

UNITED STATES OF AMERICA
BEFORE THE FEDERAL ENERGY REGULATORY COMMISSION

**FINAL APPLICATION FOR NEW LICENSE FOR MAJOR PROJECT -
EXISTING DAM**

**EXHIBIT B – PROJECT
OPERATION AND RESOURCE
UTILIZATION**

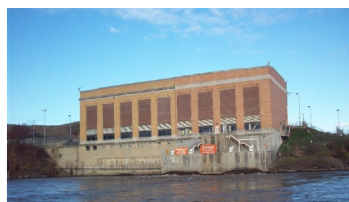
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May 2022

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**CRESCENT HYDROELECTRIC PROJECT
RELICENSING**

FERC NO. 4678



**NY Power
Authority**

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1 Introduction

The Crescent Hydroelectric Project (Project) (FERC No. 4678) is an 11.8 MW hydroelectric project located on the Mohawk River in Saratoga, Albany, and Schenectady Counties, New York, and in the Towns of Waterford, Colonie, Halfmoon, Clifton Park, and Niskayuna. The Crescent Project and Vischer Ferry Project (FERC No. 4679) are located adjacent to one another on the Mohawk River in New York at river miles 4 and 14, respectively. The Crescent Project is the lower of the two projects and is located 2 miles upstream of the School Street Hydroelectric Project (FERC No. 2539) owned by Erie Boulevard Hydropower, L.P. The upstream project boundary of the Crescent Project is the downstream project boundary of the Vischer Ferry Hydroelectric Project. The Crescent Project generally consists of a dam, powerhouse, impoundment, and appurtenant facilities. The Crescent Project dam was originally constructed as part of the New York State Barge Canal System¹ (Barge Canal System²) to ‘canalize’ the Mohawk River from Scotia to Crescent, providing navigable conditions for barges and vessels and facilitating water level control and lock operations. To this day, the first priority for operation of the Crescent Project is to provide adequate water levels for operation of the New York State Barge Canal, with power generation being the second priority. The Crescent Project is owned and operated by the Power Authority of the State of New York (d/b/a “New York Power Authority” and referred to as “the Power Authority”).

This exhibit is required under the Federal Energy Regulatory Commission (FERC) regulations which can be found in Title 18 of the Code of Federal Regulations (CFR) Sections 4.51(c) and 5.18(a)(5)(iii). The information provided herein covers the specifics prescribed for Exhibit B and serves the purpose of providing a statement of operation and resource utilization.

¹ The existing Barge Canal System was created following the passage of the Barge Canal Act in 1903. However, some portion of the original Erie Canal built between 1817 and 1825 still exists. For the purposes of this document, the Licensee will consistently refer to the portions of the Barge Canal or Erie Canal adjacent to the Projects as the Barge Canal System.

² The Barge Canal System is owned by the People of the State of New York and operated by the New York State Canal Corporation (NYSCC), which was created by the New York State Legislature in 1992 as a subsidiary of the New York State Thruway Authority (NYSTA). Prior to 1992, the operations of the Barge Canal System fell under the New York State Department of Transportation. On January 1, 2017, the NYSCC became a subsidiary of the Power Authority (N.Y. Public Authorities Law § 1005-b).

2 Project Operation (18 CFR Section 4.51(c)(1))

2.1 Operational Control

The Crescent hydropower plant can be operated remotely and manually. The plant is generally staffed Monday-Friday, during business hours, but the Project is typically operated remotely from the Power Authority's Blenheim-Gilboa Pumped Storage Project (FERC Project No. P-2685) control room. The Project utilizes a programmable logic controller (PLC) system to monitor impoundment water levels and plant output. Many safeguards are in place for monitoring Project operations at all times.

2.2 Annual Plant Factor

The average annual plant factor is determined using the following equation:

$$\frac{\text{Average Annual Output}}{\text{Nameplate Capacity} \times 8,760 \text{ hrs./yr.}} = \text{Avg. Annual Plant Factor}$$

The Crescent Project has a gross average annual energy production of approximately 58,250 megawatt-hours (MWh) per year (2012-2021) and an annual plant factor of approximately 56.4% based on its current FERC-authorized capacity of 11.8 MW.

2.3 Existing and Proposed Power Plant Operations

2.3.1 Relevant Background Information

The Crescent Project dam was designed in 1907 and construction of the dam was completed in 1914 as part of the extensive modifications made to upgrade the original Erie Canal. These modifications allowed canal traffic to navigate on the Mohawk River, except where channels were constructed to bypass natural barriers. Cohoes Falls, an 80-foot-high set of falls located about 1.5 miles downstream from Crescent Dam, prevented direct navigation between the Mohawk and Hudson Rivers. Crescent Dam is associated with Lock E-6 and serves as the upstream terminus of the portion of the Barge Canal System known as the Waterford Flight, which includes the canal between Lock E-2 through Lock E-6. The Waterford Flight is a 2.5 mile-long section of canal (with a total lift of 169 feet) which allows boat traffic to bypass Cohoes Falls.

In 1913, hydropower was harnessed at the site. The original powerhouse was located at the east end of Dam A and dismantled ca. 1927 when a power line was strung across the river from a newly built, larger powerhouse to take its place. This current powerhouse, located on the western bank, was built in 1925 and expanded in 1990. It houses the two original 2.8 megawatt (MW) Francis turbines and two newer 3.0 MW Kaplan turbines, for a total station capacity of 11.6 MW. On April 8, 1991, FERC issued an Order amending the license to an installed capacity of 11.8 MW based on actual performance.

2.3.2 Current Project Operations

The Crescent Project is operated on a run-of-river basis. The original purpose of the Crescent Dam was to impound water to support navigation on the Barge Canal; this remains true today. In 1983, the State of New York and the Power Authority entered into a Development Agreement whereby the State agreed to grant a perpetual hydroelectric easement to the Power Authority to develop and operate hydropower facilities at both the Crescent and Vischer Ferry project sites. The Development Agreement contains certain protocols

for standard operation and maintenance of both the Project and the Barge Canal System. Barge Canal System levels take priority over the operations of the Projects for generation. The Power Authority proposes to continue operating the Project in the same manner as under the current license.

The Crescent Project operations are performed in a manner to maintain the normal full pool elevation of the impoundment. Flow through the Project is through the powerhouse or over the dam. During the non-navigation season, a minimum flow of 100 cubic feet per second (cfs) (or inflow, whichever is less) is required to be passed at the Crescent Dam. In accordance with a July 31, 2007 FERC order, the minimum flow during canal navigation season is increased to 250 cfs and is passed through a notch in the Dam A flashboards. These minimum flows are for fish protection measures. Once minimum flows and any diversions required for canal operations are met, the remaining flow is available for power generation.

The Dam A and B sections of the Crescent Dam utilize 1-foot-high flashboards that are installed seasonally to help maintain the normal pool level in the Barge Canal System upstream of Lock E-6. The existing flashboards are wooden with vertical steel pin supports. The steel pins used to support the flashboards are set to fail when the headpond level overtops the flashboards by 4 feet. When the flashboards are up, the normal full pool elevation of the impoundment is elevation (El.) 185 ft. Barge Canal Datum (BCD). When the flashboards are out, the normal full pool elevation of the impoundment is El. 184 ft. BCD.

The Crescent hydropower plant operators monitor available water level and weather forecasting information (i.e., United States Geological Survey [USGS] webpage) for severe weather predictions. USGS maintains a streamflow gage upstream of the Crescent and Vischer Ferry Projects at Little Falls (USGS Gage No. 01347000), and downstream of the Crescent Project at Cohoes Falls (USGS Gage No. 01357500). The USGS also has streamflow gages in between the Projects and the Little Falls USGS gage, however, these gages have limited periods of records. The Little Falls USGS gage has a period of record extending back to 1927. The Cohoes USGS gage has a period of record extending back to 1917.

2.3.3 Operation During Adverse, Mean, and High Water Years

During normal water conditions, the Project is operated run of river. The Crescent units are generally operated to maintain the impoundment elevation between 1 to 4 tenths of a foot below crest. Without flashboards the Crescent impoundment is maintained between 183.9 ft. (max) and 183.6 ft. (min), with a target elevation of 183.8 ft. BCD. With flashboards the impoundment is maintained between 184.9 ft. (max) and 184.6 ft. (min), with a target elevation of 184.8 ft. BCD. The newer Kaplan units are used first. As flow rises, one of the Francis units is brought on at full load, and the remaining load is balanced between the new units to maintain the required impoundment elevation. As the flow rises, output of new units is increased, and once all four units are operating at full output, water is spilled over the dam crest.

During high river flows the Project is operated no differently than under normal flow conditions. River flows are used for generation until flows in the river exceed the hydraulic capacity of the generating units. Excess flow is released through gates or is spilled at the dams. Forebay indicators at the Project are designed to alert operators of changing river conditions. Additionally, operators monitor USGS gages along the Mohawk River. The spillway at the Crescent Project is 1,436 ft. long and has ample capacity for passing the higher flow events on the Mohawk River. On occasion a project may have to be taken off-line due to debris build up on the units' trash racks. Once the operator clears the debris, the unit(s) can be brought back on line.

During both scheduled and unscheduled maintenance and unit shutdown events, the Licensee will continue to pass inflow downstream through operation of the remaining units, through the gates or over the crest of the spillway, as necessary. Order of operation or shutdown of any of the units is based on flow conditions and what specific event is taking place.

3 Resource Utilization (18 CFR Section 4.51(c)(2))

3.1 Dependable Capacity

There are two capability periods: summer (May 1 – October 31) and winter (November 1 – April 30). For each capability period, the New York Independent System Operator (NYISO) calculates the dependable capacity (“Unforced Capacity”) for small hydro projects according to Market Services Tariff 5.12.6.2. The calculation is based on the amount of generation the Project produced during the NYISO’s 20 peak load hours for each capability period. The dependable maximum net capability (DMNC) values for the limited control run of river projects are not supported by seasonal testing, but instead are representative of their nameplate installed capacity, and are not expected to change. The DMNC for the Crescent Project is 11.6 MW for the summer period and 11.6 MW for the winter period.

3.2 Average Annual Energy Generation

Table 3-1 lists the annual and monthly gross generation (kilowatt hours [KWh]) at the Project for the past 10 years, 2012-2021.

Table 3-1 Crescent Project Annual and Monthly Gross Generation (KWh) 2012-2021

Month	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	10-year Avg
Jan	6,659,216	5,786,267	5,743,267	4,410,776	2,999,383	7,399,358	6,572,113	7,027,003	7,692,439	6,035,574	6,032,540
Feb	5,597,242	4,755,445	4,057,144	2,190,906	4,963,518	6,310,469	5,466,748	7,574,634	6,922,723	3,301,684	5,114,051
Mar	6,477,868	7,119,745	5,383,796	4,339,441	6,099,470	6,743,293	8,743,765	7,409,975	9,045,416	8,008,159	6,937,093
Apr	2,858,699	8,081,444	6,471,051	6,285,016	5,067,682	8,309,467	8,713,577	8,439,831	8,627,262	7,076,743	6,993,077
May	6,289,441	4,996,102	6,444,119	2,656,903	3,648,423	7,844,314	5,948,478	7,902,780	6,650,794	5,348,669	5,773,002
Jun	3,229,858	7,576,288	4,563,368	4,613,766	1,867,788	5,876,281	1,734,598	6,221,318	1,772,246	3,008,154	4,046,367
Jul	996,258	4,743,195	2,768,745	3,226,400	1,358,785	5,318,376	1,339,048	3,209,033	804,289	6,671,324	3,043,545
Aug	1,243,008	1,380,893	2,306,751	491,683	2,111,553	2,291,916	3,877,257	2,406,604	1,655,702	4,584,299	2,234,967
Sep	1,242,087	2,448,687	1,620,467	494,404	887,073	1,986,053	3,966,087	2,003,484	651,760	4,469,873	1,976,998
Oct	3,187,896	3,179,426	2,921,539	2,378,832	2,144,888	2,923,227	6,694,901	6,792,646	2,607,779	7,269,428	4,010,056
Nov	3,429,066	5,459,618	3,766,834	3,618,259	3,960,238	7,597,116	8,918,264	8,245,823	4,570,743	7,894,686	5,746,065
Dec	6,849,811	5,943,388	6,667,841	4,132,313	6,679,262	5,203,132	8,625,758	6,687,274	5,522,926	7,108,233	6,341,994
Total	48,060,450	61,470,498	52,714,922	38,838,699	41,788,063	67,803,002	70,600,594	73,920,405	56,524,079	70,776,826	58,249,754

Generation statistics are based on hourly generation data.

3.3 Project Hydrology

There are several methods and indicators available to monitor the flow rates on the Mohawk River. Since 2011, the Power Authority has collected and electronically recorded hourly outflow data for the Projects, calculated based on unit discharge and impoundment elevation. These values were used to produce flow statistics and flow duration curves provided in the Pre-Application Document. A longer period flow record is available from the USGS located downstream of the Crescent Project at Cohoes Falls (USGS Gage No. 01357500). The USGS also operates gages upstream of the Vischer Ferry Project at Little Falls (USGS Gage No. 01347000) and at Vischer Ferry. However, these other gages have limited periods of records. The Cohoes USGS gage has a period of record extending back to 1917.

Flow duration curves and flow statistics for the Project were developed from the USGS gage data at Cohoes Falls for the period 1992-2021. Since there is almost no intermittent drainage between Crescent dam and the USGS gage at Cohoes Falls, no proration factor was used. Since prorated USGS gage flows were used to develop the Crescent Project flow duration curves and flow statistics, neither includes flows that are diverted from the Crescent impoundment through Lock E-6 and the Waterford flight during the Barge Canal System's navigation season (generally May through October).

The annual and monthly minimum, median, mean, and maximum flows in cfs at the Crescent Project for the period January 1, 1992 through December 31, 2021 are provided in Table 3-2. Annual flow duration curves for the Crescent Project for the same period of record (January 1, 1992 through December 31, 2021) are shown in Figure 3-1. Monthly flow duration curves are provided in Figure 3-2 through Figure 3-13.

Table 3-2 Flow Statistics* (in cfs) for the Crescent Project

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Period of Record: 30 years (January 1, 1992 - December 31, 2021)													
Min	1,420	1,560	1,400	196	129	244	180	244	175	544	587	1,300	129
Median	5,075	4,555	8,100	11,500	4,730	2,895	2,000	1,760	1,655	2,990	5,760	6,355	4,240
Mean	7,359	6,206	11,233	14,126	6,624	5,010	3,507	2,816	2,697	5,130	7,008	7,946	6,635
Max	92,600	52,800	64,600	79,000	42,800	89,700	34,500	96,900	82,200	51,500	63,600	55,500	96,900

Source: New York Power Authority

*Based on flow data from USGS gage 01357500 Mohawk River at Cohoes.

Figure 3-1 Annual Flow Duration Curve for the Crescent Project

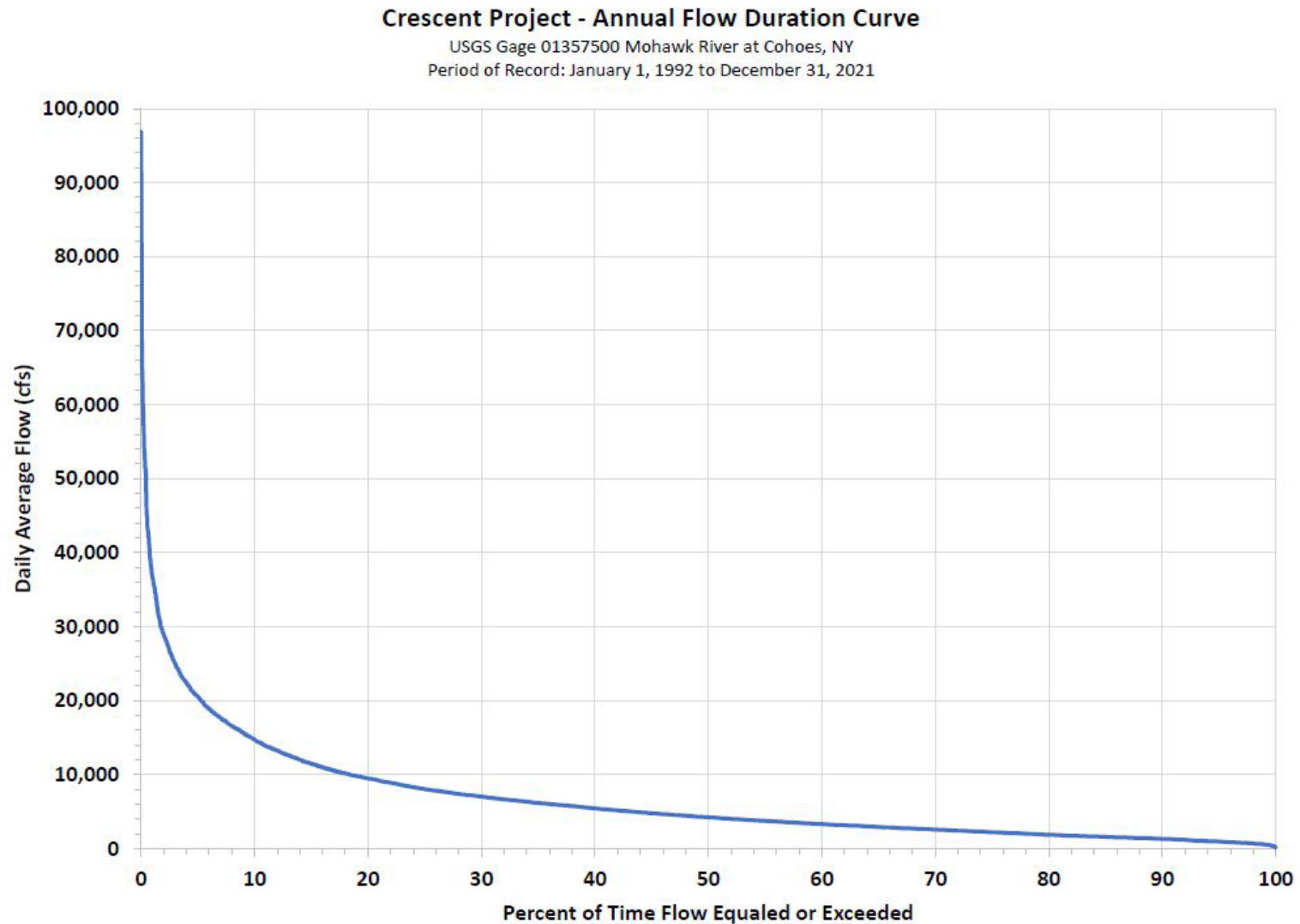


Figure 3-2 Monthly Flow Duration Curve for the Crescent Project - January

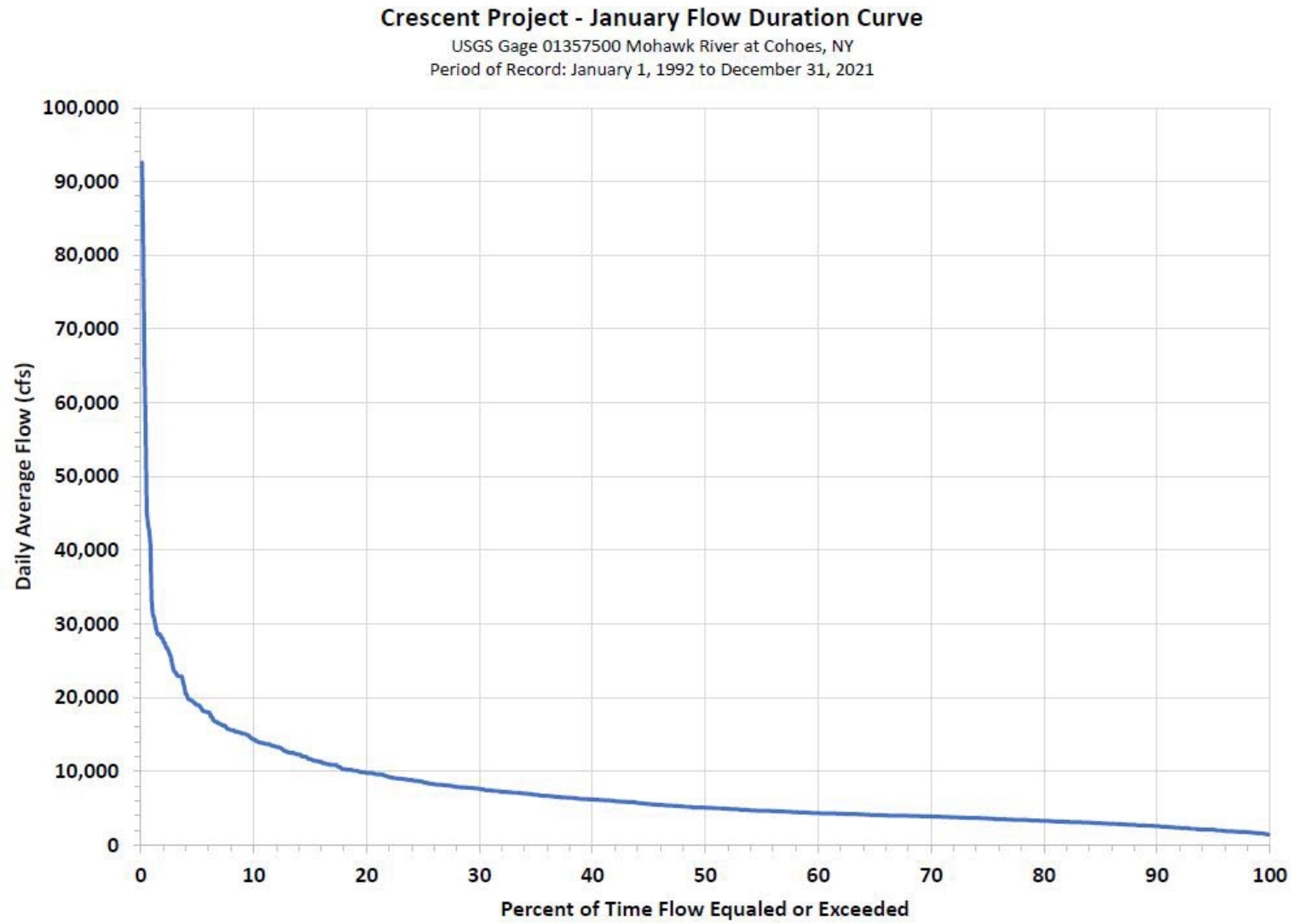


Figure 3-3 Monthly Flow Duration Curve for the Crescent Project - February

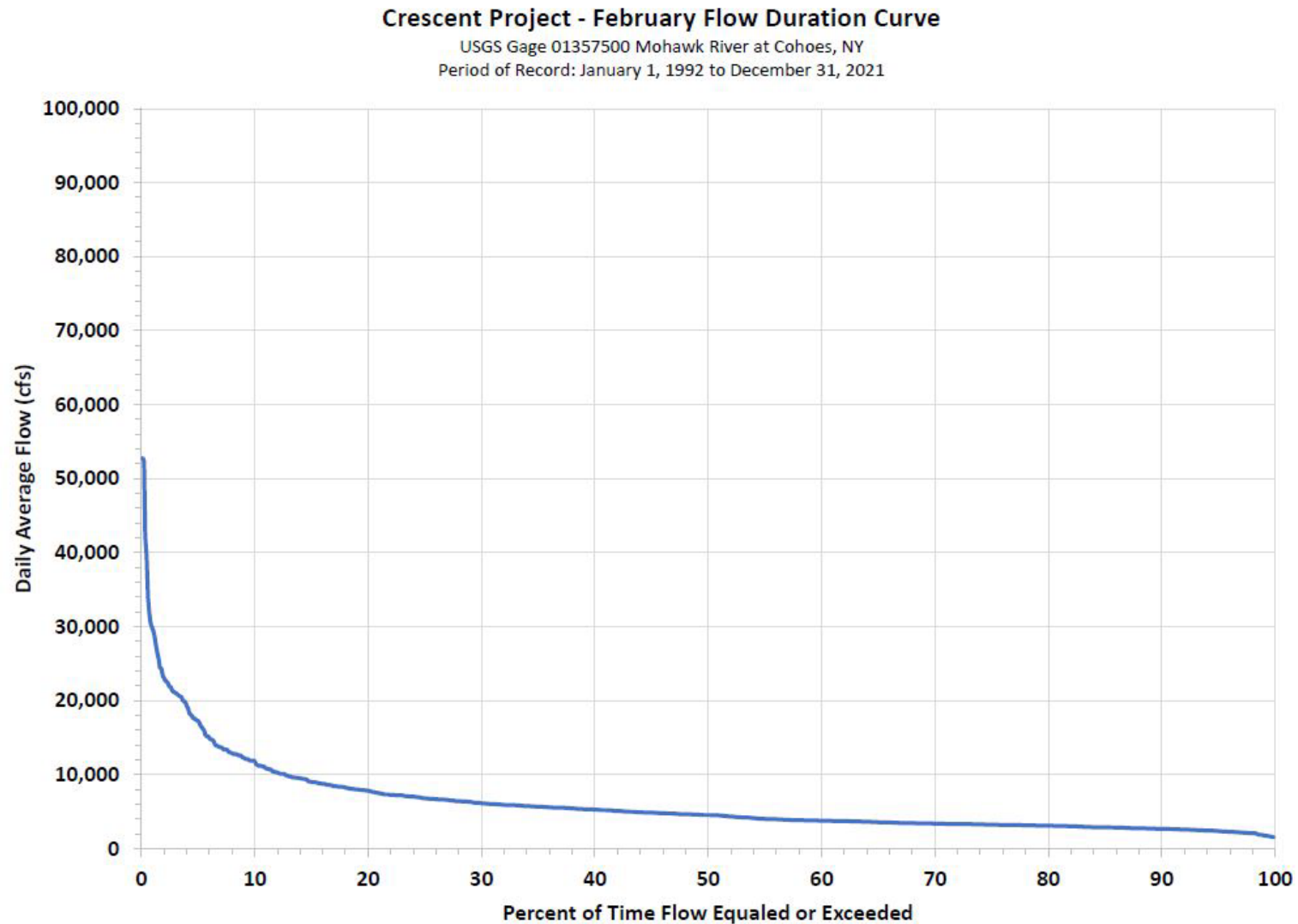


Figure 3-4 Monthly Flow Duration Curve for the Crescent Project - March

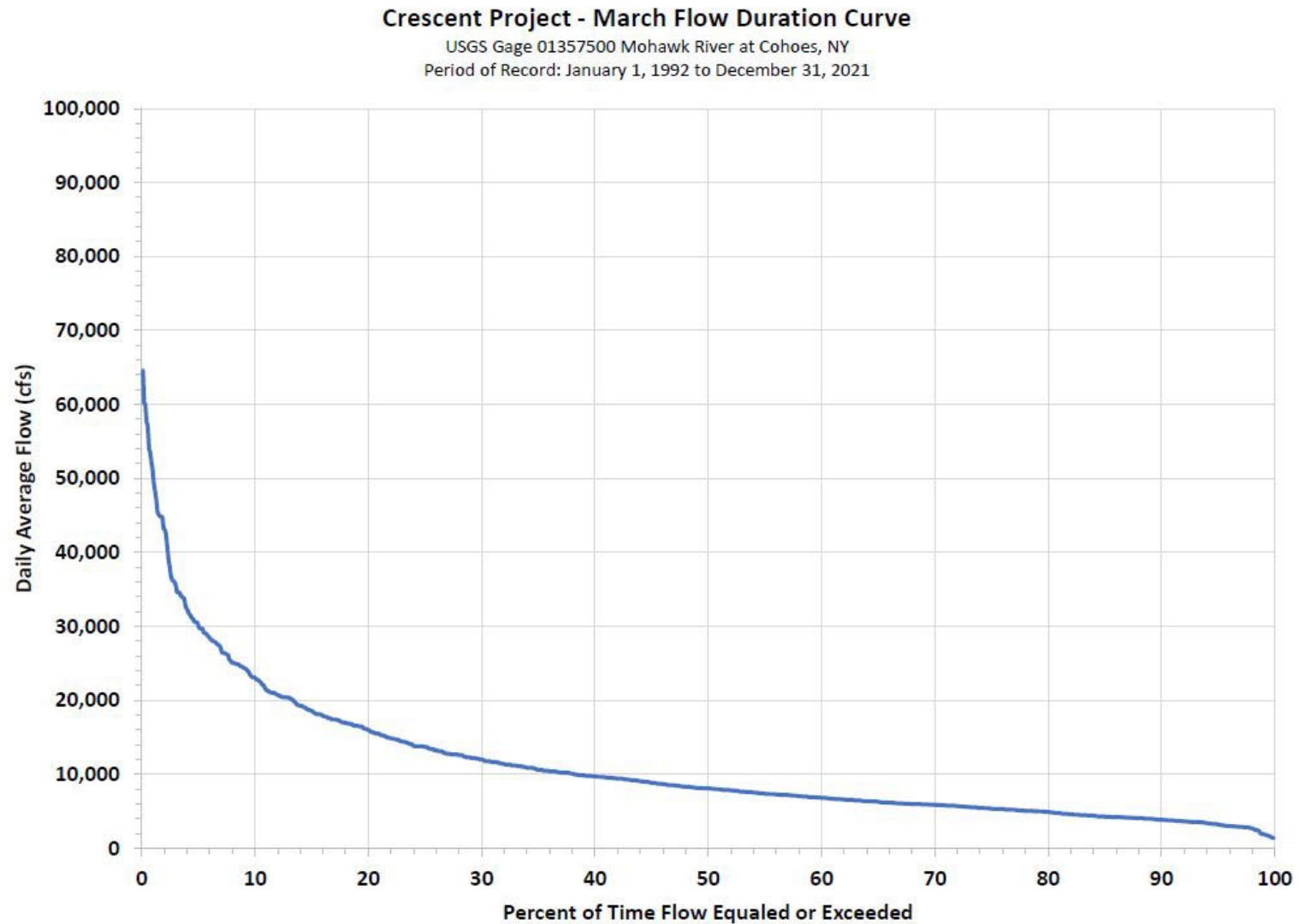


Figure 3-5 Monthly Flow Duration Curve for the Crescent Project - April

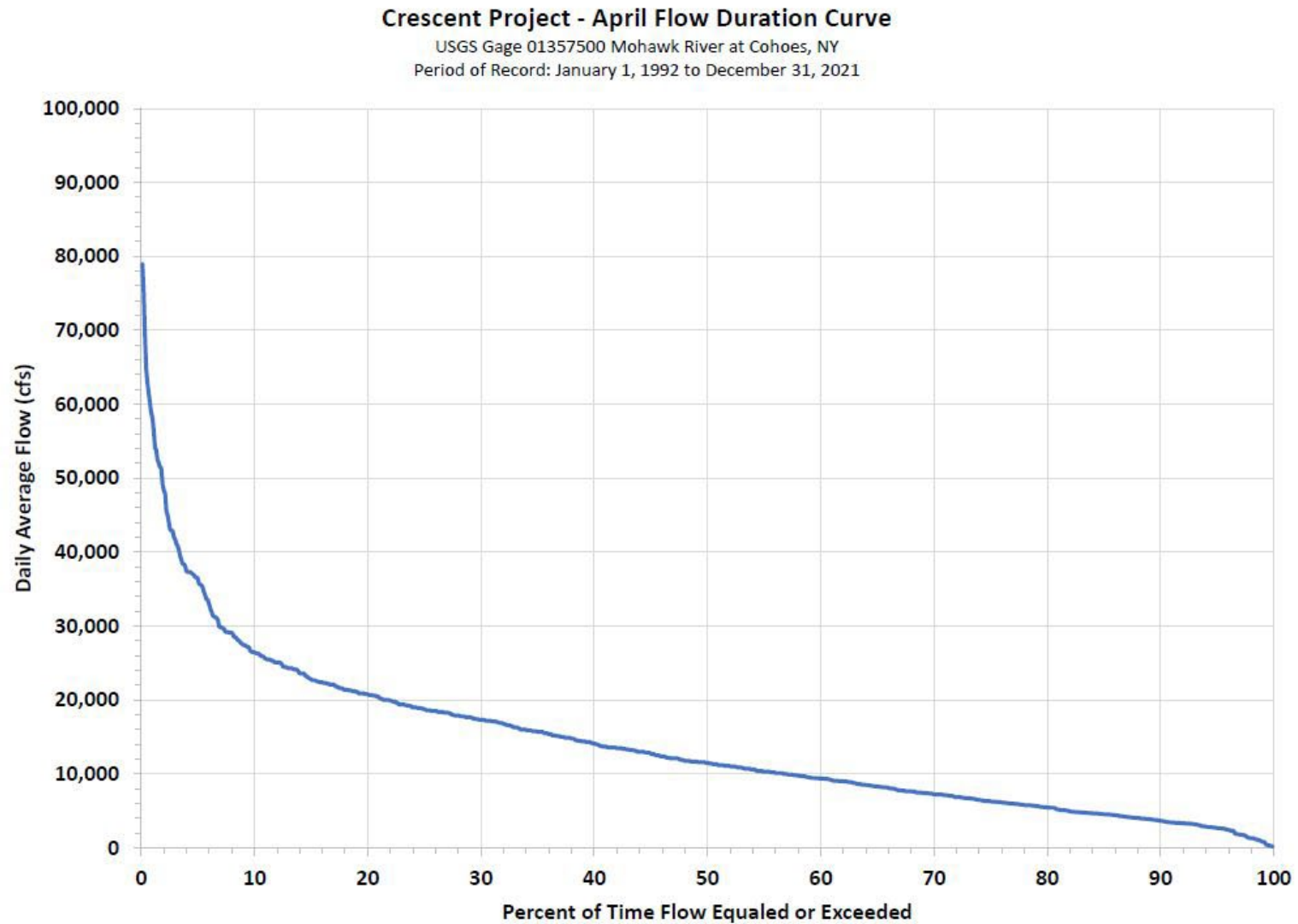


Figure 3-6 Monthly Flow Duration Curve for the Crescent Project - May

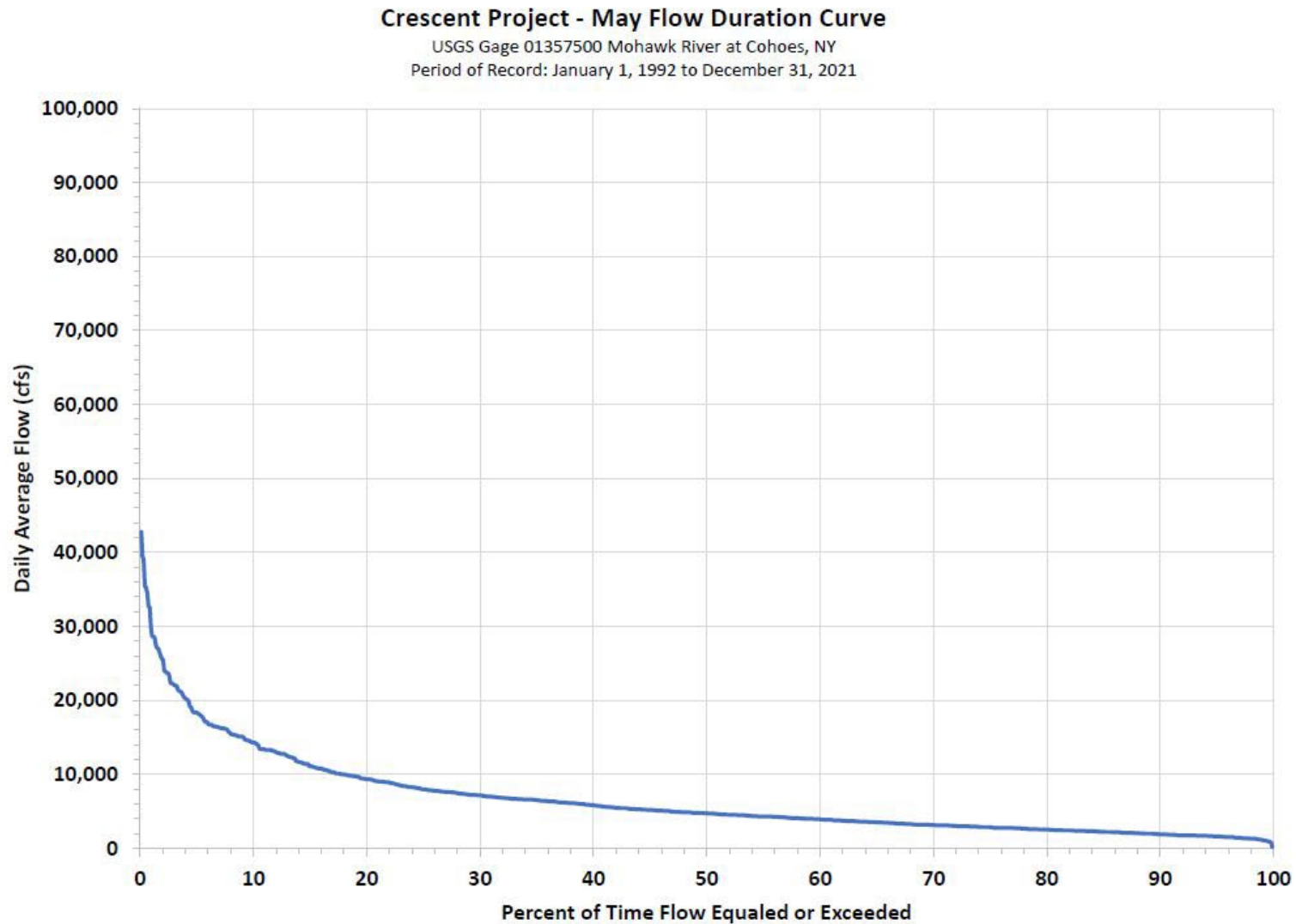


Figure 3-7 Monthly Flow Duration Curve for the Crescent Project - June

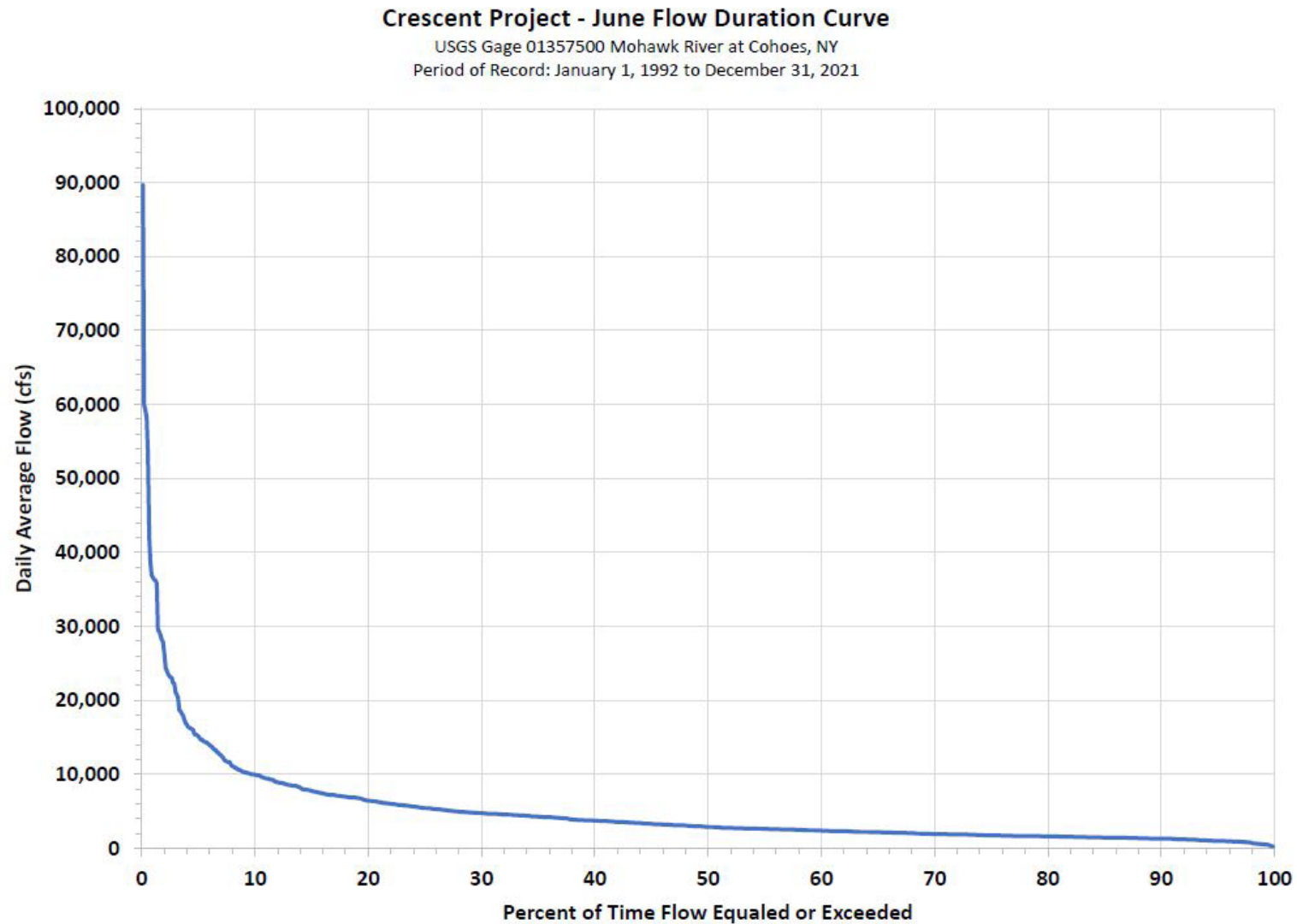


Figure 3-8 Monthly Flow Duration Curve for the Crescent Project - July

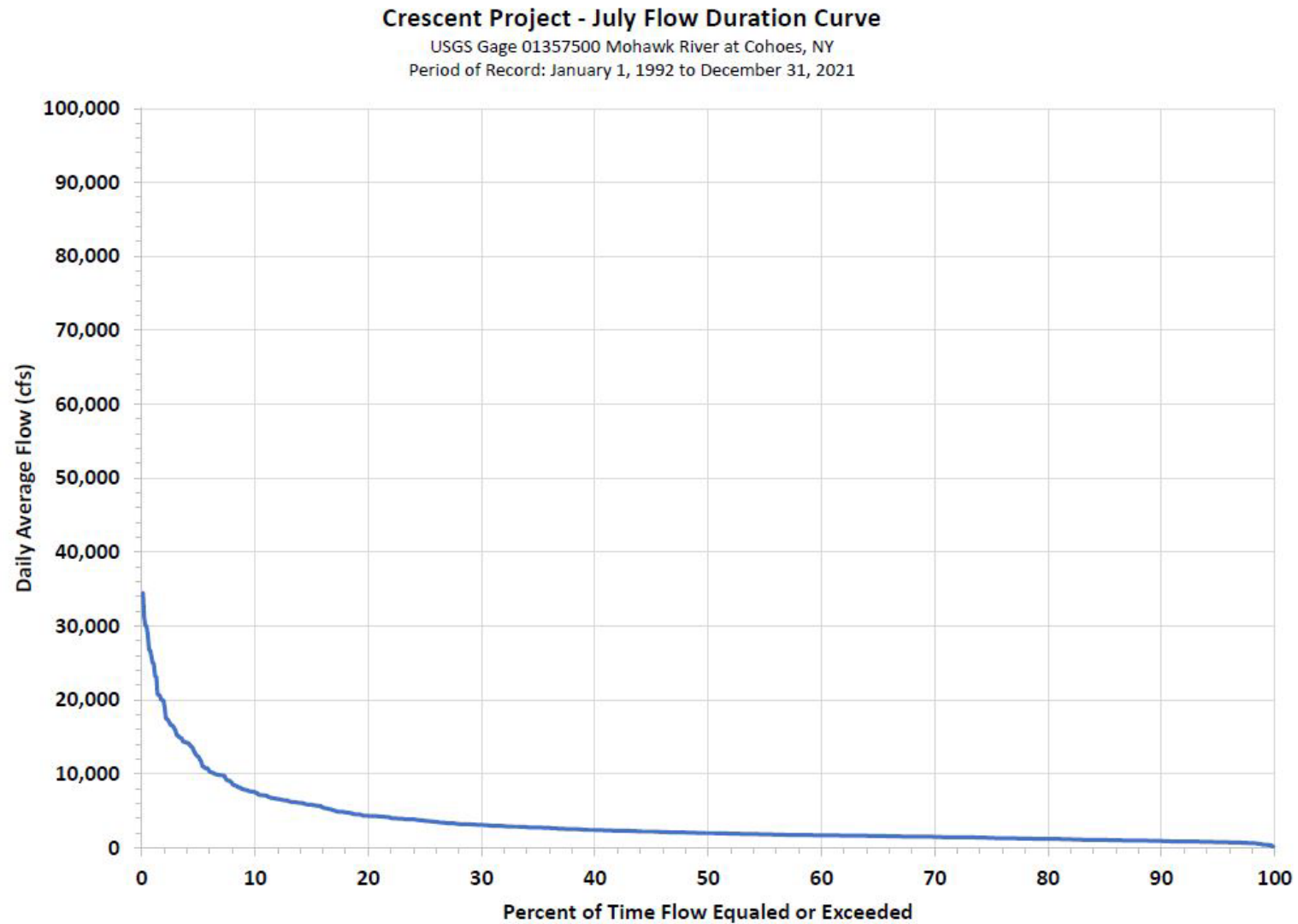


Figure 3-9 Monthly Flow Duration Curve for the Crescent Project - August

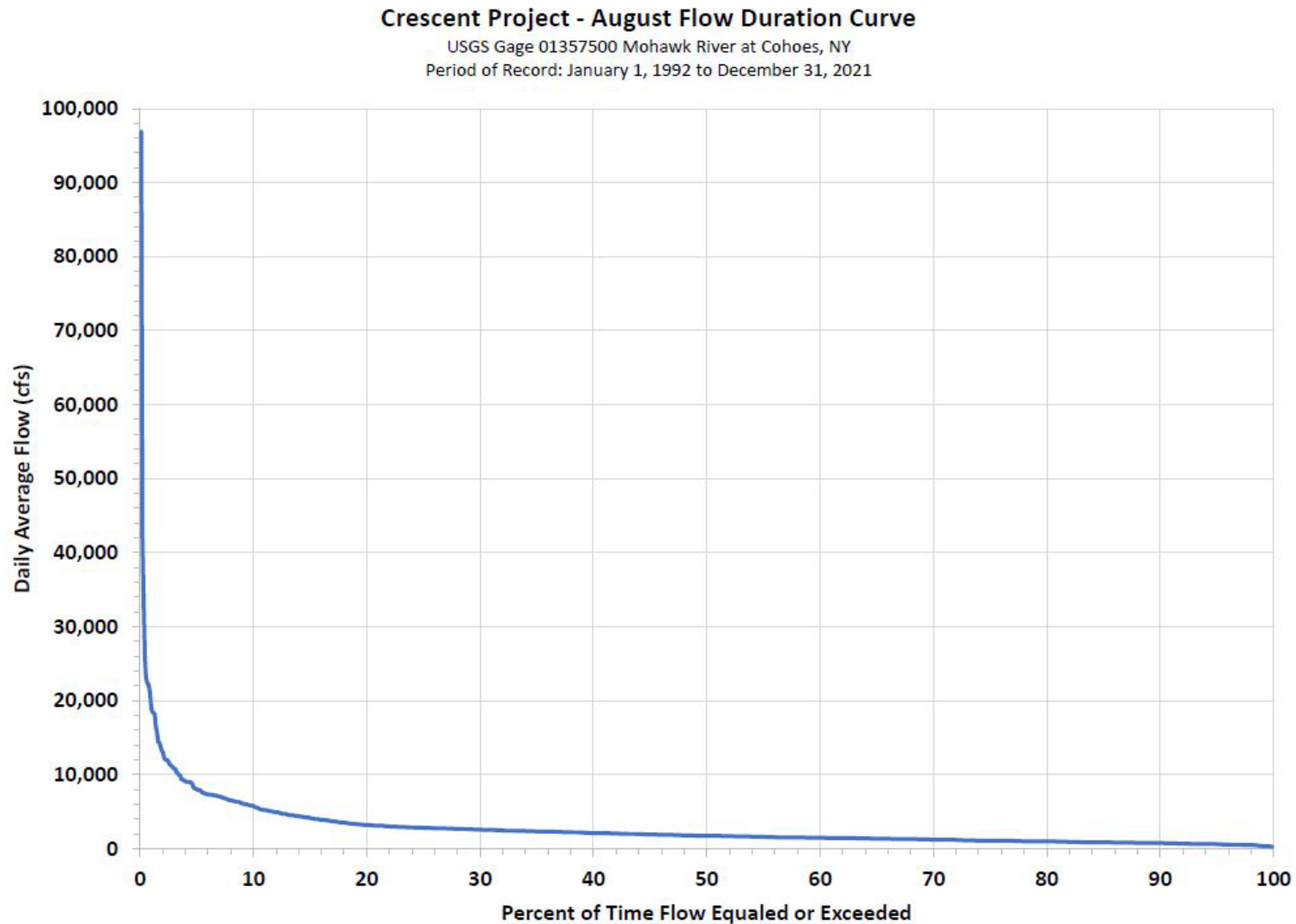


Figure 3-10 Monthly Flow Duration Curve for the Crescent Project - September

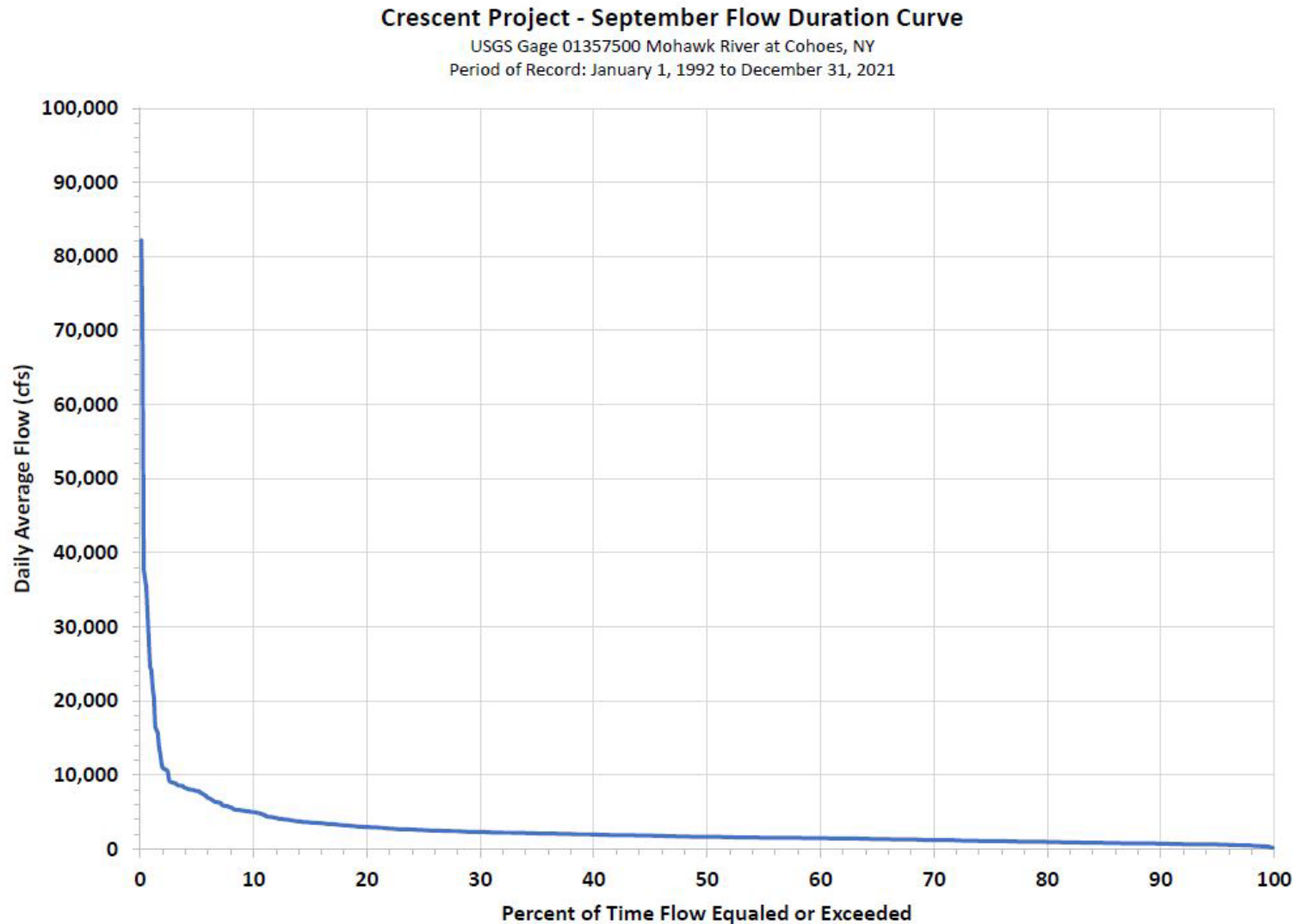


Figure 3-11 Monthly Flow Duration Curve for the Crescent Project - October

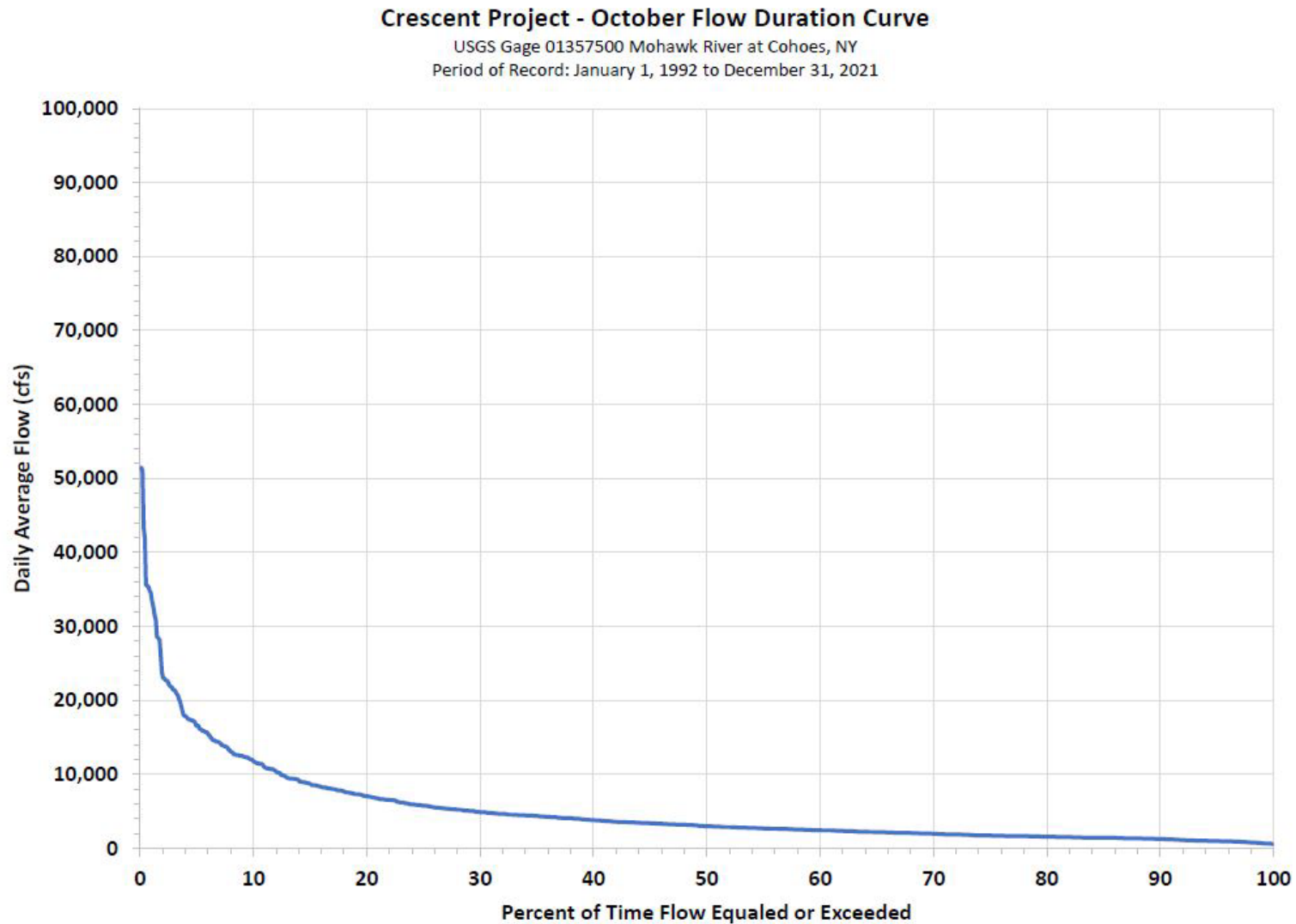


Figure 3-12 Monthly Flow Duration Curve for the Crescent Project - November

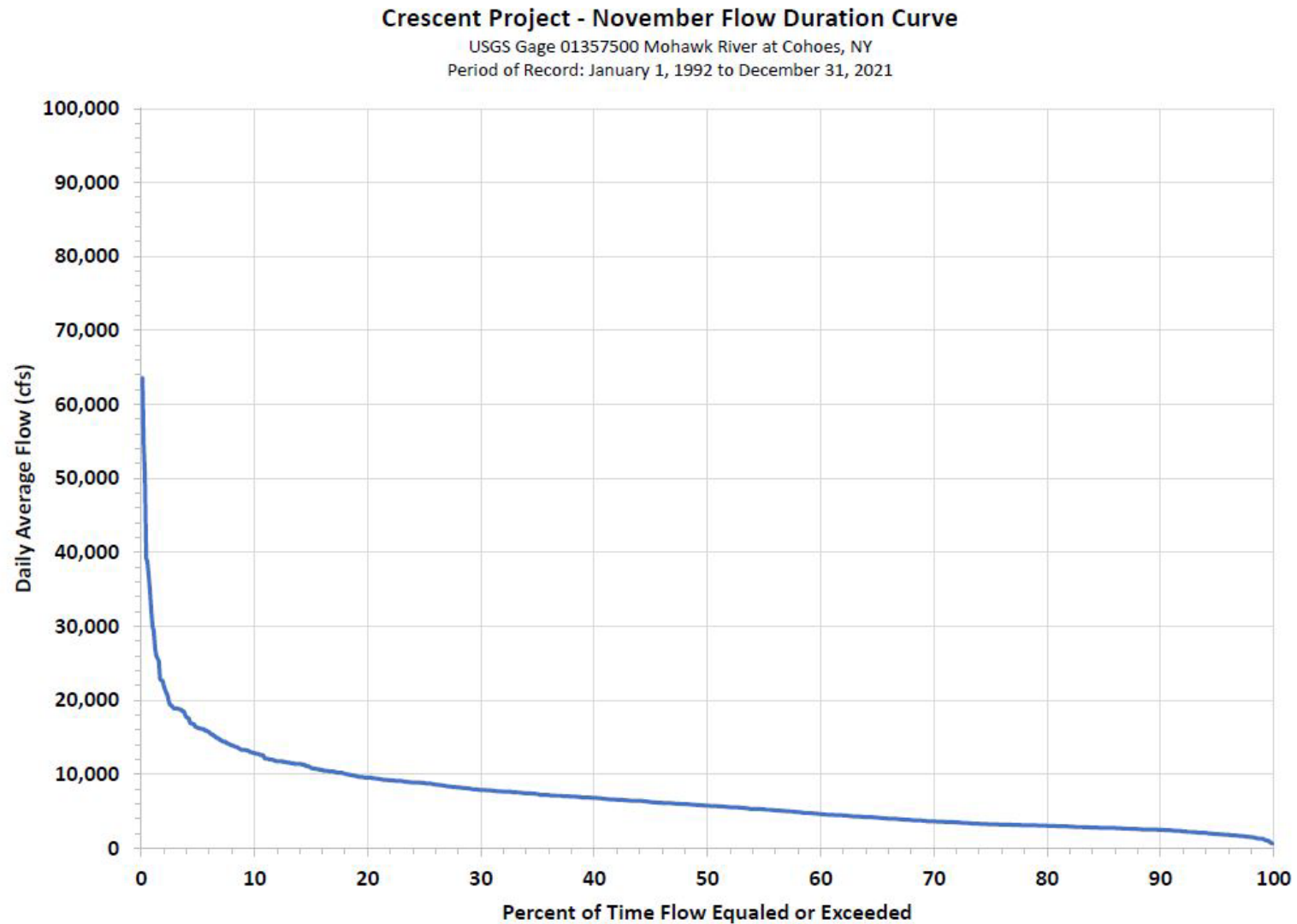
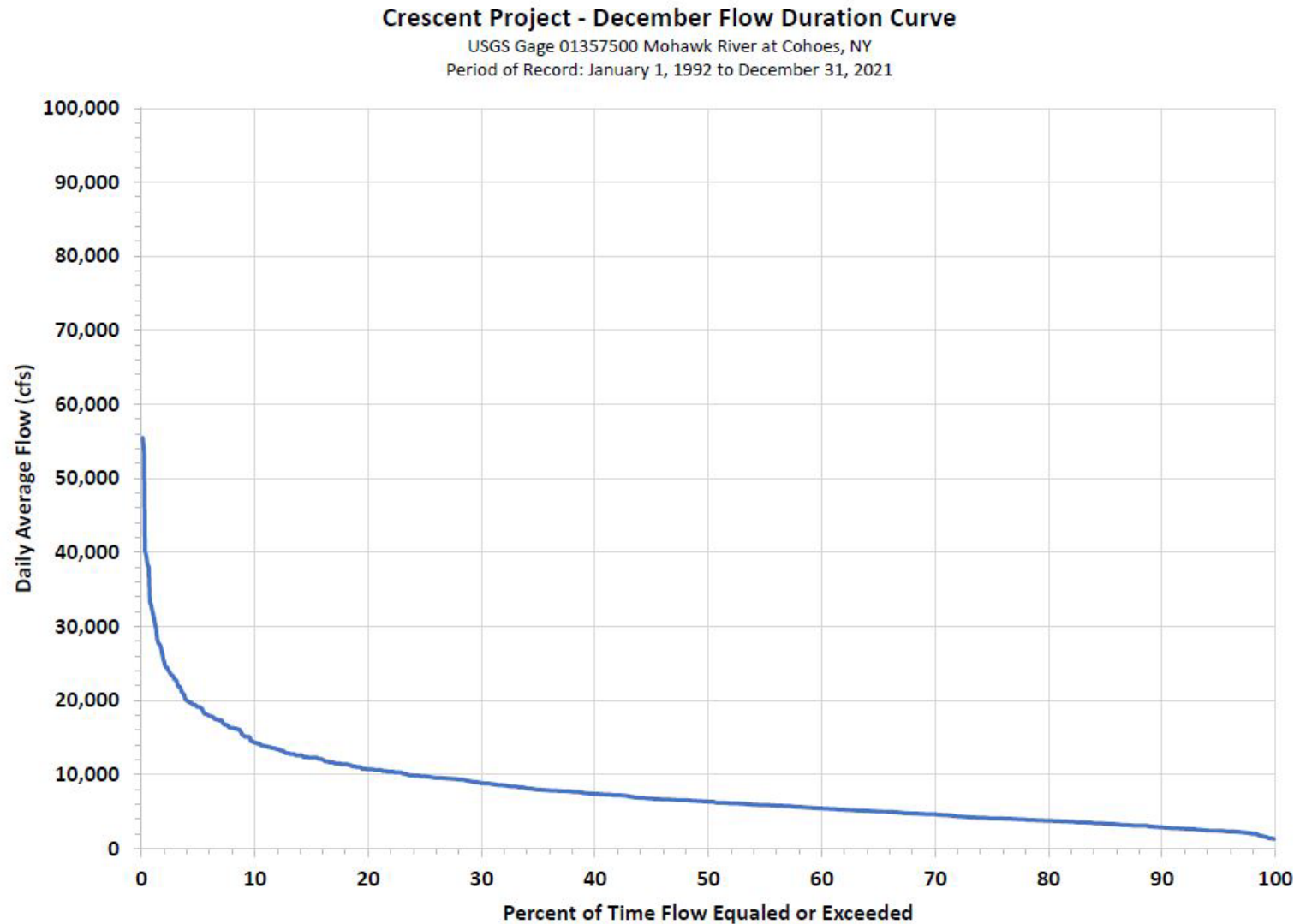


Figure 3-13 Monthly Flow Duration Curve for the Crescent Project - December



3.4 Area Capacity and Rule Curve

The Crescent Project is operated as run-of-river. The Project has limitations on impoundment level fluctuations and requirements for minimum flows and does not have the capacity to store or manage flows on a long-term basis.

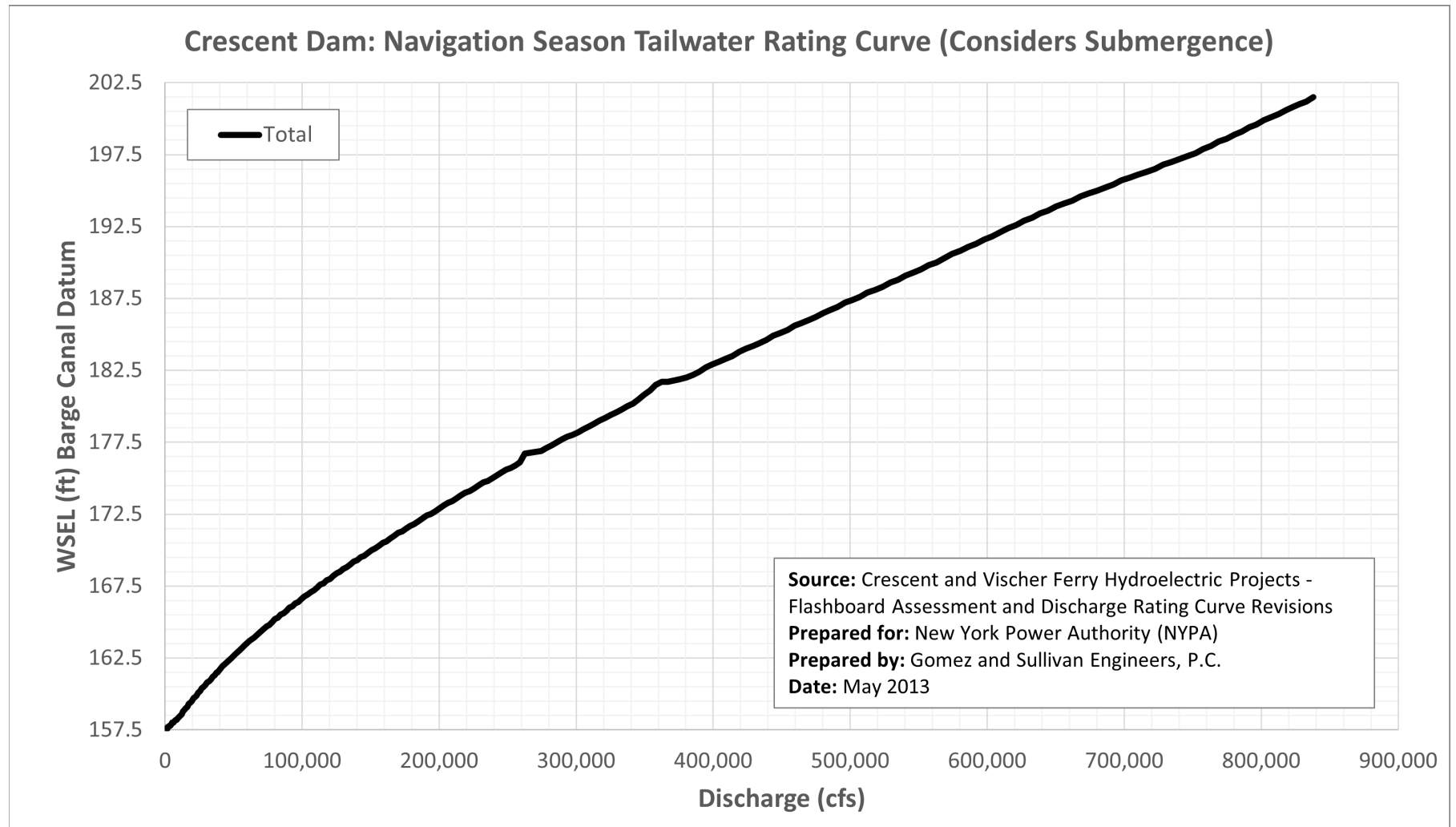
3.5 Hydraulic Capacity

The minimum hydraulic capacity of each of the Project's four turbine units is approximately 350-400 cfs. The maximum hydraulic capacity of each of the Project's four turbine units is approximately 1,500-1,820 cfs.

3.6 Tailwater Rating Curve

The tailwater elevation for the Project is approximate El. 157 ft. BCD. The tailwater rating curve for the Project is shown in Figure 3-14.

Figure 3-14 Crescent Project Tailwater Rating Curve



4 Utilization of Project Power (18 CFR Section 4.51(c)(3))

The primary purpose of the Project dam is for navigation in support of the operation of the Barge Canal System. The Project's other purpose is for generation of clean, renewable power. Electricity generated at the Project is used to supply energy and capacity to the NYISO, a regional transmission organization that coordinates the generation and transmission of wholesale electricity within the state of New York. The Project plays a role in New York's renewable energy portfolio as it provides low-cost emissions-free, baseload power.

5 Plans for Future Development (18 CFR Section 4.51(c)(4))

The Power Authority has no plans to construct new facilities or to alter operations at the Project. The Power Authority seeks authorization to continue operating the Project in its current configuration and as it is currently licensed to operate.

6 Literature Cited

Gomez and Sullivan Engineers. P.C. May 2013. Crescent and Vischer Ferry Hydroelectric Projects - Flashboard Assessment and Discharge Rating Curve Revisions. Prepared for the Power Authority.