## EXHIBIT B

## PROJECT OPERATION AND RESOURCE UTILIZATION

### 1.0 PROJECT OPERATION

The Parr Shoals Development ("Parr Development" or "Parr") operates in modified run of river mode, and generates as a baseload facility using available inflows up to 4,800 CFS. This flow is associated with turbines set at approximately 50 percent gate opening, as the full hydraulic capacity of 6,000 cfs results in power output that exceeds the rated capacity of generators[1]. When inflows are below 4,800 CFS, the Parr Development's turbines are operated to meet the minimum flow requirements. The minimum flow required to be released from the Project during the months of March, April, and May is the lesser of 1,000 CFS or daily average inflow (minus evaporative losses from both reservoirs). During the remainder of the year, the minimum flow requirements are 150 CFS instantaneous flow and 800 CFS daily average flow, or the daily average inflow (minus evaporative losses), whichever is less.

The Fairfield Pumped Storage Development ("Fairfield Development" or "Fairfield") is utilized as a peaking resource, and also as a reserve generation asset to the extent it is not being used to meet peak demand of the Applicant's system. Fairfield generates and pumps using an active storage of up to 29,000 acre-feet of water. During the generation cycle, active storage in the upper Monticello Reservoir is released from the powerhouse into the lower Parr Reservoir. During the pumping cycle, the active storage is transferred from the Parr Reservoir back into the Monticello Reservoir. This cycle can occur almost daily, and the transfer of up to the full active storage results in an upper reservoir maximum fluctuation of 4.5 feet, and a corresponding lower reservoir fluctuation of up to 10 feet. When inflows to the Project begin to exceed 6,000 CFS, the allowable maximum reservoir elevation is reduced from el. 265.3[2] and Bascule gates on the Parr Development spillway dam are

[1] The turbines operate at a maximum head of 44 feet, but original design was 35 feet prior to raising the Parr Reservoir the additional 9 feet. Power output exceeds the generator ratings at full gate opening, and the gate settings are therefore limited to prevent equipment damage.

[2] Unless otherwise noted, all elevation references in this Exhibit are referenced to the North American Vertical Datum of 1988 (NAVD 88); conversion to National Geodetic Vertical Datum of 1929 (NGVD29), used in numerous supporting studies for this license application and often erroneously referred to as MSL, requires the addition of 0.7 feet to elevation values referenced to NAVD88.

systematically lowered to prevent upstream inundation at critical sections due to backwater effects. Generation from the Fairfield Development is also partially curtailed during these conditions to prevent total project flow releases from contributing to downstream flooding. When inflows reach a threshold that causes flooding downstream of the Project, all spillway gates are fully lowered to pass natural inflows, and Fairfield generation is completely suspended until flows recede. Fairfield pumping operations may occur with any flow in the Broad River. On the falling leg of a flood event, the gates are gradually raised to retain active storage while preventing the reservoir from exceeding the normal maximum elevation. Monticello Reservoir lower operating levels have been agreed to by the Atlanta Regional Office during the current license period. These agreements are described in more detail in Exhibit H-7 and H-8.

As a reserve asset, in the event of a loss of generation on the Applicant's system, available Fairfield units can be started and brought to full load within 15 minutes. This allows a rapid response to emergencies on the Applicant's system, and also helps fulfill the Applicant's reserve share obligation as a member of the Virginia-Carolinas Electric Reliability Council (VACAR) under the VACAR Reserve Sharing Arrangement (VRSA). It should be noted that, in order to be considered a reserve generation asset at any given time, Fairfield units must be on standby and cannot be providing generation for other purposes.

### 1.1 Manual or Automatic Operation

The Parr Development units normally are dispatched remotely from SCE&G's System Control Center in Cayce. Once started, the units are under automatic control. Units can also be operated manually from the powerhouse. The plant is manned five days per week, eight hours per day, with plant checks conducted on weekends and holidays. Personnel are also available for call out should a problem arise outside of plant personnel normal working hours.

Fairfield Development units are operated from a local control room in the Fairfield powerhouse that is manned continuously.

## 1.2 Estimate of Plant Capacity Factor

The annual plant capacity factor (the ratio of the average load on the plant for a certain period of time to the capacity rating of the plant) for the Parr Development is estimated to be 43 percent, based on average annual gross generation of 55,893 MWH for the period 2000 through 2017, as shown in Exhibit B-1.

The annual plant capacity factor for the Fairfield Development is estimated to be approximately 15 percent, based on average annual gross generation of 660,582 MWH for the period 2000 through 2017. Average annual pumping energy for this same period for the Fairfield Development is 918,671 MWH, as shown in Exhibit B-1.

## 1.3 Proposed Operation During Adverse (Low), Mean (Normal), and High Water Years

Adverse (Low) Flow Years: During periods of low flow in the Broad River, Parr Development will generate continuously using one or more units to pass the natural river flow and provide any prescribed downstream flows. Fairfield Development will be dispatched each day in both generation and pumping modes to meet the Applicant's system peak demand and energy storage requirements, subject to the availability of water in Parr Reservoir. During periods of extremely low flow, it is sometimes not possible to completely replenish Monticello Reservoir each day due to evaporative and other losses (e.g. leakage) from the project reservoirs, and the energy dispatched from Fairfield must be reduced each day during the following generation cycle to account for this.

Mean (Normal) Flow Years: Operation of the Project in mean flow years will generally consist of continuous generation at Parr Development to pass the natural river flow, with flows that exceed the hydraulic capacity of the powerhouse spilled using the crest gates. Fairfield Development will be dispatched each day in both generation and pumping modes to meet the Applicant's system peak demand and energy storage requirements.

High Flow Years: Operation of the Project in high flow years will generally consist of continuous generation at Parr Development with all available units to pass the natural

river flow, with flows that exceed the hydraulic capacity of the powerhouse spilled using the crest gates. Fairfield Development will be dispatched each day in both generation and pumping modes to meet the Applicant's system peak demand and energy storage requirements, subject to the requirements (based on Article 39 of the current license) to curtail generation at Fairfield during floods so as not to add to downstream flood flows. The maximum elevation limits on the Parr Reservoir will be reduced as inflow increases to prevent upstream flooding from backwater effects during high inflows. This requires additional management of usable storage via gate operations throughout a high inflow event. Operation during high flow events is described in more detail in Exhibit H.

## 2.0 GENERATION AND HYDROLOGY

### 2.1 Estimate of Dependable Capacity

Dependable capacity as defined by the Energy Information Administration is "The load-carrying ability of a station or system under adverse conditions for a specified period of time." For the Parr Development, adverse conditions are extended periods of low inflow, with the headpond near the minimum level following a Fairfield Development pumping cycle. During the lowest flow month of September, the adverse condition selected for this estimate is the flow that is met or exceeded 90 percent of the time, which is approximately 800 cfs[3]. This is sufficient flow for a single turbine-generator to generate at 50 percent gate, and at minimum headpond produces an estimated dependable capacity of 1.4 MW.

Because Fairfield operates within a range of available head using storage from the upper reservoir, adverse conditions are not associated with river flow. Rather, the lower end of the head range is the adverse condition. At minimum head conditions, Fairfield has a rated capacity of 511.2 MW, which is considered the dependable capacity.

[3] USGS Annual Statistics for station 02161000, Broad River at Alston.

## 2.2 Gross Generation

Annual gross generation for Parr Development and Fairfield Development for the years 2000 through 2017 is shown in Exhibit B-1. The average gross annual generation over this period was 55,893 MWH for the Parr Development, and 660,582 MWH for the Fairfield Development. Average annual energy consumption by the Fairfield Development over the same period was 918,671 MWH, resulting in a net consumption of 258,089 MWH.

## 2.3 Streamflow Data & Flow Duration Curves

The Parr Hydroelectric Project is located on the Broad River near Jenkinsville, SC. The total contributing drainage area at the Parr Development is 4,750 square miles. The monthly and annual flow regime data was collected from a United States Geological Survey (USGS) gauge (02161000, Broad River at Alston, SC) located on the Broad River downstream of Parr Development. The contributing drainage area for this gauge is 4,790 square miles with an average annual flow of 5,122 CFS (USGS 2016). The data from this gauge was used to develop the curves shown in Exhibits B-2 through B-14. The period of record for the data that is used in these graphs dates from 1981 through 2017.

The flood of record for the Broad River at the Project location occurred on October 3, 1929, and was estimated by the USGS at 228,000 CFS. The minimum daily average flow is 48 cfs, which occurred on September 12, 2002.

## 2.4 Area Capacity Curves

Area-capacity curves for Parr Reservoir are given in Exhibit B-15, with a corresponding table presented as Exhibit B-16. Area-capacity curves for Monticello Reservoir (Fairfield Development) are given in Exhibit B-17, with a corresponding table presented as Exhibit B-18.

Parr Reservoir has gross storage of approximately 32,000 acre feet at full pool elevation 265.3', and usable storage (for pumped storage operation) of approximately 29,000 acre feet between elevation 265.3' (full pool) and elevation 255.3'. Parr

Reservoir surface area is approximately 4,250 acres at full pool elevation 265.3', and is approximately 1,400 acres at an elevation of 255.3'.

Monticello Reservoir has gross storage of approximately 400,000 acre feet at full pool elevation 424.3', and usable storage (for pumped storage operation) of approximately 29,000 acre feet between elevation 424.3' (full pool) and elevation 419.8'. Monticello Reservoir surface area is approximately 6,600 acres at full pool elevation 424.3', and is approximately 6,400 acres at an elevation of 419.8'.

## 2.5 Reservoir Guide Curves

This project is a combination of modified run of river and pumped storage, and as such does not utilize reservoir guide or rule curves for either project reservoir.

## 2.6 Estimated Hydraulic Capacity

The estimated hydraulic capacity of the Parr Development is 4,800 CFS at 44 feet of head and approximately 50 percent gate opening. At full gate opening, the estimated capacity is 6,000 cfs; however, the power output exceeds the generator capacity, and therefore gate openings are currently limited to prevent equipment damage. The hydraulic capacity of the Fairfield Development is 50,400 CFS in generating mode and 41,800 CFS when pumping (all 8 units operating).

## 2.7 Spillway Rating Curve

A spillway rating curve for Parr Development with all crest gates in the fully down position is given in Exhibit B-19.

## 2.8 Tailwater Rating Curve

A tailwater rating curve for Parr Development is given in Exhibit B-20.

## 2.9 Powerplant Capability vs. Head Curves

Net head-capacity curves for Parr Development and reservoir elevation – capacity curves for Fairfield Development are given in Exhibits B-21 and B-22, respectively. For Parr Hydro, these represent the Applicant's estimate of the development's

generating capacity based on operating experience and the installed turbine and generator nameplate ratings. The curve represents the current limitation of operating the turbines at 50 percent gate opening. For Fairfield Development, the curve represents generator nameplate ratings at 60ºC temperature rise as the limiting factors across the range of the net head and is indicated by a straight line. Best gate setting of the turbines (75 to 80 percent gate) allows 576 MW output at 80ºC temperature rise.

## 3.0 POWER UTILIZATION

Parr Shoals Development

Parr Development normally operates as a baseload, modified run of river plant using available natural flow in the Broad River. Energy generated is utilized in the Applicant's system to serve customer demand.

Fairfield Development

### Peaking Power

The primary use for the Fairfield Development is to provide peaking generation each day during periods of high customer demand, and to store energy produced by baseload plants during off peak periods by pumping water from Parr Reservoir into Monticello Reservoir. The peaking power produced is used in the Applicant's system to serve customer demand.

### Generation for Applicant's System Reserve

When Fairfield Development is utilized to replace the sudden loss of power from another generation asset on the Applicant's own system, the power produced is used in the Applicant's system to serve customer demand, usually for periods of one to several hours, until such time as other generation assets can be brought on line, or purchased off-system power becomes available to balance the Applicant's system load.

### Generation for Regional Reserve Sharing Obligations

When Fairfield is utilized in fulfillment of all or a portion of the Applicant's reserve sharing obligation under the VRSA, the power produced by Fairfield represents excess generation above the requirements of the Applicant's own customer demand. The excess power is made available through the interconnected regional transmission system (the "grid"), to balance generation and load over the interconnected system. Compensation to the Applicant for reserve generation provided to other VRSA member systems is made according to the terms of the VRSA.

## 4.0 FUTURE DEVELOPMENT

A resource utilization study was conducted in 2015 to determine the feasibility of increasing capacity and/or energy production at both developments of the Project. The results indicate that the Parr Development may benefit from new generators to allow full turbine capacity to be utilized. At the Parr Development, the power output exceeds the generator ratings at full gate opening, and the gate settings are therefore limited to prevent equipment damage. A Generation Capacity Increase Review (Kleinschmidt 2017) was conducted to quantify the potential improvements. It was determined that higher capacity generators would result in both higher station generating capacity, estimated to be 22 MW and an increase of hydraulic capacity of approximately 20 percent from 6,000 cfs (at minimum head) to approximately 7,254 cfs (at maximum head) for the total station. As part of the mitigation for reducing downstream flow fluctuations year round, the Applicant proposes to modify or replace the generators at the Parr Development so as to allow the turbines to operate at their original designed hydraulic capacity and potentially reduce the frequency of spillage at Parr Dam. All generators will be upgraded or replaced by the end of the tenth calendar year following the year of License issuance as described in the Generator Upgrade Implementation Plan in Exhibit E-2. Other equipment, such as transformers, excitation system, switchgear, cable and bus work, etc., may need to be changed or upgraded in support of this modification. The specifics of all necessary equipment improvements will not be fully known until a thorough study has been completed. The proposed increase in hydraulic capacity and megawatts may achieve the criteria of a

capacity related amendment. However, since this is being proposed as part of the relicensing process and will be included in the new license, the Applicant believes it should not require an amendment to the license as described in 18 CFR §4.201.

At Fairfield, the capacity of the generators and the hydraulic capacity of the penstocks are at or near capacity. No additional development or capacity increases are currently planned.

EXHIBIT B-1

Parr Hydroelectric Project P-1894

Gross Annual Generation for the Period 2000 - 2017

| YEAR | PARR DEVELOPMENT GROSS ANNUAL GENERATION (MWH) | FAIRFIELD DEVELOPMENT GROSS ANNUAL GENERATION (MWH) | FAIRFIELD DEVELOPMENT ANNUAL PUMPING ENERGY (MWH) |
|---|---|---|---|
| 2000 | 51,798 | 715,569 | 1,010,759 |
| 2001 | 44,609 | 682,301 | 959,575 |
| 2002 | 50,517 | 741,217 | 1,024,706 |
| 2003 | 82,557 | 821,300 | 1,130,655 |
| 2004 | 78,631 | 894,179 | 1,243,560 |
| 2005 | 81,945 | 903,183 | 1,236,325 |
| 2006 | 56,144 | 834,824 | 1,140,710 |
| 2007 | 41,536 | 824,684 | 1,126,602 |
| 2008 | 40,221 | 808,870 | 1,111,636 |
| 2009 | 61,762 | 658,252 | 911,209 |
| 2010 | 59,314 | 619,254 | 859,595 |
| 2011 | 45,556 | 587,692 | 812,356 |
| 2012 | 48,402 | 639,920 | 890,357 |
| 2013 | 72,327 | 424,295 | 599,449 |
| 2014 | 50,306 | 372,498 | 524,880 |
| 2015 | 48,948 | 461,014 | 644,241 |
| 2016 | 44,387 | 519,448 | 771,958 |
| 2017 | 47,117 | 381,967 | 537,497 |
| **AVERAGE 2000 - 2017** | **55,893** | **660,582** | **918,671** |

EXHIBIT B-2

PARR HYDROELECTRIC PROJECT P-1894

ANNUAL FLOW DURATION CURVE

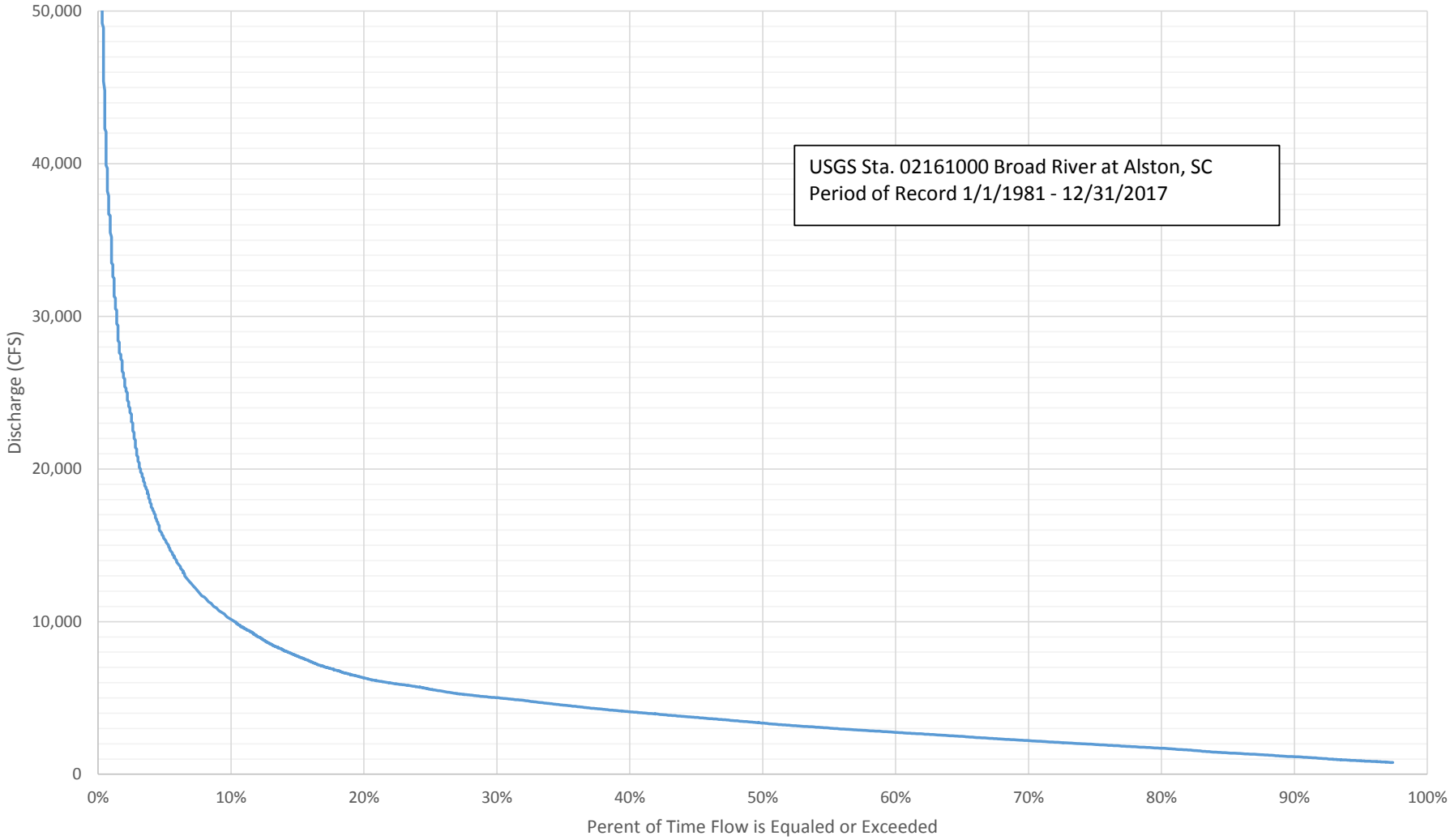

EXHIBIT B-3

PARR HYDROELECTRIC PROJECT P-1894

JANUARY FLOW DURATION CURVE

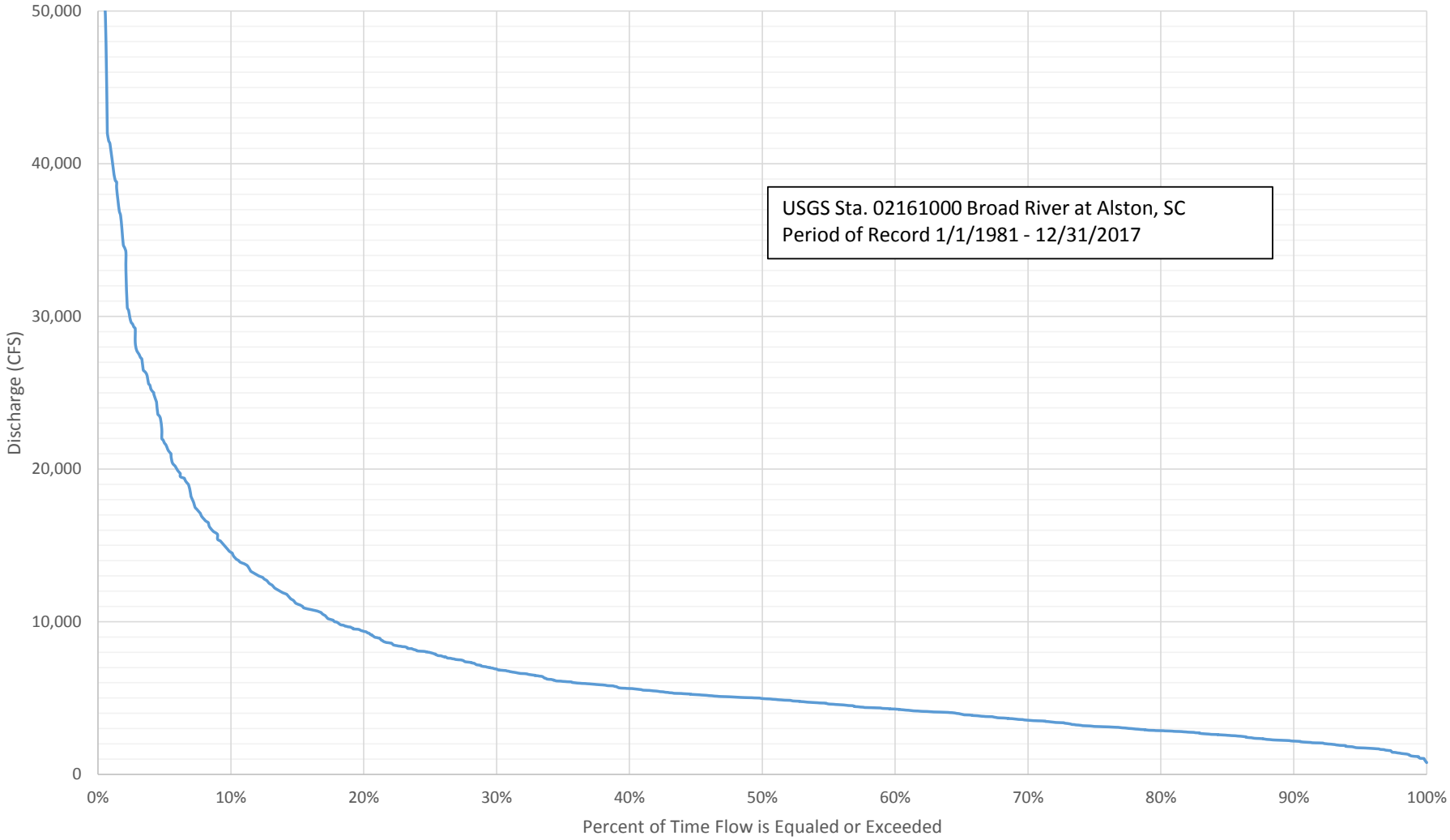

EXHIBIT B-4

PARR HYDROELECTRIC PROJECT P-1894

FEBRUARY FLOW DURATION CURVE

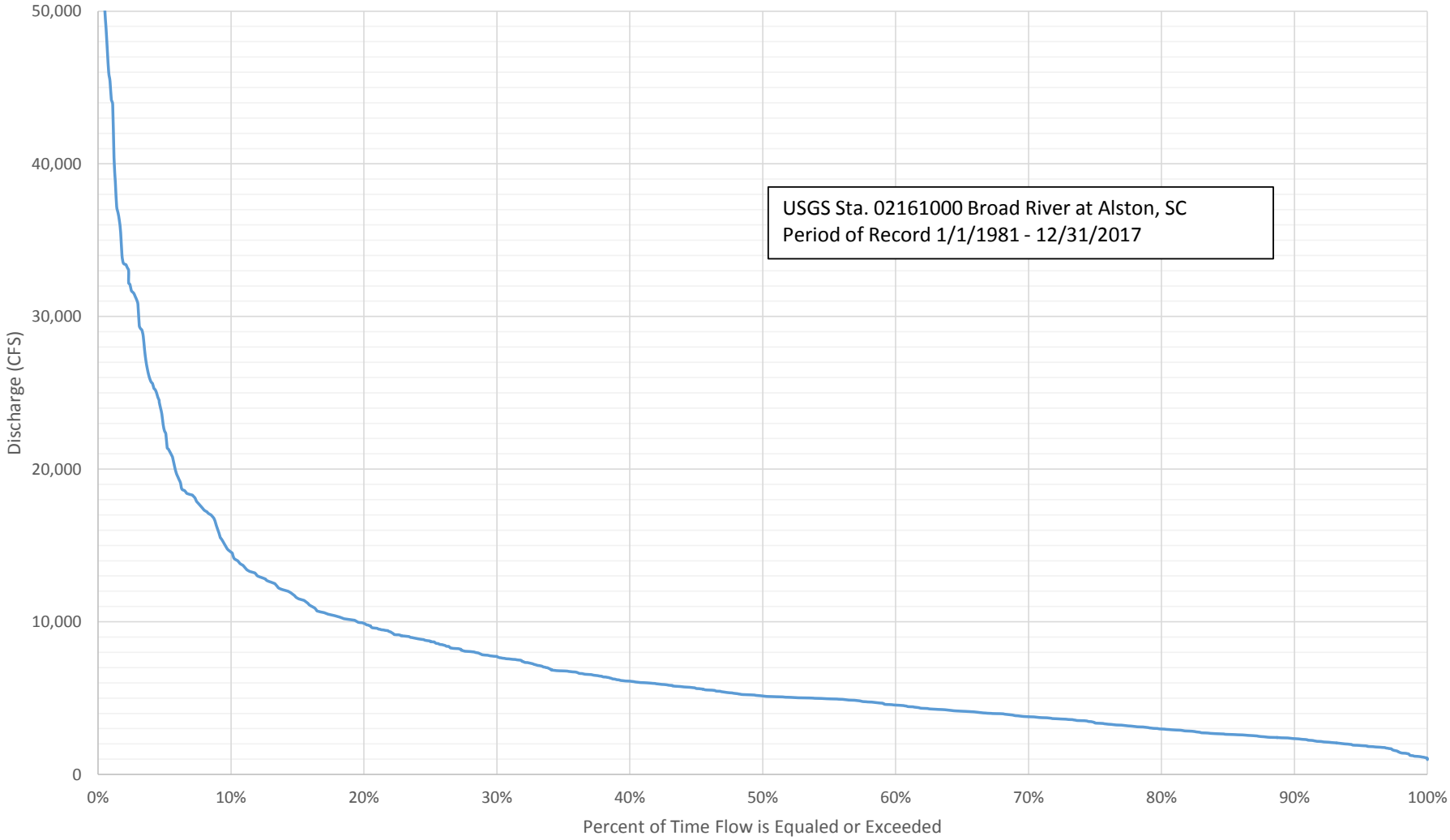

EXHIBIT B-5

PARR HYDROELECTRIC PROJECT P-1894

MARCH FLOW DURATION CURVE

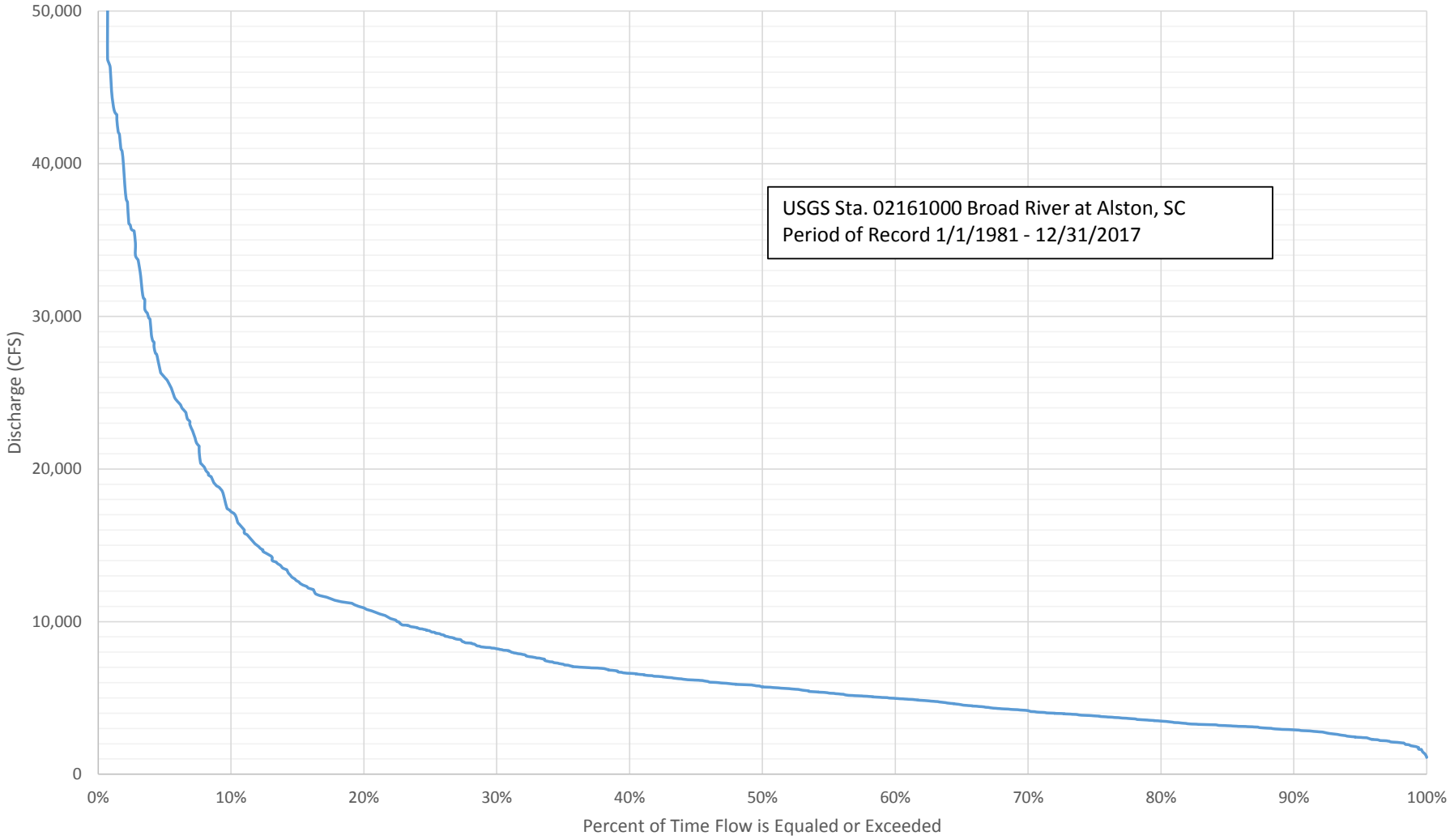

EXHIBIT B-6

PARR HYDROELECTRIC PROJECT P-1894

APRIL FLOW DURATION CURVE

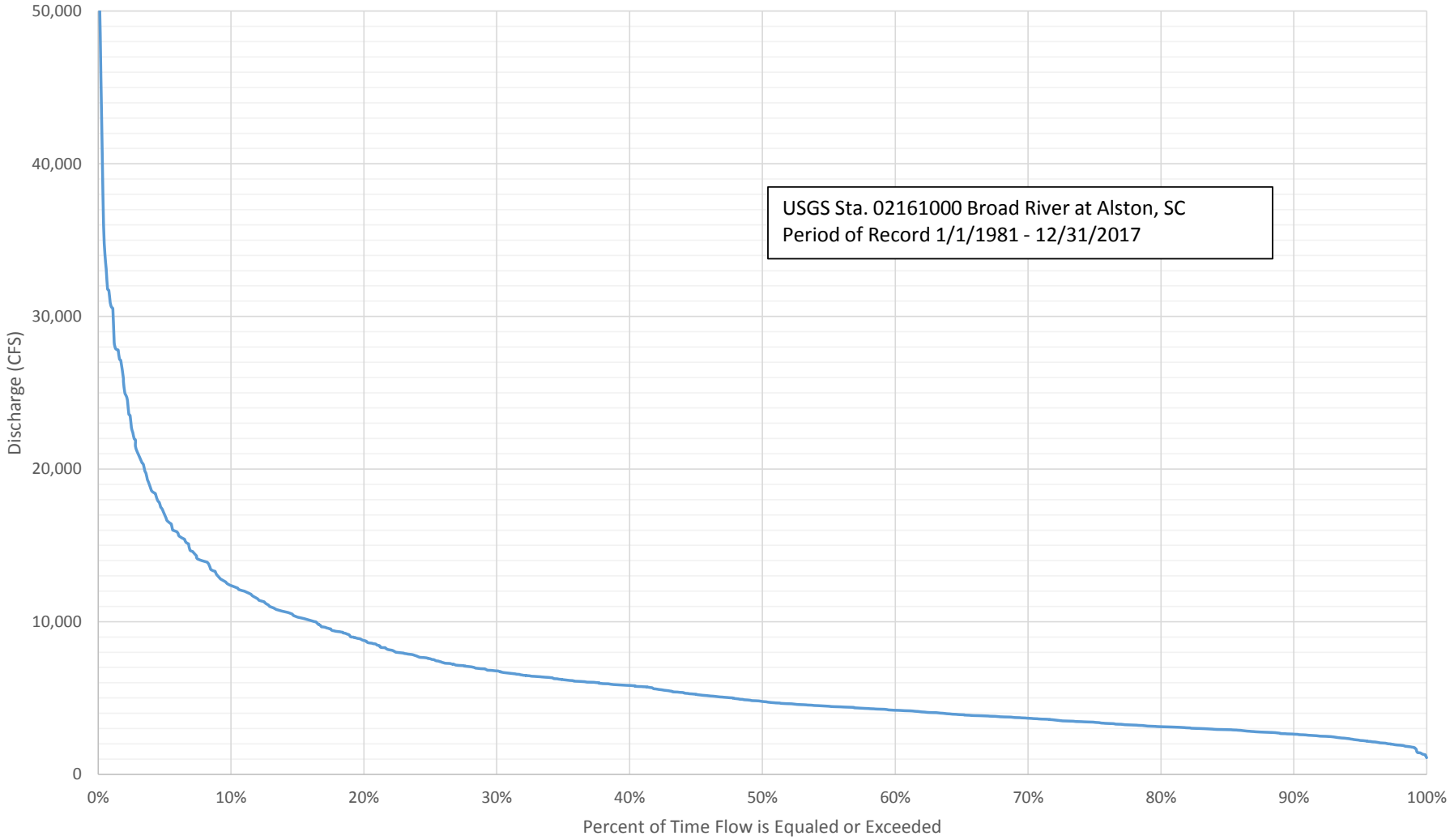

EXHIBIT B-7

PARR HYDROELECTRIC PROJECT P-1894

MAY FLOW DURATION CURVE

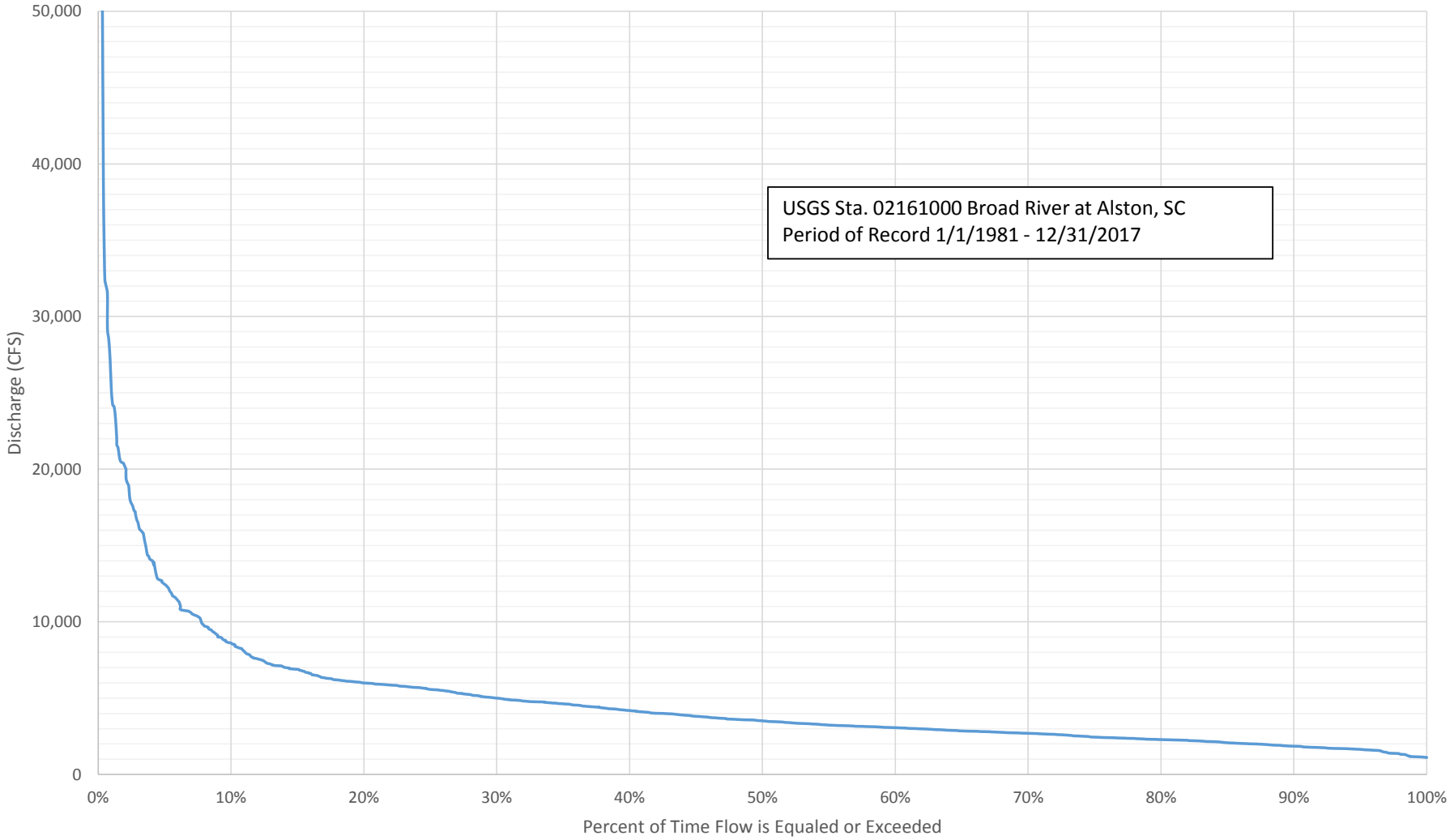

EXHIBIT B-8

PARR HYDROELECTRIC PROJECT P-1894

JUNE FLOW DURATION CURVE

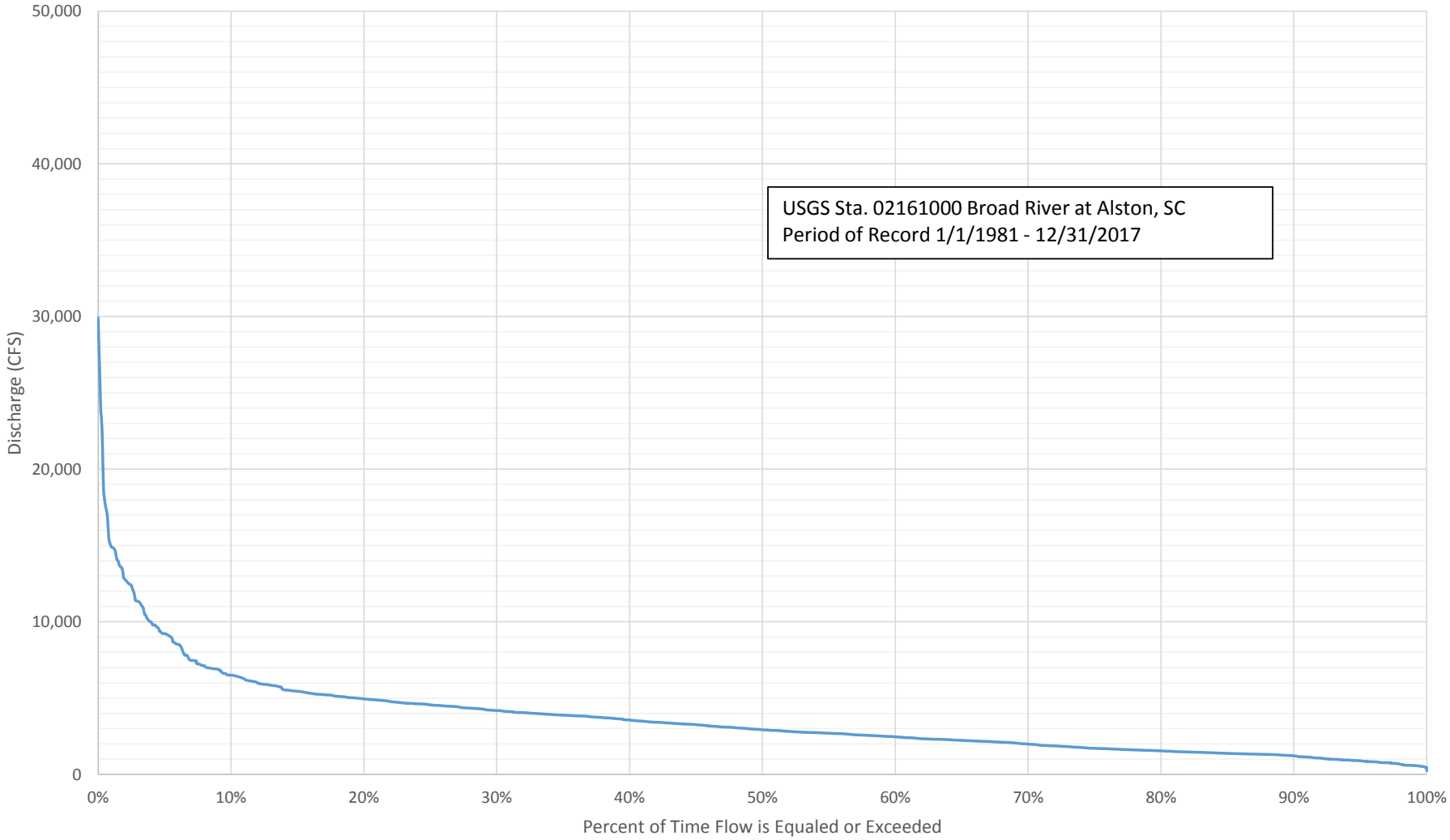

EXHIBIT B-9

PARR HYDROELECTRIC PROJECT P-1894

JULY FLOW DURATION CURVE

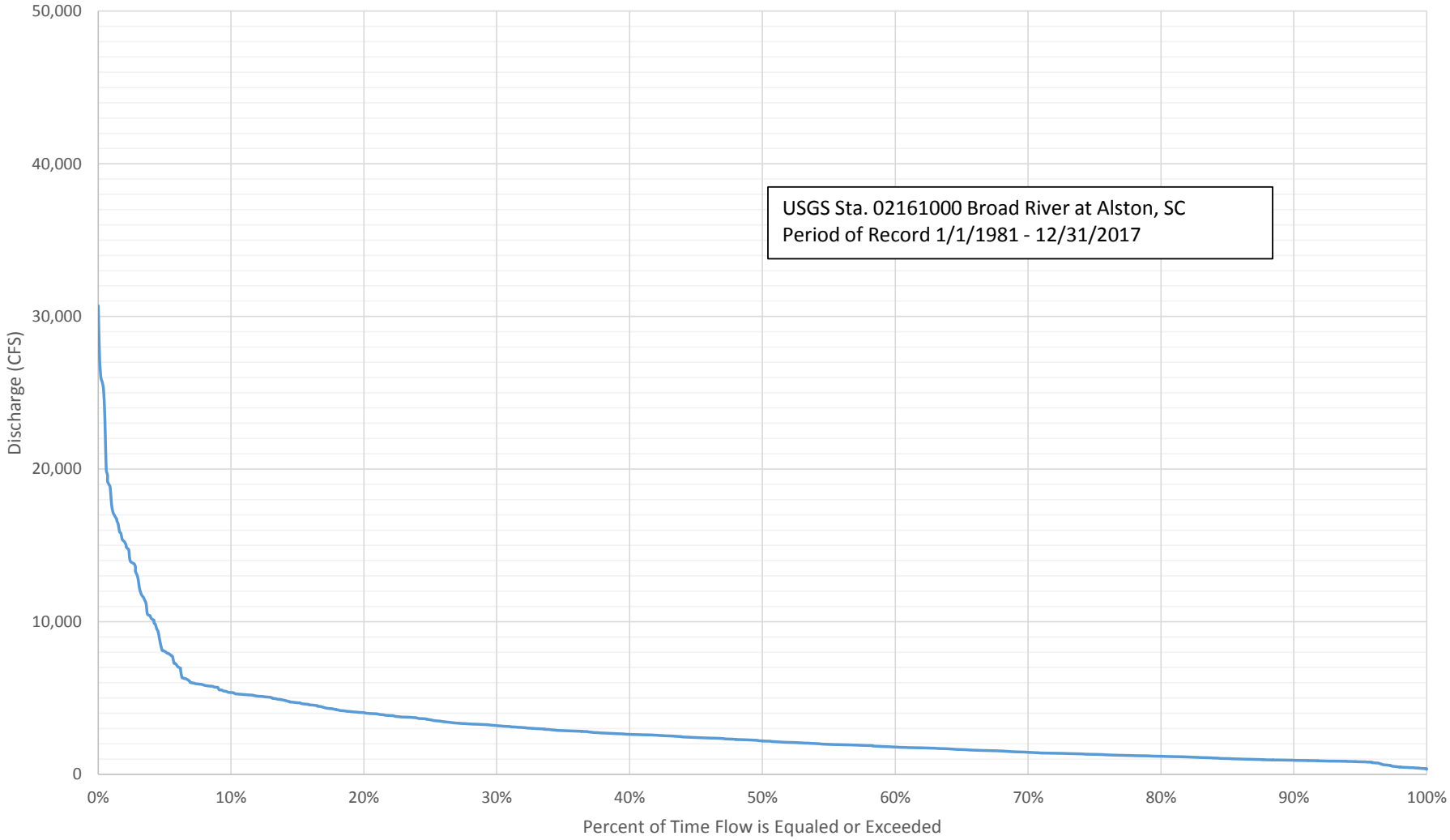

EXHIBIT B-10

PARR HYDROELECTRIC PROJECT P-1894

AUGUST FLOW DURATION CURVE

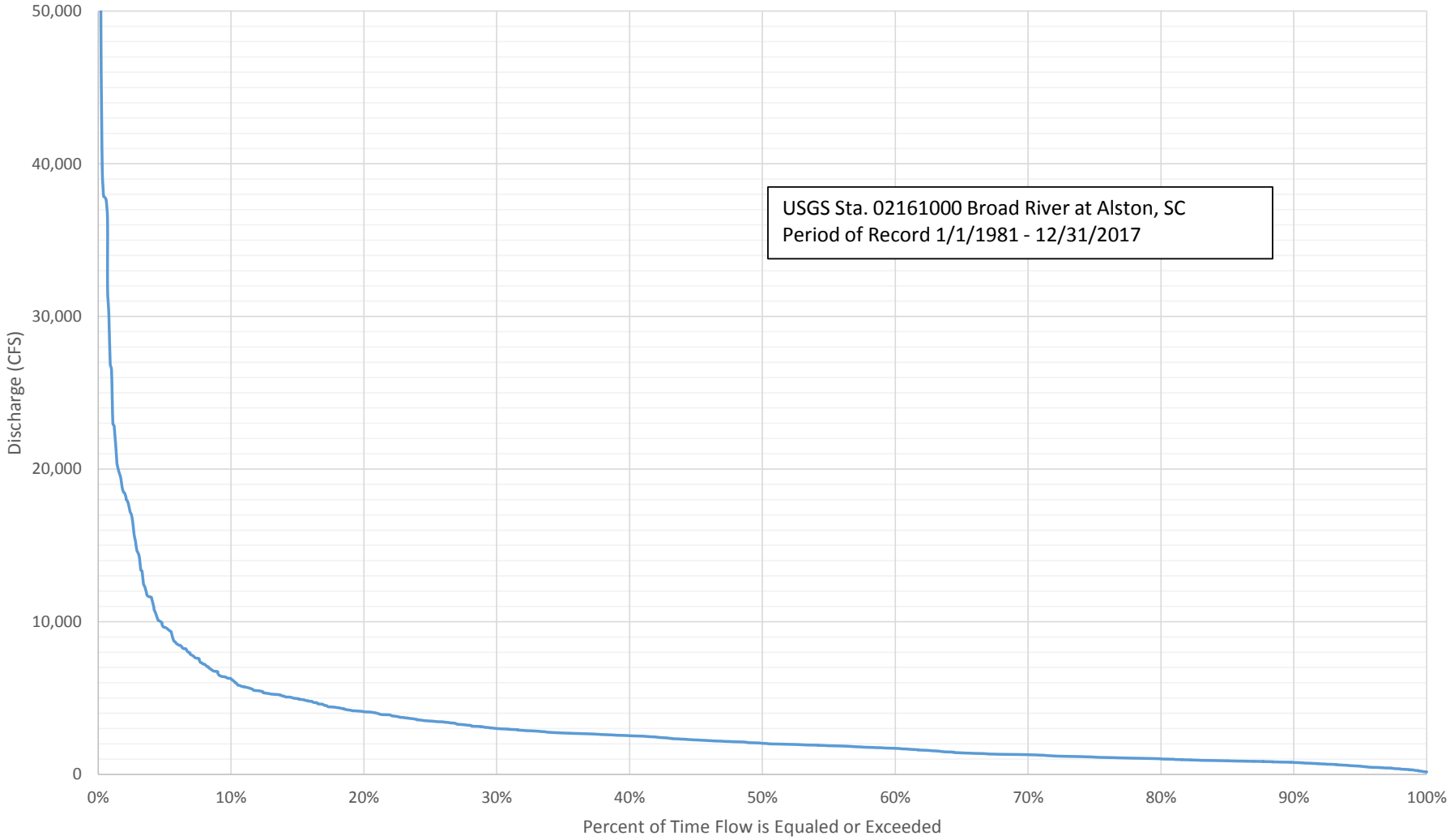

EXHIBIT B-11

PARR HYDROELECTRIC PROJECT P-1894

SEPTEMBER FLOW DURATION CURVE

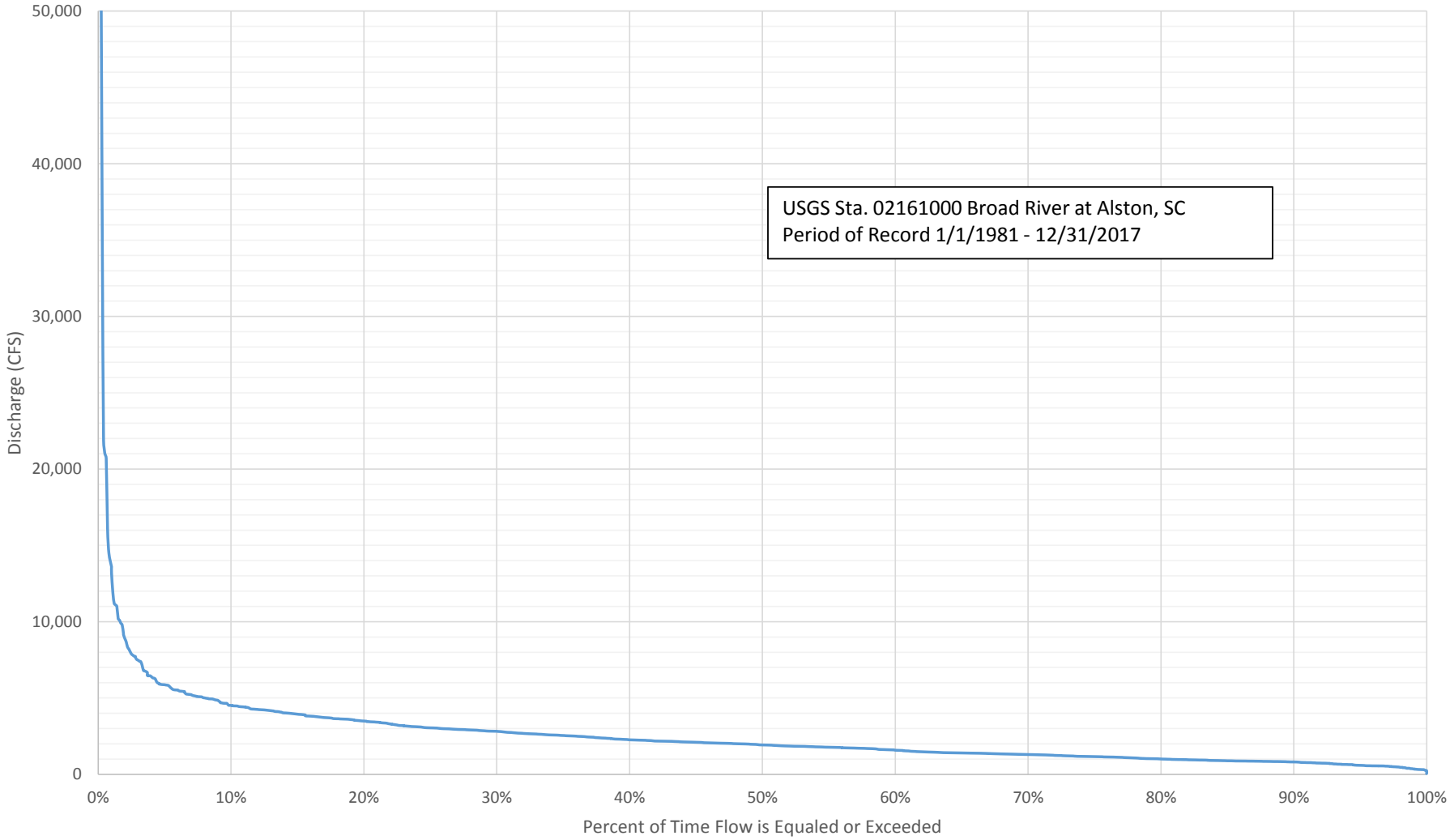

EXHIBIT B-12

PARR HYDROELECTRIC PROJECT P-1894

OCTOBER FLOW DURATION CURVE

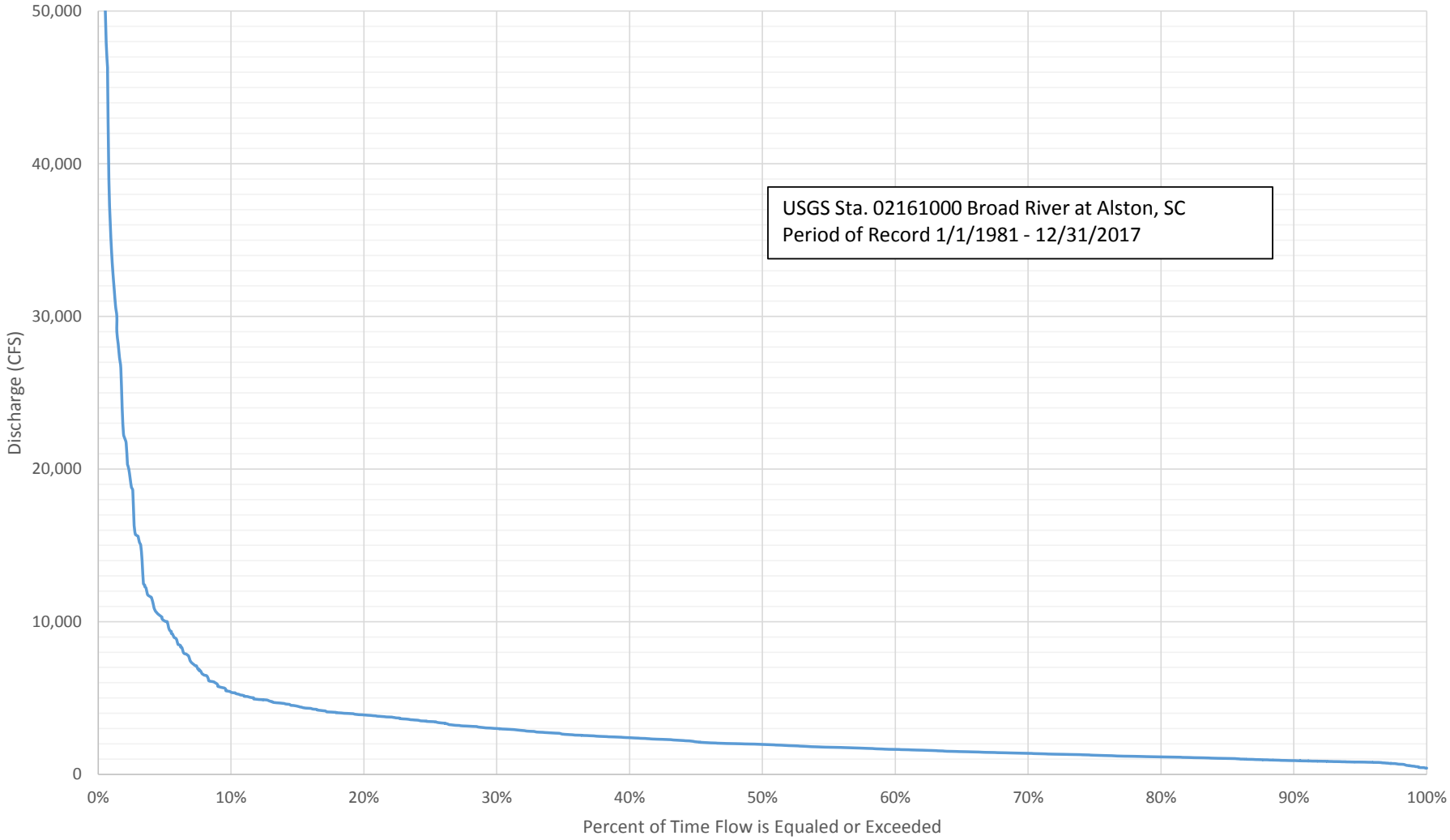

EXHIBIT B-13

PARR HYDROELECTRIC PROJECT P-1894

NOVEMBER FLOW DURATION CURVE

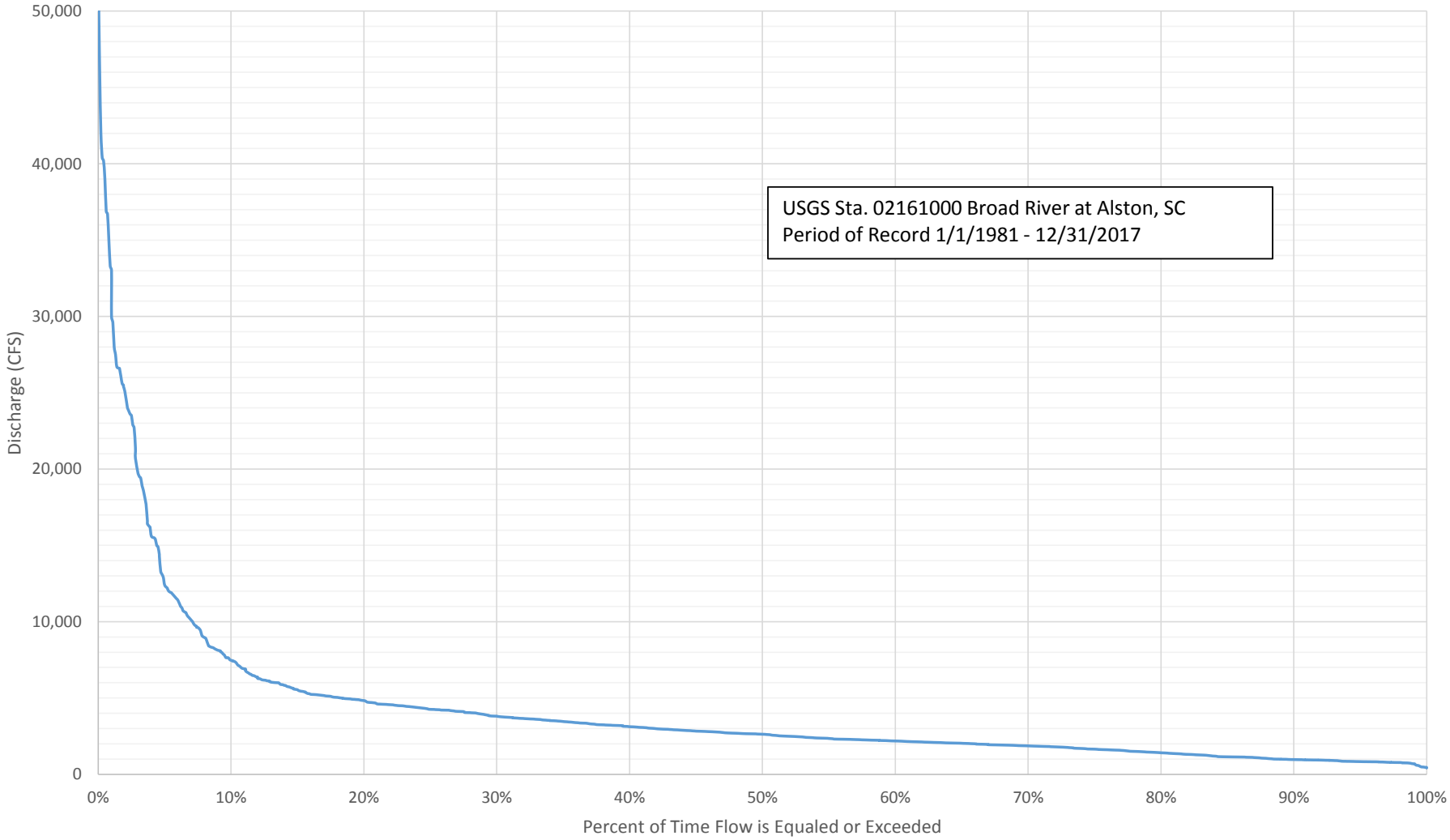

EXHIBIT B-14

PARR HYDROELECTRIC PROJECT P-1894

DECEMBER FLOW DURATION CURVE

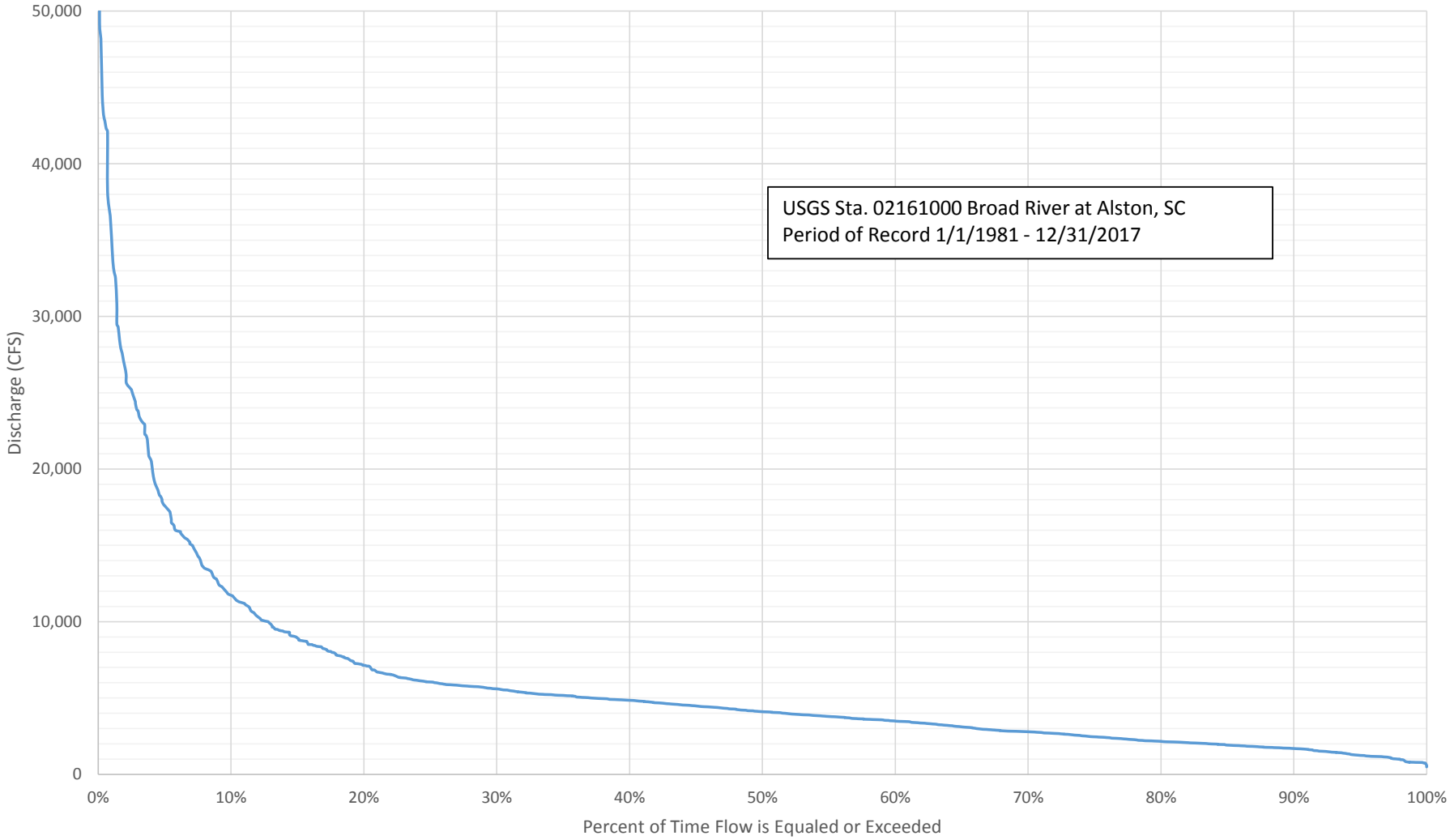

EXHIBIT B-15

PARR HYDROELECTRIC PROJECT P-1894

PARR RESERVOIR AREA CAPACITY CURVES

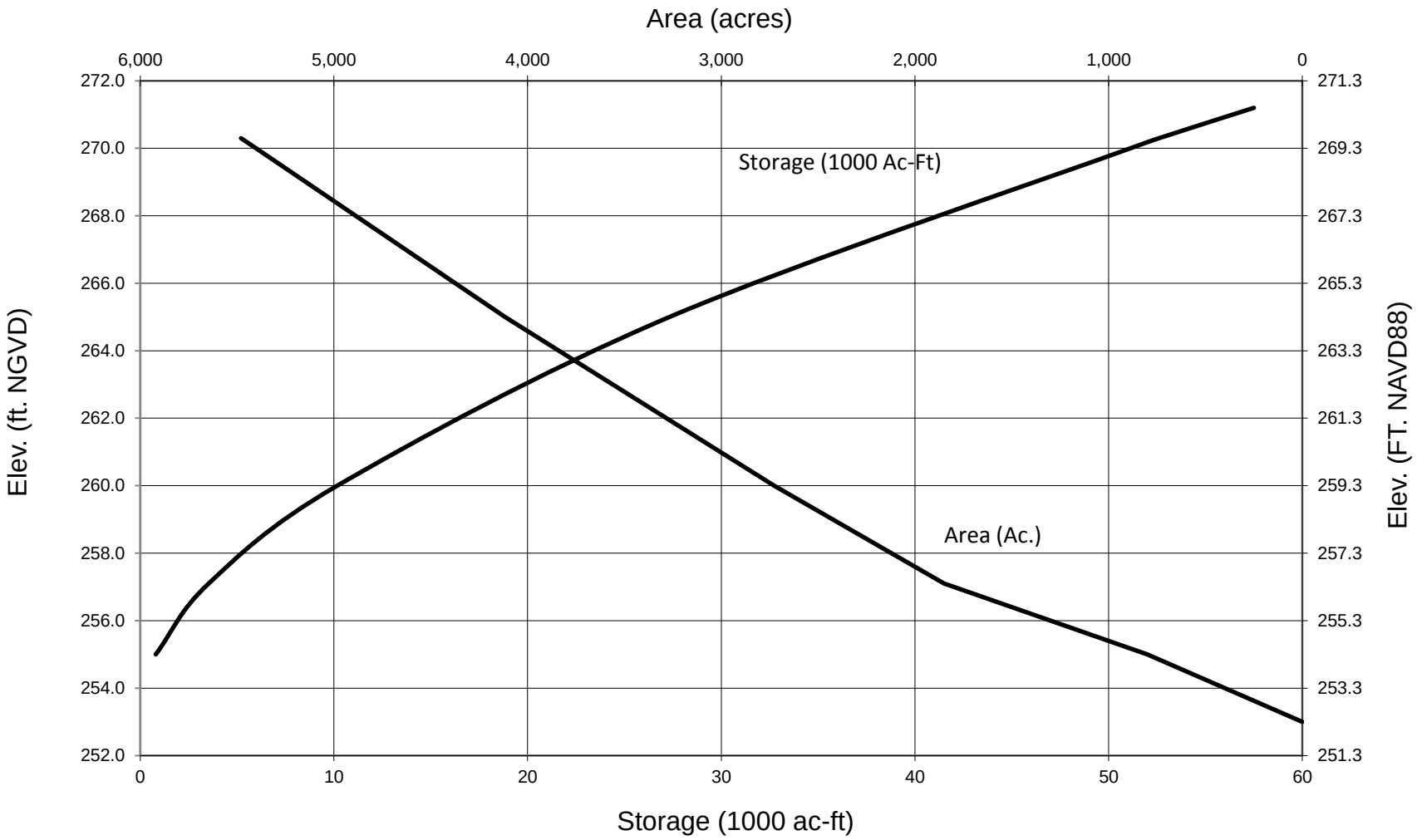

EXHIBIT B-16

PARR HYDROELECTRIC PROJECT P-1894

PARR RESERVOIR AREA CAPACITY TABLE

| Reservoir Elevation (FT. NGVD 1929) | Reservoir Elevation (FT. NAVD 1988) | Reservoir Area (acres) | Reservoir Storage (ac-ft) |
|---|---|---|---|
| 253.0 | 252.3 | 0 | 0 |
| 255.0 | 254.3 | 800 | 800 |
| 257.1 | 256.4 | 1,850 | 3,533 |
| 260.0 | 259.3 | 2,727 | 10,171 |
| 265.0 | 264.3 | 4,116 | 27,321 |
| 270.0 | 269.3 | 5,402 | 51,116 |

EXHIBIT B-17

PARR HYDROELECTRIC PROJECT P-1894

MONTICELLO RESERVOIR AREA CAPACITY CURVES

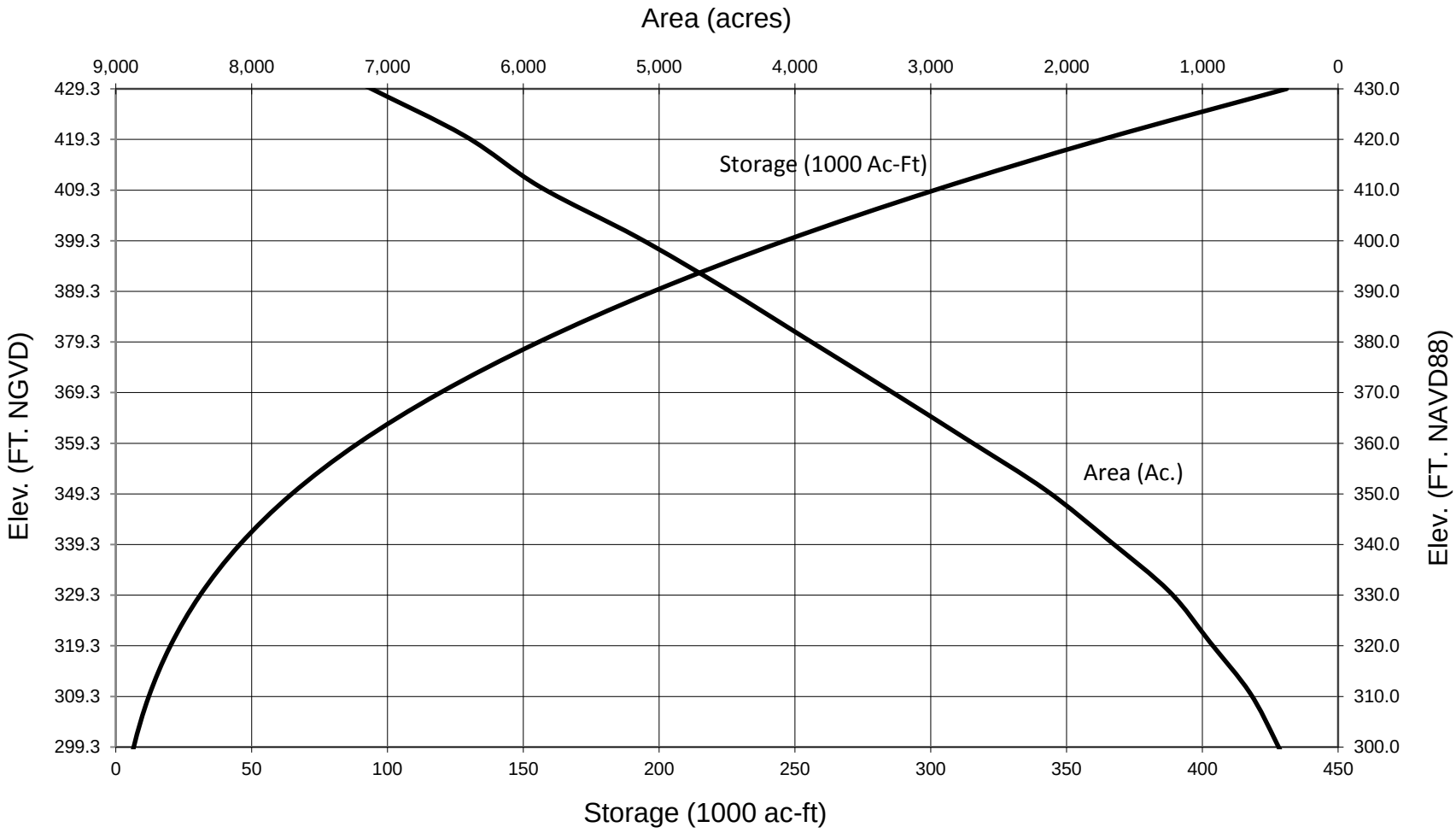

EXHIBIT B-18

PARR HYDROELECTRIC PROJECT P-1894

MONTICELLO RESERVOIR AREA CAPACITY TABLE

| Reservoir Elevation (ft. NGVD 1929) | Stage-Area-Storage Table Reservoir Elevation (ft. NAVD 1988) | Area (acres) | Storage (ac-ft) |
|---|---|---|---|
| 270.0 | 269.3 | 37 | 0 |
| 280.0 | 279.3 | 137 | 870 |
| 290.0 | 289.3 | 279 | 2,950 |
| 300.0 | 299.3 | 451 | 6,600 |
| 310.0 | 309.3 | 649 | 12,150 |
| 320.0 | 319.3 | 943 | 20,110 |
| 330.0 | 329.3 | 1,242 | 31,030 |
| 340.0 | 339.3 | 1,682 | 45,650 |
| 350.0 | 349.3 | 2,150 | 64,810 |
| 360.0 | 359.3 | 2,730 | 89,250 |
| 370.0 | 369.3 | 3,320 | 119,500 |
| 380.0 | 379.3 | 3,920 | 155,700 |
| 390.0 | 389.3 | 4,520 | 197,900 |
| 400.0 | 399.3 | 5,160 | 246,300 |
| 410.0 | 409.3 | 5,880 | 301,500 |
| 420.0 | 419.3 | 6,430 | 363,050 |
| 430.0 | 429.3 | 7,170 | 431,050 |

EXHIBIT B-19

PARR HYDROELECTRIC PROJECT P-1894

PARR SHOALS SPILLWAY RATING CURVE (GATES DOWN)

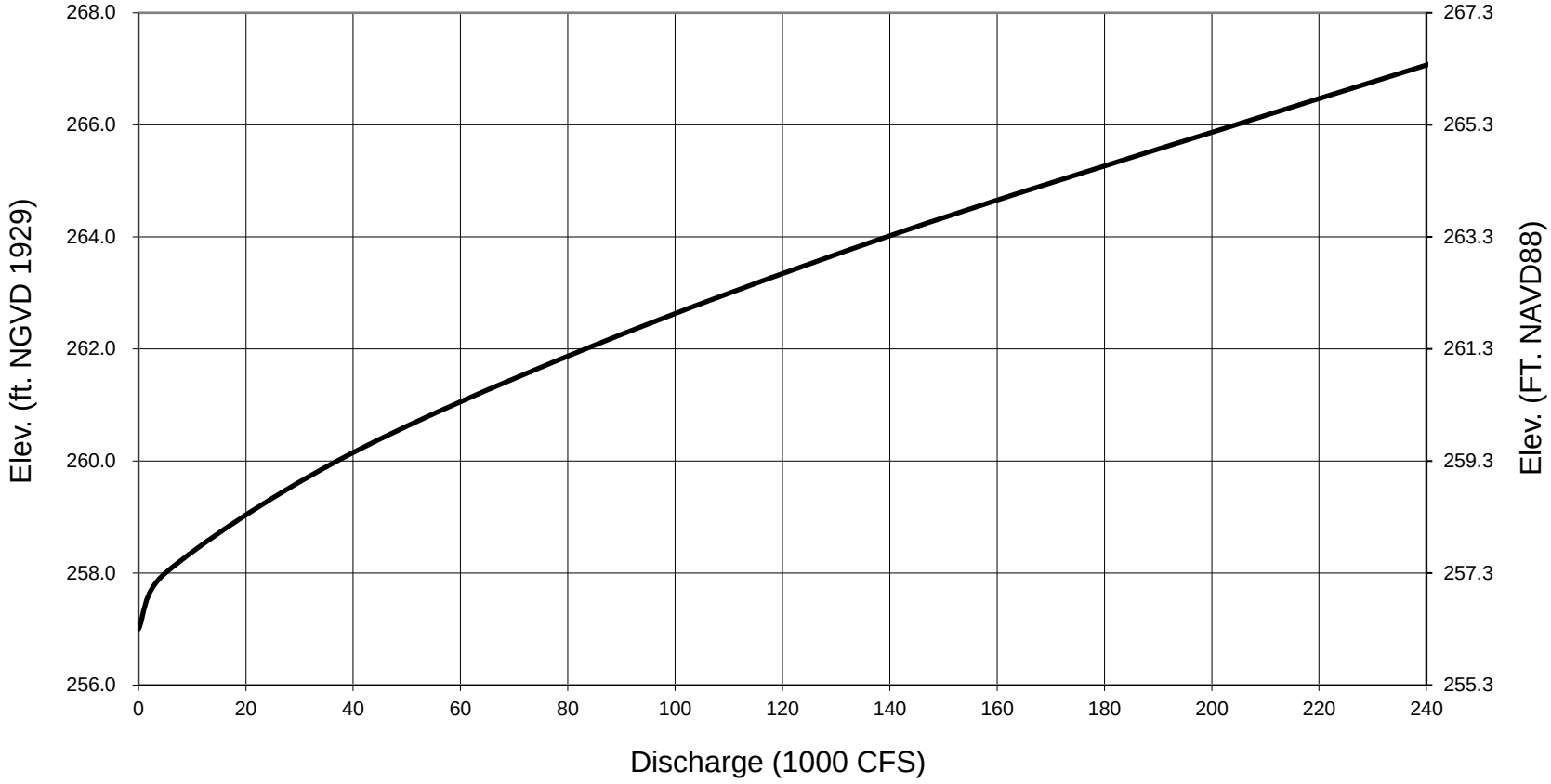

EXHIBIT B-20

PARR HYDROELECTRIC PROJECT P-1894

PARR SHOALS TAILWATER RATING CURVE

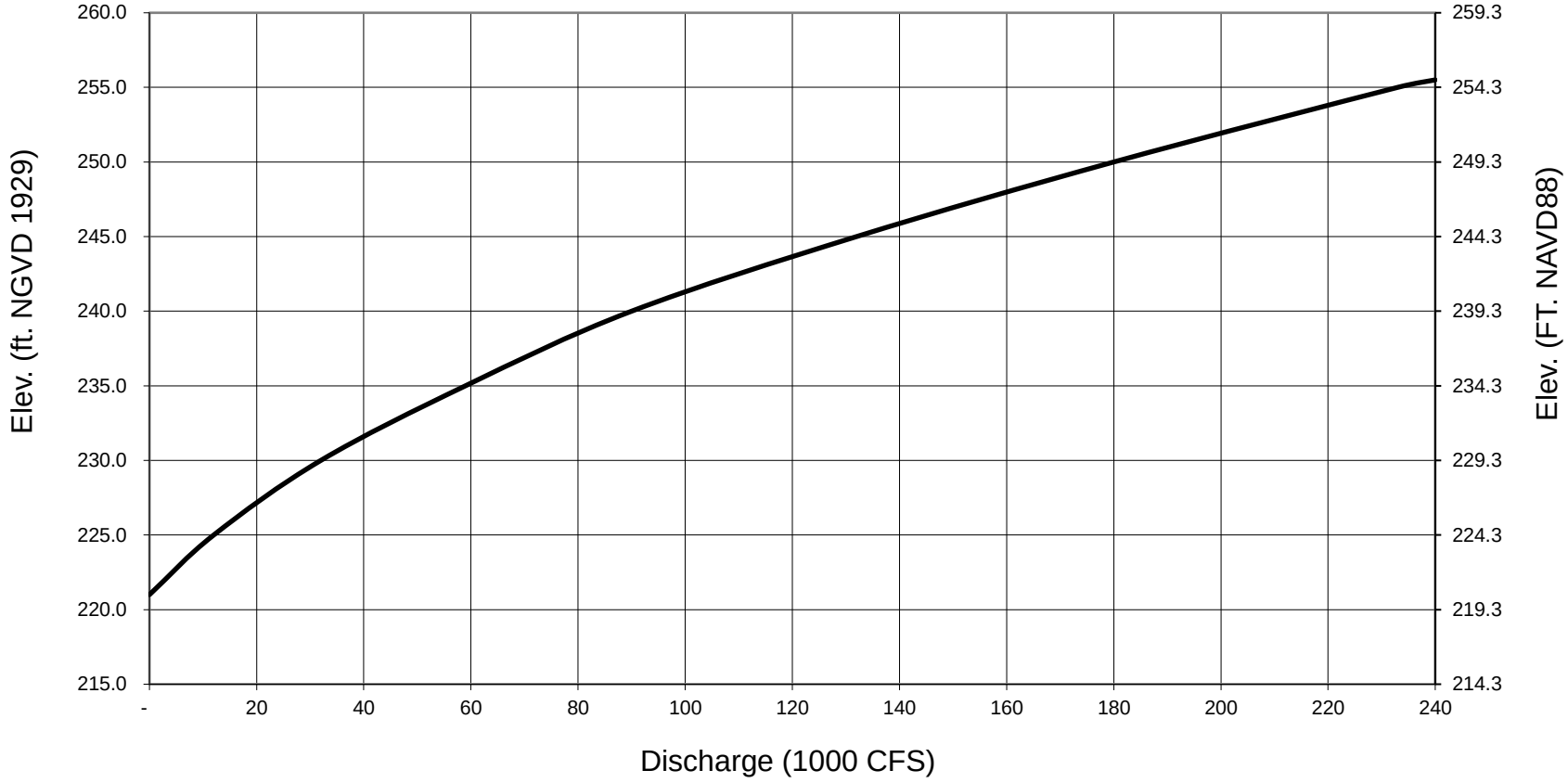

EXHIBIT B-21

PARR HYDROELECTRIC PROJECT P-1894

PARR SHOALS DEVELOPMENT CAPABILITY CURVE

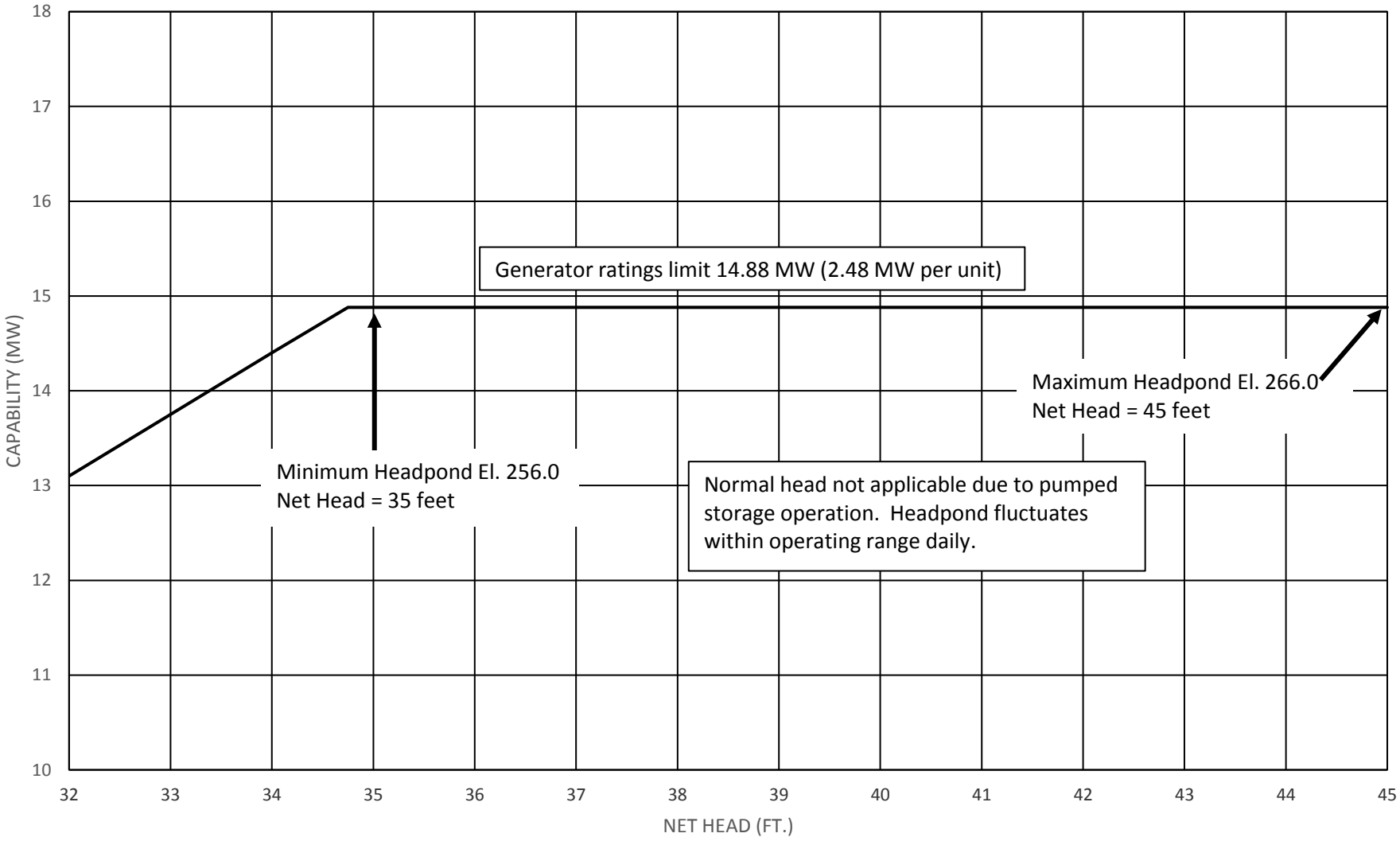

EXHIBIT B-22

PARR HYDROELECTRIC PROJECT P-1894

FAIRFIELD PUMPED STORAGE DEVELOPMENT CAPABILITY CURVE