Exhibit B

September 11, 2017

Via email to: elder.ghigiarelli@maryland.gov

Elder Ghigiarelli, Jr.,
Deputy Program Administrator
Wetlands and Waterways Program
Water Management Administration
Maryland Department of the Environment (MDE)
1800 Washington Boulevard, Suite 430
Baltimore, MD 21230

Re: Conowingo Hydroelectric Project, Application for Water Quality Certification, Application # 17-WQC-02

Dear Mr. Ghigiarelli:

Please accept the following comments on Exelon Generation Company's application for Clean Water Act Section 401 water quality certification ("Exelon Application"),[1] which Exelon is requesting as a necessary precondition of its related application to the Federal Energy Regulatory Commission ("FERC") for a new 50-year license for the continued operation of the Conowingo Dam Project.

FERC itself has acknowledged that one of the "primary issues" associated with relicensing the Conowingo Dam Project is the threat of "sedimentation effects on aquatic resources downstream of Conowingo dam, including the Chesapeake Bay."[2] Unfortunately, FERC has also made clear, through its inadequate study of that threat, that Maryland cannot count on FERC to impose conditions on the Project needed to prevent or offset Project-induced scouring of sediment concentrated behind the Dam.[3] Unless Maryland imposes such conditions, its water quality goals and pollution control measures could be undermined by catastrophic sediment and nutrient discharges during one or more predicted high-flow events during the

[1] Exelon Generation, Section 401 Water Quality Certification Application, Conowingo Hydroelectric Project (FERC Project No. 405), Cecil and Harford Counties (May 17, 2017).

[2] Final Multi-Project Environmental Impact Statement for Hydropower Licenses, Susquehanna River Hydroelectric Projects (March 2015) at xxxviii.

[3] *Id*. at 139 (characterizing sediment as a "watershed-wide issue" and dismissing the profound effect of the Project in artificially concentrating sediment behind the Project's Dam).

requested license period.[4] But Exelon has failed to provide sufficient information about the current and future effects of the Conowingo facility's ongoing operation on water quality, and has failed to propose measures to offset those effects. Exelon has also failed to account for the additive effects of climate change upon sediment scouring, and Maryland must consider these impacts in its certification analysis. We therefore urge Maryland to either impose conditions requiring Exelon to participate as a financial partner in a specific plan for removing a minimum of 4 million tons of sediment from Conowingo reservoir annually until 100 million tons are removed, and for maintaining the same level thereafter. Alternatively, Maryland should deny the application due to its deficiencies.

I. LEGAL BACKGROUND

Section 401 of the Clean Water Act ("CWA") gives states the authority to review any federally-permitted or licensed activity that may result in a discharge to navigable waters, and to condition the permit or license upon a certification that any discharge would comply with key provisions of the CWA and appropriate state laws.[5] This expansive certification authority preserves a substantial role for the states in protecting water quality, even when permitting authority lies solely in federal hands. As the U.S. Supreme Court characterized it:

> State certifications under § 401 are essential in the scheme to preserve state authority to address the broad range of pollution… "No polluter will be able to hide behind a Federal license or permit as an excuse for a violation of water quality standard[s]. No polluter will be able to make major investments in facilities under a Federal license or permit without providing assurance that the facility will comply with water quality standards. No State water pollution control agency will be confronted with a fait accompli by an industry that has built a plant without consideration of water quality requirements."[6]

A. Application of CWA § 401

Pursuant to § 401 of the CWA, a state certification is needed when there is:

> Any applicant for a Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may result in any discharge into the navigable waters, shall provide the licensing or permitting agency a certification from the State in which the discharge originates

[4] *See* USGS, *et al.*, Lower Susquehanna River Watershed Assessment, Maryland and Pennsylvania at 65, Table 4-3 (May 2015) (hereafter "LSRWA"), http://dnr.maryland.gov/waters/bay/Documents/LSRWA/Reports/LSRWAFinalMain20160307.pdf (setting forth the annual exceedance probability for various return interval flow events, with expected flow estimates for the flow gauge at Conowingo Dam).

[5] 33 U.S.C. § 1341(a)(1).

[6] *S.D. Warren Co. v. Maine Bd. of Envtl. Protection*, 547 U.S. 370, 386 (2006) (citation omitted).

> or will originate … that any such discharge will comply with the applicable provisions of sections 1311, 1312, 1313, 1316, and 1317 of this title.[7]

The term "discharge" has been broadly interpreted to include the release of anything that flows out, including discharges from hydroelectric dams.[8] The discharge also need not be certain; rather, the mere possibility of a discharge is sufficient to trigger the requirements of § 401.[9]

When § 401 applies to a project due to a potential discharge, the certification process applies to the "activity as a whole," not merely to the discharge itself.[10] Therefore, the certifying state must determine whether any aspect of the project (not just a discharge) would violate the relevant federal or state laws. In the case of a hydroelectric dam project, for example, a certifying state must apply the certification process to a wide range of actions such as the trapping of nutrients and sediment behind the dam, changes to stream flow and water temperature, increases in total dissolved gas levels below the dam, and the release of sediments and nutrients below the dam during both routine operation and increasingly common storm events.[11]

B. Procedure

Section 401(d) of the CWA directs states to certify § 401 projects only when the project activities would comply with all applicable federal and state laws. These laws include the federal effluent limitations (§ 1311), federal water quality related effluent limitations (§ 1312), state water quality standards and implementation plans (§ 1313), federal new source performance standards (§ 1316), toxic and pretreatment effluent standards (§ 1317), and "any other appropriate requirement of State law."[12]

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[7] 33 U.S.C. § 1341(a)(1).

[8] *S.D. Warren Co.*, 547 U.S. at 373.

[9] 33 U.S.C. § 1341(a)(1) (stating that certification is required when an activity "may" result in a discharge); *see also* U.S. EPA, *Clean Water Act Section 401 Water Quality Certification: A Water Quality Protection Tool for States and Tribes* (2010) at 4, https://www.epa.gov/sites/production/files/2016-11/documents/cwa_401_handbook_2010.pdf ("EPA § 401 Guidance").

[10] *PUD No. 1 of Jefferson County v. Washington Dept. of Ecology*, 511 U.S. 700, 712 (1994).

[11] Due to climate change, it is predicted that all parts of the U.S. will see increases in storm intensities, and the Northeast will also experience a 58% increase in the average number of days with very heavy precipitation. Garfin et al., *Assessment of Climate Change in the Southwest United States: A Report Prepared for the National Climate Assessment* (2013), at 6, 8, http://www.swcarr.arizona.edu/sites/all/themes/files/SW-NCA-color-FINALweb.pdf; Hall and Stuntz, *Climate Change and Great Lakes Water Resources* (Nov. 2007) at 6-7, http://online.nwf.org/site/DocServer/Climate_Change_and_Great_Lakes_Water_Resources_Report_FI.pdf.

[12] 33 U.S.C. § 1341(a)(1), (d).

If a project would not comply with the applicable laws, a state must either deny § 401 certification,[13] or conditionally grant certification with "any effluent limitations and other limitations, and monitoring requirements necessary to assure" compliance with the law.[14] If a state denies certification, the federal permit or license for the project may not be issued.[15] In this way, § 401 grants states the authority to halt projects that illegally harm water quality. Alternatively, in cases where specific permit conditions would ensure compliance with the law, a state may conditionally grant certification and these conditions would become binding limitations on the permit or license.[16]

States must complete their § 401 certifications within "a reasonable period of time (which shall not exceed one year) after receipt of [a certification] request."[17] If a state fails to act on a certification within a year's time, the certification process is deemed waived.[18] However, the waiver period only applies to the certification decision. Any conditions imposed on a § 401 certification need not be completed within a year's time and may extend into the licensing period and beyond.[19]

The federal agency responsible for issuing the permit or license may, by regulation, choose to impose a waiver period that is shorter than one year, but the certifying state has the authority to determine when the waiver period begins.[20] FERC's pertinent regulations maintains the one-year-long waiver period and provides for waiver only "if the certifying agency has not denied or granted certification by one year after the date the certifying agency received a written request for certification."[21] In the state of Maryland, a "written request for certification" must be a complete application which includes the information outlined in the Code of Md. Regulations ("COMAR") 26.08.02.10(B). Therefore, the Maryland Department of the Environment ("MDE") must make a decision on Exelon's application for certification for its FERC relicensing within

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[13] *Id.* § 1341(a)(1).

[14] *Id.* § 1341(d).

[15] *Id.* § 1341(a)(1).

[16] *Id.* § 1341(d).

[17] *Id.* § 1341(a)(1).

[18] *Id*.

[19] *Alcoa Power Generating Inc. v. FERC*, 643 F.3d 963, 974 (D.C. Cir. 2011).

[20] *See, e.g.*, *Ackels v. EPA*, 7 F.3d 862 (9th Cir. 1993) (noting that EPA's NPDES regulations require state certification within sixty days, but also noting that EPA had discretion to accept certification after sixty days); *City of Fredericksburg v. FERC*, 876 F.2d 1109, 1111-12 (4th Cir. 1989) (holding that the state of Virginia was permitted to impose its own filing procedures on certification requests and that the certification waiver clock never began in that case because the applicant never made a formal application for certification in accordance with Virginia's requirements).

[21] 18 C.F.R. § 4.34(b)(5)(iii).

one year of the date it received a complete application from Exelon that fulfilled COMAR 26.08.02.10(B), likely May 17, 2017.

Furthermore, Maryland regulations state that MDE must provide public notice of every application for certification, accept written comments on the application, and hold a public hearing when "(1) [t]he Department determines the activity requiring certification is of broad, general interest; or (2) The application for certification generated substantial public interest as indicated by written comments concerning water quality issues."[22] MDE has already indicated it intends to hold a public hearing on the Conowingo Dam relicensing § 401 certification.[23]

C. Scope of State Authority

States have extensive authority to deny or impose conditions during the § 401 certification process. As EPA has explained in recent guidance, "[c]onsiderations can be quite broad so long as they relate to water quality," and "[c]ertification may address concerns related to the integrity of the aquatic resource and need not be specifically tied to a discharge."[24] In addition to ensuring compliance with the statutorily enumerated provisions of the CWA (§§ 1311, 1312, 1313, 1316, and 1317), certifying states must assure compliance with "any other appropriate requirement of State law."[25] Courts have consistently interpreted this provision to mean that all state water quality standards must be satisfied.[26] State water quality standards include designated uses for water bodies,[27] as well as the quantitative (numeric) and qualitative (narrative) criteria needed to achieve the designated uses,[28] and anti-degradation.[29] Therefore, certifying states have the obligation to ensure compliance with not only numeric water quality standards (and the total maximum daily loads ("TMDLs") used to enforce them), but also mandates designed to protect recreational uses and aquatic life.[30] Indeed, courts have repeatedly allowed certifying states to deny certifications based on the need to comply with state water

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[22] COMAR 26.08.02.10(C), (D).

[23] Maryland Department of the Environment, Public Notice, Proposed Relicensing of the Conowingo Hydroelectric Project (Aug. 8, 2017), http://mde.maryland.gov/programs/Water/WetlandsandWaterways/Documents/Conowingo-PN-Comment-Period-Ext-8-8-17.pdf.

[24] EPA § 401 Guidance, *supra* note 9, at 23.

[25] 33 U.S.C. § 1341(d).

[26] *See, e.g.*, *PUD No. 1 of Jefferson Co.*, 511 U.S. 700 (holding that state water quality standards, including minimum stream flow requirements, should be enforced through § 401 certifications).

[27] 40 C.F.R. § 131.10.

[28] *Id.* § 131.11.

[29] *Id.* § 131.12.

[30] *Anacostia Riverkeeper Inc. v. Jackson*, 798 F. Supp. 2d 210, 238 (D.D.C. 2011) (holding that a state's total maximum daily loads for a water body must ensure protection of all state water quality standards, including *all* designated uses and water quality criteria, in order to satisfy the CWA).

quality standards, including non-quantitative standards such as the protection of aquatic life and shellfish habitat.[31]

In the case of Exelon's application for certification, the legal mandate to expansively enforce all state water quality standards prevents Exelon from simply relying on the Chesapeake Bay TMDL to absolve itself of any obligation to address the sediment pollution from the Dam. The Chesapeake Bay TMDL did not include a wasteload or load allocation to accommodate discharges of sediment or nutrients scoured from behind the Dam, and did not purport to relieve Exelon of its responsibility for such discharges. MDE must instead look beyond the TMDL and independently ensure the project's sediment discharges do not interfere with attainment of the Chesapeake Bay TMDL, or with the designated uses which ensure support of estuarine and marine aquatic life and shellfish harvesting.[32] MDE must also ensure compliance with Maryland's narrative water quality standards which prohibit pollution by any material in an amount that would "[c]hange the existing color to produce objectionable color for aesthetic purposes" or "[i]nterfere directly or indirectly with designated uses," among other things.[33] In other words, MDE may not grant § 401 certification unless it imposes conditions which prevent the violation of all numeric and narrative water quality standards, and all designated uses.

D. Review of § 401 Certification Decisions

The federal permitting or licensing agency has no authority to review a state's decision about a § 401 certification. If a state denies certification, the federal agency may not issue the permit or license,[34] and if the state conditionally grants certification, all state conditions must be included in the permit or license without review.[35] Only a court can review the legality of state-imposed certification conditions.[36] Depending on the nature of the challenge, either a federal court or a state court may be the appropriate forum to review a § 401 certification decision.[37]

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[31] *See, e.g.*, *AES Sparrows Point LNG v. Wilson*, 589 F.3d 721, 733 (4th Cir. 2009); *Islander East Pipeline Co., LLC v. McCarthy*, 525 F.3d 141 (2d Cir. 2008).

[32] *See* COMAR 26.08.02.08(B) (designating the Lower Susquehanna as Class I-P and Class II in various segments); COMAR 26.08.02.02 (designating Class II waters as "Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting").

[33] COMAR 26.08.02.03.

[34] 33 U.S.C. § 1341(a).

[35] *Id.* § 1341(d); *see also American Rivers, Inc. v. FERC*, 129 F.3d 99, 102-111 (2d Cir. 1997) (holding that FERC did not have the authority to exclude any state § 401 certification conditions on a FERC hydropower license, and that only a court could review the legality of state-imposed certification conditions).

[36] *American Rivers, Inc. v. FERC*, 129 F.3d at 102, 112.

[37] EPA § 401 Guidance, *supra* note 9, at 31.

II. MDE SHOULD EITHER DENY CERTIFICATION OR ESTABLISH CONDITIONS ON ITS CERTIFICATION SUFFICIENT TO OFFSET PROJECT-INDUCED EFFECTS ON NUTRIENT AND SEDIMENT DISCHARGES.

A. Any § 401 certification for the Conowingo Dam Project should include conditions requiring Exelon to contribute to removal of sediment from Conowingo Reservoir.

The Conowingo Dam Project has profoundly altered the Lower Susquehanna River system. It has historically trapped an average of 50-67% of the annual sediment load (1.5 to 2 million tons),[38] along with the nitrogen and phosphorus attached to the trapped sediment. If not for the Conowingo Dam, this load would have been delivered to the Lower Susquehanna River and Chesapeake Bay at normal rates. Exelon incorrectly claims that the Conowingo Dam Project has functioned as a "best management practice" for the Chesapeake Bay, but this is an overly simplistic portrayal of the Project's effects. In fact, the Dam and its reservoir have produced an enormous artificial repository of sediment and associated nutrients that can be scoured by high flow events, re-mobilized, and delivered downstream by large storm-induced flows.[39] In fact, these scoured loads add additional pollutant loads at times when the downstream receiving waters are already vulnerable, receiving their heaviest loads of suspended pollution from the Susquehanna River Watershed.[40]

The threshold flow needed to produce scouring will be surpassed many times during the requested license period.[41] As the U.S. Geological Survey stated in a 2012 peer-reviewed report:

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[38] *See* Final Study Report: Sediment Introduction and Transport Study: RSP 3.15 (Aug. 2012) at 11, 14-15 ("FSR 3.15"), http://mde.maryland.gov/programs/Water/WetlandsandWaterways/Documents/ExelonMD/FERC/Conowingo-FRSP-3.15.pdf; *id*. at 58 tbl.3.2-1 (citing Michael J. Langland, *Bathymetry and Sediment-Storage Capacity Change in Three Reservoirs on the Lower Susquehanna River, 1996-2008* (2009) (hereafter "Langland (2009)"): sediment accumulation rate for 1996-2008 was 1.5 million tons/year; for 1959-2008 average rate was 2 million tons/year); *see also* FSR 3.15 app. F at 5 (Exelon's bathymetric survey of Conowingo Pond, estimating 1.45-1.69 tons deposited annually based on 2008-2011 average).

[39] *See* FSR 3.15 at i, 10-11; Michael J. Langland & Robert A. Hainly, *Changes in Bottom-Surface Elevations in Three Reservoirs on the Lower Susquehanna River, Pennsylvania and Maryland, Following the January 1996 Flood—Implications for Nutrient and Sediment Loads to Chesapeake Bay* (1997) (hereafter, "Langland & Hainly (1997)"); Langland (2009); Robert M. Hirsch, *Flux of Nitrogen, Phosphorus, and Suspended Sediment from the Susquehanna River Basin to the Chesapeake Bay during Tropical Storm Lee, September 2011, as an Indicator of the Effects on Reservoir Sedimentation on Water Quality* (2012) (hereafter "Hirsch (2012)").

[40] LSRWA at 78 (noting that proportion of scoured sediment loads increases with higher flows); *id*. Table 4-7 (Scour and Load Predictions for Various Flows in Conowingo Reservoir).

[41] LSRWA at 65, Table 4-3.

> The evidence presented in this report indicates that the predicted changes are not just a theoretical issue for future consideration, but are already underway. These changes in the reservoirs are already overwhelming the progress being made to reduce constituent loads from the Susquehanna River watershed. Therefore, efforts to reduce nutrient and sediment inputs to the Chesapeake Bay will need to include consideration of changes in the trapping of sediment entering, and scouring of sediment in, the reservoirs along with the management actions implemented upstream in the watershed.[42]

Thus, scoured loads deliver much greater quantities of sediment and nutrients to the Chesapeake Bay than the natural loading that would have occurred during the same flow events had the Project not been in place. Particularly in the case of very large storms – such as 25-year, 50-year, 75-year, and 100-year return interval flow events, for which there is a substantial to reasonable likelihood of occurrence during the requested license period, as discussed below – Project-induced scouring could overwhelm pollution reductions undertaken upstream in the Lower Susquehanna River watershed.

Indeed, the effects of climate change will likely lead to more frequent and severe scouring events at the Project. Over the past century or so, the Northeast (including the Chesapeake Bay region) has experienced increases in the average annual temperature, amount of precipitation, and amount of extreme precipitation events, and these trends are expected to continue and strengthen in the coming years due to climate change.[43] For example, the average temperature in the Northeast is expected to rise between 2.7 and 3 °F by 2035, between 3.6 and 4.8 °F by 2055, and between 4.7 and 8 °F by 2085, compared with the average temperature in 1971-1999.[44] In addition, the annual amount of precipitation in the Northeast is expected to increase between 2-7% in 2041-2070, compared with 1971-2000.[45] Finally, the frequency of extreme precipitation, defined as the number of days with over an inch of precipitation, is expected to increase by about 10-20% in the Chesapeake Bay watershed by 2041-2070,

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[42] Hirsch (2012) at 13.

[43] Kunkel, K. E., L. E. Stevens, S. E. Stevens, L. Sun, E. Janssen, D. Wuebbles, and J. G. Dobson, 2013: Regional Climate Trends and Scenarios for the U.S. National Climate Assessment: Part 9. Climate of the Contiguous United States, NOAA Technical Report NESDIS 142-9, *available at* https://scenarios.globalchange.gov/sites/default/files/NOAA_NESDIS_Tech_Report_142-1-Climate_of_the_Northeast_U.S_1.pdf ("Kunkel et al."); *see also* Raymond Najjar, *Climate Change in the Northeast U.S.: Past, Present, and Future*, The Pennsylvania State University, Chesapeake Climate Projections Workshop, March 7-8, 2016, available at http://www.chesapeake.org/stac/presentations/258_Najjar%20Climate%20Chesapeake.pdf ("Najjar").

[44] Kunkel et al., *supra* note 43, at 35, 38.

[45] *Id*. at 56.

compared with 1971-2000.[46] These significant climate-related impacts must be considered by MDE during the certification process because they will likely increase the predicted levels of scouring threshold exceedances that were originally assumed for the Project.

Moreover, MDE cannot rely on the Chesapeake Bay TMDL to account for the effects of climate change, and must independently analyze the best available climate projections for the region in order to account for these additive impacts. Fundamentally, MDE has a legal obligation to consider more than mere TMDL compliance (or noncompliance) because the agency must also analyze whether the Project as a whole will interfere with the river's designated uses and narrative water quality standards under the expected climate conditions in the coming decades.[47] The Chesapeake Bay TMDL does not analyze the effects of the Conowingo dam on Maryland's state water quality standards under any conditions, much less under the projected future climate in the Northeast, and this climate analysis is an essential component of the state certification process. Furthermore, any increases in nutrient and sediment pollution from the dam due to climate change were simply not considered in the Chesapeake Bay TMDL. To the extent the dam's effects were included in the TMDL, the TMDL's assumptions about pollution levels did not account for the additive effects of climate change. In fact, only a very vague and preliminary assessment of climate change was completed for the Chesapeake Bay TMDL as a whole in 2010, due to limitations in the modeling that was available at the time.[48] Although the TMDL's "Midpoint Assessment" is expected to incorporate more up-to-date information about the impacts of climate change,[49] it remains unclear precisely how climate change impacts will change the TMDL load allocations, if at all.[50] Moreover, there are no indications the Midpoint

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[46] *Id*. at 60; *see also* Najjar, *supra* note 43, at 20-21.

[47] *See, e.g.*, 33 U.S.C. § 1341(d); *PUD No. 1 of Jefferson Co. v. Wa. Dep't of Ecology*, 511 U.S. 700 (1994) (holding that state water quality standards, including minimum stream flow requirements, should be enforced through § 401 certifications); *Anacostia Riverkeeper Inc. v. Jackson*, 798 F.Supp.2d 210, 238 (D.D.C. 2011) (holding that a state's total maximum daily loads for a water body must ensure protection of all state water quality standards, including *all* designated uses and water quality criteria, in order to satisfy the CWA); *AES Sparrows Point LNG v. Wilson*, 589 F.3d 721, 733 (4th Cir. 2009); *Islander East Pipeline Co., LLC v. McCarthy*, 525 F.3d 141 (2d Cir. 2008); *see also supra* part I.C of these comments.

[48] EPA, Chesapeake Bay TMDL, App. E, https://www.epa.gov/sites/production/files/2015-02/documents/appendix_e_climate_change_final.pdf.

[49] EPA, Chesapeake Bay TMDL 2017 Mid-Point Assessment: Guiding Principles and Options for Addressing Climate Change Considerations in the Jurisdictions' Phase III Watershed Implementation Plans (Dec. 13, 2016), http://www.chesapeakebay.net/channel_files/24456/ii.f._climate_options_for_phase_iii_wips_crwg_briefing_document_12.13.16.pdf.

[50] *See, e.g., Chesapeake Bay TMDL 2017 Midpoint Assessment Policy Options and Implementation Considerations for Addressing Climate Change in Jurisdictions' Phase III Watershed Implementation Plans* (Sept. 6, 2017) (noting that the relevant committee has not yet decided whether to change the TMDL's quantitative load allocations to account for the impacts of climate change), *available at*

Assessment will consider the impacts of climate change on the Conowingo Dam's specific effects. Therefore, MDE must complete its own, independent analysis of the effects climate change will have on the Conowingo Dam Project's impacts to Maryland's water quality standards.

For all the above reasons, we propose that any § 401 certification issued to support a renewed FERC license for the Conowingo Dam Project (1) include a detailed analysis of the effects of climate change, and (2) include conditions requiring Exelon to contribute financially to a specific plan for removing at least 4 million tons of sediment annually from the Conowingo reservoir, in order to offset the 1.5-2 million tons collected in the reservoir annually at the time the Chesapeake Bay TMDL modeling was performed, to eventually remove 100 million tons of material from the reservoir that would be vulnerable to scouring during the proposed license period, and to maintain that level thereafter. These conditions, at a minimum, would be necessary to avoid nutrient and sediment-related violations of state water quality standards as required by 33 U.S.C. § 1341(d).

B. Alternatively, the shortcomings in Exelon's application justify an outright denial of certification at this time.

In the alternative, should Maryland find that more information and study is required to support the certification conditions that we request and that are needed to protect water quality in Maryland's waters, the state should reject Exelon's § 401 Application due to its fatal deficiencies. As an initial matter, we note that Exelon's application mentions the Sediment Study it agreed to help fund in 2014, but it does not provide information on the results or the status of that study.[51] Given that the need for additional study was the primary reason given for delaying the licensing process, this is a serious omission. We and others in the public should not be required to comment on an application that is so patently incomplete. This section of our comments discuss additional deficiencies of Exelon's application.

1. Exelon over-relies on the Lower Susquehanna River Watershed Assessment, despite serious shortcomings.

Exelon's Application relies heavily on the Lower Susquehanna River Watershed Assessment ("LSRWA"), an inter-agency project led by the U.S. Army Corps of Engineers ("Corps") and the U.S. Geological Survey ("USGS") to assess the effects of sediment and nutrient discharges from the three dams located on the Lower Susquehanna River – Holtwood, Safe Harbor, and Conowingo.[52] As long ago as September 2014, Exelon was aware of three

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https://www.chesapeakebay.net/channel_files/25446/mpa_climate_change_policy_option_briefing_memo_wqgit_090617.pdf.

[51] § 401 Application at 2 ("…in December 2014, Exelon entered into an agreement with MDE to work with state agencies in Maryland, the U.S. Army Corps of Engineers, the U.S. Geological Survey, the University of Maryland Center for Environmental Science, and the U.S. Environmental Protection Agency to design and conduct a multi-year Sediment Study to provide additional information to MDE.")

[52] LSRWA, *supra* note 4.

significant shortcomings in the LSRWA, identified in our comments on FERC's Draft Environmental Impact Statement ("DEIS"): (1) it did not model the effects of a potential project-induced scouring event for a large-magnitude storm (*e.g.* 984,000 cubic feet per second ("cfs")), for which there is a reasonable chance of occurrence during the license period; (2) it did not sufficiently evaluate the effects of project-induced scouring on submerged aquatic vegetation ("SAV") and; (3) it did not adequately evaluate the effect of additional nutrient loading caused by project-induced scouring.[53]

In addition, today we submit with these comments our independent third-party review of the LSRWA ("LSRWA Review").[54] As discussed separately in Section III, below, the Review confirms our prior observations that the LSRWA modeling effort was undermined by unjustified and questionable assumptions, as well as important omissions, which caused the LSRWA modelers to underestimate potentially catastrophic effects of project-induced scouring on nutrient and sediment discharges to the Chesapeake Bay.

Exelon relies heavily on both the LSRWA and FERC's DEIS as support for its claim that the adverse water quality effects of the ongoing operation of the Conowingo Dam facility need not be offset by conditions in Maryland's § 401 certification, yet Exelon failed to address or overcome any of the errors or omissions in the LSRWA and DEIS. For this reason alone, Maryland is justified in denying the certification.

2. Exelon's application for a § 401 certification over-relies on the Chesapeake Bay TMDL, yet it badly mischaracterizes the analyses, assumptions, and requirements of the Chesapeake Bay TMDL.

Exelon's application mischaracterizes the *Chesapeake Bay Total Maximum Daily Load for Nitrogen, Phosphorus and Sediment* (Dec. 29, 2010) ("Chesapeake Bay TMDL"), incorrectly claiming that it provides a "comprehensive framework" for addressing "any impacts resulting from the reduction in trapping capacity behind Conowingo Dam caused by sediment introduced upstream of Conowingo Dam." [55] This assertion can be readily dismissed, given that the U.S. Environmental Protection Agency ("EPA") expressly declined to include a wasteload allocation in the Chesapeake Bay TMDL to account for scoured-sediment and nutrient discharges from the Conowingo Dam Project.[56] This decision was based on the incorrect assumption that the Conowingo reservoir had not yet reached dynamic equilibrium (the point "after which the

[53] Comments of Stewards of the Lower Susquehanna, the Lower Susquehanna Riverkeeper, and Waterkeepers Chesapeake on Draft Multi-Project Environmental Impact Statement for Hydropower Licenses: Susquehanna Hydroelectric Projects (FERC Project No. 405-106, Sept. 29, 2014), Accession No. 20140929-5322.

[54] Paul Frank, P.E., FlowWest, Lower Susquehanna River Watershed Assessment Review (August 25, 2017), enclosed as Attachment A.

[55] Exelon Application at 3.

[56] Chesapeake Bay TMDL, Appx. T at T-2, T-5.

amount of sediment flowing into the reservoir equals the amount leaving the reservoir, and the stored volume of sediment is relatively static") and would not until after 2025.[57]

Exelon further incorrectly claims that EPA "recognized that sediment-related pollution impacts… need to be addressed directly without reliance on Conowingo Dam."[58] EPA said no such thing. It simply assumed that the Conowingo reservoir would have "trapping capacity" through 2025, and promised to revisit Pennsylvania's, Maryland's, and New York's "2-year milestones" under the TMDL if that assumption proved to be incorrect.[59]

In any event, Exelon's Application contains no evidence that reductions to ongoing pollution discharges into the Conowingo Dam reservoir from elsewhere in the watershed are capable of preventing, much less offsetting, discharges of scoured sediments and nutrients that are already concentrated in the reservoir due to the presence of the facility since 1928, and that are already liable to be discharged during flow events that exceed the scouring threshold. As long ago as 2012, the USGS noted an observed rise in the flux of total phosphorus at Conowingo, supporting the "hypothesis that this rise is caused by the filling of the reservoir, resulting in a decrease in deposition at moderate flows and a decrease in the threshold of flow required to cause scour of the reservoir sediments."[60] Whereas previous estimates had placed the scour threshold for Conowingo Pond at around 400,000 cfs, the 2012 USGS study supported an updated estimate of 175,000–300,000 cfs.[61] Based on historic flows, we can expect to see the scour threshold exceeded many times during the proposed license period.

III. MARYLAND CANNOT RELY ON THE LSRWA BECAUSE OF ITS SERIOUS SHORTCOMINGS

The LSRWA used a "daisy chain" of models to produce estimates and make predictions about future conditions related to the Conowingo Dam Project's sediment discharges, with output from one model fed into the next model in the series.[62] At each stage, the modelers made choices that resulted in under-estimations of sediment quantities and therefore underrepresented potential sediment impacts and associated nutrient impacts on the Chesapeake Bay. As a result, Maryland cannot rely on the flawed analysis and findings of the LSRWA.

This section summarizes three particular flaws in the LSRWA: (1) the modelers did not evaluate larger-sized storms for which there is a reasonable chance of occurrence during the license period; (2) for those flow events that were modeled, the modelers used a fatally-flawed

[57] *Id*. at T-1 to T-2.

[58] Exelon Application at 19.

[59] Chesapeake Bay TMDL, Appx. T at T-5 ("If future monitoring shows the trapping capacity of the dam is reduced, then EPA would consider adjusting the Pennsylvania, Maryland and New York 2-year milestone loads based on the new delivered loads.").

[60] Hirsch (2012) at 10.

[61] *Id*. at 12.

[62] LSRWA Review at 12.

approach that likely substantially underestimated the effects of those flows on sediment discharges; and (3) the modelers did not properly evaluate the effects of sediment and nutrients during the SAV growing season. These flaws are discussed in greater detail in the enclosed LSRWA Review.

A. The LSRWA modelers did not model a 25-year, 50-year, 75-year, or 100-year return interval flow event, which have a high to reasonable chance of occurring during the license period.

Exelon is requesting a 50-year operating license. The following table sets forth the approximate chance that a particular return interval flow event will occur during a given 50-year period, and it demonstrates there is a reasonable chance that such storm events will occur during the license period.

Return interval flow event	**Percentage chance of occurring in a given 50-yr. period**[63]
100-year	40%
75-year	49%
50-year	63%
25-year	87%
20-year	92%

The LSRWA modeled flow events representing only an approximately 20-year return interval flow event. In particular, the modelers depicted Tropical Storm Lee, an approximately 20-year return interval flow event.[64] The modelers also set out to depict a high-flow event that occurred in January 1996 (for which the peak flow represented approximately a 25-50 year return interval flow event), but because of errors discussed in section III.B below, the resulting analysis was approximately equivalent to evaluating a 20-year return interval flow event, similar to Tropical Storm Lee.

The decision not to model and study the effects of a larger return interval flow event was a serious omission in the LSRWA. Because the relationship between sediment concentration and flow is exponential (as detailed below), a 50-year, 75-year or 100-year return interval flow event would have produced sediment scouring effects substantially greater than storms modeled by the LSRWA modelers. Since such storms are likely to occur during the license period, Maryland lacks the sort of analysis that would be necessary to estimate the project-induced effects that must be offset by conditions in the § 401 certification.

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[63] National Oceanic and Atmospheric Administration, National Weather Service, Flood Return Period Calculator, https://www.weather.gov/epz/wxcalc_floodperiod. *See also* LSRWA Review at 8.

[64] *Id*. at 2, 5-7.

B. The LSRWA modelers underestimated the effects of the flow events they modeled by using *averages* to represent peak flow conditions and associated sediment concentrations.

Both the USGS and the Corps' models represented "peak" Tropical Storm Lee conditions based on *daily average flow* rather than using other methods of calculating peak conditions, a choice that caused the LSRWA to underrepresent the storm's effects.[65] In particular, while the highest daily average flow recorded during Tropical Storm Lee was 709,000 cfs, the highest *24-hour running average flow* was 746,000 cfs, and the highest *instantaneous flow* was 778,000 cfs. Similarly, for one part of their analysis the Corps modelers represented Tropical Storm Lee by its *storm average flow*, which was just 632,000 cfs. These choices likely explain why the models predicted sediment quantities that were lower than the best available estimates or actual measured data suggested.[66]

While the modelers at least recognized that their model outputs constituted underestimations, they chose to respond by increasing the assumed inflow load by 10%.[67] As discussed in more detail in the LSRWA Review, simply increasing the modeled loads by a mere 10% was unjustified and likely did little to improve the validity of the modeling.[68]

The LSRWA analysis also involved modeling of the January 1996 high-flow event, but the modelers represented that storm based on daily average flows rather than instantaneous flows.[69] While use of the *daily average* measure meant that the modelers considered the January 1996 flow event as having a peak of 622,000 cfs, the *instantaneous flows* (measured in 15-minute increments) peaked at 909,000 cfs.[70] As a result, the modeling for the January 1996 event represented something closer to a 20-year return interval flow event, similar to Tropical Storm Lee and significantly smaller than the high-flow events reasonably likely to occur during the requested license period.

The consequences of these choices were substantial because the relationship between flow and transport of sediment is an exponential, not linear, relationship.[71] Had the LSRWA modelers represented these storms using a more appropriate measure of peak flows, because of the exponential relationship they would certainly have predicted much greater sediment and nutrient effects. Instead, the LSRWA models presented an unjustified rosy picture of the likely effects of future high-flow events.

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[65] *Id*. at 1-2.

[66] *Id*. at 2-6, 12.

[67] *Id*. at 4.

[68] *Id*. at 4-5.

[69] *Id*. at 7.

[70] *Id*.

[71] *Id*. at 6 (citing Scott and Sharp, USGS, Sediment Transport Characteristics of Conowingo Reservoir at 19, fig.6 (Feb. 2014)).

C. The LSRWA modelers did not properly evaluate the effects of a large flow event on the SAV growing season.

The LSRWA modeling considered the effects of sediment discharges to the Chesapeake Bay during the months of January, June, and October. The modelers made this choice despite the fact that the 1967-2013 historic flow record shows there were more days at or above the scouring threshold during March, April, and May than all other remaining months.[72] As a result, the SAV growing season was largely excluded from the analysis.

CONCLUSION

As the foregoing discussion and attached supporting information demonstrates, Exelon's Application for a § 401 water quality certification cannot be issued unless Maryland imposes a requirement for the company to participate as a financial partner in a specific plan for removing a minimum of 4 million tons of sediment from Conowingo reservoir annually until 100 million tons are removed, and for maintaining the same level thereafter. If Maryland concludes that it lacks sufficient information at this time – a conclusion that is well justified given the shortcomings of the analyses discussed in this letter – Maryland should deny the certification outright. In either case, Maryland must preliminarily complete a detailed analysis of the effects of climate change in order to accurately assess the impacts the Project will have on the state's water quality standards.

We request an opportunity to meet with you and your staff to discuss these comments. If there are any questions or you would like to set a time to meet, please contact Jennifer Chavez at jchavez@earthjustice.org or by phone at 202-667-4500, ext. 5208.

Sincerely,

/s/ Jennifer C. Chavez

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[72] *Id*. at 9-10.

Michael Helfrich
Lower Susquehanna Riverkeeper
Stewards Of The Lower Susquehanna
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/s/ Betsy Nicholas
Betsy Nicholas
Waterkeepers Chesapeake
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Enclosure

Exhibit C

MARYLAND DEPARTMENT OF THE ENVIRONMENT

Clean Water Act Section 401 Certification For the Conowingo Hydroelectric Project
FERC Project No. P-405 / MDE WSA Application No. 17-WQC-02

Certification Issued To:

Exelon Generation Company, LLC
300 Exelon Way
Kennett Square, PA 19348

Table of Contents

Attachments:

1. MDE Fish Passage Improvement Plan

   Appendix A – Calculation of Fishway Capacity for a 6,500 Gallon Hopper
   Appendix B – Calculating Trap and Transport Credit
   Appendix C – Trap and Transport Mortality Study
   Appendix D – Upstream and Downstream Migration Periods for Certain Species
   Appendix E – Diagram of Fish Passage Definitions

2. MDE Eel Passage Improvement Plan

3. MDE Invasive Species Mitigation Plan

4. Minimum Flow Regime

5. Year 10 Flow Regime

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1. Authority

This Certification is issued to Exelon Generation Company, LLC (the "Licensee") by the Maryland Department of the Environment ("MDE" or the "Department") pursuant to Section 401 of the Federal Water Pollution Control Act, as amended, 33 U.S.C. §1341 et seq. (the "Clean Water Act"), Title 9, Subtitle 3 of the Environment Article, and Section 26.08.02 of the Code of Maryland Regulations ("COMAR"), with respect to the Conowingo Hydroelectric Project, FERC Project Number P-405 (the "Project").

2. Definitions and Administrative Provisions

A. Definitions

In addition to terms defined elsewhere in this Certification, the following terms have the following meaning when used in this Certification and the Attachments hereto:

"Application" means that certain Application for a Maryland Water Quality Certificate for the Conowingo Hydroelectric Project submitted to the Department by the Licensee with respect to the Project on May 17, 2017, as amended, supplement, or modified.

"Authorization" means any applicable license, permit, approval, consent, exemption or authorization from a federal, State or local governmental authority.

"Bay" means the Chesapeake Bay and its tidal tributaries.

"cfs" means cubic feet per second.

"CPI" means the Consumer Price Index for All Urban Consumers (CPI-U; U.S. City Average; all items, not seasonally adjusted; 1982-84=100 reference base) published from time to time by the U.S. Bureau of Labor Statistics.

"Dam" means the Conowingo Dam, as described in Section 1.1 of the FERC Application.

"DNR" means the Maryland Department of Natural Resources.

"DO" means dissolved oxygen.

"DO Non-Attainment Area" means the portion of the Bay consisting of Chesapeake Bay segments CB4MH (Middle Central Chesapeake Bay Mesohaline deep water and deep channel) and the Maryland portion of CB5MH (Lower Central Chesapeake Bay Mesohaline deep water).

"DOI" means the United States Department of the Interior.

"EAV" means emergent aquatic vegetation.

"Eel" means American eel (*Anguilla rostrata*).

"East Fish Lift" or "EFL" means the east fish lift at the Project.

"Environment Article" means the Environment Article of the Annotated Code of Maryland.

"FERC" means the Federal Energy Regulatory Commission.

"FERC Application" means that certain Application for New License for Major Water Power Project-Existing Dam submitted to FERC by the Licensee with respect to the Project on or about August 9, 2012, as amended, supplemented, or modified.

"Herring" means, interchangeably and collectively, alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*).

"Holtwood" means the Holtwood Hydroelectric Project, FERC Project Number 1881.

"Laws" means applicable laws, statutes, regulations, rules, administrative orders, and judicial orders.

"Lower River" means the River from the Dam to its confluence with the Bay.

"Marietta Gage" means the water stage gage located on the River approximately one mile downstream of Marietta, Pennsylvania, USGS station #01576000.

"MDE-AEPIP" means the MDE American Eel Passage Improvement Plan, set forth in Attachment #2 to this Certification, which is incorporated herein by reference.

"MDE-FPIP" means the MDE Fish Passage Improvement Plan, set forth in Attachment #1 to this Certification, which is incorporated herein by reference.

"MDE-ISMP" means the MDE Invasive Species Mitigation Plan, set forth in Attachment #3 to this Certification, which is incorporated herein by reference.

"Minimum Flow Regime" means the operational flow requirements set forth in Attachment #4 to this Certification, which is incorporated herein by reference.

"Muddy Run" means the Muddy Run Pumped Storage Project, FERC Project Number 2355.

"New License" means the license for the Project to be issued by FERC.

"NMFS" means the National Marine Fisheries Service.

"Peach Bottom" means the Peach Bottom Atomic Power Station.

"PCBs" means polychlorinated biphenyls.

"ppt" means parts per thousand.

"Reservoir" means the water impounded by the Dam, which is sometimes referred to as the Conowingo Pond or Conowingo Pool.

"River" means the Susquehanna River.

"Safe Harbor" means the Safe Harbor Hydroelectric Project, FERC Project Number 1025.

"SAV" means submerged aquatic vegetation.

"Secretary" means the Secretary of the Environment of the State of Maryland, and any successor thereto.

"Shad" means American shad (*Alosa sapidissima*).

"Shoreline Management Plan" or "SMP" means the Licensee's Shoreline Management Plan dated August 2012, included the Application and in Volume 3 of the FERC Application, which is incorporated herein by reference.

"Station 643" means DO and temperature monitoring station 643, located approximately 0.6 miles downstream of the Dam, which was established at such location by the Licensee in consultation with DNR.

"Sturgeon" means Atlantic and shortnose sturgeon (*Acipenser brevirostrum, Acipenser oxyrinchus oxyrinchus*).

"Tailrace" means the area downstream of the Dam that is in the hydraulic influence of Project operations.

"Tailwaters" means the Tailrace, extending to the downstream tip of Rowland Island.

"Term" means the term of the New License.

"TMDL" means a total maximum daily load for a body of water, pursuant to the Clean Water Act.

"USFWS" means the United States Fish and Wildlife Service.

"West Fish Lift" or "WFL" means the west fish lift at the Project.

"Year 10 Flow Regime" means the operational flow requirements set forth in Attachment #5 to this Certification, which is incorporated herein by reference.

"WQS" means applicable Maryland water quality standards.

B. Construction and Interpretation

All references herein to Sections or Attachments are references to Sections of or Attachments to this Certification, unless otherwise indicated. All Attachments to this Certification are deemed to be incorporated by reference and made a part of this Certification. All documents incorporated by reference into this Certification that are not attached hereto are qualified by the provisions, requirements and conditions of this Certification. Whenever the words "include," "includes," or "including" are used in this Certification, they shall be deemed to be followed by the words "without limitation." Every reference herein to any Law shall be deemed to be a reference to such Law as it may be amended, supplemented, modified, renumbered, or re-codified from time to time. The Table of Contents and Section headings contained in this Certification (including the Attachments hereto and documents incorporated herein by reference) are for convenience only and shall not in any way affect the meaning or interpretation of this Certification. All references herein to temperatures are expressed in degrees Fahrenheit, unless otherwise noted. All references herein to "days" are calendar days unless otherwise noted. All references herein to governmental entities are to such governmental entities and any successor(s) thereto.

C. Plans

Where the Licensee is required by this Certificate (including any Attachment hereto) to submit to MDE for review and approval any plans, reports, or other documents, including the NCAP (defined below), the 643 Monitoring Plan (defined below), the Fish Kill Monitoring Plan (defined below), the Chlorophyll-A Monitoring Plan (defined below), the Chlorophyll-A Reduction Plan (defined below), the SMP Updates (defined below), the Bog Turtle Plan (defined below), the Map Turtle Plan (defined below), the Waterfowl Plan (defined below), the Tailrace Gage Plan (defined below), the Sturgeon Plan (defined below), the HIP Plan (defined below), the Fish Protection Plan (defined below), the FPP Updates (defined below), and the Stranding Minimization Plan (defined below) (each, a "Plan"), the following procedures shall apply, unless otherwise specified in this Certification:

i. MDE may approve any Plan, in whole or in part, or decline to approve it and provide written comments. MDE may also request additional information. The Licensee shall consult with MDE at least thirty (30) days prior to submission of any Plan about the subject matter thereof. To be effective, any approval by MDE hereunder must be provided in writing.

ii. MDE may solicit public comments and may hold, or require the Licensee to hold, one or more public hearings or meetings with respect to any Plan submitted by the Licensee. MDE may consult and share relevant information with, and may require the Licensee to consult and share relevant information with, other governmental entities or third parties having particular expertise in connection with the review, implementation, and/or oversight of any Plan, including DNR, USFWS, NMFS, the Susquehanna River Basin Commission and the Eel Passage Advisory Group. In connection with each proposed Plan, the Licensee shall provide MDE with (a) documentation regarding consultation with other governmental entities and third parties, (b) an explanation of how the proposed Plan addresses comments or recommendations from governmental entities or third parties, and (c) an explanation of why any such comments or recommendations are not addressed in the proposed Plan.

iii. Upon approval by MDE in writing, the Plan is incorporated into this Certification, and Licensee shall comply with such Plan as approved by MDE. Any failure to comply with an approved Plan, including any deadlines set forth therein, shall be deemed noncompliance with this Certification.

iv. In the event of MDE's disapproval, in whole or in part, of any Plan, MDE shall specify any deficiencies in writing to the Licensee. The Licensee shall correct the deficiencies within thirty (30) days from receipt of disapproval by MDE unless MDE grants an extension, and submit the corrected Plan to MDE for review.

v. If the Licensee takes exception to all or part of MDE's disapproval of any Plan, the Licensee shall submit a written statement of the grounds for the exception to MDE within fifteen (15) days from receipt of disapproval by MDE. Representatives of MDE and the Licensee may confer in person or by telephone in an attempt to resolve any disagreement. If a resolution is reached, that resolution shall be reduced to writing and signed by representatives of each party. In the event that resolution is not reached within fifteen (15) days, unless MDE grants an extension, the Licensee shall modify the Plan as required by MDE.

vi. Each Plan shall include (a) periodic reporting by the Licensee to MDE at such intervals as MDE deems reasonably necessary; and (b) a timeline for implementation of the Plan.

vii. The Licensee shall (a) provide all data and reports, including monitoring results, collected or developed pursuant to any Plan to MDE in electronic format, (b) make all such data and reports publically available on the Web Portal (defined below), (c) make all Plans publicly available on the Web Portal contemporaneously with submission thereof to MDE, and (d) make all approved Plans publicly available on the Web Portal upon receiving approval thereof from MDE.

viii. To the extent any Plan requires sampling, the number of samples, techniques used to obtain samples, and sampling locations shall be subject to approval by MDE.

3. Certification

The Department hereby certifies that the Project's operations and discharge into navigable waters will comply with applicable effluent limitations, other limitations, and water quality standards and requirements issued or approved under Sections 301, 302, 303, 306, and 307 of the Clean Water Act or applicable State Law, provided that Licensee complies with all of the provisions, requirements, and conditions in this Certification.

4. Summary Project Description

The Project consists of (1) the Dam, (2) a spillway, (3) the Reservoir, (4) an intake and powerhouse, and (5) the West Fish Lift and the East Fish Lift, all of which are located on the River approximately 10 miles north of the River's confluence with the Bay.

The West Fish Lift, adjacent to the Dam's right abutment, is currently operated under an agreement with USFWS for Shad egg production and other research purposes. The newer East Fish Lift, located near the midpoint of the Dam, is used primarily to pass Shad, Herring, and other migratory fish during the March-June migration season. The Project also includes a new Eel passage facility on the west side that began operation in May 2017.

The Reservoir serves as the lower reservoir for Muddy Run. It also serves as the source of cooling water for Peach Bottom and the York Energy Center. The Reservoir is also a public water supply source, with the City of Baltimore and Chester Water Authority (in Pennsylvania) having permitted withdrawals of 250 million gallons per day and 30 million gallons a day, respectively.

The powerhouse is integrated with the Dam. There are 13 turbine-generator units, associated draft tubes, and transformer bays. Water flowing through the turbines is discharged via the draft tubes into the Tailrace.

The Project area includes 15 recreation facilities and public access areas: Lock 13, Lock 15, Muddy Creek Boat Launch, Cold Cabin Boat Launch, Dorsey Park, Line Bridge, Broad Creek Public Landing, Glen Cove Marina, Conowingo Swimming Pool and Visitor's Center, Peach Bottom Marina, Conowingo Creek Boat Launch, Funk's Pond, Conowingo Dam Overlook, Fisherman's Park/Shures Landing, and Octoraro Creek Access.

5. Applicable Maryland Water Quality Standards & Criteria

A. Reservoir

The Reservoir has been designated as a Class I-P water, i.e., the Reservoir is to be used for water contact recreation, habitat for non-tidal warmwater aquatic life, and public water supply. The water quality criteria that are currently applicable to the Reservoir and relevant to this Certification are:

i. DO of at least 5 mg/L;

ii. Bacteriological criteria;

iii. PCBs in fish tissue;

iv. Chlorophyll-A (10 ug/l 30 day average, 90th percentile not greater that 30 ug/l);

v. Turbidity (150 max, 50 average); turbidity levels may not exceed levels detrimental to aquatic life;

vi. pH (6.5-8.5);

vii. Temperature (not to exceed 90 degrees); and

viii. Narrative criterion that prohibits waters from being polluted with any material in amounts sufficient to: (1) be unsightly; (2) produce taste or odor; (3) change the existing color to produce aesthetically objectionable color; (4) create a nuisance; or (5) interfere directly or indirectly with designated uses.

B. Downstream

The discharge from the Project impacts water quality in the River below the Dam and in the Bay. Applicable water quality standards for these waters, including designated uses, relevant to this Certification are as follows:

i. *The mainstem of River from the Dam to the confluence with the Bay.* This water has been designated as a Class II-P water. This water is to be used for water contact recreation, public water supply, habitat for non tidal warmwater aquatic life, estuarine and marine aquatic life and shellfish harvesting, migratory spawning and nursery, seasonal shallow water submerged aquatic vegetation (SAV), and Open-Water Fish and Shellfish. The water quality criteria which are currently applicable to this water and relevant to this Certification include:

a. Narrative criterion that prohibits the water from being polluted with any material in amounts sufficient to: (1) be unsightly; (2) produce taste or odor; (3) change the existing color to produce aesthetically objectionable color; (4) create a nuisance; or (5) interfere directly or indirectly with designated uses; and

b. DO criteria for Class II-P waters are the same as Class I-P waters ("the [DO] concentration may not be less than 5 milligrams/liter at any time"), except for the following subcategories applicable in the reach downstream of Dam:

    1. Seasonal and Migratory Fish Spawning and Nursery: From February 1 through May 31, the DO level must be greater than or equal to 6 milligrams/liter (mg/l) for a 7-day averaging period, with an instantaneous minimum requirement of greater than or equal to 5 mg/l. For all other times during the year, the DO levels are as follows: (A) greater than or equal to 5.5 [mg/l] for a 30-day averaging period . . . in tidal fresh waters (salinity less than or equal to 0.5 ppt); (B) greater than or equal to 5 [mg/l] for a 30-day averaging period . . . (salinity greater than 0.5 ppt); (C) greater than or equal to 4.0 [mg/l] for a 7-day averaging period; (D) greater than or equal to 3.2 [mg/l] as an instantaneous minimum; and (E) for protection of the endangered shortnose sturgeon, greater than or equal to 4.3 [mg/l] as an instantaneous minimum at water column temperatures greater than 77 degrees;

    2. Seasonal Shallow-Water SAV: Same as items (A) through (E) in Section 5.B.i.b.1, year-round; and

    3. Open-Water Fish and Shellfish: Same as items (A) through (E) in Section 5.B.i.b.1, year-round;

c. Temperature (not to exceed 90 degrees);

d. pH: Normal pH values may not be less than 6.5 or greater than 8.5;

e. Turbidity may not exceed levels detrimental to aquatic life. With regard to turbidity resulting from any discharge, such turbidity "may not exceed 150 units at any time or 50 units as a monthly average" (measured in Nephelometer Turbidity Units);

f. Color in the surface water may not exceed 75 units as a monthly average. Units shall be measured in Platinum Cobalt Units;

g. Concentrations of chlorophyll a in free-floating microscopic aquatic plants (algae) may not exceed levels that result in ecologically undesirable consequences that would render tidal waters unsuitable for designated uses; and

h. Class II-P waters are subject to MDE's toxic substances criteria for protection of fresh water and freshwater-adapted estuarine aquatic organisms and to protect public water supplies and the wholesomeness of fish and shellfish for human consumption (MDE's regulations set forth criteria for some 112 toxic substances, including inorganic substances, organic compounds, polycyclic aromatic hydrocarbons and phthalates, and pesticides and chlorinated compound).

ii. *The Bay.* The Bay has designated uses of aquatic life, fishing, seasonal migratory fish spawning and nursery, seasonal shallow water SAV uses from April 1 to October 30 to a depth of 1 meter, open-water fish and shellfish uses, seasonal deep-water fish and shellfish, seasonal deep-channel refuge, and narrative criteria that prohibits waters from being polluted by materials or substances which are unsightly, putrescent, odorous, create a nuisance, or interfere directly or indirectly with designated uses. The numeric water quality criteria that are currently applicable and most relevant to this Certification are the DO criteria (and in particular, the DO criteria for the DO Non-Attainment Area), including:

a. Seasonal Migratory Fish

1. From February 1-May 31: DO must be greater than or equal to 6 mg/L for a 7 day averaging period with an instantaneous minimum requirement of greater than or equal to 5 mg/L; and

2. From June 1-January 31: Same as Open-Water Fish and Shellfish.

b. Open-Water Fish and Shellfish:

1. DO must be greater than or equal to 5.5 mg/L for a 30 day average (salinity less than or equal to 0.5 ppt);

2. DO must be greater than or equal to 5.0 mg/L for a 30 day average (salinity greater than 0.5 ppt);

3. DO must be greater than or equal to 4.0 mg/L for a 7 day averaging period and greater than or equal to 3.2 mg/L as an instantaneous minimum; and

4. For protection of shortnose sturgeon, DO must be greater than or equal to 4.3 mg/L as an instantaneous minimum when water column temperatures exceed 77 degrees.

c. Seasonal Shallow-Water SAV: Year-round, same as Open-Water Fish and Shellfish.

d. Seasonal Deep Water Fish and Shellfish:

1. DO must be greater than or equal to 3.0 milligrams/liter for a 30-day averaging period from June 1 through September 30;

2. DO must be greater than or equal to 2.3 milligrams/liter for a 1-day averaging period from June 1 through September 30;

3. DO must be greater than or equal to 1.7 milligrams/liter as an instantaneous minimum from June 1 through September 30; and

4. The open-water fish and shellfish subcategory criteria apply from October 1 to May 31.

e. Seasonal Deep Channel Refuge: DO must be greater than or equal to 1.0 milligrams/liter as an instantaneous minimum from June 1 to September 30 except for Bay segments subject to variances.

6. Summary of Findings

In light of all the evidence before the Department, including the Application, comments and testimony received, and all other studies, modeling, and information reviewed during the Application review process, the Department has determined that the Project adversely impacts water quality in the State of Maryland, including but not limited to the following ways:

A. The Project has significantly and adversely impacted biota in the Lower River and the northern Bay over the past 90 years of operation, as a result of: (i) its highly unnatural operational flow regimes; (ii) the Dam serving as a barrier to fish passage upstream; and (iii) the Dam serving as an obstacle to fish passage and coarse-sediment transport for habitat downstream. Aquatic habitat in the Tailrace is adversely affected by daily peaking flows and the elimination of movement of some coarse-grained sediments that are stored in the Reservoir. Daily peaking hydropower operation also results in high velocities and excessive turbulence in water discharged through the Dam, which reduces deposition of any available coarse-grained sediment and affects the amount of Lower River habitat available to species such as Shad, Herring, Sturgeon, Eels, turtles, and freshwater mussels, as well as SAV and macro-invertebrate communities.

B. When initially constructed and for many decades of its initial operation, the Project had no provision for fish to move upstream and did not maintain any minimum level of water flowing downstream. Fish kills occurred downstream and the quantity and quality of suitable habitat for riverine species in the River were adversely impacted. The duration of time before the Project was required to maintain any amount of daily minimum flow downstream throughout the year, and before any working fishlift was constructed to allow fish to move by their own volition upstream, has had significant consequences for the health of the aquatic system from above the Dam to the northern Bay.

C. As currently operated, the Project's peaking flow regime, characterized by drastic daily changes in water depth below the Dam and velocities of discharge over a period of one hour, continues to cause fish kills downstream by stranding fish in shallow pools with insufficient water and subjecting them to increased threat of predation. The flow regime also delays upstream movement of important migratory spawning species such as Shad and Herring, and adversely impacts downstream habitat and the integrity of the downstream aquatic system.

D. Additional provision for fish passage is necessary to assist in the recovery of historic fish populations. Prior to the construction and operation of the Project, species such as Shad and Herring spawned in prime spawning habitat in the River above the current location of the Dam. The River and northern Bay were vibrant and active fisheries for these species. With a healthy aquatic system, millions of Shad and Herring should be passing upstream in the River every year; in 2017, only 15,000 Shad and 65 Herring passed the Dam. Millions of Eel, an important host species for freshwater mussels that filter pollution out of waters, should be present in the Lower River, including areas upstream of the Dam; in 2017, only thousands were collected at the base of the Dam and transported upstream. Consequently freshwater mussel populations have declined dramatically in the system. The River should support tens of millions of freshwater mussels; today, the freshwater mussel population is significantly diminished above and below the Dam such that it is considered unviable.

E. The Reservoir, formed by the construction of the Project, replaced 14 miles of flowing, dynamic River habitat with an impoundment and fundamentally altered aquatic habitat. The Reservoir lacks suitable habitat for freshwater mussels, which has adverse consequences for water quality, as these organisms provide important ecosystem services of filtration and transformation of sediment and nutrient pollution. Reservoir-adapted fish such as gizzard shad have replaced and continue to threaten populations of riverine species that would typically be dominant. The Reservoir has elevated levels of chlorophyll-A during summer months with increased water temperatures, which impact drinking water supply uses of the water. Elevated PCB levels in fish tissue in fish in the Reservoir and below the Dam impact fish consumption-related uses, and have triggered the development of TMDLs to address these impairments.

F. Invasive fish species, which may be more likely to proliferate in a degraded system, passing the Dam have the potential to suppress native species, alter the food web, and reduce biodiversity. Invasive species including the blue catfish (*Ictalurus furcatus*) and northern snakehead (*Channa argus)* have spread throughout the Bay watershed. Based on information from Licensee, a snakehead or blue catfish has already passed volitionally through a fishlift at the Project in 2017. The blue catfish and snakehead are both top predators in areas where they have become established and would further threaten the ecological balance of the River.

G. Although the Dam has in the past trapped and stored sediment and nutrients and served as a barrier to downstream transport to the Bay, the Reservoir is now full, as no efforts have been undertaken over the life of the Project, such as routine dredging, to maintain any trapping function. As a result, sediments and nutrients move downstream, and during large storm events, significant amounts of trapped sediment and nutrients are scoured from the behind the Dam and discharged downstream. By releasing significant amounts of sediment and nutrients through scouring during storm events, the Dam has altered the nature, timing, and delivery method of these materials with adverse consequences for the Lower River and the Bay. Nutrients discharged as a result of the in-filled state of the Reservoir adversely impact DO levels and thus aquatic life in the DO Non-Attainment Area.

H. In-filling of the Reservoir with sediment increases the velocity of water in the Reservoir, and the altered hydrological dynamics result in unfavorable substrate conditions and a

generally sparse invertebrate community in the lower two-thirds of the Reservoir. Increased water velocity also increases bed shear and induces additional scour and movement downstream of sediment and associated nutrients.

I. The Project traps trash and debris behind the Dam, which accumulates over time, threatening recreational uses of the Reservoir and potentially concentrating pollutants, and if not removed regularly is vulnerable to sudden downstream transport during moderate to large storm events. Significant amounts of trash and debris moving downstream in single events creates hazards for recreational uses and blocks water supply intakes downstream.

J. Absent the Dam, there would be 24 miles of open river between the dam at Holtwood and the Bay, and there would be some natural transformation and attenuation of sediment and nutrients, as the River would be better connected to its floodplain and there would be coarse sediment regularly moving downstream. This would support larger SAV beds, and the area downstream of the head of tide (about 5 miles from the mouth of the River) would have a larger delta formed from deposition of sediment carried by the River as its flow enters the slower moving water in the Bay. More coarse sediment, floodplain connection, and SAV would make the River system more resilient, including its ability to attenuate nutrients and minimize damage associated with moderate to large rainfall events.

7. Requirements and Conditions

A. Compliance with WQS, Generally

The Project shall comply with all WQS and other applicable Laws and Authorizations.

B. Fish Passage

i. The Licensee shall implement and comply with all provisions of:

(a) the MDE-FPIP;

(b) the MDE-AEPIP; and

(c) the MDE-ISMP.

ii. The Licensee shall take such actions as may be necessary to permit at least 5,000,000 Shad and at least 12,000,000 Herring that approach the Project to pass the Dam each year during the Term on a schedule to be determined by MDE as the Licensee implements the MDE-FPIP.

iii. Notwithstanding any provision of the MDE-FPIP to the contrary, if the Shad population immediately upstream of York Haven Dam is determined to be less than 150,000 (using a counting methodology approved by MDE) as of December 31, 2039, MDE will reassess the trap and transport crediting aspects of the MDE-FPIP, and MDE will decide, in consultation with DNR and, as MDE deems appropriate, other fisheries experts, whether and

how to adjust such crediting. The Licensee shall be bound to apply whatever adjustments that MDE makes at that time to the crediting aspects of the MDE-FPIP from that point forward.

iv. Notwithstanding any provision of the MDE-FPIP to the contrary, if the Shad population immediately upstream of York Haven Dam is determined to be less than 400,000 (using a counting methodology approved by MDE) as of December 31, 2054, MDE will reassess the trap and transport crediting aspects of the MDE-FPIP, and MDE will decide, in consultation with DNR and, as MDE deems appropriate, other fisheries experts, whether and how to adjust such crediting. The Licensee shall be bound to apply whatever adjustments that MDE makes at that time to the crediting aspects of the MDE-FPIP from that point forward.

C. Aquatic Life and Seasonal Migratory Fish - Operational Flow Regime Impacts

i. The Licensee shall operate the Project in accordance with the Minimum Flow Regime beginning on September 1, 2018 and ending on December 31, 2028.

ii. The Licensee shall operate the Project in accordance with the Year 10 Flow Regime starting on January 1, 2029, *provided, however*, if MDE determines, based on Adaptive Management Flow Studies, that modifications to the Year 10 Flow Regime are likely to result in benefits to the aquatic system greater than or equal to the benefits MDE expects if the Year 10 Flow Regime is implemented without such modifications, the Secretary will notify the Licensee of such determination in writing prior to January 1, 2029, in which case the Licensee shall operate the Project in accordance with the Year 10 Flow Regime, modified in accordance with such notice from the Secretary (the "Modified Year 10 Flow Regime"), starting on January 1, 2029.

iii. For purposes of this Section 7.C, "benefits to the aquatic system" includes statistically significant improvement in (a) the percentage of Shad and Herring moving from the Tailrace and being captured in the fishlifts within three days of their entry into the Tailrace; (b) the quality of downstream aquatic life as evidenced by reduction in the number of fish strandings; (c) the quality and abundance of the macroinvertebrate community and freshwater mussel community; and (d) the abundance of SAV within the segment of the River between the Project and the head of tide.

iv. For purposes of this Section 7.C, "Adaptive Management Flow Studies" means scientifically sound studies voluntarily completed by or for the Licensee as described more fully below, subject to independent external scientific peer review and submitted by the Licensee to MDE. For each Adaptive Management Flow Study, the Licensee shall develop a study design, with the objective of testing one or more component parts of the Year 10 Flow Regime to determine whether such component part(s) provide benefits to the aquatic system. The Licensee shall subject the study designs to independent external scientific peer review by at least five qualified and independent scientists with specialties in the appropriate scientific disciplines, and incorporate any consensus recommendations into the study design as a result of that process. The Licensee shall provide to MDE for approval a copy of each final study design with the results of the independent external scientific peer review prior to initiating the Adaptive Management Flow Study. For each Adaptive Management Flow Study, a report containing the data collected and an analysis of results shall be subjected to independent external scientific peer

review by at least five qualified and independent scientists with specialties in the appropriate scientific disciplines. Once independent external scientific peer review of the Adaptive Management Flow Study results is completed, the Licensee shall incorporate and/or address any consensus-based comments and provide to MDE the study report and copies of all independent external scientific peer review comments. The study report and the results of independent external scientific peer review shall be submitted to MDE by January 1, 2027, so that MDE has adequate time to review and consider the need for potential changes to the Year 10 Flow Regime.

v. If compliance with the Minimum Flow Regime, the Year 10 Flow Regime, or the Modified Year 10 Flow Regime, as the case may be (each, "Applicable Flow Requirements"), would cause the Licensee, any of its affiliates, or any subsequent owner or operator of Peach Bottom or Muddy Run to violate or breach any Law, Authorization, or agreement with any governmental entity, including the Nuclear Regulatory Commission license for Peach Bottom and any agreement with the City of Baltimore, the Licensee may deviate from the Applicable Flow Requirements to the least degree necessary in order to avoid such violation or breach. In such circumstances, the Licensee shall provide to MDE, within one week of each such deviation, a written report identifying the Law, Authorization, or agreement that necessitated the deviation, describing the actual minimum flows provided during the deviation period, the duration of the actual minimum flows under these circumstances, and any observed adverse impacts to aquatic life (e.g., fish kills, additional observed delays in migratory fish reaching the fishlifts, etc.).

D. Dissolved Oxygen (DO) in the Chesapeake Bay

i. The Licensee shall ensure that Project operations and discharges do not adversely impact DO levels, and consequently aquatic life, in the Bay in any manner that would constitute a violation of WQS including designated and achieved uses.

ii. To ensure the Project's compliance with DO WQS including designated and achieved uses, beginning with calendar year 2025, the Licensee shall annually reduce the amount of nitrogen included in the Project's discharges by six million (6,000,000) pounds and the amount of phosphorus in the Project's discharges by two hundred sixty thousand (260,000) pounds (or such different amounts of phosphorus and nitrogen reductions as may be approved by MDE, provided that such different amounts of nitrogen and phosphorus reductions provide the equivalent protection of DO levels in the DO Non-Attainment Area that would be provided by six million (6,000,000) pounds of nitrogen reductions and two hundred sixty thousand (260,000) pounds of phosphorus reductions) (the "Required Nutrient Reductions").

iii. If, in a final watershed implementation plan intended to mitigate the water quality impacts of the Reservoir in-fill (the "Conowingo WIP"), one or more of Maryland, the District of Columbia, New York, Delaware, Virginia, West Virginia, and Pennsylvania (each, a "Bay Jurisdiction") has committed to actions that will result in some portion(s) of the Required Nutrient Reductions being achieved, the Licensee may credit against its Required Nutrient Reduction obligation the nitrogen and/or phosphorus reductions that are actually achieved by the Bay Jurisdictions. To obtain any such credit, the Licensee shall submit a written request therefor, with supporting documentation, to MDE.

iv. The Licensee shall provide to MDE for review and approval, no later than December 31, 2019, a nutrient corrective action plan (the "NCAP") for achieving the Required Nutrient Reductions and otherwise ensuring that DO levels in the DO Non-Attainment Area are not adversely impacted by Project operations and discharges. The NCAP may propose any combination of corrective action strategies, including:

(a) Payment of an in-lieu fee annually at $17.00 per pound of nitrogen and $270.00 per pound of phosphorus in accordance with payment instructions provided by MDE from time to time; *provided*, that the in-lieu fee amounts of $17.00 and $270.00 are deemed effective as of January 1, 2019 and shall be adjusted for inflation on January 1, 2020 and on January 1 of each year thereafter, based on the cumulative change in the CPI;

(b) Installation of best management practices and/or ecosystem restoration actions (e.g., restoration of buffers, land conservation, stream and wetland restorations, re-forestation, and/or freshwater mussel and oyster restoration); and/or

(c) Dredging the Reservoir, subject to Licensee obtaining all necessary Authorizations for such dredging.

v. Subject to the other provisions of this Section 7.D.v, the Licensee shall comply with the NCAP as approved by MDE in writing during the Term. If MDE determines during the Term that the Required Nutrient Reductions are, in whole or in part, either not necessary or not sufficient to meet DO criteria in the River and/or the Bay, MDE may re-open this Certification pursuant to Section 7.Q.xvii to reduce, eliminate, or increase the Required Nutrient Reductions. If MDE re-opens this Certification to increase or reduce the Required Nutrient Reductions, the Licensee shall submit a revised NCAP to MDE for approval within 60 days after MDE notifies the Licensee in writing that this Certification is being re-opened.

vi. The Licensee shall develop and submit for MDE review and approval no later than December 31, 2019, a Sediment & Nutrient Monitoring Plan, the purpose of which shall be to: (a) quantify changes in the extent and amount of sediment and nutrients being discharged from the Dam over the Term; (b) understand the impacts of changing sediment and nutrient conditions on living resources in the Bay; and (c) understand nutrient and sediment changes and impacts resulting from major storm events of greater than 400,000 cfs.

E. DO in the River Downstream of the Dam as Measured at Station 643

i. The Licensee shall ensure that Project operations and discharges do not adversely impact DO levels, and consequently aquatic life, in the River in any manner that would constitute a violation WQS including designated and achieved uses.

ii. No later than June 30, 2019, the Licensee shall submit to MDE for approval a plan for monitoring DO at Station 643 (the "643 Monitoring Plan"). The 643 Monitoring Plan shall provide for continuous monitoring of DO levels in the Tailrace at Station

643 beginning no later than December 31, 2019. The 643 Monitoring Plan shall include a description of data collection and analysis procedures, equipment maintenance and calibration procedures, and schedules for reporting results to MDE.

iii. If the monitoring conducted under the 643 Monitoring Plan identifies violations of the daily average or instantaneous standard, the Licensee shall, within 30 days, notify MDE of the exceedence in writing and submit a plan to MDE for approval proposing corrective actions to prevent similar exceedences in the future. The Licensee shall implement such corrective action plan after it is approved by MDE.

iv. No later than June 30, 2019, the Licensee shall submit to MDE for approval a plan for monitoring and reporting any fish kills exceeding 50 fish in the Reservoir and/or the Tailrace (the "Fish Kill Monitoring Plan"). The Fish Kill Monitoring Plan shall include data collection procedures, analysis methods, and reporting commitments.

F. Trash and Debris in Reservoir and Movement Downstream

i. The Licensee shall employ clamming (or any other equally or more effective measures of its choosing approved by MDE), to remove floating and water surface trash and debris that accumulates in the Reservoir behind the Dam at least weekly (unless storm conditions preclude removal in a particular week). During clamming/trash and debris removal events, the Licensee shall remove all visible trash and debris. Removal shall occur at least forty (40) times per year between January 1 and November 1, starting in January 2019. The Licensee shall monitor and record the duration of the clamming/trash and debris removal events (number of hours), and the amount of debris and trash removed and subsequently disposed of during each clamming/trash and debris removal event (in cubic yards). The Licensee shall submit these data to MDE each year by November 30 and, after 3 years of this effort, and, based on these data, the Licensee may request from MDE a reduction in the required frequency of clamming/trash and debris removal events, and MDE may reduce the required frequency of clamming/trash and debris removal events based on a review of the data.

ii. The Licensee shall, no later than December 31, 2019, employ on a daily basis the use of a self-propelled skimmer barge (unless storm conditions preclude its use during a particular timeframe). If the Licensee seeks to reduce the requirement to use this skimmer barge on a daily basis, the Licensee shall provide MDE with data collected over a 3 year period documenting the days and hours of operation and the amount of material collected and disposed of (in cubic yards) for each week of operation. Based on the data collected, the Licensee may request a from MDE a modification to this requirement for daily operation of the skimmer barge, and MDE may modify the requirement to use a self-propelled skimmer barge daily based on a review of the data.

iii. The Licensee shall respond to any complaint from a marina operator or public boat ramp "monitor" (e.g., DNR) about accumulated trash and debris interfering with recreational uses in the Reservoir by removing any accumulated trash and debris that is interfering with recreational uses within 48 hours of a complaint during the recreational season (between Memorial Day and Labor Day) and properly disposing of removed materials. The Licensee shall maintain for MDE review, records of complaints filed (name, date, time, location,

nature of the trash and/or debris issue and amount), and corrective actions taken (date, time, description of action, and, amount of trash and/or debris removed).

iv. The Licensee shall sponsor at least two annual community-based cleanups of the Reservoir, tributaries upstream of the Project that feed the Reservoir, and the River and tributaries downstream of the Project. The Licensee shall advertise each event, provide all needed supplies, and arrange and pay for the disposal of collected materials.

v. After any storm event which has resulted in trash and debris moving downstream and blocking downstream water supply intakes in the River, the Licensee shall ensure that trash and debris that is blocking downstream water supply intakes is removed as soon as it is safe to enter the water after the storm event.

vi. No later than December 31, 2019, the Licensee shall perform and submit to MDE a study regarding the feasibility of using one or more water wheel trash interceptors powered by solar panels or other renewable sources (a "Trash Wheel"), to remove floating and water surface trash and debris in the Reservoir. If Licensee determines that using one or more Trash Wheels to aid compliance with WQS would be reasonably practical, the Licensee shall submit to MDE for approval a plan for the installation thereof at the Project.

G. Chlorophyll-A Levels in the Reservoir

i. No later than June 30, 2019, the Licensee shall submit to MDE for approval a plan for monitoring chlorophyll-A levels in the Maryland portion of the Reservoir (the "Chlorophyll-A Monitoring Plan"). The Chlorophyll-A Monitoring Plan shall provide for collection of three (3) years of data on chlorophyll-A levels in the Maryland portion of the Reservoir between May 1 and September 30, in accordance with a monitoring protocol to be provided by MDE no later than March 31, 2019, and shall be designed to determine with a high level of statistical confidence whether chlorophyll-A WQS are exceeded in the Maryland portion of the Reservoir between May 1 and September 30 in any particular year.

ii. Pursuant to the Chlorophyll-A Monitoring Plan, the Licensee shall provide MDE with (a) annual reports of all measured chlorophyll-A levels and dates and locations of monitoring in the Maryland portion of the Reservoir by December 31 of the year in which the monitoring occurred; and (b) a final report that analyzes and presents the results of all chlorophyll-A monitoring completed by June 30 of the year after the final year of monitoring.

iii. If any of the reports required by Section 7.G.ii reflect that chlorophyll-A levels in the Maryland portion of the Reservoir exceed WQS, the Licensee shall, within six (6) months after the date on which such report was submitted to MDE, submit to MDE for approval a plan to reduce chlorophyll-A levels in the Maryland portion of the Reservoir between May 1 and September 30 to meet WQS for chlorophyll-A within five (5) years (the "Chlorophyll-A Reduction Plan").

iv. If MDE determines at any time that chlorophyll-A levels in the Maryland portion of the Reservoir exceed WQS, and the City of Baltimore withdrew water from the Reservoir and incurred necessary additional treatment costs associated with elevated chlorophyll-

A levels in that year, the Licensee shall promptly reimburse the City of Baltimore for such additional costs.

H. PCB Levels in Fish Tissue

i. The Licensee shall ensure that Project operations and discharges do not cause or contribute to PCB levels in fish tissue in violation of WQS including designated and achieved uses.

ii. MDE is reviewing available information on the potential sources of PCBs in the Reservoir and downstream of the Project to determine the need for additional data collection and/or corrective actions to address elevated PCB levels in fish tissue in the Reservoir and downstream. MDE may, in the future, require the Licensee to undertake data collection (e.g., sampling of sediment for PCBs) and/or actions to reduce PCB levels in the Reservoir and/or in the Project's discharges to the River.

iii. Should MDE determine that the Licensee needs to undertake data collection and/or reduce PCB levels in the Project's discharges to the River and/or in the Reservoir, MDE may re-open this Certification pursuant to Section 7.Q.xvii to require the Licensee to develop a plan for MDE review and approval for data collection and/or corrective actions to reduce PCB levels in the Reservoir and/or in the Project's discharges to the River. The Licensee shall prepare and submit for MDE approval any such plan requested by MDE within twelve (12) months of MDE's request.

I. Shoreline Management Plan (SMP)

i. The Licensee shall comply with the SMP, subject to the other provisions of this Section 7.I.

ii. Non-Project use of Project Land. If the Licensee intends to make any non-Project use of any Project land, or receives any request from a third party for non-Project use of any Project land, the Licensee shall (a) prepare, or require the third-party requestor to prepare, a written an assessment of the impacts on water quality of the proposed use; (b) provide this assessment to MDE for MDE's review and decision regarding whether the proposed use is consistent with WQS including designated and achieved uses; and (c) not engage in or allow such use until MDE notifies the Licensee in writing that MDE has no objections to such proposed use.

iii. Shoreline Vegetation Management. If the Licensee intends to make any modifications to the shoreline vegetation for viewshed maintenance and development and recreation access within the Project boundary, the Licensee shall (a) prepare a written assessment of the impacts on water quality of the proposed modifications; (b) provide this assessment to MDE for MDE's review and decision regarding whether the proposed modifications are consistent with WQS including designated and achieved uses; and (c) not undertake any such modifications until MDE notifies the Licensee in writing that it has no objections to such proposed use.

iv. Sensitive Natural Resources Protection Overlay and Policies. The Licensee shall consult with MDE regarding any proposed modification of an existing use of Project lands in cases where such use may affect any sensitive aquatic resource identified by the Licensee in the "sensitive resources overlays" included in the SMP.

v. SMP Updates. No later than January 1 of 2028, 2038, 2048, and 2058, the Licensee shall submit to MDE for approval proposed improvements to the SMP (each, an "SMP Update"). Each SMP Update shall include an assessment of the impacts of deleted, revised, or new measures on water quality.

J. Turtle Management Plans

i. Notwithstanding anything to the contrary in the SMP, the Licensee shall, no later than September 1, 2019, submit to MDE for approval, a plan for the protection and enhancement of the bog turtle population associated with Project lands (the "Bog Turtle Plan"). The Bog Turtle Plan shall include (a) the restriction of mowing in the wetlands within the Project boundaries that are documented to support bog turtles; (b) invasive plant and woody plant control, particularly red maples and reed canary grass, in the areas around the wetlands within the Project boundaries that are documented to support bog turtles; (c) limits on public access to the wetlands within the Project boundaries that are documented to support bog turtles without advertising the reason; and (d) an assessment of the impacts, if any, of the specific measures planned to be implemented on WQS including designated and achieved uses.

ii. Notwithstanding anything to the contrary in the SMP, the Licensee shall, no later than September 1, 2019, submit to MDE for approval, a plan for the protection and enhancement of the northern map turtle population associated with Project lands (the "Map Turtle Plan"). The Map Turtle Plan shall include (a) annual monitoring of the northern map turtle population at the Project for 10 years, followed by population monitoring every 5 years during the Term; (b) a study to determine the amount of artificial basking habitat needed over the normal range of generation flows to support current and future populations of northern map turtles within the Reservoir and all areas of the downstream River affected by generation flows; (c) a study to determine the proper locations for deployment of artificial basking platforms; (d) nest management and protection measures; (e) annual monitoring of the use and success of both the mitigation and protection measures; (f) an assessment of the northern map turtle's response to changes in operating practices at the Project that are required by this Certification or the New License; and (g) methods of altering or amending protection and mitigation measures as a result of the monitoring, in consultation with MDE.

K. Waterfowl Nesting Protection Plan

Notwithstanding anything to the contrary in the SMP, the Licensee shall, no later than September 1, 2019, submit for MDE approval a waterfowl nesting protection plan (the "Waterfowl Plan"). The Waterfowl Plan shall: (i) identify specific Project-related effects on nesting waterfowl, such as flooding during the nesting season; (ii) identify which species of nesting waterfowl (including the black-crowned night heron) are affected by the Project, if any; (c) if Project-related effects are identified, describe appropriate protection or mitigation

measures; and (d) provide an assessment of the impacts of such protection and mitigation measures on water quality.

L. Monitoring Stream Flows in the Tailrace

Notwithstanding anything to the contrary in the SMP, the Licensee shall, no later than September 1, 2019, submit to MDE for approval a plan for the re-design, installation, and maintenance of best available real-time flow telemetry at the stream gage in the Tailrace (USGS Station Gage #01578310) (the "Tailrace Gage Plan"). The Tailrace Gage Plan shall provide for Licensee to submit monitoring results from the Tailrace Gage to MDE no less than annually, by December 31 of each year, which results shall be included in the Minimum Stream Flow Operation Plan (MSFOP) annual report.

M. Sturgeon Protection

Notwithstanding anything to the contrary in the SMP, the Licensee shall, no later than September 1, 2020 (or sooner, if required by a federal governmental agency), submit to MDE for approval a plan for the protection and enhancement of the Sturgeon populations associated with the Project (the "Sturgeon Plan"). The Sturgeon Plan shall include: (i) provisions to monitor and report stranded Sturgeon within Project boundaries and in the River downstream from the Project; (ii) provisions to eliminate stranding of Sturgeon as a result of Project operations; (iii) procedures for trapping, handling, and safely returning Sturgeon lifted at any fish lift to the Tailrace; (iv) monitoring of water quality in any tanks used to hold Sturgeon; and (v) procedures for monitoring tagged Sturgeon and other tagged fish below the Dam and in the Bay including Environmental DNA.

N. Habitat Improvement Projects

i. No later than September 1, 2019, the Licensee shall submit to MDE for approval a plan for implementing Habitat Improvement Projects ("HIPs") in the River extending approximately 4.5 miles downstream of the Dam to the island complex that includes Robert and Spencer Islands (the "HIP Plan"). The HIPs shall target habitat improvements for Shad, Herring, freshwater mussels, native EAV and SAV, shortnose sturgeon, smallmouth bass, and macroinvertebrates at the following locations: (a) the mouth of Octoraro Creek; (b) the north end of Sterret Island; (c) McGibney Island; (d) the Robert, Wood, and Spencer Island complex; (e) the mouth of Deer Creek; (f) Snake Island; (g) downstream of Bird Island; (h) Rowland Island; and (i) the Fish Pot area along the western shore, located southwest of Bird Island. The objectives of the HIPs shall include creating, enhancing, or protecting (1) habitat for Shad and Sturgeon at the spawning and fry life stages; (2) natural vegetation (while minimizing the potentially negative impacts of working near invasive vegetative species); and (3) habitat for other aquatic species.

ii. The Licensee shall develop conceptual HIP designs based on a review of the latest Habitat Suitability Index maps, water surface elevations, depths, velocities, and substrate mapping. Hydraulic analysis shall be used to assist in determining the final location, length, height, and structural design of HIP structures to meet HIP objectives. The HIP Plan shall include for each HIP a description of the proposed HIP, the current habitat suitability, the

limiting factors for specific flow regimes, a preliminary assessment of feasibility, and any potential constraints.

O. Lower River Fisheries Survey

i. No later than September 1, 2019, the Licensee shall submit to MDE for approval a plan for monitoring and protection of fish in the Lower River, specifically targeting the federally-endangered Maryland Darter ("Darter") and the State-threatened Chesapeake Logperch ("Logperch") population(s) (the "Fish Protection Plan"). The Fish Protection Plan shall (a) include monitoring by Licensee of the River tributaries' fish populations and the lower riffle habitats of Deer Creek, Octoraro Creek, Broad Creek, and Conowingo Creek during spring, summer, and fall every five years; (b) provide for monitoring by electrofishing (conventional and trawl), snorkeling, and/or seine surveys, or otherwise as approved by DNR; and (c) require each sampling event in riverine habitat to include sampling technique(s) targeting Darter and Logperch.

ii. No later than September 1 of each year during the Term after 2019, the Licensee shall submit to MDE a comprehensive fisheries report including (a) analysis of fish population trends and correlations with abiotic data, if available, based on data obtained through implementation of the Fish Protection Plan; and (b) the Licensee's recommendations for continued protection and enhancement of the fish populations below the Dam and statistical methodologies used to estimate sample size and/or extinction probabilities.

iii. No later than September 1 of 2024, 2029, 2034, 2039, 2044, 2049, and 2054, the Licensee shall submit to MDE for approval proposed improvements to the Fish Protection Plan (each, an "FPP Update").

P. Spillway Modifications/Fish Stranding Minimization

No later than September 1, 2019, the Licensee shall submit to MDE for approval a plan for modifying the spillway Tailrace and/or modifying operational flow practices at the Project to reduce the numbers of rare, threatened, or endangered fish species stranded by Project operations (the "Stranding Minimization Plan"). If the Stranding Minimization Plan includes physical alterations in the spillway tailrace area, the Licensee shall include proposed methods to excavate new exit channels and/or the fill the designated isolated pools. If the Stranding Minimization Plan includes newly constructed exit channels, such new exit channels shall direct fish and other aquatic species towards the River's thalweg and shall be designed to prevent fish from avoiding the proposed channel exit to the Tailrace.

Q. General Requirements and Conditions

i. Other Authorizations. This Certification does not relieve the Licensee of the responsibility to obtain any other Authorizations related to the Project.

ii. Compliance with WQS / No Unauthorized Discharge or Other Work: The Licensee shall meet all applicable WQS including designated and achieved uses associated with the operations of and discharge from the Project. Except as specifically set forth herein (if at

all), this Certification does not authorize the discharge of any pollutants. The Licensee shall not discharge any waste or wastewater from the Project, unless specifically authorized by MDE. This Certification does not authorize any work to occur in waters of the State, including any dredging or the construction or placing of any physical structures, facilities, fill, or debris or the undertaking of related activities in any waters of the State.

iii. Civil and Criminal Liability: In issuing this Certification, MDE does not waive or surrender any right to proceed in administrative, civil, or criminal action for any violations of any Law occurring before issuance of this Certification. Nothing in this Certification shall be constructed to preclude the institution of any legal action for any reason or relieve the Licensee from any civil or criminal responsibilities, liabilities, or penalties for violation of any Law, including the Environmental Article and the Clean Water Act.

iv. Penalties for Noncompliance with Law and Violations of Certification: The Licensee shall comply at all times with the provisions, requirements, and conditions of this Certification, the Environment Article, the Clean Water Act, and all other applicable Laws and Authorizations. MDE may seek criminal, civil, and administrative penalties to the full extent provided by law for any violations of the provisions, requirements, and conditions set forth in this Certification, or for noncompliance with the Environment Article, the Clean Water Act, or other applicable Laws and Authorizations.

v. Record Keeping: All records and information resulting from the monitoring, sampling, record keeping, inspection, and reporting activities required by this Certification shall be retained during the Term, plus 5 years. This period shall be extended automatically during the course of litigation, or when requested by MDE. For any measurements or sampling taken to satisfy the requirements of this Certification, the Licensee shall record (a) the exact place, date, and time of sampling or measurement; (b) the person(s) who performed the sampling or measurement; (c) the dates and times the analyses were performed; (d) the person(s) who performed the analyses; (e) the analytical techniques or methods used; and (f) the results of all required analyses. The sampling and analytical methods used to shall conform to procedures for the analysis of pollutants as identified in 40 CFR Part 136 - "Guidelines Establishing Test Procedures for the Analysis of Pollutants" unless otherwise specified by MDE in writing.

vi. Right of Entry: In addition to any other right of entry provided for by law, MDE, or its authorized representatives, shall have the right to enter at reasonable times the premises or property that is the subject of this Certification (including the Reservoir and all land within Project boundaries) or where any records are required to be kept under the provisions, requirements, and conditions of this Certification. This right of entry shall include the right to:

a. Access and copy, at reasonable times, any records that are required to be kept under the provisions, requirements, and conditions of this Certification;

b. Inspect, at reasonable times, any monitoring equipment or monitoring method required in this Certification;

c. Inspect, at reasonable times, any discharge facilities subject to this Certification;

d. Conduct sampling, at reasonable times, of any discharge or of the water column in the River or Reservoir;

e. Take soil or sediment borings or core samples, at reasonable times, in the bed of the River or the Reservoir; and

f. Take photographs.

vii. Duty to Provide Information: The Licensee shall submit to MDE, within the time frame stipulated by MDE, any information that MDE may require to determine compliance with this Certification. The Licensee shall also submit to MDE, upon request, copies of any records required to be kept by this Certification. When the Licensee is required to submit to any other federal or State resource agencies any reports that relate to the Project, the Licensee shall also submit a copy to MDE. Subject to the Maryland Public Information Act, all information submitted to MDE or collected as a condition of this Certification may be made publicly available.

viii. Property Rights: The issuance of this Certification does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor does it authorize any infringement of federal, State, or local Laws.

ix. Notice / Reporting of Noncompliance: Unless MDE provides different instructions in writing from time to time, any notice or other submission due to MDE under this Certification shall be provided in writing to:

Maryland Department of the Environment
Water and Science Administration
1800 Washington Boulevard
Baltimore, Maryland 21230

For any violations of the provisions, requirements, or conditions of this Certification, the Licensee shall promptly notify MDE by telephone within twenty four (24) hours of discovery of the violation, at 410-537-3510. In addition, within five (5) days, Licensee shall provide MDE with the following information in writing:

a. A description of the violation, including the date, time, location, and estimated discharge volume (if applicable), and impact on receiving water;

b. The cause of the violation, to the extent known;

c. The anticipated time the cause of the violation is expected to continue, or, if the condition has been corrected, the duration of the period of the violation;

d. Steps taken by the Licensee to eliminate or correct the violation;

e. Steps planned or implemented by the Licensee to prevent the recurrence of the violation; and

f. A description of the Licensee's accelerated or additional monitoring to determine the nature of any impact or harm caused by the violation.

Any notice or other submission due under this Certification to any governmental agency other than MDE shall be provided in writing to such agency in accordance such agency's written instructions from time to time.

x. Web Portal: The Licensee shall maintain at all times during the Term a web site or page specifically designed to provide the public with access to the information contemplated by Section 2.C.vii (the "Web Portal").

xi. Annual Reporting: The Licensee shall submit annual reports to MDE by September 1 of each calendar year following the issuance of this Certification and shall contemporaneously post such reports on the Web Portal. The annual reports shall summarize all work performed by the Licensee to comply with the provisions, requirements, and conditions of this Certification, and shall be in a format approved by MDE.

xii. No Waivers: MDE's failure to enforce any provision, requirement, or condition of this Certification shall not constitute a waiver of MDE's right to enforce any such provision, requirement, or condition, or otherwise relieve the Licensee from compliance with any obligations imposed by this Certification.

xiii. Additional Monitoring: The Licensee shall undertake additional monitoring, studies, or other measures relating to compliance with WQS including designated and achieved uses if MDE determines that there is a likelihood that any violations of WQS including designated and achieved uses have occurred or may occur.

xiv. Transfer: The Licensee shall notify MDE in writing upon transferring property ownership or responsibility for compliance with these conditions to another person. The new owner/operator shall request in writing transfer of this Certification to its name.

xv. Severability: The provisions of this Certification are severable. If any provision of this Certification is held invalid for any reason, the remaining provisions shall remain in full force and effect. If the application of any provision of this Certification is held invalid, its application to other circumstances must not be affected. In the event any provision of this Certification is held invalid, and the Department determines that any applicable effluent limitation, other limitations, or water quality standards or requirements issued or approved under Sections 301, 302, 303, 306, and 307 of the Clean Water Act or applicable State Law will not be met (including the failure to sustain a designated or achieved use) or that State or federal Law will be violated, or that further conditions are necessary to assure compliance, the Department may reevaluate and modify this Certification in accordance with Section 7.Q.xvii to include additional conditions necessary to assurance compliance with all such limitations, standards, or requirements.

xvi. No Third Party Beneficiaries: No provisions of this Certification are intended, nor will be interpreted, to provide or create any third party beneficiary rights. No third party shall have any legally enforceable rights, claims, or benefits under this Certification as to the Department, nor shall forbearance to enforce any term of this Certification by the Department be construed as creating any rights, claims, or benefits for any third party. No third party shall have any rights to enforce the terms of this Certification against the Licensee except as may be expressly be provided by federal law, including the citizen suit provisions of the Clean Water Act. This Certification does not affect and is not intended to influence any third party's rights to independently investigate, evaluate, respond to, and file claims regarding any impacts from groundwater or surface water pollution.

xvii. Adaptive Management: This Certification may be re-opened to be modified in order to comply with any applicable effluent limitation, other limitations, or water quality standards or requirements issued or approved under Sections 301, 302, 303, 306, and 307 of the Clean Water Act or applicable State law if the limitation, standard, or requirement so issued or approved contains different conditions or is otherwise more stringent that any requirements of this Certification. If MDE determines that any applicable effluent limitation, other limitations, or water quality standards or requirements issued or approved under Sections 301, 302, 303, 306, and 307 of the Clean Water Act or applicable State law are not being met (including the failure to sustain a designated or achieved use) or that State or federal law are being violated, or that further conditions are necessary to assure compliance, MDE may reevaluate and modify this Certification to include requirements or conditions necessary to assure compliance with all such limitations, standards, or requirements. This includes:

a. Additional requirements or conditions are necessary to address adverse or potentially adverse Project effects on water quality or designated or achieved uses that did not exist or were not reasonably apparent when this Certification was issued;

b. There is a change in the Project or its operations that was not contemplated by this Certification that might adversely affect water quality or designated or achieved uses;

c. The re-licensing of Holtwood and/or Safe Harbor, as well as any changes associated with Muddy Run's FERC license or the Section 401 water quality certification for Muddy Run, requires alignment of flow, fish passage, sediment, nitrogen, and phosphorus-related conditions in this Certification;

d. Future TMDLs or modifications to existing TMDLs (not otherwise addressed in this Certification) identify impairments that justify additional conditions in order to ensure that WQS including designated and achieved uses are met over the Term;

e. Revised conditions related to trap and transport credits for fish passage are necessary based on review in subsequent years of the federal license of whether numeric targets for the number of Shad upstream of the York Haven Dam are being met;

f. MDE obtains any information providing a sound, science-based rationale for modifying any Plans or any requirements or conditions in this Certification, including information pertaining to climate change; or

g. Any typographical error is found in this Certification.

Any modified conditions of this Certification shall, so long as it is in effect, become a condition of any federal Authorization that is hereafter issued for the Project, and MDE may seek, in accordance with applicable Law, to have any modified Certification condition incorporated into any existing federal Authorization for the Project.

xviii. Reimbursement of Oversight Costs: The Licensee shall reimburse MDE and DNR for the reasonable and actual costs incurred by MDE, DNR and their contractors in connection with the direct administration and oversight of Licensee's compliance with this Certification, including any costs for conducting environment health monitoring or testing, collecting and analyzing soil samples, surface water samples, or groundwater samples, or reviewing any data, plans or information submitted by the Licensee. The maximum amount of costs for which Licensee shall be required to reimburse MDE pursuant to this Section 7.Q.xviii shall be Two Hundred Fifty Thousand ($250,000) per year, and the maximum amount of costs for which Licensee shall be required to reimburse DNR pursuant to this Section 7.Q.xviii shall be Two Hundred Fifty Thousand ($250,000) per year *provided*, that each of the foregoing amounts shall be adjusted for inflation after the date of this Certification on July 1, 2019 and on July 1 of each year thereafter, based on the cumulative change in the CPI.

xix. Final Decision; Appeal Rights: This is a final decision on the Application. Any person aggrieved by the Department's decision to issue this Certification may appeal such decision in accordance with COMAR 26.08.02.10F(4). A request for appeal shall be filed with the Department within 30 days of publication of the final decision, and specify in writing (a) the reason why the final decision should be reconsidered; and (b) a detailed description of the requestor's specific legal right, duty, privilege, or interest which may be adversely affected by the Department's final decision. A request for appeal shall be submitted to: Secretary of the Environment, Maryland Department of the Environment, 1800 Washington Boulevard, Baltimore, MD 21230. After issuance of notice of the Department's decision on the request for reconsideration, a contested case hearing shall be available in accordance with the applicable provisions of State Government Article, § 10-201, et seq., Annotated Code of Maryland. Any request for an appeal does not stay the effectiveness of this Certification.

DATED this 27th day of April, 2018.

D. Lee Currey
Director
Water and Science Administration
Maryland Department of the Environment
State of Maryland

ATTACHMENT #1
To Clean Water Act Section 401 Certification For the Conowingo Hydroelectric Project
FERC Project No. P-405 / MDE WSA Application No. 17-WQC-02

MDE Fish Passage Improvement Plan ("MDE-FPIP")

This MDE-FPIP is based on the requirements of DOI's Modified Prescription for Fishways Pursuant to Section 18 of the Federal Power Act for the Project, dated June 8, 2016 (the "Prescription"), which shall be authoritative guidance for purposes of interpreting this MDE-FPIP and defining the Licensee's obligations hereunder. Notwithstanding the foregoing, in the event of any conflict between this MDE-FPIP and the Prescription, this MDE-FPIP shall govern and control.

Without limiting the generality of Section 2.C.ii of the Certification, in all cases where this MDE-FPIP requires the Licensee to consult with or make any submission to MDE, the Licensee shall also consult with, or make such submission to DNR, unless otherwise specified.

1. Initial Fishlift Capacity

The Licensee shall provide a fish lift capacity of at least 7 million pounds of fish per season immediately after issuance of the New License. Two 6,500-gallon hoppers sharing the same holding pool, with a cycle time of 15 minutes, provides capacity to move 7 million pounds of fish in a single season. Based on projected numbers of a successful Shad restoration using the population model, a fish lift capacity of 7 million pounds of fish should provide safe passage at the Project for approximately half of the Term (assuming that the gizzard shad population does not grow larger than 4.4 million fish). For details on calculating fish lift capacity, refer to Appendix A to this MDE-FPIP.

2. Final Potential Fishlift Capacity

The Licensee shall construct sufficient fishlift capacity during the Term to ensure that as populations of Shad and Herring grow in the system, that fishlift capacity is increased as necessary to ensure that upstream passage is not impeded by undersized fishlift capacity preventing the attainment of the restoration objectives. MDE recognizes the potential lack of capacity during the later years of Shad and Herring restoration, and will re-open this Certification to address this issue at a later date if fishway capacity appears to be a limiting factor to population restoration, as reflected in declining upstream fish passage efficiency due to lack of fishway capacity.

3. Design Flows for Fishways/Fishlifts

The Licensee shall design new fishlifts to ensure operation under River flows in the range of 6,330 cfs to 143,000 cfs. However, the Licensee shall not be required to operate the fishlifts at flows greater than 113,000 cfs unless data available at the time demonstrates that operation of fishlifts at flows greater than 113,000 cfs is necessary to achieve the target efficiency.

Furthermore, the fishlifts shall be designed with sufficient freeboard (or other protection) to minimize damage from River flows of up to the 50-year return interval.

4. Efficiency Criteria

The Licensee shall meet the SRAFRC (2010, 2013) and the USFWS (2015b) upstream and downstream passage efficiency criteria for the River basin that are the basis for the Department of the Interior (DOI) 2016 Modified Fishway Prescription (and the requirements of this Certification). MDE defines upstream fish passage efficiency as the proportion of the fish in the Tailwaters that successfully move through the fishlift and continue upstream migrations, calculated as a percentage. Downstream fish passage efficiency is the proportion of the fish that approach the upstream side of the Project and survive unharmed as they pass the Project and continue downstream migrations. Definitions for certain fish passage terms used in this MDE-FPIP are provided in Section 18 of this MDE-FPIP. Where no numeric efficiency criteria are set, MDE's goal is to minimize Project impacts to migratory fish populations, with a goal of 100 percent passage and the understanding that no project is likely to fully achieve that goal despite application of the best available technology. Where MDE, based on DNR analysis, has information or modeling indicating that restoration may be achieved with less than 100 percent passage, MDE has adopted numeric targets that will achieve restoration, and measures to reach those targets.

4.1 Criteria for Upstream Shad Passage Efficiency

The Licensee shall operate the Project to achieve the upstream passage efficiency criterion of passing 85 percent of all adult Shad that enter the Tailwaters ("Target Efficiency"). The Licensee can receive additional credit toward achieving the upstream passage efficiency criterion for adult Shad by trapping at the Project and transporting Shad to upstream of York Haven Dam and thus avoiding upstream passage impediments at the intervening hydroelectric projects on the River (see Section 13 of this MDE-FPIP).

4.2 Criteria for Downstream Shad Passage Efficiency

The Licensee shall operate the Project to achieve the downstream survival efficiency criterion of at least 80 percent of the adult Shad moving downstream past the Dam. The Licensee shall operate the Project to achieve the downstream survival efficiency criterion of at least 95 percent of the juvenile Shad moving downstream past the Dam.

4.3 Criteria for Upstream Herring Passage Efficiency

The Licensee shall operate the Project to provide safe, timely and effective upstream migration for adult Herring that approach the Tailwaters. MDE reserves the right to develop numerical criteria for upstream Herring passage efficiency in the future when additional information about Herring populations becomes available and re-open this Certification in the future to establish required numeric targets for upstream passage efficiency for Herring. Any needed change in fishlift requirements resulting from such new targets is not provided for in this Section 4 and would also be considered a basis for re-opening the Certification.

4.4 Criteria for Downstream Herring Passage Efficiency

The Licensee shall operate the Project to achieve the downstream survival efficiency criterion of at least 80 percent of the adult Herring moving downstream past the Dam. The Licensee shall operate the Project to achieve the downstream survival efficiency criterion of at least 95 percent of the juvenile Herring moving downstream past the Dam.

5. Seasonal Implementation of Fish Passage

5.1 The Licensee shall operate a fishlift for upstream passage of anadromous fish daily during the Shad and Herring upstream Migration Period, as set forth in Appendix D to this MDE-FPIP. The Licensee shall operate the fish lift(s) daily during the upstream Migration Period, and begin releasing attraction flows at least one hour prior to the start of daily lift operations. The fish lift(s) will operate at the following times during the Migration Period: (1) in March, from 7 a.m. to 7 p.m.; (2) in April, from 6:30 a.m. to 7.30 p.m.; and (3) in May and June from 6:00 a.m. to 8:00 p.m.

5.2 The Licensee shall ensure prior to the start of the Migration Periods that all mechanical elements of the fishlifts are working properly. The Licensee shall repair, maintain, and test fishlifts as necessary in advance of the migration period, in accordance with the Fishlift Operation and Maintenance Plan ("FOMP") so as to begin operations when required.

5.3 The Licensee shall maintain and operate fishlifts to maximize fish passage effectiveness throughout the upstream and downstream migration periods, as set forth in Appendix D to this MDE-FPIP.

6. Fishlift Operation and Maintenance Plan

6.1 The Licensee shall develop and submit a FOMP to MDE approval. The Licensee shall keep the FOMP updated on an annual basis, to reflect any changes in fishlift operation and maintenance planned for the year. If MDE requests a modification of the FOMP, the Licensee shall respond to the requested modification within 30 days of the request by filing a written response with MDE.[1] Any modifications to the FOMP by the Licensee shall require approval by MDE. The FOMP shall include:

(a) Schedules for routine maintenance, pre-season testing, and the procedures for routine fishlift operations, including seasonal and daily periods of operation, and associated Dam and powerhouse operational measures needed for proper fishlift operation;
(b) Details of how the Project shall be operated during the migration season to provide for adequate fish passage conditions, including:
    (i) Pre-season preparation and testing;
    (ii) sequence of turbine start-up and operation under various flow

[1] Requested modifications to the FOMP will not include changes to turbine operations. Any modifications to turbine operations shall be implemented only pursuant to Section 8.

regimes to enhance fishlift operation and effectiveness;

(iii) debris management at the fishway entrance, guidance channels, and the exit; and

(iv) plant operations to provide near- and far-field attraction flows required for the fishlift zone of passage in the tailrace;

(c) Trap and transport logistics plan and design plans for west and east fish lift modifications needed for trap and transport, including provisions for planning trap and transport logistics so as to avoid, to the extent possible, trapping a population unrepresentative of the migrating population as a whole.

(d) Procedures for removing invasives (see Attachment #3 for invasive species requirements) and sturgeon handling;

(e) Standard operating procedures for monitoring and enumerating fish passage by species;

(f) Standard operating procedures for collecting biological samples from target species to assess restoration efforts;

(g) Standard operating procedures for monitoring and reporting operations that affect fish passage;

(h) Standard operating procedures in case of emergencies and Project outages to first, avoid, and second, minimize, potential negative impacts on fishway operations and the effectiveness of upstream and downstream passage for target species; and

(i) Plans for post-season maintenance, protection, and winterizing the fish lifts and Eel passage facilities.

6.2 The Licensee shall provide written documentation to MDE that all fishlift operational personnel have reviewed and understand the FOMP and it shall be signed by the operations manager of the Project. Copies of the approved FOMP and any modifications shall be provided to MDE on an annual basis.

6.3 By December 31 of each year, the Licensee shall provide an annual report to MDE detailing: the implementation of the FOMP, including any deviations from the FOMP and a process to prevent those deviations in the future; any proposed modifications to the FOMP, or in the case of emergencies or Project outages, the steps taken by the Licensee to minimize adverse effects on fisheries including any proposed modifications to those steps to further enhance their effectiveness in the future; and operational data for both fishlifts and the Project to allow MDE and others identified by MDE to examine correlations between particular operational patterns and successful or unsuccessful fishlift operation; and to confirm, once an operational regime with known effectiveness is settled upon, that the Project continues to operate under that regime. MDE understands that details of operation constitute confidential business information, and agrees to protect them from disclosure as such to the extent it is able to do so by law. The annual report shall also include:

(a) Description of routine maintenance as well as repairs made to the fishways or Eel passage facilities during the previous fish passage season;

(b) Average daily flows at the Marietta Gage;

(c) Daily water temperature and DO readings in the fish lift and Tailwater areas;
(d) Hourly individual turbine unit operations and discharge, hourly total discharge from the powerhouse, hourly discharge over the spillway, and hourly passage counts of all fish species at each lifted hopper;
(e) Index for every lift of each hopper's "fullnesss" through visual observations and shall be developed in consultation with MDE; provided, that if technology becomes available to quantify the bucket "fullness", then after a written request from MDE, the Licensee shall incorporate this technology;
(f) Thirty-minute recordings of total flow discharging from behind the hopper, total flow discharging from the attraction water supply diffuser, water surface elevation immediately upstream from the entrance gates, water surface elevation at the Tailwaters, elevation to the crest of the entrance weir gates, and any irregularities such as the identification of a visible boil in the zone over the floor diffusers;
(g) Number of fish by species trapped and transported, including date, time, and location of release; and
(h) Daily collection of biological information from adult Shad, gizzard shad, Herring, or other species as designated by MDE to include sex ratio, condition, length, weight, and age.

6.4 In addition to the annual report, the data for daily flows, water quality, Project operations, fishlift operations and fish passage as described above shall be recorded in a database during the fish passage season and MDE and its designees shall be provided open access to that database. Data shall be entered into the database no later than one week after collection. These data shall be used to assess the impacts of River conditions and hydropower operations on successful fish passage through the lifts, with the goal of achieving a better diagnosis of potential fish passage issues at the Project.

6.5 By January 31 of each year, the Licensee shall consult with MDE to discuss the FOMP. This meeting shall occur no later than January 31 of each year unless the Licensee and MDE agree on a different date. At this annual meeting the participants shall discuss the fish passage results from the previous year, review regulatory requirements for fish lift operations, and discuss any modification or testing the Licensee shall conduct during the upcoming season.

7. Sequencing of Upstream Fish Passage Construction and Implementation

Timely construction, operation, and maintenance of fishlifts is necessary to ensure their effectiveness and to achieve restoration goals. Therefore, the Licensee shall: (1) notify, and (2) obtain approval from MDE for any extension of time to comply with conditions MDE has required.

7.1 Trap and Transport of Shad and Herring

The Licensee shall trap and transport Shad and Herring to areas upstream of York Haven Dam annually. The number of Shad and Herring trapped and transported annually will be

up to 80 percent of the number of each species captured in the fish lifts up to a maximum of 100,000 of each species annually. Trap and transport operations shall continue until the Licensee achieves a measured 85 percent upstream passage efficiency for Shad at the Project without reliance on the trap and truck credit as provided for in Section 13 of this MDE-FPIP.

7.2 Initial Construction

Unless otherwise stated, the Licensee shall implement the requirements of Section 10.1 of this MDE-FPIP by September 1, 2021. Construction shall be conducted in a way as to allow for trap and transport operations as well as volitional passage at the EFL to continue uninterrupted during this time period. A fish trap shall be constructed in the EFL no later than September 1, 2019. It shall be capable of trapping and holding target fish while continuing to pass fish. Safe and effective transfer of fish from the trap to the tailrace is required. The design must be approved by MDE prior to construction.

7.3 Operation in the First Passage Season after License Issuance

No later than September 1, 2019, trap and transport operations from the EFL and WFL shall begin. A total of 80 percent of the run, up to 100,000 Shad and 100,000 Herring per year shall be trapped and transported to the mainstem River upstream of York Haven.

8. Efficiency Testing and Triggering of Subsequent Modifications

8.1 No later than September 1, 2023, the Licensee shall begin the "Initial Efficiency Test" of fish passage at the Project. The Licensee shall conduct the Initial Efficiency Test as defined in Section12.2 of this MDE-FPIP in order to evaluate passage performance relative to upstream efficiency criteria for Shad and Herring as described in Section 4 of this MDE-FPIP. Gizzard shad or other designated species (to be designated by MDE with input from DNR) shall be included in all efficiency tests to understand how they affect efficiency for Shad and Herring. In the 5th year after the year in which the New License is issued, the Licensee shall also assess mortality of Shad during the trap and transport process.

8.2 If at the end of the Initial Efficiency Test, the combined results of the three-year study (the combination of measured efficiency of the Initial Efficiency Test and the "Trap and Transport Credit" (as described in Section 13 of this MDE-FPIP) resulting in an "Adjusted Efficiency") meet the Target Efficiency of 85 percent for upstream passage of Shad, the Licensee shall operate the Project using the FOMP implemented during the Initial Efficiency Test. The Licensee shall then conduct a two-year "Periodic Efficiency Test" as defined in Section 12.2 of this MDE-FPIP in every 5th year thereafter to ensure that the upstream-prescribed efficiency criterion continues to be met through the Term.[2]

8.3 If at the end of the Initial Efficiency Test or after any Periodic Efficiency Test thereafter during the Term, or after any subsequent "Post-Modification Efficiency Test" as defined

[2] At the Licensee's election, and with MDE concurrence, the Periodic Efficiency Test may be extended an additional one year. Only after the efficiency tests are completed will the Licensee be required to propose, as may be necessary, a course of action to achieve the Target Efficiency.

in Section 12.2 of this MDE-FPIP, the study results indicate that the Licensee is not meeting the required Adjusted Efficiency, the Licensee shall conduct an evaluation of the radio telemetry data and any other data available to MDE and/or the Licensee to determine why passage efficiency is inadequate. Concurrent with the submission of the final report from an efficiency study, the Licensee shall propose a course of action most likely to achieve the Target Efficiency. MDE has designated a tiered list of options and the types of passage or capacity problems which the tiers may address. If the reason for not achieving the Target Efficiency is insufficient fishlift attraction, then the Licensee shall follow the actions in Section 10.2 of this MDE-FPIP.

If the fish lift capacity is insufficient then the Licensee shall follow the actions in Section 11 of this MDE-FPIP. In the event that both fishlift attraction and fish lift capacity are limiting factors to achieving the Target Efficiency, the Licensee shall address items listed under both Sections 10.2 and 11 of this MDE-FPIP, but only to the extent both attraction and capacity measures are necessary to achieve the required Target Efficiency and alleviate over-capacity. The list of measures in Sections 10.2 and 11 of this MDE-FPIP is not exclusive and does not preclude MDE or the Licensee from identifying and proposing other measures commensurate with the required level of improvement and corresponding tier. MDE shall react to the Licensee's proposal for improving fish passage efficiency within 90 days of receipt. It may:

(a) Say nothing, in which case the Licensee shall proceed with its proposed course of action;
(b) Agree affirmatively with the Licensee's proposed course of action, in which case the Licensee shall proceed;
(c) Propose a different option, not on the tiered list of options, which the Licensee shall proceed with if it agrees;
(d) Require, instead, that the Licensee implement an option or options from the appropriate (or lower numbered) tier to address each problem. MDE will choose that option (s) it deems most likely to achieve the *Target Efficiency. MDE* may select an option from a higher-numbered tier only if all options from an appropriate or lower-numbered tier have been implemented. If two or more options appear equally likely to achieve the efficiency criterion, MDE will present the Licensee with the choice, and the Licensee may proceed with whichever it prefers. MDE shall explain, in writing, its reasons for finding that its choice(s) is more likely than the Licensee's to lead to the desired passage efficiency. The Licensee shall then proceed with the selected course of action.

9. General construction requirements.

All functional (i.e., 30 percent, 60 percent, and 90 percent) and final design plans, operation and maintenance plans, construction schedules, and hydraulic model studies for the new fishlifts or modifications to existing fishlifts described herein shall be submitted to MDE for approval. The planning and design process for structures shall generally include computational fluid dynamics (CFD) modeling prior to construction and post-construction shakedown and testing to confirm modeling.

MDE, DNR, and USFWS shall be consulted during the design and construction of the fishlifts and MDE must approve all plans in writing prior to construction initiation. Upon a decision to build or modify, the Licensee shall meet with MDE, DNR, and USFWS to develop detailed construction plans and schedules, which shall be submitted for MDE approval no later than March 1, 2019, and thereafter, by January 31 of each construction year for approval by MDE. The detailed construction schedules shall be designed to minimize interruption of the fishlift operations and, to the extent possible, fishlift operation interruptions shall be scheduled during the month of June.

10. Fish Passage Facilities

10.1 Initial Construction Items

(a) *East Fish Lift Modifications*. The Licensee shall modify the EFL facility to provide 900 cfs attraction flow to the EFL. If the attraction flow cannot be provided within the current EFL structure without exceeding USFWS design specifications, flow in addition to internal EFL flow will be provided to achieve a total of 900 cfs. Modifications to the EFL facility will include replacing spillway gates A & B, replacing the crowder system, addressing structural vibration issues, replacing diffuser gates A and B, replacing the control system, and upgrading the electrical system to allow for a 15 minute lift cycle.

(b) *Replace the current 3,300-gallon hopper with two 6,500-gallon hoppers at the EFL*. The Licensee shall remove the current hopper and install two 6,500-gallon hoppers within the existing superstructure of the EFL. One hopper will replace the current 3,300-gallon hopper and the second hopper will be located immediately upstream from the current location of the existing EFL hopper (see Figure 10 from the DOI Modified Fishway Prescription of June 2016 showing the conceptual drawing of proposed modifications to the EFL). Access to both hoppers will be provided by the current entrance gates (A, B, and C) and the hoppers will share the same holding pool.

(c) *Trap and Transport Facilities at the EFL*. The Licensee shall reduce cycle time at each hopper at the EFL to be able to lift fish four times per hour and complete modifications to the EFL structure to allow for trapping and sorting fish at the EFL facility and transporting them to the western side of the Dam to a truck for transport upstream. Modifications to the EFL shall include two new sorting tanks; a loading tank; and a by-rail truck and forklift, or functionally similar equipment, to facilitate movement of Shad from sorting tanks at the EFL to the west shore. These improvements shall be accomplished without losing a season of the passage provided by the EFL.

(d) *Trap and Transport Facilities at the WFL*. WFL modifications shall be made to facilitate trap and transport including: decreasing lift cycle time by replacing the crowder linkage system and raising the elevation of the sorting tank(s), and providing a mechanism to allow for direct sluicing of fish into tanks mounted on the transport vehicle. These initial improvements shall be accomplished without losing a season of the passage provided by the EFL or trap and transport from the WFL.

(e) *Provide a Zone of Passage (ZOP) to the Fish Passage Facilities*. The Licensee shall construct and maintain structures, to provide Shad and Herring a ZOP (i.e., route of passage) as described in this Section 10.1(e). In advance of any ZOP development and/or construction, MDE and the Licensee will review CFD modeling results from the tailrace. The Licensee shall run the model under a predetermined number of structures arrangements (e.g., different angles, different spacing between the weirs, different weir slopes). In consultation with MDE, the Licensee shall choose to construct the configuration of structures that provides the most conducive hydraulic conditions for fish passage of Herring. The area to be considered for potential ZOP improvements includes approximately 2,500 feet on the west bank and 3,500 feet on the east side of Rowland Island. Based on CFD modeling results that analyze discharge velocities and turbulence, the Licensee shall provide stone weirs, and/or other suitable alternatives or measures that provide a contiguous ZOP from the southern tip of Rowland Island to one or both of the lifts. The Licensee shall install up to ten stone weirs, with the option of considering other configurations for structures. Model results will guide the placement and formation of these structures to provide for the hydraulic conditions necessary for the weakest swimmers (Herring) to reach the lifts. Specifically, the ZOP must be designed to maintain instantaneous velocities below 3 feet per second, separated only by brief regions of higher velocity that Herring may traverse in seconds at burst speeds up to 6 feet per second, over the full range of operational flows for the EFL, and in all generation scenarios. After ZOP construction is completed, the Licensee shall assess the ZOP for upstream migrating Herring under the full range of the current fish passage design flows (i.e., up to 113,000 cfs of River flow). These structures shall also minimize or eliminate sheltering areas for predators. The ZOP shall be subject to approval by MDE.

10.2 Improving Attraction Efficiency

Presented below is a list of physical and operational modifications to the Project intended to address observed deficiencies in fishlift attraction efficiency. The tiered process for improving attraction efficiency is based on passage efficiency during the most recent efficiency test. The items included in the different tiers were developed to be commensurate with the degree of shortfall from the *Target Efficiency*. If, based on the *Adjusted Efficiency* of the current test, all appropriate options from the corresponding tier, including any option proposed by the Licensee and approved by MDE have been exhausted, the items from the next highest numbered tier may be required, regardless of the current Project passage efficiency. More than one item from a tier may be completed at one time depending on the degree of the *Adjusted Efficiency* shortfall.

(a) *Tier I (Adjusted Efficiency 70%-85%)*. In the year following any failure by the Licensee to reach the *Target Efficiency* due to inadequate fishway attraction, the Licensee shall implement one or more of the modifications to Project operations and facilities described in this Section 10.2(a).

(i) *Correct any Technical Operational Problems and/or Implement Internal Modifications*. The Licensee shall correct any technical operational problems that may have been detected during the fish passage season and/or implement internal modifications to the WFL and/or EFL (e.g., energy dissipation, hydraulic attraction).

(ii) *Implementation of preferential turbine operating schemes.* The Licensee shall develop a turbine operation scheme that can range from simply first on/last off to modification of specific Francis and Kaplan unit operation to ensure that fish are able to successfully locate and access the fish lift entrances.

(iii) *Increase attraction flow at the EFL.* The Licensee shall construct an alternative attraction water structure as part of the EFL which shall be constructed to allow more than 1,000 cfs during the fish and Eel migration season and be adaptable for fish and Eel attraction and maintain velocities at or below USFWS criteria. The alternative attraction water structure and velocities must use field verification for the target species.

(b) *Tier II (Adjusted Efficiency 55%-69%).* Within 2 years following any failure to meet the *Target Efficiency,* the Licensee may implement either one of the modifications to the Project facilities described in this Section 10.2(b) to reach upstream passage efficiency.[3]

(i) *Relocate EFL Entrances A & B.* If the CFD modeling results indicate modifications to Entrances A & B will improve guidance to and accessibility of the lift entrances, then the Licensee shall extend the entrance channel at entrance A with two 45-degree turns in the fish passage facility channel, so as to discharge into the area behind the catwalk piers and upstream from the Kaplan turbine discharge/boil. The attraction flow should be effective along the catwalk and through the space between the piers. The Licensee shall also modify the existing entrance B so that the centerline of the discharge plume will be at a 45-degree angle to the River flow.

(ii) *Construct new Entrances with a separate crowder and holding pool.* No later than December 31, 2033, the Licensee shall build new entrances with a separate crowder and holding pool (Figure 10). The hopper will be accessed from the new entrance and through a proposed collection gallery that will span the full length of the Kaplan turbine section of the powerhouse. The new entrances and the collection gallery are intended to provide access to the EFL from the Francis turbine section of the powerhouse. The new collection gallery will be located against and along the powerhouse wall.

(c) *Tier III (Adjusted Efficiency less than 55%).* Following any failure by the Licensee to reach upstream passage efficiency, the Licensee may implement one or more of the modifications to Project operations and facilities described in this Section 10.2(c).

(i) *Construct an Auxiliary Water Supply (AWS) at the EFL.* The Licensee shall construct a new AWS stilling basin and system so the energy from up to 4,300 cfs

[3] MDE may require relocation of Entrances A&B and, if the *Adjusted Efficiency* continues to be between 55%- 69%. Entrance D at a later point. But then, per Tier III (and consistent with the "not before" dates), may only require the AWS, not the WFL. Alternatively, MDE may require the relocation of Entrance A&B. and in subsequent cycles proceed to choose the WFL (again. consistent with the "not before" dates) if(a) the *Adjusted Efficiency* is below 55% and Entrance D has not been constructed or (b) the *Adjusted Efficiency* is between 55%- 69% and MDE determines that Entrance D is not likely to achieve the efficiency criterion.

can be dissipated and incorporated into effective attraction flows emanating from the multiple fish lift entrances.

(ii) *WFL Construction.* No later than December 31, 2043, the Licensee shall construct a new WFL (as described below, in parts 1-5) in the west corner of the powerhouse tailrace. The Licensee shall operate the new WFL as a Tailwater to headpond fish lift with a collection facility for fish sampling that could be used as a fish trap and transport facility. If MDE requires construction of the WFL for reasons of passage efficiency, it agrees not to subsequently require the EFL AWS stilling basin and system before 10 years after the completion of the WFL.

(A) WFL Construction, Part 1. The Licensee shall construct a facility that provides the capability of enumerating fish passage by species, allows for two independent trapping and holding facilities for biological sampling while continuing to pass fish, and that can also be used for trapping and transporting Shad and Herring with the potential for captured fish to be transported upstream of the York Haven Dam.

(B) WFL Construction, Part 2. The Licensee shall install two 6,500-gallon hoppers, with separate crowders, in the new WFL, capable of operating simultaneously.

(C) WFL Construction, Part 3. The Licensee shall construct the WFL to have the ability to provide up to 5 percent of hydraulic capacity of the Project (or up to 4,300 cfs) for attraction flow to the fishway entrance(s). During the design phase and during preconstruction, the Licensee shall conduct CFD modeling and other supporting analysis to develop appropriate fish lift entrance attraction flows, velocities, and hydraulic conditions. The Licensee shall operate the WFL to provide attraction flow of at least 2,600 cfs (3 percent of hydraulic capacity of the Project) during the Upstream Migration Period for Shad and Herring. With the goal of improving fish passage efficiency at the WFL following initial start-up of the new WFL, MDE may require the lift operator to modify operation of the fish lift, the allocation of flows through its AWS, and/or the total amount of flow being supplied to the WFL (up to a maximum of 4,300 cfs or 5 percent of the Project hydraulic capacity).

(D) WFL Construction, Part 4. The Licensee shall design and construct an AWS that meets science-based criteria for energy dissipation of the attraction flow while maintaining water quality standards.

(E) WFL Construction, Part 5. The Licensee shall conduct an assessment of the ZOP downstream of the WFL to ensure that it continues to be passable over the range of flows in which the WFL is operational.

11. Improving Fish Lift Capacity

Presented below are physical and operational modifications to the Project intended to address deficiencies in fish lift capacity. Implementation of modifications in the capacity tiers is independent of the implementation of similar items used to improve passage efficiency. Both

attraction and capacity improvements can be required simultaneously if deemed appropriate from the most recent study results and capacity calculations.

Capacity shall be deemed exceeded if daily capacity is exceeded more than 5 days in a passage season. If an index of fullness indicates that one hopper is consistently fuller than the other, capacity shall be prorated based on that index. Over the Term, depending on the length of the migratory run (as defined by the cumulative five percent to ninety-five percent) the number of days designated to define overcapacity may be changed by MDE in consultation with the Licensee.

11.1 Tier I (Adjusted Efficiency 70% — 85%)

Within 2 years following the Project having been deemed by MDE to have exceeded capacity, the Licensee shall submit to MDE for approval a plan to implement new additional entrances with a separate crowder and holding pool. The new hopper will be accessed from the new entrance and through a proposed collection gallery that will span the full length of the Kaplan turbine section of the powerhouse. The new entrances and the collection gallery are intended to provide access to the EFL from across the Kaplan section and the Francis turbine section of the powerhouse. The new collection gallery will be located against and along the powerhouse and shall be adaptive for fish including Eels. The new collection gallery shall be located against and along the powerhouse wall.

11.2 Tier II (Adjusted Efficiency less than 70%)

Within 3 years following any failure by the Licensee to reach upstream passage efficiency due to inadequate fishlift capacity, the Licensee shall submit to MDE for approval a plan to implement a new WFL (as described in Section 10.2(c)(ii) of this MDE-FPIP) in the west corner of the powerhouse tailrace. The Licensee will operate the new WFL as a Tailwater to headpond fish lift with a collection facility for fish sampling that could be used as a fish trap and transport facility. The WFL shall have a trap system with two independent holding facilities allowing passage while both traps are being operated.

12. Fish Passage Effectiveness Monitoring

Efficiency testing of both upstream and downstream fish passage, and determining mortality rates of Shad when using trap and transport are critical to evaluating the success of fish passage structures and operations, diagnosing problems, and determining both when modifications are needed and what modifications are likely to be effective. These measures are essential to ensuring the effectiveness of fishlifts over the Term, particularly in cases where the increasing size of fish populations as a result of improved upstream passage may also lower upstream fish passage efficiencies due to migrating fish crowding and exceeding daily or annual lift capacity, thus keeping some fish from successfully passing the Dam and limiting net effectiveness.

12.1 Fishway Effectiveness Monitoring Plan

The Licensee shall submit to MDE for approval a Fishway Effectiveness Monitoring Plan ("FEMP") no later than March 1, 2019. The FEMP will contain the plans for the studies described in Sections 12.2 through 16 of this MDE-FPIP. If MDE requests a modification of the FEMP, the Licensee shall file a written response with MDE within 30 days. Any modifications to the FEMP by the Licensee will require approval by MDE prior to implementation.

The Licensee shall submit yearly interim study reports to MDE following the conclusion of each study year. The interim and final reports for upstream passage studies will be submitted to MDE by December 31st of each study year. The interim and final reports for downstream passage studies will be submitted to MDE by August 1 following each study year. The final study report will include results for each life stage and type of study conducted with a determination of the Licensee's success or failure in achieving the passage efficiency criteria established in this Plan. In conjunction with submitting the final study report(s), the Licensee shall also provide electronic copies of all data collected from studies to MDE.

The Licensee shall consult with MDE to discuss the FEMP. This meeting will occur no later than January 31 each year unless the Licensee and MDE agree on a different date. At this annual meeting the participants shall discuss with the fish passage results from the previous year, review regulatory requirements for fish lift and Eel passage operations, and discuss any upcoming modification or testing the Licensee proposes for the upcoming fish passage season.

12.2 Initial Efficiency Test, Post-Modification Efficiency Tests, and Periodic Efficiency Tests for Upstream Passage of Shad and Herring

The *Initial Efficiency Test* and any *Post-Modification Efficiency Tests* will consist of a three-year fish tagging and monitoring study of Shad and Herring using radio telemetry, or other best tracking technology. If after two years the criteria cannot mathematically be obtained by a third year of study, the initial efficiency test will be concluded. The *Periodic Efficiency Tests* will consist of a two-year Shad-tagging study using the same techniques unless the Licensee elects, with MDE concurrence, to conduct an additional one year of study. The *Initial Efficiency Test* will begin in the 5th passage season after New License issuance. The *Post-Modification Efficiency Test* will begin in the first fish passage season immediately following any required modification implemented from the tiers. The *Periodic Efficiency Test* will be conducted on every 5th year after a previous study determines that the *Adjusted Efficiency* of the Project is achieving 85 percent passage efficiency for Shad. Early Periodic Efficiency Tests may be delayed by up to two years to coincide with the schedule for tests at Muddy Run agreed upon in the 2015 Settlement Agreement between USFWS and the Licensee.

These studies will use sufficient numbers of test fish to account for drop-back and other fish loss. These fish will be collected from a downstream location, and be representative of the migrating population as a whole. Specific details of the telemetry studies such as sample sizes, collection of and release location of tagged Shad and Herring, arrangement of telemetry receivers,

and appropriate statistical analyses shall be developed by the Licensee in conjunction with MDE and other resource agencies. The Licensee shall submit final study plans to MDE for approval prior to initiating any study.

13. Trap and Transport Credit for Shad

The Licensee shall receive additional credit toward the upstream passage efficiency criterion for adult Shad that are trapped and transported upstream of York Haven Dam. MDE will recognize the benefits to the species by giving credit towards the calculation of whether the efficiency criterion for upstream Shad passage is met, due to the value to restoration of avoiding the passage of impediments at the upstream hydroelectric projects. Details of the credit toward the efficiency criterion are provided in Appendix A to this MDE-FPIP. Part of the calculation of the credit toward efficiency criterion requires an estimate of the mortality associated with trap and transport operations. Beginning January 1, 2023, the Licensee shall work with MDE and other resource agencies to develop a one-year study to estimate the mortality of fish which are trapped and transported to areas upstream of York Haven Dam. Such a study will include assessment of immediate mortality (mortality occurring during transport) as well as delayed mortality (mortality occurring during some time period after release). The results of the study will be used to modify, as necessary, the mortality input utilized in the trap and truck credit. MDE adopts the Service's proposed methodology for this study as described in Appendix C to this MDE-FPIP; however the Licensee and MDE must reach agreement on the final methodology and final study design post-licensing.

14. Downstream Adult and Juvenile Shad and Herring Effectiveness Testing

The Licensee shall conduct downstream passage effectiveness studies of Shad and Herring in 2027 in coordination with MDE. As part of the FEMP for downstream passage, the Licensee shall evaluate both juvenile and adult life stages using a study protocol developed cooperatively with MDE to include a Reservoir route of passage study and an evaluation of passage survival. A route of passage study will be conducted to determine the routes chosen by downstream migrating fish through the Project under various generation conditions to determine if there are preferred routes of passage at the Dam and variations on survival through each of the routes. The route of passage study will be conducted for 2 years to account for inter-annual variation in flow conditions. The Licensee has the option to extend the route of passage study for an additional year.

If the above study is insufficient to determine survival, a one year separate and discrete passage study for both adult and juvenile Shad and Herring shall be conducted to estimate survival through the Kaplan and Francis turbines under best gate efficiency. This study will commence in the year following the completion of the above study. The effects of trauma due to changes in barometric pressure, such as the expansion and rupture of a fish's swim bladder, ,during turbine passage will be included as part of the turbine survival studies for all life stages when possible. Results of the studies will be used to determine through-Project survival (i.e. via spill, Francis turbines, Kaplan turbines, etc.), and immediate and latent mortality for each route to achieve the passage criteria. If Licensee is unable to achieve the efficiency criteria for

survival based on the results of the downstream studies, MDE may re-open the Certification to address this issue.

15. Fishway Inspections

The Licensee shall provide MDE personnel, DNR personnel, and other MDE-designated representatives, timely access to the fish passage facilities at the Project and to pertinent Project operational records for the purpose of inspecting the fishlifts to determine compliance with the MDE-FPIP.

16. Pre-License Actions Agreed to by the Licensee

16.1 The Licensee agreed to develop and finalize a detailed logistics plan and operating protocol for trap and transport of Shad and Herring from both the EFL and WFL. The Logistics plan was required to address near-term operations, as well as logistics necessary to support the collection and transport of up to 80 percent of the Shad and Herring passing the Project with a maximum transport of 100,000 Shad and 100,000 Herring annually. This plan was to be completed by December 31, 2017. The Licensee shall provide MDE with a status report on the logistics plan and operating protocol for trap and transport of Shad and Herring no later than September 1, 2018. If these items have not yet been completed, Licensee shall complete these items and submit them to MDE by no later than January 1, 2019.

16.2 The Licensee also agreed develop detailed Computational Fluid Dynamics (CFD) models of the zones of passage, in consultation with the Service, to the EFL and WFL to assess the ability of fish to reach the lifts. The Licensee shall provide MDE with a status report on these models no later than September 1, 2018. If these items have not yet been completed, Licensee shall complete these items and submit them to MDE no later than January 1, 2019.

16.3 The Licensee also agreed to develop its initial FOMP (as described earlier) by September 30, 2017. The Licensee shall provide MDE with a status report on the initial FOMP no later than September 1, 2018. If the initial FOMP has not yet been completed, the Licensee shall complete the initial FOMP and submit to MDE no later than September 30, 2018.

17. Items to be completed in 2017 – 2018

The Licensee shall finalize design plans for initial fishlift improvement and improvements to facilitate the trap and transport program by no later than December 31, 2018.

18. Definitions of Certain Terms

In addition to terms defined elsewhere in the Certification and this MDE-FPIP, the following terms have the following meaning when used herein:

Adjusted Efficiency - The calculated fish passage efficiency that accounts for the biological benefit of fish trapped and transported from the Project to areas upstream of other

mainstem dams. This calculated efficiency gives credit towards efficiency targets for the number of fish that are trapped and transported.

Anadromous - migratory fish that spawn in freshwater rivers but spend most of their life in the ocean.

Attraction Efficiency - The proportion of the migrating population that successfully passes a designated downstream point at the Project (i.e. the downstream end of Rowland Island), and successfully enters the fish lift.

Fish Ladder - an engineered ramp-like structure, typically constructed of concrete and/or metal, used to provide upstream fish passage.

Fish Lift - an elevator-like structure with a hopper used to convey fish from the Tailwaters to the headpond of high dams.

Fish Passage Facility - the physical structure of the fishway used to convey fish upstream; with the term being synonymous with "fish lift" at this Project.

Hopper - the structural part of the fish lift used to hold fish as they are transported from the Tailwaters to the head pond.

Safe Passage - the movement of fish through the zone of passage that does not result in any unacceptable stress, incremental injury, or death of the fish.

SRAFRC - Susquehanna River Anadromous Fish Restoration Cooperative.

Trap and Transport or T&T - fish that are collected at a downstream project and loaded in a tank truck and transported and released into some location upstream of that project.

Upstream Fish Passage Efficiency - the percentage of the fish present in the Tailwaters that successfully move through the fish lift and continue upstream migrations; e.g. the proportion of fish that start at point B (downstream end of Rowland Island in the case of the Dam) and passes point E in the diagram set forth in Appendix E to this MDE-FPIP.

Volitional Passage - a fish passage facility that allows fish to swim unimpeded from the Tailwaters to the headpond; fish lifts are not considered volitional passage because the fish rely on the operation of the lifts in order to pass upstream into the headpond.

Zone of Passage (ZOP) - The contiguous area of sufficient lateral, longitudinal, and vertical extent in which adequate hydraulic and environmental conditions are maintained to provide a route of passage through a stream reach influenced by a dam (or stream barrier); e.g. the area between point A and point E in the diagram set forth in Appendix E to this MDE-FPIP.

Appendix A to Attachment #1
Calculation of Fishway Capacity for a 6,500-Gallon Hopper

Biological Parameters:

$\lambda_m = 0.052$ (season/day)	Season-to-season run compression coefficient empirically determined design parameter
$\beta = 0.15$ (day/hr)	Hour-to-hour run compression coefficient empirically determined design parameter
T = 15 min	Lift cycle time (recommended)

Hopper Size:

$Vol_H = 868.9$ ft.^{3}	Estimate of proposed hopper volume (6,500 gallons)
$Vol_{fH} = 0.1$ (ft^3 / lbf)	Volume required per fish-pound, USFWS criterion; for lift times greater than 15 minutes, a 30 percent increase in Vol_{fH} is recommended

Allowable peak biological loadings:

$Flb_h = (Vol_H/v_{fH}*T)$	$Flb_h = 34,756$ lbf/hr	Allowable loading of fish in pounds per peak hour
$Flb_d = Flb_h / \beta$	$Flb_d = 231,706$ lbf/day	Allowable loading of fish in pounds during the peak day
$Flb_s = Flb_d / \lambda_m$	$Flb^s = 4,455,897$ lbf/season	Allowable loading of fish in pounds during an entire season

Appendix B to Attachment #1
Calculating Trap and Transport Credit

Credit Towards an Overall Efficiency Criterion (85 percent of fish entering the Tailrace)

For a given number of Shad trapped and transported we can estimate the number that would need to pass the Dam via the fish lift to result in the same number of spawners upstream of York Haven Dam. This number is termed "lift equivalents" (L_e) and is calculated as:

$$[1] \qquad L_e=(\sum_{i=1}^{n} TTi) \bullet (1-TT_m)/D$$

Where TT_i refers to the number trapped and transported each year during a single or multi-year study to measure passage efficiency, and TT_m is the mortality associated with trapping and transporting Shad. Harris and I lightower (2011) estimated mortality of trapped and transported Shad in the Roanoke River to be 15 percent. However, SRAFRC (1997) gave estimates of mortality for holding Shad prior to trap and transport, mortality during the transport, and delayed mortality following release. When all these factors are considered, the overall mortality associated with trap and transport operations was 6 percent, which was used in this model. The denominator ***(D)*** in equation [1] will be calculated using the maximum efficiency of each of the two upstream dams with the highest passage efficiency over the three year study and the average of these efficiencies. For example, if the highest efficiencies of Holtwood, Safe Harbor, and York Haven Dams over the three year study were 0.60, 0.78, and 0.50, respectively, then the denominator would be calculated as $D = 0.60 \bullet 0.78\ (0.60+0.78)/2 = 0.3229$. It was assumed that other than the mortality associated with trap and transport operations, no other negative impacts on their fitness occurred compared to Shad that would migrate via multiple fish passage facilities to areas upstream of York Haven Dam.

The L_e can be added to the observed number that were lifted past the Dam during the study period to arrive at an adjusted total number that are passed via the fish lift (L_a).

$$[2] \qquad L_a = Le + \sum_{i=1}^{n} TTi)\ Li$$

where L_i is the observed number lifted in each year.
During a radio telemetry study at the Dam, an estimate of passage efficiency will be made and given the total number of Shad actually passed (lifted and released into the Reservoir + trapped and transported upstream), an estimate of the total number of Shad downstream of the Dam during all years of the study can be made.

$$[3] \qquad N = (\sum_{i=1}^{n} Pi)/Eo$$

where P_i is the total number passed each year and E_a is the estimated passage efficiency during the study. Equation [3] also assumes that no mortality is suffered while attempting to pass the Dam.

The variance of N can be estimated by the delta method using the estimated variance of E_a.

[4] $Var(N) = [Var(E_a) / E^4_a E^4] \bullet (\sum_{i=1}^{n} Pi)^2$

The adjusted passage efficiency is then the adjusted number that are lifted during the study divided by the total number of Shad downstream of the Dam during all years of the study.

[5] $E_a = L_a/N$

The associated variance from the delta method is:

[6] $Var(E_a) = [Var(N)/N^4] \bullet L^2_a$

The 95 percent confidence interval for $E_a$can be approximated as:

[7] 95% *C.I. is approximately equal to* 1.96 • square root of $Var(E_a)$

If the upper 95% confidence limit is greater than or equal to the efficiency criterion, then the criterion is considered to be met.

Appendix C to Attachment #1
Trap and Transport Mortality Study

To assess the mortality associated with trap and transport of Shad collected at the Dam and transported to areas upstream of York Haven Dam, a study design similar to that of Millard et al. (2005) will be employed. This study will have both a treatment group (Shad trapped and transported) and a control group (Shad not trapped and transported). The purpose of having both a treatment and a control group is to evaluate both the immediate and delayed mortality associated with T&T operations while controlling for mortality associated with handling stress while carrying out the study.

Control groups will consist of Shad that are caught in the lifts at the Dam, sorted from non-target species, and rather than being loaded into a truck and transported upstream, they will be released to a large holding tank located at the Dam (size to be determined) and monitored for 72 hours post-release.

Treatment groups will consist of Shad that are caught in the lifts at the Dam, sorted from non-target species, loaded into a truck, and driven around in the truck for a length of time equivalent to the trip duration to areas upstream of York Haven Dam. After simulating transport, the Shad will be placed into a holding tank located at the Dam and monitored for 72 hours post-release.

Experimental tanks for both treatment and control groups will be located at the Dam in order to eliminate any confounding effects of differences in water temperature/chemistry between treatment and control groups and to isolate the effects of transport. Experimental tanks will be set up with flow through conditions using water pumped from the Tailrace.

Each week throughout the fish passage season, a truck load's worth of fish (exact number yet to be determined) will be used in both treatment and control groups. Thus, the experiment will be temporally replicated for 4 to 8 weeks depending on the duration of the spawning run in a given year. This will allow assessment of mortality over the range of water temperatures experienced by Shad throughout the season.

During the 72 hour monitoring period, dead Shad will be removed from the tank as soon as they are noticed. Mortality will be quantified as the number of dead Shad divided by the number of Shad that entered either the treatment or control group. Mortality in the treatment group will include all Shad that died during the entire process from loading them into the truck to those found dead at the end of the 72 hour monitoring period.

Statistical Analysis

It will be assumed that total mortality of the treatment group consists of two components: 1) mortality associated with transport and release of the Shad; and 2) mortality associated with experimental handling of the Shad. Thus, total mortality of the treatment group = T&T mortality + handling mortality. The control group would only experience mortality associated with experimental handling. The instantaneous handling mortality rate (m_h) will be estimated from the control group as

$$Mh = -ln(S_c)$$

where S_c is the survival of the control group over all replicates throughout the season. The instantaneous total mortality in the treatment group will be estimated as

$$M_t = -ln(S_t)$$

where S_t is the survival of the treatment group over all replicates throughout the season. The conditional mortality associated with trap and transport (conditioned on handling mortality) is

$$u_{TT}) = A - [(A \cdot M_t) / ln(1 - A)].$$

where A is the fraction of fish that die from all causes ($1-S_t$). This equation is based on the traditional fisheries expression $u = A \cdot F/Z$ where u = the expectation of death from fishing, A = total mortality rate from all causes, F = the instantaneous fishing mortality rate, and Z = the total instantaneous mortality rate. Estimation of the conditional mortality associated with trap and transport (u_{TT}) according the above equation is preferred because it accounts for the probability that the two sources of mortality, trap and transport stress and handling stress, occur simultaneously over the monitoring period (Millard et al. 2005).

Literature cited:

Millard, M.J., J.W. Mohler, A. Kahnle, and A. Cosman. 2005. Mortality associated with catch-and-release angling of striped bass in the Hudson River. North American Journal of Fisheries Management. 25:1533-1541

Appendix D to Attachment #1
Upstream and Downstream Migration Periods for Certain Species

Species	*Upstream Migration Period* [1,2,3]	*Downstream Migration Period* [1,2,3]
Shad	Starting when River temperature reaches 50 ° F, until River temperatures rise above 72 ° F for four consecutive days, but ending no earlier than June 1, and no later than June 15[2]	July 1 through November 15 (juv.) May 1 through July 1, as long as river temperature is above 65 ° F[2] (adult)
Herring	Starting when River temperature reaches 50 ° F, until River temperatures rise above 72 ° F for four consecutive days, but ending no earlier than June 1, and no later than June [2,3,4]	June 15 through October 14 (juv.) April 15 1 through July 1 (adult)

Notes:

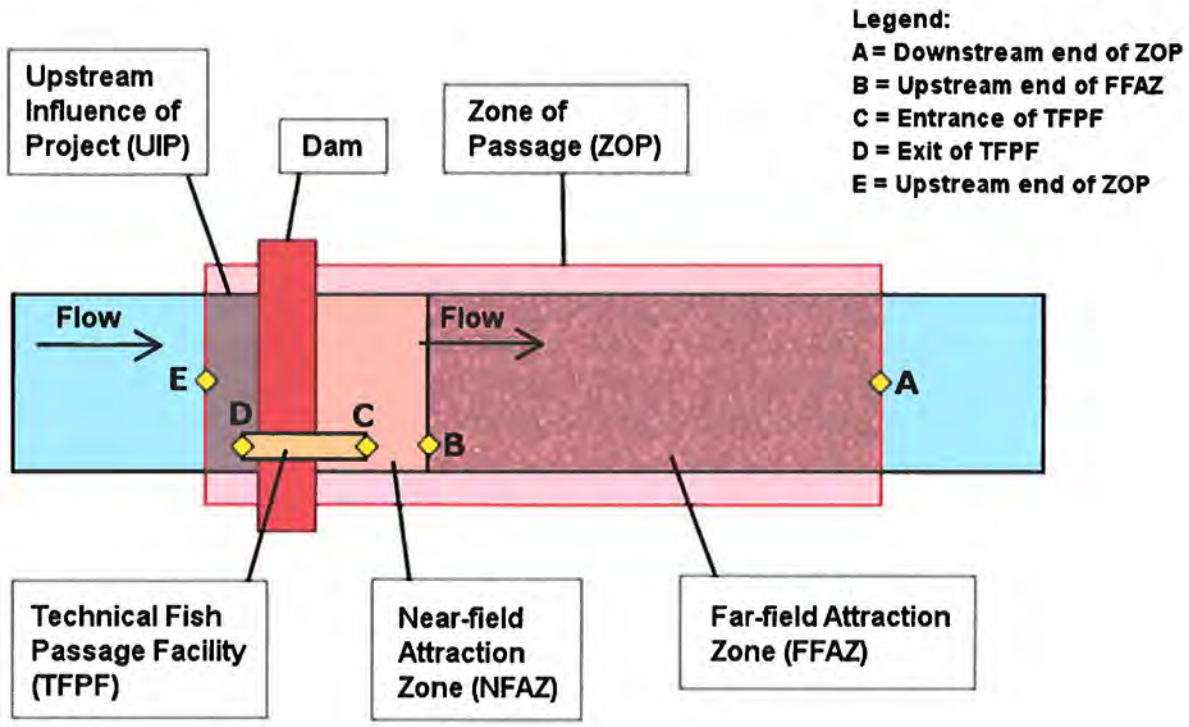
1. Any of these migration periods may be changed during the Term by MDE, based on new information. At any time during the Term, Licensee may submit new information to MDE in support of a request to change the migration periods. In the event MDE seeks to require downstream passage by means other than through the units, the downstream migration periods automatically will be reviewed jointly by MDE, other fishery agencies, and the Licensee.

2. Water temperatures shall be monitored once daily at 11 a.m. at Station 643 or some other location agreed upon by the Licensee and MDE.

3. MDE recognizes that, because of factors outside of the Licensee's control, safety considerations may preclude the personnel from performing duties necessary to commence fish passage measures at the Project by the commencement date. When such conditions arise, the Licensee shall notify MDE, and MDE and the Licensee shall consult regarding the anticipated schedule for commencing such measures.

4. This migration period is based on alewife migration timing from other tributaries to the Bay (Sutherland 2000, p. 9; Eyler et al. 2002, p. 59; Slacum et al. 2003, p. 13).

Appendix E to Attachment #1
Diagram of Fish Passage Definitions



ATTACHMENT #2
To Clean Water Act Section 401 Certification For the Conowingo Hydroelectric Project
FERC Project No. P-405 / MDE WSA Application No. 17-WQC-02

MDE American Eel Passage Improvement Plan (MDE-AEPIP)

The Licensee shall construct, operate, and maintain Eel fishways at the Dam to pass upstream migrating Eels that arrive at the Project in a safe, timely, and efficient manner. The Project shall also be operated to provide safe, timely, and effective downstream passage of Eels.

Without limiting the generality of Section 2.C.ii of the Certification, in all cases where this MDE-AEPIP requires the Licensee to consult with or make any submission to MDE, the Licensee shall also consult with, or make such submission to DNR, unless otherwise specified.

A. General Provisions

1. For purposes of this MDE-AEPIP, "Upstream Eel Migration Season" is defined as May 1 through November 1 or when fall mean daily River temperature below the Dam is 10 degrees Celsius or less for three consecutive days, whichever is later.

2. For purposes of this MDE-AEPIP, "Downstream Eel Migration Season" is defined as September 15 through February 15 (or whenever River temperature is above 37 degrees Fahrenheit for four consecutive days).

3. Water temperatures shall be monitored hourly at Station 643 or some other location agreed upon by the Licensee and MDE. This initial operational period is based on preliminary data on Eel migration timing from other tributaries to the Bay.

4. MDE, in consultation with DNR, will use the results from the downstream Eel effectiveness monitoring studies conducted pursuant to Section B.18 of this MDE-AEPIP to further refine the Downstream Eel Migration Period throughout the Term.

B. Eel Passage Requirements and Conditions

1. During the Eel passage season starting May 1, 2019, the Licensee shall document congregations of juvenile Eels visually via bi-weekly nighttime surveys during the migration period, unless another method is approved in writing by MDE. The locations surveyed shall focus on the EFL area including inside the EFL and stilling pool(s) and the Dam spillway adjacent to the EFL. Based on the results of the site-determination studies and engineering analysis, the Licensee shall submit an Eel siting report by February 1, 2020 and then shall design, install, operate and maintain temporary mobile traps to inform the potential location of one or more additional permanent Eel trapping facility(s).

2. No later than March 15, 2020, the Licensee shall submit to MDE for approval a plan to construct and operate temporary, exploratory traps at various locations below the Dam, based on the visual assessments, during multiple years, to assess the ability to collect Eels at

locations where they congregate (the "Eel Collection Plan"). Collection facilities for the temporary site determination study shall be similar to those used in the 2011 study conducted by the Licensee. The Eel Collection Plan shall include (a) locations of Eel fishways, (b) description of substrates, (c) attraction flow at the ramps, (d) attraction flow from the spill gates, (e) description of holding tanks, and (f) frequency of trap checks with contingency for likely high collection periods.

3. No later than March 15, 2022, the Licensee shall submit to MDE for approval an "Eel Passage and Restoration Plan", which shall include (a) detailed plans for the design and construction of new permanent East Eel Fishway(s) ("EEF") located in one or more areas that have high potential to capture Eels migrating up the east side of the mainstem River in the Tailrace; (b) details regarding the annual operation and maintenance of all current and proposed Eel Fishways; and (c) proposed attraction flow speed and volume, slopes of the ramps, matting, and methods to reduce predation.

4. The Licensee shall design and install the EEFs within 12 months of MDE approval of the Eel Passage and Restoration Plan, using paired ramps with different substrates, tanks, etc. to provide sufficient capacity for captured Eels. The number of EEFs and their locations, dependent on survey results, will be determined by MDE. If the number of Eels attempting to migrate within an EEF exceeds the maximum capacity of Eels per unit of ramp area, the Licensee shall redesign and construct the EEF to reduce crowding. In addition, the Licensee shall ensure the holding tank has continuous temperature, DO and water flow exchange monitoring devices with alarms that sound in a permanently staffed location if levels of any parameter are outside established limits. Upon observation, the Licensee shall remove, enumerate and report dead Eels. The holding tank shall be designed and operated to hold Eels at densities not exceeding 10 elvers per liter unless otherwise approved by MDE. If deemed necessary by MDE, the Licensee will provide aeration to the holding tanks. Licensee shall provide daily reports to MDE, DNR, and other resource agencies designated by MDE.

5. Upon completion of the EEFs and thereafter as necessary, the Licensee shall consult at least yearly by February 1, with MDE concerning modifications and adjustments to the passage facilities to improve their operation and efficiency and previous year's data.

6. The Licensee shall not make any modifications to any EEF, undertake any construction associated with any EEF, or make any changes to the operation of any EEF without MDE's written approval in advance..

7. Upon modification to any fish lifts, the Licensee shall investigate Eel congregation locations and follow the procedures outlined in Section B.1 of this MDE-AEPIP to assess the need for additional facilities or modification to the existing Eel collection facilities.

8. The Licensee shall include within the Eel Passage and Restoration Plan detailed plans for the conversion of the EEF(s) and the existing West Eel Fishway ("WEF") to volitional passage, which shall be operational by the Upstream Eel Migration Season in 2031 unless MDE states otherwise in writing. Based on the status of Eel passage at the Holtwood, Safe Harbor and York Haven dams and the results of Eel stocking studies, MDE may delay or eliminate the

requirement to convert to volitional passage if the continuation of the trap and transport program is a preferred option for Eel restoration.

9. The Licensee shall operate the existing WEF annually during each Upstream Shad Migration Season in accordance with the approved Eel Passage and Restoration Plan.

10. The Licensee shall operate the WEF and EEF (interchangeably and collectively, the "Eel Fishways") continuously (24 hours per day, 7 days per week) during each Upstream Eel Migration Season during the Term, regardless of whether the Eel Fishways are operated as a trap or a volitional fishway. If the Eel Fishway(s) is located within the EFL during the Shad passage season, the Eel Fishway(s) will be operated at night when the EFL is not lifting unless MDE modifies this requirement in writing.

11. Unless MDE determines that no effective technology is available to enable such testing, the Licensee shall submit to MDE upstream Eel Fishway efficiency studies (each, an "Efficiency Study") for approval, in accordance with this Section B.11. Each Efficiency Study shall be conducted with juvenile Eels in the vicinity and within the Eel Fishways in 2019, or once technology is available, and once every ten years thereafter. Each Efficiency Study shall determine the Eel upstream passage efficiency of all Eel Fishways during the Upstream Eel Migration Season and any issues that impact Eel survival and efficiency through the Eel Fishways. Each Efficiency Study will consist of two components: determining attraction efficiency to the facility and passage efficiency within the facility once an Eel enters the Eel Fishway. If not already tested at the WEF prior to issuance of the Certification, internal Eel Fishway efficiency at the WEF shall be tested in 2019, regardless of testing for attraction and overall passage efficiency. At all other Eel Fishways, internal Eel Fishway efficiency shall be tested in the year immediately after the year in which the Eel Fishway is completed, regardless of testing for attraction and overall passage efficiency. Efficiency Studies will be repeated following all modifications to Eel Fishway operations, physical structures or the fish lifts which impact River flows or the shoreline to evaluate the success of the modifications. If MDE determines that any Efficiency Study cannot be conducted due to the lack of technology, the Licensee shall conduct visual surveys every five years after the Eel Fishway(s) are constructed to locate Eels below the Dam. The Licensee shall provide an annual report on the efficiency or visual study to MDE DNR by December 31 of the study year.

12. Within twelve months after completion of the Eel Fishways on the east side of the Project (at or near the EFL and the east bank of the River), the Licensee will submit to MDE for approval a multi-year study plan to evaluate those facilities, which plan shall include (a) substrate types, (b) attraction flow at each ramp, (c) attraction flow from the EFL attraction flow spill gates, and (d) potential adjustments to the locations of the Eel Fishways.

13. The Licensee shall yearly, or at such other interval as may be approved in writing by MDE, visually assess the numbers and density of Eels using the Eel Fishways during periods when use is anticipated to be high (e.g. increases in discharge or turbidity) to determine if capacity is exceeded.

14. No later than September 1, 2020, the Licensee shall submit to MDE for approval a plan to conduct in-River, post-stocking surveys including one year of baseline (pre-stocking) data to assess the impact of Eel reintroduction into streams (the "Eel Reintroduction Plan"). These post-stocking surveys shall be for three consecutive years and then once every five years thereafter or until MDE agrees in writing to not continue the annual surveys. Provisions in the Eel Reintroduction Plan shall include the following:

(a) Representative stream segments of the tributaries; provided that the Licensee will propose locations and methods for this survey at least one year in advance to MDE for review and approval;
(b) The number, length, and location of transects sampled shall be subject to approval by MDE;
(c) Eels shall be captured by electrofishing or other methods as approved by MDE;
(d) Block netting shall be required on tributary streams; and
(e) Sampling shall include bivalves and crayfish.

During sampling, Licensee shall document the number of Eels captured and collect data from a representative subsample of Eels. Sampled Eels shall be scanned for passive integrated transponder ("PIT") tags and data from recaptured Eels shall be recorded. Captured Eels larger than 200mm will be tagged with PIT tags and released. Should DNR determine that the number of Eels larger than 200mm is excessive, the Licensee shall consult with MDE and DNR to determine if a subsample of Eels may be PIT tagged. Data collected shall include a variety of life history characteristics e.g., length, weight, condition factor and a description of maturity (e.g. elver, yellow phase, silver phase). that can be assessed to determine how well stocked Eels are utilizing the River and tributaries. A portion of the subsample will be sacrificed and examined for age (otolith analysis), gender, and level of *Anguillicoloides crassus* infection.

15. No later than February 1 of each year, beginning in the year after the Eel Reintroduction Plan is implemented, Licensee shall provide MDE an annual report based on the results of the stream surveys performed in the previous year pursuant to the Eel Reintroduction Plan. The report shall include a.description of (a) stream segments surveyed, (b) dispersal of the stocked Eels, (c) estimate the density of stocked Eels, (d) an evaluation of the growth, condition, age, gender, (e) level of infestation with *Anguillicoloides crassus* of Eels, (f) mussel and crayfish survey results.

16. The Licensee shall submit to MDE for approval a plan showing proposed stocking locations for collected Eels to MDE for review 90 days prior to each Upstream Eel Migration Season.

17. Transport of juvenile Eels upstream shall occur as necessary based on the capacity of holding tanks at the Eel Fishways. The holding tanks shall have an automatically engaging back up pump and an alarm that sounds in a daily staffed location if the primary pump malfunctions. The holding tank shall have continuous temperature, DO and gallon/minute water exchange monitoring devices with alarms that sound in a daily staffed location if levels of any parameter are outside of established limits. All Eels shall be moved within one week of capture.

Eels from the holding tank(s) shall be transferred to a transport vehicle equipped with an insulated transport container(s) that shall be covered and aerated. The transport vehicle(s) shall have an automatically engaging back up pump and an alarm that sounds in the cab of the vehicle(s). The transport vehicle shall have continuous temperature and DO monitoring devices with alarms that sound in the vehicle cab if levels of any parameter are outside of established limits. The transport vehicle(s) shall be designed and operated to hold Eels at densities not exceeding 10 juvenile Eels per liter unless otherwise permitted by MDE in writing. Eels shall be trucked to appropriate release locations on the same day of removal from holding. Upon observation, dead Eels shall be removed, enumerated, and reported.

18. The trigger date for initiation of downstream Eel passage studies shall be the date on which MDE, determines that available data indicates that Eels are maturing upstream of the Project in sufficient numbers to require downstream Eel passage studies at the Dam ("Downstream Study Trigger Date"). Within six months after receiving written notice from MDE that the Downstream Study Trigger Date has occurred, the Licensee shall submit to MDE for approval a plan to conduct a silver Eel downstream survival study (the "Downstream Survival Plan"). The Downstream Survival Plan shall (a) be designed to demonstrate continued compliance with the 85% downstream silver Eel survival target; and (b) include ballon tagging study(ies). The Licensee shall provide a report of the study results from implementation of the Downstream Survival Plan within 180 days after the date of study completion. If such results indicate that the Licensee can operate the Project so that it achieves at least 85% downstream passage of Eel through the Project, the Licensee shall incorporate into the Eel Passage and Restoration Plan all operational measures needed to meet this survival rate. If such results do not indicate that the Project can be operated to achieve at least 85% downstream passage survival of Eel, the Licensee shall propose a plan and schedule for mitigation to achieve the maximum possible downstream Eel passage.

19. No later than September 1, 2021, the Licensee shall submit to MDE for approval a plan for implementing radio telemetry monitoring of Eel at the Project year-round for at least three consecutive years (the "Telemetry Plan"). The Telemetry Plan must include route of passage, delay estimates, and project related mortality. If there are an insufficient number of Eels after three years of implementing the approved Telemetry Plan to determine route of passage, delay estimates, and project related mortality, the Licensee shall continue the Telemetry Plan until such determinations can be made.

ATTACHMENT #3
To Clean Water Act Section 401 Certification For the Conowingo Hydroelectric Project
FERC Project No. P-405 / MDE WSA Application No. 17-WQC-02

MDE Invasive Species Mitigation Plan (MDE-ISMP)

In order to minimize the introduction and spread of aquatic invasive species ("AIS") into the River through the fish lifts at the Dam, the Licensee shall, beginning in September of 2018:

1. The Licensee shall notify DNR and USFWS in accordance with Section 7 of this MD-ISMP if an AIS is (a) collected in the WFL, (b) collected in the EFL, or (c) passed in the EFL into the Reservoir.

2. During EFL Operations, the Licensee shall:

   (a) View the hopper dumping into the fish exit trough. If an AIS is viewed in the hopper or chute, close the gate at the viewing window immediately, and institute a draw-down to remove the AIS from the trough before releasing the remaining fish into the Reservoir.

   (b) Remove any AIS that are observed while conducting tagging operations in the EFL trough.

3. During WFL Operations, the Licensee shall remove any invasive species that are collected in the WFL.

4. The Licensee shall also:

   (a) Retrofit/redesign the EFL no later than March 1, 2019 to remove AIS and allow tagging fish when required.

   (b) Design fishlifts to remove all AIS prior to upstream migration or Tailrace reintroduction while not significantly impacting fish passage.

   (c) Ensure the proper disposal of all AIS captured in the fish lifts.

5. MDE may require the Licensee to implement the following protocol beginning in the 2019 migratory fish passage season that starts when River temperatures reach 48 degrees for three consecutive days and ends when River temperatures rise above 72 degrees for four consecutive days:

   (a) For all AIS collected at the Dam, Licensee shall kill or dispatch the AIS and place it in the freezer used for Shad heads during the tank spawning studies, for DNR and/or USFWS to dispose of such AIS.

(b) If freezer space for storage of AIS becomes limited the Licensee shall notify MDE and DNR.

(c) If freezer space for storage of AIS is not limited, at the end of the season, Licensee shall send the frozen AIS with the Shad heads to the Van Dyke Hatchery and notify MDE and DNR as to the number and type of frozen AIS sent to the Van Dyke Hatchery.

6. MDE reserves the right to adaptably modify conditions for invasive species control, based on a sound science and after consultation with DNR, USFWS and the Licensee. Licensee shall implement any modifications to these conditions as required by MDE on a schedule established by MDE.

7. Agency Notification Protocol: If an AIS is captured and removed or passed in a fish lift, the Licensee shall notify DNR and USFWS within 24 hours. Notification shall include: (a) species name and number observed/collected; (b) disposition of the AIS observed/collected; (c) approximate size of AIS observed/collected; (d) date and time of passage; and (e) estimated flow through the Dam at time of passage.

ATTACHMENT #4
To Clean Water Act Section 401 Certification For the Conowingo Hydroelectric Project
FERC Project No. P-405 / MDE WSA Application No. 17-WQC-02

Minimum Flow Regime

Time Period	Minimum Flow
January	4,000 cfs
February	4,000 cfs
March	4,000 cfs
April	18,200 cfs
May	18,200 cfs
June	7,500 cfs
July	5,500 cfs
August	4,500 cfs
September 1-14	3, 500 cfs
September 15-30	3,500 cfs
October	4,000 cfs
November	4,000 cfs
December	4,000 cfs

ATTACHMENT #5
To Clean Water Act Section 401 Certification For the Conowingo Hydroelectric Project
FERC Project No. P-405 / MDE WSA Application No. 17-WQC-02

Year 10 Flow Regime

For purposes of the following table, "below normal" at the Marietta Gage means flow less than monthly Q50, and "above normal" means flow greater than or equal to monthly Q50.

Month(s)	Min Flow	Down Ramping Rate	Upramping Rate	Maximum Flow
December-January	11,000 cfs	Up to 20,000 cfs/hour	Up to 40,000 cfs/hour	None
February	12,500 cfs	Up to 20,000 cfs/hour	Up to 40,000 cfs/hour	None
March	24,000 cfs when upstream inflow at the Marietta Gage is below normal; 30,000 cfs when upstream inflow at the Marietta Gage is above normal.	Up to 20,000 cfs/hour	Up to 40,000 cfs/hour	None
April	29,000 cfs when upstream inflow at the Marietta Gage is below normal; 35,000 cfs when upstream inflow at the Marietta Gage is above normal.	Up to 20,000 cfs/hour	Up to 40,000 cfs/hour	None
May	17,500 cfs when upstream inflow at the Marietta Gage is below normal; 25,500 cfs when upstream inflow at the Marietta Gage is above normal.	Up to 20,000 cfs/hour	Up to 40,000 cfs/hour	65,000 cfs
June	10,000 cfs when upstream inflow at the Marietta Gage is below normal; 14,000 cfs when upstream inflow at the Marietta Gage is above normal.	Up to 20,000 cfs/hour	Up to 40,000 cfs/hour	65,000 cfs
July	5,500 cfs when upstream inflow at the Marietta Gage is below normal; 8,500 cfs when upstream inflow at the Marietta Gage is above normal.	Up to 10,000 cfs/hour if instream flow is less than 30,000 cfs; Up to 20,000 cfs/hour if upstream flow is between 30,000 and 86,000 cfs	Up to 40,000 cfs/hour	65,000 cfs
August	4,500 cfs when upstream inflow at the Marietta Gage is below normal; 6,000 cfs when upstream inflow at the Marietta Gage is above normal.	Up to 20,000 cfs/hour	Up to 40,000 cfs/hour	65,000 cfs
September	3,500 when upstream inflow at the Marietta Gage is below normal; 5,500 cfs when upstream inflow at the Marietta Gage is above normal.	Up to 20,000 cfs/hour	Up to 40,000 cfs/hour	65,000 cfs
October	4,500 cfs when upstream inflow at the Marietta Gage is below normal; 6,000 cfs when upstream inflow at the Marietta Gage is above normal.	Up to 20,000 cfs/hour	Up to 40,000 cfs/hour	None
November	6,000 cfs when upstream inflow at the Marietta Gage is below normal.; OR 11,000 cfs when upstream inflow at the Marietta Gage is above normal.	Up to 20,000 cfs/hour	Up to 40,000 cfs/hour	None

Exhibit D

Colleen Hicks
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and Licensing, Hydro
Exelon Power

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January 30, 2014

The Honorable Robert Summers
Secretary
Maryland Department of the Environment
1800 Washington Boulevard
Baltimore, MD 21230

RE: Maryland Section 401 Water Quality Certificate Application
Conowingo Hydroelectric Project (FERC Project No. 405)
Cecil and Harford Counties

Dear Secretary Summers:

On August 30, 2012, Exelon Corporation, on behalf of its wholly-owned subsidiary, Exelon Generation Company, LLC (Exelon), filed with the Federal Energy Regulatory Commission (FERC) an Application for a New License for Major Project – Existing Dam – (FERC Application) for the Conowingo Hydroelectric Project (Conowingo Project). In accordance with Section 401 of the Clean Water Act (33 U.S.C. § 1341), and Title 26 of the Code of Maryland Regulations, Exelon hereby submits to the Maryland Department of the Environment (MDE) an application for certification (WQC Application) that the Conowingo Project meets applicable Maryland water quality standards.

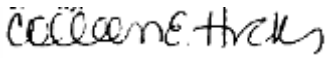
As part of the FERC relicensing proceeding for the Conowingo Project, Exelon conducted a number of resource studies. Those resource studies, and Exelon's FERC Application, are cross-referenced herein to applicable Maryland water quality standards. Copies of the FERC Application and the resource studies are included on CDs enclosed with this document and the information and analyses contained on the CDs should be deemed incorporated into this WQC Application.

Exelon reserves the right to supplement this application and the record with additional relevant information to support Exelon's WQC Application. Supplemental information may include, among others things, the conditions set forth in the Commonwealth of Pennsylvania's

water quality certificate for the Muddy Run Pumped Storage Project and information resulting from the Lower Susquehanna River Watershed Assessment. Exelon looks forward to continuing its dialogue with Maryland regarding the environmental, recreation, and socioeconomic benefits of the Conowingo Project and the appropriate conditions for the Project in the new FERC license.

If you have any questions regarding Exelon's application, or require additional information, please do not hesitate to contact me. Thank you for your assistance in this matter.

Respectfully submitted,



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CC: Steven Johnson (MDE)
Brent Bolea (Maryland Energy Administration)

Enclosures: FERC Application and Associated Relicensing Studies

Exhibit E

STATE OF MARYLAND

January 31, 2014

Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First St., N.E., Room 1A
Washington, DC 20426

RE: Conowingo Hydroelectric Project
Federal Energy Regulatory Commission (FERC) Project No. P-405-106

COMMENTS ON FINAL LICENSE APPLICATION AND OBJECTION TO FINDING OF READY FOR ENVIRONMENTAL ANALYSIS

Dear Secretary Bose:

Pursuant to the Code of Federal Regulations (CFR), 18 C.F.R. §5.23, FERC's April 29, 2013 Notice of Acceptance and Ready for Environmental Analysis (REA), and subsequent notices granting extensions of time, Maryland's Department of Natural Resources, Power Plant Research Program, and Maryland's Department of the Environment (the "State" or "State Agencies") hereby submit the following comments on the Final License Application (FLA) filed on August 20, 2012, by Exelon Generation Company, LLC ("Exelon" or "Applicant") for the Conowingo Project.[1] The State's position is that the Final License Application in this matter does not adequately identify and address the environmental concerns of the State of Maryland and its citizens, and that it is not Ready for Environmental Analysis. Maryland is committed to working cooperatively with the parties to resolve the issues identified herein.

Objection to Finding of Ready for Environmental Analysis

The State Agencies object to FERC's finding of Ready for Environmental Analysis with respect to the FLA. The current FERC license for the Conowingo Project expires on September

[1] The State of Maryland has long used a coordinated multi-agency review process for evaluation and comment on federally licensed projects. PPRP is a program within Maryland DNR that performs coordinated reviews of power plants and related facilities with other State agencies, including the Maryland Department of the Environment (MDE). For many years, PPRP has served as the State's point of contact with FERC with respect to hydroelectric facilities and other projects subject to FERC's jurisdiction. Consistent with this role, PPRP has submitted comments to, filed interventions with, and taken appeals from FERC and the decisions it renders. PPRP is filing these comments on behalf of DNR and MDE, and speaks for the Departments in this proceeding.

1, 2014. Exelon now seeks permission to operate the Project for the next 46 years—almost a half-century. The Conowingo Project is the only major hydroelectric facility in Maryland. The Project's location across the lower Susquehanna River makes it an integral part of the flow into, and health of, the Chesapeake Bay. The Dam spans the full width of the Susquehanna River, thereby preventing migratory fish and eels from passing up or down river, as well as imposing several other detrimental impacts on important living resources. The Dam also creates a barrier that interrupts the natural flow of water, sediments, and nutrients through the river system. The 14 mile long reservoir created by the Dam has acted as a repository for millions of tons of sediments and nutrients. This repository will have effectively reached capacity within the new license term, if not already. The potential implications of this on Maryland's water quality and living resources needs to be fully explored and carefully considered before a new license is issued for the Project. Unfortunately, the Applicant's FLA is deficient with respect to this issue, and at this point, the record before FERC fails to provide a sufficient basis upon which to draw reasonable conclusions about the Project's impacts or appropriate Protection, Mitigation and Enhancement (PM&E) measures.

Since 2009, the State Agencies have repeatedly requested that FERC require Exelon to conduct appropriate sediment and nutrient studies to determine the Project's impacts on water quality and living resources of the Lower Susquehanna River and Chesapeake Bay.[2] The State Agencies expressed concern that failure to fully conduct appropriate studies could impede timely, appropriate consideration of the Project's impacts during the State's Water Quality Certification review and Coastal Zone Management Act Consistency evaluation.[3] Although FERC eventually required Exelon to conduct a sediment and nutrient study, the fundamental design of this study and Exelon's implementation of it were inadequate to reasonably determine the Project's impacts on water quality and living resources.[4]

Exelon and FERC have attempted to remedy this deficiency by referring to an ongoing sediment and nutrient study led by the US Army Corps of Engineers (USACE). Although the USACE study will advance scientific knowledge with respect to sediment and nutrient dynamics and impacts in the Lower Susquehanna River and Chesapeake Bay, the study was never intended to be part of FERC's licensing process, and it is not yet complete. Consequently, statements in Exelon's FLA with respect to Project impacts and proposed mitigation related to sediments and

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[2] *See* July 10, 2009 Comments on PAD; November 23, 2009 Comments on Proposed Study Plan; January 20, 2010 Comments on Revised Study Plan; March 21, 2012 Comments on Updated Study Report.

[3] *See* June 20, 2012 Request for Rehearing. The State Agencies note that Exelon has asserted in its FLA that the Project has little if any adverse impact on water quality. This conclusion is premature. The State will conduct a careful review of the Project's water quality impacts once an application for a Water Quality Certification has been received. Similarly, Exelon's FLA asserts that the Project is consistent with Maryland's Coastal Zone Management Program. Again, this conclusion is premature. Under the Coastal Zone Management Act, the State has six months to concur or object to Exelon's assertion of consistency. Exelon, by letter dated March 5, 2013, which was filed with FERC, has agreed that the 6 month review period shall be stayed for one year from whenever Exelon files its Water Quality Certification application with MDE. The State will be conducting a consistency evaluation once it receives Exelon's Water Quality Certification application.

[4] The State sought rehearing from the Commission on the sediment and nutrient issues, twice, during the pre-application phase of FERC's Integrated Licensing Process. The Commission denied rehearing on the basis that the State's concerns were not ripe for review, and indicated that such concerns may be raised after acceptance of the Final License Application. Since that time has now come, the State Agencies hereby incorporate in these comments the arguments set forth in their requests for rehearing filed in June and August of 2012.

nutrients are not informed by the conclusions or recommendations of the USACE study to which both Exelon and FERC point.

The Environmental Protection Agency (EPA) has filed comments in this case expressing concern that once capacity is reached, "the suspended sediment load to the Chesapeake Bay may increase up to 150 percent, nitrogen load by up to 2 percent, and the phosphorus load by up to 40 percent," and that this may impede progress toward meeting the Chesapeake Bay Total Maximum Daily Loads (TMDL). The State Agencies share this concern. In addition, the State Agencies note that a recent study issued by the U.S. Geological Survey reports that concentrations of total nitrogen, total phosphorus, and suspended sediment measured from samples taken below Conowingo Dam are "substantially higher than they were 10 to 15 years ago" when the reservoir was not as full.[5] EPA "strongly recommends that FERC include the results of" the USACE study as part of the Environmental Impact Statement in this matter. The State Agencies concur with EPA's recommendation, but also caution that it is premature to make any conclusions as to whether the USACE study will be adequate to appropriately identify and evaluate sediment and nutrient impacts on water quality and living resources related to the Conowingo Project.

General Comments

As explained above, Exelon's FLA is deficient and is not Ready for Environmental Analysis. In addition, there are several instances throughout the FLA where environmental impacts related to the Project are either not recognized or downplayed, resulting in fundamental deficiencies with respect to proposed PM&E measures. Some of the most egregious examples of this are set forth below.

Recreation

We agree with the Applicant that improvements to existing facilities would enhance access and recreational use of the Project, consistent with the Commission's policy of maximizing public recreation at licensed hydropower projects. Exelon has proposed to improve and enhance Lock 13, Lock 15, Muddy Creek Boat Launch, Cold Cabin, Dorsey Park, Peach Bottom Marina, Line Bridge, Conowingo Creek Boat Launch, Glen Cove Marina, Funk's Pond, Conowingo swimming pool, Conowingo Dam Overlook, Fisherman's Park/Shure's Landing, and Peach Bottom access; however, we also believe other recreational improvements need to be made. For example, bird watchers gather along the Project's shoreline on an almost daily basis, but the Applicant did not propose any new improvements specific to their interest. Furthermore, the Applicant ignored the public's request for additional hiking trails even though user-groups have routinely been outspoken at public meetings and have filed letters with the FERC regarding this topic. It appears the Applicant has attempted to pass off "maintenance projects" as improvements. We suggest the Applicant give serious consideration to the public's interest in recreation and propose additional improvements that address all user-groups and maximize public access.

Rare, Threatened and Endangered Species

[5] Hirsh, R.M., 2012, Flux of Nitrogen, phosphorus and suspended sediment from the Susquehanna River Basin to the Chesapeake Bay during Tropical Storm Lee, September 2011, as an indicator of the effects of reservoir sedimentation on water quality: U.S. Geological Survey Scientific Investigations Report 2012.

The Applicant fails to address impacts to the Northern Map Turtle (Graptemys geographica) in this section. This reptile, also known as the common map turtle, is a state-listed endangered species that has been extirpated from large areas of their range. In fact, the only known populations to exist in Maryland are in and around the Susquehanna River, both immediately upstream and downstream of the dam. According to research conducted by Towson University, anthropogenic alterations to this area (most notably heavy recreational use and Project operations) appear to have a negative impact on these populations.

It is well understood that turtles, like all reptiles, rely on solar radiation to maintain body temperature, digest food and prepare for mating and nesting. However, constant changes in the water level caused by Project operations and other human activities have a direct impact on the availability of basking sites, nesting areas and egg production and viability.

Maryland made no request for a formal study during the FERC licensing process, not because this species can be ignored during relicensing, but because Towson University had already begun to independently study the Project area and had published papers on the Project's effects. Also, the Applicant has partnered with Towson University to further study this issue and is certainly aware of the Project's impacts and potential mitigation; however, they have failed to propose any meaningful PM&E measures to address this issue.

Water Quality

The Applicant's assertions with respect to Maryland water quality standards are premature. MDE will fully evaluate the Project's impacts on water quality standards after it receives a Clean Water Act Section 401 water quality certification application.

Fish Passage

The Applicant proposed specific measures to extend the life of the facilities over the new license term, as detailed in Appendix B to FLA Exhibit E; however, they clearly state in Exhibit E that the "Remaining life expectancy of the EFL will be up to 25-30 years (from present) with the implementation of the proposed preventative maintenance plan" (page E-150) and that the "[r]emaining life expectancy of the WFL will be up to 15 years" (page E-152). Since the Applicant is not proposing any new improvements to the fish lifts and is seeking a 46 year license, which is longer than their life expectancy, all upstream volitional fish passage, trap and transport and spawning activities would end before the next license term expires, which is unacceptable.

Even if we assume measures are taken to extend the life expectancy of the fish lifts, simply maintaining these under-sized and poorly functioning facilities will never meet established restoration goals. Furthermore, the Applicant has discussed their existing preventive maintenance plan with the Resource Agencies for a number of years, but serious issues continue to exist. As the Applicant notes in their 3.9 study, 1) the head gate that allows water to enter the fish trough and be used as attraction flow is currently only operable from 0-14% open, which provides insufficient water flows through the attraction flow system when headpond levels are low, 2) the upstream-downstream channel gate, that would allow passage to be set to either the A and B weir gates or the C weir gate, is currently inoperable and set in the full open position, which limits the flexibility of choosing a preferred passage route based on river and generation conditions and 3) weir gate A is reportedly overtopped when sufficient Kaplan units are

generating (Unit Nos. 8, 9, 10, and 11), which may mask the design attraction flow from the crowder area for fish entering through the weir gate C entrance. Weir gate A is normally in the closed position when the Kaplan units are operating and is not used for fish passage. Furthermore, Gate B has been out of service for years. Although these issues have been well understood for a number of years, the Applicant has done little to address them in this license term, which has had a direct effect on American Shad and river herring restoration. We believe this clearly demonstrates that simply memorializing an industry-standard preventative maintenance plan is not an adequate proposed measure.

The Applicant reported that "[o]f the 89 shad radio-tagged for the study, 73% entered into the EFL; 44.9% completed passage through the EFL; and 43.8% remained upstream for 48 hours or more after passage," and "Radio telemetry data collected in the spring of 2012 will provide additional information on the effectiveness of the EFL".

As the Applicant points out, the radio telemetry results summarized in the FLA were based on the 2010 study period. The radio telemetry study results in 2012 demonstrated a fish passage efficiency of only 25.8%. When compared to the Safe Harbor hydroelectric dam, which consistently passes over 70% of American Shad and is located just 22 miles upstream of the Project, it is clear that fish passage effectiveness can be improved at Conowingo. It is also worth noting that the Holtwood hydroelectric dam, located just 14 miles upstream of Conowingo, made significant structural modifications to redirect a portion of the discharge flow down the piney channel, excavate portions of the river to minimize velocity barriers and construct a weir in the river to allow fish to move from the spillway side of the project to the fish lift. Their current 401 water quality certification also includes a Tier 1 passage goal of 75% for upstream passage within 5 days for American Shad.

The Applicant notes that "[t]he study, in conjunction with Exelon's companion study on EFL attraction flows, did not identify any single operational parameter for the Project or the EFL that may result in substantial improvements in fish passage effectiveness at the EFL." Since the Applicant concludes operational changes to the Project and/or the EFL will do little to help pass migratory fish, they should have proposed measures to modify physical structures in order to pass enough migratory fish with minimal delay and stress to meet the restoration goal of 2 million American Shad and 5 million river herring above York Haven. Absent structural modifications or the installation of new fish lifts, poor passage at this Project will continue to obstruct the restoration efforts of migratory fish in the watershed, which is unacceptable.

The Applicant also stated that "[m]oreover, Project operations do not appear to be adversely impacting upstream or downstream passage"; however, this statement is contradicted by the results evident in animation data collected as part of both the 2010 and 2012 telemetry studies. Both those studies show that fish present in the tailrace immediately below the project move out of the tailrace or are displaced when there is a significant change in generation and additional turbines are turned on. Therefore, there is clear evidence that changes in project operations affect the movements of American Shad in the vicinity of the powerhouse.

Further addressing this issue, the Applicant also notes "[m]oreover, fish migrated upstream with little observable difficulty regardless of Project discharge". While the study results demonstrate that fish can reach the tailrace, what is not addressed is whether the daily changes in magnitude

of discharge may be contributing to the multiple upstream and downstream movements demonstrated by many of the tagged fish, and thus contributes to the delay in upstream migration. This delay, 11 days on average, coupled with poor passage through the EFL, is unacceptable.

In addition, the Applicant did not include important variables such as water temperature, time of season, time of day, ratio of attraction flow to unit discharge, and EFL gate operations in their analysis. These factors affect fish passage and should be included before any conclusions can be drawn about the impacts of unit operations on fish passage.

The Applicant concludes that "[i]n all respects, Exelon's studies confirmed that Conowingo Pond and the Project tailrace supports a diverse assemblage of fishes and a healthy multi-species sport fishery supported by natural reproduction." We continue to assert and believe that data from sampling programs conducted in 1982 and 1987, and data from the fish lifts, which are very biased sampling gear, are inadequate to accurately characterize current populations of fish in the river. Assessments based on these old data sets are unsupportable and inadequate for identifying needed PM&E measures for fisheries.

For example, the characterization of the fish community downstream of the Project includes the statement that "....Gizzard shad have become the increasingly dominant species over time, river herring have decreased proportionally, and American shad have generally increased proportionally", based on data presented in Table 3.3.3.1.1-3. However, that table presents fisheries data collected through 2010 and does not include data from the 2012 ichthyoplankton study (RSP 3.21) which found river herring to be the second most abundant species in the ichthyoplankton and approximately two thirds as abundant as gizzard shad.

The Resource Agencies have stated numerous times, beginning with comments on the Applicant's proposed licensing studies, that the fish lift data do not provide a current picture of the fish community downstream of the Project. The validity of that view is supported by the comment made in the first paragraph on pg. E-124 indicating few blueback herring were taken in the lift in recent years. The results of RSP 3.21 conclusively demonstrate that blueback herring are quite abundant downstream of the dam, suggesting that the community characterization based on fish lift and old historical data is likely to be inaccurate.

American Eel

The Susquehanna River Anadromous Fish Restoration Cooperative's, American Eel Restoration Plan is an Addendum to the 2010 Migratory Fish Management and Restoration Plan for the Susquehanna River Basin. This plan should be addressed here in the FLA.

Statements such as "....The continued operation of the Project will not have a significant impact on the American eel population of the Susquehanna River..." are clearly incorrect, since the project prevents upstream migration of juvenile eels into the Susquehanna River watershed and thus obstructs recolonization.

Flow Regime

The study results and other available literature show a clear connection between Project operations, more specifically flows (including duration, magnitude and ramping rates), and its

effects on migratory fish passage, habitat availability, fish stranding and RTE species. Therefore, it's surprising and unacceptable that the Applicant did not propose any changes to its existing minimum flow regime, especially since their current license with the FERC allows for up to 12 hours of no flow (0cfs) per day from December 1st through February 28th.

Closure of Catwalk

The Applicant has taken a position that the estimated cost to reopen the catwalk, reported to be $2.5 million, is not warranted because they have already built the Fisherman's Wharf, which is a similar recreational opportunity. Although both facilities provide anglers with access to the river, the similarities end there. The Fisherman's Wharf, which runs parallel to the river and provides approximately 70 feet of shoreline access, can never replace the catwalk, which crosses the river and provides approximately 1,000 feet of "in-river" access. Absent a boat, anglers find it very difficult to access the river in this way, something the Fisherman's Wharf will never replicate.

Debris Management

The Applicant failed to propose improvements or new measures for debris management, which is an important issue for the State. We understand that the Project, as currently constructed, provides significant difficulties in removing debris during spill conditions. However, the study report identified several potential improvements to the Applicant's current practices that need to be fully investigated. In the end, the State is seeking a Best Management Practices approach for removing debris during all flow conditions.

Project Lands / Boundary

We understand that the Applicant is considering removing lands from the Project boundary. In some instances, these actions benefit the public and would gain our support; however, because there are still incomplete studies and fundamental deficiencies in the FLA, FERC should delay their decision on this topic until the Applicant proposes PM&E measures for all issues that need to be addressed.

Sincerely,

s/Shawn A. Seaman
Shawn A. Seaman, Program Manager
Maryland Department of Natural Resources
Power Plant Research Program

Exhibit F

MARYLAND DEPARTMENT OF THE ENVIRONMENT
1800 Washington Boulevard • Baltimore MD 21230
410-537-3000 • 1-800-633-6101 • www.mde.state.md.us

Martin O'Malley
Governor

Anthony G. Brown
Lieutenant Governor

Robert M. Summers, Ph.D.
Secretary

FOR IMMEDIATE RELEASE

Media Contact:
Jay Apperson
410-537-3003
jay.apperson@maryland.gov

Department of the Environment solicits comment, schedules public hearing on Water Quality Certification application for proposed Conowingo Dam relicensing

Applicant must show project will comply with State water quality standards; MDE states intention to deny application due to insufficient information

BALTIMORE, MD (November 18, 2014) -- The Maryland Department of the Environment has issued public notice of the Proposed Relicensing of the Conowingo Hydroelectric Project Application for Water Quality Certification. The purpose of the notice is to solicit comments from the public and to announce the scheduling of a public hearing.

The Federal Energy Regulatory Commission (FERC) has issued a one-year extension of the current license for the operation of the Conowingo Dam. Under federal law and as part of FERC's relicensing process, Exelon is required to obtain a Clean Water Act, Section 401 Water Quality Certification from MDE for the continued operation of the facility. Issuance of a Water Quality Certification is contingent upon the applicant demonstrating to MDE that the project will comply with State water quality standards. At this time, although no final determination has been made MDE intends to deny the application due to insufficient information provided by the applicant regarding the impacts of the activity on State water quality standards.

The insufficiency of information is reflected in the draft Lower Susquehanna River Watershed Assessment report. The draft report found that the loss of long-term sediment trapping capacity at the Conowingo Dam is causing impacts to the health of the Chesapeake Bay ecosystem. It also found that additional nutrient pollution associated with these changed conditions in the lower Susquehanna River system could result in Maryland not being able to meet Chesapeake Bay water quality standards, even with full implementation of Watershed Implementation Plans by 2025, in some of the Bay's deeper northern waters. The draft report recommends additional study to quantity the full impact on Bay water quality caused by conditions at the Conowingo Dam. Enhanced monitoring is planned over the next two years.

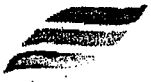
If it is ultimately determined that the project cannot comply with State water quality standards, the applicant could be required to mitigate the impacts to water quality through, for example, actions taken at the facility or by offsetting the facility's impacts with pollution reduction activities at other locations in the watershed.

Exelon filed its Water Quality Certification application on January 31, 2014. The State must act within one year of receipt of the application or it waives its right to make a decision. Notice of the application, solicitation of public comments and the scheduling of a public hearing were published in the Maryland Register. A public hearing on this application is scheduled for January 7, 2015, at MDE's Baltimore headquarters. Written comments may also be submitted. All comments must be received by the close of business on January 7, 2015.

Information on the notice, including information on submitting written comments, is on MDE's website at http://bit.ly/MDEConowingowqc.

###

Exhibit G



Exelon Generation

December 4, 2014

The Honorable Robert Summers
Secretary
Maryland Department of the Environment
1800 Washington Boulevard
Baltimore, MD 21230

Re: Withdrawal of Application for Water Quality Certification

Dear Secretary Summers:

Exelon Corporation, on behalf of its wholly-owned subsidiary, Exelon Generation Company, LLC ("Exelon") is in the process of relicensing the Conowingo Hydroelectric Project located in Cecil and Harford Counties, Maryland. Pursuant to Section 401 of the Clean Water Act, 33 U.S.C. § 1341, prior to obtaining a new license from the Federal Energy Regulatory Commission, Exelon must obtain a water quality certification from the Maryland Department of the Environment ("MDE"). On January 31, 2014, Exelon submitted to MDE an application for certification that the Conowingo Project meets applicable Maryland water quality standards.

Based on conversations with representatives from the State of Maryland, it is our understanding that MDE believes it currently has insufficient information to process Exelon's application at this time. As a result, Exelon is hereby withdrawing its pending application for a water quality certification. Federal Energy Regulatory Commission policy requires that an applicant resubmit its request for a water quality certification within 90 days of the date of withdrawal.[1] Accordingly, Exelon will work with MDE to coordinate the refiling of its application for certification within the next 90 days.

On a related matter, Exelon and MDE previously agreed to extend the Federal Consistency timeclock under the Coastal Zone Management Act to coincide with MDE's review and issuance of the water quality certification. Exelon, therefore, agrees to extend the Federal Consistency six-month timeclock until one year from the date that Exelon refiles its application for certification. Exelon agrees that if the withdrawal and resubmission of the application for certification continues to be necessary, the Federal Consistency timeclock shall continue to be automatically stayed until one year from the date that Exelon resubmits its application for certification to MDE.

[1] *See* Letter from Federal Energy Regulatory Commission Staff to Skykomish River Hydro, Inc., Project No. 10942-001 (Jan. 3, 2003) ("Consistent with Commission policy, a request for section 401 certification must be on file with the Commission within 90 days of the date of . . . withdrawal to allow continued processing of [the] application.").

Please do not hesitate to contact the undersigned with any questions regarding this matter.

With kind regards,

Vicky Will
Vice President, Environmental Services
Exelon Power
Exelon Generation Company, LLC
300 Exelon Way
Kennett Square, PA 19348
Tel: (610) 765-5611
Email: Vicky.Will@exeloncorp.com

CC: Steven Johnson (MDE)
Brent Bolea (Maryland Energy Administration)

Exhibit H

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December 22, 2014

VIA ELECTRONIC FILING

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John B. Smith, Chief
Mid-Atlantic Branch
Division of Hydropower Licensing
Office of Energy Projects
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Re: Conowingo Hydroelectric Project, FERC Project No. 405
Response to Letter from Office of Energy Projects Regarding
Withdrawal of Section 401 Water Quality Certificate Application

Dear John:

On December 9, 2014, Exelon Corporation, on behalf of its wholly owned subsidiary, Exelon Generation Company, LLC ("Exelon") filed with the Federal Energy Regulatory Commission a letter stating it had entered into an agreement with the Maryland Department of the Environment ("MDE") to conduct a multi-year sediment study. MDE has requested the additional sediment study in order to process Exelon's application for a water quality certificate pursuant to section 401 of the Clean Water Act for the Conowingo Hydroelectric Project.

On December 18, 2014, you requested clarification regarding: (1) the timeline for the multi-year sediment study; and (2) whether Exelon intends to continue to withdraw and refile the section 401 application every year until the study is complete.

Based on the study plan agreed upon by Exelon and MDE, Exelon estimates that the sediment study will be completed in 2016 or 2017 depending on the number of storm events that occur annually. As discussed with MDE, Exelon intends to continue to withdraw and refile the Conowingo Hydroelectric Project section 401 application every year until the study is complete.

I would like to wish you all the best during the holiday season. If you have questions or require additional information regarding this matter, please do not hesitate to contact me.

Respectfully submitted,

Jay Ryan
Baker Botts L.L.P.
The Warner
1299 Pennsylvania Avenue, N.W.
Washington, DC 20004
(202) 639-7789
jay.ryan@bakerbotts.com
Counsel to Exelon Corporation

cc: Emily Carter (FERC)
Official Service List for Docket No. P-405

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon each person designated on the official service list compiled by the Secretary in this proceeding. Dated this 22nd day of December, 2014 in Washington, D.C.

Marcia Hook

Marcia Hook
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Exhibit I

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March 4, 2015

VIA ELECTRONIC FILING

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Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Re: Conowingo Hydroelectric Project, FERC Project No. 405
Copy of Request for Section 401 Water Quality Certification

Dear Secretary Bose:

Pursuant to 18 C.F.R. § 5.23(b), Exelon Generation Company, LLC ("Exelon") respectfully submits a copy of Exelon's request to the Maryland Department of the Environment ("MDE") for a Clean Water Act Section 401 water quality certification for the Conowingo Hydroelectric Project (FERC Project No. 405), which was refiled with MDE on March 3, 2015.

If you have questions or require additional information regarding this matter, please do not hesitate to contact the undersigned.

Respectfully submitted,

/s/ Jay Ryan

Jay Ryan
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jay.ryan@bakerbotts.com
Counsel to Exelon Corporation

Attachment: Request for Clean Water Act Section 401 Water Quality Certification for the Conowingo Hydroelectric Project

cc: Emily Carter (FERC)
Vince Yearick (FERC)

Brent Bolea (MDE)
Andrew Tittler (DOI)

Official Service List for Docket No. P-405

Exelon Generation

March 3, 2015

MDE
MAR 0 3 2015
1:10pm

The Honorable Benjamin H. Grumbles
Acting Secretary
Maryland Department of the Environment
1800 Washington Boulevard
Baltimore, MD 21230

Re: Section 401 Water Quality Certification Application
Conowingo Hydroelectric Project (FERC Project No. 405)
Cecil and Harford Counties

Dear Secretary Grumbles:

Exelon Corporation, on behalf of its wholly-owned subsidiary, Exelon Generation Company, LLC ("Exelon") is in the process of relicensing the Conowingo Hydroelectric Project ("Conowingo Project") located in Cecil and Harford Counties, Maryland. Pursuant to Section 401 of the Clean Water Act, 33 U.S.C. § 1341, prior to obtaining a new license from the Federal Energy Regulatory Commission ("FERC"), Exelon must obtain a water quality certification from the Maryland Department of the Environment ("MDE").

On January 31, 2014, Exelon submitted to MDE an application for a water quality certification for the Conowingo Project. Representatives from the State of Maryland subsequently indicated that MDE believed it had insufficient information to process Exelon's application. As a result, Exelon entered into an agreement with MDE to work with state agencies in Maryland, the U.S. Army Corps of Engineers, the U.S. Geological Survey, the University of Maryland Center for Environmental Science, and the U.S. Environmental Protection Agency to design and conduct a multi-year sediment study ("Sediment Study") that will provide additional information to MDE. The goals of the Sediment Study are to quantify the amount of suspended sediment concentration, associated nutrients, suspended sediment load, and nutrient load present in the major entry points to the Lower Susquehanna River Reservoir System and the upper Chesapeake Bay. Exelon will contribute $3.5 million to fund the Sediment Study.

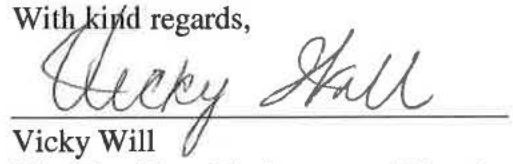
Because states must act on applications under Section 401 of the Clean Water Act within one year, and the Sediment Study would not be completed prior to January 31, 2015, Exelon withdrew its application for a water quality certification on December 4, 2014. In its withdrawal letter, Exelon indicated its intent to refile its application for a water quality certification within 90 days, as required by FERC policy.

Accordingly, Exelon hereby resubmits its application for certification that the Conowingo Project meets applicable Maryland water quality standards in accordance with Section 401 of the Clean Water Act (33 U.S.C. § 1341) and Title 26 of the Code of Maryland Regulations. The application consists of the materials submitted previously to MDE on January 31, 2014, as supplemented by the Sediment Study referenced above.

Exelon commits to update the record with any information resulting from the Lower Susquehanna River Watershed Assessment or the Sediment Study. Exelon also reserves the right to supplement this application and the record with any other relevant information to support Exelon's application for a water quality certification.

Please do not hesitate to contact the undersigned with any questions regarding this matter.

With kind regards,



Vicky Will
Vice President, Environmental Services and
Operations Support
Exelon Power
Exelon Generation Company, LLC
300 Exelon Way
Kennett Square, PA 19348
Tel: (610) 765-5611
Email: Vicky.Will@exeloncorp.com

CC: Steven Johnson (MDE)
Brent Bolea (Maryland Energy Administration)

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon each person designated on the official service list compiled by the Secretary in this proceeding. Dated this 4th day of March, 2015 in Washington, D.C.

/s/ Marcia Hook

Marcia Hook
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Exhibit J

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April 26, 2016

Kimberly D. Bose
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

Jay Ryan
TEL: 2026397789
FAX: 2025851015
jay.ryan@bakerbotts.com

Re: Conowingo Hydroelectric Project, FERC Project No. 405
Copy of Request for Section 401 Water Quality Certification

Dear Secretary Bose,

Pursuant to 18 C.F.R. § 5.23(b), Exelon Generation Company, LLC ("Exelon") respectfully submits a copy of Exelon's request to the Maryland Department of the Environment ("MDE") for a Clean Water Act Section 401 water quality certification for the Conowingo Hydroelectric Project (FERC Project No. 405).

If you have questions or require additional information regarding this matter, please do not hesitate to contact the undersigned.

Respectfully,

/s/ Jay Ryan
Jay T. Ryan
Baker Botts L.L.P.
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(202)-639-7700
jay.ryan@bakerbotts.com

Counsel for Exelon Generation Company, LLC

Enclosure: Request for Clean Water Act Section 401 Water Quality Certification for the Conowingo Hydroelectric Project

cc: Official Service List for FERC P-405
Emily Carter (FERC)
Vince Yearick (FERC)
Bobbie James (MDE)

Exelon Generation®

April 25, 2016

The Honorable Benjamin H. Grumbles
Secretary
Maryland Department of the Environment
1800 Washington Boulevard
Baltimore, MD 21230

Re: Section 401 Water Quality Certification Application
Conowingo Hydroelectric Project (FERC Project No. 405)
Cecil and Harford Counties

Dear Secretary Grumbles:

Exelon Corporation, on behalf of its wholly-owned subsidiary, Exelon Generation Company, LLC ("Exelon") is in the process of relicensing the Conowingo Hydroelectric Project ("Conowingo Project") located in Cecil and Harford Counties, Maryland. Pursuant to Section 401 of the Clean Water Act, 33 U.S.C. § 1341, prior to obtaining a new license from the Federal Energy Regulatory Commission ("FERC"), Exelon must obtain a water quality certification from the Maryland Department of the Environment ("MDE").

As you know, Exelon entered into an agreement with MDE to work with state agencies in Maryland, the U.S. Army Corps of Engineers, the U.S. Geological Survey, the University of Maryland Center for Environmental Science ("UMCES"), and the U.S. Environmental Protection Agency ("EPA") to design and conduct a multi-year sediment study ("Sediment Study") that will provide additional information to MDE. The goals of the Sediment Study are to quantify the amount of suspended sediment concentration, associated nutrients, suspended sediment load, and nutrient load present in the major entry points to the Lower Susquehanna River Reservoir System and the upper Chesapeake Bay. Exelon will contribute up to $3.5 million to fund the Sediment Study.

In 2016, the Sediment Study entered its second planned year. To date, two official high flow sampling events have occurred (out of a planned six events). In addition, some *ad hoc* supplemental data collection has occurred as well. Due to the lack of storm events since the commencement of the study, focus has recently shifted from a field-based sampling approach to a modeling-based approach that will utilize the field sampling data collected to date. Therefore, Exelon has been working closely with the EPA Chesapeake Bay Program modeling workgroup to develop enhancements to the current suite of models, which are anticipated to be used for the 2017 Chesapeake Bay Total Maximum Daily Load Midpoint Assessment.

Exelon previously filed an application for a water quality certification on March 3, 2015. Because states must act on applications under Section 401 of the Clean Water Act within one year, and the Sediment Study would not be completed prior to March 3, 2016, Exelon withdrew its application for a water quality certification on February 5, 2016. In its withdrawal

letter, Exelon indicated its intent to refile its application for a water quality certification within 90 days, as required by FERC policy.

Accordingly, Exelon hereby resubmits its application for certification that the Conowingo Project meets applicable Maryland water quality standards in accordance with Section 401 of the Clean Water Act (33 U.S.C. § 1341) and Title 26 of the Code of Maryland Regulations. The application consists of the materials submitted previously to MDE on March 3, 2015, as supplemented by the Sediment Study referenced above. In addition, Exelon recently reached an agreement with the U.S. Department of the Interior ("Interior") that resolves all issues between Exelon and Interior relating to fish passage at the Conowingo Project. Exelon has included a copy of the Settlement Agreement, which also contains Interior's modified prescription for fishways at the Conowingo Project. Finally, Exelon notes that the Lower Susquehanna River Watershed Assessment ("LSRWA") Final Report was released on March 10, 2016, and can be accessed at http://dnr.maryland.gov/bay/lsrwa/report.htm. Exelon will provide a hard copy of the LSRWA Final Report upon request.

Exelon reserves the right to supplement this application and the record with any other relevant information to support Exelon's application for a water quality certification.

Please do not hesitate to contact the undersigned with any questions regarding this matter.

With kind regards,

Colleen E. Hicks

Colleen E. Hicks
Manager, Regulatory and Licensing
Exelon Power
Exelon Generation Company, LLC
300 Exelon Way
Kennett Square, PA 19348
Tel: (610) 765-6791
Email: colleen.hicks@exeloncorp.com

CC: Steve Talson (Maryland Energy Administration)
Bobbie James (MDE)

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon each person designated on the official service list compiled by the Secretary in this proceeding.

Dated at Washington, D.C., this 26th day of April, 2016.

/s/ Marcia Hook

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Exhibit K

May 17, 2017

The Honorable Benjamin H. Grumbles
Secretary
Maryland Department of the Environment
1800 Washington Boulevard
Baltimore, MD 21230

Re: Section 401 Water Quality Certification Application
Conowingo Hydroelectric Project (FERC Project No. 405)
Cecil and Harford Counties

Dear Secretary Grumbles:

Exelon Generation Company, LLC ("Exelon") is in the process of relicensing the Conowingo Hydroelectric Project ("Conowingo Project") located in Cecil and Harford Counties, Maryland. Pursuant to Section 401 of the Clean Water Act, 33 U.S.C. § 1341, prior to obtaining a new license from the Federal Energy Regulatory Commission ("FERC"), Exelon must obtain a water quality certification from the Maryland Department of the Environment ("MDE"). Exelon has enclosed six compact discs, each of which contains a complete copy of Exelon's application for a water quality certification for the Conowingo Project ("Application"), including all supporting materials referenced therein. Exelon expressly reserves the right to supplement the Application, as necessary.

Exelon has provided below a brief overview of the commitments contained in the Application. As demonstrated in the Application, the Conowingo Project, as proposed, is consistent with applicable Maryland water quality standards. Further, the additional protection, mitigation, and enhancement ("PM&E") measures Exelon has committed to implement in connection with the relicensing of the Conowingo Project will provide immediate, measurable benefits to Maryland's aquatic resources.

Background

On January 31, 2014, Exelon submitted to MDE an application for a water quality certification for the Conowingo Project. That application included copies of the resource studies that had been completed to date as part of the FERC relicensing process. In addition, Exelon and MDE both had an opportunity to review and comment on the draft Lower Susquehanna River Watershed Assessment ("LSRWA") report prepared by the U.S. Army Corps of Engineers.

After review of both Exelon's application and the draft LSRWA report, MDE communicated to Exelon that an additional study to understand the impacts of sediment transport on water quality in the Susquehanna River and Chesapeake Bay ("Sediment Study") would be

required to evaluate Exelon's application for a water quality certification. While Exelon believed its application was complete and that no additional study was required for MDE to issue a water quality certification for the Conowingo Project, in December 2014, Exelon entered into an agreement with MDE to work with state agencies in Maryland, the U.S. Army Corps of Engineers, the U.S. Geological Survey, the University of Maryland Center for Environmental Science, and the U.S. Environmental Protection Agency to design and conduct a multi-year Sediment Study to provide additional information to MDE.

The goals of the Sediment Study were to quantify the amount of suspended sediment concentration, associated nutrients, suspended sediment load, and nutrient load present in the major entry points to the Lower Susquehanna River Reservoir System and the upper Chesapeake Bay. Exelon contributed $3.5 million to fund the Sediment Study.

Because states must act on applications under Section 401 of the Clean Water Act within one year and the Sediment Study would not be completed prior to January 31, 2015, on December 4, 2014 Exelon withdrew its application for a water quality certification, indicating its intent to refile within 90 days, as required by FERC policy. Exelon refiled its application for a water quality certification on March 3, 2015, and withdrew that application on February 5, 2016 pending conclusion of the Sediment Study. Exelon again refiled its application on April 25, 2016, and withdrew that application on February 17, 2017. On March 13, 2017, MDE indicated that it expected to receive Exelon's resubmission by no later than May 18, 2017 and would, upon receipt of the resubmission, initiate its review of the water quality impacts associated with the operation of the Conowingo Project.[1]

Overview of Commitments

As described more fully in the attached Application, Exelon has committed to a comprehensive suite of PM&E measures that will provide measurable and immediate benefits to Maryland aquatic resources.

FERC Final License Application

In its Final License Application ("FLA") filed with FERC, Exelon committed to enhance Dissolved Oxygen ("DO") at the Conowingo Project using the turbine venting systems on Units 1 through 7 and the aerating runners on Units 2 and 5, and to continuously monitor DO levels from May 1 through October 1 at the Station 643 location, located approximately 0.6 miles downstream of Conowingo Dam. Exelon also proposed to implement a Debris Management Plan to remove submerged debris from the area upstream of the powerhouse intakes and floating surficial debris in front of the powerhouse intakes, and to sponsor community-based clean-ups in the pond and downstream of Conowingo Dam.

In addition, Exelon proposed to implement a Sediment Management Plan that identifies benchmarks and thresholds for actions to address sediment issues that may affect operation of the Conowingo Project, and to conduct a bathymetric survey of Conowingo Pond every five years to monitor sediment transport and depositional patterns. Exelon also committed

[1] Letter from Ben Grumbles, Secretary, Maryland Department of the Environment to Vicky Will, Vice President, Operations Support, Exelon Generation Company, LLC (Mar. 13, 2017).

to implement a Shoreline Management Plan that includes measures and policies designed to, *inter alia*, control sediment introduction from lands within the Conowingo Project boundary. The FLA, a copy of which is included in the Application, provides further detail on these commitments and sets forth additional PM&E measures that will benefit Maryland aquatic resources.

Exelon is not proposing, as part of the Application, to address sediment and other pollutants introduced by unaffiliated third-party sources upstream of Conowingo Pond. Exelon has no ability to control upstream point and non-point sources and the Clean Water Act imposes no legal obligation on Exelon to address pollutants introduced by others. Moreover, the Chesapeake Bay Total Maximum Daily Load for Nitrogen, Phosphorus, and Sediment ("TMDL") provides a comprehensive framework for addressing Chesapeake Bay water quality issues, including any impacts resulting from the reduction in trapping capacity behind Conowingo Dam caused by sediment introduced upstream of Conowingo Dam. Specifically, "[i]n developing the TMDL, EPA considered the impact of [the Susquehanna River] dams on the pollutant loads to the Bay and how those loads will change when the dams no longer function to trap nitrogen, phosphorus, and sediment."[2]

Settlement Agreement with U.S. Department of the Interior

In April 2016, Exelon entered into a Settlement Agreement ("Settlement Agreement") with the U.S. Department of the Interior ("Interior") in which Exelon agreed to further augment the PM&E measures described above.[3] Under the Settlement Agreement, Exelon will implement substantial improvements to the existing fish passage facilities at the Conowingo Project within three years of license issuance ("Initial Construction Items"). The Initial Construction Items include:

- Modifying the existing East Fish Lift to provide 900 cubic feet per second ("cfs") of attraction flow.
- Replacing the current 3,300-gallon hopper at the East Fish Lift with two 6,500-gallon hoppers.
- Reducing cycle time at each hopper at the East Fish Lift to be able to lift fish four times per hour.
- Completing modifications to the East Fish Lift structure to allow for trapping and sorting fish at the East Fish Lift facility and transporting them to the western side of the dam to a truck for transport upstream.
- Modifying the existing West Fish Lift to facilitate trap and transport.
- Constructing and maintaining structures, implementing measures, and/or operating the Conowingo Project to provide American shad and river herring a zone of passage to the fish passage facilities.

[2] Chesapeake Bay TMDL at 10-7.
[3] Offer of Settlement and Explanatory Statement, FERC Docket No. P-405-106 (filed May 12, 2016).

- Evaluating potential trapping locations for American eel on the east side of Conowingo Dam, including Octoraro Creek starting in May of the first calendar year after license issuance or immediately if license issuance occurs during the upstream American eel migration period.

In addition to these Initial Construction Items, Exelon will commence trap and transport of American shad and river herring from the Conowingo Project to above the York Haven Hydroelectric Project beginning the first fish passage season after license issuance.[4] Exelon also has committed to trap and transport American eels at the west side of Conowingo Dam until 2030, and to implement volitional American eel passage starting in the 2031 fish passage season.

Five years after issuance of the new license, Exelon will commence a three-year "Initial Efficiency Test" of fish passage at the Conowingo Project. The Initial Efficiency Test will measure the passage efficiency of the improved facilities. If the facilities achieve an 85 percent upstream passage efficiency for adult American shad,[5] Exelon will continue to operate the facilities without further modification. Exelon will then conduct two-year "Periodic Efficiency Tests" every five years to ensure that the Conowingo Project maintains an upstream passage efficiency of 85 percent for adult American shad throughout the term of the new license.

If the Conowingo Project does not achieve an upstream passage efficiency of 85 percent after the Initial Efficiency Test or any Periodic Efficiency Test, Exelon will be required to implement measures to improve passage efficiency at the Conowingo Project. Exelon and Interior have agreed on a tiered list of potential measures, which are designed to address fish passage impediments associated with attraction flow and capacity limitations. The degree of the shortfall from the 85 percent passage efficiency target determines the scope of the additional mitigation and enhancement measures that will be required. As set forth in the Settlement Agreement, these additional mitigation measures range from the implementation of preferential turbine operating schemes to the construction of a new West Fish Lift.

In the first fish passage season after Exelon implements any measure or measures to improve passage effectiveness, Exelon will commence a three-year Post-Modification Efficiency Test. The Post-Modification Efficiency Test will measure the passage efficiency of the improved facilities. If the Conowingo Project achieves an upstream passage efficiency of 85 percent for American shad, Exelon will continue to operate the facilities without modification and will return to conducting two-year Periodic Efficiency Tests every five years. Again, if any Periodic Efficiency Test demonstrates that the Conowingo Project is not achieving an 85 percent passage efficiency, Exelon will implement measures from the tiered list of options, to be followed by a Post-Modification Efficiency Test. This cycle of testing and modifying, as necessary, will continue throughout the term of the license.

In addition to the improvements described above, Exelon will develop and implement a Fishway Operation and Maintenance Plan that will provide extensive information

[4] Exelon has agreed to annually trap and transport up to 80 percent of the run, up to a maximum of 100,000 fish for each species.

[5] Pursuant to the Settlement Agreement, Exelon receives credit toward achieving the upstream passage target efficiency of 85 percent as a result of its trap and truck operations.

about the operations of the Conowingo Project's fish passage facilities. The Settlement Agreement includes downstream American eel effectiveness monitoring, upstream American eel effectiveness testing, and downstream adult and juvenile American shad and river herring effectiveness testing. The plans for all the studies described in the Settlement Agreement will be contained in the Fishway Effectiveness Monitoring Plan—a document Exelon will develop in consultation with Interior, which is subject to approval by Interior and FERC.

In any year that Exelon is conducting a study, it will submit a yearly interim study report to Interior and FERC following the conclusion of the study year. The interim and final reports for upstream passage studies will be submitted to Interior by December 31st of each study year. The interim and final reports for downstream passage studies will be submitted to Interior by August 1 following each study year. The final study report will include results for each life stage and type of study conducted with a determination of Exelon's success or failure in achieving the passage efficiency criteria set forth in the Settlement Agreement. In conjunction with submitting the final study report(s), Exelon also will provide Interior electronic copies of all data collected from the studies.

Further, Exelon agreed to meet annually with Interior and the Susquehanna River Anadromous Fish Restoration Cooperative to discuss the Fishway Effectiveness Monitoring Plan and Fishway Operation and Maintenance Plan. This meeting will occur no later than January 31 each year, unless Exelon and Interior agree on a different date. At this annual meeting, Exelon will discuss with Interior and the Susquehanna River Anadromous Fish Restoration Cooperative the fish passage results from the previous year, review regulatory requirements for fish lift and eel passage operations, and discuss any upcoming modification or testing Exelon proposes for the upcoming fish passage season.

Exelon has agreed to operate the Conowingo Project to achieve a downstream survival efficiency of at least 80 percent for the adult and 95 percent for the juvenile American shad and river herring moving downstream past the Conowingo Project. Exelon also has agreed to operate the Conowingo Project to achieve a downstream survival efficiency criterion of at least 85 percent for the adult American eel moving downstream past the Conowingo Project. If the results of the downstream studies indicate that the Conowingo Project is not achieving these efficiency criteria, Interior may exercise its reservation of authority to address the issue.

Each of the above commitments is described more fully in the Settlement Agreement, a copy of which is included in the Application.

Supplemental Eel Passage Commitments

Finally, Exelon recently submitted a filing with FERC ("Supplemental Filing") requesting that FERC incorporate certain eel passage requirements from the water quality certification for the Muddy Run Pumped Storage Project into the FLA for the Conowingo Project.[6]

[6] Supplemental Information Regarding Exelon Generation Company, LLC's Application for a New License, Docket No. P-405-106 (filed Apr. 21, 2017).

Specifically, Exelon committed to design, install and operate an eel trapping facility and eel holding facility along the western shore of the Conowingo Dam near the location of the current United States Fish and Wildlife Service trapping location and facility. Those facilities began operation on May 1, 2017 and will be operated by Exelon annually until 2030, at which point Exelon will construct and operate a volitional upstream eel facility at Conowingo Dam, for operation starting in 2031 through the term of the new FERC license, as described in the Settlement Agreement.

Exelon will submit daily emails and an annual report ("Annual Report") providing information regarding the operation of the eel passage facilities to the ("EPAG"), a group that is chaired by Exelon and composed of a representative from each of the Pennsylvania Department of Environmental Protection, Pennsylvania Fish and Boat Commission, United States Fish and Wildlife Service, the Maryland Department of Natural Resources Maryland Power Plant Research Project and the Susquehanna River Basin Commission.

Every three years, unless a different period is established by the PADEP in writing beginning in 2018 through 2030, Exelon will conduct stream segment evaluations through electrofishing or other methods identified after consultation with EPAG. Results of stream segment evaluations will be included in the Annual Report and will document dispersal of the stocked eels, estimate the approximate density of stocked eels, and evaluate the growth, condition, age, gender and level of infestation with *Anguillicoloides crassus* of stocked eels.

These additional eel passage commitments are described more fully in the Supplemental Filing, a copy of which is included in the Application.

Recreation

As part of the FLA, Exelon developed a Recreation Management Plan for managing recreational resources at the Conowingo Project over the new license term. In the Recreation Management Plan, Exelon proposes to implement substantial improvements and enhancements to the recreation facilities at Lock 13, Lock 15, Muddy Creek Boat Launch, Cold Cabin, Dorsey Park, Peach Bottom Marina, Line Bridge, Conowingo Creek Boat Launch, Glen Cove Marina, Funk's Pond, Conowingo swimming pool, Conowingo Dam Overlook, and Fisherman's Park/Shures Landing.

These improvements and enhancements to the recreational facilities at the Conowingo Project are described more fully the Recreation Management Plan, a copy of which is included in the Application.

Minimum Flows

In addition to the fish passage enhancements, shoreline recreational improvements, and measures to address sediment introduction on Conowingo Project lands, Exelon has proposed to increase its minimum flows and to make them continuous year-round. Specifically, Exelon is proposing the following:

Month	Min. Flows (cfs)
December	4,000
January	4,000
February	4,000
March	4,000
April	18,200
May	18,200
June	7,500
July	5,500
August	4,500
September	3,500
October	4,000
November	4,000

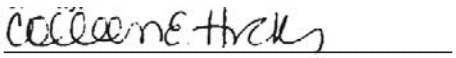
These flow conditions provide for an operational regime that adequately mitigates the impacts of the Conowingo Project's regulation of flow in the lower Susquehanna River, and protects suitable habitats and key natural processes. These flow conditions also adequately balance both environmental and economic interests.

Conclusion

As demonstrated in the Application, the Conowingo Project, as proposed, is consistent with applicable Maryland water quality standards. Further, the additional PM&E measures Exelon has committed to implement in connection with the relicensing of the Conowingo Project will provide immediate, measurable benefits to Maryland's aquatic resources. Accordingly, Exelon respectfully requests that MDE issue a water quality certification, consistent with the commitments set forth above and detailed in the enclosed application materials.

Please do not hesitate to contact the undersigned if you have any questions or require additional information regarding this matter

Sincerely,



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Exelon Generation's

Application for a
Maryland Water Quality Certificate
for the Conowingo Hydroelectric Project

May 17, 2017

I. INTRODUCTION

Maryland's water quality standards comprise three elements: (1) designated use or uses of a water body; (2) water quality criteria necessary to protect the use or uses; and (3) an antidegradation statement. The mainstem segment from Conowingo Dam downstream to the confluence with Chesapeake Bay is designated Use II-P. Maryland's water quality criteria to protect this designated use are expressed in terms of chemical-specific concentrations, toxicity levels, and narrative criteria. These criteria include standards to address bacteria, dissolved oxygen, temperature, pH, turbidity, and toxic substances. Maryland's narrative criteria also prohibit pollution of State waters by sewage, industrial waste, or other waste, and the State's antidegradation policy protects existing water quality where it exceeds minimum requirements specified by water quality standards.

In support of its application for a new Federal Energy Regulatory Commission (FERC) license for the Conowingo Hydroelectric Project (Project), Exelon conducted a number of resource studies to assess the impacts and benefits of the Project. These relicensing studies, implemented pursuant to a FERC-approved study plan, led to the development of the Conowingo license application. The final license application was filed with FERC on August 30, 2012 (Final License Application).

In addition, on April 21, 2016, Exelon entered into a Settlement Agreement (Settlement Agreement) with the U.S. Department of the Interior (Interior), in which Exelon agreed to implement additional fish passage measures at the Project over the term of the new license. Exelon also recently submitted a filing with FERC (Supplemental Filing) requesting that FERC incorporate certain eel passage requirements from the water quality certification for the Muddy Run Pumped Storage Project (Muddy Run Project) into the license application for the Project.

The Final License Application (including the extensive environmental analysis set forth in Exhibit E), the FERC Final Environmental Impact Statement (FEIS), the relicensing studies, the Settlement Agreement with Interior, and the Supplemental Filing are incorporated into this water quality certificate application and submitted as part of the record. As summarized below, the relicensing studies demonstrate that the Project, as proposed, is consistent with applicable Maryland water quality standards. Specifically, the minimum flows pursuant to which the Project operates; the aeration capabilities of certain generating units; the recreational facilities; the operation of the East and West fish lifts; measures to protect rare, threatened, and endangered species; and the implementation of best management practices to minimize or eliminate sediment and nutrient delivery to Project waters ensure that the Project will meet applicable water quality standards and protect existing uses while operating under the new FERC license. The additional protection, mitigation, and enhancement (PM&E) measures that Exelon has committed to implement in connection with the relicensing of the Project also will provide immediate, measurable benefits to Maryland's aquatic resources.

II. MARYLAND WATER QUALITY STANDARDS

Maryland's water quality standards, described below, consist of three elements: (1) the designated use or uses of a water body; (2) the water quality criteria that are necessary to protect the use or uses; and (3) an antidegradation statement.

1. Designated Uses

a. Generally

Section 303(c) of the Clean Water Act requires that each state designate uses for each water body or segment thereof within the state.[1] A designated use can be either an existing use or a higher quality use, even if such higher use does not currently exist in that water body.[2] Under Section 303, designated uses can be propagation of fish and wildlife, recreation, public water supply, agriculture, navigation, and industrial use.[3] As set forth in EPA's regulations:

> [W]ater quality standards should, wherever attainable, provide water quality for the protection and propagation of fish, shellfish and wildlife and for recreation in and on the water and take into consideration their use and value of public water supplies, propagation of fish, shellfish, and wildlife, recreation in and on the water, and agricultural, industrial, and other purposes including navigation.[4]

A state may designate several compatible uses for the same water body,[5] and can remove a designated use—as long as it is higher than an existing use—if the state can demonstrate that attaining the designated use is not feasible.[6]

Pursuant to these requirements, MDE has designated eight water use classes, including four applicable to the Project:[7]

- *Use I:* "Water Contact Recreation, and Protection of Nontidal Warmwater Aquatic Life."[8] Use I waters include those that are suitable for:

  (a) Water contact sports;

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1 33 U.S.C. § 1313(c).
2 *See* 40 C.F.R. § 131.3(f) (defining "designated uses" as "those uses specified in water quality standards for each water body or segment whether or not they are being attained").
3 33 U.S.C. § 1313(c)(2)(A).
4 40 C.F.R. § 131.2.
5 *See* 33 U.S.C. § 1370.
6 40 C.F.R. § 131.10(g). A designated use can be removed if "[d]ams, diversions or other types of hydrologic modifications preclude the attainment of the use. . . ." *Id.* § 131.10(g)(4).
7 *See* Md. Code Regs. § 26.08.02.02(B).
8 *Id.* § 26.08.02.02(B)(1).

(b) Play and leisure time activities where individuals may come in direct contact with the surface water;

(c) Fishing;

(d) The growth and propagation of fish (other than trout), other aquatic life, and wildlife;

(e) Agricultural water supply; and

(f) Industrial water supply.[9]

- *Use I-P:* "Water Contact Recreation, Protection of Aquatic Life, and Public Water Supply."[10] Use I-P waters include all uses identified for Use I waters, as well as "[u]se as a public water supply."[11]

- *Use II:* "Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting."[12] Use II waters include all uses identified for Use I waters located in:

  (a) All tidally influenced waters of the Chesapeake Bay and tributaries, the Coastal Bays, and the Atlantic Ocean to the 3-mile boundary; and

  (b) Tidally influenced waters that are or have the potential for:

    (i) Shellfish propagation and storage, or harvest for marketing purposes; and

    (ii) Actual or potential areas for the harvesting of oysters, soft-shell clams, hard-shell clams, and brackish water clams.[13]

- *Use II-P:* "Tidal Fresh Water Estuary."[14] Use II-P waters include all uses identified for Use II waters, as well as "[u]se as a public water supply."[15]

b. Designated Uses at Conowingo

The mainstem segment from Conowingo Dam downstream to the confluence with Chesapeake Bay is designated Use II-P,[16] with the following subcategories applicable:

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9 *Id.* § 26.08.02.02(B)(1)(a)-(f).
10 *Id.* § 26.08.02.02(B)(2).
11 *Id.* § 26.08.02.02(B)(2)(a)-(b).
12 *Id.* § 26.08.02.02(B)(3).
13 *Id.* § 26.08.02.02(B)(3)(a)-(b).
14 *Id.* § 26.08.02.02(B)(4).
15 *Id.* § 26.08.02.02(B)(4)(a)-(b).
16 *Id.* § 26.08.02.08(B)(2)(a).

- Migratory Spawning and Nursery: Applies from February 1 to May 31, inclusive.[17]

- Seasonal Shallow-Water Submerged Aquatic Vegetation (SAV): Applies from April 1 to October 30, inclusive, and to a depth of 2.0 meters. MDE's regulations note that "no grow zones" of SAV are present in this reach.[18]

- Open-Water Fish and Shellfish: Applies from January 1 to December 31, inclusive.[19]

2. Water Quality Criteria

Water quality criteria "are elements of State water quality standards, expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports a particular use. When criteria are met, water quality will generally protect the designated use."[20] Upon adoption by a state, these "ambient criteria" become the applicable regulatory requirements for the protection of designated waters to which they apply.[21]

As set forth in MDE's regulations, Maryland's water quality criteria to protect the above-described designated uses are expressed in terms of chemical-specific concentrations, toxicity levels, and narrative criteria. The water quality criteria applicable to the stream segment in which Conowingo is located are described below.

a. Chemical-Specific Concentrations

The segment of the mainstem Susquehanna River from Conowingo Dam to the confluence with Chesapeake Bay has been designated as Use II-P, with the following applicable subcategory uses present in this segment: Migratory Spawning and Nursery, Seasonal Shallow-Water SAV, and Open-Water Fish and Shellfish. Under MDE's regulations, therefore, the following criteria apply:

- *Bacteriological*: MDE's bacteriological criteria for Use II-P waters are the same as Use-I-P waters. These criteria address E. coli, freshwater enterococci, and marine water enterococci,[22] For each bacterial indicator, the regulations establish: (1) a steady state geometric mean indicator density for all areas; and (2) a range of single-sample maximum allowable densities, depending upon whether the full-body contact recreation in a given location is "frequent," "moderately frequent," "occasional," or "infrequent."[23] For freshwater enterococci, the steady state geometric mean density is 33 counts per 100 milliliters (ml), with a maximum allowable density ranging from 61 to 151 counts per 100 ml. For E. coli, the steady state geometric mean density is 126 counts per 100 ml, with a maximum allowable density ranging from 235 to 576 counts

17 *Id.*
18 *Id.*
19 *Id.*
20 40 C.F.R. § 131.3(b).
21 "For waters with multiple use designations, the criteria shall support the most sensitive use." 40 C.F.R. § 131.11(a).
22 *See* Md. Code Regs. §§ 26.08.02.03-3(A)(1)(a), 26.08.02.03-3(B).
23 *Id.* 26.08.02.03-3(A)(1)(a).

per 100 ml. For marine water enterococci, the steady state geometric mean density is 35 counts per 100 ml, with a maximum allowable density ranging from 104 to 500 counts per 100 ml.[24] There also is an added requirement that, in Shellfish Harvest waters, "there may not be any pathogenic or harmful organisms in sufficient quantities to constitute a public health hazard in the use of waters for shellfish harvesting."[25]

- *Dissolved Oxygen (DO)*: DO criteria for Use II-P waters are the same as Use I-P waters ("the [DO] concentration may not be less than 5 milligrams/liter at any time"[26]), except for the following subcategories applicable in the reach downstream of Conowingo Dam:

    - Seasonal and Migratory Fish Spawning and Nursery: From February 1 through May 31, the DO level must be greater than or equal to 6 milligrams/liter (mg/l) for a 7-day averaging period, with an instantaneous minimum requirement of greater than or equal to 5 mg/l. For all other times during the year, the DO levels are as follows:

        (i) Greater than or equal to 5.5 [mg/l] for a 30-day averaging period . . . in tidal fresh waters (salinity less than or equal to 0.5 parts per thousand);

        (ii) Greater than or equal to 5 [mg/l] for a 30-day averaging period . . . (salinity greater than 0.5 parts per thousand);

        (iii) Greater than or equal to 4.0 [mg/l] for a 7-day averaging period . . .;

        (iv) Greater than or equal to 3.2 [mg/l] as an instantaneous minimum . . .; and

        (v) For protection of the endangered shortnose sturgeon, greater than or equal to 4.3 [mg/l] as an instantaneous minimum at water column temperatures greater than 29ºC (77ºF).[27]

    - Seasonal Shallow-Water SAV: Same as items (i) through (v), above, year-round.[28]

    - Open-Water Fish and Shellfish: Same as items (i) through (v), above, year-round.[29]

- *Temperature:* Temperature criteria for Use II-P waters are the same as Use I-P waters.[30] For Use I-P waters, MDE's regulations establish a maximum temperature of 90ºF "or

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24 *Id.*
25 *Id.* § 26.08.02.03-3(C)(1); *see also id.* § 26.08.02.03-3(C-1)(1).
26 *Id.* § 26.08.02-03-3(A)(2).
27 *Id.* § 26.08.02.03-3(C)(8)(d)(i)-(v); *see also id.* § 26.08.02.03-3(C)(8)(b)(iii).
28 *Id.* § 26.08.02.03-3(C)(8)(c).
29 *Id.* § 26.08.02.03-3(C)(8)(d).
30 *Id.* § 26.08.02.03-3(C)(3).

the ambient temperature of the surface . . . waters, whichever is greater."[31] This criterion applies in areas "outside the mixing zone."[32]

- pH: Criteria for pH in Use II-P waters are the same as those in Use I-P waters.[33] "Normal pH values may not be less than 6.5 or greater than 8.5."[34]

- *Turbidity:* Turbidity criteria for Use II-P waters are the same as Use I-P waters.[35] "Turbidity may not exceed levels detrimental to aquatic life."[36] With regard to turbidity resulting from any discharge, such turbidity "may not exceed 150 units at any time or 50 units as a monthly average," measured in Nephelometer Turbidity Units.[37]

- *Color:* "Color in the surface water may not exceed 75 units as a monthly average. Units shall be measured in Platinum Cobalt Units."[38]

- *Water Clarity Criteria for Seasonal Shallow-Water SAV:* MDE's regulations establish three ways in which a segment can achieve attainment with the water clarity criteria:

  (1) SAV occupies at least 12,149 acres – the acreage restoration goal for this segment of the Susquehanna River.[39]

  (2) The shallow-water acreage that meets or exceeds the water clarity criterion is 2.5 times greater than the acreage restoration goal of 12,149 acres. For this segment, the water clarity criteria application depth is 2.0 meters,[40] so the Secchi depth equivalence criteria are 1.4 meters for tidal fresh waters, 1.4 meters for oligohaline waters, and 1.9 meters for mesohaline waters.[41] These criteria apply from April 1 to October 1 of each year.[42]

  (3) A combination of the actual SAV acreage attained and meeting the applicable water clarity criteria in an additional, unvegetated shallow water surface area equals 2.5 times the remaining SAV acreage necessary to meet the segment's restoration goal.[43]

- Chlorophyll a: "Concentrations of chlorophyll a in free-floating microscopic aquatic plants (algae) may not exceed levels that result in ecologically undesirable

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31 *Id*. § 26.08.02.03(A)(3)(a).
32 *Id.* "Mixing zones" are established pursuant to MDE regulations. *See id.* § 26.08.02.05.
33 *Id*. § 26.08.02.03-3(C)(4).
34 *Id*. § 26.08.02.03-3(A)(4).
35 *Id*. § 26.08.02.03-3(C)(5).
36 *Id*. § 26.08.02.03-3(A)(5)(a).
37 *Id*. § 26.08.02.03-3(A)(5)(b).
38 *Id.* § 26.08.02.03-3(A)(6); *see id.* §§ 26.08.02.03-3(C)(6), 26.08.02.03-3(C-1)(1).
39 *Id.* § 26.08.02.03-3(C)(9)(a)(i); *see also id.*§ 26.08.02.03(C)(9)(c).
40 *See id.* § 26.08.02.08(B)(2)(a).
41 *Id.* § 26.08.02.03-3(C)(9)(b).
42 *Id.*
43 *Id.* § 26.08.02.03-3(C)(9)(a)(iii).

consequences that would render tidal waters unsuitable for designated uses."[44]

- *Toxic Substance Criteria:* Use II-P waters are subject to MDE's toxic substances criteria established: "(a) For protection of fresh water and freshwater-adapted estuarine aquatic organisms"; and "(b) To protect public water supplies and the wholesomeness of fish and shellfish for human consumption."[45] MDE's regulations set forth criteria for some 112 toxic substances, including inorganic substances, organic compounds, polycyclic aromatic hydrocarbons and phthalates, and pesticides and chlorinated compounds.[46]

b. Narrative criteria

MDE has adopted the following "general" narrative criteria that apply to all surface waters throughout Maryland:

> The waters of this State may not be polluted by:
>
> (1) Substances attributable to sewage, industrial waste, or other waste that will settle to form sludge deposits that (a) are unsightly, putrescent, or odorous, and create a nuisance, or (b) interfere directly or indirectly with designated uses;
>
> (2) Any material, including floating debris, oil, grease, scum, sludge, and other floating materials attributable to sewage, industrial waste, or other waste in amounts sufficient to:
>
> (a) Be unsightly;
>
> (b) Produce taste or odor;
>
> (c) Change the existing color to produce objectionable color for aesthetic purposes;
>
> (d) Create a nuisance; or
>
> (e) Interfere directly or indirectly with designated uses;
>
> (3) High temperature or corrosive substances attributable to sewage, industrial waste, or other waste in concentrations or combinations which (a) interfere directly or indirectly with designated uses, or (b) are harmful to human, animal, plant, or aquatic life;

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44 *Id.* § 26.08.02.03-3(C)(10).
45 *Id.* § 26.08.02.03-3(C-1)(2).
46 *See id.* § 26.08.02.03-2(G).

(4) Acute toxicity from any discharge outside the mixing zone established under Regulation [26.08.02.05] for the application of acute criteria for protection of aquatic life; and

(5) Toxic substances attributable to sewage, industrial wastes, or other wastes in concentrations outside designated mixing zones, which (a) interfere directly or indirectly with designated uses, or (b) are harmful to human, plant, or aquatic life.[47]

3. Antidegradation

MDE has established an antidegradation policy applicable to surface waters within Maryland, which provides: "Where water quality is better than the minimum requirements specified by the water quality standards, that water quality shall be maintained."[48] MDE regulations meet this requirement by establishing and maintaining a list of waters designated as "Tier II" waters where the water quality exceeds minimum water quality standards.[49]

47 *Id.* § 26.08.02.03(B).
48 *Id.*§ 26.08.02.04-1(A).
49 *Id.* § 26.08.02.04-1(O).

III. GENERAL PROJECT INFORMATION

As required by Maryland Code of Regulations § 26.08.02.10(B)(1), Exelon is providing the following general project information for this Water Quality Certificate Application.

A. Applicant Information

The exact name, address, and telephone number of the Applicant:

Exelon Generation Company, LLC
300 Exelon Way
Kennett Square, PA 19348
Tel: (610) 765-5959

The Applicant is a foreign limited liability company qualified to do business in Maryland.

The exact name, address, and telephone number of the person authorized to act as agent for the Applicant in this application:

Colleen E. Hicks
Manager Regulatory and Licensing, Hydro
Exelon Generation Company, LLC
300 Exelon Way
Kennett Square, PA 19348
Tel: (610) 765-6791
Colleen.hicks@exeloncorp.com

B. Facility Description

The Project is a peaking hydroelectric facility that utilizes a limited active storage reservoir to generate during peak electricity demand periods. The Project is located on the Susquehanna River (at river mile 10) in Maryland, which has a total drainage area of 27,100 square miles. Conowingo Dam is located in Maryland connecting Cecil and Harford counties, as is the lowermost six miles of the Project reservoir, Conowingo Pond. The remaining eight miles of Conowingo Pond are located in Pennsylvania, within York and Lancaster counties. The Project consists of: 1) a main dam with an integrated powerhouse, 2) a spillway, 3) a reservoir (Conowingo Pond), 4) an intake and powerhouse, and 5) two fish lifts.

Conowingo Dam

The Conowingo Dam is a concrete gravity dam with a maximum height of approximately 94 feet and a total length of 4,648 feet. The dam consists of four distinct sections from east to west: a 1,190-foot long non-overflow gravity section with an elevation of 115.7 feet; an ogee shaped spillway, the major portion of which is 2,250 feet long with a crest elevation of 86.7 feet, and the minor portion of which is 135 feet long with a crest elevation of 99.2 feet; an intake-powerhouse section which is 946 feet long; and a 127-foot long abutment section. The tailrace and spillway

sections of the dam are separated by a dividing wall extending 300 feet downstream of the powerhouse. The dam and powerhouse also support US Highway Route No. 1, which passes over the top of Conowingo Dam.

Spillway

The gated spillway at Conowingo Dam is ogee shaped, the major portion of which is 2,250 feet long with a crest elevation of 86.7 feet, and the minor portion of which is 135 feet long with a crest elevation of 99.2 feet. Flow over the ogee spillway sections is controlled by 50 stony-type crest gates with crest elevations of 86.7 feet and two regulating gates with crest elevations of 99.2 feet. Each of the crest gates is 22.5 feet high by 38 feet wide; each gate has a discharge capacity of approximately 16,000 cubic feet per second (cfs) at a reservoir elevation of 109.2 feet.

The two regulating gates are 10 feet high by 38 feet wide and have a discharge capacity of approximately 4,000 cfs per gate at a reservoir elevation of 109.2 feet. The Dam's tailwater elevation, which varies with discharge, is at an approximate elevation of 20.5 feet with all units operating with no spillway discharge (*i.e.*, 86,000 cfs).

Three 90-ton gantry cranes are used to perform gate operations. Normally only two of the three gantry cranes are active. All three gantry cranes can be powered from the 440-volt bus on the headworks. Each gantry crane contains diesel generators for emergency backup power. The cranes are mounted on tracks that traverse the powerhouse intake structure and spillway sections of the dam.

Conowingo Pond

Conowingo Pond extends approximately 14 miles upstream from Conowingo Dam to the lower end of the Holtwood Project tailrace. Conowingo Pond is generally maintained at an elevation of 109.2 feet (NGVD1929), with a surface area of approximately 8,500 acres and a total impoundment design volume of 310,000 acre-feet at that elevation.

Conowingo Pond serves many diverse uses including hydropower generation, water supply, industrial cooling water, recreational activities, and various environmental resources. Relative to hydropower generation, Conowingo Pond serves as the lower reservoir for the Muddy Run Project, located 12 miles upstream of the Conowingo Dam. Conowingo Pond also serves as a cooling water source for the Peach Bottom Atomic Power Station (PBAPS) and the York Energy Center, both located approximately seven miles upstream of the Conowingo Dam. The Muddy Run Project has a maximum pumping capacity of 28,000 cfs, while PBAPS has a maximum withdrawal capacity of 3,450 cfs (2,230 MGD). The York Haven Energy Center is permitted to withdraw up to 20 cfs (13 MGD) for cooling water. In addition, Old Dominion Electric Cooperative has authorization to withdraw up to 8.7 MGD of water from Conowingo Pond for use as cooling and processing water for the Wildcat Point Generating Facility.

Conowingo Pond is used as a public water supply source, with the City of Baltimore and Chester Water Authority (CWA) having permitted maximum withdrawals of 387 cfs (250 MGD) and 46 cfs (30 MGD), respectively.

Intakes and Powerhouse

The intakes for each turbine are individually protected by seven trash racks; five are entirely steel (clear spacing of 5.375 inches) and two are steel-framed with wood racks (clear spacing of 4.75 inches). The top two racks are constructed of wood due to frazzle ice accumulations on the steel sections.

The first seven units (1-7), which are Francis turbine/generating units, are completely enclosed within the powerhouse, while the last four units (8-11), which are Kaplan units, are an outdoor type of construction thereby eliminating a superstructure in this area.

For Units 1-7, a 27-foot diameter butterfly valve is installed at the entrance to the scroll case. These valves are operated by oil pressure cylinders which are opened from a central oil pressure system, but are rarely used. Dewatering is performed by placement of headgates and stoplogs.

The main power station superstructure enclosing Units 1-7 includes the generator room and the electrical bay. The electrical bay is located between the generator room and the powerhouse headworks and consists of the 13.8-kilovolt (kV) bus and switching equipment. Compartments for step-up transformers are located on the roof of the electrical bay, together with the station service control room and the main control room. Two house turbines are also enclosed within the powerhouse. These Francis turbine/generating units are rated at 1,900 horsepower each when operating at full gate under a normal head. These two units are utilized to provide station service and black-start capability.

Units 8-11 are of an outdoor type of construction. There are no valves within the intake; unit dewatering is performed by placement of headgates and stoplogs. Generator circuit breakers and electrical equipment are located in a two-story structure between the generator area and the headworks. The main step-up transformers are located on the roof of this structure.

Fish Passage Facilities

The Project currently operates two fish lifts. The West Fish Lift, adjacent to the dam's right abutment, is currently operated under an agreement with the United States Fish and Wildlife Service (USFWS) for American shad egg production and other research purposes. The newer East Fish Lift, which uses the regulating gate bays for attraction flow, is used primarily to pass American shad, river herring, and other migratory fishes during the April-June migration season.

Tailrace

The tailrace is approximately 2,800 feet in length, extending from the powerhouse to the downstream end of Rowland Island. The tailrace width ranges from approximately 900 feet near the powerhouse to 1,500 feet near Rowland Island.

C. Description of the Project Operations and Discharge

The Project utilizes a limited active storage reservoir located on the Susquehanna River to generate during peak electricity demand periods, discharging waters once passed through the turbines. Discharge also results from spillage of excess waters through the existing gates and over the spillways at the Project. The Project is typically operated semi-automatically as the generation setting (in MW) is programmed into the control system; however, turbines can be brought on-line manually by an operator to ensure an efficient start-up until the generation setting is reached. At times, the Project is also operated in either full manual or automatic mode, and this type of operation is typically dictated by the prevailing river flow and system load conditions. The Project license allows for the Conowingo Pond to fluctuate between elevation 101.2 feet and 110.2 feet, NGVD 1929. Conowingo Pond has limited storage capability (2.0 hours at 250,000 cfs), and the pond's actively used storage is small compared to the flows experienced in the river.

The following factors also influence the management of water levels (all elevations below are NVGD 1929) within Conowingo Pond:

- Conowingo Pond must be maintained at elevation of 107.2 feet on weekends between Memorial Day and Labor Day to meet recreational needs;
- The Muddy Run Project typically does not operate its pumps below elevation 104.7 feet due to cavitation;
- PBAPS begins experiencing cooling problems when the elevation of the pool drops to 104.2 feet;
- The Chester Water Authority cannot withdraw water below elevation 100.5 feet;
- The PBAPS Nuclear Regulatory Commission license requires PBAPS to shut down completely if Conowingo Pond is at or below 99.2 feet;
- The York Energy Center cannot withdraw water below elevation 98.0 feet; and
- The City of Baltimore cannot withdraw water below elevation 91.5 feet.

The current flow regime below Conowingo Dam was formally established with the signing of a settlement agreement in 1989 between the Project owners and several federal and state resource agencies. The flow regime was determined through negotiations and based on several studies, including a habitat-based instream flow study conducted by the Susquehanna River Basin Commission (SRBC). In addition, studies were subsequently completed by MDNR that examined

benthic macroinvertebrate populations. These study results were used to establish the flow regime below Conowingo Dam as follows:

March 1 – March 31	3,500 cfs or natural inflow, whichever is less
April 1 – April 30	10,000 cfs or natural inflow, whichever is less
May 1 – May 31	7,500 cfs or natural inflow, whichever is less
June 1 – September 14	5,000 cfs or natural inflow, whichever is less
September 15 – November 30	3,500 cfs or natural inflow, whichever is less
December 1 – February 28	3,500 cfs intermittent (maximum six hours off followed by equal amount on)

The downstream discharge must equal these values or the discharge measured at the Susquehanna River at the Marietta United States Geological Survey (USGS) gage (No. 01576000), whichever is less. The Marietta USGS gage is located approximately 35 miles upstream of Conowingo Dam above the Safe Harbor Dam. The drainage area at the Marietta gage is 25,990 square miles. The Conowingo USGS Gage No. 01578310 is located on the downstream face of Conowingo Dam (RM 10), and has a drainage area of 27,100 square miles.

During periods of regional drought and low river flow, Exelon has requested and received FERC approval for a temporary variance in the required minimum flow release from the Project. Specifically, Exelon has sought approval to count the leakage from the Project (approximately 800 cfs)[50] as part of the minimum flow discharge. This temporary variance is typically approved by resource agencies (*i.e.*, SRBC, MDNR, PFBC, and USFWS) as well.

When implemented, the temporary variance allows Exelon to maintain an adequate pond level elevation and storage capacity throughout a low-flow period. Maintaining water storage volume is critical under low-flow conditions, not only for electric generating capacity, but also to ensure an adequate water supply is available for recreational interests and consumptive water usage on Conowingo Pond.

As noted above, the current Maryland State DO standard applicable to discharges from Conowingo Dam is as follows:

[50] As a result of a recent agreement with resource agencies, beginning in 2012 the minimum flow variance, when in effect, will count approximately 580 cfs as part of the minimum flow discharge at the Project. The remaining portion of the Project leakage (approximately 220 cfs) will be credited to the PBAPS facility, as part of its consumptive use agreement.

February 1 through May 31: DO ≥ to 6 mg/L for a 7-day averaging period.

June 1 to January 31: DO ≥ 5.5 mg/L for a 30-day averaging period; 4.0 mg/L for a 7-day average; 3.2 mg/L as an instantaneous minimum year round; and for protection of endangered shortnose sturgeon, 4.3 mg/L as an instantaneous minimum at water column temperatures greater than 77°F (29°C).

Exelon's 2012 Water Quality Study Report completed for the relicensing of the Project provides data that show discharge from Conowingo Dam (as measured at Station 643) met the state DO standards 100% of the time in 2010. This report also documents that measured DO concentrations in the transects below Conowingo Dam were all greater than 5.5 mg/L.

D. Discharge Treatment Equipment

Of the 11 main Conowingo turbines, seven currently have the ability, through an air venting system installed at each of these turbines, to aerate waters as it passes through these turbines. Since the initial installation in 1991, the turbine venting system has been used to meet the Maryland DO standards. With no venting from 1982-1988, hourly DO values were less than 5 mg/L 20.3% of the time with 8.6% of the values less than 4.0 mg/L, and some years had DO levels below 5 mg/L nearly 40% of the time. In contrast, 1989-2007 hourly DO values less than 5 mg/L occurred only 0.03% (11 hours) of the time, and no readings were less than 4.3 mg/L. In addition, Exelon installed aerating turbine runners in two Francis units in 2005 and 2008, providing additional measures to increase DO concentrations in Project discharges.

E. Duration of Discharge Activity Under New License

The current FERC license expired on September 1, 2014 and Exelon is currently operating under annual licenses issued by FERC. Exelon formally initiated the FERC relicensing process for the Project with the filing of a Notice of Intent and Pre-Application Document (PAD) on March 12, 2009. Exelon is requesting that FERC issue a new license for the continued operation of the facility under FERC jurisdiction for a period of 50 years.

F. Discharge Monitoring

Exelon continuously monitors flows from the Project; DO levels are monitored from May 1 through October 13 at the Station 643 location approximately 0.6 miles downstream of Conowingo Dam. Exelon intends to continue this monitoring at this location for the entire term of the new FERC license.

IV. PROJECT IMPACTS AND MITIGATION MEASURES

Set forth below is an overview of the environmental impacts of Exelon's Project under current and proposed operating conditions as identified in the FERC relicensing studies. A detailed environmental analysis of the Project can be found in the enclosed Exhibit E and resource study reports that were submitted with the Final License Application, as well as the enclosed FEIS prepared by FERC pursuant to the National Environmental Policy Act. Exhibit E, the resource study reports, and the FEIS are incorporated into this Application. Exelon expressly reserves the right to supplement this Application, as necessary.

Also described below are Exelon's proposed PM&E measures. More details about Exelon's proposed PM&E measures can be found in the Final License Application, the Settlement Agreement, and the Supplemental Filing. The PM&E measures ultimately included in the Project's new license and water quality certification will reflect settlement discussions between stakeholders and Exelon.

A. Results of Project Relicensing Studies and FERC's FEIS

Exelon's Integrated Licensing Process studies supporting the Final License Application and FERC's FEIS demonstrate that the Project meets Maryland water quality standards and provides rich shoreline and recreation resources.

1. Water Quality

Exelon's analysis of the water quality issues, summarized below, is set forth in Exhibit E, Section 3.3.2.

Water Quality Study. Exelon's study of seasonal and diurnal water quality, Revised Study Plan (RSP) 3.1, demonstrates that Project operations have little, if any, adverse impact on water quality, and that the Project is meeting state water quality standards. Notably:

- State DO water quality standards are being met downstream of the Project.[51]
- A comparison of water temperature data collected upstream and downstream of the dam confirmed that the operation of the Project has no measurable effect on the temperature of the water being released downstream; water temperatures were uniform throughout the lower Conowingo Pond and the tailwater area under a variety of unit operating and river flow conditions.[52]
- Average DO conditions within all the turbine boils were always at or above standards, and were usually similar to the DO conditions measured downstream of the Project at

[51] Seasonal and Diurnal Water Quality in Conowingo Pond and Below Conowingo Dam, RSP 3.1 at i (Conowingo RSP 3.1).
[52] *Id.* at ii, 18.

Station 643.[53]

RSP 3.1 involved weekly monitoring of DO, water temperature, surface pH, and turbidity at five historically (1996-1999) established transects in Conowingo Pond as well as three transects established for this study below Conowingo Dam between April and October 2010. Fecal coliform samples also were collected once per month at the midpoint station of each transect. Additionally, discharge "boils" of operating turbines were sampled hourly (0600 hr to 1800 hr) on 20 dates in July and August (preselected by FERC during study scoping).

Water temperature data collected in Conowingo Pond (at Transect 5, approximately 0.5 miles upstream of Conowingo Dam) were compared to data collected at monitoring Station 643, approximately 0.6 miles downstream of Conowingo Dam, to assess the effect of Project operations on the temperature of water being released downstream. DO and temperature data collected in the turbine boils and the downstream transects were compared to that measured at the continuous DO monitoring station (Station 643) to confirm that Station 643 is a representative location for determining compliance with the applicable Maryland state DO standards.

Relative to the historic records, flows in the Susquehanna River during the 2010 sampling period were lower in April through September but higher in October. Likewise, incoming water temperatures were higher in April through September and lower in October relative to historical records. Comparison of water temperature data collected upstream and downstream of Conowingo Dam in 2010 confirmed that the operation of the Project has no measureable effect on the temperature of the water being released downstream. Water temperatures were uniform throughout lower Conowingo Pond and the tailwater area under a variety of unit operating and river flow conditions. Moreover, the temperature of the water measured at Station 643 was also consistently similar (R^2 square ≥ 0.99) to that measured along transects in both the lower Conowingo Pond and in the tailwater areas.

Comparisons of the water temperature of specific turbine boils to the temperature measured at Station 643 were also made. The water temperature recorded at downstream Station 643 was virtually identical to that of turbine discharge boils.

Aeration capabilities on the smaller Francis generating units (Units 1-7) increase the DO concentration of the water being released from the Project and ensure the discharges meet current state DO standards. DO concentrations measured at the three transects below Conowingo Dam (and Station 643) were at, or above, the instantaneous minimum standard on all sampling days in 2010. Comparison of DO concentrations along the downstream transects with the DO measured at Station 643 indicated that Station 643 is representative of DO conditions measured along Transects 6 and 7 most of the time. DO concentrations measured in the turbine boils were above the Maryland State instantaneous standard of 3.2 mg/L.

[53] *Id.*; Final License Application Exhibit E at E-85 to E-86.

A detailed comparison of DO concentrations measured in the turbine boils to the DO measured at Station 643 indicated that under most combinations of unit operation, DO concentrations measured at Station 643 are representative of DO conditions in the turbine boils. Exceptions can occur when one or more of the larger Kaplan turbines (Units 8-11) are operating and the head pond is stratified with bottom water DO less than 5.0 mg/L. Under these circumstances, DO measured at Station 643 is, at times, somewhat higher than the average DO concentration measured in the turbine boils. However, when DO was averaged across all the turbine boils during a given sampling day, the DO concentrations in the turbine discharge were shown to be the same as that measured at Station 643 during the same period (33% of the time, 85 of 255 observations), and within + 0.5 mg/l of Station 643 72% of the time (184 of 255 measurements). Moreover, a frequency plot of the differences in DO values observed between the turbine boils and Station 643 showed that the distribution was nearly equal between observations when Station 643 under or over recorded the DO measured in the turbine boils.

Numeric State Water Quality Standards. It is anticipated that the Project will continue to meet current Maryland water quality standards for the term of the new license. The 2010 water quality study (Normandeau and GSE 2012a) demonstrated that:

- Water temperature in the Project discharge is similar to pond water temperatures and is unaffected by Project operations;
- DO and temperature measured at Station 643 are very similar to the DO and temperature conditions measured in the turbine discharge boils and along the downstream transects. Thus, Station 643, is a good, representative location for monitoring compliance with state standards; and
- State DO standards in the Conowingo tailrace were met or exceeded 100% of the time during the period May 1 through October 31, 2010 as measured at Station 643.
- The minimum and maximum turbidity values recorded downstream of Conowingo Dam were 1.1 and 31.9 NTU units, and were within Maryland water quality standards.

The FERC FEIS also concluded existing project operations generally do not exceed state standards for water temperature and DO, and determined that no further measures to protect or enhance water temperature and DO at the Project are needed.

Erosion and Sediment

The Susquehanna River basin, draining parts of New York, Pennsylvania, and Maryland, is responsible for approximately 46%, 26%, and 33% (respectively) of the nitrogen, phosphorus, and sediment loads delivered to the Chesapeake Bay annually.[54] The majority of this sediment is

[54] Chesapeake Bay TMDL (Dec. 29, 2010), available at http://www.epa.gov/reg3wapd/pdf/pdf_chesbay/FinalBayTMDL/CBayFinalTMDLSection4_final.pdf

introduced to the Susquehanna River system as a result of man-made practices; nitrogen, phosphorus, and sediment loads originate from both point (*e.g.*, municipal wastewater facilities, industrial discharge facilities, etc.) and non-point (*e.g.*, agricultural lands, stormwater runoff, etc.) sources in the Susquehanna River basin. Of all these sources, agriculture is the largest contributor of nitrogen (44%), phosphorus (44%), and sediment (65%) loading to the Chesapeake Bay.[55]

In contrast to these upstream sources, relatively little sediment is introduced from Project lands. While erosion along the Conowingo Pond shoreline (including the mouths of tributaries) and the Conowingo tailrace shoreline is present, this erosion is predominantly due to natural processes (wind generated waves, extremely high river flow, surface runoff, and mass wasting).

While relatively small amounts of sediment are introduced to the Susquehanna River basin from the Project area, the Conowingo Dam historically trapped significant amounts of sediment and associated nutrients generated by upstream sources. In fact, it has been estimated that Conowingo Pond has trapped approximately two-thirds of the sediment generated upstream in Pennsylvania and New York since Conowingo Dam was constructed in 1928.[56] In this capacity, Conowingo Dam has essentially functioned as the Chesapeake Bay's Best Management Practice (BMP).[57]

Despite the positive contribution of the Conowingo Dam made over the years, the Environmental Protection Agency (EPA) recognized that sediment-related pollution impacts to the Chesapeake Bay from upstream sources need to be addressed directly without reliance on Conowingo Dam. Consequently, the EPA established the Chesapeake Bay Total Maximum Daily Load (TMDL) in 2010 to address the *sources* of sediment. According to the EPA:

> The TMDL – the largest ever developed by EPA – identifies the necessary pollution reductions of nitrogen, phosphorus and sediment across Delaware, Maryland, New York, Pennsylvania, Virginia, West Virginia and the District of Columbia and sets pollution limits necessary to meet applicable water quality standards in the Bay and its tidal rivers and embayments. Specifically, the TMDL sets Bay watershed limits of 185.9 million pounds of nitrogen, 12.5 million pounds of phosphorus and 6.45 billion pounds of sediment per year – a 25 percent reduction in nitrogen, 24 percent reduction in phosphorus and 20 percent reduction in sediment. These pollution limits are further divided by jurisdiction and major river basin based on state-of-

[55] Chesapeake Bay TMDL (Dec. 29, 2010), available at http://www.epa.gov/reg3wapd/pdf/pdf_chesbay/FinalBayTMDL/CBayFinalTMDLSection4_final.pdf

[56] Lower Susquehanna River Watershed Assessment (LSRWA) August 15, 2013 Quarterly Meeting, available at http://mddnr.chesapeakebay.net/LSRWA/Docs/LSRWA%20Aug%2015%202013%20meeting%20enclosures.pdf, page 25.

[57] The Chesapeake Bay Foundation stated that "The dam, historically, has been the Bay's best [Best Management Practice], removing much of what normally would have flowed downstream, particularly phosphorus and sediment." Chesapeake Bay Foundation, *Inaccuracies in Funk and Bolton's Letter About Conowingo Dam* (Nov. 2012), *available at* http://governor.maryland.gov/documents/inaccuraciesfactsheet.pdf.

> the-art modeling tools, extensive monitoring data, peer-reviewed science and close interaction with jurisdiction partners.
>
> The TMDL is designed to ensure that all pollution control measures needed to fully restore the Bay and its tidal rivers are in place by 2025, with at least 60 percent of the actions completed by 2017. The TMDL is supported by rigorous accountability measures to ensure cleanup commitments are met, including short-and long-term benchmarks, a tracking and accountability system for jurisdiction activities, and federal contingency actions that can be employed if necessary to spur progress.[58]

To that end, states are implementing measures to reduce sediment and nutrient loads from major sources. Implementation of the TMDL program will result in the Bay and its tidal tributaries achieving water quality standards for dissolved oxygen, water clarity, and chlorophyll by the year 2025.

Concurrent with EPA's implementation of the TMDL, the U.S. Army Corps of Engineers and MDE partnered to conduct the Lower Susquehanna River Watershed Assessment (LSRWA), which studied sediment transport and nutrient loading in the Susquehanna River's lower three impoundments (Lake Clarke, Lake Aldred, Conowingo Pond), the reach downstream of Conowingo Dam, and the Susquehanna Flats.

The LSRWA evaluated measures at the three impoundments to manage sediment and nutrient loads that may be mobilized during high flow/storm events. Results from the LSRWA study, however, suggest that the measures under consideration are not practicable or effective, and are cost-prohibitive. For example, the LSRWA's modeling analysis indicated that dredging 3 million cubic yards of sediment from Conowingo Pond would only result in a 1.4 percent reduction of total sediment outflow load to Chesapeake Bay.[59] Moreover, the cost of dredging and upland disposal of 3 million cubic yards of sediment from Conowingo Pond is estimated at $48 to $267 million annually.[60]

Consistent with the EPA TMDL and Clean Water Act approach of addressing pollution at its source, Exelon has proposed several measures to address sediment management as it relates to the Project. These measures include incorporation of BMPs on Project lands to protect and stabilize streambanks and to establish riparian buffers as part of a Shoreline Management Plan (SMP). During relicensing, Exelon also conducted a bathymetric survey of Conowingo Pond to establish a baseline for future surveys to monitor sediment accumulation, and assess remaining storage

[58] Chesapeake Bay TMDL Executive Summary, http://www.epa.gov/reg3wapd/pdf/pdf_chesbay/FinalBayTMDL/CBayFinalTMDLExecSumSection1through3_final.pdf.
[59] Lower Susquehanna River Watershed Assessment (LSRWA) Final Report, at 137 (May 2015) http://dnr.maryland.gov/waters/bay/Documents/LSRWA/Reports/LSRWAFinalMain20160307.pdf.
[60] *Id.* at ES-5.

capacity. As part of its relicensing proposal, Exelon has committed to undertake additional bathymetric surveys every five years to continue the monitoring program.

Citing the LSRWA findings, the FERC FEIS also concluded that operational changes at Conowingo would not address the sediment transport issue, and that dredging of Conowingo Pond would be cost prohibitive and ineffective. Because it is a watershed-wide issue, FERC found that there was no justification for requiring Exelon to implement measures such as dredging to help control sediment and nutrient loading in the Bay, which would occur in the long-term whether or not Conowingo Dam was in place.

*Effects on the Suspension of Toxic Compounds and Algae Growth***.** Under Exelon's proposed action, effects on DO in Conowingo Pond and below the dam will not create conditions leading to algal blooms. Additionally, Project peaking operations, under Exelon's proposed action, will not affect any potentially toxic compounds in suspension from upstream sources nor cause the re-suspension of any compounds present in surficial bottom sediment also delivered from the upstream watershed.

*Salinity and Salt Wedge Encroachment in the Lower Susquehanna River***.** Under Exelon's proposed action, Project impacts on the encroachment of saline water in the tidal portion of the Susquehanna River are expected to be low. Exelon's environmental analysis indicates that the Project does not influence salinity levels in the lower Susquehanna River. Elevated salinity appears to be related to prolonged drought and low river flow conditions.

Effects of Project Operations on Flooding. Under the proposed action, the Project would have little or no impact on downstream flooding. Because of the limited storage available in Conowingo Pond (2.0 hours at 250,000 cfs), the dam cannot substantially change flooding durations that are days-long, and managing the pond to do so would be ineffective. The pond's actively used storage is small compared to the flows experienced in the river. The three alternatives investigated in Exelon's study represented a wide range of operational changes that could be made to Conowingo Dam, and none of the investigated operational alternatives would substantially reduce flooding in Port Deposit if implemented.

The FERC FEIS also concluded that Project operation has little effect on downstream flooding, stating that the storage available in Conowingo Pond is not enough to mitigate even relatively small events such as the 10-year flood. Additionally, FERC concluded that there do not appear to be any operational changes that could be made that would reduce downstream flooding for the 10-, 50-, 100-, or 500-year storm events.

2. Aquatic Resources

Exelon's analysis of aquatic resource issues, summarized below, is set forth in Exhibit E, Section 3.3.3. Exelon's studies confirmed that Conowingo Pond and the Project tailrace support a diverse assemblage of fishes and a healthy multi-species sport fishery supported by natural reproduction. Moreover, Project operations do not appear to be adversely impacting fish propagation.

Additional studies concluded that water level fluctuations attributable to Project operations do not affect: (1) littoral habitat; (2) fish access to Conowingo tributaries; and (3) the downstream emergent aquatic vegetation (EAV)/SAV communities, or species' use of EAV/SAV-associated habitats.

a. Velocity Barriers and Flows

Exelon's study on velocity barriers concluded that there was no evidence suggesting that water velocities present a barrier to upstream migration of American shad or river herring.[61] Only at the highest Project discharge rate modeled do velocities in some areas of the river appear to be in excess of the fishes' swimming abilities. This does not preclude migrating alosines from reaching the dam, however, as American shad and river herring will seek slower currents, avoid excessive velocity, and alternate between swimming and resting. In addition, a radio telemetry study conducted in 2010 clearly illustrated the American shad's ability to traverse the length of the riverine portion of the Susquehanna River below Conowingo Dam.

Moreover, fish migrated upstream with little observable difficulty regardless of Project discharge. There is no clear indication that migratory behavior or movement to the immediate vicinity of Conowingo Dam and Powerhouse is adversely influenced by operations of Conowingo Dam in the approximately 4-mile river reach below the tailrace. Variations in migration times did occur among upstream forays, but these did not positively correlate to Conowingo Dam discharge. Radio telemetry data indicate that regardless of Project discharge, tagged adult American shad migrated upstream to the Dam with little observable difficulty.

Flow conditions in the river are naturally turbulent, inhibiting sediment deposition until the change in hydraulic gradient near the tide line at Deer Creek. The majority of the non-tidal river reach would essentially consist of bedrock substrate without the Project, except where there is a discrete sediment supply. The sediment from major tributaries, Octoraro Creek and Deer Creek, is the source for sediment deposited in areas of locally dissipated flow. These areas provide unique combinations of depth, velocity and substrate, providing areas of refuge for species and life stages that are not well suited for the conditions found in the river's main channel.

Fish stranding can occur below the Conowingo Dam spillway when downstream water levels decline following peaking generation. Stranding is highest in the summer, compared to the spring and fall season. However, resident fish species such as gizzard shad and common carp made up 90% or more of the stranded fish. Very low numbers of anadromous fish species such as American shad, river herring, and white perch were documented, and only in spring and early summer. Dead fish documented were highest in spring (18% of the total) and less than 4% of the total in the summer and fall seasons.

[61] Final License Application Exhibit E at E-144 to E-145.

In the FEIS, FERC concluded that few fish are killed by stranding under existing operation, and about 90 percent of those killed were gizzard shad, carp, and catfish species. Although implementing an alternative flow regime could reduce this source of mortality, FERC concluded that the results of Exelon's stranding surveys indicate that the magnitude of this benefit would be minor.

b. Fish Lifts and Upstream Passage

East Fish Lift and West Fish Lift. The East Fish Lift, located near the mid-point of the Conowingo Dam, was constructed in 1991 to allow for direct passage of fish to Conowingo Pond. The East Fish Lift also supported interim trap and transport operations pending completion of the upstream fish passage facilities at the Holtwood, Safe Harbor, and York Haven Projects. Radio telemetry data collected in 2010 indicates that 73% (65 of 89) of adult American shad that migrated to the Project tailrace entered into the East Fish Lift and 45% (40 of 89) of those adult American shad that migrated to the Project tailrace successfully completed passage through the East Fish Lift. The study, in conjunction with Exelon's companion study on East Fish Lift attraction flows, did not identify any single operational parameter for the Project or the East Fish Lift that may result in substantial improvements in fish passage effectiveness at the East Fish Lift.

Exelon conducted an additional site-specific telemetry study in the spring of 2012 to provide more information on the effectiveness and efficiency of the East Fish Lift operation. 2012 radio telemetry data indicate that 44% (29 of 66) of adult American shad that migrated to the Project tailrace entered into the East Fish Lift. Of those adult American shad that migrated to the Project tailrace successfully, 26% (17 of 66) completed passage through the East Fish Lift.

The West Fish Lift has been in operation since 1972 and has a remaining life expectancy of up to 15 years.[62] According to the PFBC, the West Fish Lift is currently adequate to provide enough fish for spawning American shad at the site, and supporting the hatchery and stocking program.

Upstream American Eel Passage. Exelon conducted biological and engineering studies which described the spatial distribution and size characteristics of American eels in the Conowingo tailrace, examined the engineering feasibility and costs of upstream and downstream passage options, and assessed the cumulative impacts to biodiversity of the Susquehanna River ecosystem of upstream and downstream passage of American eel, among other objectives.[63] American eel were collected between 2005 and 2011 utilizing a ramp facility located near the West Fish Lift. The annual catch at this facility ranged from 19 to 85,000 elvers. Exelon collected eels at two locations in the spillway in 2010 and 2011. Of these locations, the location known as spillway 50 (extreme eastern side of the spillway) captured slightly more elvers (697) than the East Fish Lift spillway ramps (569).

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62 Final Study Report Biological and Engineering Studies of the East and West Fish Lifts (Conowingo RSP 3.9).
63 Biological and Engineering Studies of American Eel (Conowingo RSP 3.3).

Upstream Alewife and Blueback Herring Passage. Based on annual passage counts, the East Fish Lift is capable of passing more than 200,000 river herring in a single day of operation. Personal observations by East Fish Lift operating crews note that if herring are present in the Conowingo tailrace, the bulk of the run occurs during a very short period of time (3 to 7 days), or on a single day.

Hydraulic model outputs indicate that there are relatively few areas in the non-tidal river reach where water velocities are greater than the burst speeds of river herring (> 6 fps) resulting from discharges of 10,000 and 40,000 cfs. Additionally, there are significant areas of passage where the velocity is below burst speed and in the range of sustained or prolonged swim speeds. There is no evidence available to suggest that discharge velocities preclude migrating alosines from reaching the dam. No matter what the strategy, seeking slower currents, avoiding excessive velocity, swimming and resting, etc., river herring successfully reach the dam.

c. Entrainment and Impingement

The overall entrainment and impingement impact on resident fishes is moderate for gizzard shad and low for all other target species (bluegill, channel catfish, largemouth bass, smallmouth bass, and walleye). Fish lacking the swimming ability to avoid the intakes will pass through the bar racks and not be impinged. Passage survival through the Francis units 1-7 is high (100-95%) for juvenile bluegill; high to moderate-high (100-90%) for juvenile channel catfish and smallmouth bass; and high to moderate (100-85%) for juvenile gizzard shad, largemouth bass and walleye. Adult bluegill and smallmouth bass survival is moderate-high to low-moderate (95-80%); adult channel catfish, gizzard shad, and largemouth bass were rated moderate-high to low (95-<80%); and adult walleye were rated moderate to low (90-<80%).

Survival of juvenile fish passing the Kaplan units 8-11 is high (100-95%) for bluegill, channel catfish, and smallmouth bass; and high to moderate (95-90%) for juvenile gizzard shad, largemouth bass, and walleye. Survival for adult life stages is high to moderate (95-90%) for bluegill and smallmouth bass; high to low (100-<80%) for channel catfish; moderate-high to low-moderate (95-80%) for gizzard shad and largemouth bass; and moderate-high to low (95-<80%) for walleye, the largest of the adult life stages.

Passage survival through the two house turbines is moderate-high (95-90%) for bluegill; moderate-high to low-moderate (95-80%) for channel catfish and smallmouth bass; and moderate-high to low (95-<80%) for gizzard shad, largemouth bass, and walleye. For the adult life stage, bluegill and channel catfish have the highest survival potential at moderate-high to low (95-<80%), smallmouth bass have a moderate to low survival potential (90-<80%), and the remainder (gizzard shad, largemouth bass, and walleye) have a low survival potential rating (<80%).

The entrainment potential for most resident fish species is low at the Project.[64] Entrainment, when it occurs, does not necessarily result in injury to fish. In fact, Exelon's study estimated survival rates for juvenile American shad are greater than 90%.[65] Adult American shad have a survival rate of 86.3% when passing through the Project's Kaplan units, and a survival rate of 93.0% when passing the Project's Francis units.[66]

d. Downstream Passage

Downstream Juvenile and Adult Shad Passage. Downstream passage of juvenile and post-spawned adult American shad (and other herring species) occurs via the Project turbines during the October-November and June timeframes, respectively. Site-specific studies at Conowingo indicate a high survival rate for juvenile American shad passing through the turbines (~90% for passage through the Francis units and ~95% for passage through the Kaplan units). Site-specific studies at Conowingo also indicate a high survival rate for adult American shad passing through the turbines (~93% for passage through the Francis units and ~86% for passage through the Kaplan units).

Downstream Adult Eel Passage. Upon maturity, a portion of the eels transported or volitionally passed upstream will migrate downstream and pass through one or more of the dam's turbines. Site-specific data collected in the fall of 2011 indicate that adult American eel survival at Conowingo ranges from 89.8% to 100%.

Downstream Juvenile and Adult Alewife and Blueback Herring Passage. Downstream passage of juvenile and post-spawned adult river herring species occurs via the Project turbines during the October-November and June time frames, respectively. Juvenile American shad are considered to be a proxy for juvenile river herring, and adult American shad a conservative proxy given the differences in body size between adult American shad and adult river herring.

Both site-specific survival and literature based studies indicate a relatively high survival rate for juvenile and adult American shad passing through the turbines. Site-specific studies at Conowingo indicate a relatively high survival rate for juvenile American shad passing through the turbines (~90% for passage through the Francis units and ~95% for passage through the Kaplan units). Site-specific studies at Conowingo indicate a relatively high survival rate for adult American shad passing through the turbines (~93% for passage through the Francis units and ~86% for passage through the Kaplan units).

e. Downstream Aquatic Communities

The Susquehanna River below Conowingo Dam supports numerous fish species, including gizzard shad, white perch, common carp, quillback, comely shiner, channel catfish, walleye, smallmouth and largemouth bass, along with seasonal migrants like American shad, blueback herring, alewife,

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64 Conowingo Downstream Passage RSP 3.2 at ii.
65 *Id.* at iii, 9; Conowingo Juvenile Shad RSP 3.2 at 5, 11.
66 *Id.* at iii; *see also* Final License Application Exhibit E at E-125.

sea lamprey, American eel and striped bass. While some species have increased or declined in abundance, the fish species assemblage has remained healthy, diverse and robust; the same core group of species was observed in the 1980s. The river continues to support a healthy year-round sport fishery.

Exelon completed an instream flow study to analyze the impact of the flow regime on aquatic habitat downstream of the Conowingo Dam for the proposed continued operation of the Project. Habitat preferences for different life stages of several aquatic species were incorporated into the study, and included American shad, shortnose sturgeon, smallmouth and striped bass, river herring and macroinvertebrates. Habitat was quantified spatially throughout the river reach below Conowingo Dam for steady state flows between 2,000 cfs, and 86,000 cfs, which encompassed the Project's normal operating flow range.

Table 1 quantifies the habitat available for the various species and life stages, expected to be present in the river reach below Conowingo Dam during various periods of the year, at the existing minimum flows, as a percentage of the maximum available habitat. The results of this analysis showed that the existing flow regime for the Project provides habitat which has the ability to support the different life stages of the species present in the study area.

Table 1: Percentage of the Maximum Weighted Usable Area Habitat for the Proposed Minimum Flow Regime

Period	Minimum Flow	Target Species	Percentage of Maximum Available Habitat for Specified Minimum Flow
December-February[67]	3,500	Shortnose Sturgeon juveniles	57
		Shortnose Sturgeon adults	57
		Smallmouth bass juveniles	100
		Smallmouth bass adults	73
		Trichoptera	85
March	3,500	Shortnose Sturgeon juveniles	57
		Shortnose Sturgeon adults	57
		River Herring spawning	96
		Smallmouth bass adults	73
		Trichoptera	85
April	10,000	American shad spawning	53
		American shad fry	78
		Striped bass spawning	42
		Striped bass fry	35
		Shortnose sturgeon spawning	60
		Shortnose sturgeon fry	76
		River Herring spawning	82
May	7,500	American shad spawning	41
		American shad fry	69
		Striped bass spawning	34
		Striped bass fry	27
		Shortnose sturgeon spawning	49
		Shortnose sturgeon fry	66
		River Herring spawning	96
June	5,000	American shad fry	58
		American shad juvenile	94
		Striped bass fry	18
		Striped bass juvenile	59
		Smallmouth bass spawning	100
		Smallmouth bass adults	82
		Trichoptera	94
July	5,000	American shad fry	58
		American shad juvenile	94
		Striped bass juvenile	59
		Smallmouth bass fry	57
		Smallmouth bass adults	82
		Trichoptera	94
August-September 1-14	5,000	American shad juvenile	94
		Striped bass juvenile	59
		Smallmouth bass juvenile	100

[67] The 3,500 cfs minimum flow is provided on an intermittent basis, typically with a maximum six hours off followed by equal amount on. During off periods the minimum flow provided is 800 cfs. Percent of maximum WUA represents conditions at 3,500 cfs.

Period	Minimum Flow	Target Species	Percentage of Maximum Available Habitat for Specified Minimum Flow
		Smallmouth bass adults Trichoptera	82 94
September 15-November	3,500	American shad juvenile Striped bass juvenile Smallmouth bass juvenile Smallmouth bass adults Trichoptera	88 50 100 73 85

The Freshwater Mussel Characterization study below Conowingo Dam found that mussels are fairly well established in the Project area.[68] Species included eastern elliptio (*Elliptio complanata*), alewife floater (*Anodonta implicata*), eastern floater (*Pyganodon cataracta*), tidewater mucket (*Leptodea ochracea*), and eastern lampmussel (*Lampsilis radiata*). The study found that much of the reach below the dam is a challenging environment for mussels, due to the bedrock/boulder-dominated river bottom and turbulent water flow.

FERC's analysis of instream flows downstream of Conowingo within the FEIS determined that Exelon's current flow regime is generally adequate for protection of aquatic resources downstream of the Project, although some adjustments to these flows such as eliminating periods of zero minimum flow in December through February and increasing the minimum flow to 7,500 cfs in the first half of June could provide additional protection to downstream aquatic habitat.

f. Migratory Fish Reproduction

The Impact of Plant Operation on Migratory Fish Reproduction study evaluated the potential impact of Project operations, including the current minimum flow regime, on the reproduction of target anadromous fish (*e.g.*, American shad, river herring, striped bass, and white perch). The study found that Project operations had minimal to no adverse impacts on these species, and that any population declines—particularly in the case of river herring—were likely attributable to impacts unrelated to Project operations.

Further, sampling was conducted in the spring of 2012 to gather additional information on the occurrence of ichthyoplankton in the Susquehanna River downstream of Conowingo Dam. The study showed that the lower Susquehanna River continues to provide recruitment for many fish species. Nearly 20 different taxa were collected in the plankton nets during the 2012 sampling. The ichthyoplankton collections were similar to those obtained in the early 1980s. Gizzard shad eggs and larvae, continually increasing in numbers in the lower Susquehanna, proved to be the predominant species. White perch eggs and larvae, abundant historically, have dramatically

[68] Freshwater Mussel Characterization Study Below Conowingo Dam (RSP 3.19).

diminished from the sampling area. Reproduction of river herring continues to be well documented in the lower Susquehanna River.

The condition factor and length-weight relationships of representative common fish species downstream of Conowingo Dam associated with the existing flow regime are comparable to those from other normal, natural populations and are indicative of relatively favorable conditions and habitats in the lower Susquehanna River.

3. Terrestrial Resources

Exelon's analysis of terrestrial resource issues, summarized below, is set forth in Exhibit E, Section 3.3.4.

The potential effects of Project operations on downstream SAV communities are likely to be minimal, and any effects are minimized further by the timing of high flow/high water events, which occur mostly during periods when SAV is not present. The assessment of potential operational impacts on SAV requires consideration of seasonality. Submerged vegetation species common to the low salinity waters of the upper Chesapeake Bay and tributaries become established generally from July through September. The presence of these species below Conowingo Dam generally coincides with periods of minimal water level fluctuation and low flows. River flows for the months of July, August, and September exceed a flow equivalent to the maximum generation at Conowingo (86,000 cfs) only 1.0 to 3.5 percent of the time, based on flow duration curves for the USGS Gage at Conowingo Dam (developed as part of the Hydrologic Study of the Lower Susquehanna River). Peaking operations at Conowingo are, on average, more infrequent during the summertime growing period than at other times of the year, lowering the potential for effects associated with elevated generation flows on downstream SAV communities. In contrast, flows at or exceeding 86,000 cfs during the winter and spring seasons (December-May) occur approximately 9.9 to 22.5 percent of the time, based on the results of the Hydrologic Study of the Lower Susquehanna River. As such, although the potential effects of Project operations on downstream SAV communities is likely to be minimal, they are minimized further by the timing of high flow/high water events, which more often occur during periods when SAV is not present.

The FERC FEIS determined that SAV downstream of Conowingo dam is limited to areas that have finer-grained substrate or are protected from high water velocities associated with high river flows. The highest concentrations of SAV are in the lower part of the river closer to the mouth of the river, where river levels are influenced by tidal flow from the Chesapeake Bay and velocities tend to be lower. Portions of the river closest to Conowingo Dam have a steeper gradient, a substrate of primarily bedrock and boulder, and little SAV. FERC concluded that SAV distribution downstream of the dam is more influenced by existing substrate conditions and natural high-flow events, which have the potential to scour and redistribute finer-grained substrate, than by normal day-to-day project operation.

EAV communities below Conowingo Dam are not likely to be impacted to a significant degree by Conowingo operations over the range of generation flows. According to the results of EAV vegetation studies, the maintenance of EAV communities below Conowingo Dam likely are controlled more by water elevation than by flow intensities. This may explain why significant EAV growth was observed in the eastern channel of McGibney Island, an area subject to elevated water velocities during periods of higher generation flows. The less frequent peaking flows during the summer likely promote colonization by EAV by providing reduced water elevations and frequent but brief periods of inundation.

The relicensing studies also determined that existing botanical habitat is functioning properly, and that terrestrial wildlife populations are present and functioning properly. No Project impacts are anticipated for botanical or terrestrial wildlife resources.

4. Rare, Threatened, and Endangered Species

Exelon's analysis of rare, threatened, and endangered species issues, summarized below, is set forth in Exhibit E, Section 3.3.5.

Exelon conducted relicensing studies to examine potential impacts of the Project on rare, threatened, and endangered species, including the bald eagle, osprey, black-crowned night heron, shortnose and Atlantic sturgeon, and the Maryland darter.

The bald eagle is not listed as threatened or endangered by Maryland, but is listed as threatened by Pennsylvania. Shoreline forests along Conowingo Pond and the Susquehanna River downstream of Conowingo Dam provide habitat that currently supports 11 pairs of breeding bald eagles and many foraging and roosting bald eagles each year.[69]

Exelon's study on the osprey, which is not listed as threatened or endangered by Maryland, but is listed as threatened by Pennsylvania,[70] sought to identify locations in the Project area inhabited by osprey.[71] A total of 11 osprey nests were found in the Project area in 2010 and a twelfth nesting location was identified in 2011. Of these nests, four are located in the Maryland portion of the Project area and eight are located in the Pennsylvania portion of the Project area.[72]

The black-crowned night heron is not listed as threatened or endangered by Maryland, but is listed as endangered in Pennsylvania.[73] Field surveys identified approximately three to six birds regularly foraging below Conowingo dam in Maryland, traveling between Rowland Island and Fisherman's Park, and roosting in trees over the water on Rowland Island. No black-crowned night

69 Final License Application Exhibit E at E-234.
70 Osprey Nesting Survey, RSP 3.30 (Conowingo RSP 3.30); 58 Pa. Code § 133.21(2)(i) (2012).
71 Conowingo RSP 3.30 at i.
72 *Id.* at 11-12, Figure 4.1-1; Final License Application Exhibit E at E-245.
73 58 Pa. Code § 133.21(1)(xii).

heron nests were observed, however, and these locations are not anticipated to change in character over the new license term.[74]

The Northern Map Turtle, is listed as endangered by Maryland. Exelon funded studies in the Lower Susquehanna River below Conowingo Dam, conducted by researchers from Towson University, that (1) addressed whether current and potential nesting sites can be modified to enhance nesting success by Northern Map Turtles; (2) determined the severity and impacts of altered basking frequency as a function of changes in river flow and human boating; (3) began a pilot study to determine the feasibility of creating artificial basking platforms; and (4) began a pilot study to determine the feasibility of a rapid population assessment of map turtles in the lower Susquehanna River.

Study results indicated that nesting of Northern Map Turtles occurs at several locations along the Susquehanna River below Conowingo Dam. During the 2011 studies, predation rates on nests from raccoons, foxes, and feral dogs was nearly 100% at several locations. However, a few select historical nesting sites were relatively free of predation. Nesting most often occurred on sunny days after rain events, and was observed as early as 0630 hours and as late as 1930 hours, but no nocturnal nesting was observed. Turtles were found to make almost immediate use of newly-opened gaps (*i.e.*, tree-falls) in the forest canopy, suggesting that attempts to create new nesting sites by habitat manipulations could be successful, as turtles will quickly utilize new gaps in the canopy cover as nesting sites. Northern map turtles have been identified within the Project boundary.

In Maryland, MDNR identified 13 Maryland state-listed plant species. Species-specific surveys were not conducted. Although the general habitat for a plant may be present in the Project area, none of these species were observed during any of the field studies. It is anticipated that based on habitat suitability and prior documented occurrences, certain plant species of concern are present in the Project area. Continued operation of the Project will not result in adverse impacts to these species.

Shortnose sturgeon is listed as federally endangered. The historic abundance of shortnose sturgeon in the Susquehanna River is poorly understood. There appears to be little documentation of sturgeon historically occurring upstream of the site of Conowingo Dam beyond a few anecdotal accounts of captures published in the late 1700s and early 1800s. No directed, fishery-independent studies to evaluate sturgeon presence in the Susquehanna River have been conducted; however, a few shortnose sturgeon collections have been documented in the lower Susquehanna River, including from the Conowingo Dam tailrace. Exelon conducted monitoring of the Susquehanna River for tagged sturgeons from other river systems (Delaware River, Potomac River) that might use the Susquehanna River. No tagged sturgeon were recorded in the Susquehanna River in the Exelon studies.

[74] Black-Crowned Night-Heron Nesting Survey, RSP 3.31 (Conowingo RSP 3.31) at 17.

Atlantic sturgeon is also listed as federally endangered. Historically, Atlantic sturgeon abundance was considered to be high, and in the late 1800s large scale commercial fisheries commenced. The Delaware Bay fishery was the largest, but Chesapeake Bay supported several fisheries as well, specifically in the James, York, Rappahannock, Wicomoco/Pokomoke, Nanticoke, Choptank, Potomac, and Patuxent Rivers. By 1901 the mid-Atlantic fishery had collapsed. Reviews of fishery dependent and independent captures for Atlantic sturgeon in Chesapeake Bay from the late 1950's through the mid-1990s yielded limited occurrences suggesting to researchers that stocks were depressed to the point that meaningful reproduction was not occurring. The most informative contemporary data regarding distribution of Atlantic sturgeon in the upper Chesapeake Bay comes from the USFWS's coast-wide sturgeon tagging database and the USFWS and MDNR reward program for live sturgeon captured in the Maryland portion of Chesapeake Bay. Welsh et al.[75] compiled reports from the reward program for 1996-2000 depicting the distribution of collections reported throughout much of the upper Chesapeake Bay. Only two were from as far up bay as Elk Neck (adjacent to the Susquehanna River) and none were from the Susquehanna River.

Exelon conducted monitoring of the Susquehanna River for sonic transmitter tagged sturgeons from other systems (Delaware River, Potomac River) that might use the Susquehanna River during 2010 and 2011 with fixed station acoustic telemetry receivers.[76] Monitoring was conducted when a number of Atlantic sturgeon might have been at large with active acoustic transmitters. No tagged sturgeon were recorded in the Susquehanna River in the Exelon studies.[77]

FERC concluded in the FEIS that while there is suitable habitat downstream of Conowingo for both shortnose and Atlantic sturgeon species, only occasional individual shortnose sturgeon have been reported from the river below the Conowingo Dam, and there is no evidence of any recent occurrence of Atlantic sturgeon in the lower Susquehanna River. Therefore, continued operation of the Project would not be likely to adversely affect either the shortnose or Atlantic sturgeon.

In Conowingo Pond, Chesapeake logperch, listed as threatened by Maryland, is considered to be locally abundant. In the 2010-2011 lower Susquehanna River Maryland darter surveys, Chesapeake logperch were found to be widely distributed and abundant. Chesapeake logperch was the second most abundant darter species over 193 sampling locations, and the most abundant darter species in Octoraro Creek. The species is established under the existing operational regime. Continued operation of the Project will not result in adverse impacts to this species.

Surveys for Maryland darter, a federally endangered species, were conducted seasonally from fall 2010 through fall 2011 in the lower Susquehanna River (157 locations), Octararo Creek (12 locations), and Deer Creek (24 locations). Deer Creek sampling included the riffle where the

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[75] Welsh, S.A., S.M. Eyler, M.F. Mangold, and A.J. Spells. 2002a. Capture Locations and Growth Rates of Atlantic Sturgeon in the Chesapeake Bay. American Fisheries Society Symposium 28: 183-194.

[76] Shortnose and Atlantic Sturgeon Life History Studies, RSP 3.22 (Conowingo 3.22).

[77] Exelon is continuing to consult informally with the National Marine Fisheries Service on shortnose and Atlantic sturgeon.

species was recorded as last observed, as well as sites upstream and downstream of it. No Maryland darters were collected; however, five of six darter species were recorded in the lower Susquehanna River Basin. The collection of numerous other darters indicated that the method was a sound approach for sampling Maryland darter. The study represents the most extensive and intensive sampling effort conducted in the Lower Susquehanna River for Maryland darter. The study results strongly indicate that it is unlikely that the species still exists in the Project area, so operations will not have any impacts on the species.

5. Recreation Resources

Exelon's analysis of recreation issues, summarized below, is set forth in Exhibit E, Section 3.3.6.

A thorough evaluation of recreation resources in the Project vicinity was performed. Exelon's Recreational Inventory and Needs Assessment (1) inventoried recreation in the Project area to identify public access points within the Project boundary; (2) estimated the amount of recreational use occurring at the Project; and (3) determined whether enhanced and/or new recreation facilities are needed to support recreation use at the Project.[78] The assessment, which involved on-site data collection for one year, found that recreational users are satisfied with existing recreation conditions and opportunities at the Project, and that capacity at the Project's numerous and diverse recreation facilities far exceeds demand.[79] Even with an estimated one-third increase in recreation demand at the Project through 2050,[80] Project recreation facilities are expected to continue to be substantially underutilized.[81]

The Project offers extensive formal and informal recreation sites which provide the recreating public trails, day use and interpretive sites, boat launch facilities, a swimming pool, wildlife viewing areas, and shoreline fishing opportunities. Exelon partners with state, county, municipal, non-profit agencies, and individuals for the development and management of these recreational facilities which, together with public access lands administered directly by Exelon, occupy over 720 of the 1,270 acres of Project lands above the ordinary high water mark.

Although user surveys indicate high levels of satisfaction and Exelon's studies show excess capacity at existing Project recreation facilities, Exelon believes that improvements to existing facilities will enhance access and recreational use of the Project, consistent with FERC's policy of maximizing public recreation at licensed hydropower projects.

6. Land Use

Exelon's analysis of land use issues, summarized below, is set forth in Exhibit E, Section 3.3.7.

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78 *See* Recreation Management Plan at i, included in Volume III of the Final License Application.
79 *Id.* at 6-41 (calculating facility use and capacity at Project recreation areas to range from 10 to 40%).
80 *Id.* at 7-4; *see also* Final License Application Exhibit E at E-293.
81 Recreation Management Plan at 7-6 to 7-7.

Project lands, which consist mainly of recreational and undeveloped, publicly accessible land, have little effect on the land use in the area. Land use adjacent to the Project is currently dominated by agricultural land and heavily forested land. The Project as it exists and as it is proposed is fully consistent with adjacent land uses and provides public benefits including parks, trails, and interactive displays. As there are currently no proposed changes to Project operations, use of adjacent lands is not anticipated to be affected.

Exelon undertook a number of studies to evaluate the Project's benefits and effects on the numerous environmental resources and uses that relate to the Project's shoreline. These studies contributed to the development of the SMP, a comprehensive plan for the management of the Project shoreline over the new license term.

In the FEIS, FERC concluded that implementation of Exelon's proposed SMP would provide a single source for shoreline management guidelines, policies, and an overall framework for managing the Conowingo shorelines over the terms of the new license. The proposed plan would bring all existing shoreline management programs and activities, such as the current residential lot and cottage lease program, and any other guidelines, into a single, comprehensive document. Project lands would remain available for public recreational uses, and private and commercial uses would continue to be allowed on project lands pending proper reviews. Exelon would review permit applications for activities such as improvements to leased cottages, construction of boat docks, piers, and landscaping, and would ensure that all residential cottages sewage systems meet local standards on an annual basis.

B. Protection, Mitigation, and Enhancement Measures

1. Flow Regime & Water Quality

The existing flow regime ensures that project operations will not adversely affect SAV/EAV, and will support the propagation of fish, shellfish, and wildlife, and aquatic habitat downstream of Conowingo dam. Nonetheless, Exelon proposes to increase its minimum flows and to make them continuous year-round to provide additional protection to downstream aquatic habitat, as recommended in FERC's FEIS. Specifically, Exelon proposes the following minimum flows:

Month	**Minimum Flows (cfs)**
December	4,000
January	4,000
February	4,000
March	4,000
April	18,200

Month	Minimum Flows (cfs)
May	18,200
June	7,500
July	5,500
August	4,500
September	3,500
October	4,000
November	4,000

These flow conditions provide for an operational regime that adequately mitigates the impacts of the Project's regulation of flow in the lower Susquehanna River, and protects suitable habitats and key natural processes.

2. Fish Passage

Significant catches of river herring were made at the existing East Fish Lift in 1997 (242,815 herrings), 1999 (130,625 herrings), and 2001 (284,291 herrings). After 2002, however, very few river herring have been passed, with the maximum annual catch of 530 recorded in 2005. American shad catch at the existing East Fish Lift show a similar trend. Between 2000 and 2004, the average annual East Fish Lift catch was 137,923 fish. However, in subsequent years the annual American shad catch has fallen dramatically from 68,926 fish in 2005 to 12,733 fish in 2013.

These trends suggest that other non-Project factors may have a greater effect on American shad and river herring populations in the watershed. In addition, predation, bycatch, and competition are possible factors impacting the American shad and river herring populations. In the ocean, American shad and river herring are likely preyed upon by many species of fish, marine mammals, and seabirds. Inshore, it has been suggested that striped bass predation may limit the American shad population. Bycatch in commercial fisheries is a threat of significant concern for American shad and river herring populations. Significant bycatch primarily occurs in coastal ocean trawl fisheries for Atlantic herring, Atlantic mackerel and squids.

Data shows that the fish assemblage in the lower Susquehanna River has become increasingly dominated by gizzard shad since the 1970s. Gizzard shad thrive in warm, shallow bodies of water that have a soft mud bottom, high turbidity, and relatively few predators, such as Conowingo Pond. Gizzard shad in early life stages consume zooplankton, often to the detriment of other young fishes, such as juvenile American shad. Additionally, it has been noted that at times the overabundance of gizzard shad appears to impede the ability for American shad to enter and utilize the East Fish Lift effectively.

Despite these non-Project impacts, Exelon's proposed improvements to fish passage facilities will substantially enhance fish passage. As set forth in the Settlement Agreement, Exelon will implement substantial improvements to the existing fish passage facilities at the Project within three years of license issuance (Initial Construction Items). The Initial Construction Items include:

- Modifying the existing East Fish Lift to provide 900 cfs of attraction flow.
- Replacing the current 3,300-gallon hopper at the East Fish Lift with two 6,500-gallon hoppers.
- Reducing cycle time at each hopper at the East Fish Lift to be able to lift fish four times per hour.
- Completing modifications to the East Fish Lift structure to allow for trapping and sorting fish at the East Fish Lift facility and transporting them to the western side of the dam to a truck for transport upstream.
- Modifying the existing West Fish Lift to facilitate trap and transport.
- Constructing and maintaining structures, implementing measures, and/or operating the Project to provide American shad and river herring a zone of passage to the fish passage facilities.
- Evaluating potential trapping locations for American eel on the east side of Conowingo Dam including Octoraro Creek starting in May of the first calendar year after license issuance or immediately if license issuance occurs during the upstream American eel migration period.

In addition to these Initial Construction Items, Exelon will commence trap and transport of American shad and river herring from the Project to above the York Haven Hydroelectric Project beginning the first fish passage season after license issuance.[82] Exelon also has committed to trap and transport American eels at the west side of Conowingo Dam until 2030, and to implement volitional American eel passage starting in the 2031 fish passage season.

Five years after issuance of the new license, Exelon will commence a three-year "Initial Efficiency Test" of fish passage at the Project. The Initial Efficiency Test will measure the passage efficiency of the improved facilities. If the facilities achieve an 85 percent upstream passage efficiency for adult American shad,[83] Exelon will continue to operate the facilities without further modification. Exelon will then conduct two-year "Periodic Efficiency Tests" every five years to ensure that the

[82] Exelon has agreed to annually trap and transport up to 80 percent of the run, up to a maximum of 100,000 fish for each species.

[83] Pursuant to the Settlement Agreement, Exelon receives credit toward achieving the upstream passage target efficiency of 85 percent as a result of its trap and truck operations.

Project maintains an upstream passage efficiency of 85 percent for adult American shad throughout the term of the new license.

If the Project does not achieve an upstream passage efficiency of 85 percent after the Initial Efficiency Test or any Periodic Efficiency Test, Exelon will be required to implement measures to improve passage efficiency at the Project. Exelon and Interior have agreed on a tiered list of potential measures, which are designed to address fish passage impediments associated with attraction flow and capacity limitations. The degree of the shortfall from the 85 percent passage efficiency target determines the scope of the additional mitigation and enhancement measures that will be required. As set forth in the Settlement Agreement, these additional mitigation measures range from the implementation of preferential turbine operating schemes to the construction of a new West Fish Lift.

In the first fish passage season after Exelon implements any measure or measures to improve passage effectiveness, Exelon will commence a three-year Post-Modification Efficiency Test. The Post-Modification Efficiency Test will measure the passage efficiency of the improved facilities. If the Project achieves an upstream passage efficiency of 85 percent for American shad, Exelon will continue to operate the facilities without modification and will return to conducting two-year Periodic Efficiency Tests every five years. Again, if any Periodic Efficiency Test demonstrates that the Project is not achieving an 85 percent passage efficiency, Exelon will implement a measure or measure(s) from the tiered list of options, to be followed by a Post-Modification Efficiency Test. This cycle of testing and modifying, as necessary, will continue throughout the term of the license.

In addition to the improvements described above, Exelon will develop and implement a Fishway Operation and Maintenance Plan (FOMP) that will provide extensive information about the operations of the Project's fish passage facilities. The Settlement Agreement includes downstream American eel effectiveness monitoring, upstream American eel effectiveness testing, and downstream adult and juvenile American shad and river herring effectiveness testing. The plans for all the studies described in the Settlement Agreement will be contained in the Fishway Effectiveness Monitoring Plan (FEMP)—a document Exelon will develop in consultation with Interior, and which is subject to approval by Interior and FERC.

In any year that Exelon is conducting a study, it will submit a yearly interim study report to Interior and FERC following the conclusion of the study year. The interim and final reports for upstream passage studies will be submitted to Interior by December 31st of each study year. The interim and final reports for downstream passage studies will be submitted to Interior by August 1 following each study year. The final study report will include results for each life stage and type of study conducted with a determination of Exelon's success or failure in achieving the passage efficiency criteria set forth in the Settlement Agreement. In conjunction with submitting the final study report(s), Exelon also will provide Interior electronic copies of all data collected from the studies.

Further, Exelon agreed to meet annually with Interior and the Susquehanna River Anadromous Fish Restoration Cooperative (SRAFRC) to discuss the FEMP and FOMP. This meeting will occur no later than January 31 each year unless Exelon and Interior agree on a different date. At this annual meeting Exelon will discuss with Interior and SRAFRC the fish passage results from the previous year, review regulatory requirements for fish lift and eel passage operations, and discuss any upcoming modification or testing Exelon proposes for the upcoming fish passage season.

Exelon has agreed to operate the Project to achieve a downstream survival efficiency of at least 80 percent of the adult and 95 percent of the juvenile American shad and river herring moving downstream past the Project. Exelon also has agreed to operate the Project to achieve a downstream survival efficiency criterion of at least 85 percent of the adult American eel moving downstream past the Project. If the results of the downstream studies indicate that the Project is not achieving these efficiency criteria, Interior may exercise its reservation of authority to address the issue.

Finally, in the Supplemental Filing, Exelon committed to design, install and operate an eel trapping facility and eel holding facility along the western shore of the Conowingo Dam near the location of the current United States Fish and Wildlife Service (USFWS) trapping location and facility. Those facilities began operation on May 1, 2017 and will be operated by Exelon annually until 2030, at which point Exelon will construct and operate a volitional upstream eel facility at Conowingo Dam through the term of the new FERC license, as described in the Settlement Agreement.

Exelon will submit daily emails and an annual report (Annual Report) providing information regarding the operation of the eel passage facilities to the (EPAG), a group that is chaired by Exelon and composed of a representative from each of the Pennsylvania Department of Environmental Protection, Pennsylvania Fish and Boat Commission, USFWS, the Maryland Department of Natural Resources Maryland Power Plant Research Project and the SRBC.

Every three years, unless a different period is established by the PADEP in writing beginning in 2018 through 2030, Exelon will conduct stream segment evaluations through electrofishing or other methods identified after consultation with EPAG. Results of stream segment evaluations will be included in the Annual Report and will document dispersal of the stocked eels, estimate the approximate density of stocked eels, and evaluate the growth, condition, age, gender and level of infestation with *Anguillicoloides crassus* of stocked eels.

3. Rare, Threatened, and Endangered Species

Bald Eagle Management Plan. Exelon's Bald Eagle Management Plan, which was developed in consultation with the USFWS, the Pennsylvania Game Commission (PGC), and the MDNR, addresses the use of Project lands by bald eagles for nesting, roosting, and foraging based on the

national Bald Eagle Management Guidelines.[84] It provides a framework for evaluating and implementing land management practices that minimize impacts to bald eagles on Project lands. Exelon anticipates that implementation of the plan will enhance and benefit bald eagles on Project lands and in the region as a whole.

Osprey Protection Measures. Twelve osprey nests were found in the Project area; four in the Maryland portion of the Project and eight in the Pennsylvania portion.[85] To appropriately protect these and other nests, Exelon's SMP includes an Osprey Management Policy developed in consultation with state and federal agencies.[86] The Policy includes the establishment of appropriate buffers to prevent visual or auditory disturbances of nests during the breeding and nesting season (January to late July). The policy also includes the following measures to protect ospreys nesting on Exelon lands:

- Nest Buffers: Nest buffers of 330 feet will be implemented during breeding season for most activities. For activities with the potential to emit excessive noise (which excludes routine Project operation and maintenance activities), larger buffers up to 600 feet will be implemented during breeding season.

- Herbicide application for vegetation control will be avoided within 330 feet of nests during breeding season.

- Tower nests: In the event that nests located in towers are identified as problem nests, Exelon will consult with the USFWS to identify the appropriate best management practices and obtain applicable permits for nest removal or relocation. A typical best management practice for problem nests in towers is the installation of nest platforms on towers or nearby.

Changes to existing vegetation management practices are not proposed.

4. Recreation Resources

Using the suggestions received through user preference surveys, informal comments received at public meetings, and formal written comments submitted during the relicensing process, Exelon has developed a Recreation Management Plan for managing recreational resources at the Project over the new license term. Exelon is proposing to improve and enhance Lock 13, Lock 15, Muddy Creek Boat Launch, Cold Cabin, Dorsey Park, Peach Bottom Marina, Line Bridge, Conowingo Creek Boat Launch, Glen Cove Marina, Funk's Pond, Conowingo swimming pool, Conowingo Dam Overlook, and Fisherman's Park/Shures Landing.

Exelon believes these enhancements reflect its commitment to provide high-quality public recreation at the Project, meet current and future recreational demand in the Project area, and

[84] Because the Bald Eagle Management Plan includes sensitive information about the species, it was filed as privileged in Volume IV of the Final License Application. Exelon will file a copy upon request.
[85] *Id.* at 11-12, Figure 4.1-1; Final License Application Exhibit E at E-245.
[86] Conowingo SMP at 6-6.

appropriately consider the needs of persons with disabilities. The estimated cost for constructing these recreation improvements is approximately $2.5 million.

5. Land Use / Sediment Erosion and Control

Exelon's proposed sediment and erosion mitigation measures reflect the relative impact of Project operations on sediment and nutrient delivery to the Susquehanna River. Exelon has developed a SMP which will ensure, among other things: (1) protection of environmental resources such as wetlands, fish and wildlife habitat, and spawning areas; (2) maintenance of water quality; and (3) minimization of sediment and nutrient delivery to Project waters.

The proposed SMP includes a land classification system, and a "Sensitive Natural Resource Protection Overlay," which identifies the locations of natural or cultural resources within the Project boundary that may be affected by Project operations or the activities of lessees of Project lands or recreating members of the public. Prior to undertaking any ground-disturbing activity or significant exterior maintenance, or permitting a lessee to undertake such activities, Exelon will review the overlay to determine if natural or cultural resources may be affected. If so, Exelon will take appropriate avoidance or mitigation measures consistent with the plans, programs, and policies consolidated within the SMP to better inform shoreline users and the public, and to enhance coordination with government agencies and interested non-governmental organizations.

The SMP encompasses the following policies and practices:

- Shoreline Erosion Control Policy to guide the modification of shoreline vegetation for control purposes.
- General Maintenance Policy to address shoreline buffer maintenance and modification.
- Erosion and Remediation Policy to monitor and remediate erosion affecting Project resources.
- Shoreline Vegetation Management Policy to guide the maintenance and modification of shoreline vegetative cover.
- Viewsheds and Shoreline Access Policy to address modifications to shoreline vegetation to enhance water views and access.
- Woody Debris Policy to provide for Exelon's treatment of woody debris.
- Leased Premises Policy for Non-Cottage Lands to guide the lease of Project lands and waters for non-Project purposes, consistent with the provisions of the Standard Use and Occupancy Article, any relevant L-Form standard articles, or a FERC order approving the lease, as applicable.
- Leased Premises Policy for Cottage Lands to incorporate the comprehensive rules and regulations for leases of Project lands for existing seasonal cottages, and to reflect

Exelon's policy not to permit any new cottage leases.

- Conowingo Islands Public Use Policy to limit access and use areas for leased lots on islands in Conowingo Pond for seasonal cottages.

- Public Recreation and Access Facilities to govern parcels of Project land that are leased to local, county, or state agencies, or commercial vendors for development and operation of public recreation and access facilities.

- Limitations on Public Recreation Access to restrict public access to Project lands for operational, public safety, and security reasons, such as prohibiting hunting and fishing in posted secure areas, and prohibiting the use of off-road vehicles on all Project lands.

- Overall Land Use Monitoring and Enforcement to provide for regular inspection of Project facilities and property to ensure adherence by lessees and members of the public to applicable contractual or regulatory requirements, and implementation of measures necessary to ensure compliance.

In addition, the SMP provides for the protection of aquatic and terrestrial resources and habitat on Project lands by requiring all activities undertaken by Exelon or its permittees to incorporate BMPs to minimize or eliminate sediment and nutrient delivery to Project waters. The BMPs will minimize soil erosion, control sedimentation, and restrict the use of impervious surfaces associated with new construction activities. Exelon also will implement BMPs for the use of pesticides and fertilizers, and restrict removal of vegetation.

Finally, the SMP incorporates Exelon's plans for management of rare, threatened, and endangered species, as well as for historic properties.

V. CONCLUSION

The PM&E measures proposed in Exelon's FERC application for a new license, the Settlement Agreement, and the Supplemental Filing coupled with existing Project features, will ensure that operation of the Project meets Maryland water quality standards. To the extent that studies have identified Project impacts to water quality, these impacts have either already been addressed (*e.g.*, aeration of the turbines to improve DO), or will be addressed in the new license (*e.g.*, American eel passage facilities, implementation of sediment and nutrient best management practices, improvements to recreation facilities). Accordingly, the State of Maryland should certify that the Project will comply with applicable Maryland water quality standards.

SUPPORTING DOCUMENTATION

Project FERC License Application (The entire FERC license (four volumes) is also provided for the Water Quality Certificate Application in a separate folder on the CD.)

Project FERC Licensing Study Report and Management Plans

- Water Quality Study Report
- Eel Study Report
- Instream Flow Study Report
- Migratory Fish Study Report
- Telemetry Study Report
- Shoreline Management Plan
- Recreation Management Plan

FERC Final Environmental Impact Statement (FEIS)

Settlement Agreement with U.S. Department of the Interior

Supplemental Filing

Exhibit L

Maryland
Department of
the Environment

Larry Hogan
Governor

Boyd Rutherford
Lieutenant Governor

Ben Grumbles
Secretary

March 13, 2017

Ms. Vickie Will
Vice President, Operations Support
Exelon Generation Company, LLC
300 Exelon Way
Kennett Square, PA 19348

Dear Ms. Will:

The Maryland Department of the Environment ("Department" or "MDE") received your February 17, 2017 letter withdrawing Exelon Corporation's pending application for a Clean Water Act Section 401 Water Quality Certification for the Conowingo Hydroelectric Project. This action is not intended to delay re-licensing by the Federal Energy Regulatory Commission, but rather to ensure that MDE's certification relies on the most current information. As indicated in your letter, Exelon is withdrawing this application because the multi-year sediment study and related water quality modeling work, funded by Exelon, to quantify discharges of sediment and nutrients from the Conowingo facility to the Lower Susquehanna River and upper Chesapeake Bay, will not be completed before April 25, 2017.

The Department expects to receive your resubmission for the 401 Certification by May 18, 2017, and will, upon receipt of your resubmission, initiate its review of the water quality impacts associated with the operation of the Conowingo facility. It is important that MDE move forward and complete its review and, where needed, put in place conditions to ensure that the Conowingo facility meets applicable State water quality standards and requirements. Accordingly, we intend to use the best available data and information, and we are committed to completing this review in coordination with other departments and agencies within 12 months of the receipt of your resubmission.

If I may be of further assistance, please contact me at 410-537-3084, or Lee Currey, Acting Director of the Water Management Administration, at 410-537-3567 or by email at *lee.currey@maryland.gov*.

Sincerely,

Ben Grumbles
Secretary

cc: D. Lee Currey, Acting Director, Water Management Administration

Exhibit M

Dredging Is An Option

The sediment buildup behind Susquehanna River hydroelectric dams has been characterized as a time-bomb. The issue emerged in the Susquehanna because recent studies by the U.S. Geological Survey showed that the 250-million-ton sediment trapping capacity at four dams built between 1904 and 1931 has been reached, including Conowingo Reservoir. (Blankenship, 2001) Since their reservoirs are full, huge amounts of dirt and nutrients spill over during storm events, fouling River and Bay water quality. The Conowingo Dam reservoir, although thought to not fill until after 2025, is now at dynamic equilibrium. Dynamic Equilibrium is the point at which the amount of sediment flowing into the reservoir equals the amount leaving the reservoir, and the stored volume of sediment is relatively static. (Chavez, 2017)

We are at a historical moment never realized before in time. All hydroelectric dams on the Lower Susquehanna River are at dynamic equilibrium. Hydroelectric dams serve one purpose, and that is to produce power. They do not serve as a best management practice for any watershed, as Exelon has repeatedly claimed throughout this relicensing process. In fact, there are considerable risks since the Dam's reservoir is now full. The Bay Program's Scientific and Technical Advisory Committee studied the impacts of increased sediments from the Susquehanna River on the Chesapeake Bay. According to the scientists the consequences includes increased amounts of phosphorus reaching the middle portions of the Chesapeake Bay. Increased turbidity in the Bay and faster sedimentation everywhere in the Upper Bay, especially in navigation channels, which would increase the need for channel dredging. Adverse impacts on the recovery of underwater grass beds because the sediment would reduce the amount of light reaching the plants. Benthic (bottom-dwelling) organisms would suffer increased mortality and reduced reproduction. Those that aren't killed would have to spend more energy to keep from being buried. Young oysters are especially sensitive to sediment deposition. Fish might be impacted as increased sediment could affect their feeding, clog gill tissues and smother eggs. Siltation could also result in habitat alterations, and increased turbidity may change the abundance of planktonic prey important for larval and juvenile fish. (Blankenship, 2001) (Lower Susquehanna River Watershed Assessment, MD & PA, 2015)

Sedimentation

Sedimentation, in the geological sciences, process of deposition of a solid material from a state of suspension or solution in a fluid (usually air or water). (Britannica, 2017) Sedimentation is a natural occurring process which takes place in all river systems. Tributaries to a river also contribute a tremendous inflow of sediments due to many factors. The sediment flowing down the river stems from a variety of watershed activities over time. Scientists estimate that the pre-settlement forests probably yielded only about one-tenth of a ton of sediment per acre per year. But sediment greatly increased as the forests were cleared and farms developed. Today's sediment problems don't just stem from dirt washing off the land. When silt-laden water blasts into an unstable stream bank, barren of vegetation, it causes the bank to collapse into the waterway, adding still more sediment. In one 68-square-mile watershed in southern Pennsylvania, it's estimated that between 37,000 and 78,000 tons of sediment came not from the land, but streambank erosion during a 16-month period. (Blankenship, 2001)

Sediment has decreased over time, with only about 3 million tons a year reaching the dams today. Still, much of the sediment from past activities remain in rivers and streams throughout

the basin where it has become part of the sediment "bedload" which can take decades to work its way downstream. Farmers and landowners must control sediment coming off their land but there also must be accountability for sediment eroded by the stream itself. It's unknown how much of the sediment in the streams is from "new" runoff, how much is bedload and how much is from streambank erosion. If streambank erosion is a major source of sediment, that means simply trying to keep sediment on the land isn't enough. Major efforts are needed to restore streams to their floodplains as well. The long-term solution is going to be the restoration of the watershed. Dredging old sediment from behind the dams is a way to maintain their sediment trapping capacity, at least until the benefits of other stream restoration and runoff control actions are "felt" at the dams years from now. Dredging behind the Lower Susquehanna River Dams isn't unprecedented. For about 20 years, until 1973, sediment was dredged annually from behind the Safe Harbor Dam, the second largest on the river, to recover coal. About 10 million tons of coal were excavated from the reservoir in all. (Blankenship, 2001)

Lower Susquehanna River Watershed Assessment (LSRWA) Deficiencies

Researchers studied the effects of sediment transport in relation to flow using various models outlined in the study titled Lower Susquehanna River Watershed Assessment (LSRWA). However, decision makers cannot rely on the LSRWA because of its serious shortcomings. The LSRWA used a "daisy chain" of models to produce estimates and make predictions about future conditions related to the Conowingo Dam Project's sediment discharges, with output from one model fed into the next model in the series. At each stage, the modelers made choices that resulted in under-estimations of sediment quantities and therefore underrepresented potential sediment impacts and associated nutrient impacts on the Chesapeake Bay.

The LSRWA modelers did not model a 25-year, 50-year, 75-year, or 100-year return interval flow event, which have a high to reasonable chance of occurring during the license period**.** The decision not to model and study the effects of a larger return interval flow event was a serious omission in the LSRWA. Because the relationship between sediment concentration and flow is exponential, a 50-year, 75-year or 100-year return interval flow event would have produced sediment scouring effects substantially greater than storms modeled by the LSRWA modelers. (Chavez, 2017)

Also, The LSRWA modelers underestimated the effects of the flow events they modeled by using *averages* to represent peak flow conditions and associated sediment concentrations. Both the USGS and the Corps' models represented "peak" Tropical Storm Lee conditions based on *daily average flow* rather than using other methods of calculating peak conditions, a choice that caused the LSRWA to underrepresent the storm's effects. In particular, while the highest daily average flow recorded during Tropical Storm Lee was 709,000 cfs, the highest *24-hour running average flow* was 746,000 cfs, and the highest *instantaneous flow* was 778,000 cfs. Similarly, for one part of their analysis the Corps modelers represented Tropical Storm Lee by its *storm average flow*, which was just 632,000 cfs. These choices likely explain why the models predicted sediment quantities that were lower than the best available estimates or actual measured data suggested. The consequences of these choices were substantial because the relationship between flow and transport of sediment is an exponential, not linear, relationship. Had the LSRWA modelers represented these storms using a more appropriate measure of peak flows, because of the exponential relationship they would certainly have predicted much greater sediment and

nutrient effects. Instead, the LSRWA models presented an unjustified rosy picture of the likely effects of future high-flow events. (Chavez, 2017)

Furthermore, it's important to note that the LSRWA modeling efforts indicate that the scour threshold for the current reservoir condition ranges from about 300,000 cfs to 400,000 cfs, with the threshold for mass scouring occurring at about 400,000 cfs, which represents a 4- to 5-year return flow event. The term mass scouring refers to the flow magnitude that results in very high erosion rates where significant high mass transport from the bed occurs. (Lower Susquehanna River Watershed Assessment, MD & PA, 2015) However, the often-cited 400,000 cfs value originated from Gross et al. (1978), cited by Lang (1982), and was based on a 1-year comparison of sediment loads at Harrisburg, PA, (upstream of the Marietta gauge) and Conowingo, assuming that the threshold occurs when loads at Harrisburg are lower than at Conowingo. This comparison necessarily assumed no sediment inputs/outputs between these two gauges, ignoring several small tributaries and perhaps more importantly the two reservoirs upstream of Conowingo. More recent work suggests that the scour threshold has decreased with Reservoir infill and now could be as low as 175,000 cfs (Palinkas, 2019)

Additionally, the LSRWA modelers did not properly evaluate the effects of a large flow event on the SAV growing season. The LSRWA modeling considered the effects of sediment discharges to the Chesapeake Bay during the months of January, June, and October. The modelers made this choice despite the fact that the 1967-2013 historic flow record shows there were more days at or above the scouring threshold during March, April, and May than all other remaining months. As a result, the SAV growing season was largely excluded from the analysis.

When dredging is performed (hydraulically or mechanically), any contaminant attached to the sediment could be released during placement. To predict the release of contaminants, elutriate tests can be performed. The standard elutriate test is used to predict the release of contaminants to the water column resulting from open water placement. The modified elutriate test is used to evaluate the release from a confined disposal facility. The results will vary depending on the grain size of the material being dredged. Since the LSRWA was a broad assessment of alternatives, elutriate tests **were not** performed on the potential dredged material. If specific dredging and placement sites are investigated in the future, then it is recommended that these tests be done at that time. The LSWRA states that increasing or recovering sediment storage volume of the reservoirs via dredging or other methods is possible, and in some cases can effectively reduce sediment and associated nutrient scour. (Lower Susquehanna River Watershed Assessment, MD & PA, 2015)

The LSRWA claims that dredging will offer little value in offsetting sediment/nutrient load based on the models used in the study. However, considering the models' inputs are flawed and there are discrepancies in its methodology, it is inaccurate to claim dredging will have no significant effect. Also, the LSRWA is inconclusive is determining the effects of long-term dredging. It's critical to mention the deficiencies of the LSRWA as researchers used the models in the study to determine if dredging is a viable option. Unfortunately, due to the shortcomings of the LSRWA study stated above we cannot rely on the conclusions suggested in the study but must rely on those who have experience in the field of dredging and time-tested proven methods of successful implementation. Much of the several hundred million cubic yards of sediment

dredged each year from U.S. ports, harbors, and waterways could be used in a beneficial manner, such as for habitat restoration and creation, beach nourishment, aquaculture, forestry, agriculture, mine reclamation, and industrial and commercial development. HarborRock is a sustainable and cost-effective sediment management and nutrient reduction approach to consider.

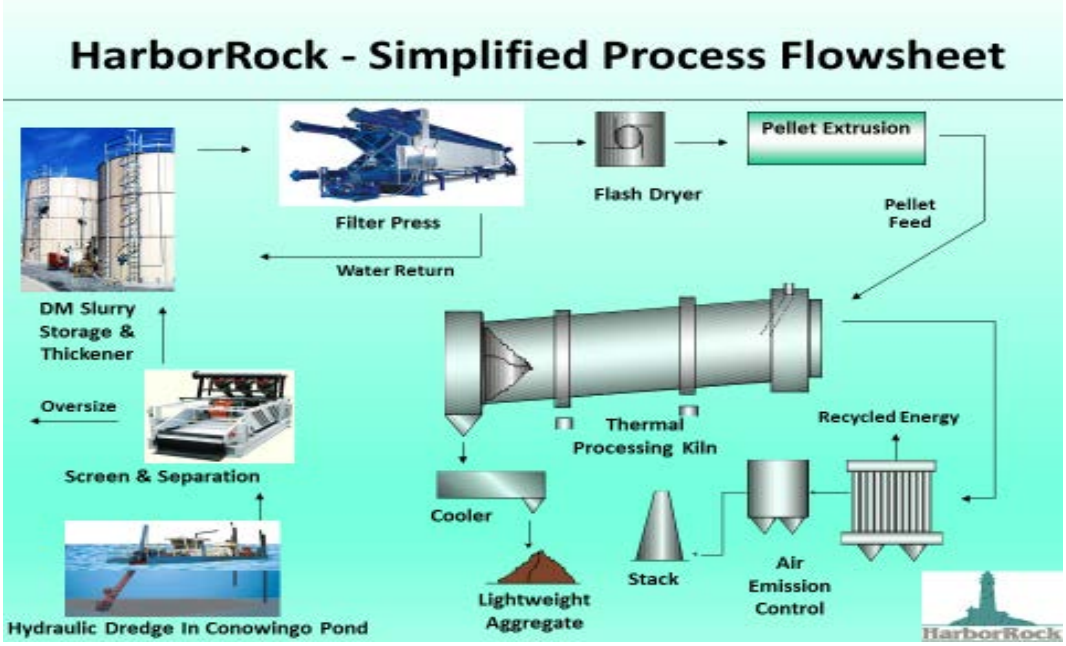
The HarborRock Process – A Proven, Practical and Cost-effective Disposal Solution

HarborRock LLC has developed a process for the manufacture of high-quality lightweight aggregate (LWA) using solely dredged sediments as the raw material. Revenue is earned from fees paid for the disposal/management of the dredged material and from the sale of the LWA and other natural materials associated with the dredged materials. The high value revenue stream from the sale of the LWA enables HarborRock to offer sediment disposal/management costs typically less than the cost of traditional confined disposal or containment facilities.

HarborRock, in collaboration with FLSmidth, a global leader in the pyroprocessing, mining and minerals industries for more than 135 years, has developed the processes to use clean or contaminated material, with varying properties, as the sole raw ingredient to make a chemically inert ASTM certified expanded clay LWA, a product commonly used in the building industry.

Key steps in the process, which has been demonstrated and validated in dozens of bench and pilot scale tests using dredged material, and in hundreds of everyday applications, include:

i. Hydraulic dredging
ii. Screening to remove debris and large aggregates and sand,
iii. Grinding and drying the fine silt and clay materials followed by extrusion into pellets which are;
iv. Fired in a rotary kiln operating at over 2,000ºF to make the LWA which is;
v. Crushing and grading of the LWA to meet the customer's end-use size requirements.
vi. The air, water and solids emissions control technologies utilized are state of the art and are proven effective at meeting all applicable federal and state control limits.
vii. The screened aggregates and sand material are washed and marketed.



Lightweight Aggregate – LWA

LWA is man made in rotary kilns by expanding clay, shale or slate. Man-made LWA is a product that is in demand worldwide. It weighs about 40% of dense rock and used in applications such as masonry blocks, structural grade concrete, hot-mix asphalt and geotechnical. Its lighter weigh reduces building costs, and offers other advantages compared to dense stone.

Experience

HarborRock has performed numerous bench and pilot scale tests in the research & development facility of FLSmidth that made LWA using dredged sediments from at least 14 different rivers and harbors in the United States, Europe and Asia. In addition, HarborRock has had its LWA tested to verify it meets ASTM C330 and C331 and other applicable standards for LWA and all applicable environmental regulations.

In Maryland, after successful demonstration of its ability to make ASTM grade LWA solely from Baltimore Harbor dredged material, the Maryland Port Administration had its consultants independently validate all aspects of the HarborRock business plan as part of its due diligence effort. This work included evaluating the capital and operating cost estimates for a sediment reuse facility, the supply, demand and pricing of the regional Maryland LWA market and the quality and availability of the sediments in Baltimore Harbor. All firms concluded that HarborRock was very conservative with all its estimates and projections.

HarborRock test locations have included:

Exhibit D1

Baltimore, MD	Mobile, AL
Bartow, FL	New York & New Jersey Harbor
Bellingham Bay, WA	Norfolk, VA
Delaware River, PA/DE and NJ	San Francisco, CA
Houston, TX	Hamburg, Germany
Jacksonville, FL	Rotterdam, Netherlands
Milwaukee, WI	Shanghai, China

HarborRock Process and Sustainability

Although the approach and process details will be determined in more detail during the project design phase, the dredging may be performed using a hydraulic dredge so that the dredged slurry can be transported via pipeline to the processing site. This approach will be cost-effective, and it will help alleviate any local concerns related to increased traffic in the project vicinity. Conceptually, the dredged slurry will then be processed by screens (and hydrocyclones if necessary) that separate the dredge material into various sized fractions. The finer silt and clay materials will be dewatered, ground, and extruded into pellets. These pellets then will be transferred into a rotary kiln that operates at temperatures greater than 2,000 degrees Fahrenheit (°F). The result is a predictable inert aggregate material with strength, weight, and size properties tailored to meet local market needs.

Throughput capacity is limited only by the number of kilns deployed. For example, two kilns, each rated to process 1 million tons per annum of sediment, may be used to offset the estimated annual accumulation behind the dam. Additional kilns may be added to further reduce the amount of accumulated sediment.

HarborRock provides an environmentally friendly and sustainable dredged material management solution for the Conowingo Reservoir and a sediment and nutrient solution to the wider Chesapeake Bay ecosystem. HarborRock's state-of-the-art process can effectively destroy organic compounds, is designed to meet all existing air emissions standards, and will be routinely and accurately monitored. The end products are proven to be inert and pass all environmental tests. The facility will supply aggregate to construction markets by either truck, rail, or barge.

HarborRock is the only proven innovative and environmentally sustainable management solution to the dredged material management problems facing the Chesapeake Bay that provides measurable environmental and economic development benefits in a fully sustainable way.

HarborRock and its Consortium look forward to working in partnership with MES and other project stakeholders to bring to successful fruition a sustainable strategy for the management of sediment and nutrients over time for the Chesapeake Bay area through a beneficial reuse facility developed at the Conowingo Dam. This is a landmark project and one for which HarborRock is extremely keen to provide its patented solution, for the benefit of the commercial and recreational users of the Chesapeake Bay.

LWA Facility & Nutrient Reduction

HarborRock's reuse technology is proven. Every component is in use currently in industry and the entire process is also in use using materials comparable to dredged sediments. The HarborRock process has been demonstrated twice in Maryland alone in its ability to use sediments of varying properties to make a high-quality lightweight aggregate. The market for lightweight aggregate is well establish, no new market needs to be created. All components in the sediment are used including sand, cobbles, silts and clays, there is no waste. The high temperature process destroys contaminants thus breaking all liability claims. The facility will use only state of the art emissions control technologies that, according to MDE and HarborRock's engineers, meet all applicable regulations.

The HarborRock consortium of companies are fully prepared to begin work immediately to design, build, own, operate and guarantee the performance of the facility. Nominally 20 acres are needed for the reuse facility. Enormous tracts of land for containment of the sediment is unnecessary. The useful life of the facility is indefinite, meaning HarborRock is a sustainable solution.

The nutrient reductions achieved are verifiably in real time. All inputs and outputs to the reuse facility will be metered and evaluated for their chemical and physical properties. From this data, the fate and transport of all materials will be known. For example, the composition of the input sediments will be tested to know the amounts of nitrogen, phosphorous and other elements it contains and the subsequent composition of the air, water and all solids emissions or aggregates sold will also be tested and measured. This will result in knowing exactly the nutrient reductions achieved by the reuse process. Their engineers have reviewed extensive amounts of the data published on the sediment quality in the Conowingo Reservoir. They are using this data to make their proposal and guarantee the performance of the nutrient reductions. HarborRock is prepared to be paid for performance, i.e. based on the actual amount of sediments reuse or nutrients reduced.

Based on the nutrient composition data previously discussed, HarborRock has estimated the capital and operating costs for a reuse facility sized to remove enough sediment to meet the necessary nutrient reduction mentioned in the Conowingo Watershed Implementation Plan. HarborRock states that an all-inclusive reuse fee which includes dredging, reuse and sale of the final products will cost $41 million per year. This all-in cost is drastically lower than the $257 million which was suggested in previous reports. According to HarborRock, Hydraulic dredging,

when the Dredge is in place, costs about $1.5 to $2.0 per Cubic yard with a CY being nominally 25% solids. HarborRock is budgeting about $800,000 per year as the operating cost for dredging. This figure does not include the capital costs for the Dredge, docks etc. A big cost component of dredging is the mobilization and demobilization of the Dredge itself. This will be especially true at Conowingo, given the fact a Dredge can't be pulled or sailed into place and road access is tough. Therefore, HarborRock is envisioning having to assemble the Dredge alongside the Reservoir and floating it into service on the Reservoir. To the dredging industry, dredging the Conowingo Reservoir is not a big job as compared to dredging a port or major waterway, river or channel for maritime commerce

By their calculation, nitrogen is the limiting nutrient, meaning more phosphorous will be removed than needed to meet MDE's requirement. In fact, over 153 tons in excess will be removed. At the same rates being charged Exelon, **the value of these credits is over $83 million/ year – twice the cost of the HarborRock reuse fee!**

As a service provider to Exelon, the State of Maryland or both:

1. HarborRock will privately finance, build, own & operate a $100+ million facility that will dredge the Conowingo Reservoir and convert the sediment into an inert lightweight aggregate (LWA), and;
2. For less than the $41 million/year estimated for the Phase III Susquehanna River Basin WIP, LWA Reuse will:
    a) Achieve Maryland's previously mandated goals for Exelon at the Conowingo Dam;
    b) Achieve Maryland's Phase III Watershed Implementation Plan (WIP) for the Susquehanna River Basin, and;
    c) Create an additional 153 tons/year of phosphorous reductions available for sale, valued at $83 million/year;
    d) Provide metered data to verify & quantify reductions in nutrients and contaminants in real-time;
    e) Be "No-risk" to Maryland. The LWA Reuse fee will be indexed to the quantity of nutrients reduced. Maryland will only pay for what it actually gets;
    f) Convert clean or contaminated sediments of varying properties into inert marketable products;
    g) Create over 65 family-wage manufacturing jobs and over 200 in-direct jobs.

Climate Change & Future Uncertainties

Lower Susquehanna Riverkeeper and Waterkeepers Chesapeake advocated for studies to be done that addresses climate change. Unfortunately, the state of Maryland and other interested parties did not have access to any climate change related studies to be supplied by Exelon during the 401 certification process. The Chesapeake Bay Watershed experienced record rainfall in 2018 followed by high flow events in the spring of 2019. All around the country and the world we are

seeing higher temperatures and increased precipitation. The effects of climate change remain unclear for the proposed fifty-year license term. A large storm like Hurricane Agnes has a 40% chance of happening over the license term with that probability increasing with climate change, that we do know. A storm of that magnitude will scour out millions of tons of nutrient rich sediment that the dam has collected, and then deliver it downstream where it will smother submerged aquatic vegetation, fish habitat, oyster beds and inevitably create large "deadzones" in the Bay. This is the single largest threat to the Chesapeake Bay right now and Exelon is choosing to ignore the facts and claim their dam does not implicate water quality.

It may be another state's silt coming downstream but that dam has blocked it and its reservoir is now full. A river's function is to transport sediment, that's simple science. The continued blame on PA to reduce its pollution is valid, to a certain extent. PA has tremendous work to do in order to achieve its TMDL reduction goals. Connecting streams back to the floodplain through restoration, institution of better farming practices statewide, combined sewer overflow corrections, enforcement of state issued NPDES permits, replacing forests, minimizing impervious surfaces and other best management approaches are being implemented, but a lot more needs to be done. Sustained funding to implement necessary PA water quality improvements remains to be insufficient.

As the operator of a 94 ft tall hydroelectric dam there bears some responsibility on the owner to mitigate what is trapped behind it. The Federal Power Act states that the licensee must protect water quality. In this case, since the Dam's reservoir is full it must protect water quality given that another large storm event will cause harm to water quality in the Susquehanna River and Chesapeake Bay. It is the dam that has blocked the sediment and a "catastrophic pulse" will be the consequence. In another large storm event, if the dam were not standing, there would be over 20 miles for sediments to attenuate until they reached the Chesapeake Bay without the influx of scoured Conowingo sediment. We will certainly advocate that the owners of Holtwood and Safe Harbor Dams bear the same responsibility for their reservoirs too in 2030.

Although the LSRWA is flawed and this data is actually underrepresented, the study suggests that during a storm event, under 2011 bathymetry conditions, the sediment scour load (from the reservoir behind Conowingo Dam) during Tropical Storm Lee (a 20-year storm event) comprises about 20 percent of the Tropical Storm Lee total sediment load (about 3.0 million tons of the 14.5 million tons). (Lower Susquehanna River Watershed Assessment, MD & PA, 2015) Given that rate of scour on a 20-year return event, it's unfortunate the study didn't assess what would happen during a 50, 75, or 100-year event. Without accurate studies, no one truly knows what will happen to the Bay if that Agnes level storm comes through and how much sediment will get scoured from behind the dam at dynamic equilibrium.

Increase Settlement Funding for Sediment Disposal

Maryland Department for the Environment Secretary Ben Grumbles stated that, "With a cleanup plan specific to the Conowingo Dam, dredging that provides materials for beneficial reuse, and an environmental plan for the dam's relicensing that includes stringent environmental conditions, we can help launch a restoration economy and restore the Bay." (Dredging Today , 2019)

Gov.-elect Larry Hogan and critics of the current pollution-fighting strategies contend that removing massive amounts of sediment flowing down the river would help restore the Chesapeake more than controversial measures to levy stormwater fees, restrict septic-based development or limit farming practices. Hogan, a Republican, said during the campaign that he would seek to shift the burden of bay cleanup from Maryland's businesses, farmers and homeowners to Exelon Corp., Conowingo's owner, and to the states up the Susquehanna. He vowed to fight the Environmental Protection Agency's bay cleanup mandates imposed on Maryland and to press Pennsylvania and New York to do more. Hogan has said he opposes granting the company a long-term renewal of its license until it agrees to help remove the sediment. (Wheeler, 2014)

Exelon must be held accountable to contributing more than $500,000 in addressing sediment disposal, in part of their federal license. Over a fifty-year license term, a mere $500,000 is a drop in the bucket. That amount of funding does not adequately address sediment disposal in relation to the enormous artificial repository the dam has created which has altered the habitats and ecology of a public resource. We recommend that Exelon funds a proportion of the total cost for dredging per year. HarborRock is fully capable & prepared to begin project execution immediately and deliver a part of the solution. $500,000 is the amount HarborRock will spend in order to get enough data to permit their facility with MD, make LWA for testing, and establish the basic design of the entire facility.

HarborRock will spend $500,000 to:

1. remove nominally 50 Cubic Yards of sediment from Conowingo Reservoir,
2. ship it to their FLSmidth test facility,
3. perform chemical and physical testing on the raw sediment and all end products,
4. process it in a test kiln to get the performance data needed for design of the air pollution control and other emissions circuits,
5. perform ASTM testing on the LWA product for sales and marketing purposes.

The company is fortunate they do not need a lot of material to test their process. Other reuse technologies require a lot more material for testing and demonstration. Consequently, their competition’s costs are far greater.

We urge that FERC, MDE, Exelon and other agencies implement HarborRock’s plan of action given their company’s credibility and commitment to reducing nutrients in the Conowingo Reservoir. This option complements the restorative work currently being done in MD and PA. Our groups will continue to pursue water quality improvements and WIP implementation in Pennsylvania through direct restoration efforts, enforcement of the law, and legislative changes that will benefit water quality.