TABLE 9. DIRECT FLOW / DIVERSION ELEMENTS

Direct Flow Elements	Inflow Element(s) / and Subbasins	Outflow Element(s)	Q_2 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)	Description	Diversion
3006	Sub. 160, Sub. 162, Div. 3002	CE. 79, Div. 4000	9	19	43	Subbasins 160 and 162 outfall	Y
4000	CE. 79	-	13	108	218	Outfall from Canyon Lake School Detention	N
4002	CE. 85, CE. 95, Sub. 300, Div. 4004, Div. 4014	CE. 83, Div. CLSD	35	103	187	Summing flows for input to downstream connection	Y
4004	CE. 87, Sub. 296, Div. 4006	CE. 85, Div. 4002	18	60	110	Summing flows for input to downstream connection	Y
4006	CE. 89, Sub. 294, Div. 4008	CE. 87, Div. 4004	13	39	70	Summing flows for input to downstream connection	Y
4008	CE. 91, Sub. 292, Div. 4010	CE. 89, Div. 4006	13	38	67	Summing flows for input to downstream connection	Y
4010	CE. 93, Sub. 290, Div. 4012	CE. 91, Div. 4008	7	15	26	Summing flows for input to downstream connection	Y
4012	Sub. 288	CE. 93, Div. 4010	4	9	15	Subbasin 288 outfall	Y
4014	Sub. 302	CE. 95, Div. 4002	20	55	95	Subbasin 302 outfall	Y
5000	CE. 97, Sub. 250	-	78	223	268	Summing flows for input to downstream connection	N
5002	CE. 99, Sub. 252	CE. 97, Div. 6014	74	213	296	Summing flows for input to downstream connection	Y
5004	CE. 101, Sub. 254, Div. 5006	CE. 99, Div. 7024	72	207	285	Summing flows for input to downstream connection	Y
5006	CE. 103, CE. 115, Sub. 256, Sub. 258, Div. 7040	CE. 101, Div. 5004	68	198	332	Summing flows for input to downstream connection	Y
5008	CE. 105, Sub. 260, Div. 5010	CE. 103, Div. 7040	64	203	360	Summing flows for input to downstream connection	Y
5010	CE. 107, CE. 111, Div. 5012, Div. 5016	CE. 105, Div. 5008	59	188	332	Confluence for Elements 107 and 111	Y
5012	CE. 109, Sub. 272	CE. 107, Div. 5010	11	36	63	Summing flows for input to downstream connection	Y
5014	Sub. 280	CE. 109	7	25	44	Subbasin 280 outfall	N
5016	CE. 113, Sub. 266, Sub. 270, Div. 5018	CE. 111, Div. 5010	48	152	269	Summing flows for input to downstream connection	Y
5018	Sub. 268	CE. 113, Div. 5018	30	84	143	Subbasin 268 outfall	Y
5020	CE. 117, Sub. 262	CE. 115	2	4	7	Summing flows for input to downstream connection	N
5022	CE. 143	CE. 117	0	0	2	Channel for Cedar Canyon Dam outfall	N
5024	CE. 139, Div. 5026	Div. 6000	14	28	45	Outfall to Rapid Creek	Y
5026	Sub. 210	CE. 139, Div. 5024	14	28	45	Subbasin 210 outfall	Y
5028	Sub. 214, Div. 5030	-	7	14	29	Subbasin 214 outfall	N
5030	CE. 141, Sub. 216	Div. 5028	12	25	41	Summing flows for input to downstream connection	Y
5032	Sub. 218, Sub. 220, Div. 5034	CE. 141	6	12	20	Subbasins 218 and 220 outfall	N
5034	Sub. 222	Div. 5032	4	9	14	Subbasin 222 outfall	Y
6000	CE. 119, Sub. 212, Div. 5024, Div. 6002	-	40	100	378	Summing flows for input to downstream connection	N
6002	CE. 121, CE. 135, Sub. 208, Div. 6004	CE. 119, Div. 6004	35	76	330	Summing flows for input to downstream connection	Y
6004	CE. 123, Sub. 202, Div. 7016	CE. 121, Div. 6002	17	38	266	Summing flows for input to downstream connection	Y
6006	CE. 131, Sub. 200	CE. 123	14	30	96	Summing flows for input to downstream connection	N

TABLE 9. DIRECT FLOW / DIVERSION ELEMENTS

Direct Flow Elements	Inflow Element(s) / and Subbasins	Outflow Element(s)	Q_2 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)	Description	Diversion
6014	Sub. 198, Div. 5002	CE. 131	6	12	67	Subbasin 198 outfall	N
6018	CE. 137, Sub. 206	CE. 135	13	27	45	Summing flows for input to downstream connection	N
6020	Sub. 204	CE. 137	8	18	29	Subbasin 204 outfall	N
7000	CE. 8002, Sub. 100, Div. 7002	CE. 8000, Div. 2000	223	589	883	Summing flows for input to downstream connection	Y
7002	CE. 8004, Sub. 102, Div. 7004	CE. 8002, Div. 7000	219	580	864	Summing flows for input to downstream connection	Y
7004	CE. 8006, CE. 8008, CE. 8014, Sub. 114, Sub. 104, Div. 7006, Div. 7014, Div. 7008	CE. 8004, Div. 7002	215	570	845	Summing flows for input to downstream connection	Y
7006	CE. 29, CE. 31, Sub. 118, Sub. 120, Div. 7008	CE. 8006, Div. 1010	15	31	51	Summing flows for input to downstream connection	Y
7008	CE. 8016, Sub. 106, Sub. 122	CE. 8008, Div. 7004	92	216	328	Summing flows for input to downstream connection	Y
7010	Sub. 112, Div. 7014	CE. 8010	6	13	104	Subbasin 112 outfall	N
7012	CE. 8010, Sub. 110, Sub. 152	CE. 8012, Div. 2000	19	38	134	Summing flows for input to downstream connection	Y
7014	CE. 7, CE. 37, CE. 8040, Sub. 116, Div. 1038	CE. 8014, Div. 7010	106	313	529	Summing flows for input to downstream connection	Y
7016	CE. 7018, CE. 8018, Sub. 124, Div. 7018	CE. 8016, Div. 6004	83	197	451	Summing flows for input to downstream connection	Y
7018	CE. 8022, Sub. 196, Div. 7020	CE. 8020, Div. 7018	13	69	301	Summing flows for input to downstream connection	Y
7020	CE. 8024, Sub. 194, Div. 1018, Div. 1020, Div. 7022	CE. 8022, Div. 7018	9	62	288	Summing flows for input to downstream connection	Y
7022	CE. 8026, Sub. 192, Div. 1024, Div. 7024	CE. 8024, Div. 7020	6	35	192	Summing flows for input to downstream connection	Y
7024	CE. 8046, Div. 5004	CE. 8026, Div. 7022	0	13	125	Summing flows for input to downstream connection	Y
7028	Div. 7038	CE. 8030	0	0	127	Overflow Channel	N
7032	Div. 1050	CE. 8034, Div. 1054	11	102	210	Proposed 36" RCP, upstream end	Y
7034	Div. 1046	CE. 8044, Div. 7036	17	161	324	Proposed parallel storm sewer	Y
7036	CE. 8044, Div. 7034	CE. 8042, Div. 1044	16	161	324	Proposed parallel storm sewer	Y
7038	CE. 8042, Div. 1042	CE. 8040, Div. 7028	16	130	287	Proposed parallel storm sewer	Y
7040	Div. 5008	CE. 8046, Div. 7024	0	14	171	Proposed parallel storm sewer	Y

4.4 Detention Elements

Detention of water is the temporary storage of runoff with a controlled release to a downstream watercourse. Detention is very effective at reducing peak flows and increasing time to peak. Detention facilities are most effective when placed in the upper reaches of tributaries to a main channel because less storage is required.

There are two (2) existing detention facilities in the RDDBDP, Cedar Canyon Dam and Canyon Lake Elementary School Detention. No improvements are recommended for either facility.

The Hartland Court Stormwater Quality Facility is a low-flow channel that can be seen in more detail in Appendix D.

Element Cedar Canyon Dam

Location: Cedar Canyon Dam is an existing detention cell located approximately 0.8 miles northwest of Canyon Lake Drive and Jackson Boulevard intersection.

Modeled Element:

Cedar Canyon Dam		
Elevation (ft)	Discharge (cfs)	Storage (Ac-ft)
3517	0	36.2
3525	4	77.9
3540	34	186.6
3545	49	258.5
3550	1185	354.8
3554	3297	455.6

Required Improvements: No improvements are necessary. This facility was designed and constructed by the United States Army Corps of Engineers as a flood control facility to protect the downstream residential area.

The pond receives flow from approximately 270 acres on the west end of the study area from Subbasin 304. The storage vs. discharge, elevation vs. discharge, and elevation vs. storage curves were taken from the original RDDBDP produced by the Alliance of Architects & Engineers in 1992.

The peak inflow is 244 cfs and the peak outflow is 2 cfs. Available storage capacity is 258.5 acre-feet. Invert of the 24" outlet is at an elevation of 3526. Peak 100 year storage is 52.5 acre-feet. Top of pool elevation at peak 100-year discharge is at approximate elevation 3520.1 and the bottom of the pond is at approximate elevation 3517.

A hydrograph for Cedar Canyon dam is not provided due to the fact that little flow is released from the structure. Cedar Canyon dam is in fact a retention pond for rainfall events up through the 100-year rainfall. The structure is large enough to contain all 100-year flows without discharging.

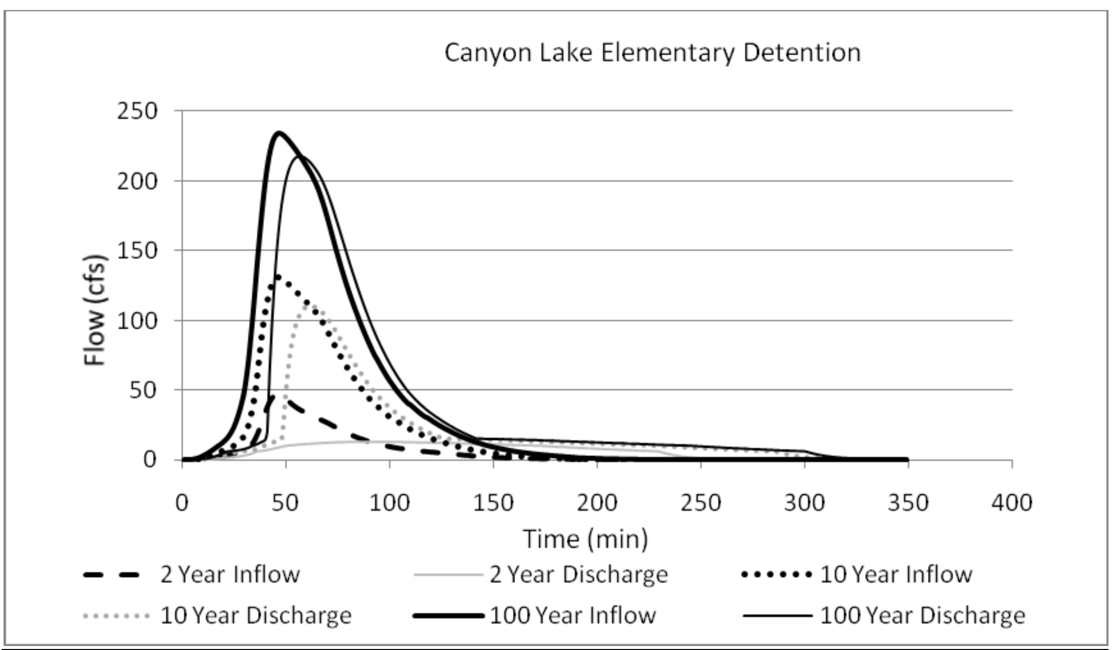
Element Canyon Lake Elementary Detention

Location: Canyon Lake Elementary Detention is an existing element located on the southwest corner of 32nd Street and Canyon Lake Drive.

Modeled Element:

Canyon Lake School Detention		
Elevation (ft)	Discharge (cfs)	Storage (Ac-ft)
3302	0	0
3303	6	0.1
3304	10	0.7
3305	15	2.1
3306	295	3.9

Required Improvements: No improvements recommended. The pond receives discharge from the Subbasin 288 thru 302. The peak 100-year inflow is 234-cfs and the peak discharge is 218-cfs. Storage in this pond is 3.4 acre-feet. Top of pool is at approximate elevation 3305.7 and the pond bottom is at approximate elevation 3302. The outlets are three (3) 18” RCP’s in the pond bottom and the top of 32nd Street is the overflow weir. The storage vs. discharge, elevation vs. discharge, and elevation vs. storage data were extracted from the original DBDP produced by the Alliance of Architects & Engineers in 1992.



5.0 Cost Estimate

Preliminary cost opinions of the DBDPA recommendations have been prepared for this study. These estimates have been prepared using the most recent available bid information on City Public Works projects. A 35% contingency has been added to all recommended improvements. This contingency includes a 10% construction contingency and a 25% indirect contingency to account for unknown circumstances, implementation time for this DBDPA and administrative, legal and engineering fees.

Except in the case of the Evergreen Drive/Cottonwood Street Outfall construction costs, no utility reconstruction was included in the cost of the drainage facilities. Street patches, curb and gutter and sidewalk were included in the construction cost opinions for all facilities. Utility reconstruction costs for the Evergreen Drive/Cottonwood Street Outfall were included since this is a project that will be completed in the near future.

In providing these opinions of probable construction cost, the City must understand that Ferber Engineering Company has no control over the cost or availability of labor, equipment or materials or over market conditions or contractors' methods of pricing. These preliminary opinions are made based on Ferber Engineering Company's professional judgment and experience. Ferber Engineering Company makes no warranty, expressed or implied, that the cost of the work will not vary from this preliminary opinion of probably construction cost.

The engineering opinion of probable construction cost is approximately $5.2 million to make all of the prescribed improvements made in the DBDPA. This results in a per acre cost of approximately $6,050 over the 858 acre Red Dale Drainage Basin. Table 10 presents the detailed opinion of probable cost. Only the facilities requiring improvements are shown.

The original DBDP opinion of probable construction cost was approximately $2.7 million. The differences in the estimates are largely due to the increase in cost of materials and construction labor over 18 years. Additionally, this DBDPA incorporates stormwater quality features that previously were not required by federal law.

5.1 Improvement Prioritization

Table 11 presents the recommended drainage improvement prioritization for the DBDPA. The elements are listed from the greatest priority to the lowest priority.

The first priority, as established by the City, is the construction of the Evergreen Drive / Cottonwood Street outfall. This facility will provide the outfall of approximately 265 acres of fully-developed basin directly to Rapid Creek. The construction of this outfall will also include the construction of a stormwater quality treatment facility. Once the outfall is constructed, the Dover Street Channel recommendation described in the Stormwater Quality section of this study can be completed as soon as practicable.

Table 10. Red Dale DBDPA Recommended Improvement Cost Opinion

Element	General Description	Total Cost
7	Channel Improvements	$16,200.00
39	24" RCP Addition	$20,026.00
53	Intersection Improvements	$119,166.53
63	36" RCP Addition	$185,080.95
89	Intersection Improvements	$72,712.35
91	Intersection Improvements	$57,511.35
97	Intersection Improvements	$108,985.50
119	36" RCP Addition	$63,113.85
121	24" RCP Addition	$69,692.40
8006	42" RCP Addition	$130,243.95
8008	72" RCP Addition	$399,369.15
8012	42" RCP Addition	$119,260.35
8016	72" RCP Addition	$353,462.40
8018	60" RCP Addition	$143,629.20
8020	48" RCP Addition	$128,090.70
8022	48" RCP Addition	$102,273.30
8024	36" RCP Addition	$116,472.60
8026	36" RCP Addition	$107,246.70
8034	36" RCP Addition	$203,634.00
8040	60" RCP Addition	$362,893.50
8042	54" RCP Addition	$67,154.40
8044	48" RCP Addition	$109,266.30
8046	36" RCP Addition	$155,042.10
Existing Dover Channel	Pervious Channel	$107,447.18
Hartland SWQ	Detention Facility	$165,540.00
Cottonwood and Evergreen (8000, 8002, 8004, 8014)	See Phase III Plans/App C	$1,826,543.25
Total (incl 35% contingency)		**$5,190,797,65**

NOTE: Total does not include Element 8012. It is assumed that the Existing Dover Channel will be constructed in lieu of Element 8012.

Table 11. Red Dale DBDPA Improvement Prioritization

Element	General Description	Total Cost
8000	See Phase III Plans/App C	--
8002	See Phase III Plans/App C	--
8004	See Phase III Plans/App C	--
8014	See Phase III Plans/App C	--
Existing Dover Channel	Pervious Channel	$107,447.18
8012	42" RCP Addition	$119,260.35
39	24" RCP Addition	$20,026.00
7	Channel Improvements	$16,200.00
8040	60" RCP Addition	$362,893.50
8042	54" RCP Addition	$67,154.40
8044	48" RCP Addition	$109,266.30
8008	72" RCP Addition	$399,369.15
8016	72" RCP Addition	$353,462.40
8018	60" RCP Addition	$143,629.20
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8026	36" RCP Addition	$107,246.70
8046	36" RCP Addition	$155,042.10
8006	42" RCP Addition	$130,243.95
53	Intersection Improvements	$119,166.53
8034	36" RCP Addition	$203,634.00
63	36" RCP Addition	$185,080.95
97	Intersection Improvements	$108,985.50
89	Intersection Improvements	$72,712.35
91	Intersection Improvements	$57,511.35
119	36" RCP Addition	$63,113.85
121	24" RCP Addition	$69,692.40

NOTE: Element 8012 is given priority, but if Existing Dover Channel is constructed Element 8012 can be removed from consideration. It is assumed that the Existing Dover Channel will be constructed in lieu of Element 8012.

6.0 Storm Water Quality

The National Pollutant Discharge Elimination System (NPDES) permit program is designed to track point sources, which are single identifiable sources that discharge pollutants into the environment, and require the implementation of controls necessary to minimize the discharge of pollutants. The NPDES program was created within the framework of the Clean Water Act in 1972 with the intention of requiring authorization to discharge pollutants to Waters of the United States.

On March 10, 2003, NPDES Phase II went into effect on a nationwide basis. Essentially, the NPDES Phase II is the latest phase of Section 402(p) of the Clean Water Act. The permit requires that local governments with municipal separate storm sewer systems (MS4) that serve less than 100,000 people or have a population density of 1,000 persons per square mile must obtain NPDES permit coverage in order to discharge stormwater. Rapid City is a Phase II community and is covered under the ***South Dakota General Surface Water Discharge Permit for Small Municipal Separate Storm Sewer Systems***.

The NPDES Phase II program contains largely nonstructural requirements, such as, public education and outreach, public participate and involvement, illicit discharge detection and elimination, construction site and post-construction stormwater runoff control and pollution control/municipal operations good housekeeping.

There are structural controls required NPDES Phase II for municipalities. These structural controls fall under two categories: temporary (construction) and permanent (post-construction). Temporary structural controls would include items such as temporary runon control upstream of construction and sediment basins at the outfall(s) from disturbed construction sites. Permanent controls include permanent sediment capacity within detention cells, grassed buffer strips, etc.

For compliance with NPDES Phase II, the State's General Permit and with regard to the Section 303(d) Impaired-Waters Assessment *Lower Rapid Creek Watershed Assessment and TMDL Development* (completed by SDSM&T), the City of Rapid City developed a Stormwater Quality Manual (SQM) that became effective in late 2007. In addition to the SQM, the City developed ordinances to better control stormwater quality. The 2007 SQM and associated ordinances were revised and updated in 2009.

One of the many goals of this DBDPA is to provide for some level of regional stormwater quality treatment. Open channels, manmade wetlands, bioretention areas and bioswales and other water quality features have been incorporated into the design plan at least implicitly. Specifically, two priority areas for stormwater quality treatment facilities are the Dover Street Channel and the Cottonwood Street Outfall.

6.0.1 Dover Street Channel:

The Dover Street Channel currently extends from Element 1002 at Leland Lane to Element 7014 at Evergreen Drive. Based on the previously discussed proposed improvements, the upstream flows that currently enter the channel at Evergreen Drive will now discharge to Rapid Creek via

Cottonwood Street. It is the intention of this study to continue to allow the overland flow of Subbasins 152 and 154 to enter the Dover Street Channel. *(The DBDPA currently shows intercepting the Dover Street Channel at the intersection of Sun Valley Drive and Dover Street. This recommendation will change if this stormwater quality option is accepted by the City.)* However, rather than leaving the Dover Street Channel in its unkempt, unsightly, unsafe state, this DBDPA proposes to create a water quality facility while maintaining the water quantity functionality.

The proposed channel modification is essentially a French drain. The proposed solution includes placing an 18-inch (or larger) perforated pipe. The pipe can either be corrugated metal or HDPE. Layers of clean rock and sand will be used to raise the invert of the channel approximately three to four feet. The top six inches of the new channel would be modified topsoil consisting of a sand/soil mix. The new channel would have an approximate depth of about 1.5 feet. Overflow storm inlets would be placed at designed intervals to minimize stormwater flows escaping the channel. The inlets would be connected to the underdrain system, which in turn would be connected to the existing Leland Lane 42-inch storm sewer. The approximate cost of this facility, including the 35% contingency is approximately $110,000.

The creation of the facility can be completed rather inexpensively and should provide a substantial decrease in mosquito complaints, maintenance and increase in the aesthetics of the neighborhood. This facility will provide an estimated underground storage volume of about 0.5 ac-ft along its 1,200 foot length. Not only can reduced peak flows be expected, but a substantial reduction in total suspended solids (TSS) can be expected, thereby also addressing stormwater quality aspects.

Maintenance of the facility would include periodic mowing of the surface and possible jetting of the drain pipe through the inlets.

6.0.2 Cottonwood Street Outfall:

As shown in this DBDPA, the goal is to route as much stormwater runoff to Cottonwood Street as possible and practical. The major facility improvements for the for this outfall include 750 feet of double cell 10-foot by 4-foot box culvert (Elements 8002 and 8004) in Cottonwood Street, 500 feet of single cell 9-foot by 4-foot box culvert (Element 8014) in Evergreen Drive, 44 feet of single cell 6-foot by 4-foot box culvert to serve as the outfall for the Evergreen Drive Pond, concrete drop structure from the end of the double 10-foot by 4-foot box culvert, a 20-foot wide earthen channel and a gabion drop structure into Rapid Creek. The proposed facility requires relocation of a portion of the Leonard “Swanny” Swanson Memorial Bike Path will need to be relocated to accommodate the proposed drop structure into Rapid Creek. Additional pedestrian access is provided to Cottonwood Street, as requested by many residents in the questionnaires. Conceptual plan and profile drawings are included in Appendix C.

A stormwater quality treatment channel will be incorporated into the recommended outfall facilities. Due to limited room for detention and with concerns regarding mosquitoes, the recommend facility is a grass-lined channel with and underdrain system. A conceptual plan view is provided in Appendix D.

The stormwater quality channel will accept flows from a proposed 36-inch reinforced concrete arch positioned in the south wall of the proposed box culvert drop structure just upstream from the downstream sill. The invert of the proposed pipe will be approximately 2.5 feet below the invert of the earthen channel. By setting the "intake" in this location, it technically will be within the conjugate depth of a hydraulic jump that will be forced to form in the stilling basin of the drop structure. This should limit hydraulic interference during high flow events. In addition to the high flow hydraulic considerations, the pipe (and the stormwater quality facility) will accept all flows under the 2-year rainfall collected by the upstream system.

This proposed pipe then discharges to an open channel with a six-foot bottom. Additional "shoulders" are recommended that extend out from the flat bottom approximately 10-feet on either side and are sloped up at 10H:1V. The cut slopes above the 10:1V slope will vary. At various locations it will be necessary to construct Redi-Block retaining structures in order limit disturbance of the root system for the large cottonwood trees.

The proposed channel will meander along an approximate length of 750 feet at a longitudinal slope of 0.0025 ft/ft. Because the channel slope is shallow, and to minimize the potential to develop ponding where mosquitoes can hatch, a 6-inch PVC under drain system is proposed. This under drain system will be bedded in select granular backfill to within 6 inches of the surface, where sandy loam topsoil will be placed. It may be necessary to cap the topsoil with a permanent turf reinforcement matting to help vegetation establishment and long-term topsoil stability.

As briefly outlined above, the bike path will need some minor realignments to accommodate the proposed facilities. The downstream end of the channel is near the present day bike path. From this point, the stormwater quality facility will discharge to another 36-inch arch pipe that will outfall to the proposed gabion drop structure of the proposed flood channel.

Issues involved with this proposed facility include the depth and location of the existing 18-inch trunk sanitary sewer and groundwater. Groundwater elevations have been measured since April 2009 and have been accounted for in the conceptual design grades. Calculation information and other notes are provided on the conceptual layout in Appendix E.

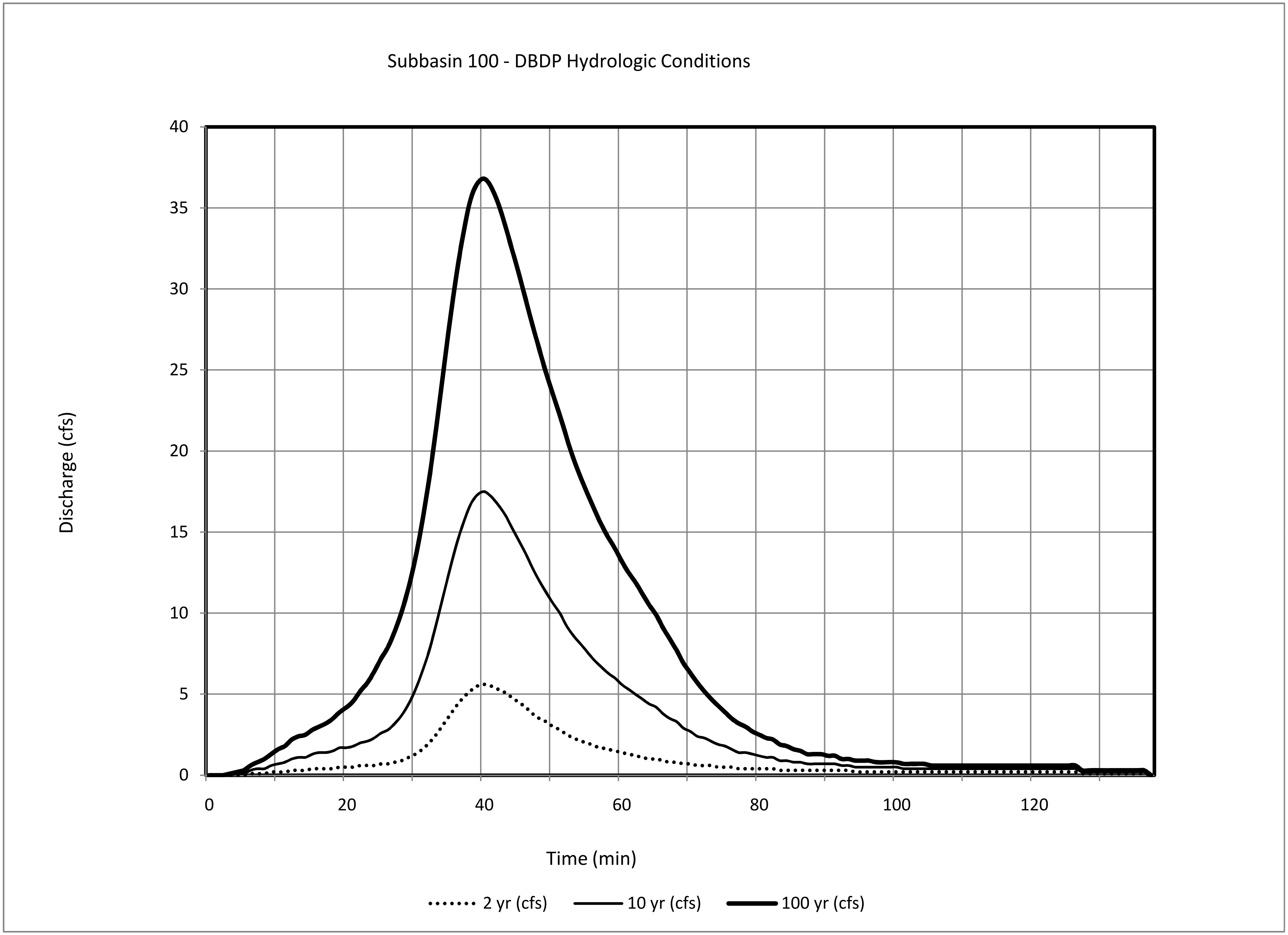
Maintenance of the facility should be limited to mowing of the stormwater channel, spot repairs to the channel from erosion and potential jetting of the 6-inch PVC under drain system. The drop structure from the box culvert should be self-cleaning and should only require minor maintenance as a result.

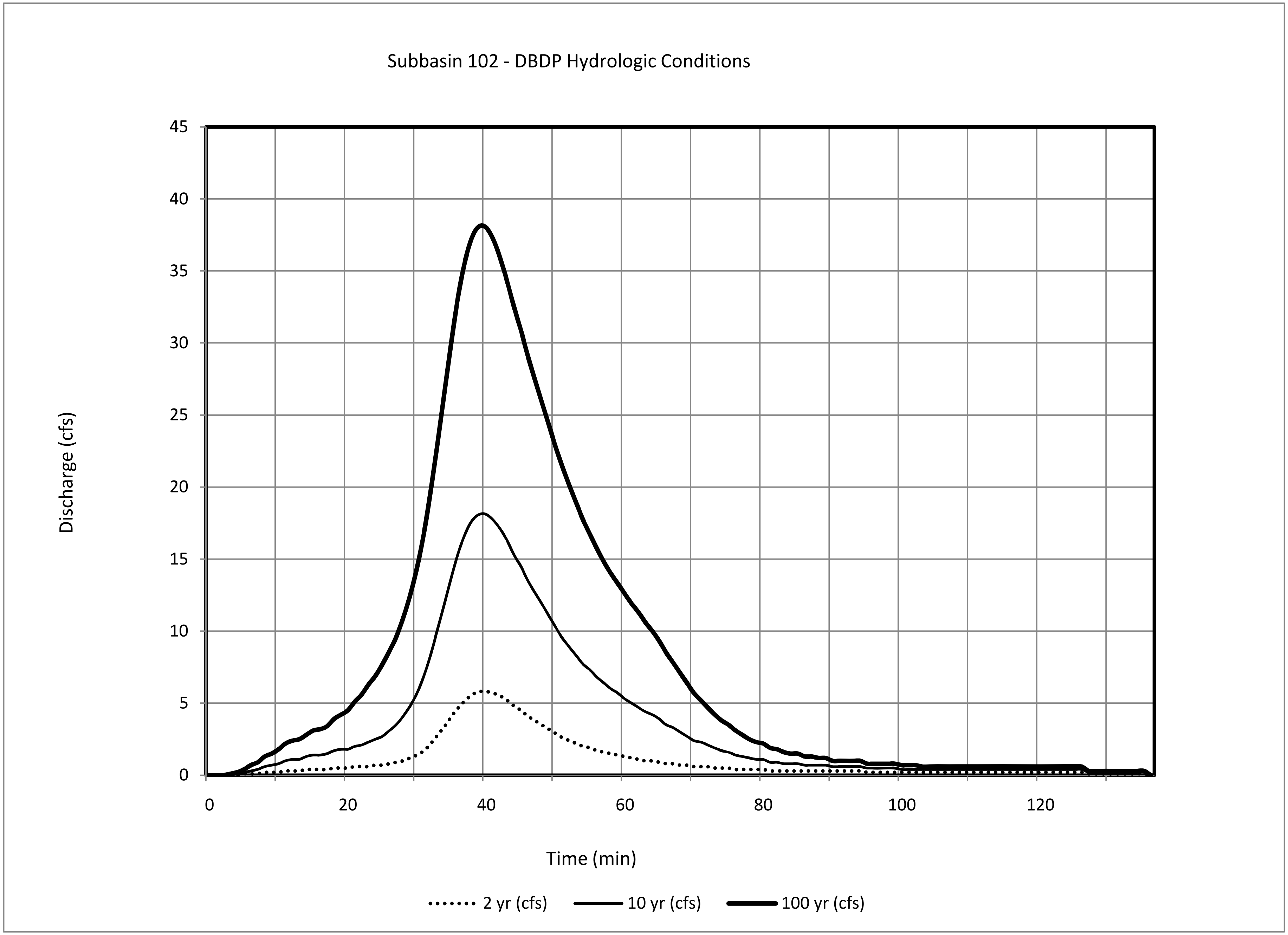
Ferber Engineering Company, Inc.

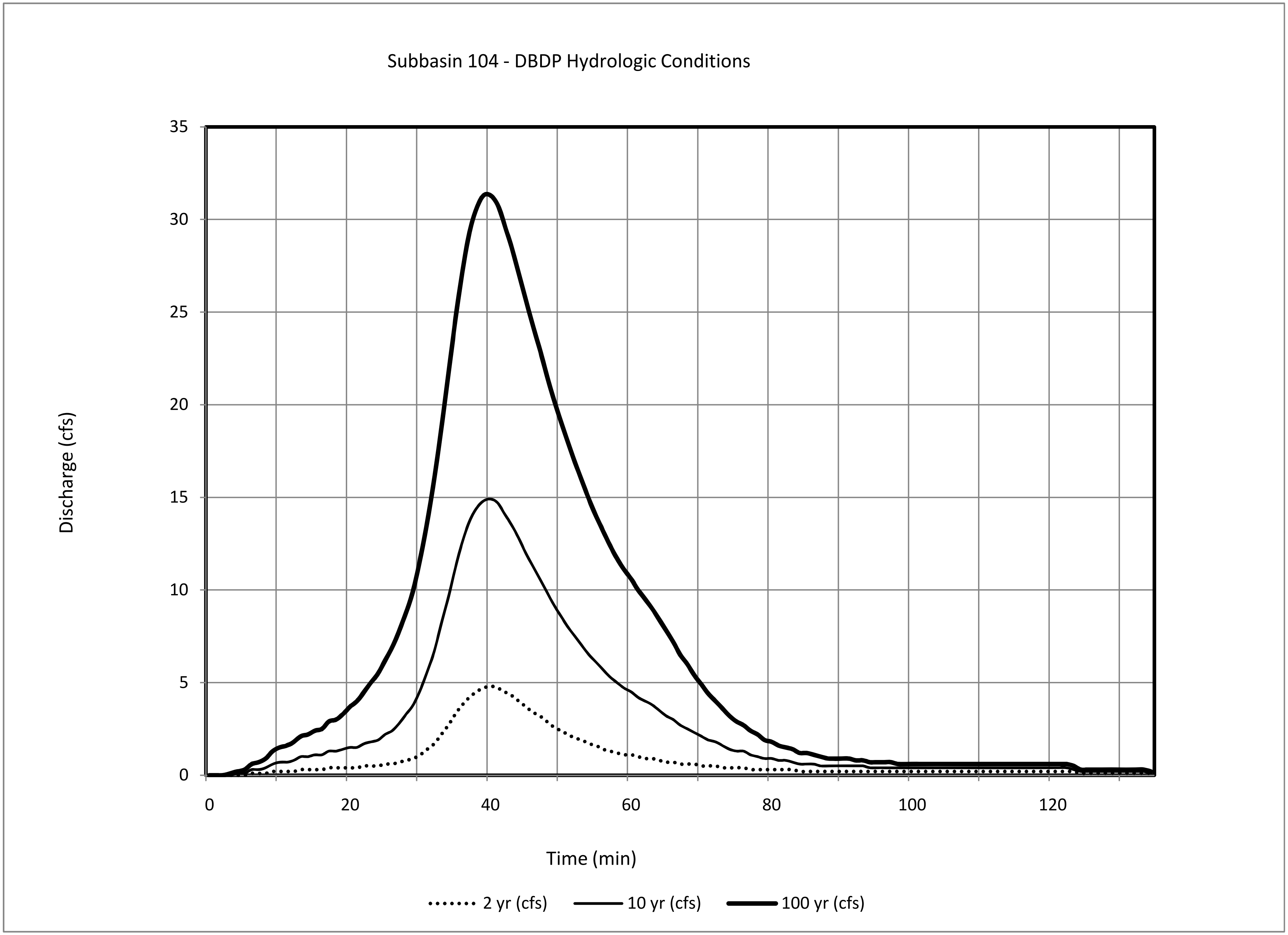
APPENDIX A

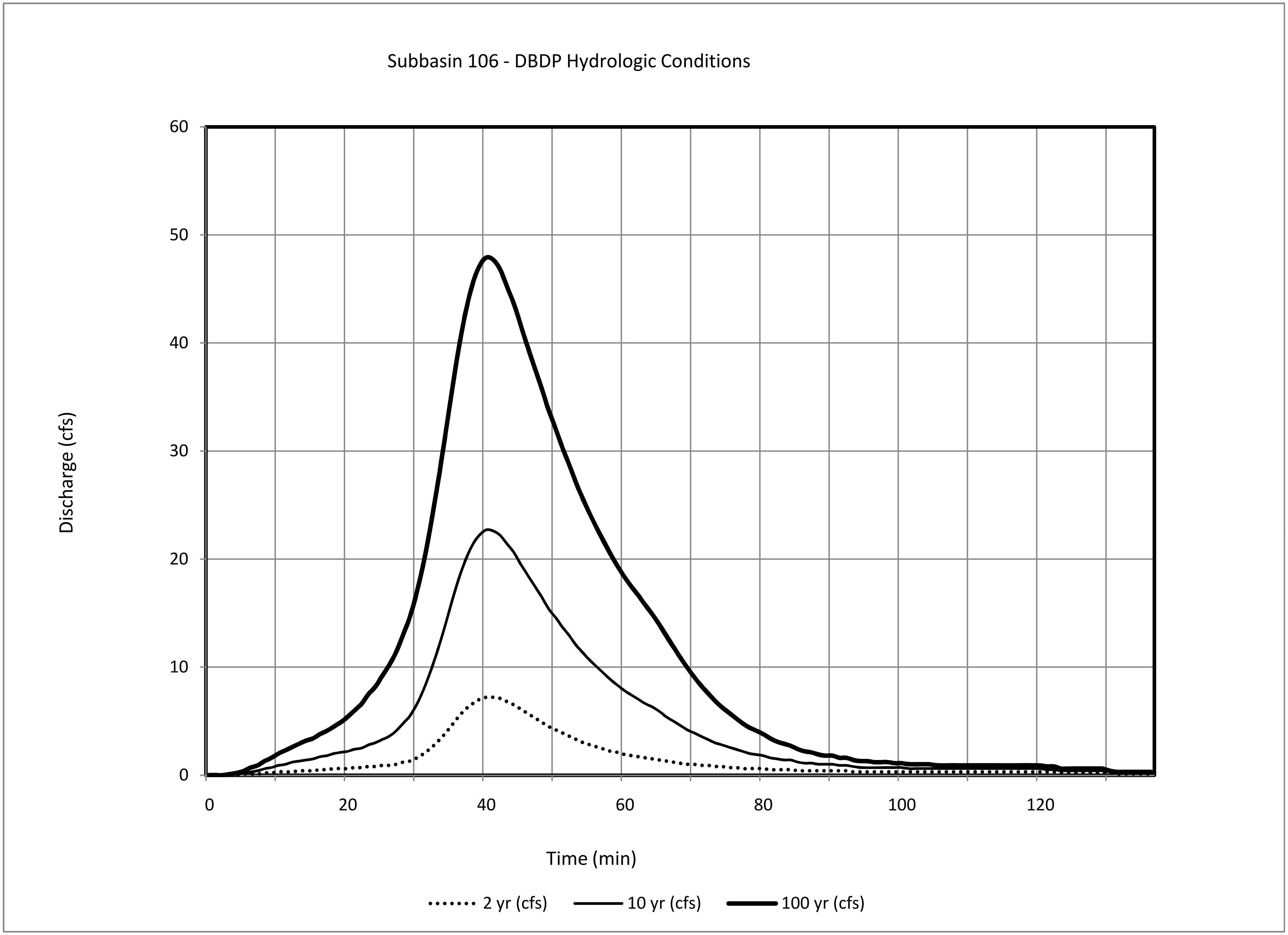
APPENDIX A

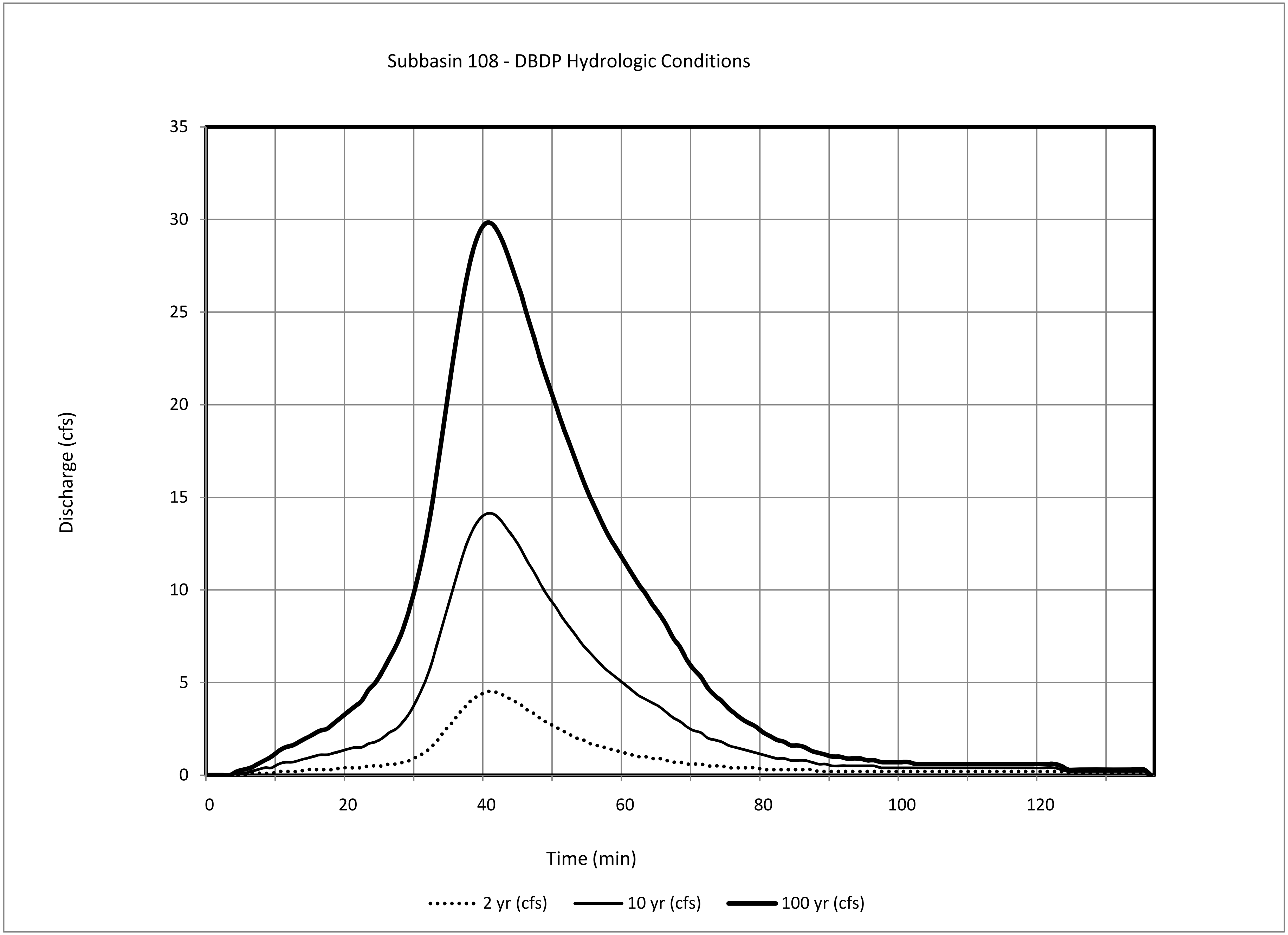
Subbasin Hydrographs / Subbasin Input


Subbasin 100 - DBDP Hydrologic Conditions
Discharge (cfs)
40
35
30
25
20
15
10
5
0
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)

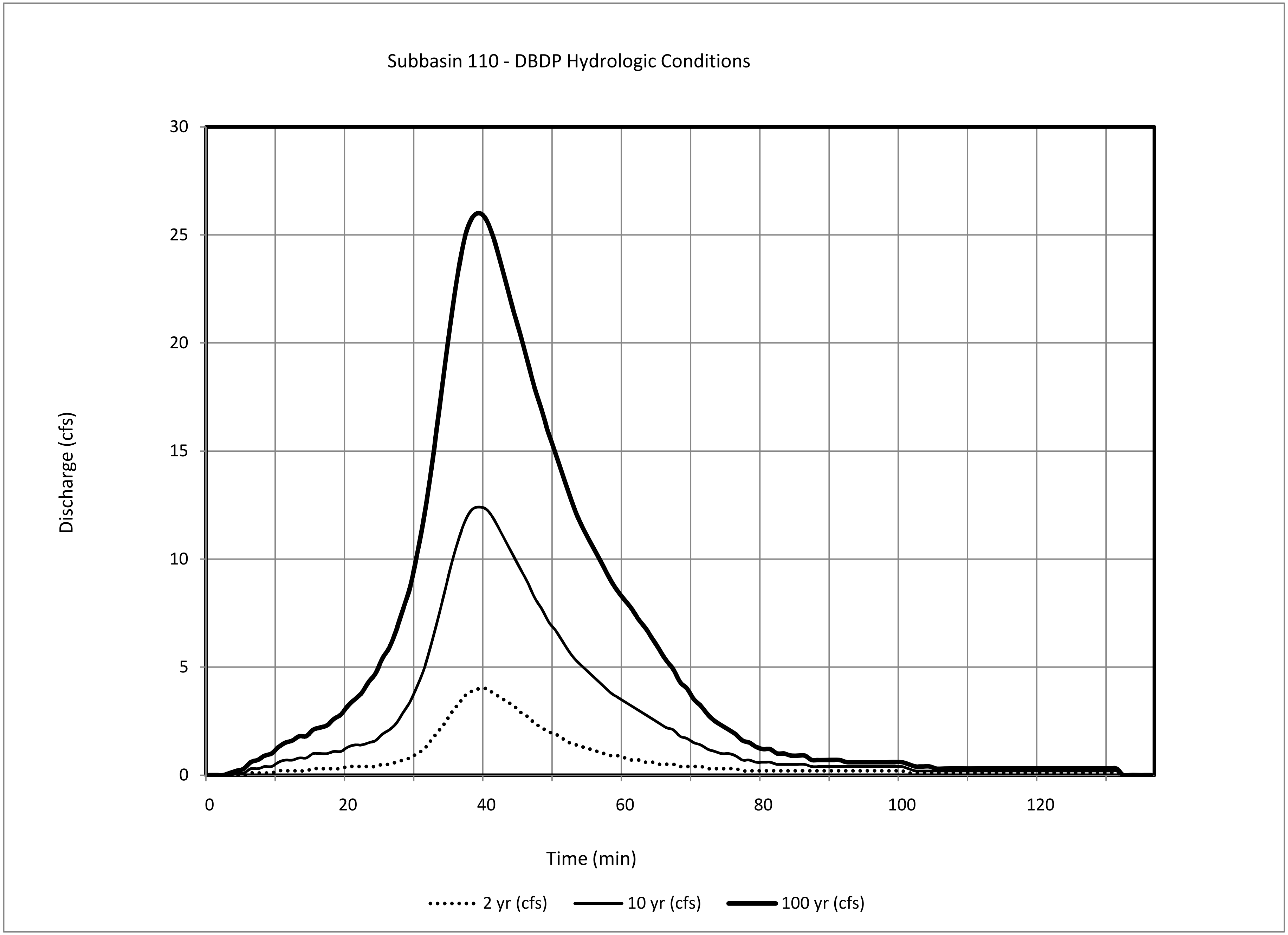

Subbasin 102 - DBDP Hydrologic Conditions
Discharge (cfs)
45
40
35
30
25
20
15
10
5
0
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)


Subbasin 104 - DBDP Hydrologic Conditions
35
30
25
20
15
10
5
0
Discharge (cfs)
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)

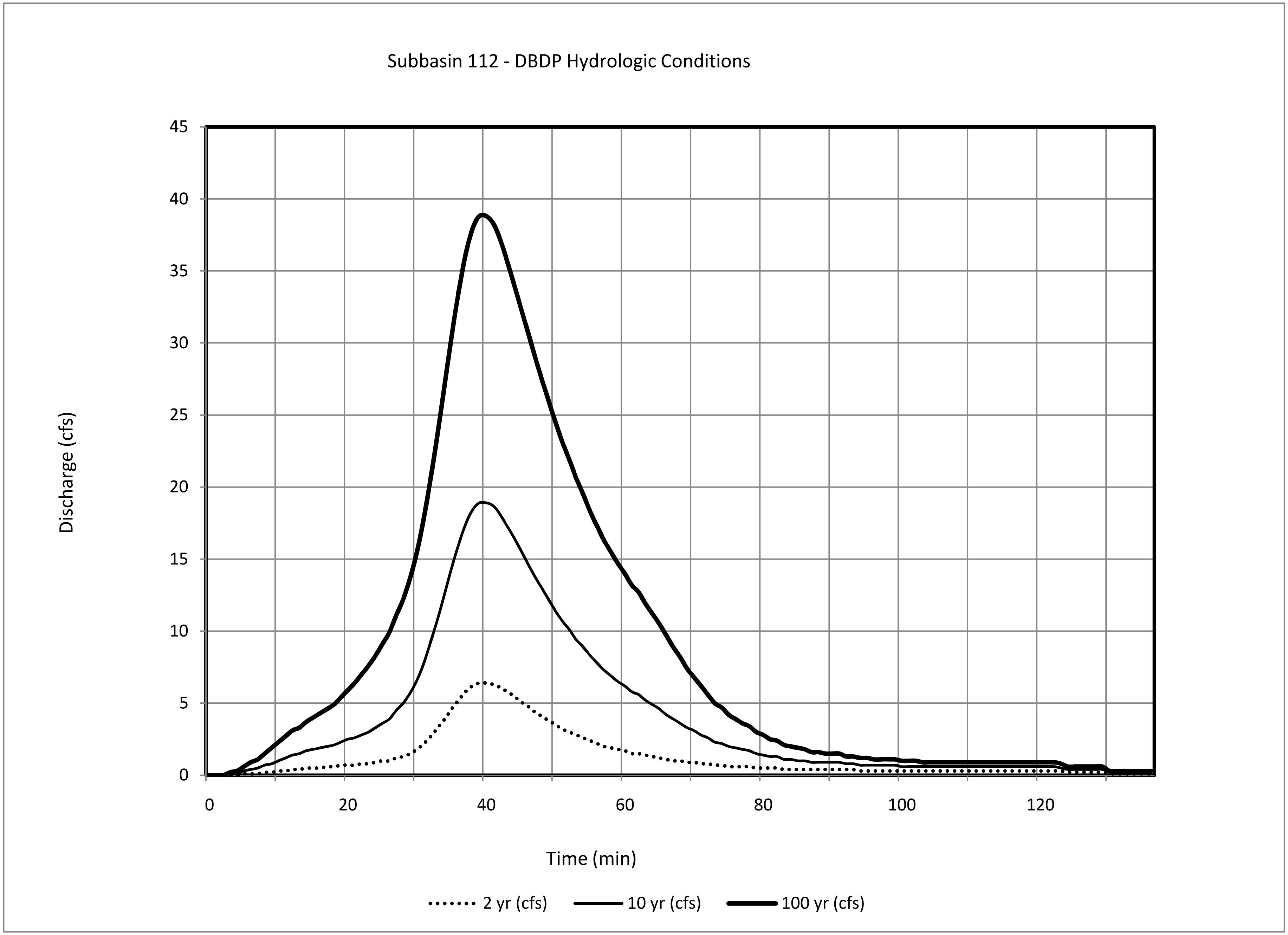

Subbasin 106 - DBDP Hydrologic Conditions
60
50
40
30
20
10
0
Discharge (cfs)
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)

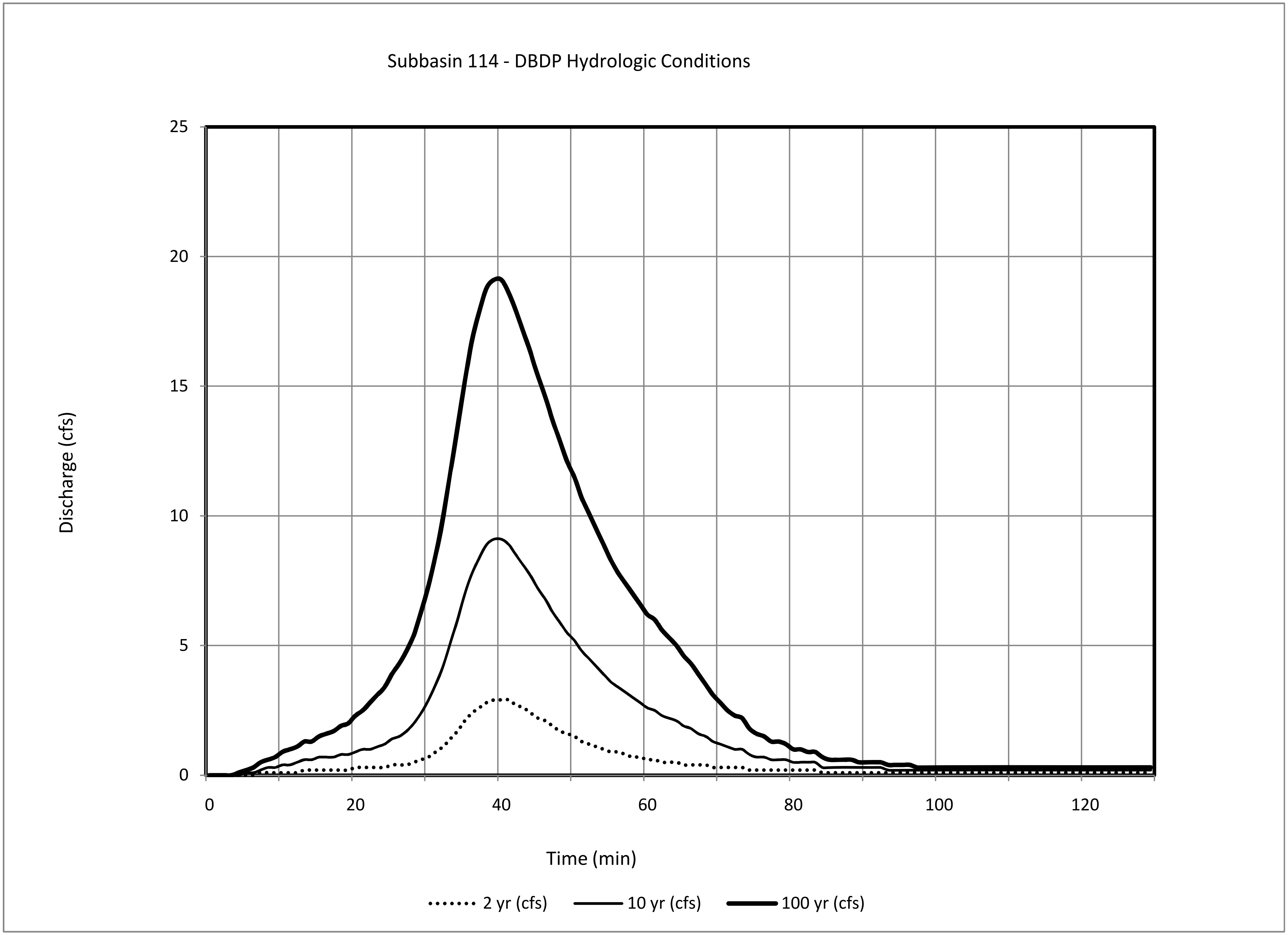


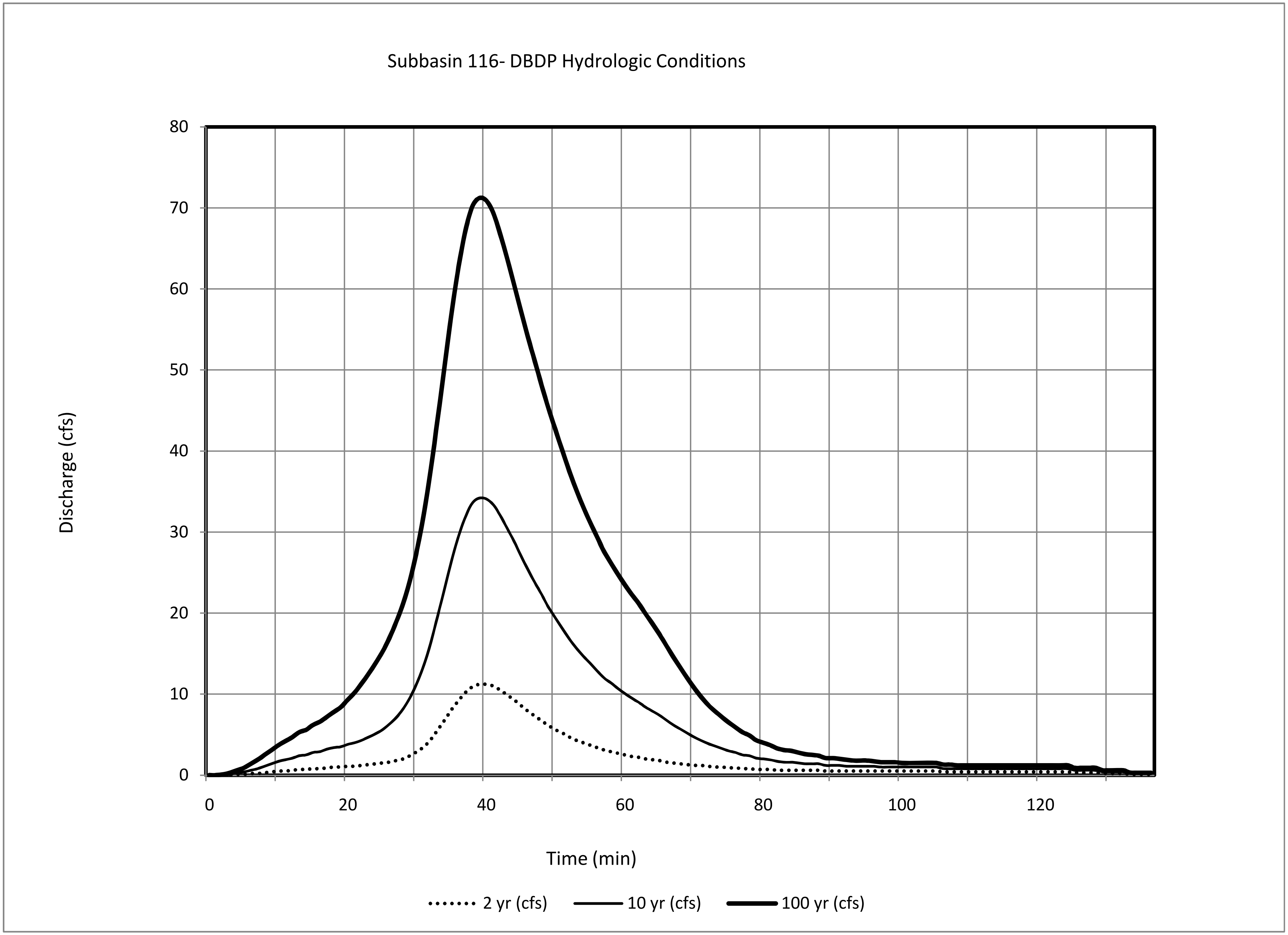
Subbasin 108 - DBDP Hydrologic Conditions
35
30
25
20
15
10
5
0
Discharge (cfs)
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)

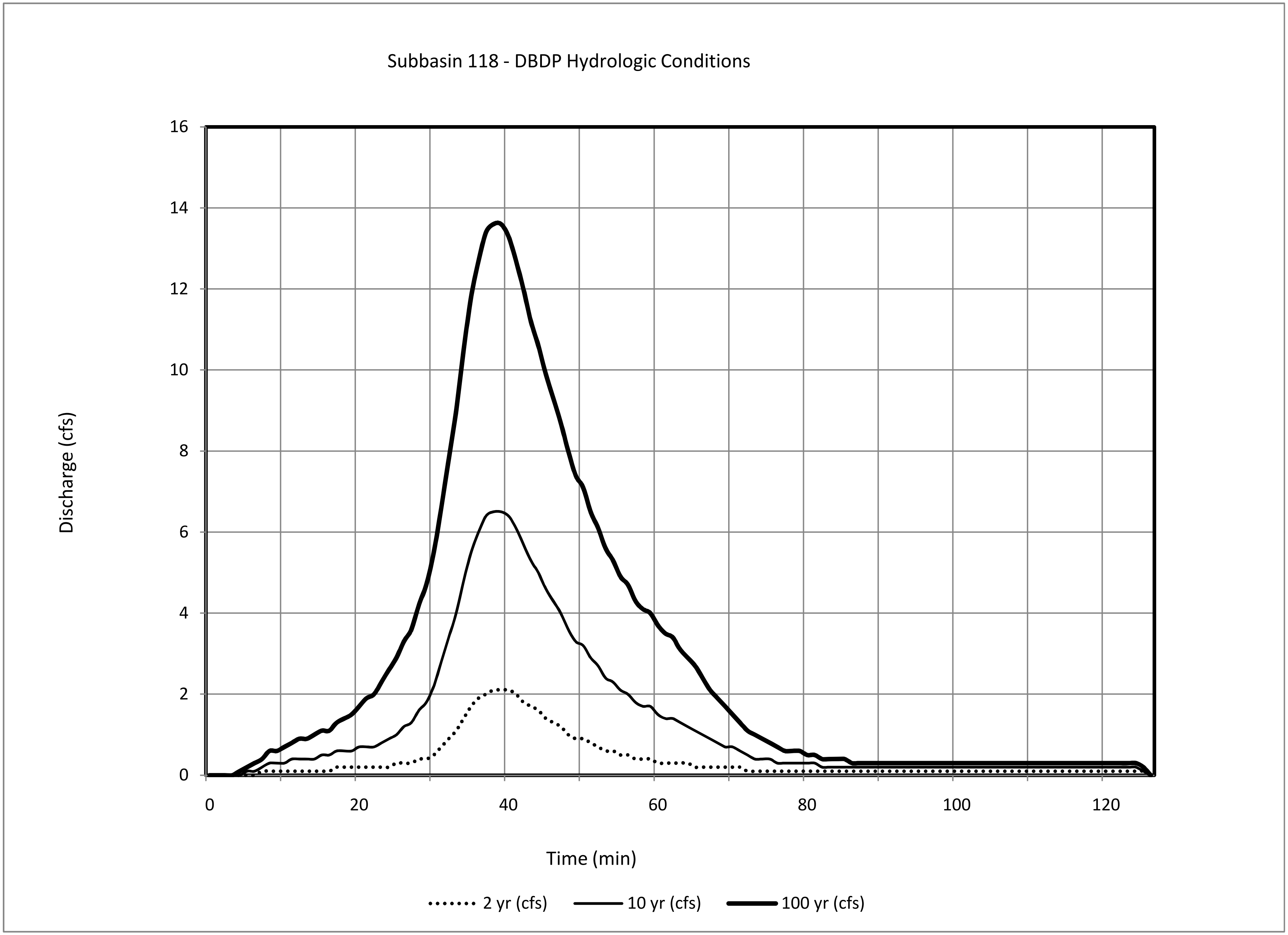


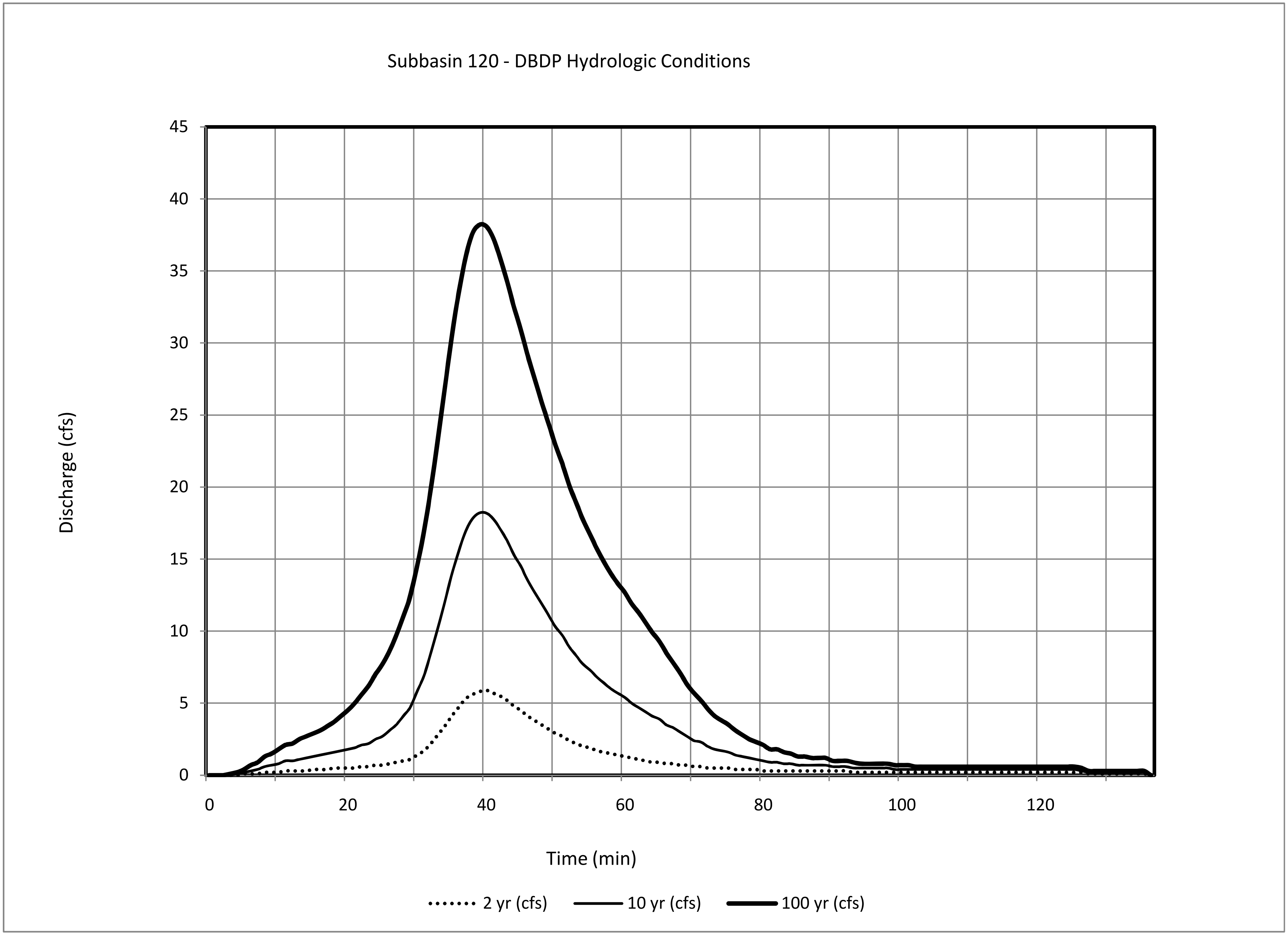
Subbasin 110 - DBDP Hydrologic Conditions
Discharge (cfs)
30
25
20
15
10
5
0
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)

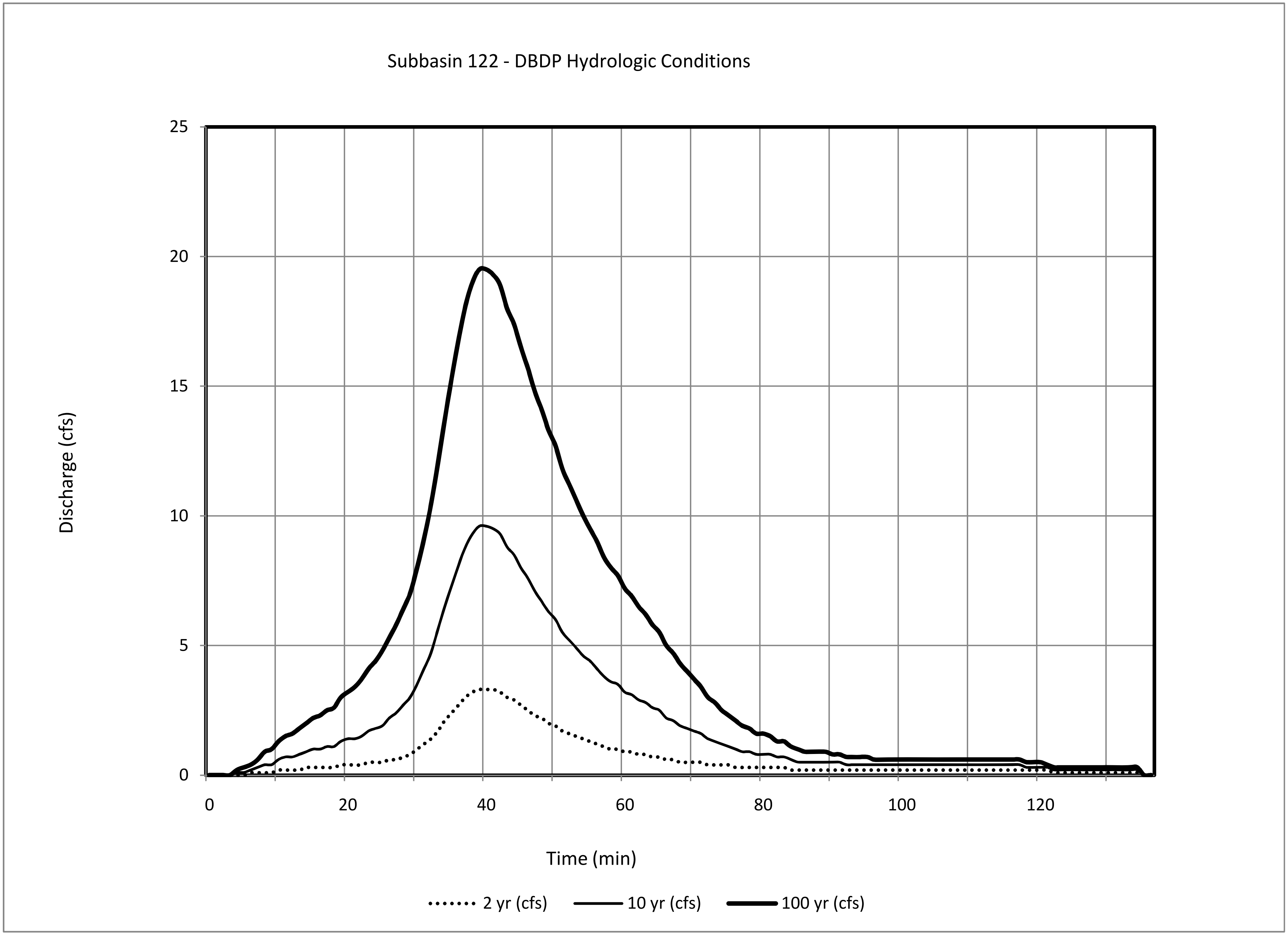

Subbasin 112 - DBDP Hydrologic Conditions
Discharge (cfs)
45
40
35
30
25
20
15
10
5
0
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)

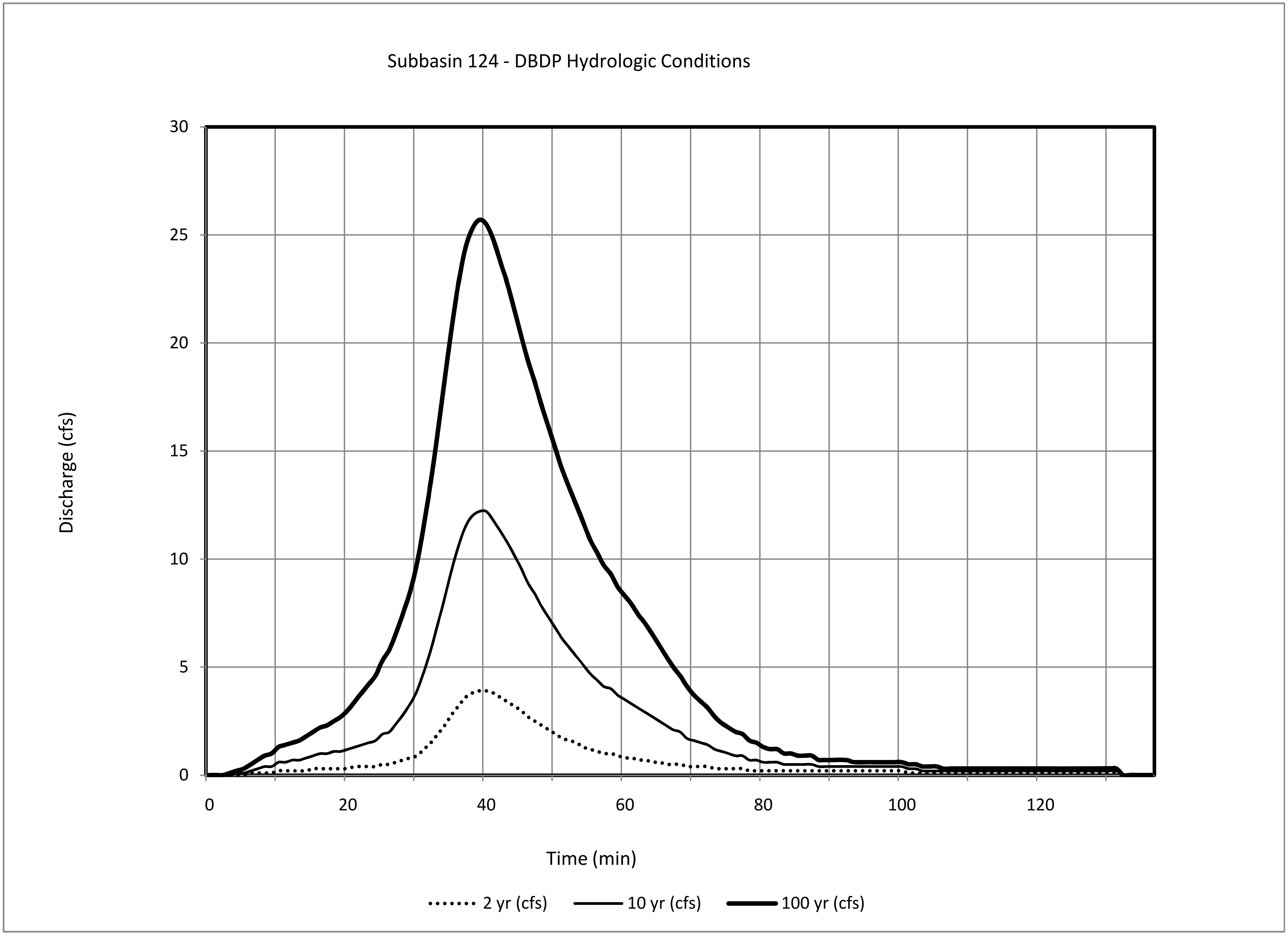

Subbasin 114 - DBDP Hydrologic Conditions
Discharge (cfs)
25
20
15
10
5
0
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)

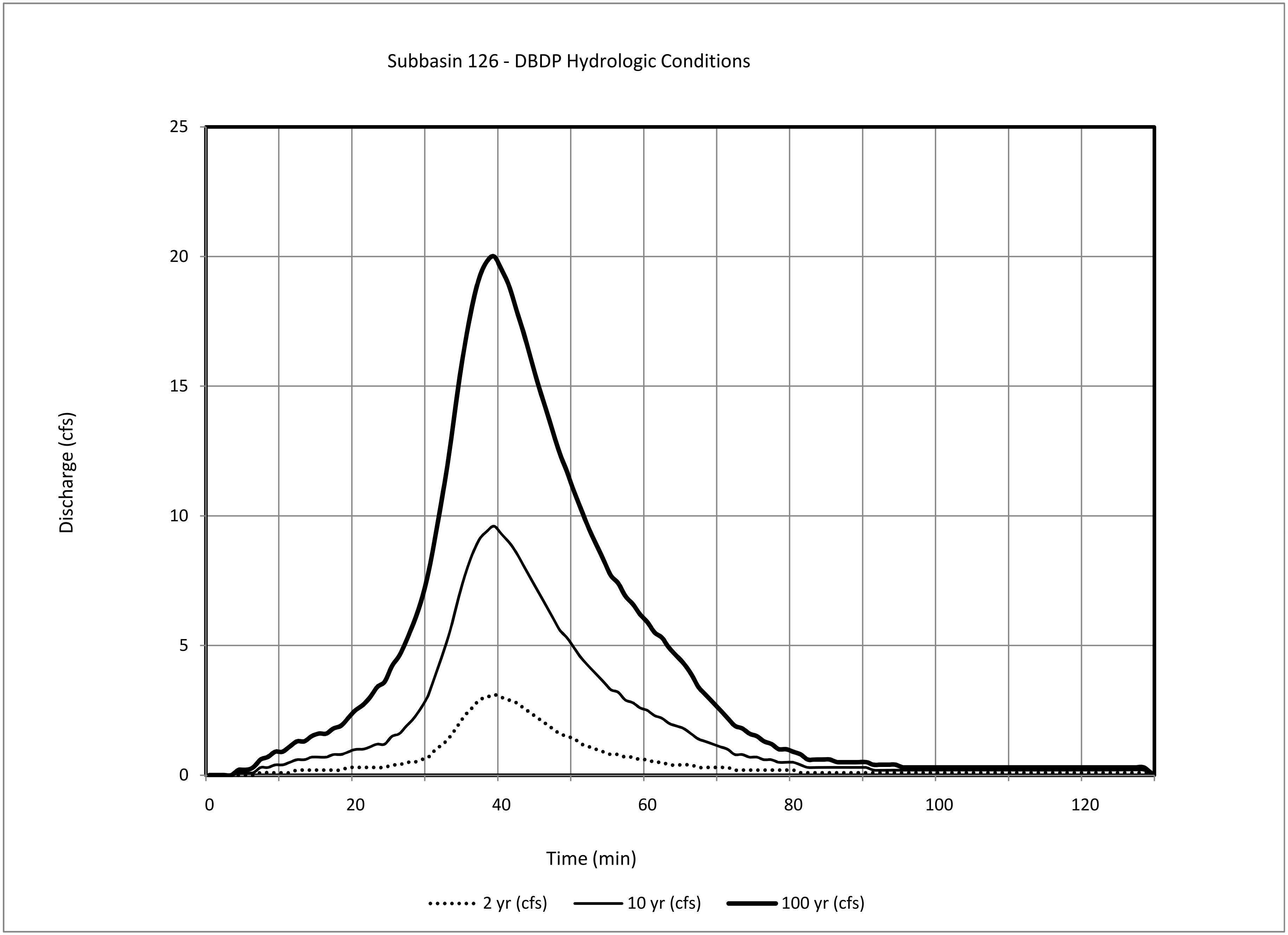

Subbasin 116- DBDP Hydrologic Conditions
Discharge (cfs)
80
70
60
50
40
30
20
10
0
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)

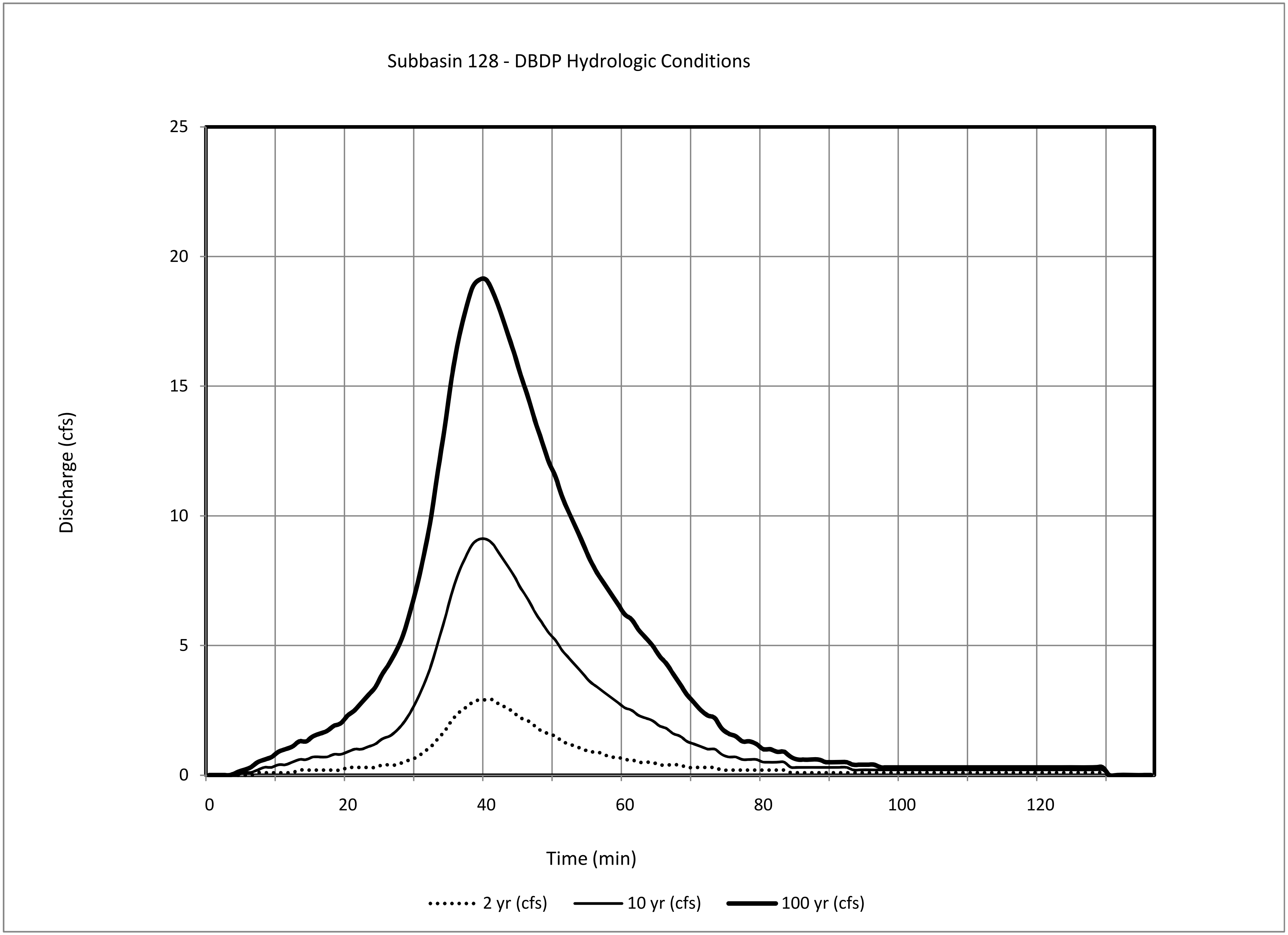

Subbasin 118 - DBDP Hydrologic Conditions
Discharge (cfs)
Time (min)
0
2
4
6
8
10
12
14
16
0
20
40
60
80
100
120
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)

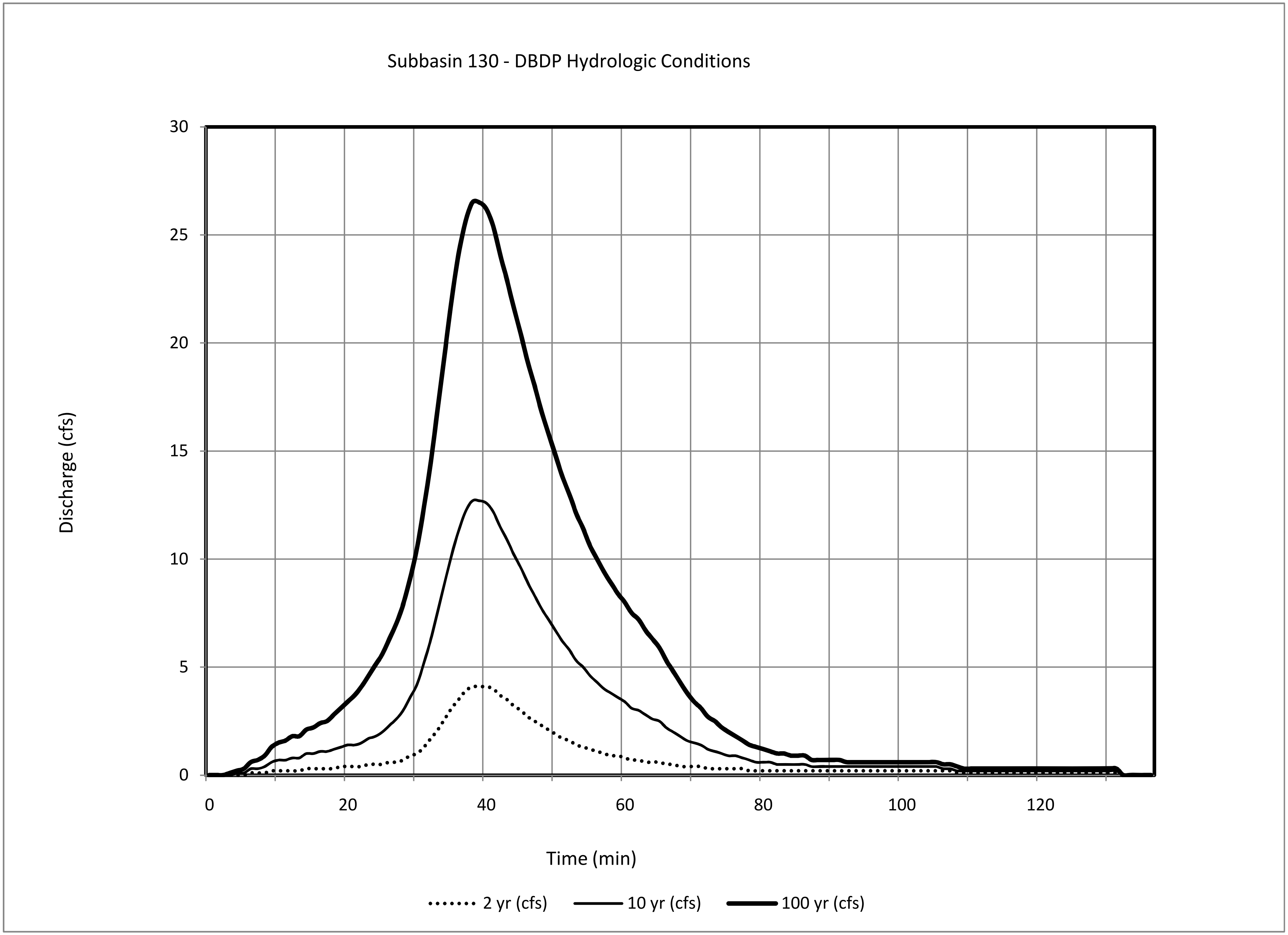

Subbasin 120 - DBDP Hydrologic Conditions
Discharge (cfs)
45
40
35
30
25
20
15
10
5
0
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)

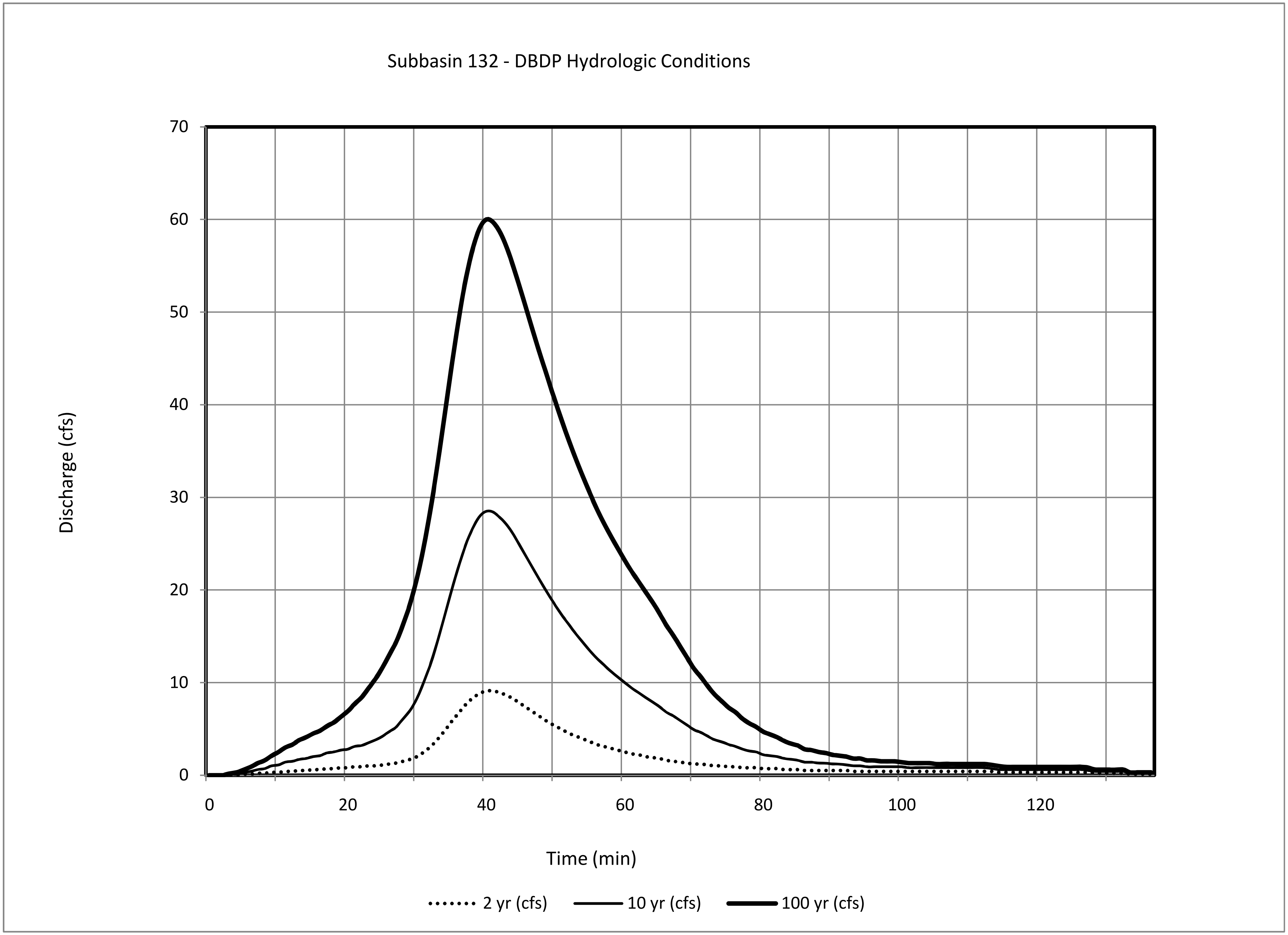

Subbasin 122 - DBDP Hydrologic Conditions
Discharge (cfs)
25
20
15
10
5
0
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)

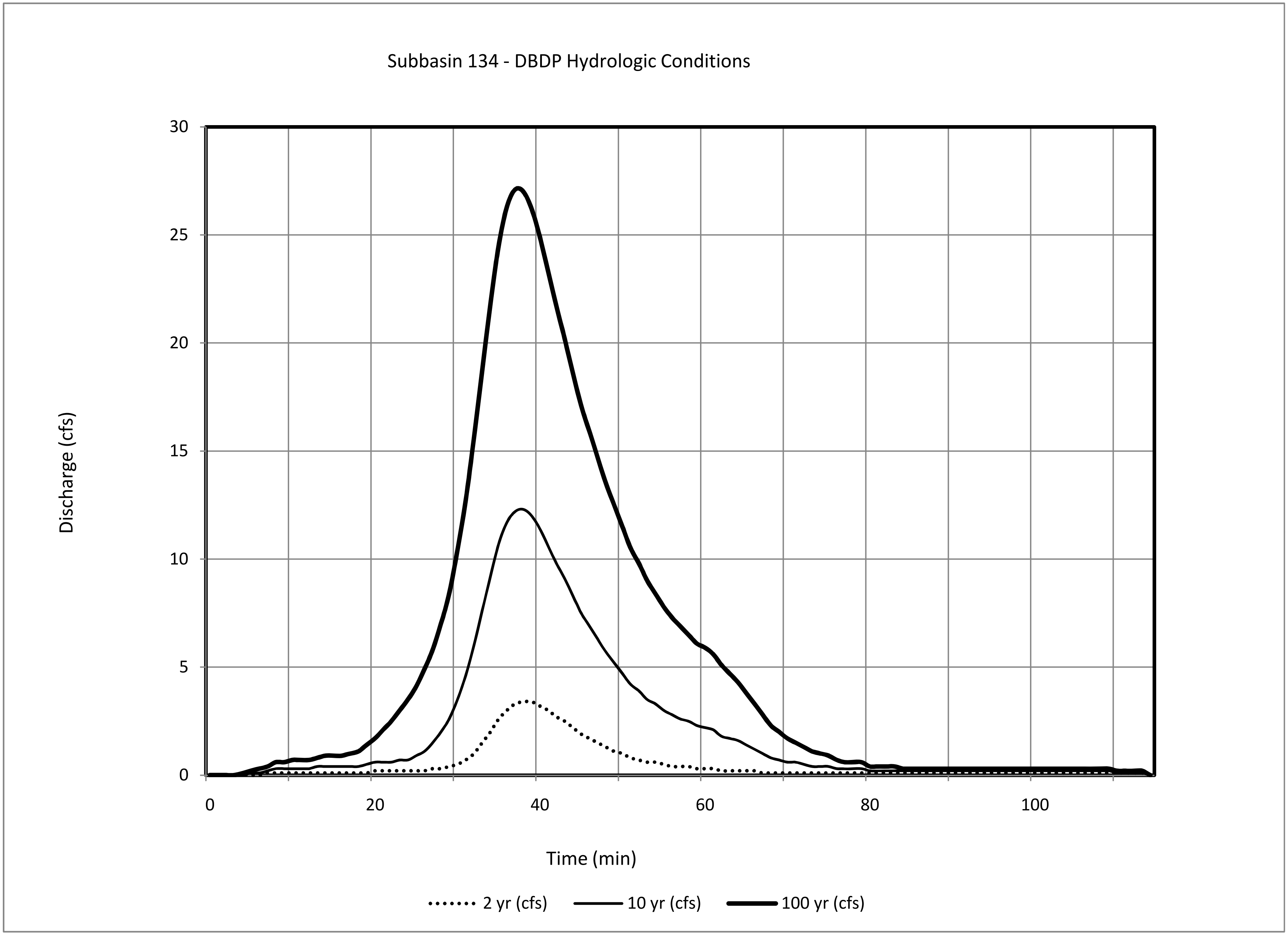

Subbasin 124 - DBDP Hydrologic Conditions
Discharge (cfs)
30
25
20
15
10
5
0
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)

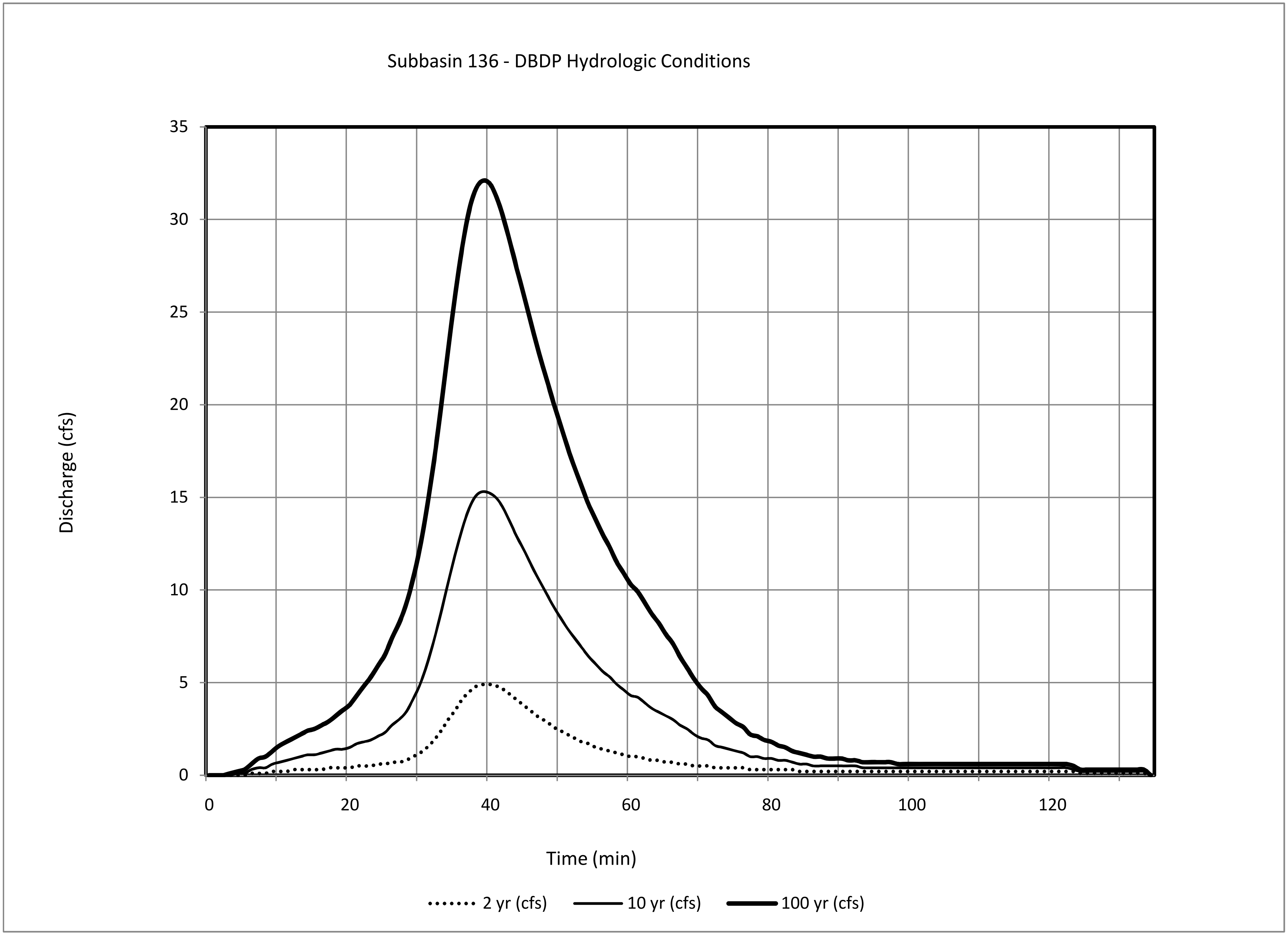

Subbasin 126 - DBDP Hydrologic Conditions
Discharge (cfs)
25
20
15
10
5
0
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)

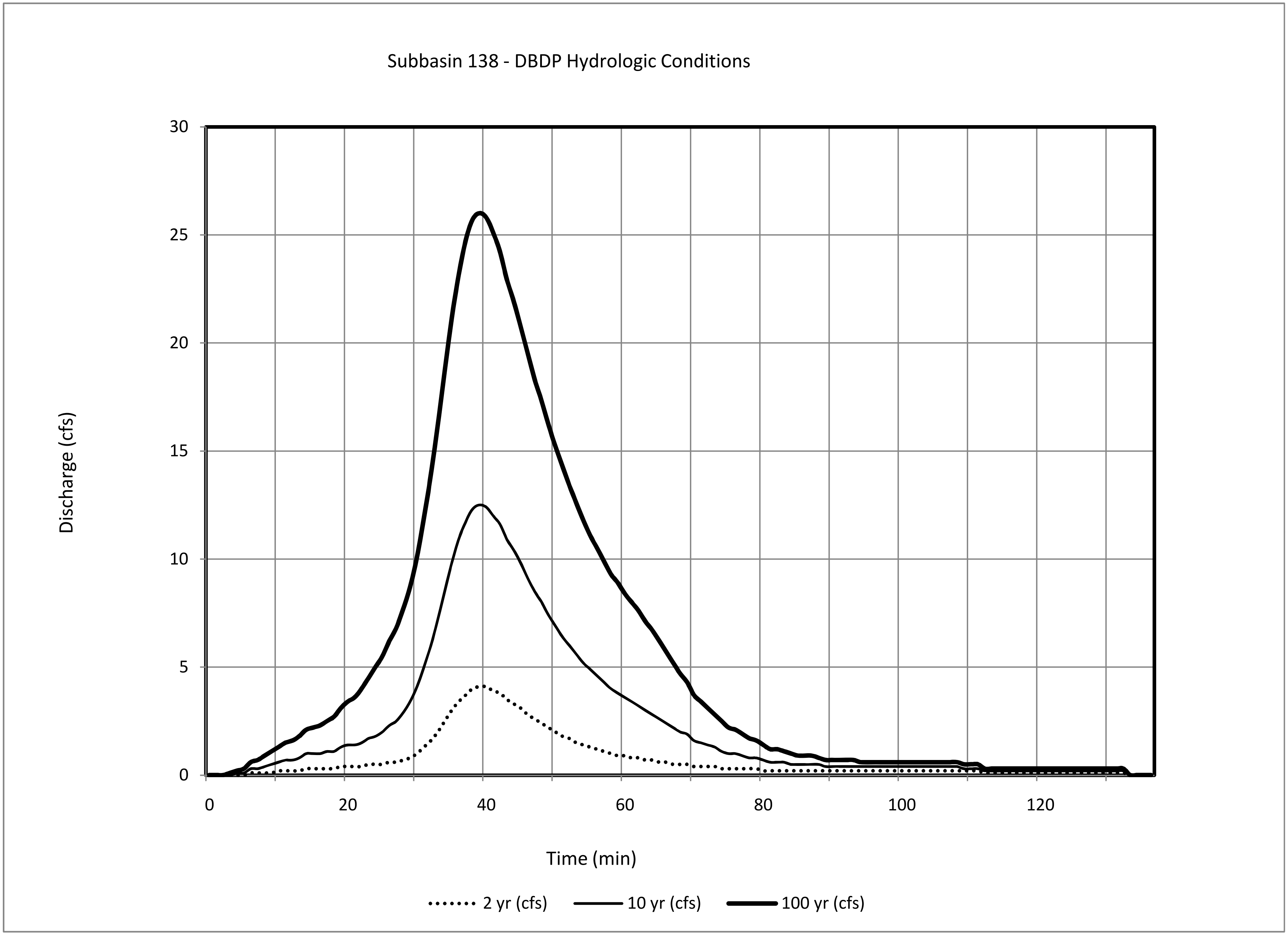

Subbasin 128 - DBDP Hydrologic Conditions
Discharge (cfs)
25
20
15
10
5
0
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)

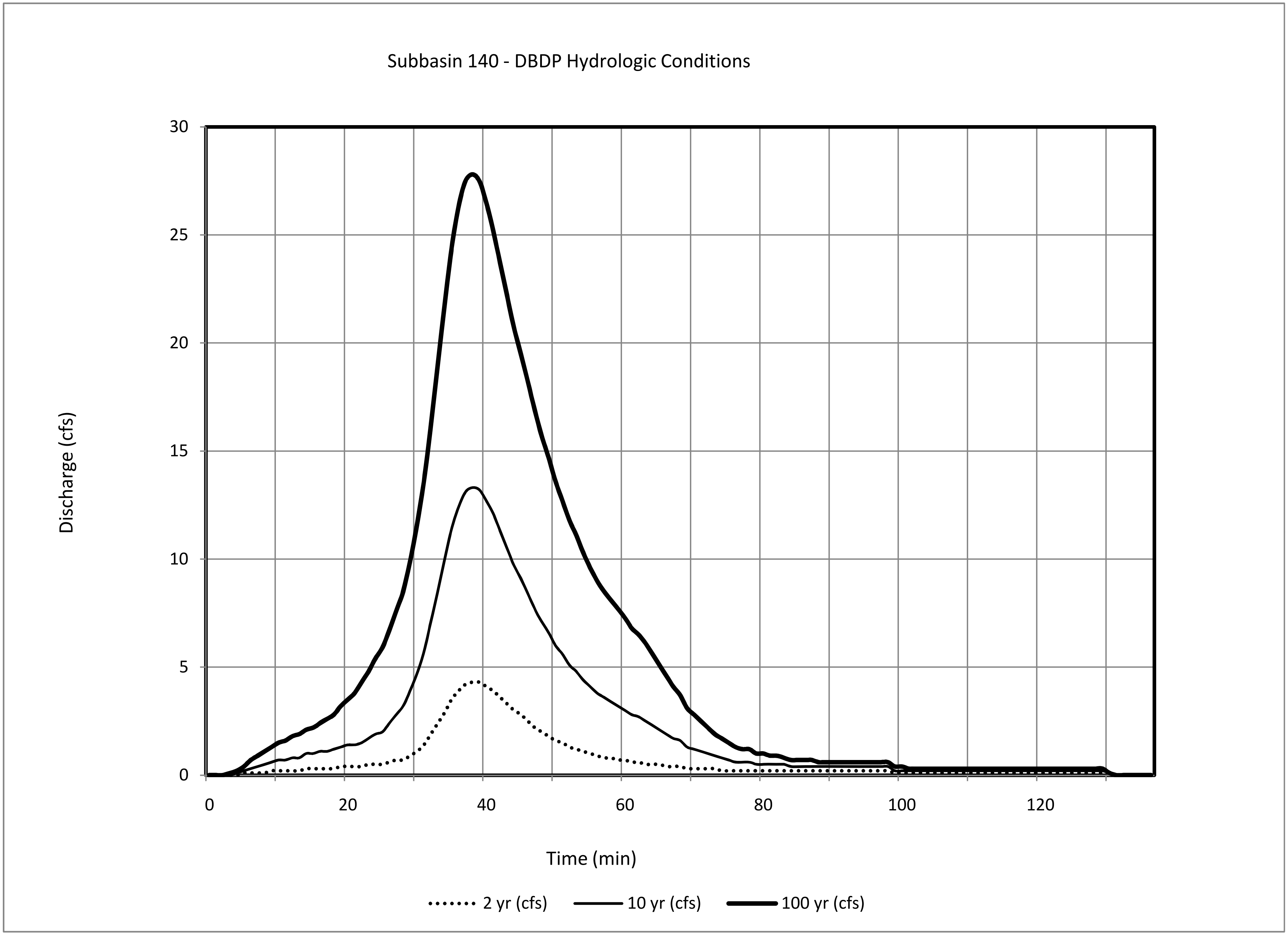

Subbasin 130 - DBDP Hydrologic Conditions
Discharge (cfs)
30
25
20
15
10
5
0
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)

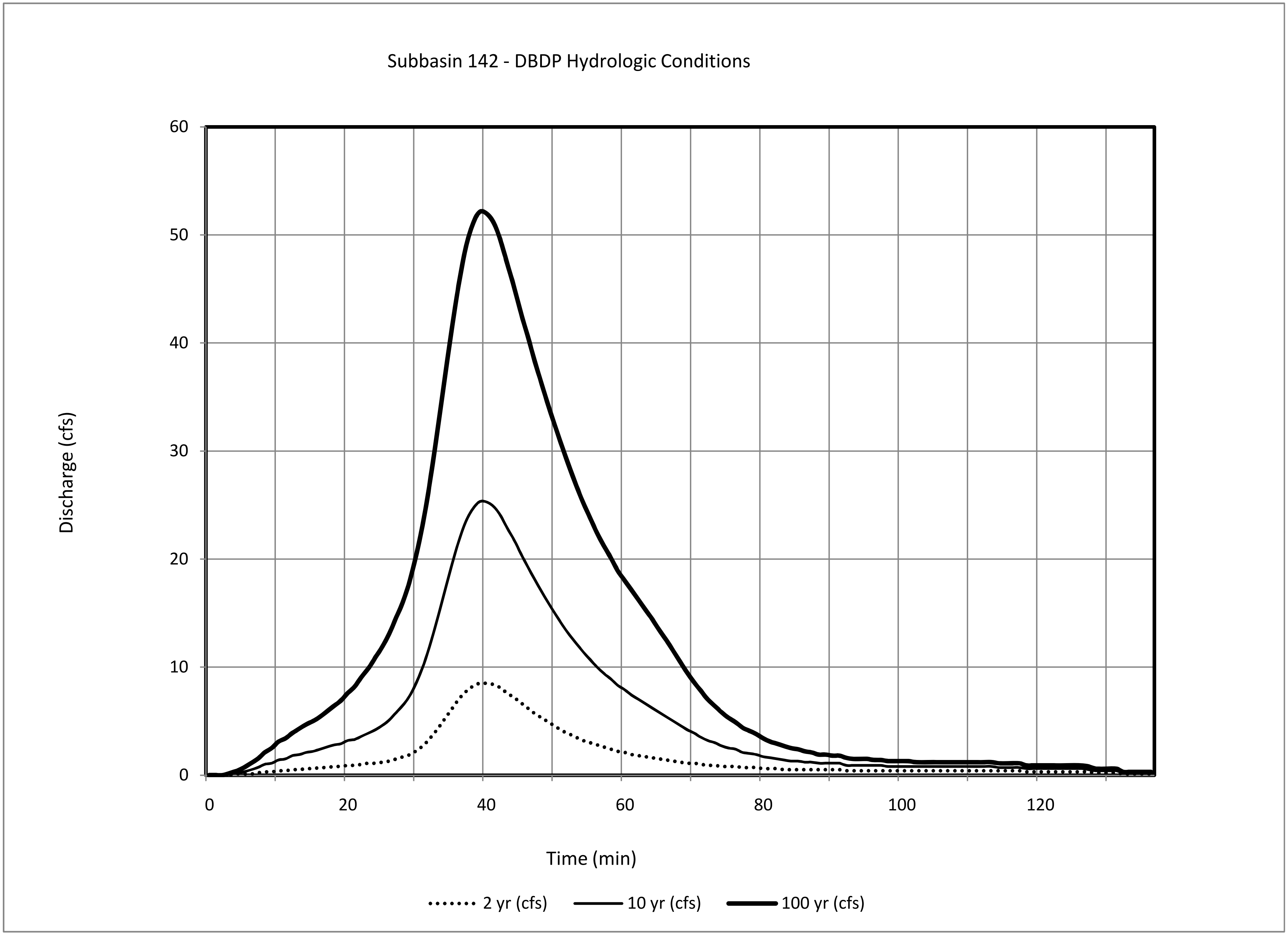

Subbasin 132 - DBDP Hydrologic Conditions
Discharge (cfs)
70
60
50
40
30
20
10
0
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)

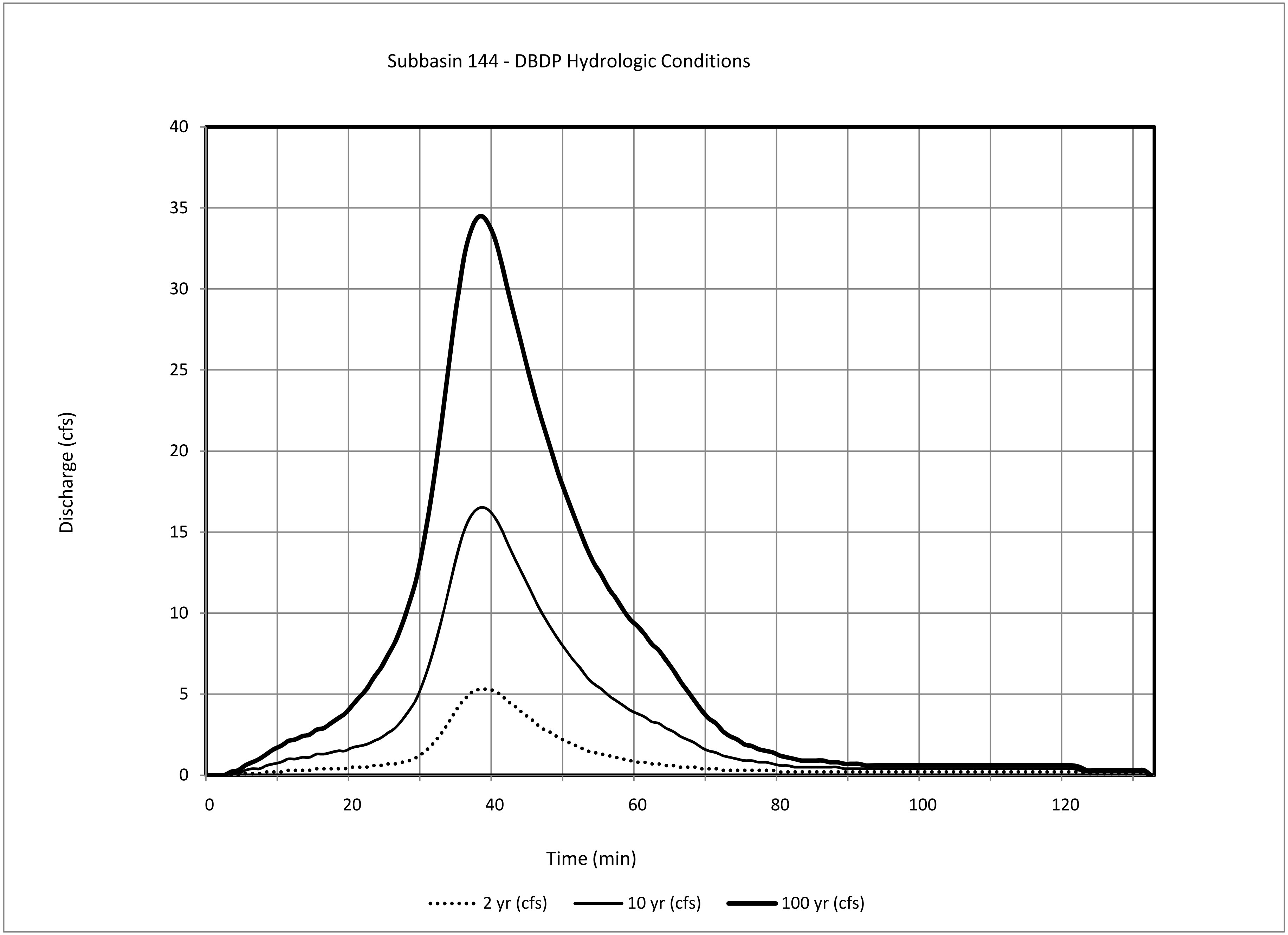

Subbasin 134 - DBDP Hydrologic Conditions
Discharge (cfs)
30
25
20
15
10
5
0
0
20
40
60
80
100
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)

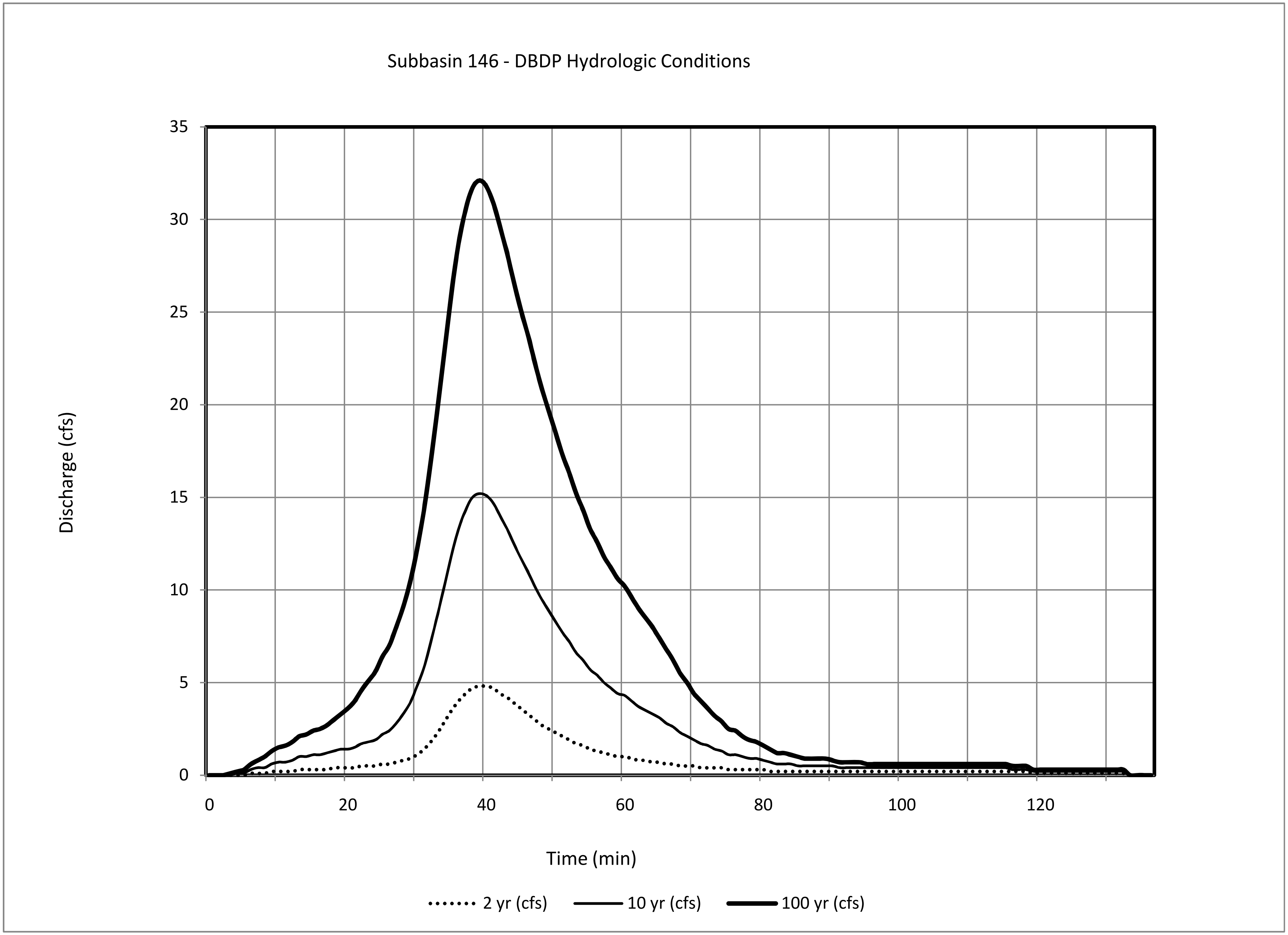

Subbasin 136 - DBDP Hydrologic Conditions
Discharge (cfs)
35
30
25
20
15
10
5
0
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)

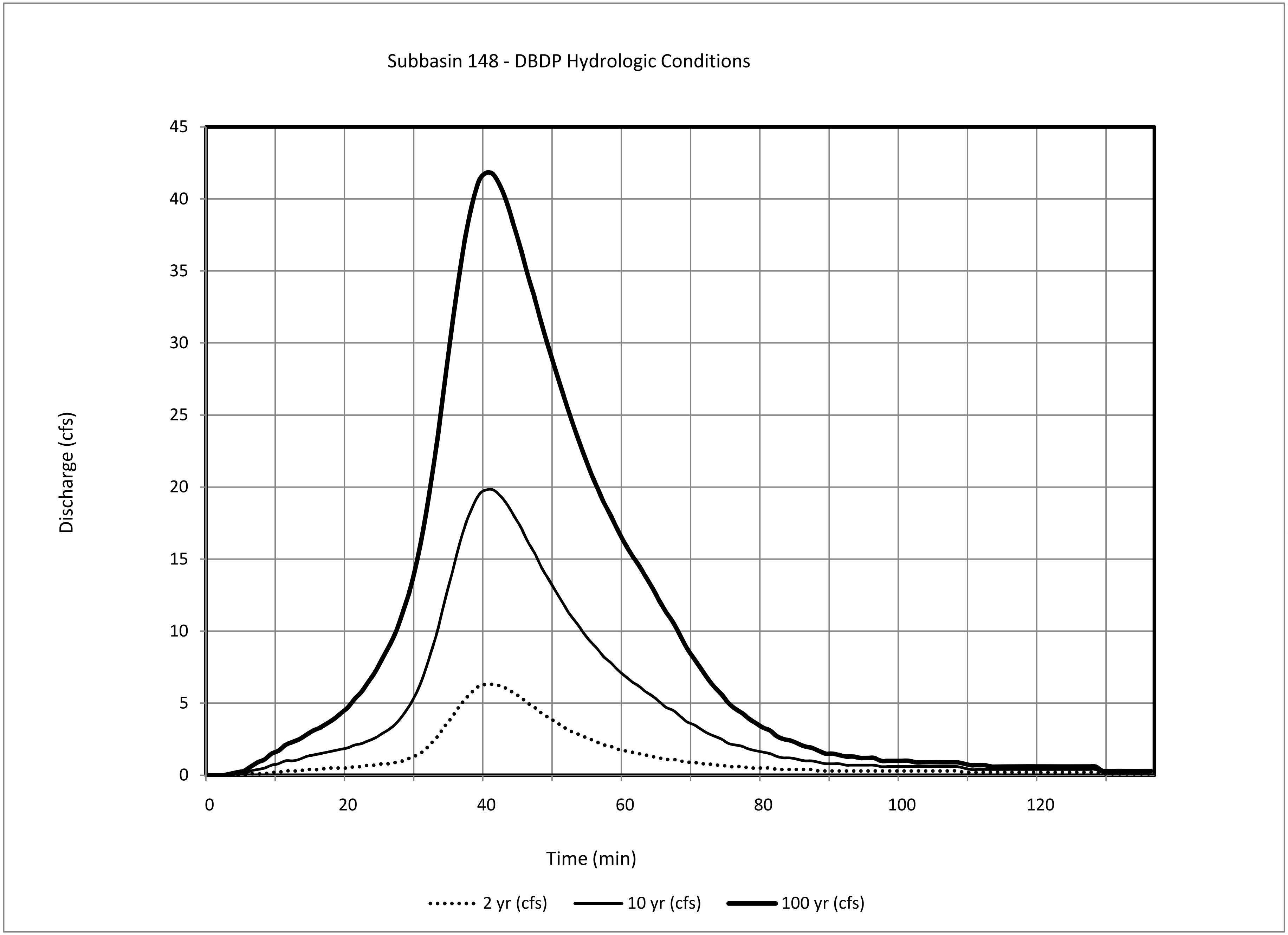

Subbasin 138 - DBDP Hydrologic Conditions
Discharge (cfs)
30
25
20
15
10
5
0
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)

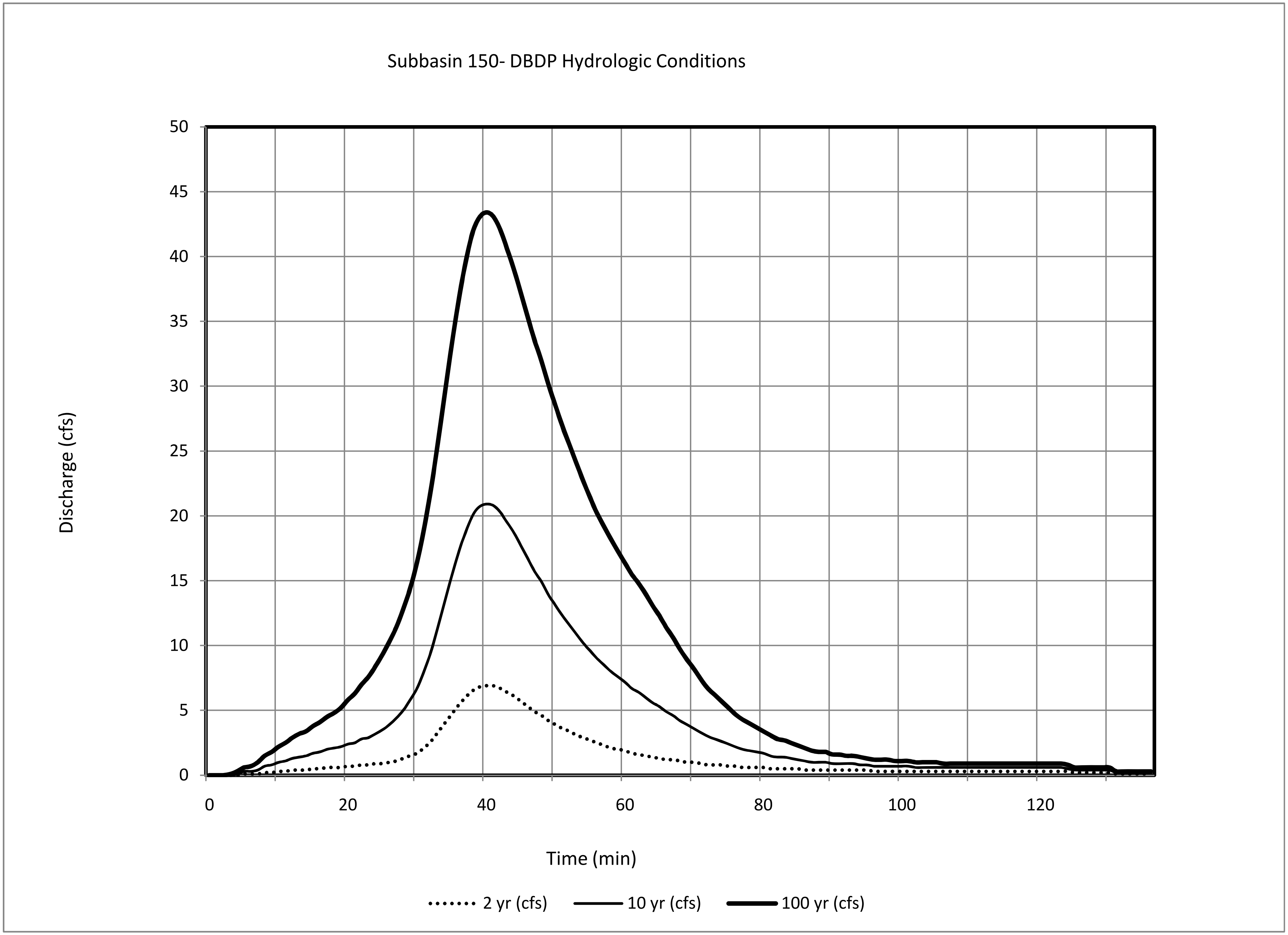

Subbasin 140 - DBDP Hydrologic Conditions
Discharge (cfs)
30
25
20
15
10
5
0
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)

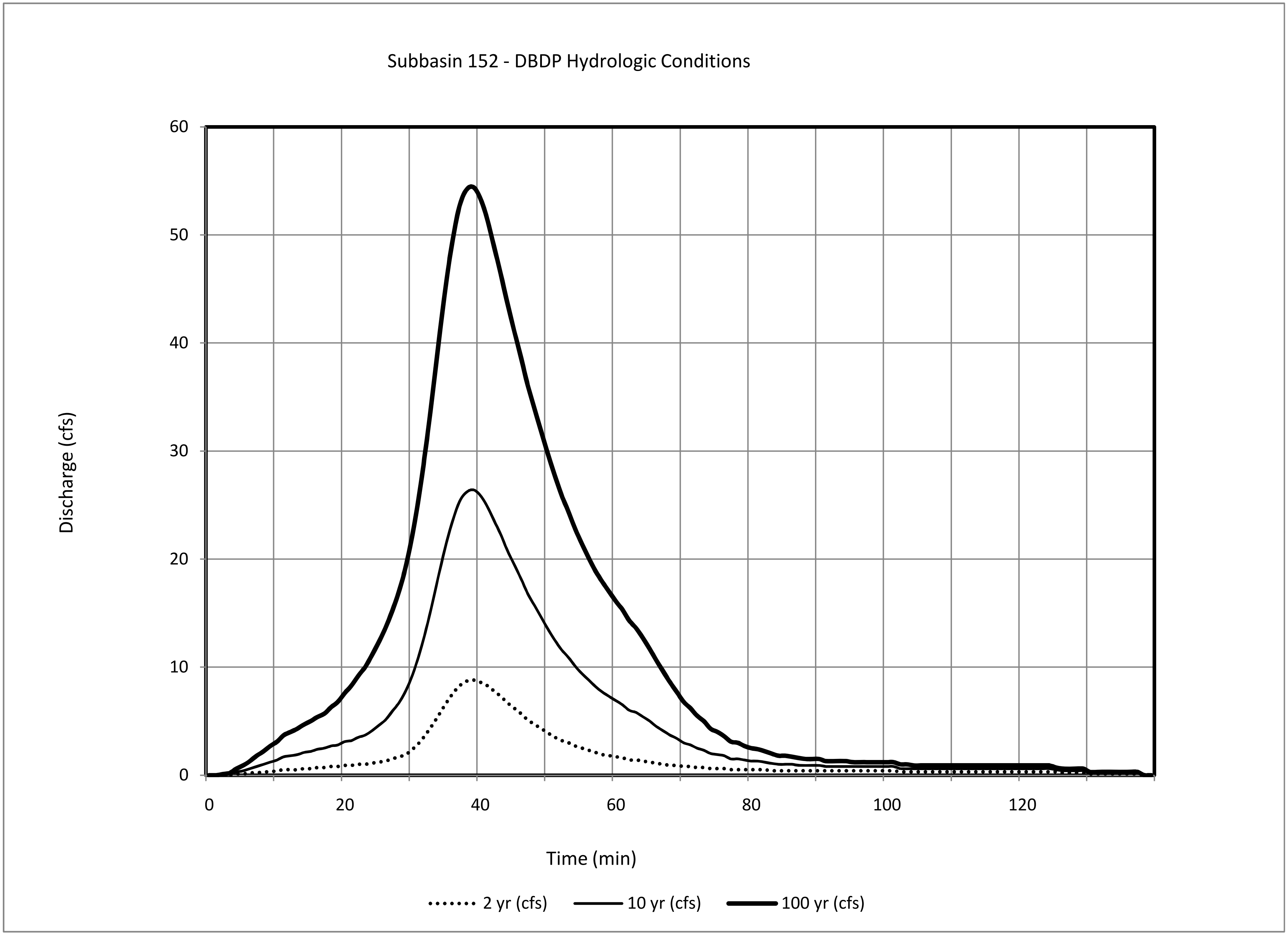

Subbasin 142 - DBDP Hydrologic Conditions
60
50
40
30
20
10
0
Discharge (cfs)
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)

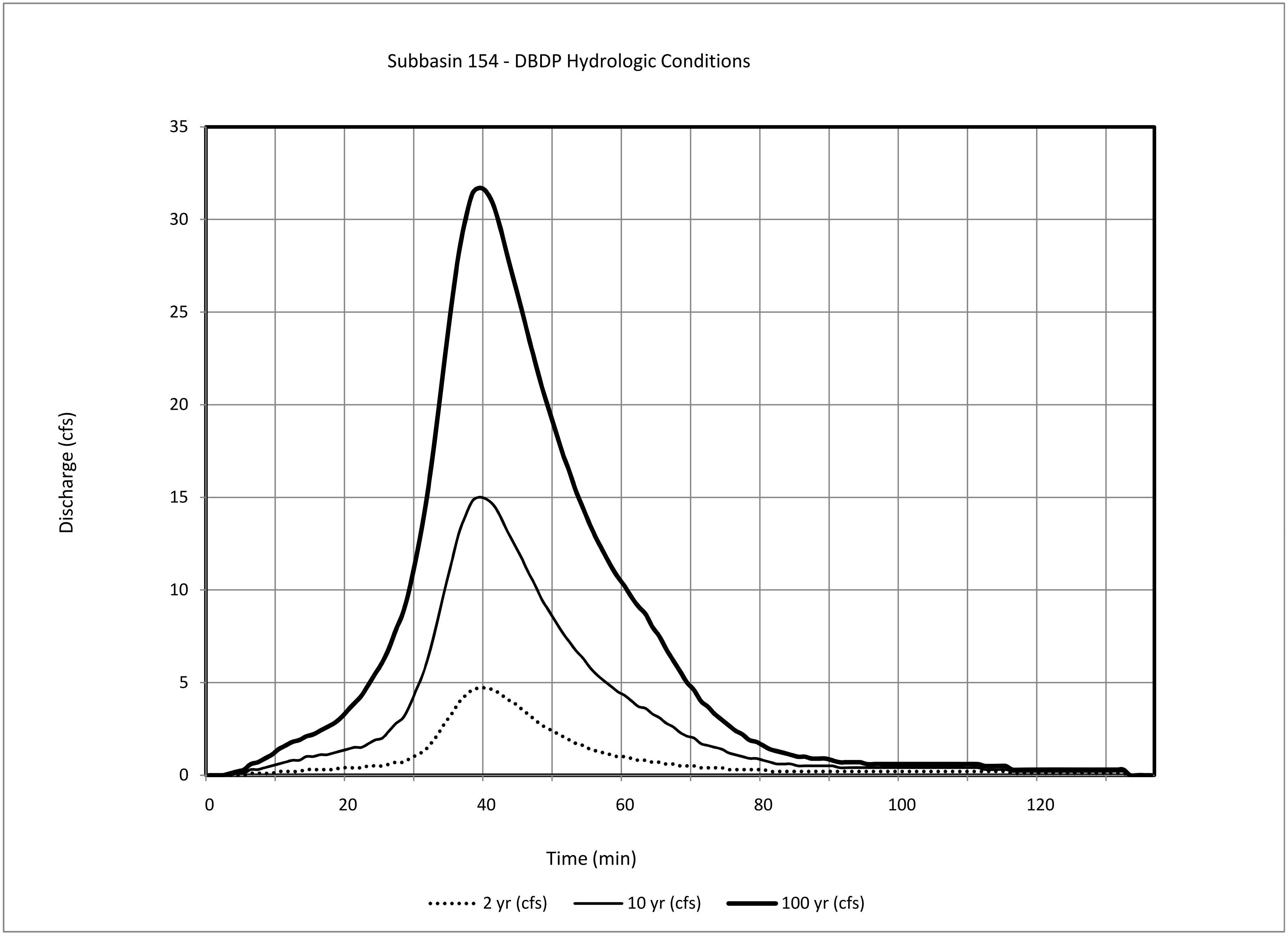

Subbasin 144 - DBDP Hydrologic Conditions
Discharge (cfs)
40
35
30
25
20
15
10
5
0
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)

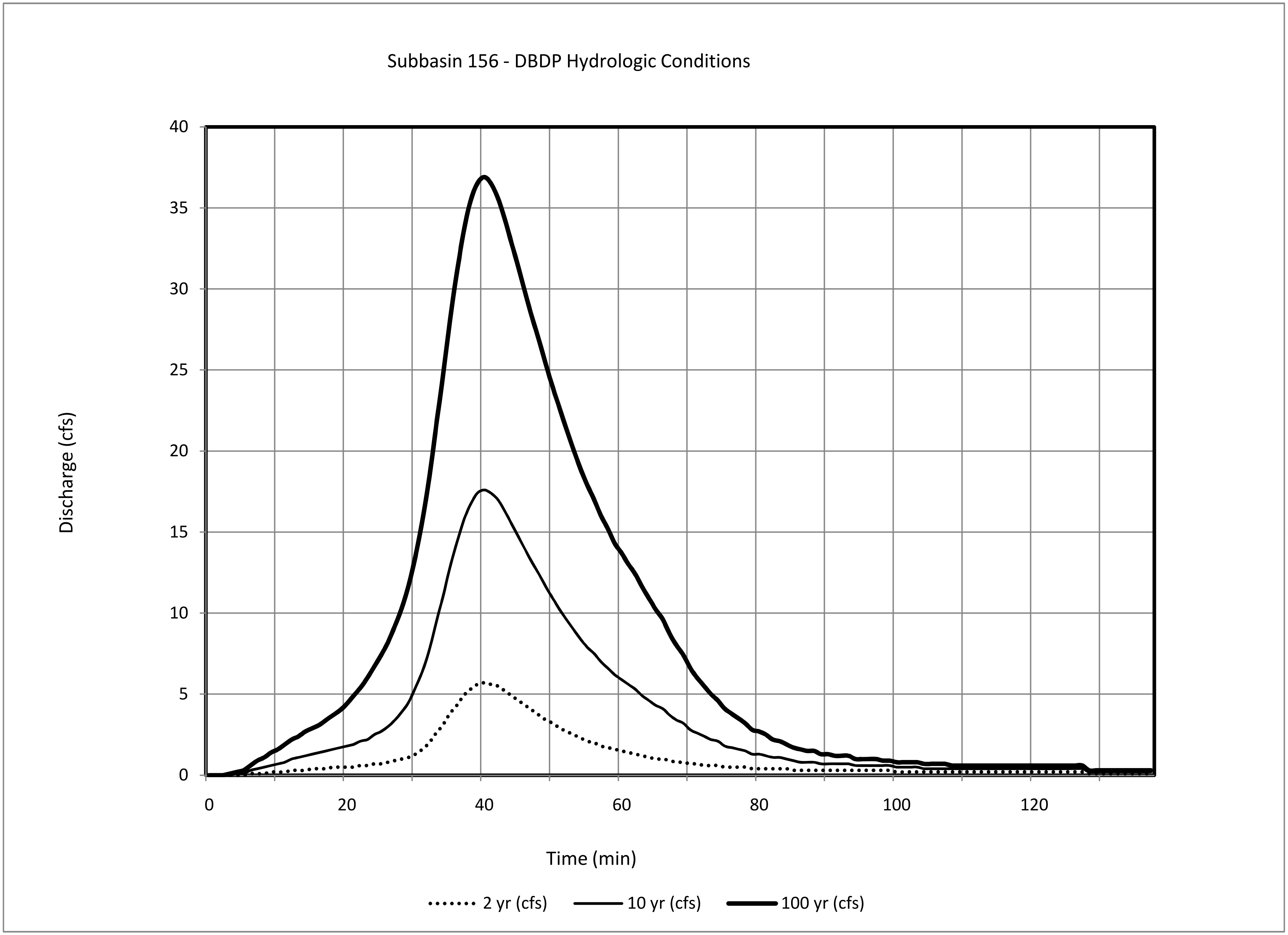

Subbasin 146 - DBDP Hydrologic Conditions
Discharge (cfs)
35
30
25
20
15
10
5
0
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)

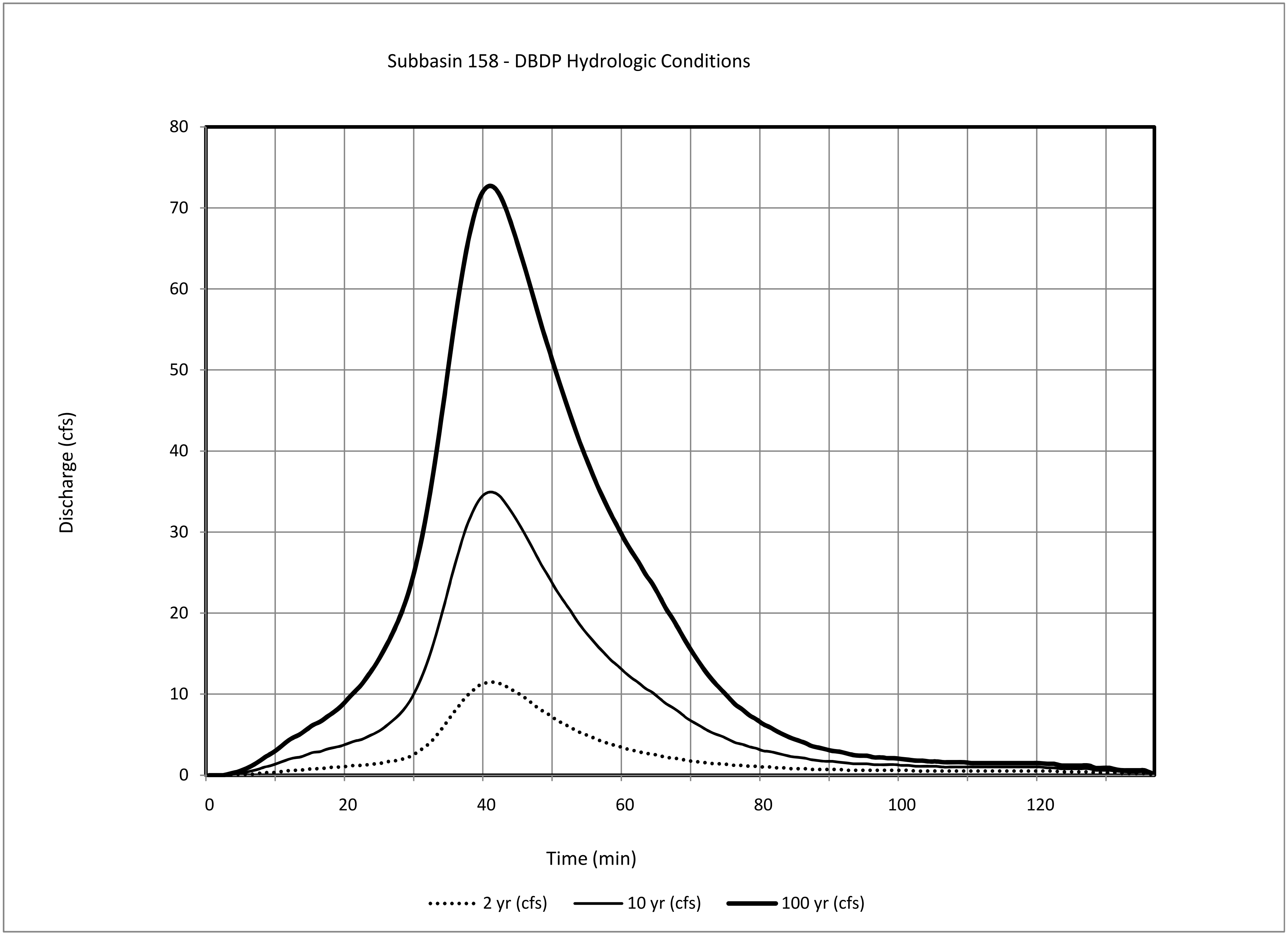

Subbasin 148 - DBDP Hydrologic Conditions
Discharge (cfs)
45
40
35
30
25
20
15
10
5
0
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)


Subbasin 150- DBDP Hydrologic Conditions
Discharge (cfs)
50
45
40
35
30
25
20
15
10
5
0
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)


Subbasin 152 - DBDP Hydrologic Conditions
Discharge (cfs)
60
50
40
30
20
10
0
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)


Subbasin 154 - DBDP Hydrologic Conditions
Discharge (cfs)
35
30
25
20
15
10
5
0
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)


Subbasin 156 - DBDP Hydrologic Conditions
Discharge (cfs)
0
5
10
15
20
25
30
35
40
Time (min)
0
20
40
60
80
100
120
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)


Subbasin 158 - DBDP Hydrologic Conditions
80
70
60
50
40
30
20
10
0
Discharge (cfs)
0
20
40
60
80
100
120
Time (min)
2 yr (cfs)
10 yr (cfs)
100 yr (cfs)