Draft Environmental Assessment
of
The Effects of Issuing an Incidental Take Permit (No. 21516) to Virginia Electric and Power Company, Doing Business as Dominion Virginia Power for Incidental Take of Atlantic Sturgeon from the Chesapeake Bay Distinct Population Segment in the Tidal Freshwater Portion of the James River from the Operation and Maintenance of Chesterfield Power Station

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Lead Agency: USDOC National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Office of Protected Resources
Greater Atlantic Regional Fisheries Office

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Location: Tidal Freshwater Portion of the James River, Virginia

Abstract: We, the National Marine Fisheries Service, propose to issue an Incidental Take Permit to Virginia Electric and Power Company, doing business as Dominion Virginia Power, under Section 10(a)(1)(B) of the Endangered Species Act of 1973 as amended (16 U.S.C. 1539(a)(1)(B)), and the regulations governing the incidental taking of endangered and threatened species (50 CFR 222.307). The permit would authorize the incidental take of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) from the Chesapeake Bay Distinct Population Segment during the conduct of otherwise lawful activities associated with operation of the Chesterfield Power Station. Specifically, these activities include surface water withdrawals from the James River, Virginia for cooling purposes and performance of required entrainment sampling. The permit would be valid for five years. The Chesterfield Power Station would continue to operate in accordance with the Virginia Pollutant Discharge Elimination System Permit Number VA0004146 issued and effective on October 1, 2016. We prepared this draft Environmental Assessment to consider the environmental impacts of our decision on Dominion Virginia Power's revised application for an incidental take permit.

Contents

1 Background

Virginia Electric and Power Company doing business as Dominion Virginia Power (Dominion) has submitted a revised application to us, the National Marine Fisheries Service (NMFS) for issuance of a permit to authorize the take[1] of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) incidental to the operation, permitting, and maintenance of the Chesterfield Power Station (CPS). Atlantic sturgeon that originate from rivers in the United States are listed under the Endangered Species Act (ESA) as five distinct population segments (DPSs). Take of Atlantic sturgeon from any of the five DPSs is prohibited by section 9 of the ESA. We may, however, issue a permit to authorize the incidental take of ESA-listed species that occurs in the course of carrying out an otherwise lawful activity (50 CFR 222.307). This permit is known as an incidental take permit (ITP).

The Chesapeake Bay DPS of Atlantic sturgeon is listed as endangered and occurs in the James River up to Richmond, Virginia. Take of Atlantic sturgeon belonging to the Chesapeake Bay DPS occurred at CPS in 2015 incidental to the otherwise lawful operation of the facility, and at that time Dominion determined that take may occur in the future. Dominion, therefore, submitted a complete ITP application and Habitat Conservation Plan (HCP) to us in 2017. We prepared a draft Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA), and published notice in the **Federal Register** announcing the availability of the EA and ITP application for public comment (82 FR 37849; August 14, 2017). Dominion subsequently revised and resubmitted their application to us in response to new information, public comment, and questions stemming from our further review. There have also been operational changes at CPS. Given the extent of the changes, we conducted a new NEPA analysis and are providing this new, draft, EA for review and comment.

1.1 Dominion's Revised ITP Application

Take of Atlantic sturgeon occurs at CPS as a result of cooling-water intake from the James River that is necessary for CPS to operate. Dominion is currently withdrawing less water from the James River for CPS operation than what was described in the 2017 ITP application. CPS is a coal-fueled power generating station located in Chesterfield, Virginia, along the upper tidal portion of the James River, Virginia (river mile 82; river kilometer 132). The power-generating units at CPS utilize a once-through cooling water system that withdraws water from the James River through cooling water intake structures (CWISs). The openings of all the intake pipes associated with the CWISs are constantly submerged and aligned flush with and parallel to the river's axis. Dominion's 2017 ITP application stated that there were six power-generating units. Each unit required cooling water for power generation, and all operated as base-load. Since then, two of the power-generating units have been retired, and two others are now operating as cycling which means that the generating units are operated at varying load levels that are in response to changes in system load requirements rather than running continuously to produce electricity at a constant rate (https://www.eia.gov/tools/glossary/).

[1] The ESA defines "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."

Dominion's authority for withdrawing cooling water from and discharging water to the James River for CPS operation is the same as described in their 2017 ITP application; a Virginia Pollution Discharge Elimination System (VPDES) Permit, Number VA0004146, that was issued October 1, 2016 (VDEQ 2016). The VPDES permit is one of several required state and federal authorizations held by Dominion for the operation of CPS. The VPDES permit program is authorized under the Clean Water Act (CWA), which requires all point source discharges of pollutants to waters of the United States to obtain a National Pollutant Discharge Elimination System (NPDES) permit (33 U.S.C. § 1342). The Virginia Department of Environmental Quality (VDEQ) is the NPDES permitting authority for the Commonwealth of Virginia.

Dominion revised their 2017 ITP application for take of Atlantic sturgeon larvae by entrainment. In December 2015, two Atlantic sturgeon larvae were found in entrainment samples collected at CPS in October 2015. These were the first known takes of Atlantic sturgeon larvae at CPS. For the 2017 application, Dominion estimated future take of Atlantic sturgeon larvae by entrainment based, in part, on these two known takes and the number of entrainment samples collected in the spring and fall. In 2018, we advised Dominion that Atlantic sturgeon early life stages (e.g., eggs, larvae) would not be present in the vicinity of CPS during the spring or early summer because spring spawning for the Chesapeake Bay DPS in the James River (i.e., April–June; Balazik and Musick, 2015) occurs downriver of CPS. Also in 2018, new information became available that affirms that Atlantic sturgeon spawned in the James River in the fall move downriver, into the vicinity of CPS, within weeks of hatching (*Sturgeon Making a Comeback in the James River*, Chesapeake Bay Magazine, October 30, 2018). Finally, there was public comment on Dominion's estimated take by entrainment for their 2017 ITP application, and there was further correspondence between us and Dominion as a result of the public comment.

Dominion revised their methodology in response to the comments. Based on the revised methodology, Dominion estimates an average annual take of 10,949 Atlantic sturgeon larvae. However, there is considerable uncertainty around this average because of the limited data available (i.e., the two known takes in 2015). Dominion initially considered the uncertainty around the flow rate and calculated that the annual take could range from 10,745 to 11,156 Atlantic sturgeon larvae per year based on flow rates at each unit and the uncertainty for flow rate at each unit. By comparison, our expert considered uncertainty for the estimate based on uncertainty around the take estimate. Under his calculations, the annual take with an interaction rate of 0.000132423 (0.000022013–0.000408657) and 82.685 million cubic meters of water flow would be an average of 10,949 with a range of 1,820 to 33,789 larvae per year. He did not generate uncertainty for the flow volumes because he considered that the flow volumes can be reasonably assumed to be known. For their application, Dominion requested that we proceed with processing the application using 10,949 as the average estimated take with 1,820 and 33,789 sturgeon larvae as the lower and upper 95% confidence interval of the estimate. In light of the uncertainty, Dominion has requested that the ITP, if issued, be valid for five years instead of ten years. Dominion is also requesting take of one Atlantic sturgeon larvae that may occur during the entrainment sampling that they are required to complete at CPS per section 316(b) of the CWA.

Dominion's revised application does not include a request for take of Atlantic sturgeon by impingement. For their 2017 ITP application, Dominion requested the take of one Atlantic sturgeon by impingement over the course of 10 years based on the October 2015 impingement of

an adult-sized Atlantic sturgeon at CPS. The sturgeon, which was injured but released alive, was the only known impingement to have occurred at CPS. In September 2018, four adult Atlantic sturgeon, all in apparent post-spawn condition, were killed as a result of impingement at the Unit 5 intake unit. Dominion examined the intake guards following this event and discovered that the Unit 5 intake guard was missing, and all but one of the intake guards for the remaining units was degraded. Based on expert opinion regarding the size of the smallest adult Atlantic sturgeon in the James River, Dominion replaced the missing and degraded guards with new guards that have less distance between the bars. The reduced spacing is expected to prevent all adult-sized Atlantic sturgeon from getting past the guards. In addition, the intake openings for Units 5 and 6 were enlarged to reduce water velocity through the guards when the river is at normal water levels. Dominion calculated the through water velocity at the intake guards, and concluded that healthy adult Atlantic sturgeon could outswim the less than 2 feet per second intake velocity. Dominion concluded that impingement of adult Atlantic sturgeon will not occur in the future at CPS because of the new guards, and based on the calculated intake velocity and the swim speed of adult Atlantic sturgeon. Therefore, Dominion is not requesting take for impingement in the revised ITP application. Dominion will continue to monitor CPS's trash racks for Atlantic sturgeon but will not monitor the intake guards of the intake structure because the guards are below the water surface and turbidity inhibits visibility, and because of safety issues for personnel.[2] Dominion is not requesting take by impingement for juvenile and subadult[3] Atlantic sturgeon because those life stages are not present in the area.

Dominion has not revised their ITP application to include any other ESA-listed species or any other activity. Dominion previously concluded that maintenance dredging, constituent discharge, thermal discharge, vessel movements, and shoreline and structure maintenance at CPS will not result in incidental take of any ESA-listed species under NMFS jurisdiction, and we agreed with their conclusions. Dominion also previously concluded that sea turtles, marine mammals, and other ESA-listed fish, including Atlantic sturgeon belonging to one of the other four DPSs, do not occur in the vicinity of CPS.

2 Purpose and Need

NMFS is proposing to issue an ITP to Dominion pursuant to Section 10(a)(1)(B) of the ESA and the regulations governing the incidental taking of endangered and threatened species (50 CFR 222.307). The purpose of our action is to consider issuance of an ITP to Dominion, which would

[2] River water must first pass the intake guards then, as the river water is drawn toward the intakes, it first encounters a floating curtain wall that extends 4.0 to 4.5 feet below the water surface at all tide levels. On the intake side of the curtain wall are vertical trash racks installed in front of the screen bays at each cooling water intake structure. Trash racks are designed to prevent large debris from entering the screen houses. On the intake side of the trash racks are traveling screens with 3/8-inch mesh (Figure 1, Dominion's revised application).

[3] Dominion's ITP application appears to be using the terms juvenile and subadult the same as in the ESA listing rules and critical habitat designations for the Atlantic sturgeon DPSs. Both terms refer to immature Atlantic Sturgeon but, juveniles are still resident in the natal estuary whereas subadults have emigrated from the natal river estuary.

require Dominion to minimize the incidental capture and killing of Atlantic sturgeon larvae at CPS and to mitigate the impacts of such taking to the maximum extent practicable.

This action is needed to reduce the capture and killing of Chesapeake Bay DPS sturgeon larvae, because the Chesapeake Bay DPS of Atlantic sturgeon is endangered and at risk of extinction. The ESA prohibits the capture and killing of ESA-listed species with limited exceptions. Dominion's 2015 water sampling showed that Chesapeake Bay DPS sturgeon larvae could be entrained at CPS. Dominion anticipates that additional takes will occur in the future because Dominion's VPDES permit requires that they conduct additional entrainment sampling, and they will continue to operate CPS for power generation. The VPDES permit issued to Dominion is the authority for withdrawing water from the James River for cooling water operations of CPS, and for discharging the heated water to the James River but it does not provide an exemption from the ESA prohibitions. Dominion has requested an ITP to meet all of its requirements for lawful operation, including ESA compliance.

Dominion anticipates that Chesapeake Bay DPS Atlantic sturgeon could be incidentally captured and killed by entrainment in the next five years during the continued operation of the cooling water intakes at CPS, and incidentally captured during fall sampling collection to complete their CWA section 316(b) studies. Therefore, Dominion has applied for an incidental take permit per section 10(a)(1)(B) of the ESA and has requested that the permit, if issued, be valid for up to five years.

To issue an ITP, we must find that: (1) the taking will be incidental; (2) the applicant will, to the maximum extent practicable, monitor, minimize and mitigate the impacts of the taking; (3) the taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild; (4) the applicant has amended the conservation plan to include any measures (not originally proposed by the applicant) that we determine are necessary or appropriate; and, (5) there are adequate assurances that the conservation plan will be funded and implemented, including any measure that we required. We prepared this EA to inform the public of our proposed action and the effects of the proposed action and its alternatives, and to use information collected and analyzed to make better informed decisions concerning this incidental take permit application.

This EA analyzes the effects to the human and natural environment caused by the issuance of an ITP to Dominion for the incidental take of Atlantic sturgeon from the Chesapeake Bay DPS, associated with the operation of CPS cooling water intakes and the performance of CWA 316(b) studies. Given the continued operation of CPS, and the need to conduct additional CWA 316(b) sampling, Dominion anticipates that take of Atlantic sturgeon may occur in the future.

3 Alternatives Including the Proposed Action

The withdrawal of water from the James River for operation of CPS to produce electrical power is an otherwise legal activity. This activity may result in the incidental take of Chesapeake Bay DPS Atlantic sturgeon by entrainment during cooling water intake at CPS. Entrainment may also occur when Dominion subsamples cooling water for entrainment studies that are a requirement of their VPDES permit. We have the authority to issue an ITP to Dominion if all of the permit issuance criteria have been met. We considered the following alternatives for our action.

3.1 Alternative 1 – No Action Alternative

Under the No Action Alternative, an ITP would not be issued. The CPS would likely continue to operate in accordance with VPDES Permit No. VA0004146. Facility and operational changes might occur at CPS in the future as a result of changes to their VPDES permit following completion of Dominion's studies to comply with section 316(b) of the CWA. However, there is no certainty as to what, if any, changes will occur. If take of Atlantic sturgeon occurred at CPS then those takes would be prohibited takes under the ESA (i.e., in violation of section 9 of the ESA). As a result, Dominion could be subject to NOAA law enforcement action or private litigation against Dominion. However, the likelihood of either action occurring, or the outcome if it were to occur, is highly uncertain particularly given that take might not be detected if Dominion was not required to monitor for larval sturgeon.

If an ITP is not issued, Dominion would not be required to implement the minimization and mitigation measures that they have proposed in their HCP. Monitoring at CPS would occur only as required by the VPDES permit, which, unlike the Dominion proposed monitoring, is unlikely to be specific to sturgeon larvae entrainment. The Chesapeake Bay DPS is listed as endangered because it is at risk of extinction, and the production and survival of offspring is necessary for recovery of the DPS. Therefore, the No Action Alternative is not the preferred alternative because: it does not afford the certainty of incidental take authorization provided by ESA Section 10(a)(1)(B); it would not provide for additional minimization and mitigation measures; and, it does not meet the purpose and need.

3.2 Alternative 2 – Issue Permit as Requested in Application (Proposed Action)

Under Alternative 2, we would issue an ITP to Dominion authorizing the incidental take of Atlantic sturgeon larvae that occur when Dominion is operating CPS and when they complete entrainment sampling for their required CWA 316(b) studies. Dominion would continue to withdraw water as under Alternative 1 with no additional changes to facility operations other than what would be required by their VPDES permit. However, in addition to any requirements of the VPDES permit, Dominion would also be required to implement the Conservation Plan submitted with their ITP application. The goals of the Conservation Plan are to avoid and minimize take, and to aid in the conservation of Chesapeake Bay DPS Atlantic sturgeon in the James River. There are three elements to the plan: minimization that has been implemented while the application was in-progress; mitigation resulting from the implementation of data collection; and, monitoring.

Dominion's changes to and repair of the intake guards minimizes the risk that adult Atlantic sturgeon will be impinged on the intake guards and should prevent the possibility of impingement at the trash racks for even the smallest adults. Dominion undertook these changes after the carcasses of four adult Atlantic sturgeon were found at the Unit 5 intake in September 2018 and were determined to have died as a result of impingement on the trash racks during a high flow event in the river. Dominion's investigation of the event revealed that the Unit 5 intake guard was missing at the time of the impingement event, and other guards needed repair. Based on information from a sturgeon expert for the James River, Dominion took steps to modify, repair and replace all intake guards, including reducing the grid openings so that the smallest adult Atlantic sturgeon could not pass through.

Dominion worked with sturgeon experts throughout the impingement event and modification of the intake guards, including: examination and salvage of the four carcasses; investigation of any additional carcasses at the trash racks of the other power-generating units; and, identifying the best spacing for the grid bars. Dominion has revised their proposed mitigation by replacing what had been proposed with an expanded approach for identifying presence of adult Atlantic sturgeon near CPS, and a new approach for identifying early life-stage (e.g., larvae) Atlantic sturgeon at CPS. Dominion describes how they expect the new information to be used and the contribution that the new information will make toward mitigation.

There is only rudimentary knowledge of the occurrence of adult sturgeon in the part of the freshwater reach of the James River where CPS is located. Dominion sees an opportunity to obtain information for movement of adult Atlantic sturgeon near CPS that could answer questions about how much time adults occur near CPS, and their movement patterns. Specifically, for that part of the mitigation that Dominion is calling "Sturgeon Movement Research", Dominion is proposing a partnership with Virginia Commonwealth University (VCU) that will allow Dominion to have access to real-time data for VCU's acoustically-tagged Atlantic sturgeon that are making their way upriver to spawn. The information will be used by Dominion to inform them when the spawning window occurs so that Dominion can better anticipate when sturgeon larvae are likely to be in the James River within the vicinity of CPS. Dominion will also contract with VCU to deploy and maintain receivers to detect acoustically-tagged sturgeon downriver of CPS where receivers do not currently exist. The new information will be used by Dominion to inform the movement of spawning condition adult sturgeon near CPS (e.g., when spawning condition adults move upstream of CPS, how far upstream of CPS do sturgeon occur, the frequency of individual sturgeon near CPS during the spawning season). The new information will also be shared with sturgeon researchers, including academia, and state wildlife managers.

Dominion is also proposing to implement a pilot study that would test the use of digital holography to identify Atlantic sturgeon larvae at CPS. Digital holography uses imaging to detect and count the targeted species. For Dominion's proposed study, traditional water sampling serves as the control. The digital holography instruments would be deployed at the same time as traditional sampling, and the results compared. Since this is a pilot study, the goal is to determine whether the technique can reliably detect Atlantic sturgeon larvae and if the data is sufficient to determine abundance. It is unknown whether digital holography will prove successful for detecting Atlantic sturgeon larvae or other early life stages. However, there are currently no other successful methods for detecting these other than entrainment sampling. Therefore, the pilot study could provide new information which would otherwise not be collected and, if successful, will provide a new tool that has many beneficial applications for recovery of the Atlantic sturgeon DPS (e.g., abundance or distribution surveys of Atlantic sturgeon early life stages).

Dominion's monitoring protocol is focused on entrainment of Atlantic sturgeon larvae and, therefore, differs from their protocol to complete the CWA 316(b) studies. Dominion also revised their monitoring approach from the 2017 ITP application by increasing the frequency of sampling during the targeted months of September and October, and for the full permit duration.

Dominion is no longer proposing to monitor for entrainment of Atlantic sturgeon larvae in the spring since larvae from spring spawning would only occur downriver of CPS and, therefore, would not be susceptible to entrainment at CPS.

Dominion will monitor entrainment of fall-spawned Atlantic sturgeon larvae by collecting four 24-hour diel entrainment samples (one every six hours), three times per week during September to October for a total of 96 samples per year. As previously proposed, samples will be collected near-bottom (i.e., approximately 3 feet above the intake bottom) and by pumping water through a 0.5-m diameter mouth plankton net constructed of 335-µm[4] netting suspended in a buffering tank. The target water volume for each entrainment sample is a total of 100 m^3 (26,417 gallons). Each sample will be comprised of four subsamples with a targeted water volume of 25 m^3 per subsample. The net will be removed from the buffer tank after each subsample collection, immediately replaced with a second net, and the contents will be washed down into a sample container. The second, third, and fourth subsamples will be washed down into the same sample container. Throughout the collection, water flow will be monitored and adjusted as necessary, and will not exceed 250-275 gallons per minute to minimize potential damage to organisms collected in the net. Samples will be sorted on site for Atlantic sturgeon larvae and eggs. Although free-floating Atlantic sturgeon eggs are generally considered non-viable, Dominion's entrainment methodology includes sorting for and retaining any suspected Atlantic sturgeon eggs. All Atlantic sturgeon eggs and larvae will be appropriately preserved.

Dominion proposes to collect entrainment samples on the river side, directly in front of the trash racks at the Unit 6 CWIS. If Unit 6 is not operating or it is unsafe or infeasible to sample at Unit 6 for other reasons, the secondary sample location will be at Unit 4. Unit 6 was selected as the primary sampling location because it withdraws the highest proportion (approximately 40 percent) of the total water volume used at the CPS; additionally, pumps at Unit 6 have been operated most often. Unit 4 was chosen as the secondary location since Unit 3 (the secondary location identified by Dominion in their 2017 application) has been retired. Unit 4 has relatively close access to the water and sufficient deck space which facilities sampling. As explained by Dominion in their August 31, 2018, letter to us, entrainment samples are not collected at the intakes for Units 5, 7, or 8 because it is unsafe and impractical given discharge or the elevation of the intake units relative to the river.

As described above, Dominion does not anticipate take of Atlantic sturgeon by impingement because the changes made to the intake guards should prevent impingement of adults, and juvenile and subadult Atlantic sturgeon do not occur near CPS. As a precaution, Dominion will continue to inspect trash rack debris at the water surface, and debris removed from the trash racks, for sturgeon. Dominion has sturgeon handling procedures in the event a living or dead sturgeon is found among the debris floating in the water or in the debris removed from the trash racks. Monitoring will not occur at the intake guards because it is not feasible due to the turbidity of the river and the safety risk for personnel.

[4] Dominion's revised ITP application mentions both 335 micrometer netting and 500 micrometer netting. Email correspondence with staff on December 19, 2019, confirmed that the netting will be 335 micrometers.

Lastly, Dominion has revised their ITP application by requesting a five-year permit instead of a ten-year permit. The shorter timeframe will afford opportunity to gather information from the proposed mitigation studies and to more promptly implement changes based on new information. In addition, as part of their VPDES permit renewal process (on-going), Dominion will have to comply with a Best Technology Available (BTA) standard for impingement and entrainment mortality, which will require Dominion to consider a variety of fish and shellfish protection measures. Therefore, an ITP issued for five years instead of a longer permit duration helps to prevent the preclusion of operational changes at CPS that may be considered or necessary for Dominion to meet the BTA standard of the future VPDES permit.

3.3 Alternatives Considered But Rejected

Issue Permit with a Requirement for Operational Changes: We considered issuance of an ITP that would require CPS to either eliminate cooling water intake by changing to closed circuit cooling or to annually suspending cooling water intake operations from August through October when Atlantic sturgeon larvae are more likely to be in the vicinity of CPS. In their initial ITP application and Conservation Plan, Dominion provided information that changing the intake structures was not feasible. We requested further elaboration. In their August 31, 2018, letter to us, Dominion explained the requirements for renewing their VPDES permit. That process requires Dominion to collect water samples from the cooling water intakes (i.e., entrainment samples). Using the data acquired from the entrainment samples and other required information, VDEQ will make a site-specific BTA determination for reducing entrainment at CPS. The draft VPDES permit would be issued after a 60-day review period by the NMFS and U.S. Fish and Wildlife Service and also a 30-day public review. After the final VPDES permit is issued, Dominion would need to implement the chosen BTA for impingement mortality and entrainment reduction technology(s) and/or operational measures at CPS.

Dominion needs to complete the required fall entrainment sampling for their VPDES permit renewal. Dominion suspended the fall sampling after the two Atlantic sturgeon larvae were discovered in 2015. If we issued an ITP that required Dominion to eliminate cooling water intake or to annually suspend cooling water intake operations from August through October, it would eliminate Dominion's ability to collect their remaining required entrainment samples for the VPDES permit renewal, and would force Dominion to be out of compliance with the CWA. We cannot issue an ITP that would cause the permit holder to not comply with other existing laws. In addition, the CWA benefits the Chesapeake Bay DPS of Atlantic sturgeon, humans, other species, and the environment, in general. Water quality in the Chesapeake Bay and its tributaries has considerably improved since implementation of the CWA, particularly in the past 30 years (Zhang et al. 2018). Issuance of an ITP which prevents compliance with the CWA is not appropriate and would likely result in harm to the Chesapeake Bay DPS, and others. We, therefore, rejected this alternative.

Issue Permit for up to 10 Years: This alternative would not require Dominion to make any facility or operational changes. It is the same as Alternative 2 with the exception that the permit would be valid for up to 10 years as originally requested by Dominion. We considered issuing a 10-year permit because a 10-year permit would allow more time for data collection from Dominion's proposed mitigation (i.e., the Sturgeon Movement Research and pilot study), and issuing a 10-year permit could reduce the administrative burden. However, as described above,

Dominion is in the process of completing requirements for the VPDES permit. That new VPDES permit will include the specific BTA measures that Dominion is required to implement at CPS. Dominion's current VPDES permit expires on September 30, 2021.

Although neither we or Dominion know what might be required for BTA measures because entrainment sampling is incomplete, it is unlikely that new BTA requirements would increase entrainment of Chesapeake Bay sturgeon larvae since doing so would be counter to the intent of using BTA. However, it is also not prudent to issue an ITP for 10 years when the VPDES permit under which CPS operates cooling water intake will be changed within the next 18 months.

In addition to the VPDES permit renewal, in March 2020, Virginia's General Assembly passed the Virginia Clean Economy Act. It requires the state's biggest utilities (e.g., Dominion) to deliver electricity from 100 percent renewable sources by 2045.

We cannot change the ITP after it is issued because the ITP process includes a "No Surprises" rule which provides assurances to Section 10 permit holders that, as long as the permittee is properly implementing the HCP and the ITP, no additional commitment of land, water, or financial compensation will be required with respect to covered species, and no restrictions on the use of land, water, or other natural resources will be imposed beyond those specified in the HCP without the consent of the permittee. We are required to consider what circumstances might change over the permit duration and as best as possible address those by including measures for changed circumstances in the Conservation Plan before the ITP is issued. However, given the level of uncertainty for what changes might occur in CPS operations over the next 10 years, we cannot predict what changes might occur and we, thus, cannot identify how to address those changed circumstances. We, therefore, rejected the alternative of issuing an ITP valid for 10 years.

4 Affected Environment

The affected environment is the tidal, freshwater reach of the James River where CPS is located including the intake pipes that bring water into CPS and the trash racks that prevent debris from entering CPS. This section presents baseline information necessary for consideration of the alternatives for the area of the James River where CPS is located, as well as others areas of the James River where the Chesapeake Bay DPS Atlantic sturgeon occurs in the river (i.e., from the river mouth to the Bosher Dam, upriver of CPS, near Richmond, VA). We describe the resources that would be affected by the alternatives. The effects of the alternatives on the environment are discussed in Section 5 of this EA.

4.1 Physical and Biological Environment

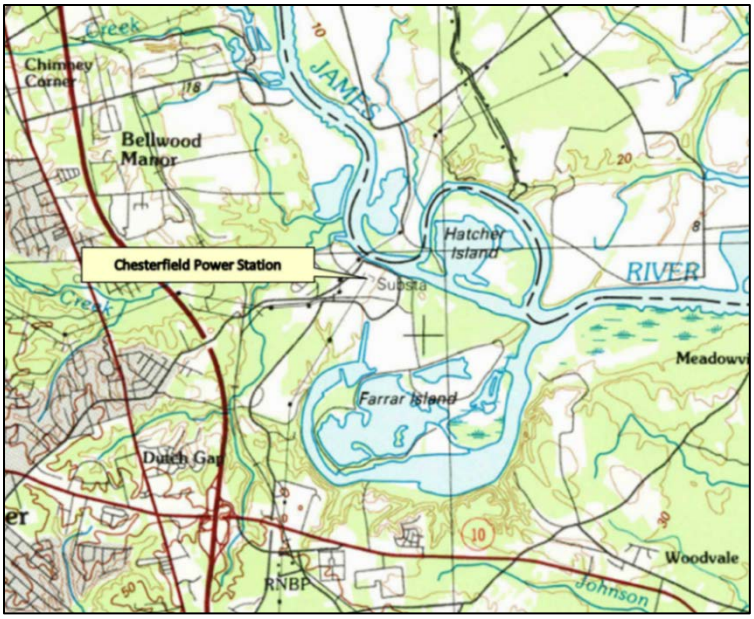
The James River has a diverse biological environment, including native and non-native species. The 340 miles (547 km) long James River is Virginia's largest river and the largest tributary to the Chesapeake Bay. Many alterations have been made to the approximately 25 foot river channel to accommodate ship traffic to and from the port at Richmond, including alterations that affect flow in and sedimentation of natural oxbows. Sediment types include mud, sand, silt, and clay (Bushnoe et al. 2005). Water quality remains a concern in the Chesapeake Bay and its tributaries, including the James River (VDEQ 2015). Issuance of the proposed ITP will have an

impact on the Chesapeake Bay DPS of Atlantic sturgeon because measures to minimize and mitigate take of the DPS will be implemented as a requirement of the ITP. If the minimization and mitigation measures reduce take of another native species, then issuance of the ITP may have an impact on that other native species as well. Otherwise, no other physical or biological features of the James River are likely to be impacted. In the absence of the ITP, the actual operation of CPS would likely continue per the VPDES permit.

The James River is one of three known spawning rivers for the Chesapeake Bay DPS, and likely has the largest spawning population of the three rivers (ASSRT 2007; Balazik et al. 2012a; Hager et al. 2014; Kahn et al. 2014; Balazik and Musick 2015; Richardson and Secor 2016). Based on modeling work using features associated with spawning habitat (e.g., suitable substrate), Bushnoe et al. (2005) concluded that the Turkey Island oxbow and the James Neck oxbow were potential spawning sites for Atlantic sturgeon in the James River. Spawning may occur as far upstream as Richmond (river mile 96; river kilometer 155), which is also the head of tide and close to the upstream extent of Atlantic sturgeon in the river given the presence of Bosher Dam at the fall line (approximately river mile 99; river kilometer 160) (Bushnoe et al. 2005; Hager 2011; Balazik et al. 2012a). More than one spawning site may be used depending on the location of the salt front in a particular year or spawning season.

Adult Atlantic sturgeon enter the James River in the spring. Based on the locations of tracked adults, the availability of hard-bottom substrate that is necessary for spawning, and the salinity distribution in the James River, adult sturgeon occur further upstream during the late summer and early fall residency than during the spring and early summer residency (Balazik et al. 2012a; Balazik and Musick 2015). Adults disperse through downriver sites and begin to move out of the river in late September to early October, occupy only lower river sites by November, and are undetected on tracking arrays in the lower river by December suggesting that adult sturgeon leave the river for the winter (Hager 2011; Balazik et al. 2012a). Dominion provided additional information describing the physical and biological environment of the James River in the vicinity of CPS. The following was provided by Dominion as part of their ITP application.

> The river in the area of CPS is downriver of the fall line, is tidal and freshwater year round, and is characterized as a meandering channel with adjacent oxbows (Figure 4-1).



Map Source: USGS Topographic Map of Petersburg, VA; Map ID #37077-A1-TM-100 (1984)

Figure 4-1. Chesterfield Power Station Area Map

Prevailing river depths at the CPS range from 2 to 39 feet at Mean Lower Low Water (MLLW) and the navigational channel is maintained (e.g., dredged) at 35 feet of water depth at MLLW to accommodate deep-draft vessels traveling upriver to the port at Richmond (VEPCO 2000). A bathymetric survey in front of CPS was conducted in 2011. Water depths immediately adjacent to the CWISs and outfalls range between 1 to 15 feet, but rapidly descend to mid-channel depths (Figure 4-2). The James River at the CPS experiences a mean tidal amplitude of approximately 2.0 feet. The water level in this portion of the James River fluctuates greatly with an extreme high elevation of 19.0 feet and an extreme low elevation of -3.5 feet. Maximum tidal current is approximately 2.8 fps with average maximum ebb and flood tidal currents of 1.34 fps and 1.5 fps, respectively.

Biological resources in the vicinity of CPS include phytoplankton, zooplankton, benthic macroinvertebrates, juvenile and adult fishes, aquatic macrophytes, and vertebrate wildlife as described in the results of the CPS CWA 316(a) demonstration study conducted between 1997 and 1999.

Benthic macroinvertebrates near the CPS are dominated numerically (98%) by Oligochaeta (worms) and Chironomidae (midges). Additionally, Blue Crabs (*Callinectes sapidus*), Asiatic Clams (*Corbicula fluminea*), and Common Grass Shrimp (*Palaemonetes pugio)* were collected in the 2005-2006 finfish surveys as part of impingement studies (EA 2007).

A total of 35 native and introduced, riverine, and estuarine species have been collected (VEPCO 2000). Juvenile and adult fish species most frequently caught in electrofishing samples included Gizzard Shad (*Dorosoma cepedianum)*, Threadfin Shad (*Dorosoma petenense)*, Bluegill Sunfish (*Lepomis macrochirus)*, Largemouth Bass (*Micropterus salmoides)*, Common Carp (*Cyprinus carpio*), Spottail Shiners (*Notropis hudsonius*), and

White Perch (*Morone americana*). Gillnet catches included Gizzard Shad, Threadfin Shad, White Perch, Blue Catfish (*Ictalurus furcatus*), and Channel Catfish (*Ictalurus punctatus*).

Hydrodynamics in the James River drive the presence of aquatic macrophytes and plant community diversity. Protected oxbows, such as the Farrar Gut support richer and more diverse plant communities consisting of Pickerelweed (*Pontederia cordata*), Wild Rice, Smartweed (*Polygonum pensylvanicum*), Arrow-Arum (*Peltandra virginica*), and Broadleaf Cattail (*Typha latifolia*). Conversely, regions of the river subject to current scouring appear to support reduced plant diversity consisting of Water-willow (*Justicia americana*) and Smartweed patches (VEPCO 2000).

Temperature, dissolved oxygen and nutrient monitoring were conducted from May 1997 through February 1999 for the CWA 316(a) study (VEPCO 2000). Results indicated that despite the influence of the thermal discharge at Outfall 003, river water temperature mirrored seasonal changes in air temperature. The oxbows act as heat sinks, but the tidal cycle influences the thermal plume, confining it to Farrar Gut on the incoming tide and extending it downriver on the outgoing tide. Dissolved oxygen in the tidal freshwater James River typically varies between 13 mg/L during winter months to 6 mg/L during the summer, with no values of less than 5 mg/L recorded (Moore et al. 2006).

Median Total Suspended Solids (TSS) in the area of Turkey Island and Shipley Cove (approximately 8 miles downstream of the CPS) ranged from 16.0 to 35.0 mg/L during April to October over the period of 1999 to 2005 (Moore et al. 2006). These TSS levels are typical of the tidal freshwater portions of the James River (Moore et al. 2006).

4.2 Status of Species Affected

For the purposes of this EA, the focus is on the Chesapeake Bay DPS of Atlantic Sturgeon which is the only affected ESA-listed species in the permit application and the species for which incidental take coverage is sought. No other ESA-listed species occur near CPS or are otherwise affected by operations at CPS.

The Chesapeake Bay DPS is listed under the ESA as endangered because it is at risk of extinction given low abundance, limited spawning, threats to habitat, and anthropogenic mortality (77 FR 5880; February 6, 2012). The DPS includes all anadromous Atlantic sturgeon that are spawned in the watersheds that drain into the Chesapeake Bay and into coastal waters from the Delaware-Maryland border from Fenwick Island to Cape Henry, Virginia (50 CFR 224.101). Within this range, Atlantic sturgeon historically spawned in the Susquehanna, Potomac, James, York, Rappahannock, and Nottoway Rivers (ASSRT 2007). Spawning still occurs in the James River and in the Pamunkey River, a tributary of the York River (Balazik et al. 2012a; Hager et al. 2014; Kahn et al. 2014). Spawning is also likely occurring in Marshyhope Creek, MD, a tributary of the Nanticoke River (Richardson and Secor 2016). Designated critical habitat for the DPS includes that part of the James River from the Bosher Dam and downstream to where the river drains into Hampton Roads (82 FR 39160; August 17, 2017).

The 2017 ASMFC stock assessment determined that abundance of the Chesapeake Bay DPS is "depleted" relative to historical levels (ASMFC 2017). The assessment also determined there is a relatively low probability (37%) that abundance of the Chesapeake Bay DPS has increased since the implementation of the 1998 fishing moratorium, and a 30% probability that mortality for the Chesapeake Bay DPS exceeds the mortality threshold used for the assessment (ASMFC 2017). Based on research captures of tagged adults, an estimated 75 Chesapeake Bay DPS Atlantic sturgeon spawned in the Pamunkey River in 2013 (Kahn et al. 2014). A total of 239 adult-sized Atlantic sturgeon were captured in the James River from 2010 through spring 2014 (Balazik and Musick 2015). This is a minimum count of the number of adult Atlantic sturgeon in the James River during the time period because capture efforts did not occur in all areas and at all times when Atlantic sturgeon were present in the river. The authors did not provide an estimate of the total number of adult Chesapeake Bay Atlantic sturgeon likely present in the James River. However, Dominion's revised ITP application includes a personal communication from one of the authors who, based on captures of spawning male sturgeon in the fall, estimated that there are 3,707 males in the fall spawning population, and who reasoned that the annual estimate of the number of spawning females is 1,250 individuals assuming that the sex ration is 1:1 and females return to spawn every 3 years.

Historical records provide evidence that Atlantic sturgeon in the Chesapeake Bay and its tributaries were targeted for the large-scale 19th century commercial Atlantic sturgeon fisheries. Harvest continued, albeit at reduced levels, into the 20th century. All directed Atlantic sturgeon fishing as well as retention of Atlantic sturgeon bycatch is currently prohibited. However, Atlantic sturgeon can only sustain low levels of mortality because they have a long period of growth before reaching maturity, adults do not necessarily spawn every year, and there are a relatively limited number of rivers suitable for successful spawning and rearing (Boreman 1997; ASSRT 2007; Kahnle et al. 2007). In addition, their wide-ranging nature and their need for and use of river-estuarine and marine waters exposes Chesapeake Bay DPS Atlantic sturgeon to multiple threats throughout their range and at every life stage. Persistent, degraded water quality, habitat impacts from dredging, continued bycatch in state and federally-managed fisheries, and vessel strikes remain significant threats to the Chesapeake Bay DPS of Atlantic sturgeon (Pyzik et al. 2004; ASSRT 2007; Balazik et al. 2010; Brown and Murphy 2010; Niklitschek and Secor 2010; Austin 2012; Balazik et al. 2012b). Information regarding the vulnerability of Atlantic sturgeon to climate change (Hare et al. 2016) suggests it poses a greater threat to the Chesapeake Bay DPS than what was anticipated when the DPS was listed in 2012.

Atlantic sturgeon are spawned in freshwater of tidal rivers, spend months to years developing in the natal estuary and use waters of increasing salinity in the river estuary before making their first emigration to the marine environment. Once in the marine environment, the immature sturgeon undertake seasonal movements similar to adults. In general, immature and mature Atlantic sturgeon move into estuaries in the spring through summer, and leave the estuaries in the fall to return to marine waters. The whereabouts of the fish in the winter is not clearly known, and they may occur throughout their broad marine range. Aggregation areas have been identified and can occur in all seasons. The purpose of aggregating is not understood but likely includes foraging in some locations given the presence of prey items in stomachs of sampled sturgeon.

Age to maturity for Chesapeake Bay DPS Atlantic sturgeon is unknown but is expected to be between 5 and 21 years given age to maturity for other Atlantic sturgeon riverine populations bracketing the Chesapeake Bay DPS (ASSRT 2007). When the fish are sexually mature, they return to their natal river to spawn. In more northern river systems, spawning occurs in the spring. The Chesapeake Bay DPS spawns in the late summer-early fall (Balazik et al. 2012a; Hager 2014; Richardson and Secor 2016), and is referred to in the literature as fall spawning. However, there is evidence that among the Chesapeake Bay DPS spawning rivers, only the James River supports both spring and fall spawning, comprised of genetically-different Atlantic sturgeon spawning populations (Balazik and Musick 2015).

4.3 Anticipated Incidental Take of Atlantic Sturgeon DPSs

As described above, Dominion is requesting an ITP for the incidental take of Chesapeake Bay DPS larvae associated with CPS cooling water intake operation and CWA 316(b) studies. Estimating take of Atlantic sturgeon larvae by entrainment at CPS is very difficult given the paucity of information. The only information available is the known take of two Atlantic sturgeon larvae in October 2015, that were discovered when the samples were examined in December 2015. None of the other samples that were collected in October 2015 contained Atlantic sturgeon larvae, including samples collected after the date when the two larvae were collected.

Dominion's revised estimated take for entrainment is based on the known take of the two larvae, and the volume of water that was sampled during that sampling time period. Based on the revised methodology, Dominion estimates an average annual take of 10,949 Atlantic sturgeon larvae. Dominion initially considered the uncertainty around the flow rate and calculated that annual take could range from 10,745 to 11,156 Atlantic sturgeon larvae per year based on flow rates at each unit and the uncertainty for flow rate at each of those. By comparison, our expert considered uncertainty for the estimate based on uncertainty around the take estimate. Under his calculations, the annual take with an interaction rate of 0.000132423 (0.000022013 - 0.000408657) and 82.685 million cubic meters of water flow would be an average of 10,949 with a range of 1,820 to 33,789 larvae per year. He did not generate uncertainty for the flow volumes because he considered that the flow volumes can be reasonably assumed to be known. For their application, Dominion requested that we proceed with processing the application using 10,949 as the average estimated take with 1,820 and 33,789 sturgeon larvae as the lower and upper 95% confidence interval of the estimate. The range of the estimate reflects the uncertainty given the very limited data available to estimate take. The estimate does consider the reduction in cooling water given operational changes at CPS since the 2017 ITP application was submitted to us. Dominion is also requesting take of one Atlantic sturgeon larvae that may occur during entrainment sampling that they are required to complete at CPS per section 316(b) of the CWA.

All Atlantic sturgeon taken as a result of CPS operations will be from the Chesapeake Bay DPS of Atlantic sturgeon. Tagging records and the relatively low rate of gene flow reported in population genetic studies provide evidence that Atlantic sturgeon return to their natal river to spawn (ASSRT 2007). Therefore, all Atlantic sturgeon larvae entrained as a result of CPS operations will belong to the Chesapeake Bay DPS of Atlantic sturgeon.

4.4 Essential Fish Habitat

The proposed action occurs in tidal fresh waters. Essential fish habitat (EFH) for federally managed species is not designated in the area. While a number of species are affected by the operation of CPS and the required 316(b) studies, no other species are likely to be affected by issuance of the proposed permit to take Atlantic sturgeon incidental to activities associated with the continued operation and maintenance of CPS as all effects would occur regardless of permit issuance.

4.5 Social and Economic Environment

A variety of human activities may occur in the action area such as commercial fishing, recreational fishing, recreational boating, ecotourism, and other commercial uses, such as shipping. Largemouth bass fishing, for example, has been a draw for large scale tournaments as well as striped bass fishing. Blue catfish was introduced to the James River years ago as a sport fish and it continues to be popular in the sport fishing community. Other native species such as striped bass support both recreational and commercial fisheries in the James River as far upriver as Richmond.

The river is also popular for other recreational activities such as boating, camping, and outdoor activities focused on viewing and learning about Atlantic sturgeon (https://thejamesriver.org/great-return/). The popularity of the James River Park System, including the riverside parks in Richmond, and other nature areas such as the Dutch Gap Conservation Area located in proximity to CPS, demonstrate the value that people place on the natural resources of the area and on Atlantic sturgeon (James River Association State of the James Report; available at https://thejamesriver.org/about-the-james-river/state-of-the-james/).

Richmond, Virginia, upriver of CPS, is generally considered the upper limit of the lower James River and of the tidal freshwater reach of the river. Richmond's port handles a variety of containers and cargo that are transported on the James River from Hampton Roads to Richmond. The cargoes cover a variety of products including chemicals, pharmaceuticals, forest products, paper, machinery, consumer goods, frozen seafood, produce, campers, steel, steel products, stone, tobacco leaf, aluminum, project cargo, vehicles, boats, wire coils, wire rods, and pipe. More than 100 motor freight companies and brokers serve the area. CSX provides a direct rail connection for transport of product to and from the Port at Richmond.

4.6 Historic Places, Scientific, Cultural, and Historical Resources

There are no specific historic, scientific, cultural, or historical resources in the specific area of CPS. There are numerous historic places, scientific, cultural, and historical resources along the James River. Historic sites in proximity to CPS include Henricus Historical Park. Downriver of CPS the James River National Wildlife Refuge is part of the U.S. Fish and Wildlife Refuge system and was established to protect endangered and threatened species including anadromous fish, such as the Chesapeake Bay DPS of Atlantic sturgeon that occurs in the river adjacent to the refuge. Also downriver of CPS is historic Jamestown. Excavations of the settlement and historical records demonstrate the importance of sturgeon to the colonists and as part of our cultural history (Virginia Commonwealth University News 2012).

5 Environmental Consequences of the Alternatives

This section presents the scientific and analytic basis for comparison of the direct, indirect, and cumulative effects of the alternatives. Regulations for implementing the provisions of NEPA require considerations of both the context and intensity of a proposed action (40 CFR 1508.27).

5.1 Effects of the No Action Alternative (Alternative 1)

Under the No Action Alternative, an ITP would not be issued to Dominion for take of Atlantic sturgeon larvae by entrainment. Dominion would not be required to implement the HCP which includes monitoring for entrained Atlantic sturgeon larvae, and actions to mitigate the take. Actions to minimize the taking of Atlantic sturgeon adults by impingement have already been implemented and are not likely to be impacted if the permit is not issued. However, takes of Atlantic sturgeon by entrainment could occur and would not be apparent because Dominion would not be required to monitor for take if the permit was not issued. These takes would be prohibited takes under the ESA but without the monitoring required under the HCP, it is uncertain whether take would be detected.

Dominion could choose, but would not be obligated, to suspend water withdrawals from the James River during times when Atlantic sturgeon larvae are most likely to occur based on currently available information (e.g., September – October). However, Dominion's application does not include suspending water withdrawals. Even if Dominion voluntarily chose to suspend water withdrawals for part of the year, entrainment could still occur if larvae were present at a different time. Dominion's proposed HCP includes studies to better inform when Atlantic sturgeon larvae are present near CPS. These studies will not occur if the permit is not issued.

Impacts of No Action (Alternative 1) on the Physical and Biological Environment:
The species most affected by any of the alternatives is the Chesapeake Bay DPS of Atlantic sturgeon which is the affected species in the permit application and the species for which incidental take coverage is sought. No other ESA-listed species occur near CPS or are otherwise affected by operations at CPS.

The potential effects of cooling water intake operations can be characterized as effects of entrainment of Atlantic sturgeon eggs and larvae. CPS is not expected to entrain viable (i.e., living) Atlantic sturgeon eggs because Atlantic sturgeon eggs that are viable become sticky within minutes of fertilization and adhere to the substrate for the relatively short and temperature-dependent period of larval development (Ryder 1888; Vladykov and Greeley 1963; Murawski and Pacheco 1977; Smith et al. 1980; Van den Avyle 1984; Mohler 2003).

Very little is known about Atlantic sturgeon larvae, and their movements in their natural setting. Most of what we know about this life stage is the result of hatchery or laboratory studies. Upon hatching, Atlantic sturgeon are nourished by a yolk sac, are mostly pelagic (e.g., exhibit a "swim-up and drift-down" behavior), and move away from light. Within days, the fish exhibit more benthic behavior which lasts until the yolk sac is absorbed at about 8 to 10 days post-hatching. Once the yolk sac is absorbed, the fish occur in the water column but feed at the bottom of the water column and use the substrate's interstitial spaces to shelter from predators (Ryder 1888; Smith et al. 1980; Van Eenennaam et al. 1996; Bain et al. 2000; Kynard and

Horgan 2002; Mohler 2003; Richardson et al. 2007; Greene et al. 2009). Studies that tracked the movements of post-larval sturgeon in other spawning rivers found that Atlantic sturgeon young-of year occur in low salinity waters for their first year and grow relatively quickly (Bain et al. 1997; Hale et al. 2016; Hilton et al. 2016).

The only known take of Atlantic sturgeon larvae at CPS are the two Atlantic sturgeon larvae that were collected during a single 24-hour sampling period on October 7-8, 2015. No other sturgeon larvae were identified in entrainment samples collected between July and December 2015, or during prior entrainment sampling at CPS during the periods of June 2005 to June 2006 (EA 2007) and January to December 1977 (VEPCO 1977). In October 2018, post-larval, juvenile, Atlantic sturgeon were found downriver of CPS (*Sturgeon Making a Comeback in the James River*, Chesapeake Bay Magazine, October 30, 2018) suggesting that Atlantic sturgeon spawned upriver of CPS move downriver, past CPS, within weeks of hatching. There are several factors that may impact the distribution of sturgeon larvae in this system including the number and precise location of spawning areas, how long the spawned offspring remain in the vicinity of the spawning grounds, and the effect of high river flows on the dispersion and distribution of larval and post-larval Atlantic sturgeon in the James River. However, we have very limited information for these factors. Consequently, based on our best available information, we conclude that Atlantic sturgeon early life stages could be present in the vicinity of CPS in the fall.

We do not know how many sturgeon larvae are produced each spawning season or the natural mortality rate for the larvae. Sturgeon researchers have been unsuccessful in collecting Atlantic sturgeon eggs and larvae during targeted sampling in the vicinity of CPS (Garman 2016) and, until 2018, had very little success in capturing young-of-year Atlantic sturgeon in the James River. As a result, we have very little information for how successful Atlantic sturgeon spawning is in the James River or the factors that affect spawning success. Dominion concluded that the number of Atlantic sturgeon larvae likely to be entrained is small relative to the potential number of larvae produced at each fall spawning event. We agree that Atlantic sturgeon females can produce a prolific number of eggs but these comparisons are speculative given the limited available information.

We also do not have information to inform what environmental factors affect spawning success. The take of larvae during entrainment sampling at CPS in 2015, and the observation of post-larval juveniles downriver of CPS in 2018 both occurred in the fall during years of high river flow. We received comment on the previous draft EA that successful spawning in the James River is likely limited and that spawning only occurs during high flows. However, we disagree with the comment because the triggers for spawning in the James River in 2015 and in 2018 occurred before the high flow events, and adults in spawning condition have been captured and observed in the James River for the past several years, including years with normal flows. It is possible that high river flows contributed to more successful outcome of spawning in 2015 and 2018. Conversely, it is also possible that spawning success in 2015 and 2018 may have been no greater than in other years but, the high flows may have forced that year's offspring further downriver and into the vicinity of CPS where they otherwise would not have occurred under normal flow conditions.

Though not required under Alternative 1, Dominion has already taken steps to minimize impingement of adult Atlantic sturgeon at CPS, as described in Section 3. Changes to the grid openings for the intake guards will prevent even the smallest adult Atlantic sturgeon from passing between the guards. Therefore, impingement at the trash racks is unlikely to occur. We did consider, however, whether Atlantic sturgeon could become impinged at the intake guards. As described above, the intake guards are the first structure to reduce the amount of river debris and living organisms from entering each intake. Dominion expanded the intake openings at Units 5 and 6 to reduce the water velocity moving past the guards, making it more likely that an adult Atlantic sturgeon would not be impinged on the guards. After modifications, the calculated water velocities at the approach to the intake guards range from 0.67 feet per second (fps) at Unit 8 to 1.01 fps at Unit 6. Water velocities at the intake guards range from 0.85 fps at Unit 7 to 1.35 fps at Unit 6[5].

There is limited available information for swimming speed of Atlantic sturgeon (Hilton et al. 2016), and no available information for the swimming speed of pre- or post-spawn, adult Atlantic sturgeon. Dominion drew comparisons to swimming speeds of up to 2.27 fps for white sturgeon and up to 2.6 fps for green sturgeon. However, the fish used in those studies were young juveniles, not adults. By comparison, swim speeds for adult-size Lake Sturgeon, similar in size to adult Atlantic sturgeon captured in the James River (Balazik et al. 2012a), sustained swimming speeds of at least 3.17 fps (96.8 centimeters per second) and swam as fast as 5 fps for shorter periods of time (Peake et al. 1996; Thiem et al. 2016). Therefore, given the similarities in size and maturity between the tested Lake sturgeon and adult Atlantic sturgeon captured in the James River, we concluded that the calculated water velocities at the approach to the intake guards and the water velocity moving past the intake guards at CPS is less than the expected swimming speed of an adult Atlantic sturgeon under normal river conditions. Therefore, the risk of impingement for adult Atlantic sturgeon at the guards has been minimized to the extent practicable.

Overall, Alternative 1 is expected to have negative impacts on the biological environment. As an anadromous fish, Atlantic sturgeon belonging to the Chesapeake Bay DPS help to transfer nutrients from the ocean to the James River estuary. Given their large volume of eggs, spawning Atlantic sturgeon likely contribute to the food web of the James River estuary and, thus, benefit the overall physical and biological environment. If no ITP is issued, some amount of take of Atlantic sturgeon eggs and larvae is expected to continue to occur in the future as described above, and limited information may be available about this level of take. That take has the potential to negatively impact recovery of the Chesapeake DPS and of the James River spawning population, in particular. Compared to the Alternative 2, Alternative 1 is expected to result in negative impacts to the biological environment because additional information would not be acquired that could benefit the Chesapeake Bay DPS, and other measures in Alternative 2 designed to benefit sturgeon populations (as described in Section 3) would not be required.

[5] See Table 3 of the revised application for Dominion's calculated water velocities at the trash racks and at the traveling screens.

Impacts of No Action (Alternative 1) on Essential Fish Habitat: The No Action alternative will not have an impact on EFH for federally managed species because none is designated in the vicinity of CPS.

Impacts of No Action (Alternative 1) on Social and Economic Environment: The No action alternative is expected to have no negative or positive impact on the social and economic environment because the current activities (e.g, use of the river by the local community) that contribute to the social and economic environment would continue to occur. Impacts to human activities as a result of the operation of CPS are related to the issuance and implementation of the regulatory authorities for operation of CPS, but those are outside of our authority and the scope of the ITP.

Impacts of No Action (Alternative 1) on Historic Places, Scientific, Cultural, and Historical Resources: The No action alternative is expected to have no negative or positive impact on the historic places, scientific, cultural, or historical resources compared to what is now occurring. If impacts to these places and cultural resources occur as a result of the operation of CPS, then those impacts are related to the regulatory authorities for the operation of CPS, regardless of whether an ITP is issued.

5.2 Effects of Issuing the Permit as Requested (Alternative 2 Proposed Action)

As under alternative 1, under Alternative 2 Dominion would continue to operate CPS with water withdrawals from the James River. However, under Alternative 2, Dominion would also undertake the measures described in their HCP to minimize and mitigate anticipated take, and to monitor for take, as summarized in Section 3. As a result of the ITP process, and as described in Section 3, Dominion has already taken steps to minimize impingement of adult Atlantic sturgeon to the extent practicable. Impingement of adult Atlantic sturgeon is no longer anticipated to occur at CPS.

Impacts of Alternative 2 (Proposed Action) on the Physical and Biological Environment: As under Alternative 1, the species most affected by Alternative 2 is the Chesapeake Bay DPS of Atlantic sturgeon which is the affected species in the permit application and the species for which incidental take coverage is sought. No other ESA-listed species occur near CPS or are otherwise affected by operations at CPS. As described above, Alternative 2 includes steps Dominion has already taken to minimize impingement of adult Atlantic sturgeon at CPS. Because these modifications have already been made, impingement of adult Atlantic sturgeon is unlikely to occur at CPS in the future.

There is still the possibility for entrainment of living larvae under Alternative 2 as in Alternative 1. The difference is that under Alternative 2, Dominion's proposed monitoring and mitigation measures would address the lack of information for the number of sturgeon larvae likely to be entrained. The new information collected as a result of the HCP measures would allow for new, informed action(s) to minimize and mitigate the takes such as planned outages during peak larval abundance. Such changes in CPS operation could be made after the ITP is issued because Dominion has included them as part of the HCP.

As described under the No Action, Atlantic sturgeon benefit the physical and biological environment of the James River estuary because they transfer nutrients between the ocean and the estuary. Therefore, Alternative 2 is likely to have a positive impact on the physical and biological environment because it has a positive impact on the survival of adult Atlantic sturgeon and on their offspring. If the proposed minimization and mitigation measures for Atlantic sturgeon incidentally reduce take of another native species, then issuance of the ITP may have a slight positive impact on that other native species as well. No other physical or biological features of the James River are likely to be impacted.

Impacts of Alternative 2 (Proposed Action) on Essential Fish Habitat: Alternative 2 will not have an impact on EFH for federally managed species because none is designated in the vicinity of CPS.

Impacts of Alternative 2 (Proposed Action) on the Social and Economic Environment: As with the No Action Alternative, Alternative 2 is not expected to have a negative impact on the social and economic environment. Compared to the No Action Alternative, Alternative 2 could have a positive impact on the social and economic environment by virtue of the positive impacts to Atlantic sturgeon survival and reproduction in the James River. For example, an increased abundance of Atlantic sturgeon would contribute to ecotourism focused on Atlantic sturgeon in the river, and could contribute to the economy of cities, such as Richmond, where people view sturgeon in the river. Other fish species, such as those targeted for recreation and commercial purposes, could also benefit from the positive impacts to the physical and biological environment with concomitant economic benefits to the human environment.

Impacts of Alternative 2 (Proposed Action) on Historic Places, Scientific, Cultural, and Historical Resources: Alternative 2 is not expected to have a negative impact on historic places, scientific, cultural, and historical resources. Compared to the No Action Alternative, Alternative 2 could have a positive impact on scientific resources such as VCU with whom Dominion is partnering to further knowledge of Atlantic sturgeon presence in the upper, tidal portion of the James River estuary. Alternative 2 could also have a positive impact on cultural resources because Atlantic sturgeon has a valued place in the pre- and post-colonial history of the James River and measures, such as those proposed in Dominion's HCP, that benefit and support the recovery of Atlantic sturgeon spur public interest for further action to benefit the DPS and the environment. No limits or changes to other ongoing activities in the area are expected to occur as a result of issuance of the ITP or implementation of the HCP. If impacts to places and cultural resources occur as a result of the lawful operation of CPS, then those impacts are related to the regulatory authorities for the operation of CPS, regardless of whether an ITP is issued. Impacts to human activities as a result of the lawful operation of CPS may be related to the issuance or implementation of the regulatory authorities for operation of CPS, but those are outside of our authority and the scope of the ITP.

5.3 Summary of Impacts

While some level of take of Atlantic sturgeon larvae could potentially continue to occur in the future as described above, the proposed monitoring and mitigation measures included in Alternative 2 will provide new information about sturgeon populations that support improvements to future management and mitigation measures. Compared to the No Action

Alternative, Alternative 2 is expected to result in positive impacts to the biological, social and economic environment in the long-term, and will have a positive impact on science and culture. Information acquired under the proposed permit terms would provide a benefit to the Chesapeake Bay DPS and affords Dominion the opportunity to comply with the ESA while otherwise legally operating CPS for power generation.

5.4 Cumulative Impact

"Cumulative impact" is defined in the Council on Environmental Quality's regulations as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of which agency (Federal or non-Federal), or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions that take place over a period of time." (40 CFR 1508.7). The negative effects of past actions (e.g., the directed fishery) are part of the existing environment described in Section 4, Affected Environment.

For this analysis, the spatial area considered is from the mouth of the James River to the CPS. The temporal scope of the action extends from 1992 (the year CPS began operations at its current level) and up to five years into the future (the timespan of the ITP, if issued as proposed). Past and ongoing threats to the Chesapeake Bay DPS include historic overharvest, unintended bycatch in state and federally managed fisheries, vessel strikes, degraded water quality, habitat impacts from dredging, and vessel strikes (77 FR 5882, NOAA 2016b).

Spawning habitat for the Chesapeake Bay DPS is accessible in nearly all current and known historical spawning rivers. However, even where spawning habitat is available, accessibility does not necessarily equate to functionality. Many alterations have been made to the James River channel to accommodate ship traffic to and from the port at Richmond. Habitat disturbance caused by in-river work such as dredging for navigational purposes is suspected of having reduced available spawning habitat in the James River (Holton and Walsh 1995; Bushnoe et al. 2005; ASSRT 2007). Water quality, while showing signs of improvement, continues to rate only fair to poor in areas of the Chesapeake Bay. Non-point sources for pollution from terrestrial activities have caused reductions in water quality leading to degradation of habitat. In addition, dredging for navigation channels has significantly altered depth, rates of sedimentation, substrate and water flow in some areas.

Other activities that may affect Atlantic sturgeon within the action area include point and non-point sources associated with industry and agriculture, including those authorized through the Virginia Pollutant Discharge Elimination System (VPDES), and vessel traffic. Vessel strikes of Chesapeake Bay DPS Atlantic sturgeon are evidenced by sturgeon carcasses found within the James River with damage consistent with a vessel strike (e.g., severed tails or heads, equally spaced gashes across the dorsal surface of the sturgeon body). Research suggests that most carcasses are not found or reported (Balazik et al. 2012). More information is needed to accurately quantify the number of Chesapeake Bay DPS sturgeon that are struck and killed by vessels.

Many factors acting on Atlantic sturgeon populations occur outside of the zone of influence of the ITP to be issued to Dominion associated with plant operations of CPS, such as bycatch of

federally-managed fisheries. Atlantic sturgeon belonging to the Chesapeake Bay DPS are incidentally caught in U.S. fisheries that operate in federal waters (Wirgin et al. 2015). Overall, there is limited observer coverage of fisheries that interact with Atlantic sturgeon. As a result, the total number of Atlantic sturgeon interactions with fishing gear in federal waters is unknown. Even when a fish is observed captured and released alive, the rate of post-release mortality is unknown.

In recent years, offshore wind energy has become more relevant. While there are currently no operational wind farms in Mid-Atlantic waters, potential offshore wind energy sites have been identified off of Virginia. The Virginia Clean Economy Act requires the state's biggest utilities (e.g., Dominion) to deliver electricity from 100 percent renewable sources by 2045. The overall impact of offshore wind energy on the Chesapeake Bay DPS is unknown, but likely to range from no impact to moderate negative, depending on the number and locations of projects that occur, as well as the effects of mitigation efforts.

Information regarding the vulnerability of Atlantic sturgeon to climate change suggests it poses a greater threat to the Chesapeake Bay DPS than what was anticipated when the DPS was listed in 2012. Ocean temperature in the U.S. Northeast Shelf and surrounding Northwest Atlantic waters has increased faster than the global average over the last decade (Pershing et al. 2015). New projections for the U.S. Northeast Shelf and Northwest Atlantic Ocean suggest that this region will warm two to three times faster than the global average (Saba et al. 2015). Global climate change affects all components of marine ecosystems, including human communities. Physical changes that are occurring and will continue to occur to these systems include sea-level rise, changes in sediment deposition; changes in ocean circulation; increased frequency, intensity and duration of extreme climate events; changing ocean chemistry; and warming ocean temperatures. A first-of-its-kind climate vulnerability assessment, conducted on 82 fish and invertebrate species in the Northeast U.S. Shelf, concluded that Atlantic sturgeon from all five DPSs were among the most vulnerable species to global climate change (Hare et al. 2016). Weather events such as those that contribute to low water flows and high water flows in the James River are likely to occur as a result of climate change.

Current and reasonably foreseeable future projects are described in Table 5-1. The majority of these activities are ongoing activities.

Table 5-1. Projects Considered for Potential Cumulative Impacts

Project Title	Project Description	Size	Potential Impacts on Atlantic Sturgeon	Project Date(s)
Biological Opinion -Gear Regulations in the Virginia Pound Net Fishery	Gear regulations enacted for the pound net fishery operating in Virginia nearshore coastal and estuarine waters including waters of the James River seaward of the Hampton Roads Bridge Tunnel (Interstate Highway-64).	See Biological Opinion	The action is likely to result in the capture of up to 13 adult or subadult Atlantic sturgeon and the mortality of one of these, annually. The 13 Atlantic sturgeon captured in Virginia pound net gear per year are anticipated to come from a mix of the five listed DPSs since sturgeon from each DPS occur where the action occurs.	2018-ongoing
Biological Opinion - Norfolk Harbors Channel/Craney Island Eastward Expansion	Dredging and placement activities associated with the Craney Island Eastward Expansion Project and Norfolk Harbor Navigation Improvements Project.	Approximately 1,500 square miles of land surrounding the harbor, and approximately 525 acres for the Craney Island Eastward Expansion with an expected total fill volume of 19,500,000 for dredged material placement.	The action is likely to result in a total of 750 non-lethal capture of Atlantic sturgeon of which 100 are expected to have originated from the Chesapeake Bay DPS, and is likely to result in the mortality of up to 23 Atlantic sturgeon belonging to the Chesapeake Bay DPS over 50 years.	2018-2068
Biological Opinion - U.S. FWS Wildlife and Sport Fish Restoration Program Grants	U.S. FWS funded state fisheries surveys, of which 44 occur in waters of the Chesapeake Bay or at least one of its tributaries.	See Biological Opinion	The action is likely to result in a total take of 136 Atlantic sturgeon by survey gear over 5 years, and of which up to 22 are expected to belong to the Chesapeake Bay DPS with no more than 4 of those resulting in mortality.	2018-2022

Project Title	Project Description	Size	Potential Impacts on Atlantic Sturgeon	Project Date(s)
Biological Opinion - James River FNP Maintenance Dredging and Disposal	Maintenance (e.g., dredging) necessary to maintain the James River navigation channel within the river from Craney Island to Richmond, VA, and associated vessel traffic use of the channel.	94 river miles (151 river km) of the James River from Craney Island (RM 5/RKM 8), continuing through the Federal Navigation Channel and up to Bosher Dam (RM 99/RKM 159).	The action is likely to result in a total of 47 lethal dredge interactions of subadult/juvenile Atlantic sturgeon over 44 years, and of which 43 are expected to belong to the Chesapeake Bay DPS.	2018-2062
Section 7 Technical Assistance - Continued Operation of Surry Nuclear Power Station, Units 1 and 2	Operation of a power generating station utilizing cooling water from and discharging heated effluent to the James River	Located along the James River on Gravel Neck Peninsula, approximately 25 miles (40 km) upstream of the river's confluence with the Chesapeake Bay	The Station is currently undergoing license renewal and the NRC is seeking NMFS concurrence with their determinations that continued operation is not likely to adversely affect Atlantic sturgeons and is not likely to destroy or adversely modify designated critical habitat for the Chesapeake Bay DPS.	To be determi
ESA Permit – No. 19642 for scientific research	Permit allowing for take of Atlantic sturgeon for the purpose of scientific research.	Chesapeake Bay and its tributaries with focus on the York and its tributaries, the Rappahannock, and Potomac and Susquehanna and their tributaries.	Non-lethal capture of up to 375 adults, subadults, or juveniles, and lethal take of up to 50 eggs or larvae for scientific research that benefits Atlantic sturgeon recovery.	2016-2021

Project Title	Project Description	Size	Potential Impacts to Atlantic Sturgeon	Project Date(
ESA Permit – No. 20314 for scientific research	Permit allowing for take of Atlantic sturgeon for the purpose of scientific research.	Chesapeake Bay, and its tributaries with a focus on the	Non-lethal capture of up to 1,400 Atlantic sturgeon over the course of the 10-year	2017-2027

Project Title	Project Description	Size	Potential Impacts to Atlantic Sturgeon	Project Date(
		James River and its tributaries.	permit and throughout the Chesapeake Bay and its tributaries as well as lethal take of up to 350 eggs or larvae in the Chesapeake Bay and its tributaries for scientific research that benefits Atlantic sturgeon recovery.	
ESA Permit – No. 21858 for scientific research	NMFS issued Scientific Research Permit 21858 which allows for salvage of Atlantic Sturgeon carcasses or their parts for scientific and educational purposes.	U.S. east coast and western Atlantic Ocean within the U.S. Exclusive Economic Zone, and rivers from Maine through Florida.	The permit: (1) maximizes the use of dead Atlantic sturgeon carcasses and parts for research and incidental educational purposes (up to 150, annually) obtained from individuals authorized to collect them in the course of salvage activities; and establishes the NMFS Atlantic and Shortnose Sturgeon Genetic Research Archive. These activities benefit Atlantic sturgeon recovery.	2018-2027
ACOE Regional Permit (RP) - Norfolk District Reissuance of Regional Permit 11	ACOE RP 11 authorizes certain Virginia Department of Transportation roadway and railway projects involving work, structures, and filling. RP-11 allows VDOT to go to construction more quickly in cases where it can comply with the ESA through informal section 7 consultation.	U.S. waters within Virginia's geographical limits under the regulatory jurisdiction of ACOE Norfolk District.	No impacts to Atlantic sturgeon since the ESA consultation requirements still apply if a proposed project may affect Atlantic sturgeon or its designated critical habitat.	2019-2024
Final Comprehensive Conservation plan (CCP) for James River	Promote the transition of 2,651 acres of former pine plantation toward mature pine savanna; protect refuge's other habitats (including for Atlantic	At least 2,651 acres.	No direct adverse effects on Atlantic Sturgeon expected. Potential beneficial	2015-2030

Project Title	Project Description	Size	Potential Impacts to Atlantic Sturgeon	Project Date(
National Wildlife Refuge (NWR),	Sturgeon); expand conservation, research, monitoring, and management partnerships to help restore and conserve the refuge.		effects on Atlantic Sturgeon.	
Chesapeake Bay and Virginia Waters Cleanup Plan	A plan for Virginia stream restoration and protection, addressing point and nonpoint pollution sources, as well as air pollution.	Chesapeake Bay and Virginia waters	Atlantic sturgeon are negatively impacted by poor water quality. Improved water quality benefits the Chesapeake Bay DPS and Atlantic sturgeon from other DPSs that occur in the Chesapeake Bay and its tributaries.	2007-ongoing
Virginia Striped Bass Fishery Regulations	In 2019 the Virginia Marine Resources Commission established new commercial gill net maximum mesh size requirements in the Chesapeake Bay and Coastal areas to protect the largest of striped bass from capture in the fishery.	Virginia waters	Atlantic sturgeon are incidentally captured in gillnet gear used in Virginia's striped bass fishery. Changing the required mesh size is likely to change the size and age class of Atlantic sturgeon incidentally captured in the gear.	2019-ongoing
Norfolk, Hampton Roads, Newport News fast ferry	Fast ferry service across the harbor and mouth of James River by ferries traveling up to 35 mph	Unknown	Potential for increased vessel traffic and vessel-sturgeon interactions.	By 2025

Summary of Cumulative Effects: Various governmental agencies, groups, and individuals are carrying out a number of efforts aimed at protecting and conserving the Chesapeake Bay DPS of Atlantic sturgeon. For example, Virginia and Maryland have received funding under the ESA's Section 6, Species Recovery Grants to States, program to conduct studies that resulted in new information necessary for management and recovery of the Chesapeake Bay DPS. The new information has helped to further conservation efforts.

Actions directed at reducing threats faced by Atlantic sturgeon and/or gaining additional knowledge could contribute to the recovery of the DPS in the future. However, there is still considerable uncertainty regarding whether the current efforts to reduce the threats to Atlantic sturgeon are being effective, and, if they are, the extent to which they are reducing threats. Overall, cumulative effects are likely having a negative impact on the Chesapeake Bay DPS of Atlantic sturgeon. We are in the process of conducting a 5-year review for the Chesapeake Bay DPS based on the best scientific and commercial data available to ensure that the listing classification remains accurate (83 FR 11730; March 16, 2018).

6 Summary

The proposed action is issuance of an ESA ITP to Dominion to authorize the incidental take of Atlantic sturgeon larvae belonging to the Chesapeake Bay DPS that occur as a result of entrainment from the otherwise legal operation of the CPS. Atlantic sturgeon was the only resource identified as being potentially affected by issuance of the ITP. Issuance of the ITP will benefit the Chesapeake Bay DPS by providing opportunity for monitoring specific to Atlantic sturgeon early life stages that would not occur as part of monitoring for compliance with CPSs VPDES permit. Issuance of the ITP will also require Dominion to implement the mitigation measures that would otherwise not occur. The monitoring and mitigation may have a secondary effect of providing information that will contribute to knowledge of Atlantic sturgeon habitat use in the James River. Compared to the No Action Alternative, Alternative 2 is expected to result in positive impacts to the biological, social and economic environment in the long-term, and will have a positive impact on science and cultural resources.

There is a high degree of uncertainty for the number of Atlantic sturgeon larvae likely to be taken at CPS annually, including whether the level of take is consistent among years or highly variable. There is no information for the number of larvae likely to be produced during fall spawning for the Chesapeake Bay DPS in the James River or the natural mortality of these. Dominion concluded that the number of Atlantic sturgeon larvae likely to be entrained is small relative to the potential number of larvae produced at each fall spawning event. We agree that Atlantic sturgeon females can produce a prolific number of eggs but, comparisons of the number of Atlantic sturgeon larvae likely to be entrained to the number of larvae produced are speculative given the paucity of available information.

We are required to implement the ESA for species under NMFS jurisdiction, including processing complete applications for an ITP. Dominion has provided a complete application. We have considered Dominion's minimization, mitigation, and monitoring measures for the required HCP. Based on the regulatory requirements, Dominion's HCP, and Dominion's request for a relatively short-term ITP (i.e., five years), we have chosen Alternative 2. Our proposed

issuance of an ITP to Dominion will require section 7 consultation, public notice, and an opportunity for public comment before we make a final determination.

7 Mitigation Measures

The mitigation measures are those proposed by Dominion and described in the description of the Proposed Action (Alternative 2). Briefly, these are: minimization that has been implemented while the application was in-progress; mitigation resulting from the implementation of data collection for movements of spawning Atlantic sturgeon; and, monitoring.

8 List of Preparers and Agencies / Persons Consulted

This document was prepared by the Greater Atlantic Regional Fisheries Office, Protected Resources Division (GARFO PRD) in Gloucester, Massachusetts who consulted with Dominion in preparing this document.

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