

SUMMARY OF UPSTREAM AND DOWNSTREAM FISH PASSAGE AT THE YORK HAVEN HYDROELECTRIC PROJECT IN 2021

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EXECUTIVE SUMMARY

Because lower River fish passage operations and passage of American Shad in the River were affected by COVID-19 and the collection and passage of Northern Snakeheads in 2020, Resource Agencies worked with the Licensees of Conowingo, Holtwood, Safe Harbor, and York Haven Dams to develop a mutually agreeable plan for migratory fish passage. In 2021, the Resource Agencies also requested that Exelon suspend East Lift operations at Conowingo and operate the West Lift to support trap and transport passage of American shad and herring. Conowingo agreed to transport and release American Shad and River Herring upstream of Safe Harbor Dam. Exelon also agreed to remove Northern Snakeheads, Flathead Catfish and Blue Catfish from the Lift catch, as they are considered to be an invasive species by the Maryland Department of Natural Resources (“MDNR”). Because volitional passage was suspended at the East Lift, the Resource Agencies and Brookfield Renewable Partners L.P. agreed to suspend Lift operations at Holtwood and Safe Harbor. York Haven Power Company (“YHPC”) agreed to staff the East Channel Fishway in 2021 four days after 500 shad were transported from the Conowingo West lift and stocked downstream of York Haven. A total of 6,825 American Shad were collected at the West Lift in 2021 and 6,413 shad were transported and released alive above Safe Harbor Dam.

Fishway preparations began in early March and volitional passage (not staffed) began on 29 March. During this 31-day period, the entrance and exit gates were opened and the North Fixed Wheel Gate was opened and set to deliver a minimum of 400 cfs to the East Channel. On Thursday 29 April, 4 days after 500 shad had been transported from the Conowingo West Lift and stocked below York Haven Dam the Fishway was staffed to count fish. The Fishway was staffed on a total of 42 days between 29 April and 9 June. During this period, fish were counted and allowed to pass upstream daily between 0800 and 1600 hrs. At 1600 hours on 9 June Fishway operation was set to provide resident fish passage (volitional) through mid-December.

During staffed Fishway operation some 8,968 fish of 16 taxa were enumerated as they passed upstream into Lake Frederic. Gizzard Shad (5,175) was the dominant fish species passed and comprised over 57.7% of the fish passed. Some 80 American Shad were counted as they passed through the ladder. Other predominant fishes passed included Channel Catfish (1,533), Carp (957), Smallmouth Bass (426) Quillback (243), White Sucker (249) and Walleye (162). Passage varied daily and ranged from 1,905 fish on 5 May when 21.2% of the season total was passed to one fish on 30 May.

A total of 80 American Shad passed upstream through the ladder in 2021. American Shad passed upstream between 2 May and 9 June. American Shad were collected and passed at water temperatures of 55.8°F to 79.2°F, River flows of 17,000 cfs to 88,300 cfs and East Channel flows of 2,050 cfs to 12,400 cfs. Some 64 American Shad (80.0%) passed before 1300 hrs. Hourly passage varied from 0 to 4 shad.

Downstream passage of adult American Shad occurred from 1 May to 30 June. The forebay Sluice Gate was opened as required (~370 cfs) for one to two hours, Monday through Friday, on 15 days in May and 14 days in June. No physical observations of post-spawned adult American Shad were noted by Station personnel. During the post-spawned adult downstream passage period, river flow varied from cfs 8,900 cfs to 118,000 cfs. Average daily water temperature in the forebay varied by over 31.5 degrees and ranged from a low of 56.0°F on 10 May to a high low of 87.6°F on 30 June.

On September 24, 2021, YHPC filed a request with FERC, with Agency support, for approval for a temporary variance to provide a flow of 370 cfs from 5PM to 11 PM from October 1 to November 30 required for the protection of downstream migrating juvenile American shad. Although construction was originally scheduled to be completed by September 30, 2021, high river flows associated with Tropical Storm Ida delayed construction activities and the Project could not safely conduct construction activities and had to remove equipment from the river. The FERC retroactively approved the Project's request for a temporary variance of its requirement to provide downstream passage flows of 370 cfs for juvenile American shad in an Order dated December 20, 2021.

During the Juvenile American Shad Passage Period ("JASPP") (1 October to 30 November), river flow was higher than normal and varied from 18,500 cfs to 149,000 cfs. Average daily water temperature during the JASPP varied almost 30 degrees and ranged from a high of 68.3°F on 16 October to a low of 38.4°F on 30 November. Although the Project had received a variance from FERC to spill 370 cfs from the Sluice Gate, the Station made accommodations to open the sluice gate in mid-October to pass a large debris field that had accumulated to the Station's forebay, which prevented the Station from operating its turbines. YHPC accelerated the construction schedule and subsequently operated the forebay sluice gate spilling 370 cfs per its License from 13 October through 30 November. The sluice gate was initially opened on 13 October for 17 hours and by 21 October the sluice gate remained open through 30 November. Station generation data for October and November confirm that Turbine Unit operation followed the JASPP operating guidelines.

1.0 INTRODUCTION

In 1993, York Haven Power Company (“YHPC”), the licensees of the Safe Harbor and Holtwood Projects, the U.S. Department of the Interior represented by the Fish and Wildlife Service (“USFWS”), the Susquehanna River Basin Commission (“SRBC”), the states of Maryland and Pennsylvania and their involved agencies – Maryland Department of Natural Resources (“MDNR”), Pennsylvania Fish and Boat Commission (“PFBC”) and Pennsylvania Department of Environmental Resources (“PADEP”), and two other parties signed the Susquehanna River Fish Passage Settlement Agreement.

This agreement established for each project a Fish Passage Technical Advisory Committee (“FPTAC”) comprised of representatives of the affected licensee, USFWS, PFBC and MDNR. Each FPTAC is responsible for reviewing and monitoring the maintenance and operation of the fish passage facilities at the respective project, preparing an annual report, and recommending studies and/or modifications to improve upstream and downstream passage. YHPC had a conference call with the York Haven FPTAC and other interested agencies on January 20, 2021 to review the 2020 Annual Fish Passage Report and discuss a January 19, 2021 USFWS request to modify the trigger for staffed Fishway operation during the spring migratory fish passage season. Based on these discussions, YHPC agreed to staff the Fishway in 2021 four days after 500 American Shad were transported from the West lift and stocked downstream of York Haven.

Since lower River fish passage operations and passage of American Shad in the River were affected by COVID-19 and the collection and passage of Northern Snakeheads in 2020 Resource Agencies worked with the Licensees of Conowingo, Holtwood, Safe Harbor and York Haven Dams to develop a mutually agreeable plan for migratory fish passage. In 2021, the Resource Agencies requested that Exelon suspend East Lift operations at Conowingo and operate the West Lift to support trap and transport passage of American Shad and River Herring. Conowingo agreed to transport and release American Shad and River Herring upstream of Safe Harbor Dam. Exelon also agreed to remove Northern Snakeheads, Flathead Catfish, and Blue Catfish from West Lift catch, as they are considered to be invasive species by the MDNR. Because volitional passage was suspended at the East Lift, the Resource Agencies and Brookfield Renewable Partners L.P. agreed to suspend lift operations at Holtwood and Safe Harbor. A total of 6,825 American Shad were collected at the West Lift in 2021 and 6,413 shad were transported and released alive above Safe Harbor Dam.

2.0 YORK HAVEN FISHWAY OPERATIONS

The installation and operation of the Fishway are part of a cooperative private, state and federal effort to restore American Shad (*Alosa sapidissima*) and other migratory fish to the Susquehanna River. In 1997, YHPC and the Resource Agencies reached a new settlement agreement to revise the type and location of the York Haven fish passage facility. The Fishway is located in Dauphin County, PA at the Three Mile Island end of the East Channel Dam at the York Haven Hydroelectric Project (FERC No. 1888). The Fishway was placed in service by YHPC in April 2000. Upstream and downstream Fishway operation is provided for in the Project’s FERC License (FERC, 2015) and the Pennsylvania Department of Environmental Protection Water Quality Certification (PA DEP, 2014) issued on December 22, 2015 and August 19, 2014, respectively.

Fishway operation coincides with a springtime minimum flow release. As part of the 1997 agreement and in accordance with its new License and Water Quality Certification, YHPC

agreed to maintain a spill of up to 4,000 cfs over the Main Dam and a minimum release of approximately 2,000 cfs in the East Channel during spring Fishway operation. River flow in excess of spring minimum flow requirements and station capacity is spilled over the Main and East Channel Dams.

2.1 Project Operation

The hydroelectric station located in York Haven, PA built in 1904, is situated on the River (river mile 55) in Dauphin and York counties, Pennsylvania (Figure 1). It is the fourth upstream hydroelectric dam on the River. The Project is a 20 unit run-of-river facility capable of producing approximately 19 MW and has an estimated hydraulic capacity of 17,000 cfs. It includes two dams that impound approximately 5 miles of the River forming Lake Frederic. The Main Dam is approximately 5,000-ft long, with a maximum height of 17 ft. The East Channel Dam is approximately 925-ft long with a maximum height of 9 ft. When River flow exceeds station hydraulic capacity (55% of the year), water is spilled over the two dams. During the spring spawning season, river flows in excess of spring minimum flow requirements were spilled over the Main and East Channel dams.

2.2 Fishway Design, Maintenance and Operation

2.2.1 Fishway Design

Fishway design incorporated numerous criteria established by the USFWS and the other Resource Agencies. The Fishway has an operating limit of 150,000 cfs River flow (East Channel flow limit of approximately 22,000 cfs). The Fishway includes two sections; a “weir cut” and a vertical notch fish ladder. Figure 2 provides the general arrangement of the Fishway. A detailed description of the Fishway and its major components is located in 2000 and 2001 summary reports (Kleinschmidt 2000 and 2002). Volitional passage at the Fishway is to begin on or about the April 1, conditions permitting.

2.2.2 Fishway Maintenance

Per the York Haven Fishway Operation Procedure (YHPC, LLC and Kleinschmidt, 2019) preparation and maintenance of the Fishway began in early March. The Fishway was inspected, and repairs undertaken which enabled the Fishway to open on March 29. Major repairs undertaken and completed in 2021 included the replacement of the Fishway exit gate actuator that malfunctioned.

Resident fish passage operation is scheduled to end on December 15 or when the average daily water temperature is ≤ 40 degrees Fahrenheit for three consecutive days. Thus, in the beginning of December, YHPC contacted its supplemental labor contractor and developed a plan and schedule to close the Fishway. While the Fishway is closed, it is inspected, and minor repairs are completed. The Fishway was closed on December 16.

Since the entrance gate actuator was used to repair the exit gate following its failure on September 10, YHPC has plans to replace the entrance gate actuator prior to operation in 2022.

2.2.3 Fishway Operation

Fishway preparations began in early March and volitional passage (not staffed) began on March 29. Between March 29 and April 28, a 31-day period, the entrance and exit gates were opened and the North Fixed Wheel Gate was opened and set to deliver a minimum of 400 cfs to the East Channel.

The Fishway was staffed on Thursday April, 29, four days after 500 shad had been transported from the Conowingo West Lift and stocked below York Haven Dam. In 2021, the Fishway was manned on a total of 42 days between April 29 and June 9. During this period, fish were counted and allowed to pass upstream daily between 0800 and 1600 hrs. At 1600 hours on June 9, Fishway operation was set to provide resident fish passage (volitional) through December 16 when the Fishway was closed for the year.

Between April 29 and June 9 both fixed wheel gates and the diffuser gate were opened. These gates remained opened throughout the spawning migration. The entrance gate was the only gate that was adjusted throughout the migratory fish passage season. Due to issues encountered with the entrance gate operator in mid-May, this gate needed to be adjusted manually until counting ended on June 9. Before issues were encountered with the operator, the differential between the surface water elevation downstream of the entrance and the water elevation in the diffuser area of the fish ladder at the entrance gate was normally 0.5 ft to 1.0 ft. After problems with the operator occurred, the differential was higher and varied from 1.2 to 1.7 ft. The 7-ft wide stop gate, located between the weir and the fish ladder entrance, remained closed during the entire period of operation.

Excluding the first and last day of the Fishway was staffed, the Fishway was typically staffed by one person. This person, a biologist or technician, adjusted the position of the entrance gate, counted and recorded the number of fish that passed through the ladder hourly, removed debris from the exit of the ladder, made visual observations of fish activity and movement in and through the ladder. These individuals also recorded water elevations several times each day on staff gauges located throughout the Fishway.

Staffed Fishway operation ended at 1600 hours on June 9, at which time the South fixed wheel gate was closed and the North fixed wheel gate and ladder were set to deliver at least 400 cfs into the East Channel. The Fishway provided volitional passage until it was closed on December 16.

Water temperature¹ was collected in the East Channel Fishway at 60-minute intervals from March 29 to December 16 with an Onset Hobo Water Temperature Pro v2 Data Logger (U22-001) that has a ± 0.2 °C accuracy. The monitor was suspended approximately 4 ft above the bottom (Elev. 274.63 ft) of the Fishway exit flume opposite the counting window on the east side of the exit flume (Figure 2). Average daily water temperature during the spring (Figure 3) increased over 33 degrees and ranged from a low of 46.9°F on April 3 to a high of 80.2°F on June 9.

2.2.4 Fish Counts

Fish that passed through the ladder were identified to species and enumerated as they passed the counting window by a biologist and/or technician. A description of the procedures used to count fish is described in prior annual operating reports (Kleinschmidt 2000 and 2002). Fish passage by the viewing window was controlled by opening or closing an aluminum grating gate with an electric hoist that was controlled from inside the viewing room. The stop gate was opened each morning at 0800 hrs and closed nightly at 1600 hrs when the Fishway was manned. Occasionally, it was closed for brief periods of time as needed each day to enable personnel staffing the Fishway to remove debris from screens and the fishway exit other conduct other activities. In addition, in an effort to improve viewing, the adjustable crowder

¹ Water temperature data to be provided separately in an Excel file.

screen was adjusted as needed to allow all fish that passed to be observed. Gate settings on the days the Fishway was staffed varied from 8 to 24 inches.

As in previous seasons, fish passage data was entered on a field data sheet and uploaded into a computer. Files were uploaded each evening, checked and corrected as necessary. Data reporting was PC-based and accomplished by program scripts, or macros, created within Microsoft Excel spreadsheets. Passage data and operational conditions were supplied electronically to YHPC's on-site coordinator/manager and other appropriate YHPC personnel on a daily basis. Passage information was subsequently provided electronically by YHPC personnel to members of the FPTAC.

2.3 Results

2.3.1 Spring Fishway Operation

2.3.1.1 Relative Abundance

The number of fish that passed through the York Haven fish ladder is presented in Table 1. During manned Fishway operation some 8,968 fish of 16 taxa were enumerated as they passed upstream into Lake Frederic. Gizzard Shad (5,175) was the dominant fish species passed and comprised over 57.7% of the fish passed. Some 80 American Shad were counted as they passed through the ladder. Other predominant fishes passed included Channel Catfish (1,533), Carp (957), Smallmouth Bass (426), White Sucker (249), Quillback (243), and Walleye (162). Passage varied daily and ranged from 1,905 fish on May 5 when 21.2% of the season total was passed to one fish on May 30.

2.3.1.2 American Shad Passage

A total of 80 American Shad passed upstream through the ladder in 2021. American Shad passed upstream between May 2 and June 9. American Shad were collected and passed at water temperatures of 55.8°F to 79.9°F, River flows of 17,000 cfs to 88,300 cfs and East Channel flows of 2,050 cfs to 12,400 (Tables 2 and 3, Figures 3 and 4).

The hourly passage of American Shad through the fish ladder is given in Table 4. Sixty-four American Shad (80.0%) passed before 1300 hrs. Hourly passage varied from 0 to 4 American Shad.

2.3.1.3 Other Alosids

No other alosines (Alewife, Blueback Herring and Hickory Shad) were observed passing through the ladder (Table 1).

2.3.2 Resident Fishway Operation

During resident fish passage, March 29 and April 28, the entrance and exit gates were opened and the North Fixed Wheel Gate was opened and set to deliver a minimum of 400 cfs to the East Channel providing volitional passage of resident fish. Following staffed operation on June 9, the Fishway was set reset to deliver a minimum of 400 cfs to the East Channel and provided resident fish passage through September 9 when the exit gate failed. Resident fish passage resumed on November 4 and continued through December 16 when the Fishway was shut down for the year. From March 29 to December 16, water temperatures varied from 38.4°F to 86.2°F and River flows of 8,850 cfs to 183,000 cfs (Figure 5).

3.0 DOWNSTREAM FISH PASSAGE

The FERC Project license and PADEP Water Quality Certification require downstream passage of adult and juvenile American Shad. Downstream passage of adult American Shad is expected to occur from May 1 to June 30 while downstream passage of juvenile American Shad is to occur from October 1 through November 30. Based on a USFWS request received on January 15, 2021, the Project began collecting water temperature¹ in the Station forebay at 60-minute intervals from March 25 with an Onset Hobo Water Temperature Pro v2 Data Logger (U22-001) that has a $\pm 0.2^{\circ}\text{C}$ accuracy. The monitor was suspended approximately 4 ft above the bottom of the forebay on the west side of the forebay opposite Turbine Unit 10. The Data logger was removed on September 28 during a high flow event that resulted in the accumulation of a large debris field in the Station forebay that was associated with sluice gate construction activities that prevented sluicing of debris. Moving forward, the Project has plans to install a standpipe to house and protect the Data Logger.

3.1 Adult American Shad Passage

When River flows exceed the sum of Project hydraulic capacity (17,000 cfs), and required flows through the East Channel (2,000 cfs) and required flows over the Main Dam (4,000 cfs), (Total of 23,000 cfs), the Project, according to its FERC License and 401 Water Quality Certification, the Station is to open and spill water via the forebay Sluice Gate (~370 cfs) to the extent practicable for a period of one to two hours during the morning on weekdays, subject to Project personnel availability and access requirements for operations and maintenance purposes and may be provided in connection with opening of the forebay Sluice Gate for purposes of passing debris. During the post-spawned adult downstream passage period, river flow varied from cfs 8,900 cfs to 118,000 cfs (Figure 6). Average daily water temperature in the forebay varied by over 31.5 degrees and ranged from a low of 56.0°F on May 10 to a high low of 87.6°F on June 30.

During the adult downstream passage period, the sluice gate was opened as required (~370 cfs) for up to two hours, Monday through Friday, throughout most of May and mid-June when river flows exceeded a total of 23,000 cfs and requirements for operations and maintenance purposes (Figure 7). The sluice gate was not opened on May 18 due to a complete station outage, May 31 the Memorial Day Holiday, and June 1 to allow the removal of Turbine Unit 1. In addition, when river flows were <23,000 cfs, the sluice gate was not opened on May 24, 25, 27 and 28 and June 21, 22, 23, 24, 25, 28, 29 and 30. No physical observations of post-spawned adult American shad were noted by Station personnel.

3.2 Juvenile American Shad Passage

During the Juvenile American Shad Passage Period (JASPP), October 1 to November 30, YHPC operates the turbines as follows. Depending on available River flow, Units 1-6 (Propeller/Kaplan units) may be operated without restriction up to available River flow. Unit 14 (larger single Francis unit) may be operated if river flow exceeds capacity of Units 1 to 6; Units 7 to 13 and 15 to 20 (double Francis units) may be operated in ascending order if river flow exceeds capacity of Units 1-6 and 14. During the downstream juvenile passage period, the Station is to also open and spill water via the Forebay Sluice Gate (~370 cfs) between the hours of 5 PM to 11 PM EST. If during the downstream passage period, River flow exceeds the sum of Project hydraulic capacity, required flows through the East Channel and required flows over the Main Dam (if any), the Project is also to open and spill water via the forebay sluice gate to

¹ Water temperature data to be provided separately in an Excel file.

the extent practicable for one to two hours during the morning, subject to Project access requirements for operations and maintenance purposes.

On September 24, 2021, YHPC filed a request with FERC, with Agency support, for a temporary variance to provide a flow of 370 cfs from 5 PM to 11 PM from October 1 to November 30 required for the protection of downstream migrating juvenile American shad to facilitate the ongoing construction of a downstream passage facility at the forebay sluice gate. Although construction was originally scheduled to be completed by September 30, 2021, high river flows associated with Tropical Storm Ida delayed construction activities. The Project held weekly consultation meetings with PADEP and USFWS to keep them apprised of construction activities and progress. FERC, in December 2021, retroactively approved the YHPC's request for a temporary variance of its request to provide 370 cfs downstream passage flows for juvenile American shad. YHPC accelerated the construction schedule and subsequently was able to operate the forebay sluice gate spilling 370 cfs from October 13 through November 30. The sluice gate generally remained open for all hours except for brief periods two to three times per week in the morning for inspection of the temporary pile protection through November 30th.

During the JASPP (October 1 to November 30), river flow was higher than normal and varied from 18,500 cfs to 149,000 cfs (Figure 8). Flows during the entire two-month period exceeded the hydraulic capacity (17,000 cfs) of the Station. Average daily water temperature (measured at the Fishway) during the JASPP varied almost 30 degrees and ranged from a high of 68.3°F on October 16 to a low of 38.4°F on November 30.

Although the Project received a variance from FERC to spill 370 cfs from the Sluice Gate, the Station made accommodations to open the sluice gate in mid-October to pass a large debris field that had accumulated to the Station's forebay, which prevented station operations. The sluice gate was initially opened on October 13 for 17 hours and by October 21, the sluice gate remained open through November 30 (Figure 9). Station generation data for October and November, provided in Appendix I, confirm that turbine unit operation followed the JASPP operating guidelines.

4.0 LITERATURE CITED

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TABLES

Table 1. Summary of the Daily Number of Fish that Passed by the York Haven Hydroelectric Project through the Serpentine Vertical Notch Ladder at the East Channel Dam in 2021

	29-Apr	30-Apr	1-May	2-May	3-May	4-May	5-May	6-May	7-May	8-May
Observation Time (hrs.)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Water Temperature (°F)	64.2	62.8	57.7	60.0	60.6	60.4	62.3	60.5	59.8	57.4
American Shad	0	0	0	3	3	0	2	18	2	0
Alewife	0	0	0	0	0	0	0	0	0	0
Blueback Herring	0	0	0	0	0	0	0	0	0	0
Gizzard Shad	0	28	16	252	546	390	1,749	736	281	81
Hickory Shad	0	0	0	0	0	0	0	0	0	0
Striped Bass	0	1	0	0	0	0	0	1	0	0
White Perch	0	0	0	0	0	0	0	0	0	0
American Eel	0	0	0	0	0	0	0	0	0	0
Brown Trout	0	0	0	0	0	0	0	0	0	0
Muskellunge	0	0	0	0	0	0	0	0	0	0
Carp	0	2	0	32	110	1	61	27	29	3
Quillback	1	2	1	1	2	0	15	21	5	2
White Sucker	146	17	5	8	0	1	0	2	0	0
Shorthead Redhorse	3	17	0	5	6	0	3	0	0	0
White Catfish	0	0	0	0	0	0	0	1	0	0
Yellow Bullhead	0	0	0	0	1	0	0	0	0	0
Brown Bullhead	0	0	0	0	1	0	0	0	0	0
Channel Catfish	0	12	0	136	142	58	70	92	54	26
Rock Bass	0	0	0	0	0	0	0	0	0	0
Redbreast Sunfish	0	0	0	0	0	0	0	0	0	0
Smallmouth Bass	4	14	0	3	3	2	2	1	1	0
Walleye	0	4	2	12	1	0	3	6	1	0
River Chub	0	0	0	0	0	0	0	0	0	0
Northern Hog Sucker	0	0	0	0	0	0	0	0	0	0
Flathead Catfish	0	0	0	0	14	7	0	0	1	2
Striped Bass Hybrid	0	0	0	0	0	0	0	0	0	0
Total	154	97	24	452	829	459	1,905	905	374	114

Table 1. Continued

	9-May	10-May	11-May	12-May	13-May	14-May	15-May	16-May	17-May	18-May
Observation Time (hrs.)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Water Temperature (°F)	55.9	55.0	55.7	54.1	54.0	55.8	58.6	58.9	59.2	62.4
American Shad	2	0	1	0	0	2	9	5	1	2
Alewife	0	0	0	0	0	0	0	0	0	0
Blueback Herring	0	0	0	0	0	0	0	0	0	0
Gizzard Shad	73	32	24	28	21	72	129	124	61	56
Hickory Shad	0	0	0	0	0	0	0	0	0	0
Striped Bass	0	0	0	0	0	0	0	0	1	0
White Perch	0	0	0	0	0	0	0	0	0	0
American Eel	0	0	0	0	0	0	0	0	0	0
Brown Trout	0	0	0	0	0	0	0	0	0	0
Muskellunge	0	0	0	1	0	0	3	0	0	0
Carp	8	0	20	18	8	11	32	44	11	9
Quillback	0	0	0	0	0	1	14	29	14	11
White Sucker	0	0	0	0	0	0	1	0	4	17
Shorthead Redhorse	1	0	0	0	0	1	1	11	8	18
White Catfish	0	0	0	0	0	0	0	0	0	0
Yellow Bullhead	0	0	0	0	0	0	0	0	0	0
Brown Bullhead	0	0	0	0	0	0	0	0	0	0
Channel Catfish	10	9	25	16	2	11	15	16	10	20
Rock Bass	0	0	0	0	0	0	0	0	1	0
Redbreast Sunfish	0	0	0	0	0	0	0	0	0	0
Smallmouth Bass	1	1	0	0	0	0	12	23	23	58
Walleye	1	1	1	1	0	0	1	4	2	0
River Chub	0	0	0	0	0	0	0	0	0	0
Northern Hog Sucker	0	0	0	0	0	0	0	0	0	0
Flathead Catfish	0	0	0	1	0	1	0	0	0	0
Striped Bass Hybrid	0	0	0	0	0	0	0	0	0	0
Total	96	43	71	65	31	99	217	256	136	191

Table 1. Continued

	19-May	20-May	21-May	22-May	23-May	24-May	25-May	26-May	27-May	28-May
Observation Time (hrs.)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Water Temperature (°F)	66.3	69.0	70.4	72.7	74.0	73.6	69.4	70.5	73.6	73.6
American Shad	0	0	0	0	6	1	5	3	2	0
Alewife	0	0	0	0	0	0	0	0	0	0
Blueback Herring	0	0	0	0	0	0	0	0	0	0
Gizzard Shad	44	52	39	60	37	16	19	28	32	19
Hickory Shad	0	0	0	0	0	0	0	0	0	0
Striped Bass	0	0	0	0	0	0	0	0	0	0
White Perch	0	0	0	0	0	0	0	0	0	0
American Eel	0	0	0	0	0	0	0	0	0	0
Brown Trout	0	0	0	0	0	0	0	0	0	0
Muskellunge	0	0	0	0	0	0	0	0	0	0
Carp	22	52	37	33	14	20	11	9	23	17
Quillback	4	20	12	15	12	8	8	6	8	5
White Sucker	1	1	1	0	9	18	5	2	0	0
Shorthead Redhorse	1	0	1	1	1	0	2	3	0	2
White Catfish	0	0	0	0	0	0	0	0	0	0
Yellow Bullhead	0	0	0	0	0	0	0	0	0	0
Brown Bullhead	0	0	0	0	0	0	0	0	0	0
Channel Catfish	35	67	95	61	22	46	22	26	72	66
Rock Bass	0	0	0	0	0	0	0	0	0	0
Redbreast Sunfish	0	0	0	0	0	0	0	0	0	0
Smallmouth Bass	26	29	24	41	26	10	21	17	25	19
Walleye	5	9	16	11	0	10	12	14	10	5
River Chub	0	0	0	0	0	0	0	0	0	0
Northern Hog Sucker	0	0	0	0	0	0	0	0	0	0
Flathead Catfish	0	0	0	0	0	0	0	0	1	1
Striped Bass Hybrid	0	0	0	0	0	0	0	0	0	0
Total	138	230	225	222	127	129	105	108	173	134

Table 1. Continued

	29-May	30-May	31-May	1-Jun	2-Jun	3-Jun	4-Jun	5-Jun	6-Jun	7-Jun
Observation Time (hrs.)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Water Temperature (°F)	67.4	62.6	62.1	65.6	67.3	67.7	68.9	73.0	75.9	78.4
American Shad	0	1	0	4	1	1	0	0	1	0
Alewife	0	0	0	0	0	0	0	0	0	0
Blueback Herring	0	0	0	0	0	0	0	0	0	0
Gizzard Shad	14	0	3	18	15	11	13	12	13	11
Hickory Shad	0	0	0	0	0	0	0	0	0	0
Striped Bass	0	0	0	0	0	0	0	0	0	0
White Perch	0	0	0	0	0	0	0	0	0	0
American Eel	0	0	0	0	0	0	0	0	0	0
Brown Trout	0	0	0	0	0	0	0	0	0	0
Muskellunge	0	0	0	0	0	0	0	0	0	0
Carp	10	0	2	14	18	20	19	46	39	34
Quillback	7	0	0	0	1	2	4	4	2	1
White Sucker	1	0	0	2	0	0	1	2	2	3
Shorthead Redhorse	1	0	0	0	1	0	1	1	1	0
White Catfish	0	0	0	0	0	0	0	0	0	0
Yellow Bullhead	0	0	0	0	0	0	0	0	0	0
Brown Bullhead	0	0	0	0	0	0	0	0	0	0
Channel Catfish	14	0	0	23	49	31	16	19	17	19
Rock Bass	0	0	0	0	0	0	0	0	0	0
Redbreast Sunfish	0	0	0	0	0	0	0	0	0	0
Smallmouth Bass	7	0	0	2	3	4	4	4	11	2
Walleye	7	0	1	0	0	1	3	3	2	6
River Chub	0	0	0	0	0	0	0	0	0	0
Northern Hog Sucker	0	0	0	0	0	0	0	0	0	0
Flathead Catfish	2	0	0	0	9	2	0	0	0	0
Striped Bass Hybrid	0	0	0	0	0	0	0	0	0	0
Total	63	1	6	63	97	72	61	91	88	76

Table 1. Continued

	8-Jun	9-Jun	Total
Observation Time (hrs.)	8.0	8.0	320
Water Temperature (°F)	79.0	79.2	-
American Shad	1	4	80
Alewife	0	0	0
Blueback Herring	0	0	0
Gizzard Shad	9	11	5,175
Hickory Shad	0	0	0
Striped Bass	0	0	3
White Perch	0	0	0
American Eel	0	0	0
Brown Trout	0	0	0
Muskellunge	0	0	4
Carp	49	42	957
Quillback	0	5	243
White Sucker	0	0	249
Shorthead Redhorse	0	0	90
White Catfish	0	0	1
Yellow Bullhead	0	0	1
Brown Bullhead	0	0	1
Channel Catfish	57	52	1,533
Rock Bass	0	0	1
Redbreast Sunfish	0	0	0
Smallmouth Bass	0	3	426
Walleye	2	5	162
River Chub	0	0	0
Northern Hog Sucker	0	0	0
Flathead Catfish	0	1	42
Striped Bass Hybrid	0	0	0
Total	118	123	8,968

Table 2. Summary of Daily Average River Flow (USGS, Harrisburg Gage), Average Flow in the East Channel, Sum of Average Flow from the Power Station and Main Dam, Water Temperature, Secchi, Stop Gate Position, and East Channel and Fishway Water Elevations during Operation of the York Haven Fishway in 2021

Date	American Shad Passage	River Flow (cfs)	East Channel Flow (cfs)	Main Channel Flow (cfs)	Water Temp. (°F)	Secchi (in)			Stop Log Gate	Elevation (ft)					
						Avg.	Min.	Max.		Head Pond			Tailwater		
										Avg.	Min.	Max.	Avg	Min.	Max.
29-Apr	0	22,400	2,300	20,100	64.2	12	12	12	Closed	279.0	278.9	279.0	273.8	273.8	273.9
30-Apr	0	21,200	2,075	19,125	62.8	12	12	12	Closed	278.9	278.9	278.9	273.6	273.6	273.6
1-May	0	26,300	2,050	24,250	57.7	12	12	12	Closed	278.8	278.8	278.9	273.6	373.6	273.7
2-May	3	71,200	10,500	60,700	60.0	12	12	12	Closed	280.8	280.6	280.9	276.4	275.8	276.8
3-May	3	62,200	9,000	53,200	60.6	12	12	12	Closed	280.6	280.5	280.7	276.1	275.9	276.2
4-May	0	52,200	5,500	46,700	60.4	8	8	8	Closed	280.3	280.2	280.4	275.4	275.3	275.5
5-May	2	48,000	5,200	42,800	62.3	12	12	12	Closed	280.0	280.0	280.0	275.0	275.0	275.0
6-May	18	55,400	5,500	49,900	60.5	12	12	12	Closed	280.3	280.3	280.3	275.6	275.5	275.6
7-May	2	59,200	7,250	51,950	59.8	8	8	8	Closed	280.4	280.4	280.5	275.7	275.7	275.8
8-May	0	58,300	7,250	51,050	57.4	8	8	8	Closed	280.4	280.4	280.4	275.7	275.7	275.7
9-May	2	57,300	7,250	50,050	55.9	12	12	12	Closed	280.4	280.4	280.4	275.6	275.6	275.7
10-May	0	60,900	7,250	53,650	55.0	12	12	12	Closed	280.4	280.4	280.4	275.7	275.7	275.8
11-May	1	88,300	12,400	75,900	55.7	12	12	12	Closed	280.9	280.7	281.1	276.5	276.2	277.0
12-May	0	118,000	18,500	99,500	54.1	8	8	8	Closed	282.0	282.0	282.0	279.0	278.9	279.0
13-May	0	95,100	13,000	82,100	54.0	6	6	6	Closed	281.4	281.3	281.5	277.9	277.7	278.0
14-May	2	74,100	11,000	63,100	55.8	10	10	10	Closed	280.9	280.8	281.0	276.8	276.5	277.0
15-May	9	60,600	9,000	51,600	58.6	12	12	12	Closed	280.6	280.5	280.6	275.9	275.9	276.0
16-May	5	51,600	6,200	45,400	58.9	12	12	12	Closed	280.2	280.2	280.2	275.3	275.3	275.4
17-May	1	44,700	4,700	40,000	59.2	12	12	12	Closed	279.9	279.8	279.9	274.9	274.9	275.0
18-May	2	39,000	4,400	34,600	62.4	12	12	12	Closed	279.8	279.8	279.8	275.0	274.7	275.2
19-May	0	34,200	4,800	29,400	66.3	12	12	12	Closed	279.7	279.6	279.7	274.5	274.5	274.6
20-May	0	30,500	2,500	28,000	69.0	10	10	10	Closed	279.1	279.0	279.2	274.2	274.2	274.2
21-May	0	27,000	2,750	24,250	70.4	10	10	10	Closed	279.2	279.2	279.2	274.1	274.0	274.1
22-May	0	24,100	2,150	21,950	72.7	12	12	12	Closed	279.1	279.0	279.1	274.0	274.0	274.0
23-May	6	21,700	2,050	19,650	74.0	10	10	10	Closed	278.8	278.8	278.8	273.7	273.7	273.7
24-May	1	19,800	2,075	17,725	73.6	12	12	12	Closed	278.7	278.7	278.7	273.6	273.5	273.6
25-May	5	18,100	2,075	16,025	69.4	12	12	12	Closed	278.7	278.6	278.7	273.6	273.6	273.6
26-May	3	17,300	2,050	15,250	70.5	12	12	12	Closed	278.8	278.7	278.8	273.5	273.5	273.6
27-May	2	17,000	2,050	14,950	73.6	10	10	10	Closed	278.8	278.8	278.8	273.5	273.5	273.6
28-May	0	16,200	2,075	14,125	73.6	12	12	12	Closed	278.7	278.7	278.8	273.5	273.5	273.5
29-May	0	16,900	2,050	14,850	67.4	11	10	12	Closed	278.8	278.8	278.8	273.5	273.5	273.5
30-May	1	19,700	2,050	17,650	62.6	10	10	10	Closed	278.8	278.8	278.8	273.7	273.7	273.8
31-May	0	25,900	2,075	23,825	62.1	12	12	12	Closed	278.9	278.9	279.0	273.8	273.8	273.8
1-Jun	4	34,000	3,200	30,800	65.6	10	10	10	Closed	279.4	279.4	279.4	274.2	274.1	274.2
2-Jun	1	31,600	3,200	28,400	67.3	9	9	9	Closed	279.4	279.3	279.4	274.1	274.1	274.1
3-Jun	1	26,500	2,750	23,750	67.7	8	8	8	Closed	279.2	279.2	279.2	273.9	273.9	274.0
4-Jun	0	23,400	2,750	20,650	68.9	10	10	10	Closed	279.2	279.1	279.3	273.9	273.8	273.9
5-Jun	0	22,900	2,300	20,600	72.0	10	10	10	Closed	279.0	279.0	279.0	273.7	273.7	273.7
6-Jun	1	23,200	2,075	21,125	75.9	10	10	10	Closed	278.9	278.9	278.9	273.6	273.6	273.6
7-Jun	0	26,900	2,075	24,825	78.4	8	8	8	Closed	278.9	278.9	279.0	273.6	273.6	273.7
8-Jun	1	27,900	2,500	25,400	79.0	8	8	8	Closed	279.1	279.1	279.2	273.7	273.7	273.8
9-Jun	4	23,500	2,500	21,000	79.2	8	8	8	Closed	279.1	279.1	279.1	273.7	273.7	273.7

Table 3. Summary of Surface Water Elevations Recorded during Operation of the York Haven Fishway in 2021

Elevation (ft)																						
Date	River	Head Pond			Tailwater			Inside Fishway			Inside Weir			Above Counting Room			Below Fixed Wheel Gate			Counting Room		
	Flow (cfs)	Avg.	Min.	Max.	Avg	Min.	Max.	Avg	Min.	Max.	Avg	Min.	Max.	Avg	Min.	Max.	Avg	Min.	Max.	Avg	Min.	Max.
29-Apr	22,400	278.9	278.9	278.9	273.8	273.8	273.8	275.0	275.0	275.0	277.4	277.4	277.4	278.4	278.4	278.4	277.3	277.2	277.3	278.4	278.4	278.5
30-Apr	21,200	278.8	278.8	278.8	273.6	273.6	273.6	274.6	274.6	274.6	277.4	277.4	277.5	278.3	278.3	278.3	277.3	277.2	277.3	278.2	278.1	278.2
1-May	26,300	278.8	278.8	278.9	273.6	373.6	273.7	274.6	274.6	274.7	277.5	277.5	277.5	278.6	278.5	278.7	277.3	277.3	277.3	278.5	278.4	278.6
2-May	71,200	280.8	280.6	280.9	276.4	275.8	276.8	277.1	276.8	277.3	278.6	278.4	278.7	280.6	280.4	280.7	278.3	278.1	278.4	280.5	280.3	280.6
3-May	62,200	280.6	280.5	280.7	276.1	275.9	276.2	276.9	276.8	277.0	278.4	278.3	278.4	280.4	280.3	280.5	278.2	278.1	278.3	280.2	280.1	280.4
4-May	52,200	280.3	280.2	280.4	275.4	275.3	275.5	276.4	276.3	276.5	278.3	278.2	278.3	280.0	280.0	280.1	278.0	277.9	278.0	279.9	279.8	279.9
5-May	48,000	280.0	280.0	280.0	275.0	275.0	275.0	276.0	276.0	276.0	278.0	278.0	278.1	279.8	279.8	279.8	277.8	277.8	277.8	279.7	279.7	279.7
6-May	55,400	280.3	280.3	280.3	275.6	275.5	275.6	276.2	276.1	276.5	278.3	278.3	278.4	280.1	280.0	280.1	278.0	278.0	278.1	280.0	279.9	280.0
7-May	59,200	280.4	280.4	280.5	275.7	275.7	275.8	276.2	276.2	276.3	278.3	278.3	278.4	280.2	280.2	280.3	278.0	278.0	278.1	280.1	280.1	280.1
8-May	58,300	280.4	280.4	280.4	275.7	275.7	275.7	276.2	276.2	276.2	278.3	278.3	278.4	280.2	280.2	280.2	278.0	278.0	278.0	280.1	280.1	280.2
9-May	57,300	280.4	280.4	280.4	275.6	275.6	275.7	276.1	276.1	276.1	278.2	278.2	278.2	280.2	280.2	280.2	278.0	278.0	278.0	280.1	280.1	280.1
10-May	60,900	280.4	280.4	280.4	275.7	275.7	275.8	276.2	276.2	276.3	278.3	278.2	278.3	280.2	280.2	280.2	278.0	278.0	278.0	280.1	280.1	280.2
11-May	88,300	280.9	280.7	281.1	276.5	276.2	277.0	277.0	276.7	277.5	278.6	278.5	278.8	280.7	280.5	280.9	278.3	278.2	278.3	280.6	280.4	280.8
12-May	118,000	282.0	282.0	282.0	279.0	278.9	279.0	279.5	279.5	279.6	280.0	280.0	280.1	282.8	282.8	282.8	279.6	279.5	279.7	281.6	281.6	281.7
13-May	95,100	281.4	281.3	281.5	277.9	277.7	278.0	278.5	278.5	278.5	279.2	279.1	279.4	281.3	281.2	281.4	279.0	278.9	279.1	281.1	281.0	281.3
14-May	74,100	280.9	280.8	281.0	276.8	276.5	277.0	277.3	277.0	277.5	278.7	278.5	278.9	280.8	280.7	280.9	278.4	278.3	278.6	280.7	280.6	280.8
15-May	60,600	280.6	280.5	280.6	275.9	275.9	276.0	276.6	276.6	276.6	278.3	278.2	278.3	280.4	280.3	280.4	278.0	278.0	278.1	280.3	280.2	280.3
16-May	51,600	280.2	280.2	280.2	275.3	275.3	275.4	276.2	276.2	276.2	278.2	278.2	278.2	280.0	280.0	280.1	277.8	277.8	277.9	279.9	279.9	280.0
17-May	44,700	279.9	279.8	279.9	274.9	274.9	275.0	276.0	276.0	276.0	278.0	278.0	278.1	279.8	279.7	279.8	277.7	277.7	277.7	279.7	279.6	279.8
18-May	39,000	279.8	279.8	279.8	275.0	274.7	275.2	275.9	275.8	276.0	277.9	277.9	278.0	279.7	279.7	279.7	277.7	277.6	277.8	279.6	279.6	279.6
19-May	34,200	279.7	279.6	279.7	274.5	274.5	274.6	275.7	275.6	275.8	277.9	277.9	277.9	279.4	279.4	279.5	277.5	277.5	277.6	279.3	279.3	279.4
20-May	30,500	279.1	279.0	279.2	274.2	274.2	274.2	275.5	275.5	275.5	277.7	277.7	277.8	278.9	278.8	279.0	277.5	277.5	277.5	278.8	278.7	278.9
21-May	27,000	279.2	279.2	279.2	274.1	274.0	274.1	275.4	275.4	275.4	277.7	277.6	277.7	279.0	279.0	279.0	277.4	277.4	277.5	278.9	278.9	278.9
22-May	24,100	279.1	279.0	279.1	274.0	274.0	274.0	275.3	275.3	275.3	277.6	277.5	277.6	278.9	278.8	278.9	277.4	277.4	277.4	278.8	278.7	278.8
23-May	21,700	278.8	278.8	278.8	273.7	273.7	273.7	275.3	275.3	275.3	277.4	277.4	277.5	278.7	278.7	278.7	277.4	277.4	277.5	278.6	278.6	278.6
24-May	19,800	278.7	278.7	278.7	273.6	273.5	273.6	275.3	275.3	275.3	277.5	277.4	277.5	278.6	278.6	278.6	277.3	277.2	277.3	278.5	278.5	278.6
25-May	18,100	278.7	278.6	278.7	273.6	273.6	273.6	275.3	275.3	275.3	277.4	277.4	277.5	278.6	278.5	278.6	277.2	277.2	277.3	278.5	278.5	278.5
26-May	17,300	278.8	278.7	278.8	273.5	273.5	273.6	275.1	275.1	275.2	277.3	277.3	277.3	278.6	278.6	278.6	277.2	277.2	277.2	278.5	278.4	278.5
27-May	17,000	278.8	278.8	278.8	273.5	273.5	273.6	275.1	275.1	275.2	277.4	277.4	277.4	278.6	278.6	278.6	277.2	277.2	277.2	278.5	278.5	278.5
28-May	16,200	278.7	278.7	278.8	273.5	273.5	273.5	275.1	275.1	275.1	277.4	277.4	277.4	278.5	278.5	278.6	277.2	277.2	277.2	278.4	278.4	278.5
29-May	16,900	278.8	278.8	278.8	273.5	273.5	273.5	275.1	275.1	275.1	277.4	277.4	277.4	278.6	278.6	278.6	277.2	277.2	277.2	278.5	278.5	278.5
30-May	19,700	278.8	278.8	278.8	273.7	273.7	273.8	275.3	275.3	275.3	277.5	277.5	277.5	278.7	278.7	278.7	277.5	277.4	277.5	278.6	278.6	278.7
31-May	25,900	278.9	278.9	279.0	273.8	273.8	273.8	275.3	275.3	275.3	277.5	277.5	277.6	278.9	278.8	278.9	277.3	277.3	277.4	278.7	278.7	278.8
1-Jun	34,000	279.4	279.4	279.4	274.2	274.1	274.2	275.3	275.3	275.3	277.9	277.8	277.9	279.2	279.3	279.3	277.6	277.6	277.6	279.2	279.2	279.2
2-Jun	31,600	279.4	279.3	279.4	274.1	274.1	274.1	275.4	275.4	275.4	277.8	277.7	277.8	279.2	279.1	279.2	277.6	277.5	277.6	279.1	279.0	279.1
3-Jun	26,500	279.2	279.2	279.2	273.9	273.9	274.0	275.2	275.2	275.3	277.6	277.6	277.6	279.0	279.0	279.0	277.5	277.5	277.6	278.9	278.8	278.9
4-Jun	23,400	279.2	279.1	279.3	273.9	273.8	273.9	275.2	275.1	275.2	277.6	277.5	277.6	279.0	278.9	279.1	277.4	277.4	277.4	278.9	278.8	279.0
5-Jun	22,900	279.0	279.0	279.0	273.7	273.7	273.7	275.1	275.1	275.1	277.4	277.4	277.4	278.8	278.8	278.8	277.3	277.3	277.3	278.7	278.7	278.8
6-Jun	23,200	278.9	278.9	278.9	273.6	273.6	273.6	275.3	275.3	275.3	277.4	277.4	277.5	278.8	278.8	278.8	277.2	277.2	277.3	278.7	278.7	278.7
7-Jun	26,900	278.9	278.9	279.0	273.6	273.6	273.7	275.3	275.3	275.3	277.5	277.5	277.5	278.8	278.8	278.9	277.3	277.2	277.4	278.7	278.7	278.8
8-Jun	27,900	279.1	279.1	279.2	273.7	273.7	273.8	275.3	275.3	275.3	277.6	277.6	277.7	279.0	279.0	279.1	277.4	277.4	277.5	278.9	278.9	279.0
9-Jun	23,500	279.1	279.1	279.1	273.7	273.7	273.7	275.1	275.1	275.1	277.5	277.5	277.5	278.9	278.9	278.9	277.3	277.3	277.3	278.8	278.7	278.8

Table 4. Hourly Summary of American Shad Passage through the Vertical Notch Fish Ladder at the York Haven Hydroelectric Project in 2021

	29-Apr	30-Apr	1-May	2-May	3-May	4-May	5-May	6-May	7-May
Observation Time (Start)	0800	0800	0800	0800	0800	0800	0800	0800	0800
Observation Time (End)	1600	1600	1600	1600	1600	1600	1600	1600	1600
Military Time (Hours)									
0800 - 0859	0	0	0	1	2	0	1	2	1
0900 - 0959	0	0	0	0	0	0	1	4	0
1000 - 1059	0	0	0	1	0	0	0	1	0
1100 - 1159	0	0	0	0	1	0	0	3	0
1200 - 1259	0	0	0	0	0	0	0	3	0
1300 - 1359	0	0	0	0	0	0	0	4	0
1400 - 1459	0	0	0	1	0	0	0	0	0
1500 - 1559	0	0	0	0	0	0	0	1	1
Total Catch	0	0	0	3	3	0	2	18	2
	8-May	9-May	10-May	11-May	12-May	13-May	14-May	15-May	16-May
Observation Time (Start)	0800	0800	0800	0800	0800	0800	0800	0800	0800
Observation Time (End)	1600	1600	1600	1600	1600	1600	1600	1600	1600
Military Time (Hours)									
0800 - 0859	0	1	0	1	0	0	1	1	3
0900 - 0959	0	0	0	0	0	0	0	0	0
1000 - 1059	0	0	0	0	0	0	0	0	1
1100 - 1159	0	1	0	0	0	0	0	5	0
1200 - 1259	0	0	0	0	0	0	1	0	0
1300 - 1359	0	0	0	0	0	0	0	0	0
1400 - 1459	0	0	0	0	0	0	0	2	0
1500 - 1559	0	0	0	0	0	0	0	1	1
Total Catch	0	2	0	1	0	0	2	9	5

Table 4. (continued)

	17-May	18-May	19-May	20-May	21-May	22-May	23-May	24-May	25-May
Observation Time (Start)	0800	0800	0800	0800	0800	0800	0800	0800	0800
Observation Time (End)	1600	1600	1600	1600	1600	1600	1600	1600	1600
Military Time (Hours)									
0800 - 0859	0	0	0	0	0	0	0	0	2
0900 - 0959	0	0	0	0	0	0	0	0	0
1000 - 1059	0	0	0	0	0	0	0	0	1
1100 - 1159	0	2	0	0	0	0	3	0	0
1200 - 1259	1	0	0	0	0	0	1	0	1
1300 - 1359	0	0	0	0	0	0	2	0	0
1400 - 1459	0	0	0	0	0	0	0	1	0
1500 - 1559	0	0	0	0	0	0	0	0	1
Total Catch	1	2	0	0	0	0	6	1	5

	26-May	27-May	28-May	29-May	30-May	31-May	1-Jun	2-Jun	3-Jun
Observation Time (Start)	0800	0800	0800	0800	0800	0800	0800	0800	0800
Observation Time (End)	1600	1600	1600	1600	1600	1600	1600	1600	1600
Military Time (Hours)									
0800 - 0859	0	1	0	0	0	0	0	0	0
0900 - 0959	0	0	0	0	0	0	0	0	0
1000 - 1059	1	0	0	0	0	0	3	0	0
1100 - 1159	1	0	0	0	0	0	1	0	1
1200 - 1259	0	1	0	0	1	0	0	1	0
1300 - 1359	0	0	0	0	0	0	0	0	0
1400 - 1459	1	0	0	0	0	0	0	0	0
1500 - 1559	0	0	0	0	0	0	0	0	0
Total Catch	3	2	0	0	1	0	4	1	1

Table 4. (continued)

	4-Jun	5-Jun	6-Jun	7-Jun	8-Jun	9-Jun		
Observation Time (Start)	0800	0800	0800	0800	0800	0800		
Observation Time (End)	1600	1600	1600	1600	1600	1600	Total	%
Military Time (Hours)								
0800 - 0859	0	0	0	0	0	3	20	25.0%
0900 - 0959	0	0	0	0	1	0	6	7.5%
1000 - 1059	0	0	0	0	0	0	8	10.0%
1100 - 1159	0	0	1	0	0	1	20	25.0%
1200 - 1259	0	0	0	0	0	0	10	12.5%
1300 - 1359	0	0	0	0	0	0	6	7.5%
1400 - 1459	0	0	0	0	0	0	5	6.3%
1500 - 1559	0	0	0	0	0	0	5	6.3%
Total Catch	0	0	1	0	1	4	80	100.0%

FIGURES

Figure 1. General Layout of the York Haven Hydroelectric Project Showing the Location of the Fishway

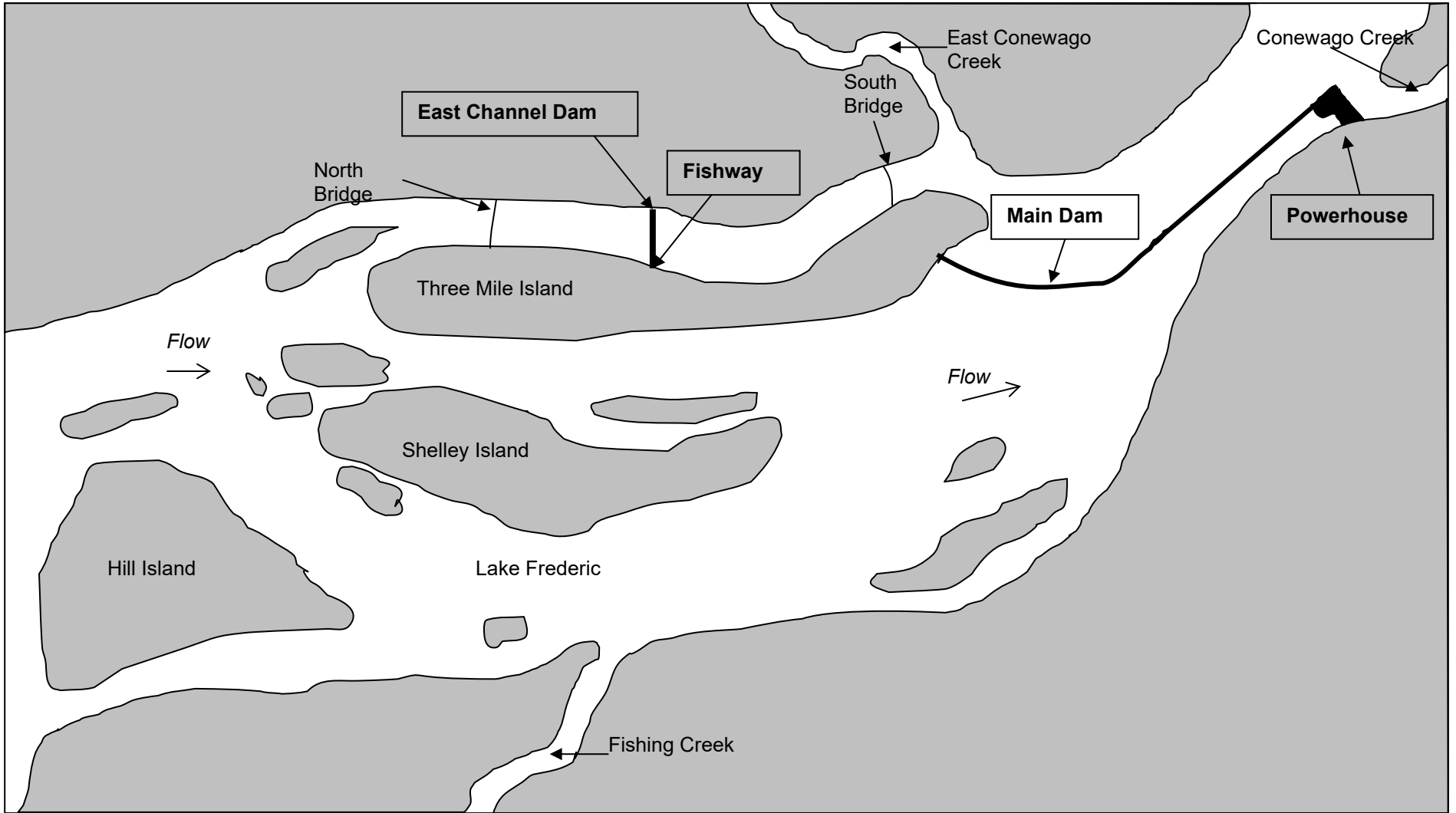


Figure 2. General Arrangement - York Haven Fishway

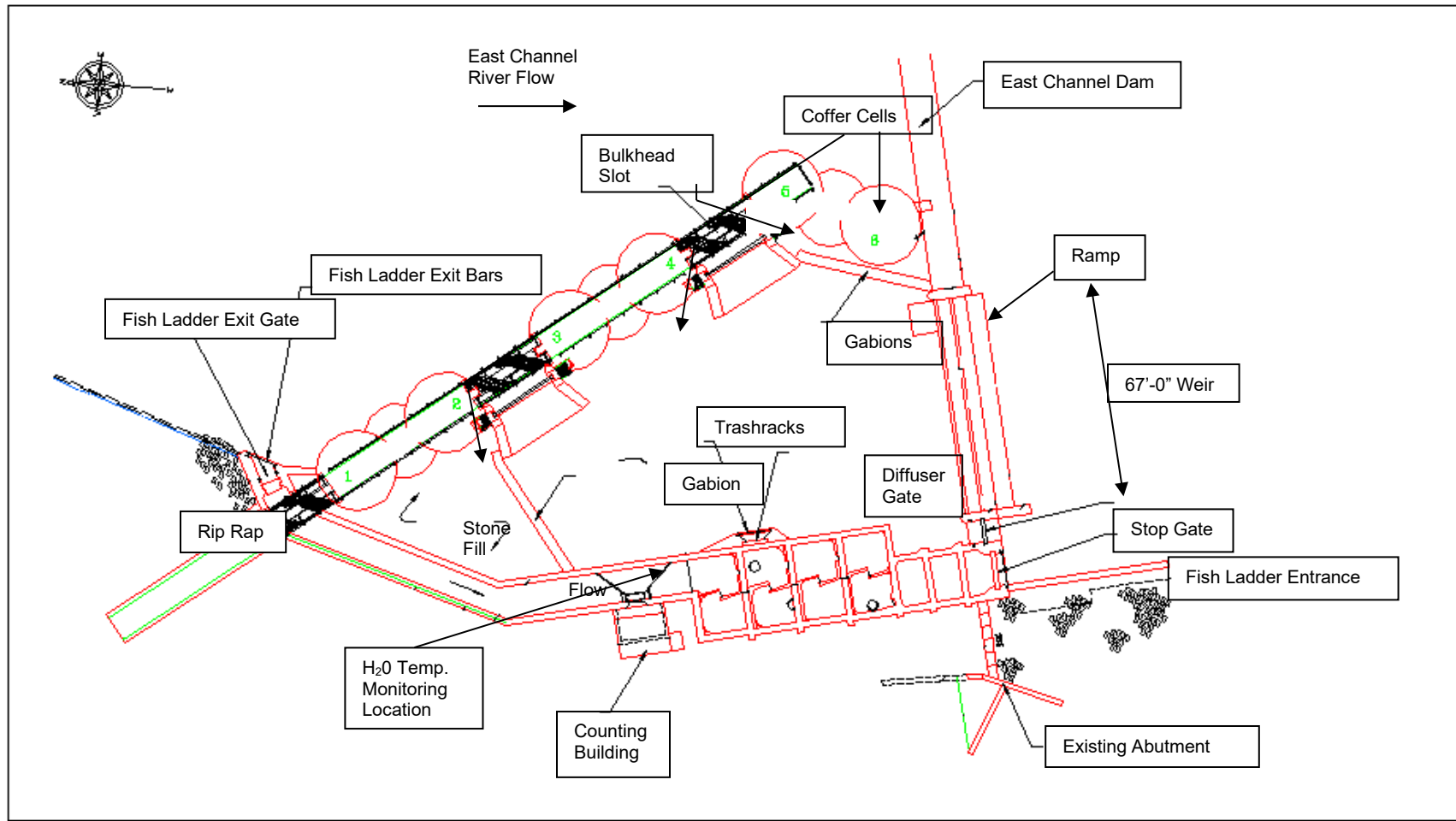


Figure 3. Plot of River Flow (x 1000 cfs) at the USGS Harrisburg Station (01570500) and Average Daily Water Temperature (F) at the York Haven East Channel Fishway in Spring 2021 and 21-Year Average Flow Values (2000-2020)

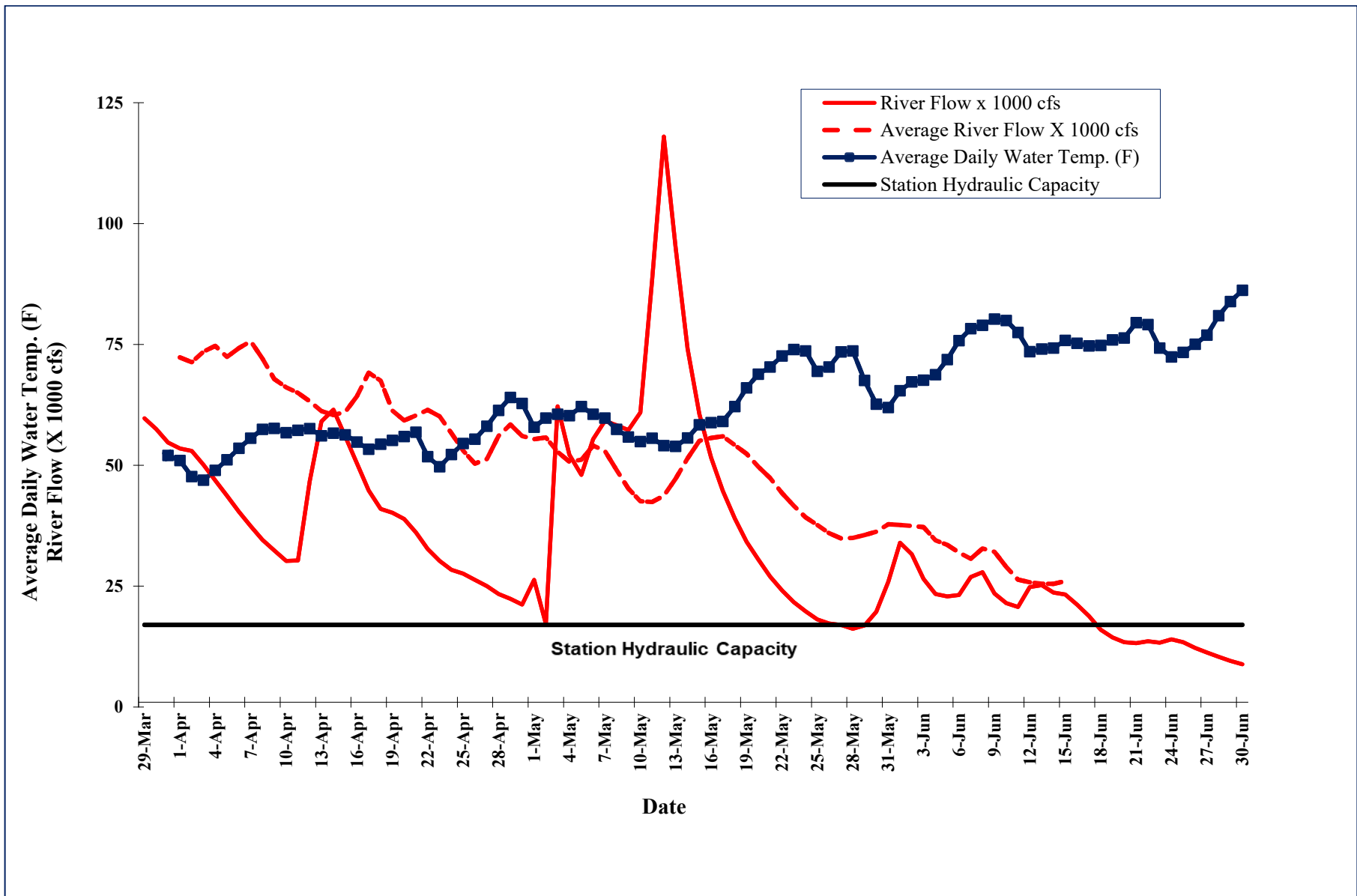


Figure 4. Plot of River Flow (x 1000 cfs) and East Channel Flow (x 1000 cfs) in Relation to the Daily American Shad Passage at the York Haven Fishway in Spring 2021

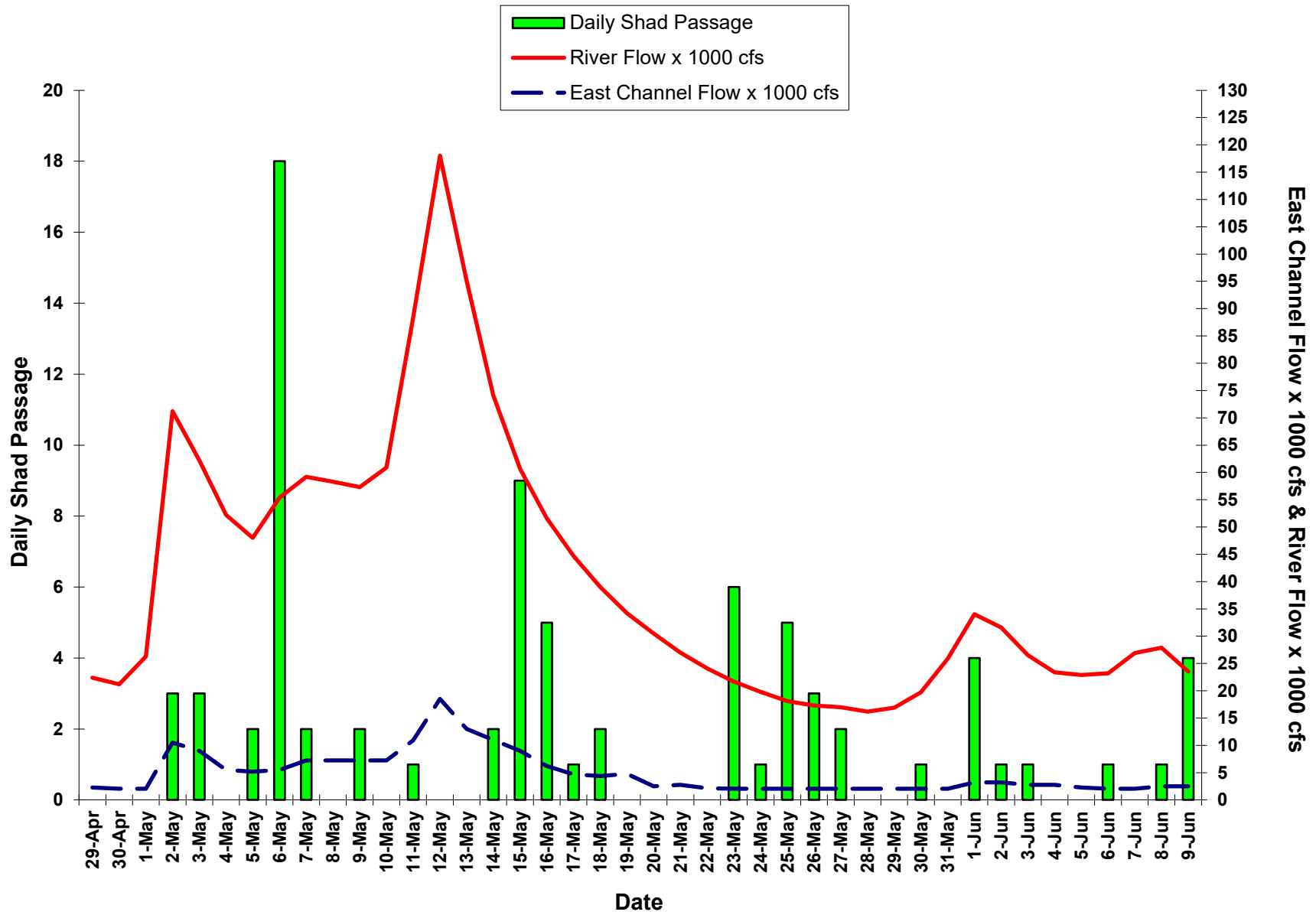


Figure 5. Plot of River Flow (cfs) at the USGS Harrisburg Station (#01570500) and Average Daily Water Temperature (F) at the York Haven East Channel Fishway, March 29 to December 16 2021

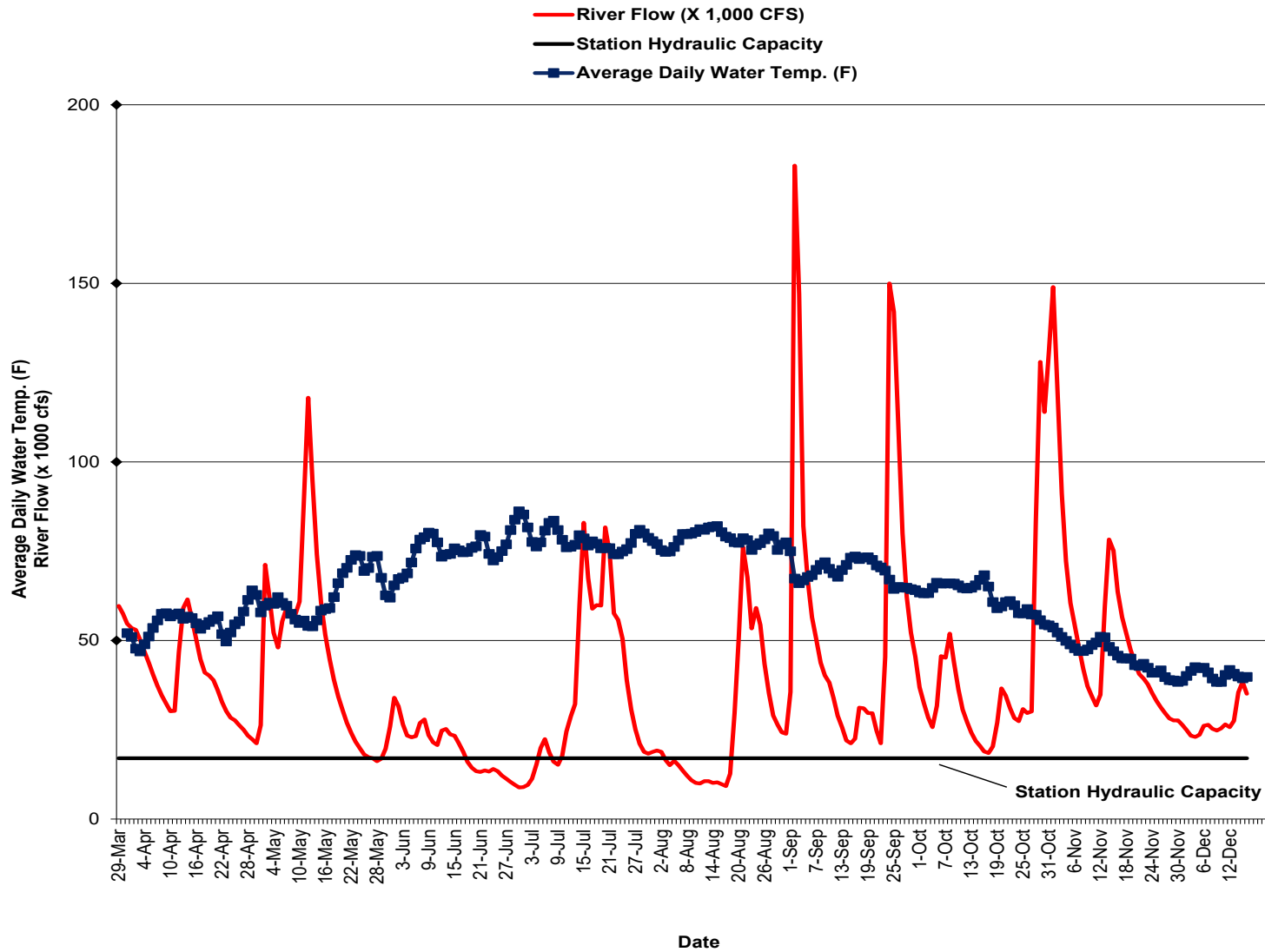


Figure 6. Plot of River Flow (cfs) at the USGS Station (#01570500) and Average Daily Water Temperature (F) in the Headrace of the York Haven Power Station, May 1 to June 30 2021

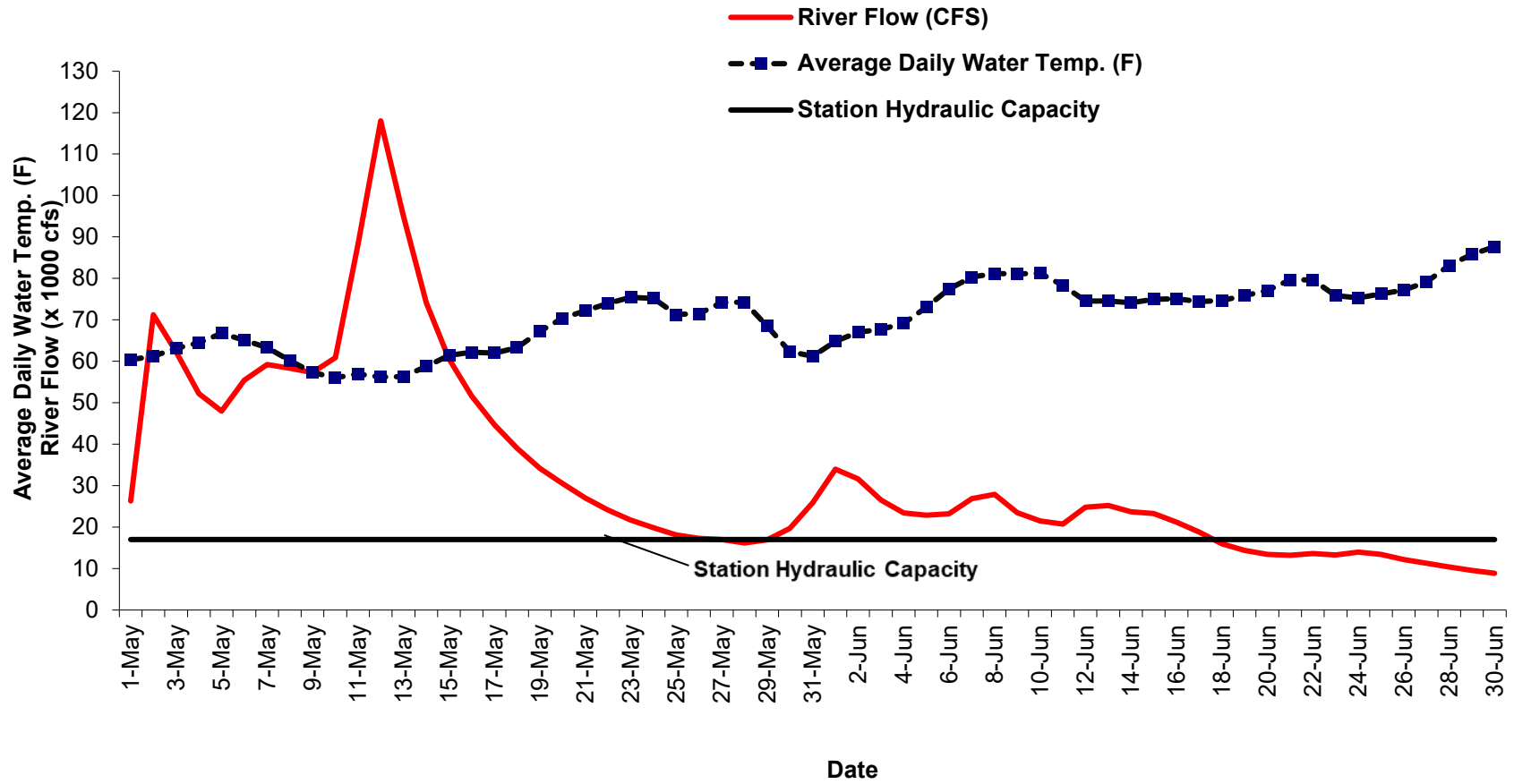


Figure 7. York Haven Sluice Gate Operation, May 1 to June 30, 2021

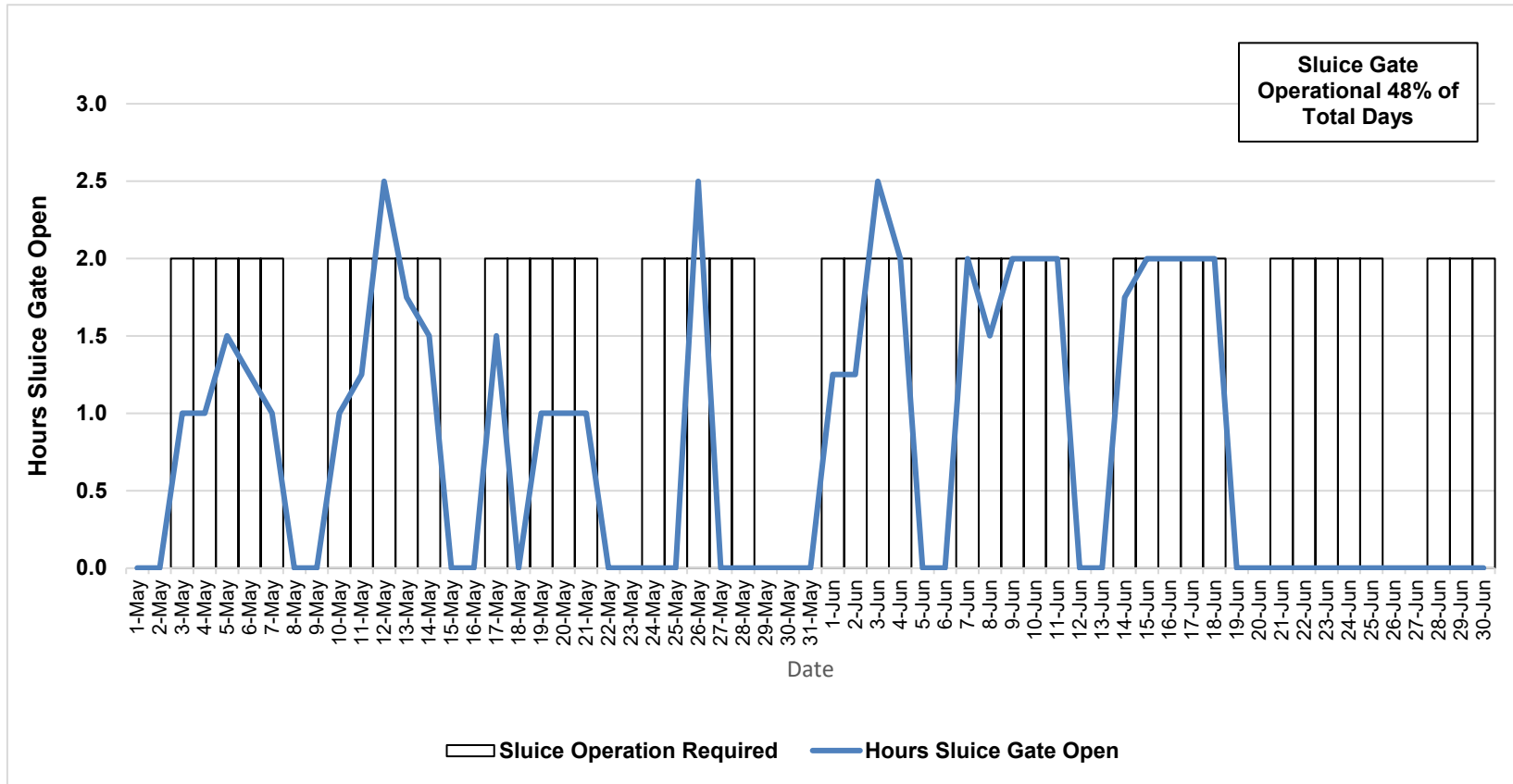


Figure 8. Plot of River Flow (cfs) at the USGS Harrisburg Station (#01570500) and Average Daily Water Temperature (F) at the York Haven East Channel Fishway, October 1 to November 30, 2021

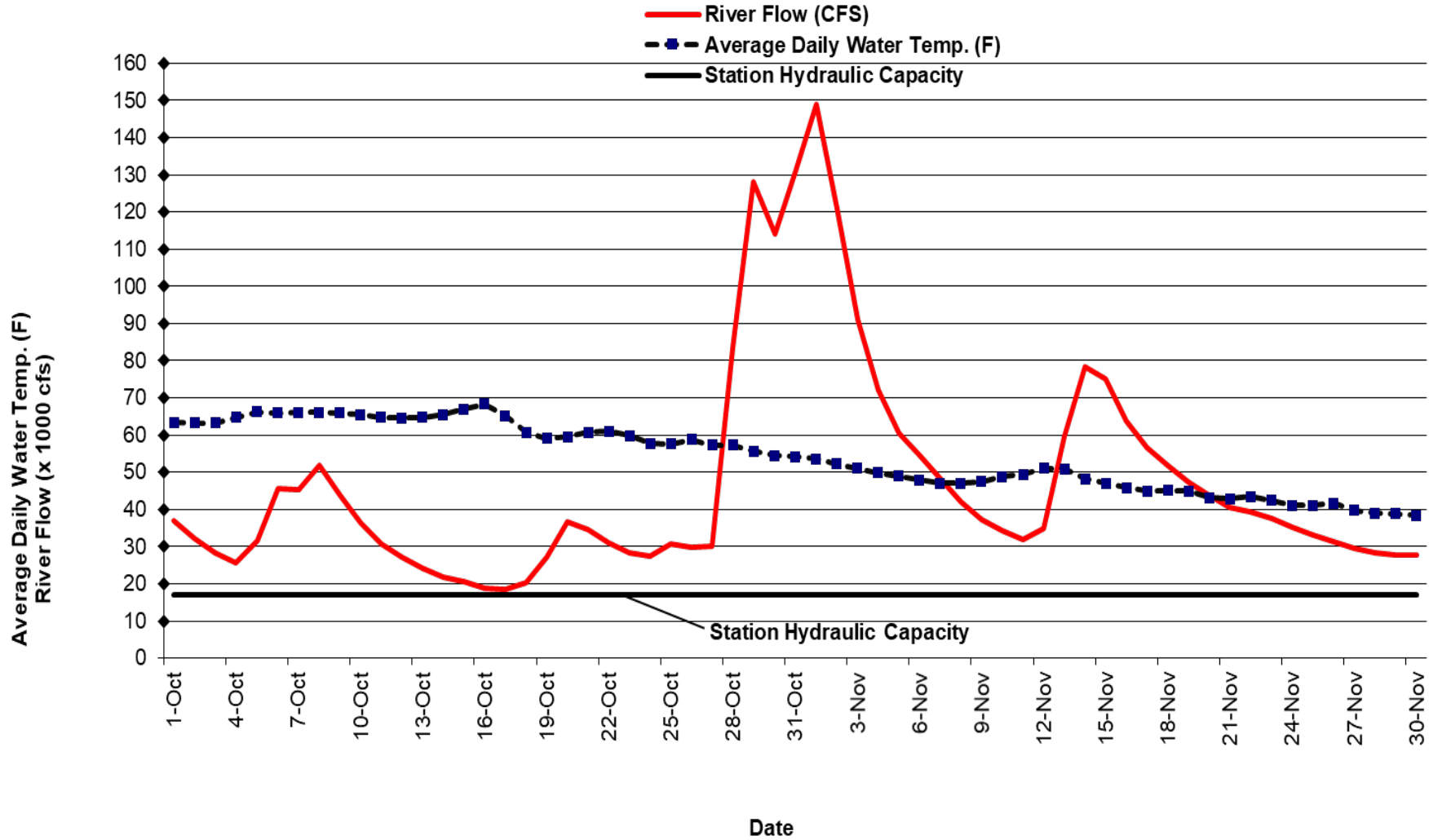


Figure 9. York Haven Sluice Gate Operation, October 1 to November 30, 2021

