Stormwater Calculations

Eagles Landing
Parking Lot Addition

City of Franklin

Submitted:
April 11, 2024

By:

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Section 1: Stormwater Calculations Summary

Introduction

This report shall identify the existing and proposed drainage aspects associated with a proposed parking lot expansion within the Eagles Landing development. The proposed site contains ±51 acres of land located on the east side of Hurricane Road approximately 2,500 feet south of the County Road 300 North and Hurricane Road intersection in the City of Franklin (see Exhibit 1: Location Map).

Pre-Development Conditions

The overall project site is situated on ±51 acres that currently is made up of a par three, eighteen-hole golf course. A 25,000 square foot building, with asphalt parking areas, is located on the property that was previously utilized as a golf school and dormitory. The parking area shall be expanded to the east of the existing parking lot and will impact a green and sand bunker. The current topography, where the parking lot shall be constructed, conveys runoff in a northerly and southerly direction where it is ultimately collected by Hurricane Creek after traversing through the existing golf course (see Exhibit 2: Pre-Development Watershed Map).

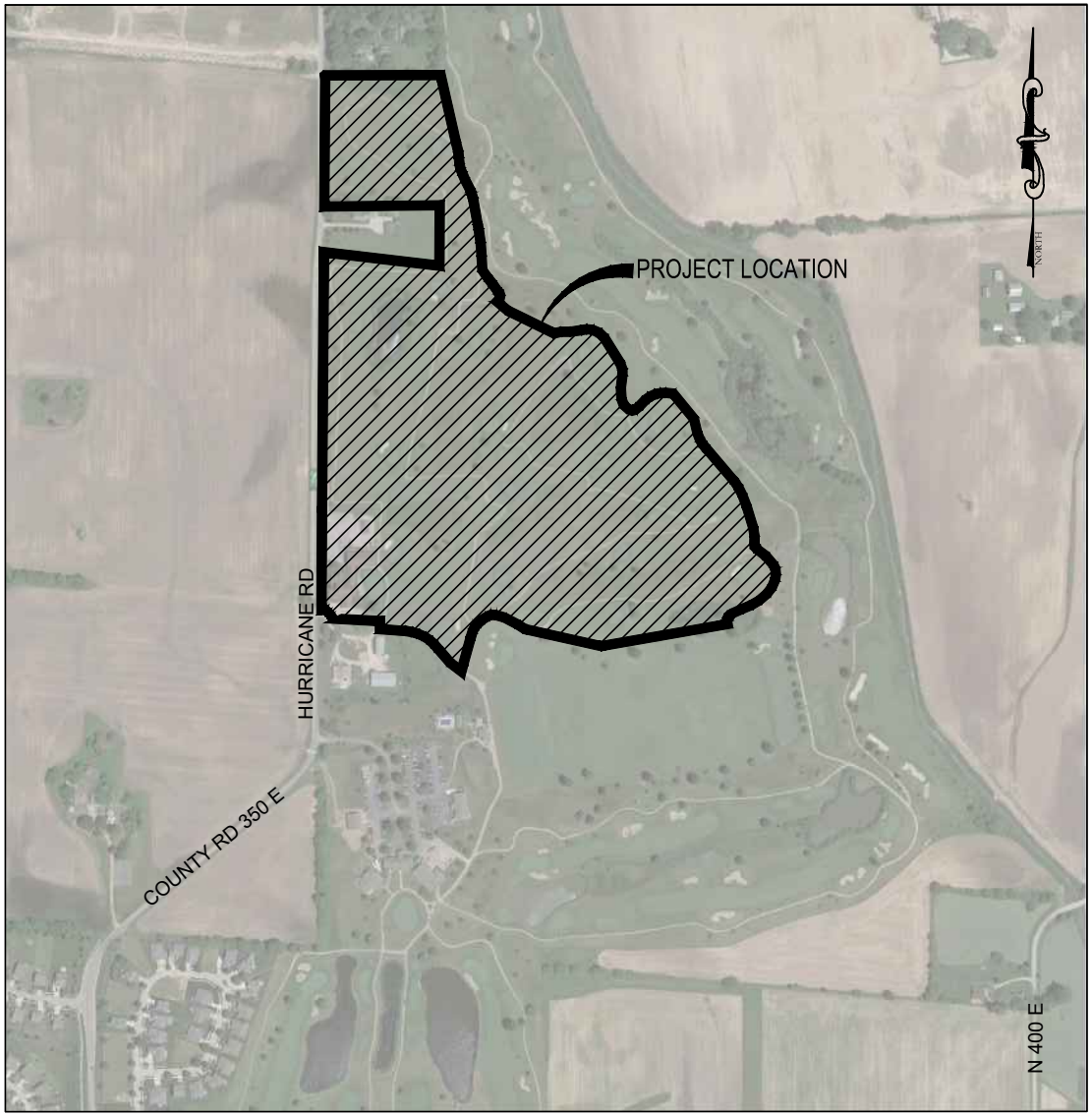
The real estate, where the parking lot shall be constructed, lies with Zone X, areas outside of the 500-year floodplain (0.2% annual chance floodplain), as shown on Flood Insurance Rate Map (FIRM) for Johnson County, Indiana, Community Panel No 18081C0144D dated August 2, 2007, and Panel No 18081C0143E dated January 29, 2021. Additionally, per the U.S. Fish and Wildlife Service – National Wetlands Inventory, there are no wetlands within the project area.

Post-Development Conditions

It is proposed to construct a 45-space parking lot to serve the uses within the existing building. The proposed parking facility shall be an extension of the existing lot and shall expand the parking to the east side of the existing building. Runoff from the parking lot shall be conveyed easterly via sheet flow to a swale along the east side of the proposed parking lot. A dry detention basin, located at the south end of the parking lot, shall capture additional sheet flow runoff and the drainage from the swale. The dry basin is sized to detain the contributing watershed being directed to it in the post-developed condition (see Exhibit 3: Post-Development Watershed Map). The swale and dry basin shall be temporary drainage components until the large detention pond for the subdivision is constructed. The detention pond shall be due east of the proposed parking lot and is identified on the Post-Developed Watershed Map. Once this detention facility is online, the swale and dry basin shall be converted back to lawn areas to be used for gathering.

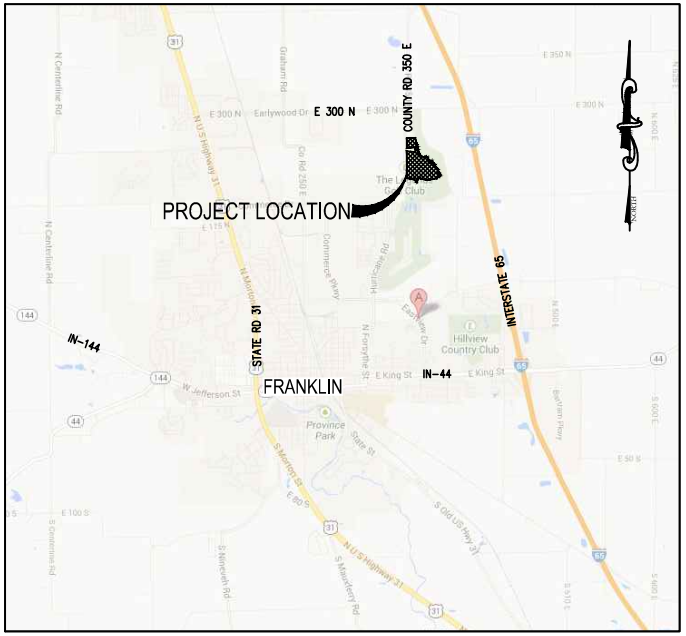
EAGLES LANDING

NOT TO SCALE



LOCATION MAP

EAGLES LANDING

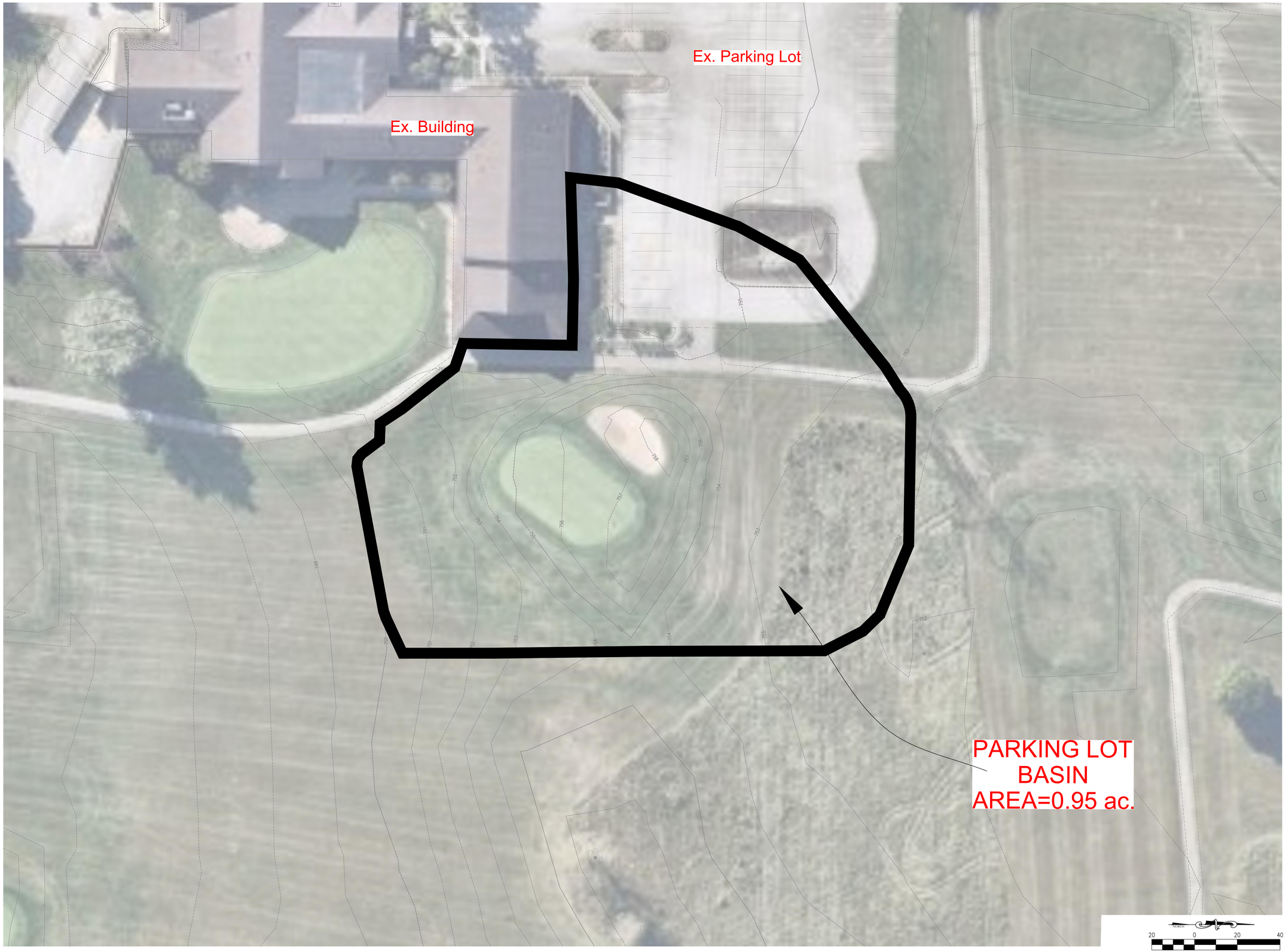


VICINITY MAP

FRANKLIN, INDIANA

PREPARED BY:

CROSSROAD ENGINEERS, PC



PRE-DEVELOPMENT WATERSHED MAP

EAGLES LANDING

JOB No.	.	DRAWN	LMC	CHECKED	DJM
DATE	APRIL 11, 2024	DESIGNED	DJM	APPR.	GJI

CROSSROAD ENGINEERS, PC
Transportation & Development Consultants
45 S. Park Place, Suite 850, Morristown, NJ 07960 (973) 765-1566

SHEET 1 of 1

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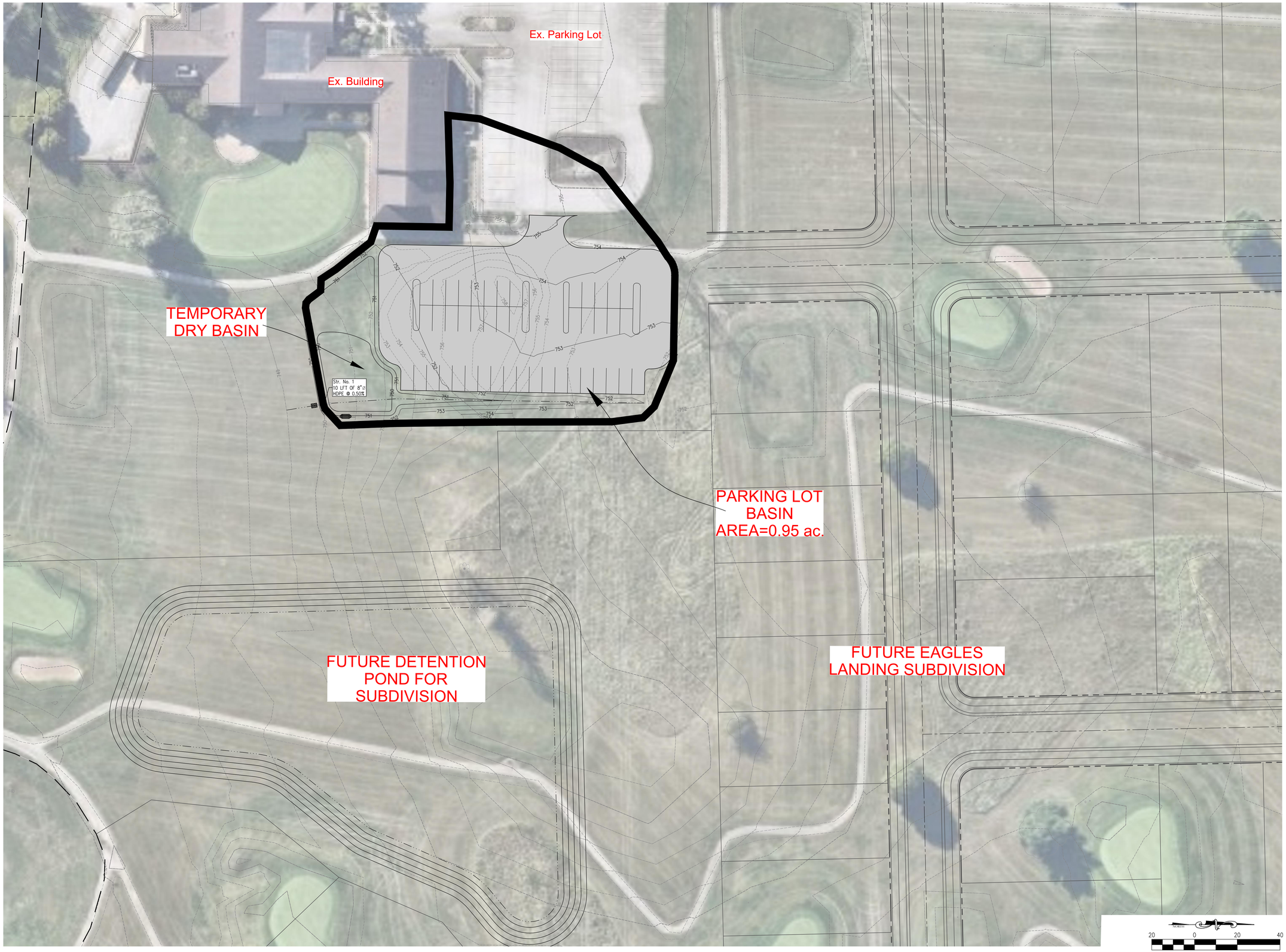

POST-DEVELOPMENT WATERSHED MAP

EAGLES LANDING

JOB No.	-	DRAWN	LMC	CHECKED	DJM	APPR.	GJI
DATE	APRIL 11, 2024	DESIGNED	DJM				

CROSSROAD ENGINEERS, PLLC
Transportation & Development Consultants
115 N. 17th AVENUE, BEECH GROVE, IN 46107 (317) 780-1555

SHEET 1 of 1

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Section 2: Hydrologic Modeling Calculations

Hydrologic modeling calculations were generated to determine allowable release rates from the contributing watershed. All drainage calculations were completed using Hydraflow modeling software. The SCS Triangular method utilizing SCS II rainfall distribution was used to calculate the onsite existing and proposed hydrographs. The TR-55 Method was used to calculate times of concentration. Curve numbers were computed based on the applicable land use and the percentage by area of each hydrologic soil type obtained from the NRCS Soils Survey.

Soil Hydrologic Group Percentage Calculations

Table 1
Soil Hydrologic Group Percentage Calculations
Parking Lot Basin

Soil Type	Hydrologic Group – C (acres)
Miami Silt Loam, MnB2	0.77
Crosby Silt Loam, CrA	0.18
Totals	0.95
Percentages of Hydrologic Groups	**100%**

Runoff Curve Number Calculations

Pre-Development Conditions

Table 2
Pre-Development Runoff Curve Number Calculations
Parking Lot Basin

Land Use Description	Runoff Curve No. For Hydrologic Group – C		Average Runoff Curve Number	Land Use Area	Overall Weighted Curve No.
	*Percentage Used**	*100%*			
Grass (Good Condition)	74		74	0.754 Ac.	**78.87**
Impervious (Pavement/Concrete)	98		98	0.193 Ac.	

*See Soil Hydrologic Group Percentage Calculations, Table 1.

Post-Development Conditions

Table 3
Post-Development Runoff Curve Number Calculations
Parking Lot Basin

Land Use Description	Runoff Curve No. For Hydrologic Group – C		Average Runoff Curve Number	Land Use Area	Overall Weighted Curve No.
	*Percentage Used**	*100%*			
Grass (Good Condition)	74		74	0.306 Ac.	**90.23**
Impervious (Pavement/Concrete)	98		98	0.641 Ac.	

*See Soil Hydrologic Group Percentage Calculations, Table 1.

Hydrologic Modeling Runoff Summary

The City of Franklin requires that the 10-year and 100-year post-development rain events shall be limited to the pre-developed 2-year and 10-year rain events, respectively.

Pre-Development Conditions

The following tables summarize the peak runoff rates (cfs) resulting from hydrologic modeling of the onsite basin. Entries in bold indicate the critical storm event for the respective return period. See Appendix A for pre-development unit and computed flood hydrograph reports.

Table 4
Pre-Development Hydrograph Peak Runoff Rate Summary
Parking Lot Basin

Return Period (years)	Storm Duration					
	1 Hour	2 Hours	3 Hours	6 Hours	12 Hours	24 Hours
2	0.19	0.39	0.53	0.81	1.24	**1.51**
10	0.79	1.24	1.51	2.06	2.64	**3.25**
100	1.78	2.52	2.98	3.80	4.68	**5.82**

Post-Development Conditions

The post-developed unit hydrograph assumes full development of the contributing watershed area. The runoff shall be conveyed to the proposed dry detention basin via sheet flow. The following tables summarize the peak runoff rate (cfs) resulting from hydrologic modeling of the proposed basin. Entries in bold indicate the critical storm event for the respective return period. See Appendix B for post-development unit and computed flood hydrograph reports.

Table 5
Post-Development Hydrograph Peak Runoff Rate Summary
Parking Lot Basin

Return Period (years)	Storm Duration					
	1 Hour	2 Hours	3 Hours	6 Hours	12 Hours	24 Hours
2	0.80	1.12	1.32	1.72	2.28	**2.61**
10	1.69	2.28	2.61	3.27	3.93	**4.59**
100	2.94	3.79	4.30	5.16	6.06	**7.20**

Section 3: Detention Calculations

Stormwater detention is addressed by releasing the critical 10 year post-development peak runoff at the critical 2 year pre-development peak runoff rate and releasing the critical 100 year post-development peak runoff at the critical 10 year pre-development peak runoff rate. As mentioned previously, the dry basin shall be employed temporarily until the detention pond required for the subdivision is constructed. See Appendix A & B for pre and post-developed hydrograph reports, respectively. See Appendix C for the proposed pond data and routed hydrographs.

Allowable Discharge Rate (see Section 2: Hydrologic Modeling Calculations, Hydrologic Modeling Runoff Summary)

Parking Lot Basin:

- Allowable 10-year discharge rate = 1.51 cfs (Ex. 2yr-24hr event)
- Allowable 100-year discharge rate = 3.25 cfs (Ex. 10yr-24hr event)

Table 6
Post Developed Routed Peak Runoff Rate Summary
Parking Lot Basin

Return Period (years)	Storm Duration					
	1 Hour	2 Hours	3 Hours	6 Hours	12 Hours	24 Hours
2	0.34	0.40	0.42	0.51	0.72	**0.86**
10	0.50	0.72	0.86	1.09	1.28	**1.49**
100	0.98	1.24	1.38	1.90	2.90	**3.18**

Peak 10 Year Post-Development Discharge Rate = **1.49 cfs** < 1.51 cfs (allowable)
Peak Water Surface Elev. = 750.66 < 751.00 (top of bank)

Peak 100 Year Post-Development Discharge Rate = **3.18 cfs** < 3.25 cfs (allowable)
Peak Water Surface Elev. = 750.99 = 751.00 (top of bank)

All post-development storms are discharged at flow rates less than their respective allowable discharge rates. All post-development storms produce a peak water surface elevation below the maximum detention basin elevation.

Appendix A: Pre-Developed Conditions

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.188	2	718	494	------	------	------	PL Basin - Ex 1hr
2	SCS Runoff	0.393	2	718	866	------	------	------	PL Basin - Ex 2hr
3	SCS Runoff	0.530	2	718	1,120	------	------	------	PL Basin - Ex 3hr
4	SCS Runoff	0.810	2	718	1,651	------	------	------	PL Basin - Ex 6hr
5	SCS Runoff	1.243	2	718	2,493	------	------	------	PL Basin - Ex 12hr
6	SCS Runoff	1.507	2	718	3,015	------	------	------	PL Basin - Ex 24hr
8	SCS Runoff	0.798	2	718	1,597	------	------	------	PL Basin - Prop 1hr
9	SCS Runoff	1.122	2	718	2,260	------	------	------	PL Basin - Prop 2hr
10	SCS Runoff	1.324	2	716	2,674	------	------	------	PL Basin - Prop 3hr
11	SCS Runoff	1.719	2	716	3,482	------	------	------	PL Basin - Prop 6hr
12	SCS Runoff	2.284	2	716	4,662	------	------	------	PL Basin - Prop 12hr
13	SCS Runoff	2.611	2	716	5,355	------	------	------	PL Basin - Prop 24hr
15	Reservoir	0.340	2	722	1,591	8	749.97	461	RTD PL Basin - 1hr
16	Reservoir	0.395	2	724	2,255	9	750.05	683	RTD PL Basin - 2hr
17	Reservoir	0.419	2	724	2,669	10	750.08	834	RTD PL Basin - 3hr
18	Reservoir	0.506	2	724	3,476	11	750.16	1,125	RTD PL Basin - 6hr
19	Reservoir	0.719	2	724	4,656	12	750.26	1,528	RTD PL Basin - 12hr
20	Reservoir	0.862	2	724	5,350	13	750.31	1,749	RTD PL Basin - 24hr

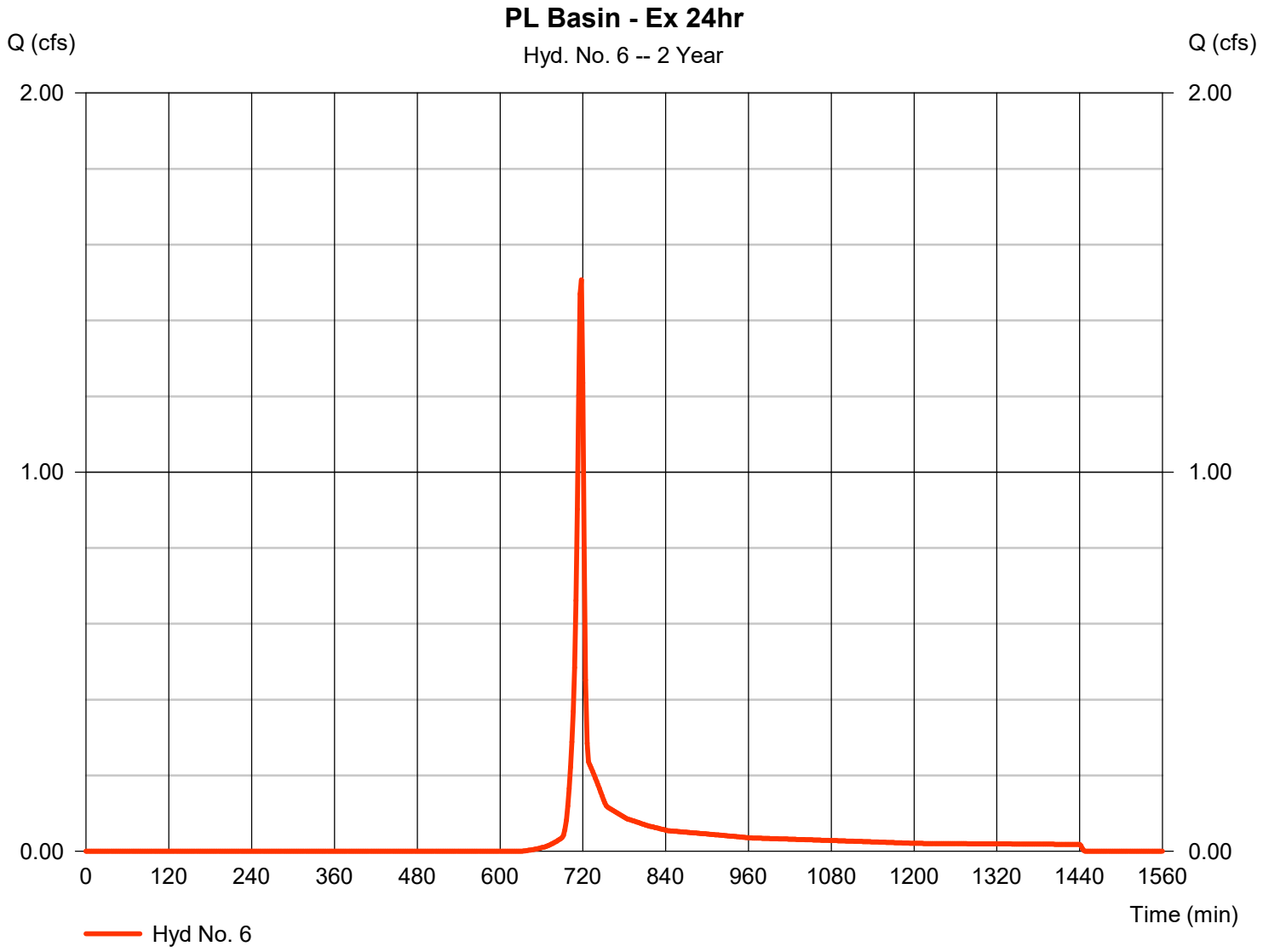
Hydrograph Report

Hyd. No. 6

PL Basin - Ex 24hr

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.507 cfs
Storm frequency	=	2 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	3,015 cuft
Drainage area	=	0.950 ac	Curve number	=	79*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	2.64 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.193 x 98) + (0.754 x 74)] / 0.950



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.790	2	718	1,614	------	------	------	PL Basin - Ex 1hr
2	SCS Runoff	1.243	2	718	2,493	------	------	------	PL Basin - Ex 2hr
3	SCS Runoff	1.507	2	718	3,015	------	------	------	PL Basin - Ex 3hr
4	SCS Runoff	2.061	2	718	4,128	------	------	------	PL Basin - Ex 6hr
5	SCS Runoff	2.640	2	718	5,315	------	------	------	PL Basin - Ex 12hr
6	SCS Runoff	3.247	2	716	6,558	------	------	------	PL Basin - Ex 24hr
8	SCS Runoff	1.692	2	716	3,427	------	------	------	PL Basin - Prop 1hr
9	SCS Runoff	2.284	2	716	4,662	------	------	------	PL Basin - Prop 2hr
10	SCS Runoff	2.611	2	716	5,355	------	------	------	PL Basin - Prop 3hr
11	SCS Runoff	3.268	2	716	6,772	------	------	------	PL Basin - Prop 6hr
12	SCS Runoff	3.926	2	716	8,217	------	------	------	PL Basin - Prop 12hr
13	SCS Runoff	4.585	2	716	9,683	------	------	------	PL Basin - Prop 24hr
15	Reservoir	0.500	2	724	3,421	8	750.15	1,105	RTD PL Basin - 1hr
16	Reservoir	0.719	2	724	4,656	9	750.26	1,528	RTD PL Basin - 2hr
17	Reservoir	0.862	2	724	5,350	10	750.31	1,749	RTD PL Basin - 3hr
18	Reservoir	1.085	2	724	6,766	11	750.42	2,208	RTD PL Basin - 6hr
19	Reservoir	1.277	2	724	8,211	12	750.54	2,684	RTD PL Basin - 12hr
20	Reservoir	1.485	2	724	9,677	13	750.66	3,165	RTD PL Basin - 24hr

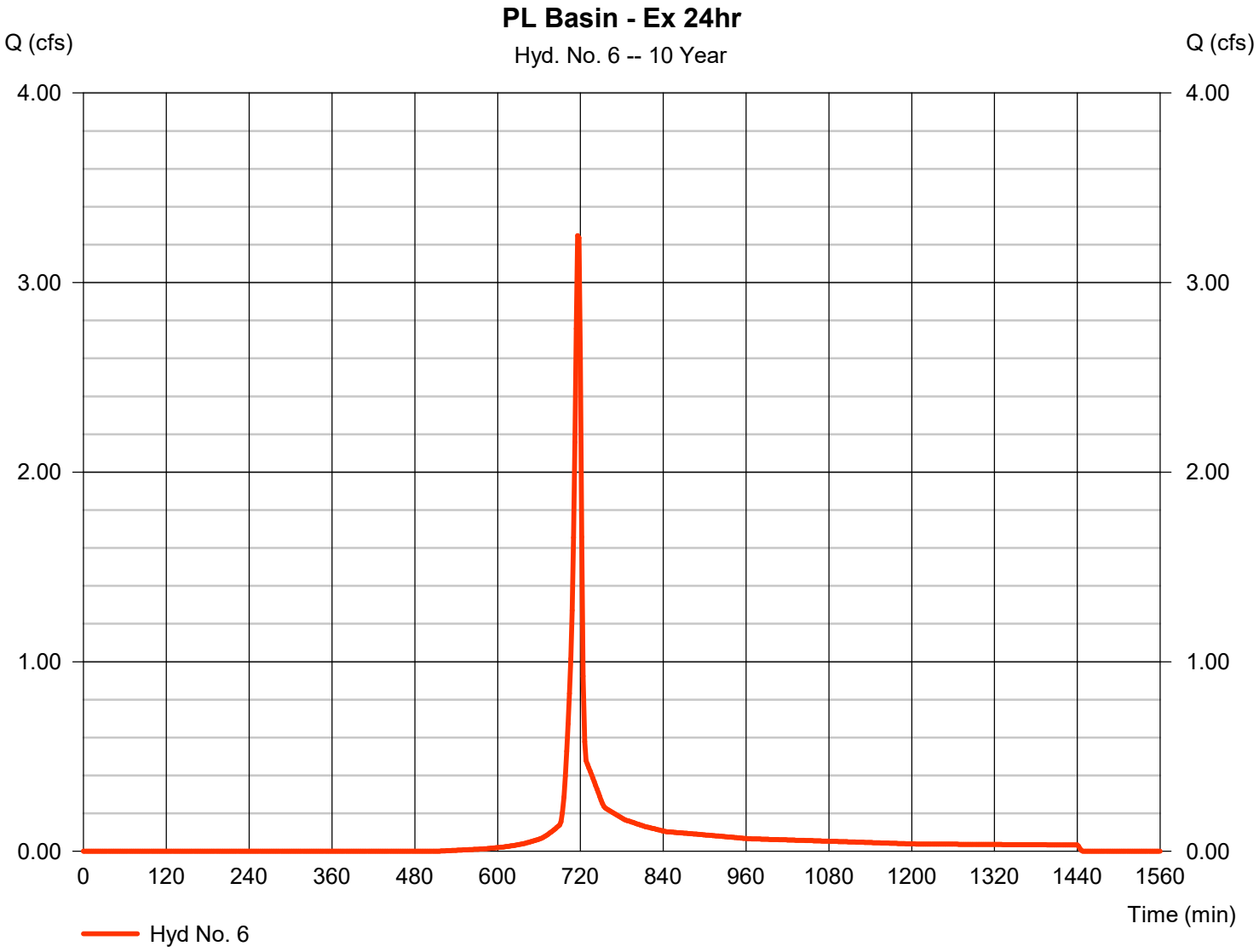
Hydrograph Report

Hyd. No. 6

PL Basin - Ex 24hr

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.247 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	6,558 cuft
Drainage area	=	0.950 ac	Curve number	=	79*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	4.08 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.193 x 98) + (0.754 x 74)] / 0.950



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	1.780	2	718	3,561	------	------	------	PL Basin - Ex 1hr
2	SCS Runoff	2.518	2	718	5,063	------	------	------	PL Basin - Ex 2hr
3	SCS Runoff	2.976	2	716	6,008	------	------	------	PL Basin - Ex 3hr
4	SCS Runoff	3.798	2	716	7,683	------	------	------	PL Basin - Ex 6hr
5	SCS Runoff	4.678	2	716	9,505	------	------	------	PL Basin - Ex 12hr
6	SCS Runoff	5.815	2	716	11,896	------	------	------	PL Basin - Ex 24hr
8	SCS Runoff	2.939	2	716	6,059	------	------	------	PL Basin - Prop 1hr
9	SCS Runoff	3.789	2	716	7,914	------	------	------	PL Basin - Prop 2hr
10	SCS Runoff	4.297	2	716	9,040	------	------	------	PL Basin - Prop 3hr
11	SCS Runoff	5.159	2	716	10,978	------	------	------	PL Basin - Prop 6hr
12	SCS Runoff	6.059	2	716	13,031	------	------	------	PL Basin - Prop 12hr
13	SCS Runoff	7.198	2	716	15,667	------	------	------	PL Basin - Prop 24hr
15	Reservoir	0.976	2	724	6,054	8	750.37	1,977	RTD PL Basin - 1hr
16	Reservoir	1.240	2	724	7,908	9	750.52	2,583	RTD PL Basin - 2hr
17	Reservoir	1.381	2	724	9,034	10	750.61	2,956	RTD PL Basin - 3hr
18	Reservoir	1.900	2	724	10,973	11	750.75	3,535	RTD PL Basin - 6hr
19	Reservoir	2.897	2	722	13,026	12	750.87	4,026	RTD PL Basin - 12hr
20	Reservoir	3.176	2	722	15,661	13	750.99	4,512	RTD PL Basin - 24hr

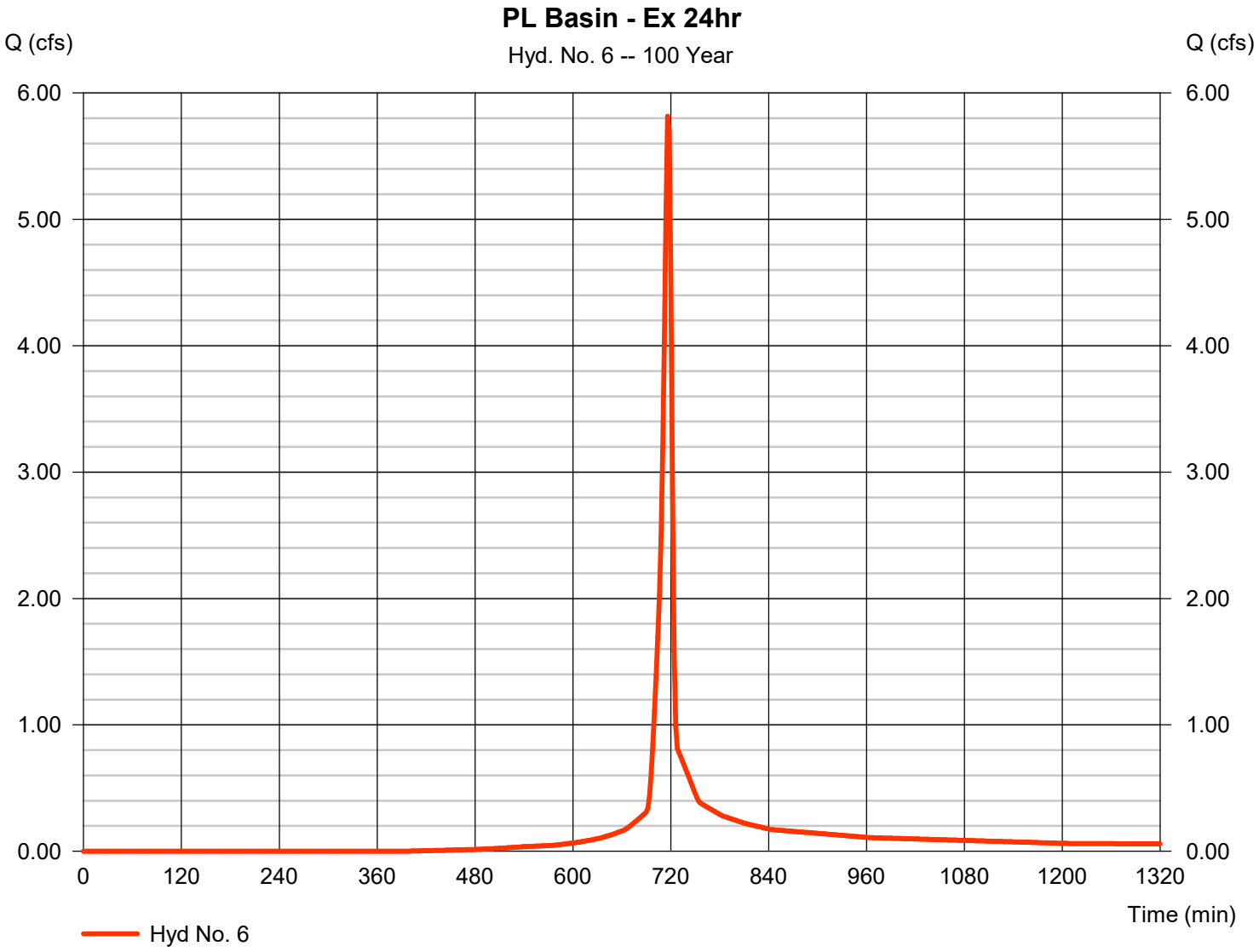
Hydrograph Report

Hyd. No. 6

PL Basin - Ex 24hr

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.815 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	11,896 cuft
Drainage area	=	0.950 ac	Curve number	=	79*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	6.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.193 x 98) + (0.754 x 74)] / 0.950



Appendix B: Post-Developed Conditions

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.188	2	718	494	------	------	------	PL Basin - Ex 1hr
2	SCS Runoff	0.393	2	718	866	------	------	------	PL Basin - Ex 2hr
3	SCS Runoff	0.530	2	718	1,120	------	------	------	PL Basin - Ex 3hr
4	SCS Runoff	0.810	2	718	1,651	------	------	------	PL Basin - Ex 6hr
5	SCS Runoff	1.243	2	718	2,493	------	------	------	PL Basin - Ex 12hr
6	SCS Runoff	1.507	2	718	3,015	------	------	------	PL Basin - Ex 24hr
8	SCS Runoff	0.798	2	718	1,597	------	------	------	PL Basin - Prop 1hr
9	SCS Runoff	1.122	2	718	2,260	------	------	------	PL Basin - Prop 2hr
10	SCS Runoff	1.324	2	716	2,674	------	------	------	PL Basin - Prop 3hr
11	SCS Runoff	1.719	2	716	3,482	------	------	------	PL Basin - Prop 6hr
12	SCS Runoff	2.284	2	716	4,662	------	------	------	PL Basin - Prop 12hr
13	SCS Runoff	2.611	2	716	5,355	------	------	------	PL Basin - Prop 24hr
15	Reservoir	0.340	2	722	1,591	8	749.97	461	RTD PL Basin - 1hr
16	Reservoir	0.395	2	724	2,255	9	750.05	683	RTD PL Basin - 2hr
17	Reservoir	0.419	2	724	2,669	10	750.08	834	RTD PL Basin - 3hr
18	Reservoir	0.506	2	724	3,476	11	750.16	1,125	RTD PL Basin - 6hr
19	Reservoir	0.719	2	724	4,656	12	750.26	1,528	RTD PL Basin - 12hr
20	Reservoir	0.862	2	724	5,350	13	750.31	1,749	RTD PL Basin - 24hr

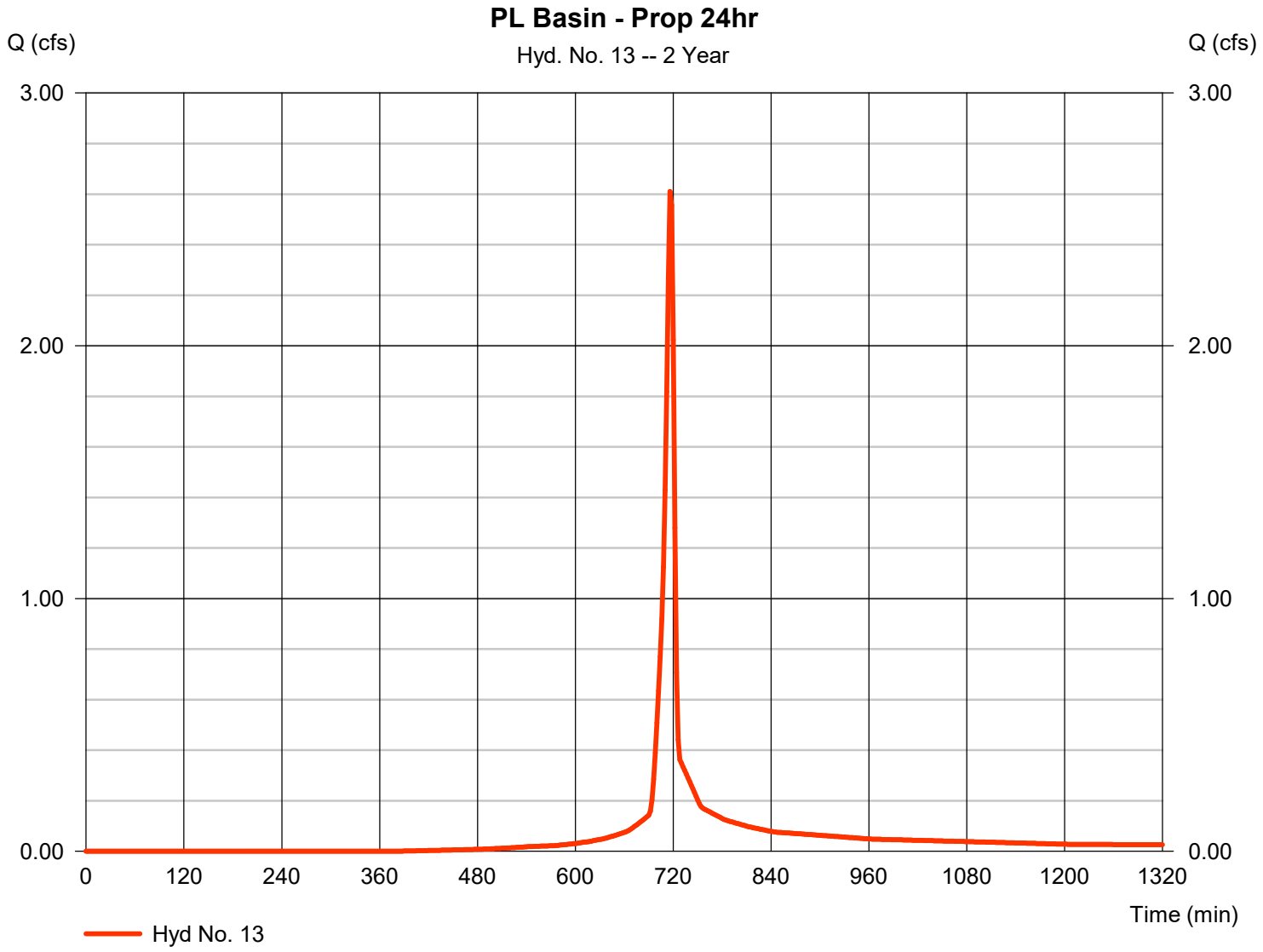
Hydrograph Report

Hyd. No. 13

PL Basin - Prop 24hr

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.611 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	5,355 cuft
Drainage area	=	0.950 ac	Curve number	=	90*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	2.64 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.641 x 98) + (0.306 x 74)] / 0.950



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.790	2	718	1,614	------	------	------	PL Basin - Ex 1hr
2	SCS Runoff	1.243	2	718	2,493	------	------	------	PL Basin - Ex 2hr
3	SCS Runoff	1.507	2	718	3,015	------	------	------	PL Basin - Ex 3hr
4	SCS Runoff	2.061	2	718	4,128	------	------	------	PL Basin - Ex 6hr
5	SCS Runoff	2.640	2	718	5,315	------	------	------	PL Basin - Ex 12hr
6	SCS Runoff	3.247	2	716	6,558	------	------	------	PL Basin - Ex 24hr
8	SCS Runoff	1.692	2	716	3,427	------	------	------	PL Basin - Prop 1hr
9	SCS Runoff	2.284	2	716	4,662	------	------	------	PL Basin - Prop 2hr
10	SCS Runoff	2.611	2	716	5,355	------	------	------	PL Basin - Prop 3hr
11	SCS Runoff	3.268	2	716	6,772	------	------	------	PL Basin - Prop 6hr
12	SCS Runoff	3.926	2	716	8,217	------	------	------	PL Basin - Prop 12hr
13	SCS Runoff	4.585	2	716	9,683	------	------	------	PL Basin - Prop 24hr
15	Reservoir	0.500	2	724	3,421	8	750.15	1,105	RTD PL Basin - 1hr
16	Reservoir	0.719	2	724	4,656	9	750.26	1,528	RTD PL Basin - 2hr
17	Reservoir	0.862	2	724	5,350	10	750.31	1,749	RTD PL Basin - 3hr
18	Reservoir	1.085	2	724	6,766	11	750.42	2,208	RTD PL Basin - 6hr
19	Reservoir	1.277	2	724	8,211	12	750.54	2,684	RTD PL Basin - 12hr
20	Reservoir	1.485	2	724	9,677	13	750.66	3,165	RTD PL Basin - 24hr

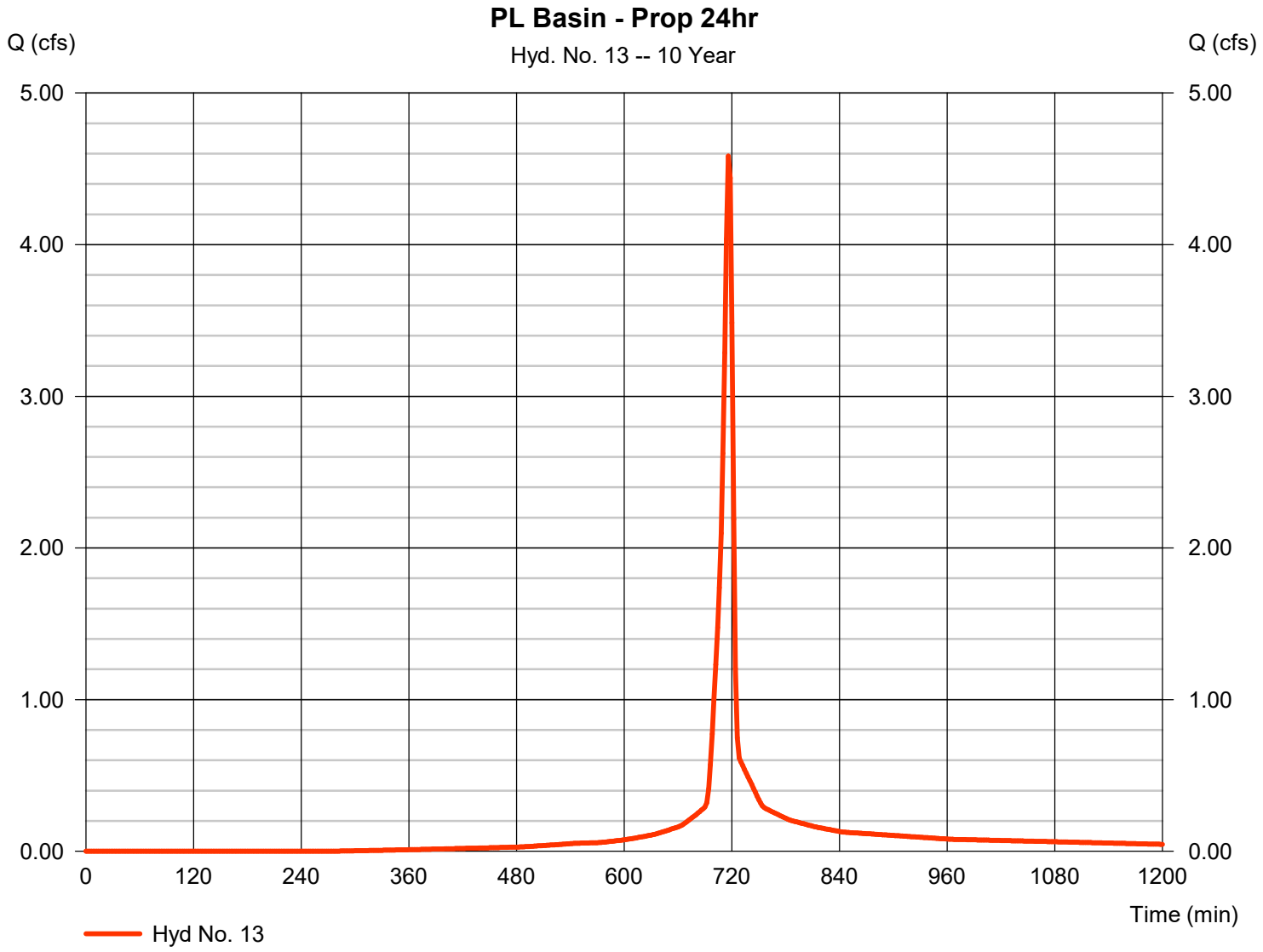
Hydrograph Report

Hyd. No. 13

PL Basin - Prop 24hr

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.585 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	9,683 cuft
Drainage area	=	0.950 ac	Curve number	=	90*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	4.08 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.641 x 98) + (0.306 x 74)] / 0.950



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	1.780	2	718	3,561	------	------	------	PL Basin - Ex 1hr
2	SCS Runoff	2.518	2	718	5,063	------	------	------	PL Basin - Ex 2hr
3	SCS Runoff	2.976	2	716	6,008	------	------	------	PL Basin - Ex 3hr
4	SCS Runoff	3.798	2	716	7,683	------	------	------	PL Basin - Ex 6hr
5	SCS Runoff	4.678	2	716	9,505	------	------	------	PL Basin - Ex 12hr
6	SCS Runoff	5.815	2	716	11,896	------	------	------	PL Basin - Ex 24hr
8	SCS Runoff	2.939	2	716	6,059	------	------	------	PL Basin - Prop 1hr
9	SCS Runoff	3.789	2	716	7,914	------	------	------	PL Basin - Prop 2hr
10	SCS Runoff	4.297	2	716	9,040	------	------	------	PL Basin - Prop 3hr
11	SCS Runoff	5.159	2	716	10,978	------	------	------	PL Basin - Prop 6hr
12	SCS Runoff	6.059	2	716	13,031	------	------	------	PL Basin - Prop 12hr
13	SCS Runoff	7.198	2	716	15,667	------	------	------	PL Basin - Prop 24hr
15	Reservoir	0.976	2	724	6,054	8	750.37	1,977	RTD PL Basin - 1hr
16	Reservoir	1.240	2	724	7,908	9	750.52	2,583	RTD PL Basin - 2hr
17	Reservoir	1.381	2	724	9,034	10	750.61	2,956	RTD PL Basin - 3hr
18	Reservoir	1.900	2	724	10,973	11	750.75	3,535	RTD PL Basin - 6hr
19	Reservoir	2.897	2	722	13,026	12	750.87	4,026	RTD PL Basin - 12hr
20	Reservoir	3.176	2	722	15,661	13	750.99	4,512	RTD PL Basin - 24hr

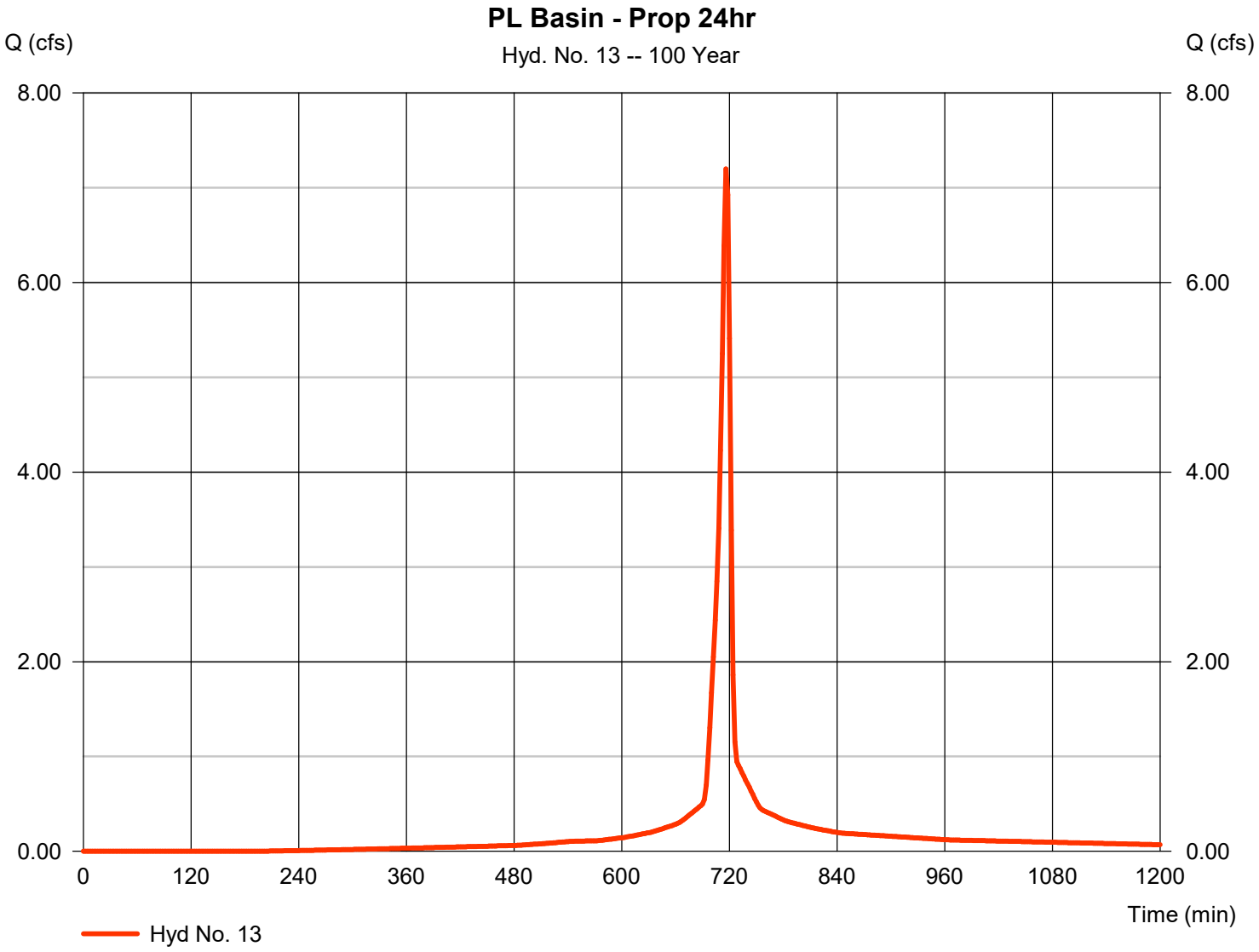
Hydrograph Report

Hyd. No. 13

PL Basin - Prop 24hr

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.198 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	15,667 cuft
Drainage area	=	0.950 ac	Curve number	=	90*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	6.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.641 x 98) + (0.306 x 74)] / 0.950



Appendix C: Detention Calculations

Pond Report

Pond No. 1 - Dry Basin

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 749.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	749.50	00	0	0
0.50	750.00	2,944	491	491
1.50	751.00	5,289	4,059	4,550

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 8.00	Inactive	Inactive	Inactive
Span (in)	= 8.00	0.00	0.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 749.50	0.00	0.00	0.00
Length (ft)	= 10.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 5.00	Inactive	Inactive	Inactive
Crest El. (ft)	= 750.67	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	Yes	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	749.50	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.50	491	750.00	0.36 oc	---	---	---	0.00	---	---	---	---	---	0.364
1.50	4,550	751.00	1.82 ic	---	---	---	2.46	---	---	---	---	---	4.280

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.188	2	718	494	------	------	------	PL Basin - Ex 1hr
2	SCS Runoff	0.393	2	718	866	------	------	------	PL Basin - Ex 2hr
3	SCS Runoff	0.530	2	718	1,120	------	------	------	PL Basin - Ex 3hr
4	SCS Runoff	0.810	2	718	1,651	------	------	------	PL Basin - Ex 6hr
5	SCS Runoff	1.243	2	718	2,493	------	------	------	PL Basin - Ex 12hr
6	SCS Runoff	1.507	2	718	3,015	------	------	------	PL Basin - Ex 24hr
8	SCS Runoff	0.798	2	718	1,597	------	------	------	PL Basin - Prop 1hr
9	SCS Runoff	1.122	2	718	2,260	------	------	------	PL Basin - Prop 2hr
10	SCS Runoff	1.324	2	716	2,674	------	------	------	PL Basin - Prop 3hr
11	SCS Runoff	1.719	2	716	3,482	------	------	------	PL Basin - Prop 6hr
12	SCS Runoff	2.284	2	716	4,662	------	------	------	PL Basin - Prop 12hr
13	SCS Runoff	2.611	2	716	5,355	------	------	------	PL Basin - Prop 24hr
15	Reservoir	0.340	2	722	1,591	8	749.97	461	RTD PL Basin - 1hr
16	Reservoir	0.395	2	724	2,255	9	750.05	683	RTD PL Basin - 2hr
17	Reservoir	0.419	2	724	2,669	10	750.08	834	RTD PL Basin - 3hr
18	Reservoir	0.506	2	724	3,476	11	750.16	1,125	RTD PL Basin - 6hr
19	Reservoir	0.719	2	724	4,656	12	750.26	1,528	RTD PL Basin - 12hr
20	Reservoir	0.862	2	724	5,350	13	750.31	1,749	RTD PL Basin - 24hr

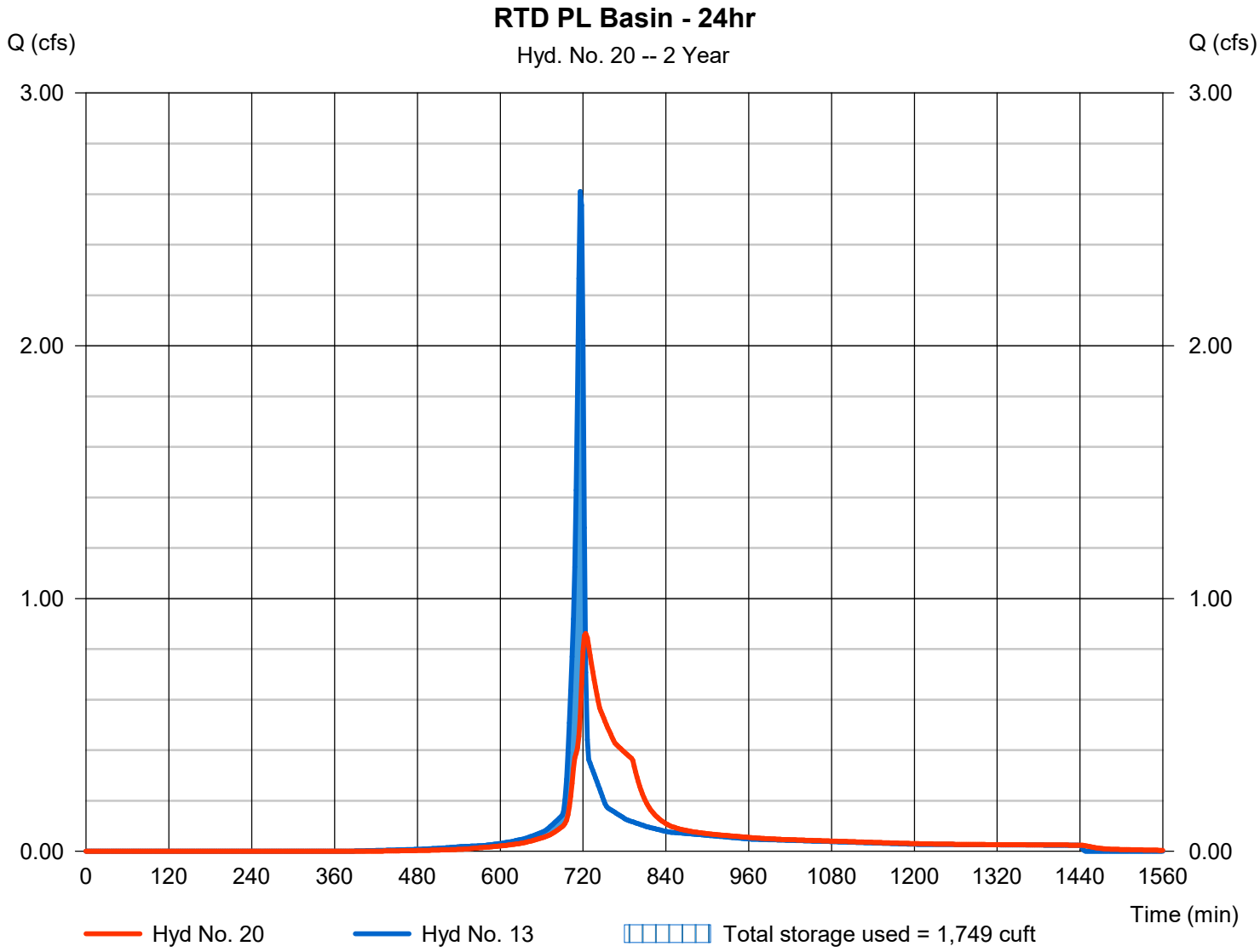
Hydrograph Report

Hyd. No. 20

RTD PL Basin - 24hr

Hydrograph type	=	Reservoir	Peak discharge	=	0.862 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	5,350 cuft
Inflow hyd. No.	=	13 - PL Basin - Prop 24hr	Max. Elevation	=	750.31 ft
Reservoir name	=	Dry Basin	Max. Storage	=	1,749 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.790	2	718	1,614	------	------	------	PL Basin - Ex 1hr
2	SCS Runoff	1.243	2	718	2,493	------	------	------	PL Basin - Ex 2hr
3	SCS Runoff	1.507	2	718	3,015	------	------	------	PL Basin - Ex 3hr
4	SCS Runoff	2.061	2	718	4,128	------	------	------	PL Basin - Ex 6hr
5	SCS Runoff	2.640	2	718	5,315	------	------	------	PL Basin - Ex 12hr
6	SCS Runoff	3.247	2	716	6,558	------	------	------	PL Basin - Ex 24hr
8	SCS Runoff	1.692	2	716	3,427	------	------	------	PL Basin - Prop 1hr
9	SCS Runoff	2.284	2	716	4,662	------	------	------	PL Basin - Prop 2hr
10	SCS Runoff	2.611	2	716	5,355	------	------	------	PL Basin - Prop 3hr
11	SCS Runoff	3.268	2	716	6,772	------	------	------	PL Basin - Prop 6hr
12	SCS Runoff	3.926	2	716	8,217	------	------	------	PL Basin - Prop 12hr
13	SCS Runoff	4.585	2	716	9,683	------	------	------	PL Basin - Prop 24hr
15	Reservoir	0.500	2	724	3,421	8	750.15	1,105	RTD PL Basin - 1hr
16	Reservoir	0.719	2	724	4,656	9	750.26	1,528	RTD PL Basin - 2hr
17	Reservoir	0.862	2	724	5,350	10	750.31	1,749	RTD PL Basin - 3hr
18	Reservoir	1.085	2	724	6,766	11	750.42	2,208	RTD PL Basin - 6hr
19	Reservoir	1.277	2	724	8,211	12	750.54	2,684	RTD PL Basin - 12hr
20	Reservoir	1.485	2	724	9,677	13	750.66	3,165	RTD PL Basin - 24hr

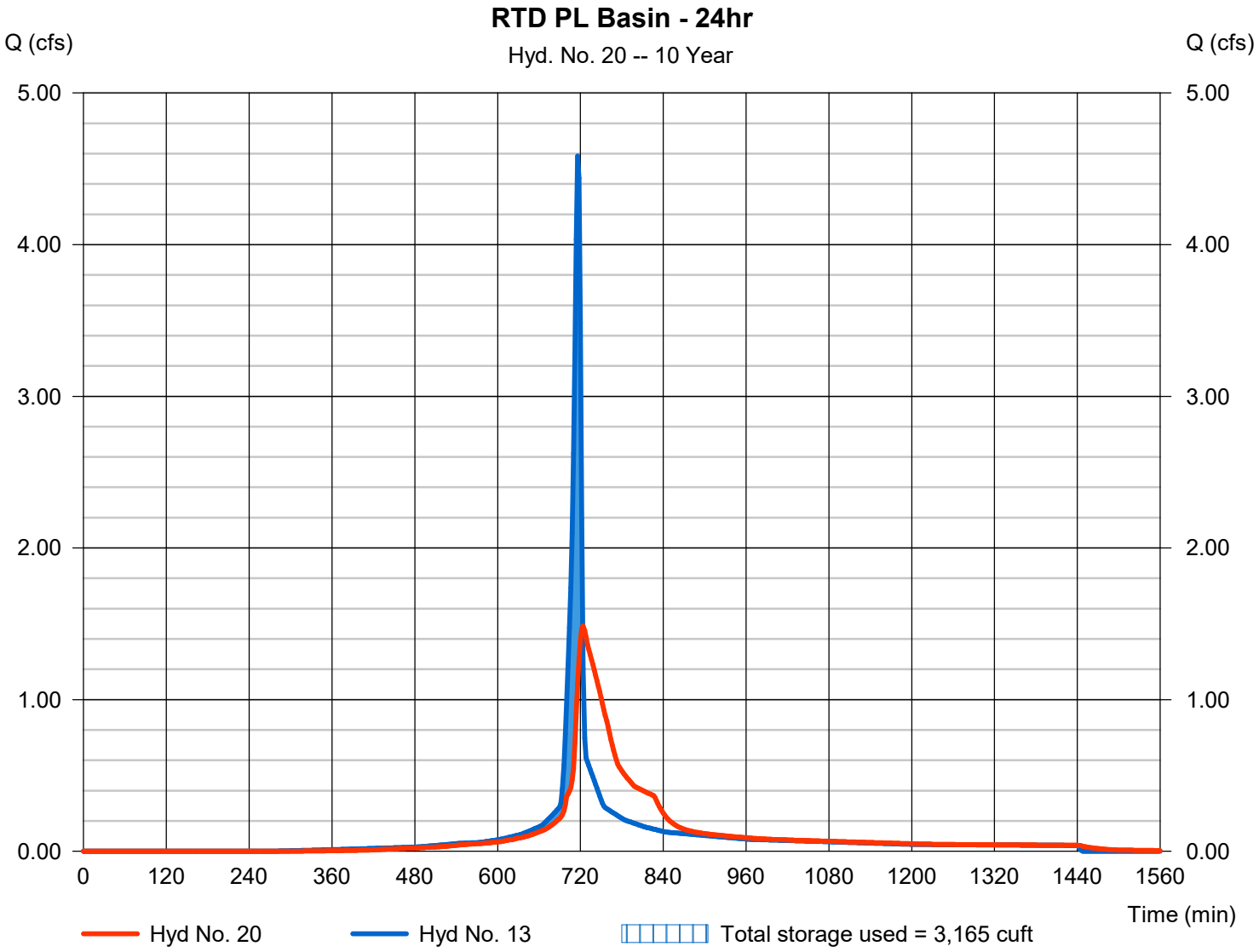
Hydrograph Report

Hyd. No. 20

RTD PL Basin - 24hr

Hydrograph type	=	Reservoir	Peak discharge	=	1.485 cfs
Storm frequency	=	10 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	9,677 cuft
Inflow hyd. No.	=	13 - PL Basin - Prop 24hr	Max. Elevation	=	750.66 ft
Reservoir name	=	Dry Basin	Max. Storage	=	3,165 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	1.780	2	718	3,561	------	------	------	PL Basin - Ex 1hr
2	SCS Runoff	2.518	2	718	5,063	------	------	------	PL Basin - Ex 2hr
3	SCS Runoff	2.976	2	716	6,008	------	------	------	PL Basin - Ex 3hr
4	SCS Runoff	3.798	2	716	7,683	------	------	------	PL Basin - Ex 6hr
5	SCS Runoff	4.678	2	716	9,505	------	------	------	PL Basin - Ex 12hr
6	SCS Runoff	5.815	2	716	11,896	------	------	------	PL Basin - Ex 24hr
8	SCS Runoff	2.939	2	716	6,059	------	------	------	PL Basin - Prop 1hr
9	SCS Runoff	3.789	2	716	7,914	------	------	------	PL Basin - Prop 2hr
10	SCS Runoff	4.297	2	716	9,040	------	------	------	PL Basin - Prop 3hr
11	SCS Runoff	5.159	2	716	10,978	------	------	------	PL Basin - Prop 6hr
12	SCS Runoff	6.059	2	716	13,031	------	------	------	PL Basin - Prop 12hr
13	SCS Runoff	7.198	2	716	15,667	------	------	------	PL Basin - Prop 24hr
15	Reservoir	0.976	2	724	6,054	8	750.37	1,977	RTD PL Basin - 1hr
16	Reservoir	1.240	2	724	7,908	9	750.52	2,583	RTD PL Basin - 2hr
17	Reservoir	1.381	2	724	9,034	10	750.61	2,956	RTD PL Basin - 3hr
18	Reservoir	1.900	2	724	10,973	11	750.75	3,535	RTD PL Basin - 6hr
19	Reservoir	2.897	2	722	13,026	12	750.87	4,026	RTD PL Basin - 12hr
20	Reservoir	3.176	2	722	15,661	13	750.99	4,512	RTD PL Basin - 24hr

Hydrograph Report

Hyd. No. 20

RTD PL Basin - 24hr

Hydrograph type	=	Reservoir	Peak discharge	=	3.176 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	15,661 cuft
Inflow hyd. No.	=	13 - PL Basin - Prop 24hr	Max. Elevation	=	750.99 ft
Reservoir name	=	Dry Basin	Max. Storage	=	4,512 cuft

Storage Indication method used.