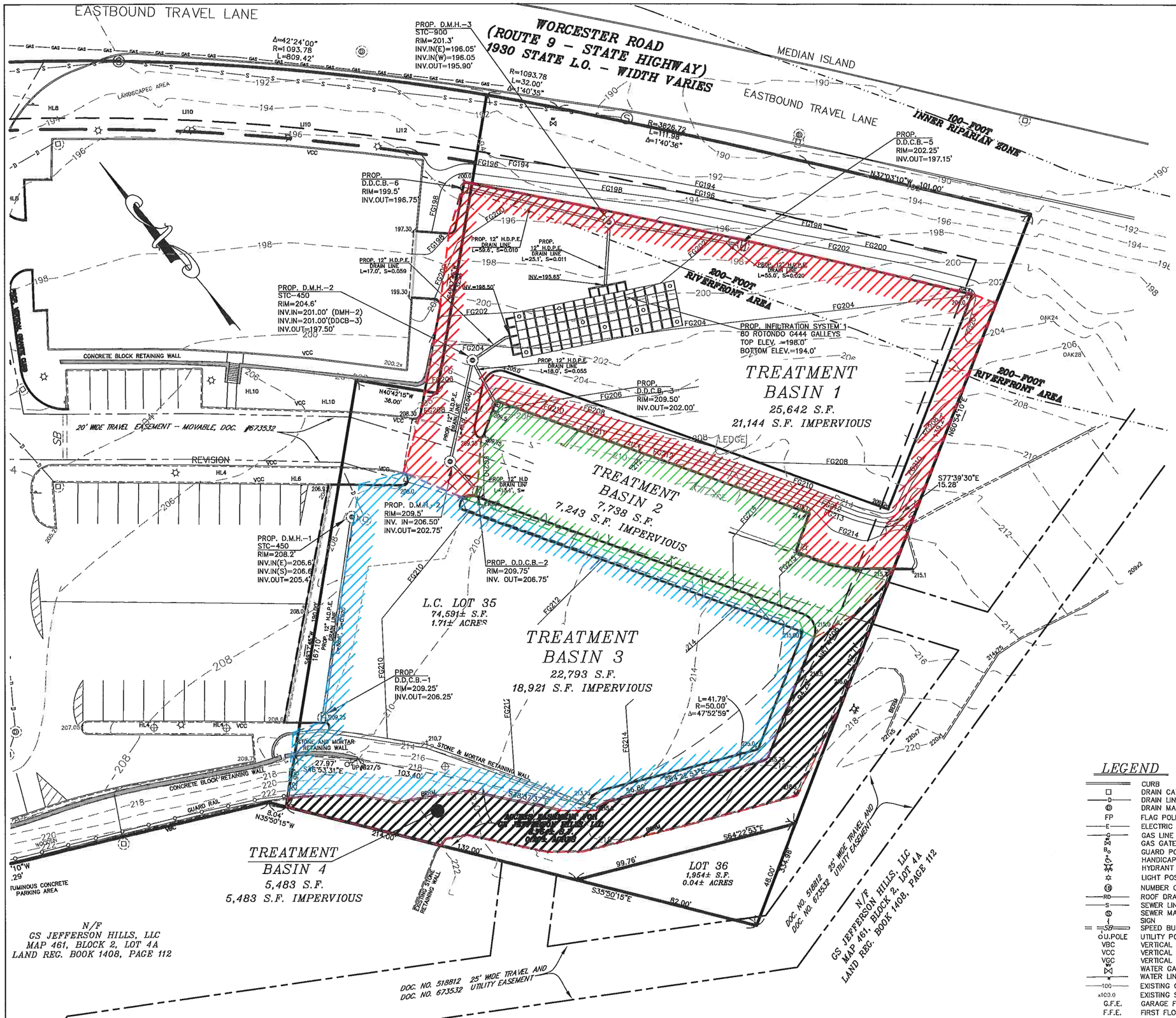
Treatment Basin 3	**Basin Area (acres)**	0.523	
BMP List	**Removal Rate (%)**	**TSS Removed (%)**	**TSS Remaining (%)**
Street Sweeping	5	5.0	95.0
Deep Sump Catch Basins	25	23.8	71.3
StormCeptor 450*	75	53.4	17.8
		TSS Removal	**82.2**

Treatment Basin 4	**Basin Area (acres)**	0.126	
BMP List	**Removal Rate (%)**	**TSS Removed (%)**	**TSS Remaining (%)**
Street Sweeping	5	5.0	95.0
		TSS Removal	**5.0**

(*) - TSS Removal Rates based on 90% of TSS removal shown on Imbrium Systems Sizing Calculations

Weighted Average TSS Removal Calculation

Location	**Area**	**TSS Removal**	**Product**
Treatment Basin 1	0.59	96.4	56.90
Treatment Basin 2	0.178	97.2	17.29
Treatment Basin 3	0.523	82.2	42.98
Treatment Basin 4	0.126	5.0	0.63
Totals	**1.417**		**117.80**
		Weighted Average for TSS Removal (%)	**83.1**



FOR METROWEST ENGINEERING, INC. *DATE*
ROBERT A. GEMMA, P.L.S. # 37046
P.E. # 31967 (CIVIL)

GRAPHIC SCALE
1 inch = 20 ft.
20 0 10 20 40 (FEET) 80
0 5 10 20 30 (METERS)

BERNARDI TOYOTA

LEGEND

- CURB
- DRAIN CATCH BASIN
- DRAIN LINE
- DRAIN MANHOLE
- FP FLAG POLE
- ELECTRIC LINE
- GAS LINE
- GAS GATE
- GUARD POST (BOLLARD)
- HANDICAP PARKING SPACE
- HYDRANT
- LIGHT POST
- NUMBER OF PARKING SPACES
- ROOF DRAIN
- SEWER LINE
- SEWER MANHOLE
- SIGN
- SPEED BUMP
- U.POLE UTILITY POLE
- VBC VERTICAL BITUMINOUS CURB
- VCC VERTICAL CONCRETE CURB
- VGC VERTICAL GRANITE CURB
- WATER GATE
- WATER LINE
- EXISTING GRADE
- x100.0 EXISTING SPOT GRADE
- G.F.E. GARAGE FLOOR ELEVATION
- F.F.E. FIRST FLOOR ELEVATION

STORMWATER TREATMENT AREA SKETCH PLAN IN FRAMINGHAM, MASS

(MIDDLESEX COUNTY)

PREPARED FOR:
JAMES P. CARNEY & AMY D. ROSSI,
TRUSTEES OF VOLADOR REALTY TRUST
1626 WORCESTER ROAD
FRAMINGHAM, MA 01702

PROPERTY OF:
VOLADOR REALTY TRUST
1626 WORCESTER ROAD
FRAMINGHAM, MA 01702

GS JEFFERSON HILLS, LLC
18 BROAD STREET, SUITE 300
CHARLESTON, SC 29401

ENGINEERS & SURVEYORS:
MWE
METROWEST ENGINEERING, INC.
75 FRANKLIN STREET
FRAMINGHAM, MA 01702
TEL.: (508)626-0063
FAX: (508)875-6440

SHEET 1 OF 1		DATE: SEPTEMBER 14, 2015
CALC'D BY: BTN	FIELD BK: 604	CAD FILE: TSS_TREATMENT_AREA_SKETCH.dwg
DRAFTER: JTS/BTN	PROJECT: FRM_WORS	DWG FILE: SK091415.dwg

CHAPTER 8: CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN (SWPPP)

STORM WATER POLLUTION PREVENTION PLAN

for

Bernardi Toyota
1624 Worcester Road
Framingham, MA 01702

Prepared for: **Bernardi Auto Group**
1626 Worcester Road
Framingham, MA 01702

Prepared by: **MetroWest Engineering, Inc.**
75 Franklin Street
Framingham, MA 01702
(508) 626-0063

September, 2015

Table of Contents

A. Project Name and Location

Name:	Lot adjacent to Bernardi Toyota Dealership
Street:	South side of Worcester Road, Natick, MA
Landmark:	Locus has frontage along Worcester Road, east of Mass Turnpike
Latitude:	42° - 17' - 42"
Longitude:	71° - 28' - 14"

B. Project Owner and Operator

1624 Worcester Road
GS Jefferson Hills, LLC
18 Broad Street, Suite 300
Charleston, SC 29401

1626 Worcester Road
Volador Realty Trust
1626 Worcester Road
Framingham, MA 01702

C. Project Engineer

MetroWest Engineering, Inc.
75 Franklin Street
Framingham, MA 01702
(508)-626-0063
Attn: Robert A. Gemma

D. Environmental Consultant

MetroWest Engineering, Inc.
75 Franklin Street
Framingham, MA 01702
(508)-626-0063
Attn: Robert A. Gemma

E. General Contractor

Construction Management & Builders Inc. (CM&B)
75 Sylvan Street, Building C
Danvers, MA 01923
Attn: Sean Fahy

F. CERTIFICATION OF STORMWATER POLLUTION PREVENTION PLAN

Project: Bernardi Toyota, 1624 Worcester Road, Framingham MA

This certification must be completed by an authorized signatory of each operator (generally the owner and the General Contractor) before the effective date of the Plan.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signed: _____

Name: Amy Rossi

Title: Vice President

Company: Bernardi Auto Group (Volador Realty Trust)

Address: 1626 Worcester Road, Framingham, MA 01702

Telephone: Office: (508) 879-7171

Date: _____

G. CONTRACTOR/SUB-CONTRACTOR CERTIFICATION

Project: Bernardi Toyota, 1624 Worcester Road, Framingham MA

This Certification is to be completed by the General Contractor and each Sub-Contractor involved in any on-site activities related to the construction.

I certify under penalty of law that I understand the terms and conditions of the general National Pollutant Discharge Elimination System (NPDES) permit that authorizes the stormwater discharges associated with industrial activity from the construction site identified as part of this certification.

Signed: _____

Name: _____

Title: _____

Company: Construction Management & Builders Inc

Address: 75 Sylvan Street, Building C, Danvers MA 01923

Telephone: (781) 246-9400

Date: _____

H. SUB-CONTRACTOR NAMES AND ADDRESSES

The following list includes all subcontractors working on the project site at any time. The general contractor and all subcontractors must sign the certification included in Section G., page 3.

Subcontractor:_____

Subcontractor:_____

Subcontractor:_____

Subcontractor:_____

Subcontractor:_____

I. Project Description

The subject property is located on the southerly side of Worcester Road (Route 9) in Framingham Massachusetts approximately three hundred feet east of the easterly Massachusetts Turnpike off ramp. The site is presently partially developed with a gravel parking area on the southerly side of the lot and an access driveway crossing the site from west to east. The property contains approximately 1.71-acres of land, of which, 0.78-acres is impervious area. Existing topography decreases in elevation approximately 30-feet from the southwesterly property corner to the frontage along Worcester Road.

The project involves the reconstruction of the existing gravel parking area and access driveway. A new parking area will be constructed on the northerly portion of the property. Both parking areas will serve the existing Bernardi Toyota facility which is located directly west of the property. Stormwater runoff from the proposed project will be collected and treated by a subsurface drainage system and routed to a proposed stormwater infiltration system. The proposed construction will not adversely impact existing drainage patterns and will reduce the amount of runoff leaving the project site.

Complete sets of site development plans are included as an attachment to this SWPPP.

J. Total Site Area and Disturbed Area

Total site area is 1.71 acres.
Existing impervious area is approximately 0.78 acres
Proposed impervious area is approximately 1.26 acres
Total developed area is approximately 1.6 acres.

K. Surrounding Developments

The project is surrounded by apartment buildings on the south and east, The Massachusetts Turnpike on the east and Worcester Road (Route 9) on the north.

L. Soil Description

Soils on site belong to the Charlton-Urban land-Hollis complex (631C) according to the NRCS Soil Survey. Charlton-Hollis soils are deep, moderately well drained soils formed in lodgement till and are classified within Hydrologic Soil Group B. Exposed ledge outcrops are present on site and on abutting properties. MetroWest Engineering Inc. performed an on-site evaluation of soil conditions at the property located at 1624 Worcester Road on June 5, 2015. The soil evaluation program consisted of six deep test holes excavated to a depth of approximately ten-feet. Test results revealed layers of fill and disturbed soils on the southerly portion of the site and areas of stratified sand and gravel (ice contact outwash) in portions of the site near Worcester Road.

M. Runoff Coefficient

Existing soils have varying permeability rates therefore runoff will be generated from major storm events. The pre-development runoff coefficient for the site is 0.60 and the post-development runoff coefficient will be 0.78.

N. Site Map and Plans

Complete project site plans are attached to this SWPPP.

O. Receiving Water

No direct discharge will occur into any near body of water.

P. Extent of Wetland Resource Areas

No wetlands occur on the locus. The Foss Reservoir located on the northerly side of Worcester Road which is a part of the Sudbury River, is located within 200-feet of the property.

Q. Sequence of Major Activities

1. The project is scheduled to begin in April 2016.
2. The existing gravel parking area will be reconstructed in May 2016.
3. Trees will be removed in May 2016.
4. The site grading will be completed in June 2016.
5. All construction will be complete by August 2016.

R. Construction Sequence

1. **Erosion Control**
   An erosion control barrier consisting of either filter mitt mulch tubes or haybales and silt fence will be placed at the limit of work around the majority of the parcel as needed and in any sensitive areas.

2. **Site Access**
   Site access, for construction equipment, will be made from the access driveway presently running through the property. An erosion control barrier to the work area shall be removed at the start of each workday and replaced at the end of each workday. The erosion control barriers will be in place during periods of inclement weather when so directed by the Environmental Consultant. The barriers will remain in place during all non-work periods until the site has been deemed to be stable by the Environmental Consultant.

3. **Construction Staging**
   A construction staging area will be established on the site in the existing gravel parking area. All construction materials, supplies, trailers and offices, portable toilets, and equipment shall be

stored within the limits of the staging area. Construction fence and filter mitt erosion control measures shall demarcate the limits of the staging area.

4. **Site Work**
   Site work, including excavation for the parking lots, excavation for drainage system, grading as well as other utilities may commence only when the site is stable from erosion and all required control measures are in place and functional. Site work during wet periods should be avoided if possible and limited to only those areas that will not have adverse impacts on wetland resource areas or abutting properties.

S. Pollution Prevention Measures

1. Before, during and after construction, functional erosion and sedimentation controls shall be implemented to prevent the silting of abutting, down-gradient properties and roads. Siltation controls shall be properly maintained and are not to be removed until so approved by the Environmental Engineer. Other controls shall be added as warranted during construction to protect the environmentally sensitive areas. Sufficient extra materials (e.g. siltation fencing and other control materials) shall be stored on site for emergencies.

2. Casting of excavated materials shall be stored away from any sensitive land areas.

3. Any stockpiling of loose materials shall be properly stabilized to prevent erosion and siltation. Preventive controls such as hay bales or jute covering shall be implemented to prevent such an occurrence.

4. There shall be no flooding, ponding, or flood related damage caused by the project or surface run-off emanating from the project on lands of an abutter, nearby or down-gradient properties.

5. All surface discharge shall meet the water quality standards for the Mass. Division of Water Pollution Control for Class "B" Water.

6. Proper landscaping of embankments and run-off areas (that is, the use of grass, vegetation, shrubbery, and crushed stone) shall be implemented before the project is completed.

7. Finish grades shall be no steeper than a slope of 2 horizontal to 1 vertical.

8. There shall be no contaminant migration caused by the project to nearby and down-gradient properties, nearby aquifers, wetlands and nearby wells.

9. The use of salt and sand on paved surfaces shall be kept to an absolute minimum during the winter months.

10. The applicant shall make sufficient provisions to control any unexpected drainage and erosion conditions that may rise during construction that may create damage on abutting properties and

11. During construction flood prevention, erosion, and sedimentation controls shall be in place before the natural ground cover is disturbed. Said controls shall be in place prior to other construction work and shall be monitored and approved by the Environmental Engineer before other work is commenced. They shall be properly maintained and are not to be removed until so approved by the Environmental Engineer.

12. The applicant shall designate a person or persons to inspect and supervise the drainage and erosion controls for the project and the Environmental Engineer shall be notified as to the means to contact said individual or individuals on a 24 hour basis on all working and non-working days of the project. Said means of contact shall include the telephone number of said designated person or persons.

13. There shall be periodic inspection of the fabric fencing and other controls by the applicant's designee to assure their continued effectiveness.

14. The Planning Board and Conservation conditions of approval shall be included as part of the contracts and subcontracts and shall be posted in the supervisory office on-site.

15. Any changes in the construction plans must be submitted in writing in advance for approval by the Engineer.

16. Upon completion of this project, the project engineer shall certify that the work completed conforms to the plans as submitted. Certification must include registered engineers stamp. In addition, an as-built plan shall be submitted to the Planning Board and Conservation Commission for approval prior to the issuance of a Certificate of Compliance.

17. Upon completion of the project, the permanent functional erosion, sedimentation, and flood control measures that are installed according to the presented plans and specifications submitted and revised shall be maintained in perpetuity.

18. Upon completion of the project, the contractor shall clean all deep sump catch basins, the Stormceptor treatment tanks, to remove all silt and sediment.

T. Other Control Measures

Off-site Vehicle Tracking. A stabilized construction entrance will be provided to help reduce vehicle tracking of sediments. The paved streets and access driveway adjacent to the site will be swept or scraped weekly to remove any excess mud, dirt, or rock tracked from the construction area. A source of fresh water for washing sediment from trucks, especially during periods of wet weather, may be provided in order to minimize the amount of street sweeping and scraping required. Any wash water resulting from this operation will be directed into a sediment trap.

Waste Materials. All trash and construction debris from the site will be hauled to an approved landfill. No construction waste material will be buried on the site. All personnel will receive instructions regarding the correct procedure for waste disposal. Notices describing these practices will be posted in

the construction office. The site superintendent will be responsible for seeing that these procedures are followed. Employee waste and other loose materials will be collected so as to prevent the release of floatables during runoff events.

Hazardous Waste. No hazardous waste is expected to be generated or encountered in this project. In the event that hazardous waste is encountered, all hazardous waste materials will be disposed of in the manner specified by local or state regulation or by the manufacturer. The site superintendent will be responsible for seeing that these practices are followed.

Sanitary Waste. Portable sanitary units will be provided for use by all workers throughout the life of the project. A licensed sanitary waste management contractor will regularly collect all sanitary waste from the portable units.

U. Maintenance

To maintain the erosion and sediment controls, the following procedures will be performed:

- **Sediment Capture Devices:** Sediment will be removed from the upstream or upslope side of the filter fabric fences, straw bale barriers, siltation ponds, diversion trenches, or other devices, when the depth of accumulated sediment reaches about one-third the height of the structure or device.

- **Storm Sewer Inlets:** Any sediment in the storm sewer inlets will be removed and disposed of properly.

- **Temporary Controls:** All temporary controls will be maintained until final site stabilization and landscaping is complete, and the Environmental Engineer approves removal.

Sediment that is removed from structural barriers; either will be hauled off the site and disposed of properly or will be used as backfill. Sediment temporarily stockpiled on site will be placed in such areas and in such manner as to minimize erosion of sediments back into the local drainage system. Berms, filter fabric fencing, straw bale barriers, and polyethylene or polypropylene covers are measures that may be utilized in minimizing erosion of stockpiled sediment.

V. Inspection Procedures

Inspections will be conducted by the responsible person(s) at least once every 7 calendar days and within 24 hrs after each storm event producing 0.5 inch of rainfall or greater. Areas that have been reseeded will be inspected regularly after seed germination to ensure complete coverage of exposed areas.

The contractor will designate a qualified person or persons to perform the following inspections:

- **Stabilization Measures:** Disturbed areas and other areas used for storage of materials that are exposed to precipitation will be inspected for evidence of, or the potential for, pollutants entering the drainage system. After a portion of the site is finally stabilized, inspections will be conducted at

- **Stabilization Measures:** Disturbed areas and other areas used for storage of materials that are exposed to precipitation will be inspected for evidence of, or the potential for, pollutants entering the drainage system. After a portion of the site is finally stabilized, inspections will be conducted at least once every month throughout the life of the project. Form 1 shows the inspection form to be used for stabilization measures.

- **Structural Controls:** Filter fabric fences, straw bale barriers, and all other erosion and sediment control measures identified in the plan will be inspected regularly for proper positioning, anchoring, and effectiveness in trapping sediments. Sediment will be removed from the upstream or upslope side of the filter fabric. Form 2 shows the inspection form to be used for structural controls.

- **Discharge Points:** Discharge points or locations will be inspected to determine whether erosion control measures are effective in preventing significant amounts of pollutants from entering receiving waters.

- **Construction Entrances:** Locations where vehicles enter or exit the site will be inspected for evidence of off-site sediment tracking.

Form 1 - **INSPECTION REPORT FORM FOR STABILIZATION MEASURES**

INSPECTOR: _____ DATE: _____

Days since last rainfall: _____ Amount of Last Rainfall: _____inches

Area	Date last disturbed	Date of next Disturbance	Stabilized?	Stabilized With	Condition

Stabilization Required:

_____
_____
_____
_____
_____
_____
_____
_____

To be performed by:_____ **On or Before:** _____

Form 2 - **INSPECTION FORM FOR STRUCTURAL CONTROLS**

INSPECTOR: _____ DATE: _____

Days since last rainfall: _____ Amount of Last Rainfall: _____inches

Location of Control	In place?	Condition	Sediment Depth	Washed out or overtopped?

Maintenance Required:

_____
_____
_____
_____
_____
_____
_____
_____

To be performed by:_____ **On or Before:** _____

W. Revisions to the SWPPP

Based on the results of the inspection, the site description and control measures of this pollution prevention plan will be revised as appropriate, but in no case later than 7 calendar days following the inspection. Form 3 shows the form to be used to record necessary changes to the SWPPP.

X. Inspection Report Summary

A report summarizing the scope of each inspection, name(s) and qualifications of personnel making the inspection, date(s) of the inspection, major observations relating to the implementation of the SWPPP, and actions taken to revise the plan will be completed and retained as part of the SWPPP for at least 3 years from the date that the site is finally stabilized. Form 4 shows the form to be used for certification of the inspection report. The report will be signed by one of the following persons:

Owner of the property.

A duly authorized representative of the property owner.

Y. Non-Storm-Water Discharges

It is expected that the following non-storm-water discharges will occur at the site during the construction period:

- **Dewatering discharges:** Water pumped from the construction area during dewatering operations (this may or may not be storm water).
- **Pressure test water:** Water used to pressure-test the potable water system.
- **Disinfectant water:** Water used to disinfect the potable water system.

Dewatering discharges will be done in such a manner as to avoid erosion problems and will pass through a portable sediment tank or temporary siltation pond. No direct discharge to surface waters or wetlands will be permitted.

Form 3 - **REPORT FORM FOR CHANGES IN POLLUTION PREVENTION PLAN**

INSPECTOR:_____ DATE: _____

SUMMARY OF REQUIRED CHANGES:

_____
_____
_____
_____
_____
_____
_____
_____
_____

REASON(S) FOR CHANGES:

_____
_____
_____
_____
_____
_____
_____
_____
_____

INSPECTOR'S SIGNATURE:_____ **DATE:**_____

Form 4 - **INSPECTION CERTIFICATION FORM**

Project: Bernardi Toyota, 1624 Worcester Road, Framingham MA

This certification must be completed after each inspection to signify that the inspection has been properly completed and the site has been found to be in compliance with the Storm Water Pollution Prevention Plan.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signed: _____

Name: _____

Title: _____

Company: _____

Address: _____

Telephone: _____

Date: _____

Z. Significant-Materials Inventory

Significant materials expected to be found at the construction site include:

- Lime (trucked onto the site for soil stabilization purposes)
- Concrete mix (trucked onto the site for construction)
- Steel reinforcing bars and related materials
- Lumber
- Diesel and Gasoline fuel and lubricating oils
- Pre-cast concrete structures
- Ductile iron pipe
- Steel pipe
- Paints
- Fertilizers
- Plastic and p.v.c. pipe
- Earth materials, stone and aggregate
- Asphalt
- Cements and adhesives
- Waterproofing tar
- Block, brick and masonry materials
- Fiberglass and foam insulation
- Propane fuel for space heaters
- Acetylene fuel for welding

This list of significant materials may be reduced or expanded once a contractor has been chosen and the materials to be used have been specified. If fewer or additional materials are required, the SWPPP will be amended to reflect these changes.

AA. Spill Prevention and Response Procedures

Spill prevention and response include good housekeeping as well as specific practices for certain products and established procedures for responding to spills.

Good Housekeeping

The following good housekeeping practices will be followed onsite during the construction project.

- **Minimize materials:** An effort will be made to store only enough material required to do the job.

- **Storage:** All materials stored onsite will be stored in a neat, orderly manner in their appropriate containers in a covered area. If storage in a covered area is not possible, the materials will be covered with polyethylene or polypropylene sheeting to protect them from the elements.

- **Labeling:** Products will be kept in their original containers with the original manufacturer's label affixed to each container.

- **Mixing:** Substances will not be mixed with one another unless this is recommended by the manufacturer.

- **Disposal:** Whenever possible, all of a product will be used prior to disposal of the container. Manufacturer's recommendations for proper use and disposal will be followed.

- **Inspections:** The site superintendent will inspect the site daily to ensure proper use and disposal of materials onsite.

- **Spoil materials:** Any excavated earth that will not be used for fill material and all demolished pavement will be hauled off site immediately and will be disposed of properly.

Product-Specific Practices

- **Petroleum Products.** All on-site vehicles will be monitored for leaks and will receive regular preventive maintenance to reduce the chance of leakage. If petroleum products will be present at the site, they will be stored in tightly sealed containers that are clearly labeled. Any asphalt substances used on site will be applied according to the manufacturer's recommendations.

- **Concrete Trucks.** Concrete trucks will not be allowed to wash out or discharge surplus concrete or drum wash water at the site.

- **Paints.** All containers will be tightly sealed and stored when not required for use. Excess paint will not be poured into the storm sewer system but will be properly disposed of according to manufacturers' instructions or state and local regulations.

- **Fertilizers.** Fertilizers will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked into the soil to limit exposure to storm water. The fertilizer will be stored in a covered area, and any partially used bags will be transferred to a sealable plastic bin to avoid spills.

Spill Control and Response Practices

A spill prevention and response team will be designated by the owner or the site superintendent. In addition, the following practices will be followed for spill cleanup:

- **Information:** Manufacturers' recommended methods for spill cleanup will be clearly posted, and site personnel will be made aware of the procedures and location of the information and cleanup supplies.

- **Equipment:** Materials and equipment necessary for spill cleanup will be present on the site at all times. Equipment and materials will include but not be limited to brooms, shovels, rags,

gloves, goggles, absorbent materials (sand, sawdust, etc.) and plastic or metal trash containers specifically designed for this purpose. The materials and equipment necessary for spill cleanup will be dependent upon the nature and quantity of the material stored on site.

- **Response:** All spills will be cleaned up immediately upon discovery.
- **Safety:** The spill area will be kept well ventilated, and personnel will wear appropriate protective clothing to prevent injury from contact with hazardous substances.
- **Reporting:** Spills of toxic of hazardous material (if present on site) will be reported to the appropriate state or local government agency, regardless of the spills size.
- **Record Keeping:** The spill prevention plan will be modified to include measures to prevent this type of spill from recurring as well as improved methods for cleaning up any future spills. A description of each spill, what caused it, and the cleanup measures used will be kept with the plan.

BB. Plan Location and Public Access

The SWPPP is not submitted to the EPA for review unless requested. The SWPPP must be available at the construction site from the date of project initiation to the date of final stabilization. The SWPPP and all reports required by the permit must be retained for at least 3 years front he date on which the site is finally stabilized.

Despite the fact that the SWPPP and associated reports are not necessarily required to be submitted with the Notice of Intent, these documents are considered to be reports according to section 308(b) of the Clean Water Act and therefore are available to the public. The permittee, however, may claim certain parts of the SWPPP as confidential according to regulations in 40 CFR part 2. These regulations state that records that contain trade secrets may be claimed as confidential.

The SWPPP shall also be at the offices of the Environmental Consultant, MetroWest Engineering, Inc (75 Franklin Street, Framingham, MA 01702).

APPENDIX A: PERMIT REQUIREMENTS

APPENDIX B: EPA NOTICES

Notice of Intent (NOI)

Notice of Termination (NOT)

APPENDIX C: EMERGENCY & INSPECTION INFORMATION

Emergency Contact Sheet

Form 1. Emergency Contact Numbers

Framingham Fire Department	
Emergency	911
Business	(508) 532-5930
Framingham Police Department	
Emergency	911
Business	(508) 872-1212
Massachusetts Department of Environmental Protection	
Northeast Regional Office	(617) 654-6500
Framingham Conservation Commission	(508) 532-5460
Framingham Board of Health	(508) 532-5470
National Response Center	1-800-424-8802
US EPA	1-888-372-7341

CHAPTER 9: STORMWATER MANAGEMENT STANDARD 7

Chapter 9:

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- The project will result in an increase of impervious area and, therefore, is considered a mix of new development and redevelopment.
- The project will comply with Stormwater Management Policy to the maximum extent practicable.

CHAPTER 10: STORMWATER MANAGEMENT STANDARD 8

Chapter 10:

Standard 8: Construction Period Pollution and Erosion and Sedimentation Control

- The Stormwater Pollution Prevention Plan is included in Chapter 8 of this Stormwater Report.
- The project is covered by a NPDES general construction permit as the project will result in over an acre of disturbance.

CHAPTER 11: OPERATION AND MAINTENANCE PLAN STORMWATER MANAGEMENT STANDARD 9

Stormwater Operation and Maintenance Plan
1624 Worcester Road, Framingham MA
Prepared By: MetroWest Engineering Inc.
Prepared For: Bernardi Auto Group

General

The project site is located on the southerly side of Worcester Road (Route 9) in Framingham, MA adjacent to the Massachusetts Turnpike Framingham exit eastbound ramp. The property abuts the easterly side of the existing Bernardi Toyota dealership.

The project site is shown on Framingham Assessors Map 461, Block 2, Lot 3A and has an area of approximately 74,591 square feet (1.71 acres). The southerly portion of the property is currently improved with a paved and gravel parking area. A paved driveway crosses the central portion of the property from west to east. The northerly portion of the lot is presently undeveloped with large trees located between the northerly edge of the driveway and the southerly sideline of Worcester Road. Total impervious area on the site, including pavement is approximately 34,141 square feet. The site slopes downhill in a northerly direction from a high point at the southwesterly lot corner to Worcester Road with approximately 26-feet of vertical relief across the site.

Resource Areas

The Foss Reservoir (#3) is located on the northerly side of Worcester Road across from the project site. The reservoir is controlled by the DCR and is considered to be part of the Sudbury River, a perennial stream. Accordingly, the 200-foot Riverfront Area extends approximately 74-feet on to the northeasterly portion of the site.

Drainage Approach

There are presently limited stormwater controls on site. A single drain catch basin is located on the westerly portion of the site and collects runoff from a small portion of the gravel parking area. Runoff from the majority of the site drains on to Worcester Road or abutting properties.

A stormwater management system is designed for the site that will reduce runoff rates and volumes from the locus through the use of a subsurface infiltration system to recharge runoff. Furthermore, all storm water runoff directed into the existing street drainage system will be pretreated in Stormceptor™ manhole units.

Maintenance Requirements

The project's stormwater collection and treatment system is designed to collect and treat stormwater so that all discharges from the system are in compliance with all local, state and federal environmental regulations. Periodic routine inspection and maintenance of the system is critical if the system is to continue to meet required performance standards.

Responsible Party

The property owner shall be responsible for all maintenance and repair activities throughout the site relating to the grounds, pavement surface, stormwater collection system and subsurface infiltration systems. Contact information for the owner/responsible party is listed below:

Owner/Responsible Party
Bernardi Auto Group
1626 Worcester Road
Framingham, MA 01702

Amy Rossi – Vice President (508) 879-7171
Email: amy.rossi@bernardiautogroup.com

David Aires – Facilities Manager (774) 573-0923
Email: david.aires@bernardiautogroup.com

If ownership of the subject property changes, the new owner shall become the responsible party. This Operation and Maintenance Plan shall run with the land.

The owner/responsible party shall be responsible for the implementation of this Operation and Maintenance Plan and the proper training of employees to ensure compliance with all daily and long term aspects of the plan.

Required Maintenance

Grounds

All slopes shall be inspected and any exposed areas or other locations susceptible to erosion shall be stabilized with mulch, sod, seed, stone or other suitable measures. All litter and trash shall be picked up and removed from all paved, landscaped and wooded areas on a regular basis. All grass clippings, leaves, brush and other natural materials will be transported to an approved composting facility. No clippings or leaves will be deposited in wooded areas or on abutting properties.

Fertilizers and pesticides shall be applied in accordance with manufacturer's instructions and all applicable local and state regulations. They shall be applied sparingly by trained personnel.

BMP1 - Parking Lot

The driveway and parking areas shall be vacuum-swept at least four times per year to remove sediments. One cleaning shall be performed during the mid-winter period of late January to early February, and another cleaning shall be performed in the spring during April or May. All sediment removed shall be disposed of in accordance with DEP policy and requirements for the disposal of road sediments.

During winter months the use of de-icing compounds shall be kept to a minimum. Untreated sand shall be used to the minimum extent necessary to provide for tire traction. During extreme events sand treated with a non-sodium de-icer may be used.

BMP 2 - Catch Basins

All catch basins shall include a deep sump and an MDC type oil/water separation hood. Catch basin sumps shall be cleaned and inspected twice per year, once in the spring and again in the fall. Catch basins may be cleaned with either clamshell bucket or by vacuum truck. Pipe inlets, outlets and MDC hoods shall be inspected at the time of the sump cleaning and shall be immediately repaired as necessary. All sediment removed shall be disposed of in accordance with DEP policy and requirements for the disposal of road sediments.

BMP 3 - Stormceptor Model 450i & 900 Treatment Systems

The Stormceptor Models 450i and 900 systems shall be cleaned a minimum of once per year. Additionally, the depth of sediment in the sumps of the units shall be measured quarterly. Additional cleaning shall commence when the depth of sediment in the sump reaches 8-inches or when oil is observed in the sump of the unit. A vacuum truck shall remove sediment and oil from the sump and dispose of the sediment in accordance with the current standards and requirements of the MADEP. Refer to the attached maintenance procedures provided by Rinker Industries.

BMP 4 - Infiltration System

All infiltration systems shall be inspected twice per year to evaluate sediment accumulation and once per year during a storm event. Routine inspection for sediment accumulation shall consist of the inspection of each chamber where an inlet is located. An inspection port cover is located at each point. Any sediment that has entered into the system at the inlet locations shall be removed and disposed of in accordance with MADEP policy.

The systems shall also be observed at least once per year during a major storm event. A major storm event shall be defined for this Operation and Maintenance Plan as one in which the 24-hour rainfall volume exceeds one-inch. The inspection shall include removal of an inspection port cover to measure the water depth inside the system. The inspection should take place after at least one-inch of rainfall has fallen and prior to the end of storm. Following the inspection, the precipitation volume, based upon the nearest reporting weather station, should be recorded in the inspection log book.

Snow Removal

There shall be no storage or stockpiling of snow within any wetland resource areas on or abutting the project site. Parking lot de-icing materials shall be stored inside the building or a location that is protected from precipitation and wind. De-icing material shall consist of sand mixed with a non-sodium based de-icing agent. Snow shall be removed from all drain inlets immediately after a snow event to prevent the accumulation of ice in parking lot areas.

Storage and Use of Chemicals

Chemical storage on the site shall be limited and all chemicals stored on site shall be done in accordance with the manufacturer's recommendations and all applicable local and state regulations.

Hazardous Waste

All hazardous waste materials shall be stored and disposed of in accordance with all applicable local and state regulations. In the event of an accident or spill involving and/or other hazardous materials the facilities manager shall contact a hazardous waste removal contractor and immediately notify local and state regulatory agencies.

There shall be no illicit discharges into the stormwater management system.

Waste Storage and Handling

All waste material shall be stored in a covered metal dumpster provided by a solid waste management company licensed in the Town of Framingham and the Commonwealth of Massachusetts. The dumpster shall be emptied on a regular basis or when full. Loose trash around the site and near the dumpster shall be picked up on a weekly basis.

Recommended Personnel

A commercial contractor should be engaged to perform the periodic cleaning and inspections required for the drainage and infiltration systems. A landscape contractor may perform gutter cleaning.

A professional engineer with expertise in drainage systems, hydrology or similar sciences should perform an annual inspection of the infiltration system and should evaluate the infiltration system during a major storm event.

Record Keeping

A logbook or other record should be maintained for all inspection, cleaning and maintenance activities. The logs or records should be provided to the drainage professional engaged to perform the annual inspection of the drainage and infiltration system. An annual report should be prepared by the drainage professional to summarize inspection and maintenance activities, review the performance of the infiltration system, and provide recommendations for repair or remedial measures required to maintain the performance of the system. The annual report should be submitted to the property owner and operator and kept on site.

Emergency Contacts

In the event of a major drainage system failure, a release of dangerous materials or other unforeseen accident, the following organizations may be contacted:

Town of Framingham Board of Health
(508) 532-5470

Town of Framingham Conservation Commission
(508) 532-5460

Town of Framingham, Building Department
(508) 532-5500

Massachusetts Department of Environmental Protection
(617) 654-6500

MetroWest Engineering, Inc. (Design Engineer)
(508) 626-0063

Bernardi Auto Group Inc
(508) 879-7171

Form 1 - *INSPECTION REPORT FORM FOR STABILIZATION MEASURES*

INSPECTOR: _____ DATE: _____

Days since last rainfall: _____ Amount of Last Rainfall: _____inches

Area	Date last disturbed	Date of next Disturbance	Stabilized?	Stabilized With	Condition

Comments and Stabilization Required:

_____
_____
_____
_____
_____
_____
_____
_____

To be performed by:_____ **On or Before:** _____

Form 2 - *INSPECTION FORM FOR DRAIN CATCH BASIN* – **Ongoing Maintenance**

INSPECTOR: _____
DATE: _____
Days since last rainfall: _____ Amount of Last Rainfall: _____inches

Structure Number	Rim Elev.	Sediment Depth	Condition	Date and Description of Cleaning

Comments and Maintenance Required:

_____
_____
_____
_____
_____
_____
_____
_____

To be performed by:_____ **On or Before:** _____

Form 3 - *INSPECTION FORM FOR STORMCEPTOR INLET UNIT*
StormCeptor STC-450i (D.M.H. 1) Ongoing Maintenance

INSPECTOR: _____
DATE: _____
Days since last rainfall: _____
Amount of Last Rainfall: _____inches

Structure Number	Rim Elev.	Sediment Depth	Condition	Date and Description of Cleaning

Comments and Maintenance Required:

_____
_____
_____
_____
_____
_____
_____
_____

To be performed by:_____ **On or Before:** _____

Form 4 - *INSPECTION FORM FOR STORMCEPTOR INLET UNIT*
StormCeptor STC-450i (D.M.H. 2) Ongoing Maintenance

INSPECTOR: _____
DATE: _____
Days since last rainfall: _____
Amount of Last Rainfall: _____inches

Structure Number	Rim Elev.	Sediment Depth	Condition	Date and Description of Cleaning

Comments and Maintenance Required:

_____
_____
_____
_____
_____
_____
_____
_____

To be performed by:_____ **On or Before:** _____

Form 5 - *INSPECTION FORM FOR STORMCEPTOR INLINE UNIT*
StormCeptor STC-900 (D.M.H. 3) Ongoing Maintenance

INSPECTOR: _____
DATE: _____
Days since last rainfall: _____
Amount of Last Rainfall: _____inches

Structure Number	Rim Elev.	Sediment Depth	Condition	Date and Description of Cleaning

Comments and Maintenance Required:

_____
_____
_____
_____
_____
_____
_____
_____

To be performed by:_____ **On or Before:** _____

Form 6 - *INSPECTION FORM FOR INFILTRATION SYSTEM 1*

Ongoing Maintenance

INSPECTOR: _____
DATE: _____
Days since last rainfall: _____
Amount of Last Rainfall: _____inches

Rim Location	Rim Elev.	Sediment Depth	Condition	Date and Description of Cleaning

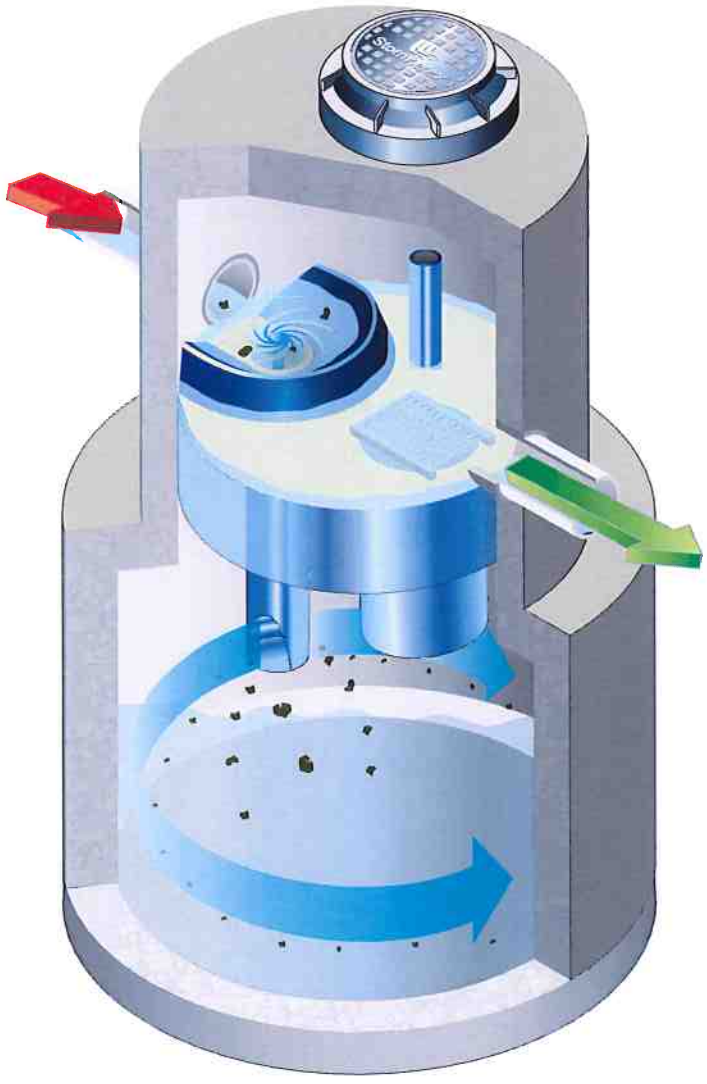
Comments and Maintenance Required:

_____
_____
_____
_____
_____
_____
_____
_____

To be performed by:_____ **On or Before:** _____

Stormceptor®

Owner's Manual



Stormceptor is protected by one or more of the following patents:

Canadian Patent No. 2,137,942
Canadian Patent No. 2,175,277
Canadian Patent No. 2,180,305
Canadian Patent No. 2,180,338
Canadian Patent No. 2,206,338
Canadian Patent No. 2,327,768
U.S. Patent No. 5,753,115
U.S. Patent No. 5,849,181
U.S. Patent No. 6,068,765
U.S. Patent No. 6,371,690
U.S. Patent No. 7,582,216
U.S. Patent No. 7,666,303
Australia Patent No. 693.164
Australia Patent No. 707,133
Australia Patent No. 729,096
Australia Patent No. 779,401
Australia Patent No. 2008,279,378
Australia Patent No. 2008,288,900
Indonesia Patent No. 0007058
Japan Patent No. 3581233
Japan Patent No. 9-11476
Korean Patent No. 0519212
Malaysia Patent No. 118987
New Zealand Patent No. 314,646
New Zealand Patent No. 583,008
New Zealand Patent No. 583,583
South African Patent No. 2010/00682
South African Patent No. 2010/01796
Other Patents Pending

Table of Contents

Congratulations!

Your selection of a Stormceptor® means that you have chosen the most recognized and efficient stormwater oil/sediment separator available for protecting the environment. Stormceptor is a pollution control device often referred to as a "Hydrodynamic Separator (HDS)" or an "Oil Grit Separator (OGS)", engineered to remove and retain pollutants from stormwater runoff to protect our lakes, rivers and streams from the harmful effects of non-point source pollution.

1 – Stormceptor Overview

Stormceptor is a patented stormwater quality structure most often utilized as a treatment component of the underground storm drain network for stormwater pollution prevention. Stormceptor is designed to remove sediment, total suspended solids (TSS), other pollutants attached to sediment, hydrocarbons and free oil from stormwater runoff. Collectively the Stormceptor provides spill protection and prevents non-point source pollution from entering downstream waterways.

Key benefits of Stormceptor include:

- Removes sediment, suspended solids, debris, nutrients, heavy metals, and hydrocarbons (oil and grease) from runoff and snowmelt.
- Will not scour or re-suspend trapped pollutants.
- Provides sediment and oil storage.
- Provides spill control for accidents, commercial and industrial developments.
- Easy to inspect and maintain (vacuum truck).
- "STORMCEPTOR" is *clearly* marked on the access cover (excluding inlet designs).
- Relatively small footprint.
- 3rd Party tested and independently verified.
- Dedicated team of experts available to provide support.

Model Types:

- STC (Standard)
- STF (Fiberglass)
- EOS (Extended Oil Storage)
- OSR (Oil and Sand Removal)
- MAX (Custom designed unit, specific to site)

Configuration Types:

- Inlet unit (accommodates inlet flow entry, and multi-pipe entry)
- In-Line (accommodates multi-pipe entry)
- Submerged Unit (accommodates the site's tailwater conditions)
- Series Unit (combines treatment in two systems)

Please Maintain Your Stormceptor

To ensure long-term environmental protection through continued performance as originally designed for your site, **Stormceptor must be maintained**, as any stormwater treatment practice does. The need for maintenance is determined through inspection of the Stormceptor. Procedures for inspection are provided within this document. Maintenance of the Stormceptor is performed from the surface via vacuum truck.

If you require information about Stormceptor, or assistance in finding resources to facilitate inspections or maintenance of your Stormceptor please call your local Stormceptor Licensee or Imbrium® Systems.

2 – Stormceptor Operation & Components

Stormceptor is a flexibly designed underground stormwater quality treatment device that is unparalleled in its effectiveness for pollutant capture and retention using patented flow separation technology.

Stormceptor creates a non-turbulent treatment environment below the insert platform within the system. The insert diverts water into the lower chamber, allowing free oils and debris to rise, and sediment to settle under relatively low velocity conditions. These pollutants are trapped and stored below the insert and protected from large runoff events for later removal during the maintenance procedure.

With thousands of units operating worldwide, Stormceptor delivers reliable protection every day, in every storm. The patented Stormceptor design prohibits the scour and release of captured pollutants, ensuring superior water quality treatment and protection during even the most extreme storm events. Stormceptor's proven performance is backed by the longest record of lab and field verification in the industry.

Stormceptor Schematic and Component Functions

Below are schematics of two common Stormceptor configurations with key components identified and their functions briefly described.

Figure 1.

Inline Stormceptor

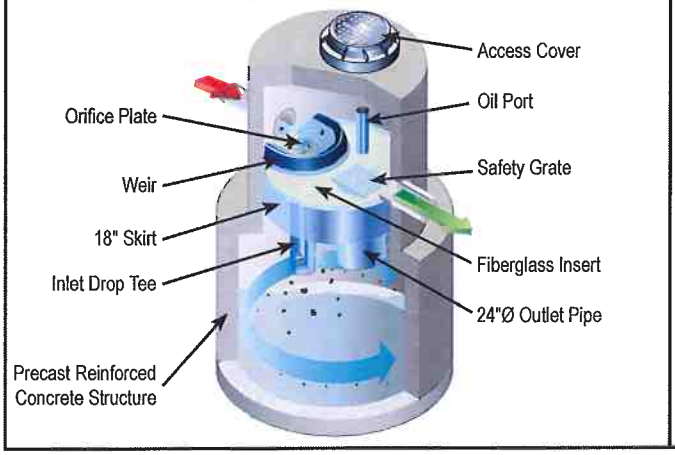
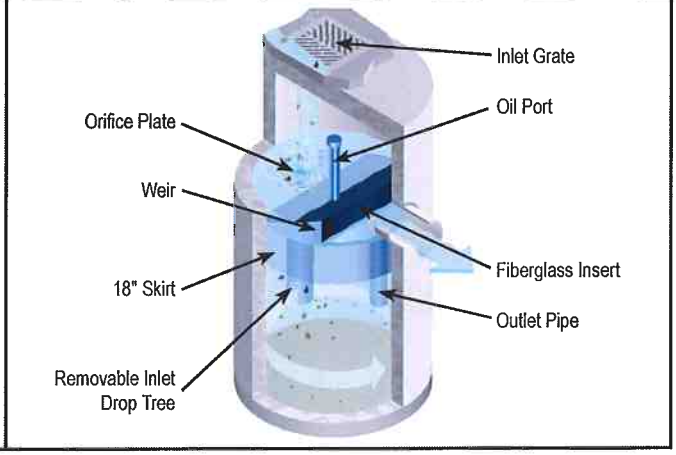


Figure 2.

Inlet Stormceptor



- **Manhole access cover** – provides access to the subsurface components
- **Precast reinforced concrete structure** – provides the vessel's watertight structural support
- **Fiberglass insert** – separates vessel into upper and lower chambers
- **Weir** – directs incoming stormwater and oil spills into the lower chamber
- **Orifice plate** – prevents scour of accumulated pollutants
- **Inlet drop tee** – conveys stormwater into the lower chamber
- **Fiberglass skirt** – provides double-wall containment of hydrocarbons
- **Outlet riser pipe** – conveys treated water to the upper chamber; primary vacuum line access port for sediment removal
- **Oil inspection port** – primary access for measuring oil depth and oil removal
- **Safety grate** – safety measure to cover riser pipe in the event of manned entry into vessel

3 – Stormceptor Identification

Stormceptor is available in both precast concrete and fiberglass vessels, with precast concrete often being the dominant material of construction.

In the Stormceptor, a patented, engineered fiberglass insert separates the structure into an upper chamber and lower chamber. The lower chamber will remain full of water, as this is where the pollutants are sequestered for later removal. Multiple Stormceptor model (STC, OSR, EOS, MAX and STF) configurations exist, each to be inspected and maintained in a similar fashion.

Each unit is easily identifiable as a Stormceptor by the trade name "Stormceptor" embossed on each access cover at the surface. To determine the location of "inlet" Stormceptor units with horizontal catch basin inlet, look down into the grate as the Stormceptor insert will be visible. The name "Stormceptor" is not embossed on inlet models due to the variability of inlet grates used/ approved across North America.

Once the location of the Stormceptor is determined, the model number may be identified by comparing the measured depth from the fiberglass insert level at the outlet pipe's invert (water level) to the bottom of the tank using **Table 1**.

In addition, starting in 1996 a metal serial number tag containing the model number has been affixed to the inside of the unit, on the fiberglass insert. If the unit does not have a serial number, or if there is any uncertainty regarding the size of the unit using depth measurements, please contact your local Stormceptor Representative for assistance.

Sizes/Models

Typical general dimensions and capacities of the standard precast STC, EOS & OSR Stormceptor models in both USA and Canada/International (excluding South East Asia and Australia) are provided in **Tables 1 and 2**. Typical rim to invert measurements are provided later in this document. The total depth for cleaning will be the sum of the depth from outlet pipe invert (generally the water level) to rim (grade) and the depth from outlet pipe invert to the precast bottom of the unit. Note that depths and capacities may vary slightly between regions.

Table 1A. (US) Stormceptor Dimensions – Insert to Base of Structure

STC Model	Insert to Base (in.)
450	60
900	55
1200	71
1800	105
2400	94
3600	134
4800	128
6000	150
7200	134
11000*	128
13000*	150
16000*	134

EOS Model	Insert to Base (in.)
4-175	60
9-365	55
12-590	71
18-1000	105
24-1400	94
36-1700	134
48-2000	128
60-2500	150
72-3400	134
110-5000*	128
130-6000*	150
160-7800*	134

OSR Model	Insert to Base (in.)
65	60
140	55
250	94
390	128
560	134
780*	128
1125*	134

Typical STF m (in.)
1.5 (60)
1.5 (61)
1.8 (73)
2.9 (115)
2.3 (89)
3.2 (127)
2.9 (113)
3.5 (138)
3.3 (128)

Notes:

1. *Depth Below Pipe Inlet Invert to the Bottom of Base Slab can vary slightly by manufacturing facility, and can be modified to accommodate specific site designs, pollutant loads or site conditions. Contact your local representative for assistance.*

**Consist of two chamber structures in series.*

Table 1B. (CA & Int'l) Stormceptor Dimensions – Insert to Base of Structure

STC Model	Insert to Base (m)
300	1.5
750	1.5
1000	1.8
1500	2.8
2000	2.8
3000	3.7
4000	3.4
5000	4.0
6000	3.7
9000*	3.4
11000*	4.0
14000*	3.7

EOS Model	Insert to Base (m)
300	1.5
750	1.5
1000	1.8
2000	2.8
3000	3.7
4000	3.4
5000	4.0
6000	3.7
9000*	3.4
10000*	4.0
14000*	3.7

OSR Model	Insert to Base (m)
300	1.7
750	1.6
2000	2.6
4000	3.6
6000	3.7
9000*	3.6
14000*	3.7

Typical STF m (in.)
1.5 (60)
1.5 (61)
1.8 (73)
2.9 (115)
2.3 (89)
3.2 (127)
2.9 (113)
3.5 (138)
3.3 (128)

Notes:

1. *Depth Below Pipe Inlet Invert to the Bottom of Base Slab can vary slightly by manufacturing facility, and can be modified to accommodate specific site designs, pollutant loads or site conditions. Contact your local representative for assistance.*

**Consist of two chamber structures in series.*

Table 2A. (US) Storage Capacities

STC Model	Hydrocarbon Storage Capacity gal	Sediment Capacity ft³	**EOS Model**	Hydrocarbon Storage Capacity gal	**OSR Model**	Hydrocarbon Storage Capacity gal	Sediment Capacity ft³
450	86	46	**4-175**	175	**065**	115	46
900	251	89	**9-365**	365	**140**	233	58
1200	251	127	**12-590**	591			
1800	251	207	**18-1000**	1198			
2400	840	205	**24-1400**	1457	**250**	792	156
3600	840	373	**36-1700**	1773			
4800	909	543	**48-2000**	2005	**390**	1233	465
6000	909	687	**60-2500**	2514			
7200	1059	839	**72-3400**	3418	**560**	1384	690
11000*	2797	1089	**110-5000***	5023	**780***	2430	930
13000*	2797	1374	**130-6000***	6041			
16000*	3055	1677	**160-7800***	7850	**1125***	2689	1378

Notes:

1. *Hydrocarbon & Sediment capacities can be modified to accommodate specific site design requirements, contact your local representative for assistance.*

**Consist of two chamber structures in series.*

Table 2B. (CA & Int'l) Storage Capacities

STC Model	Hydrocarbon Storage Capacity L	Sediment Capacity L	EOS Model	Hydrocarbon Storage Capacity L	OSR Model	Hydrocarbon Storage Capacity L	Sediment Capacity L
300	300	1450	**300**	662	**300**	300	1500
750	915	3000	**750**	1380	**750**	900	3000
1000	915	3800	**1000**	2235			
1500	915	6205					
2000	2890	7700	**2000**	5515	**2000**	2790	7700
3000	2890	11965	**3000**	6710			
4000	3360	16490	**4000**	7585	**4000**	4700	22200
5000	3360	20940	**5000**	9515			
6000	3930	26945	**6000**	12940	**6000**	5200	26900
9000*	10555	32980	**9000***	19010	**9000***	9300	33000
11000*	10555	37415	**10000***	22865			
14000*	11700	53890	**14000***	29715	**14000***	10500	53900

Notes:

1. *Hydrocarbon & Sediment capacities can be modified to accommodate specific site design requirements, contact your local representative for assistance.*

**Consist of two chamber structures in series.*

4 – Stormceptor Inspection & Maintenance

Regular inspection and maintenance is a proven, cost-effective way to maximize water resource protection for all stormwater pollution control practices, and is required to insure proper functioning of the Stormceptor. Both inspection and maintenance of the Stormceptor is easily performed from the surface. Stormceptor's patented technology has no moving parts, simplifying the inspection and maintenance process.

Please refer to the following information and guidelines before conducting inspection and maintenance activities.

When is inspection needed?

- Post-construction inspection is required prior to putting the Stormceptor into service.
- Routine inspections are recommended during the first year of operation to accurately assess the sediment accumulation.
- Inspection frequency in subsequent years is based on the maintenance plan developed in the first year.
- Inspections should also be performed immediately after oil, fuel, or other chemical spills.

When is maintenance cleaning needed?

- For optimum performance, the unit should be cleaned out once the sediment depth reaches the recommended maintenance sediment depth, which is approximately 15% of the unit's total storage capacity (see **Table 2**). The frequency should be adjusted based on historical inspection results due to variable site pollutant loading.

- Sediment removal is easier when removed on a regular basis at or prior to the recommended maintenance sediment depths, as sediment build-up can compact making removal more difficult.
- The unit should be cleaned out immediately after an oil, fuel or chemical spill.

What conditions can compromise Stormceptor performance?

- If construction sediment and debris is not removed prior to activating the Stormceptor unit, maintenance frequency may be reduced.
- If the system is not maintained regularly and fills with sediment and debris beyond the capacity as indicated in **Table 2**, pollutant removal efficiency may be reduced.
- If an oil spill(s) exceeds the oil capacity of the system, subsequent spills may not be captured.
- If debris clogs the inlet of the system, removal efficiency of sediment and hydrocarbons may be reduced.
- If a downstream blockage occurs, a backwater condition may occur for the Stormceptor and removal efficiency of sediment and hydrocarbons may be reduced.

What training is required?

The Stormceptor is to be inspected and maintained by professional vacuum cleaning service providers with experience in the maintenance of underground tanks, sewers and catch basins. For typical inspection and maintenance activities, no specific supplemental training is required for the Stormceptor. Information provided within this Manual (provided to the site owner) contains sufficient guidance to maintain the system properly.

In unusual circumstances, such as if a damaged component needs replacement or some other condition requires manned entry into the vessel, confined space entry procedures must be followed. Only professional maintenance service providers trained in these procedures should enter the vessel. Service provider companies typically have personnel who are trained and certified in confined space entry procedures according to local, state, and federal standards.

What equipment is typically required for inspection?

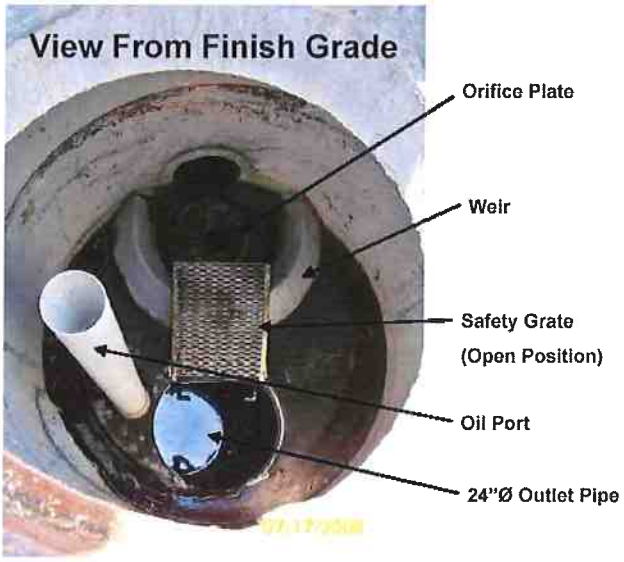
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

Recommended Stormceptor Inspection Procedure:

- Stormceptor is to be inspected from grade through a standard surface manhole access cover.
- Sediment and oil depth inspections are performed with a sediment probe and oil dipstick.
- Oil depth is measured through the oil inspection port, either a 4-inch (100 mm) or 6-inch (150 mm) diameter port.
- Sediment depth can be measured through the oil inspection port or the 24-inch (610 mm) diameter outlet riser pipe.
- Inspections also involve a visual inspection of the internal components of the system.

Figure 3.

Figure 4.



What equipment is typically required for maintenance?

- Vacuum truck equipped with water hose and jet nozzle
- Small pump and tubing for oil removal
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Gas analyzer, respiratory gear, and safety harness for specially trained personnel if confined space entry is required

Recommended Stormceptor Maintenance Procedure

Maintenance of Stormceptor is performed using a vacuum truck.

No entry into the unit is required for maintenance. ***DO NOT ENTER THE STORMCEPTOR CHAMBER*** unless you have the proper personal safety equipment, have been trained and are qualified to enter a confined space, as identified by local Occupational Safety and Health Regulations (e.g. 29 CFR 1910.146 or Canada Occupational Safety and Health Regulations – SOR/86-304). Without the proper equipment, training and permit, entry into confined spaces can result in serious bodily harm and potentially death. Consult local, provincial, and/or state regulations to determine the requirements for confined space entry. Be aware, and take precaution that the Stormceptor fiberglass insert may be slippery. In addition, be aware that some units do not have a safety grate to cover the outlet riser pipe that leads to the submerged, lower chamber.

- Ideally maintenance should be conducted during dry weather conditions when no flow is entering the unit.
- Stormceptor is to be maintained through a standard surface manhole access cover.
- Insert the oil dipstick into the oil inspection port. If oil is present, pump off the oil layer into separate containment using a small pump and tubing.
- Maintenance cleaning of accumulated sediment is performed with a vacuum truck.
    - For 6-ft (1800 mm) diameter models and larger, the vacuum hose is inserted into the lower chamber via the 24-inch (610 mm) outlet riser pipe.
    - For 4-ft (1200 mm) diameter model, the removable drop tee is lifted out, and the vacuum hose is inserted into the lower chamber via the 12-inch (305 mm) drop tee hole.

Figure 5.

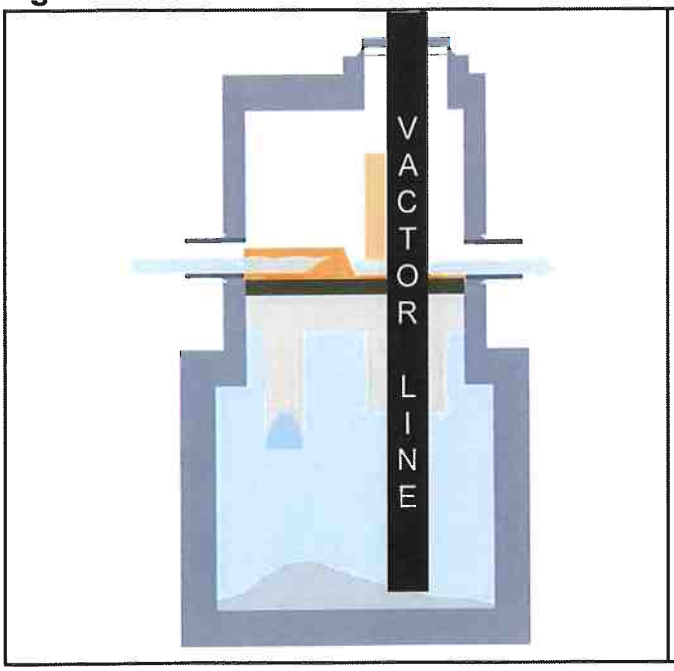
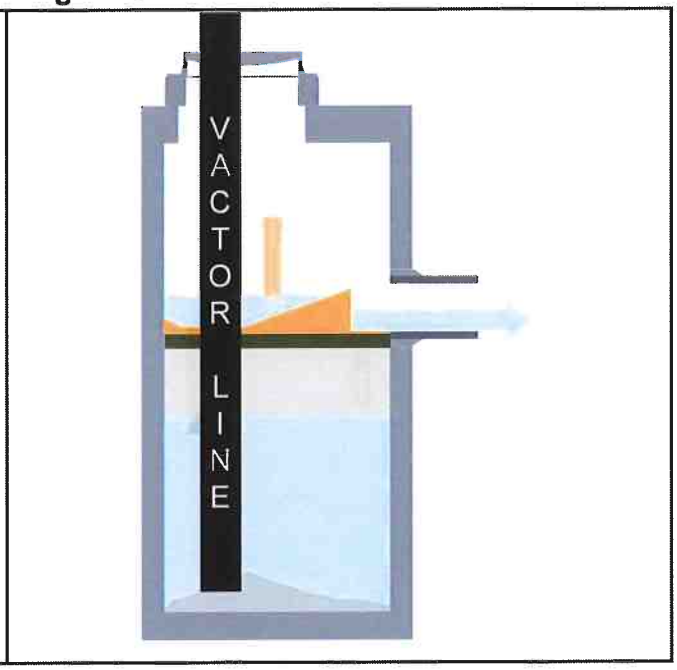


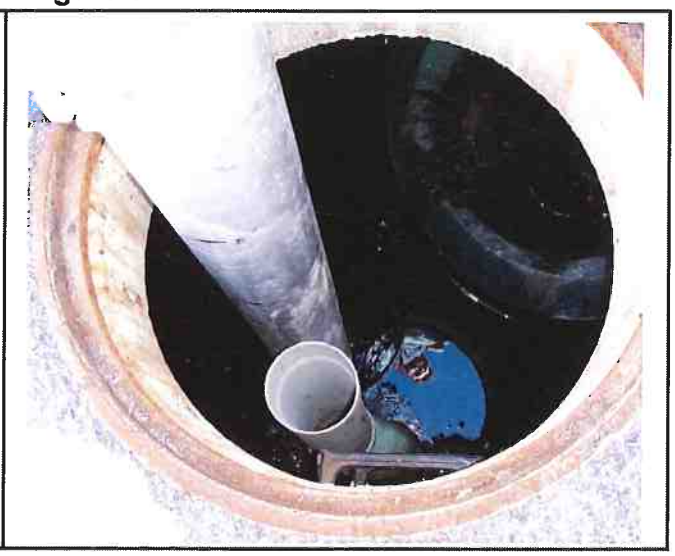
Figure 6.



- Using the vacuum hose, decant the water from the lower chamber into a separate containment tank or to the sanitary sewer, if permitted by the local regulating authority.
- Remove the sediment sludge from the bottom of the unit using the vacuum hose. For large Stormceptor units, a flexible hose is often connected to the primary vacuum line for ease of movement in the lower chamber.
- Units that have not been maintained regularly, have surpassed the maximum recommended sediment capacity, or contain damaged components may require manned entry by trained personnel using safe and proper confined space entry procedures.

Figure 7.

Figure 8.



A maintenance worker stationed at the above ground surface uses a vacuum hose to evacuate water, sediment, and debris from the system.

What is required for proper disposal?

The requirements for the disposal of material removed from Stormceptor units are similar to that of any other stormwater treatment Best Management Practices (BMP). Local guidelines should be consulted prior to disposal of the separator contents. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste. This could be site and pollutant dependent. In some cases, approval from the disposal facility operator/agency may be required.

What about oil spills?

Stormceptor is often implemented in areas where there is high potential for oil, fuel or other hydrocarbon or chemical spills. Stormceptor units should be cleaned immediately after a spill occurs by a licensed liquid waste hauler. You should also notify the appropriate regulatory agencies as required in the event of a spill.

What if I see an oil rainbow or sheen at the Stormceptor outlet?

With a steady influx of water with high concentrations of oil, a sheen may be noticeable at the Stormceptor outlet. This may occur because a hydrocarbon rainbow or sheen can be seen at

very small oil concentrations (< 10 ppm). Stormceptor is effective at removing 95% of free oil, and the appearance of a sheen at the outlet with high influent oil concentrations does not mean that the unit is not working to this level of removal. In addition, if the influent oil is emulsified, the Stormceptor will not be able to remove it. The Stormceptor is designed for free oil removal and not emulsified or dissolved oil conditions.

What factors affect the costs involved with inspection/maintenance?

The Vacuum Service Industry for stormwater drainage and sewer systems is a well-established sector of the service industry that cleans underground tanks, sewers and catch basins. Costs to clean Stormceptor units will vary. Inspection and maintenance costs are most often based on unit size, the number of units on a site, sediment/oil/hazardous material loads, transportation distances, tipping fees, disposal requirements and other local regulations.

What factors predict maintenance frequency?

Maintenance frequency will vary with the amount of pollution on your site (number of hydrocarbon spills, amount of sediment, site activity and use, etc.). It is recommended that the frequency of maintenance be increased or reduced based on local conditions. If the sediment load is high from an unstable site or sediment loads transported from upstream catchments, maintenance may be required semi-annually. Conversely once a site has stabilized, maintenance may be required less frequently (for example: two to seven year, site and situation dependent). Maintenance should be performed immediately after an oil spill or once the sediment depth in Stormceptor reaches the value specified in **Table 3** based on the unit size.

Table 3A. (US) Recommended Sediment Depths Indicating Maintenance

STC Model	Maintenance Sediment depth (in)	EOS Model	Maintenance Sediment depth (in)	Oil Storage Depth (in)	OSR Model	Maintenance Sediment depth (in)
450	8	**4-175**	9	24	**065**	8
900	8	**9-365**	9	24	**140**	8
1200	10	**12-590**	11	39		
1800	15					
2400	12	**24-1400**	14	68	**250**	12
3600	17	**36-1700**	19	79		
4800	15	**48-2000**	16	68	**390**	17
6000	18	**60-2500**	20	79		
7200	15	**72-3400**	17	79	**560**	17
11000*	17	**110-5000***	16	68	**780***	17
13000*	20	**130-6000***	20	79		
16000*	17	**160-7800***	17	79	**1125***	17

Note:

1. *The values above are for typical standard units.*

**Per structure.*

Table 3B. (CA & Int'l) Recommended Sediment Depths Indicating Maintenance

STC Model	Maintenance Sediment depth (mm)	EOS Model	Maintenance Sediment depth (mm)	Oil Storage Depth (mm)	OSR Model	Maintenance Sediment depth (mm)
300	225	**300**	225	610	**300**	200
750	230	**750**	230	610	**750**	200
1000	275	**1000**	275	990		
1500	400					
2000	350	**2000**	350	1727	**2000**	300
3000	475	**3000**	475	2006		
4000	400	**4000**	400	1727	**4000**	375
5000	500	**5000**	500	2006		
6000	425	**6000**	425	2006	**6000**	375
9000*	400	**9000***	400	1727	**9000***	425
11000*	500	**10000***	500	2006		
14000*	425	**14000***	425	2006	**14000***	425

Note:

1. *The values above are for typical standard units.*

**Per structure.*

Replacement parts

Since there are no moving parts during operation in a Stormceptor, broken, damaged, or worn parts are not typically encountered. Therefore, inspection and maintenance activities are generally focused on pollutant removal. However, if replacements parts are necessary, they may be purchased by contacting your local Stormceptor Representative, or Imbrium Systems.

The benefits of regular inspection and maintenance are many – from ensuring maximum operation efficiency, to keeping maintenance costs low, to the continued protection of natural waterways – and provide the key to Stormceptor's long and effective service life.

Stormceptor Inspection and Maintenance Log

Stormceptor Model No: _____

Allowable Sediment Depth: _____

Serial Number: _____

Installation Date: _____

Location Description of Unit: _____

Other Comments: _____

Contact Information

Questions regarding the Stormceptor can be addressed by contacting your area Stormceptor Licensee, Imbrium Systems, or visit our website at www.stormceptor.com.

Stormceptor Licensees:

CANADA

Lafarge Canada Inc.
www.lafargepipe.com

403-292-9502 / 1-888-422-4022	Calgary, AB
780-468-5910	Edmonton, AB
204-958-6348	Winnipeg, MB, NW. ON, SK

Langley Concrete Group
www.langleyconcretegroup.com

604-502-5236	BC

Hanson Pipe & Precast Inc.
www.hansonpipeandprecast.com

519-622-7574 / 1-888-888-3222	ON

Lécuyer et Fils Ltée.
www.lecuyerbeton.com

450-454-3928 / 1-800-561-0970	QC

Strescon Limited
www.strescon.com

902-494-7400	NS, NF
506-633-8877	NB, PE

UNITED STATES

Rinker Materials
www.rinkerstormceptor.com
1-800-909-7763

AUSTRALIA & SOUTHEAST ASIA, including New Zealand & Japan

Humes Water Solutions
www.humes.com.au
+61 7 3364 2894

Imbrium Systems Inc. & Imbrium Systems LLC

Canada	1-416-960-9900 / 1-800-565-4801
United States	1-301-279-8827 / 1-888-279-8826
International	+1-416-960-9900 / +1-301-279-8827
Email	info@imbriumsystems.com

www.imbriumsystems.com
www.stormceptor.com

CHAPTER 12: STORMWATER MANAGEMENT STANDARD 10

Chapter 12:

Standard 10: Prohibition of Illicit Discharges

- The Long Term Pollution Prevention Plan includes the required measures to prevent the illicit discharges.
- All Catch basins and drain inlets shall be labeled with signage to prohibit the release of any illicit substance into the drainage system.
- No floor drains will be connected to the drainage system.
- No washing of vehicles shall be permitted
- All operations and managers of the facility will be provided with training and education concerning the danger of illicit discharges into the drainage system.

Illicit Discharge Certification

I have read Standard 10 of the Massachusetts Stormwater Management Policy regarding Illicit Discharges. I have also studied the Proposed Site Plans and Stormwater Operation and Maintenance Plan and am aware of the components of the Stormwater Management System proposed at the proposed Bernardi Toyota facility located at 1624 Worcester Road in Framingham, Massachusetts. I hereby certify that there will be no illicit discharges, as defined by the Policy, from the site through any part of the Stormwater Management System.

_____
Signature

_____
Name and Title Date