DRAINAGE NARRATI`VE

3-Lot Subdivision
Church Street, Brooklyn, CT
Prepared for
Kausch & Sons, LLC

April 30, 2021

The existing parcels consist of a total of approximately 27 acres of undeveloped woodlands located to the west of Church Street in Brooklyn Connecticut. There are inland wetlands located in the north and southern parts of the site.

The proposed development consists of 2 residential building lots served by approximately 950 L.F. of new shared driveway access from Church Street. Presently, storm water in the proposed development area drains north to south, exiting the site via the wetlands and eventually discharging to the Quinebaug River to the east.

The shared driveway for the building lots is required to cross existing wetlands in three locations. The crossing locations have been determined to minimize impact to the wetland. The crossing lengths are approximately 50, 75 and 73 feet respectively.

The following determines the size of the drainage culverts required to pass the 25-year storm event with inlet control.

Methodology:
In accordance with the Town of Brooklyn's Public Improvement Specifications, the site's watershed was analyzed using the Rational method for the 25-year storm. The Rational method predicts the peak runoff according to the formula: Q=CiA, where C is a runoff coefficient, i is the rainfall intensity, and A is the sub-catchment area.

Rainfall intensities used in the calculations were taken from the Brooklyn (06-0918) weather station readings accessed via the NOAA Atlas 14 Point Precipitation Frequency website.

DEEP watershed basin boundaries and Connecticut Elevation (Lidar) Data (See SK-1) was used to determine the approximate watershed area contributing to each driveway crossing.

The site consists primarily undeveloped woodlands. A run-off coefficient (C) of 0.2 (Unimproved Surface) was utilized. The Time of Concentration for each catchment was determined using the TR-55 method.

The peak discharge (Q) for the 25-year storm event was calculated as follows:

Peak Volume (Q) = CiA = 0.2 x 6.11 in/hr x Area (acres)

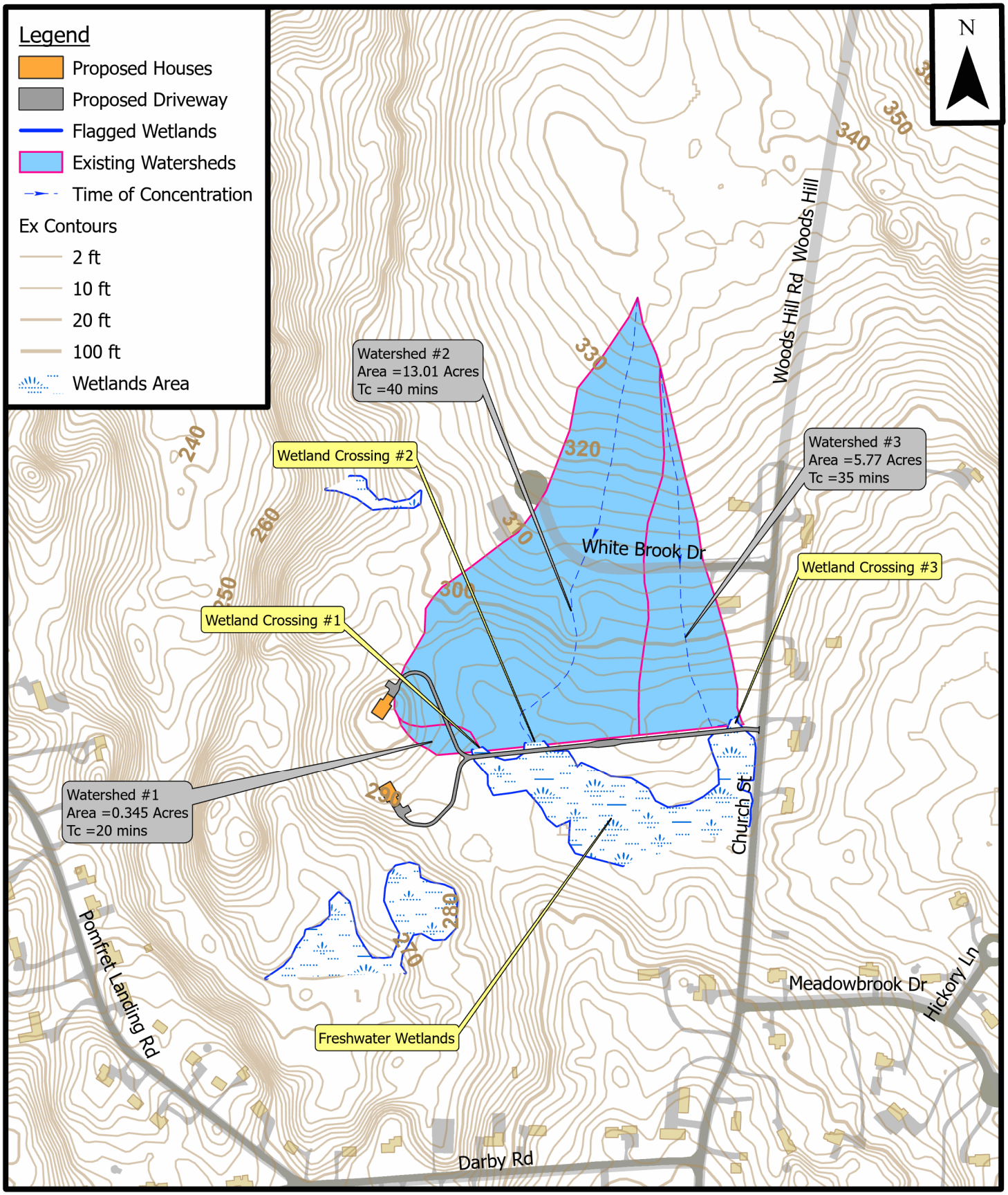
Hydrograph Reports showing peak volume discharge for each wetland crossing are shown in Appendix 1. A summary of the results is shown in the following table.

Location	Watershed Area	Tc (Mins)	Peak 25-yr Volume (cfs)	Culvert Required
Crossing 1	0.34	20	0.4	1 x 15”
Crossing 2	13.01	40	9.7	2 x 15”
Crossing 3	5.77	35	4.6	1 x 15”

Using the above results, analysis of each wetland crossing was performed to determine the size and number of culverts required to pass the peak volume at a grade consistent with the existing wetland.

Hydraflow Express culvert modeler (used in HDS-5 Hydraulic Design of Highway Culverts) was used to produce the Culvert Reports in Appendix 2.

The analysis demonstrated that the design culverts at each location have sufficient capacity to convey the peak volume.



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PROPOSED WATERSHED MAP

CHURCH STREET SITE DEVELOPMENT
BROOKLYN, CT

DATE: 4/5/2021

SCALE: 1 " = 400 Ft

FIGURE

SK-1

Hydrograph Report

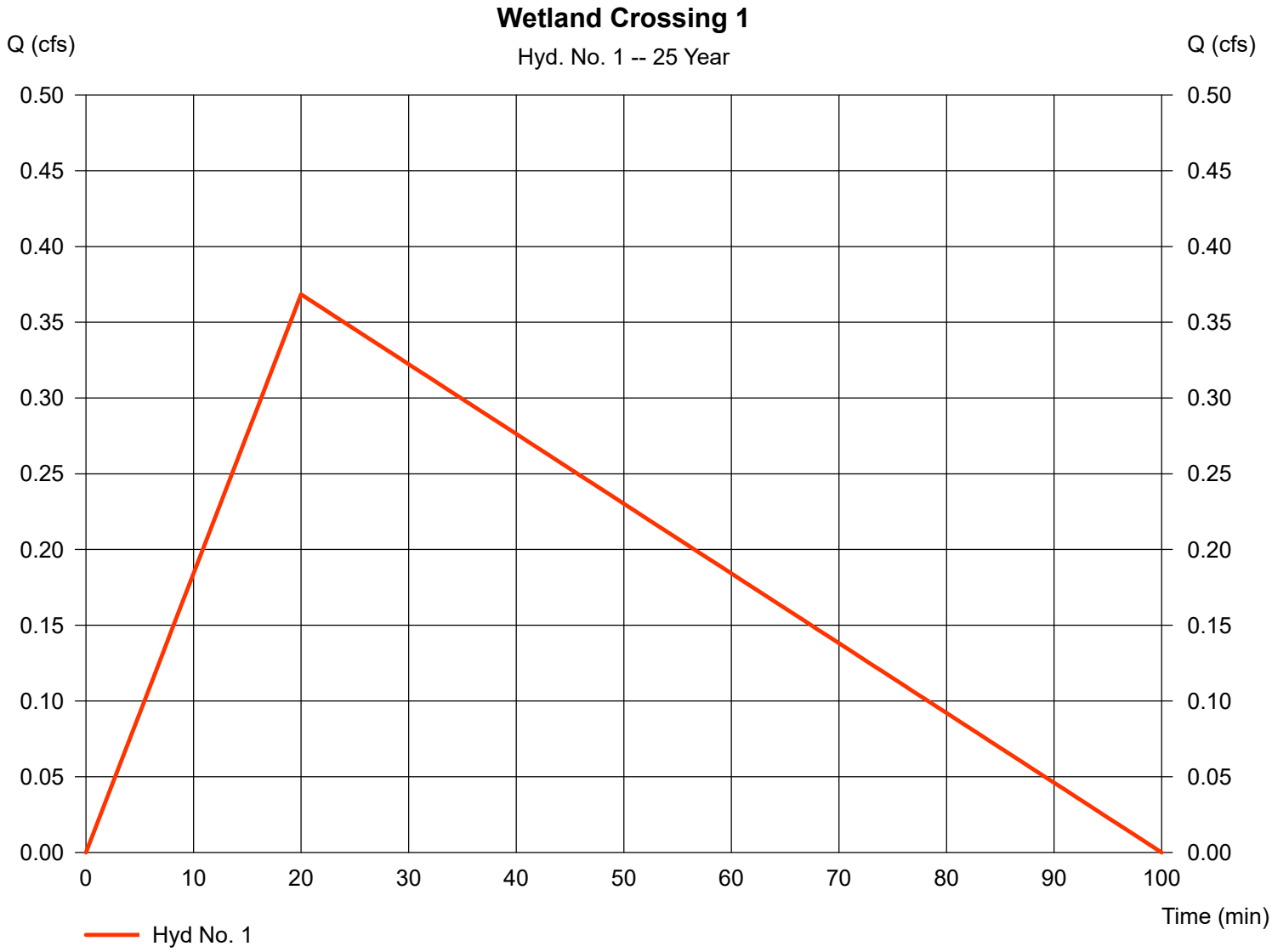
APPPENDIX 1

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Apr 5, 2021

Hyd. No. 1

Wetland Crossing 1

Hydrograph type	=	Rational	Peak discharge	=	0.368 cfs
Storm frequency	=	25 yrs	Time to peak	=	20 min
Time interval	=	1 min	Hyd. volume	=	1,105 cuft
Drainage area	=	0.345 ac	Runoff coeff.	=	0.2
Intensity	=	5.339 in/hr	Tc by TR55	=	20.00 min
IDF Curve	=	6639 Church_St.IDF	Asc/Rec limb fact	=	1/4

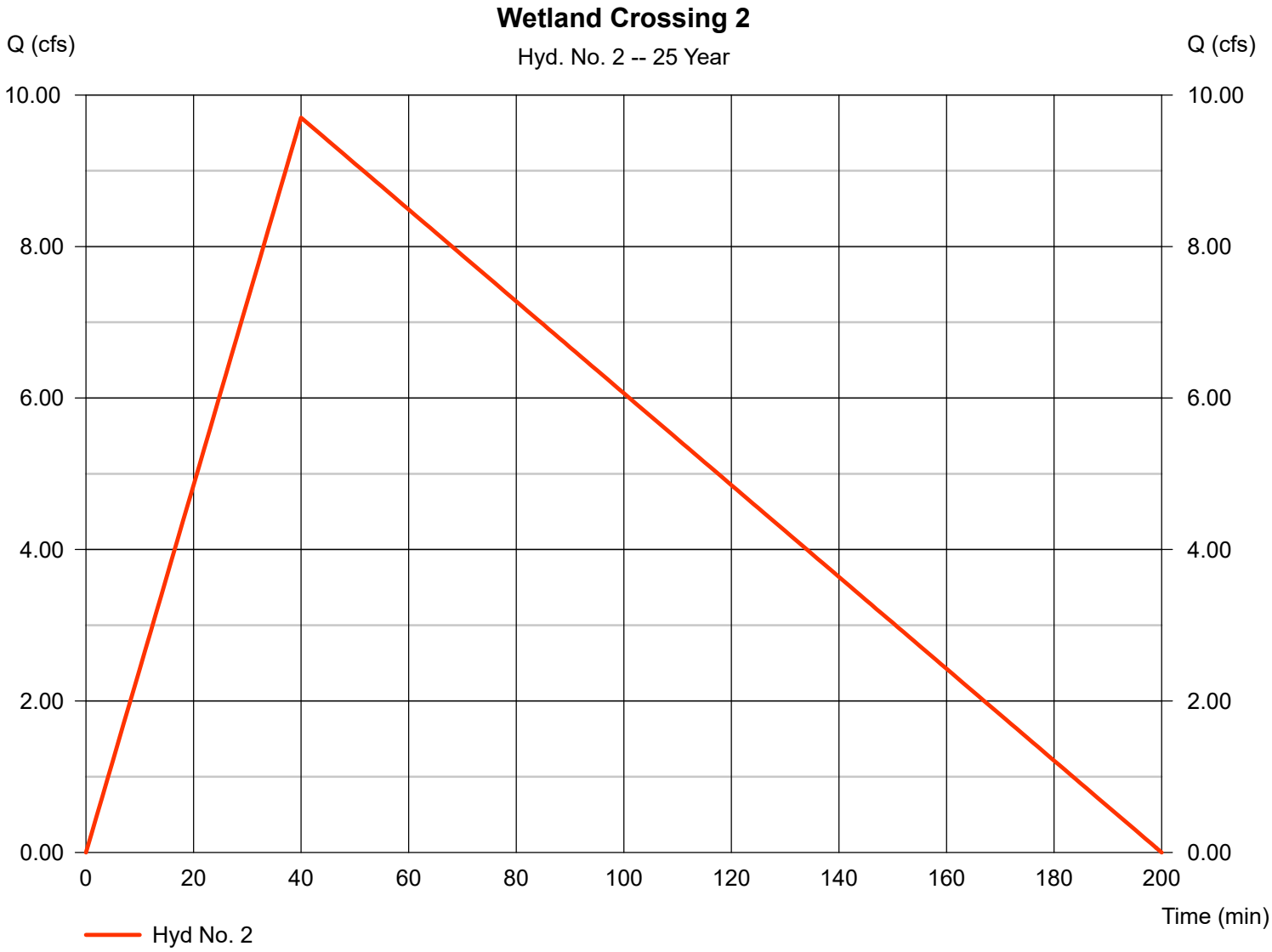


Hydrograph Report

Hyd. No. 2

Wetland Crossing 2

Hydrograph type	=	Rational	Peak discharge	=	9.701 cfs
Storm frequency	=	25 yrs	Time to peak	=	40 min
Time interval	=	1 min	Hyd. volume	=	58,207 cuft
Drainage area	=	13.010 ac	Runoff coeff.	=	0.2
Intensity	=	3.728 in/hr	Tc by TR55	=	40.00 min
IDF Curve	=	6639 Church_St.IDF	Asc/Rec limb fact	=	1/4

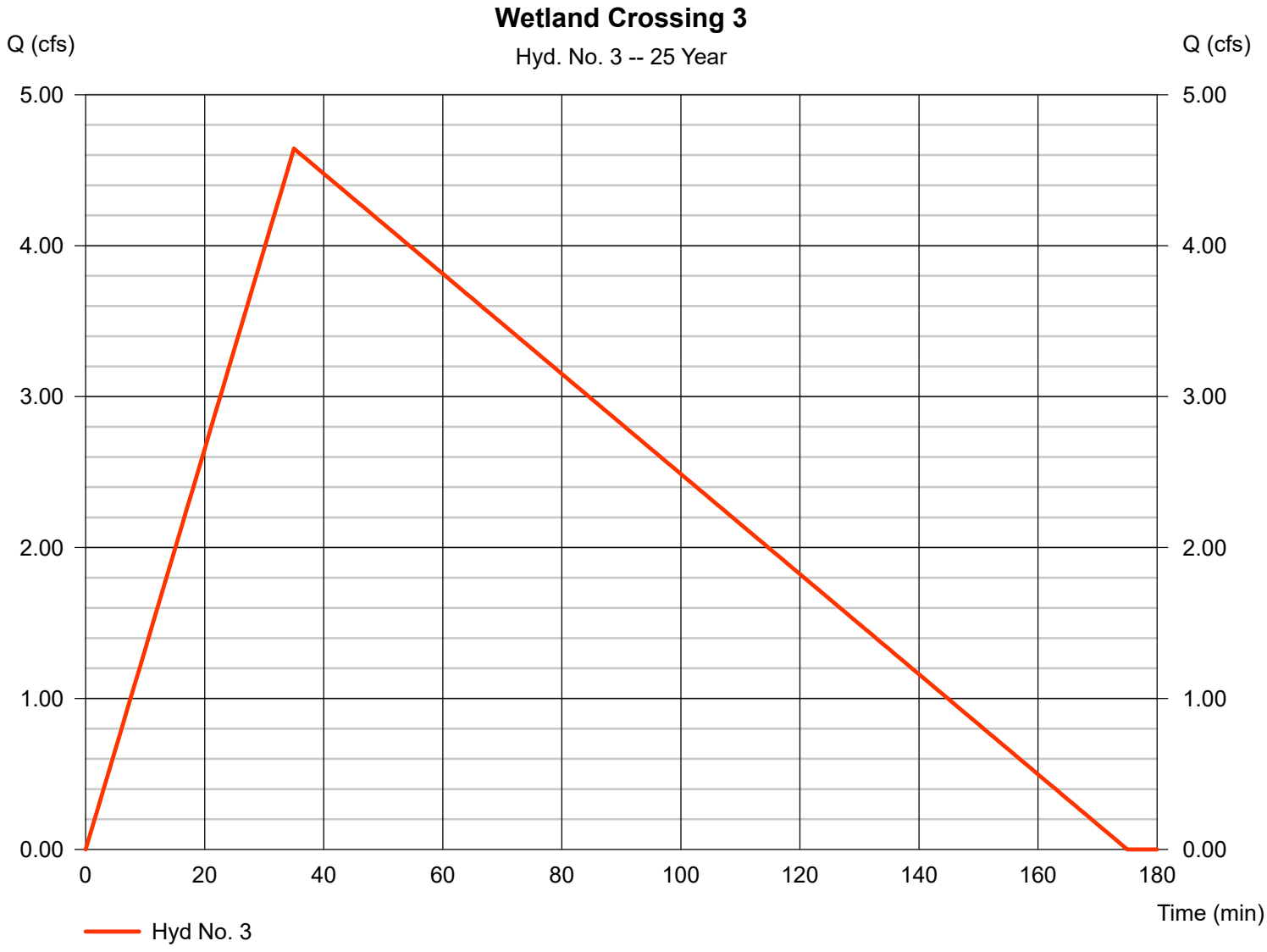


Hydrograph Report

Hyd. No. 3

Wetland Crossing 3

Hydrograph type	=	Rational	Peak discharge	=	4.643 cfs
Storm frequency	=	25 yrs	Time to peak	=	35 min
Time interval	=	1 min	Hyd. volume	=	24,375 cuft
Drainage area	=	5.770 ac	Runoff coeff.	=	0.2
Intensity	=	4.023 in/hr	Tc by TR55	=	35.00 min
IDF Curve	=	6639 Church_St.IDF	Asc/Rec limb fact	=	1/4



Culvert Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. Friday, Apr 30 2021

Wetland Crossing 1

Invert Elev Dn (ft)	=	287.80
Pipe Length (ft)	=	24.00
Slope (%)	=	0.21
Invert Elev Up (ft)	=	287.85
Rise (in)	=	15.0
Shape	=	Cir
Span (in)	=	15.0
No. Barrels	=	1
n-Value	=	0.012
Inlet Edge	=	Projecting
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.5

Embankment

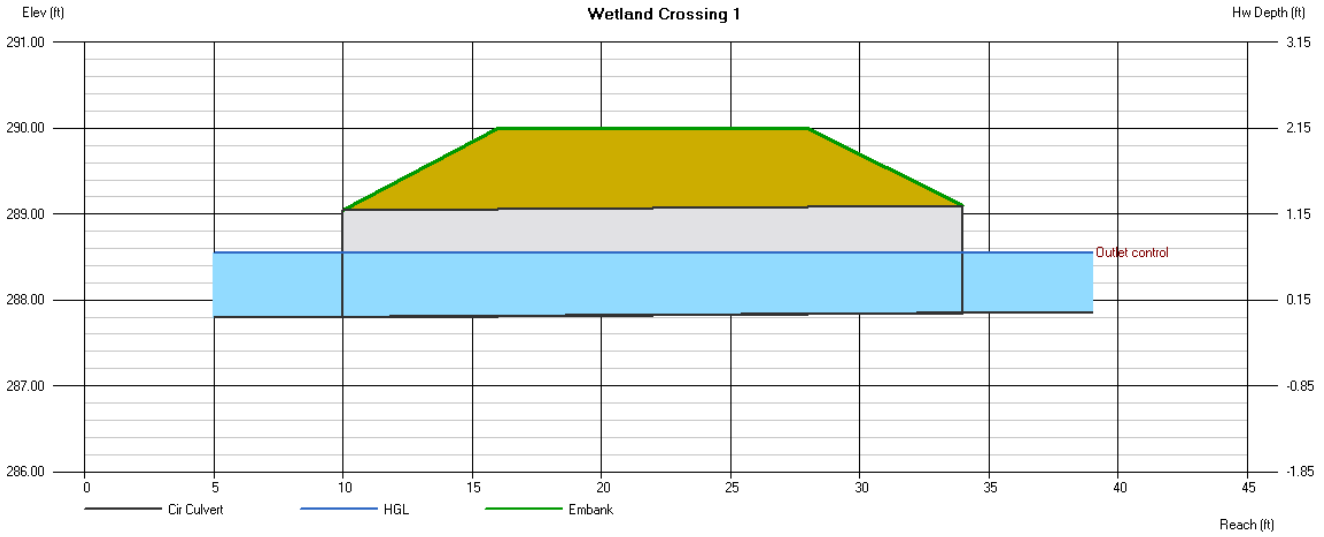
Top Elevation (ft)	=	290.00
Top Width (ft)	=	12.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	0.30
Qmax (cfs)	=	0.50
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	0.40
Qpipe (cfs)	=	0.40
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	0.52
Veloc Up (ft/s)	=	0.57
HGL Dn (ft)	=	288.55
HGL Up (ft)	=	288.55
Hw Elev (ft)	=	288.55
Hw/D (ft)	=	0.56
Flow Regime	=	Outlet Control



Culvert Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. Friday, Apr 30 2021

Wetland Crossing 2

Invert Elev Dn (ft)	=	285.90
Pipe Length (ft)	=	24.00
Slope (%)	=	0.83
Invert Elev Up (ft)	=	286.10
Rise (in)	=	15.0
Shape	=	Cir
Span (in)	=	15.0
No. Barrels	=	2
n-Value	=	0.012
Inlet Edge	=	Projecting
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.5

Embankment

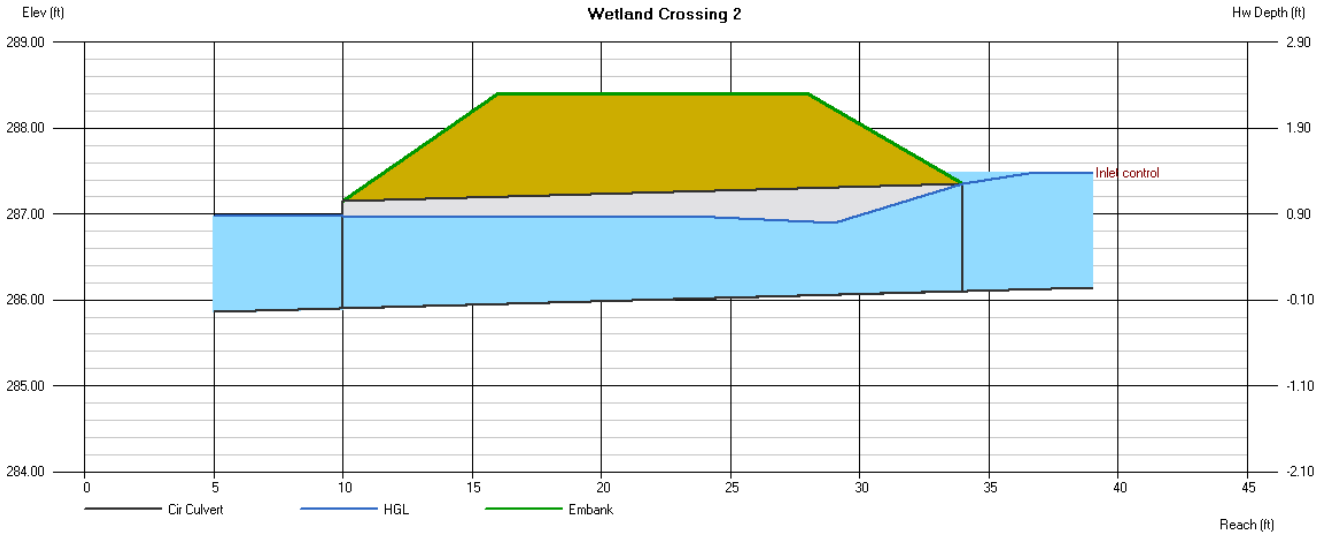
Top Elevation (ft)	=	288.40
Top Width (ft)	=	12.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	9.60
Qmax (cfs)	=	9.80
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	9.70
Qpipe (cfs)	=	9.70
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	4.33
Veloc Up (ft/s)	=	5.13
HGL Dn (ft)	=	286.97
HGL Up (ft)	=	287.00
Hw Elev (ft)	=	287.48
Hw/D (ft)	=	1.10
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. Friday, Apr 30 2021

Wetland Crossing 3

Invert Elev Dn (ft)	=	287.80
Pipe Length (ft)	=	24.00
Slope (%)	=	6.25
Invert Elev Up (ft)	=	289.30
Rise (in)	=	15.0
Shape	=	Cir
Span (in)	=	15.0
No. Barrels	=	1
n-Value	=	0.012
Inlet Edge	=	Projecting
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.5

Embankment

Top Elevation (ft)	=	291.00
Top Width (ft)	=	12.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	4.50
Qmax (cfs)	=	4.70
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	4.60
Qpipe (cfs)	=	4.60
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	4.14
Veloc Up (ft/s)	=	5.02
HGL Dn (ft)	=	288.86
HGL Up (ft)	=	290.17
Hw Elev (ft)	=	290.63
Hw/D (ft)	=	1.06
Flow Regime	=	Inlet Control