Attachment N

Conowingo Hydroelectric Project
(FERC Project No. 405)

Sediment Management Plan

CONOWINGO HYDROELECTRIC PROJECT
FERC PROJECT NUMBER 405

SEDIMENT MANAGEMENT PLAN

Prepared for:

Exelon.

Prepared by:

GOMEZ AND SULLIVAN ENGINEERS

August 2012
(Revised September 2021)

EXECUTIVE SUMMARY

To address sediment accumulation within the Project boundary, the Conowingo Hydroelectric Project (FERC Conowingo Project No. 405 or Project) draft Sediment Management Plan (2012 Plan) was developed in 2012 at the Federal Energy Regulatory Commission's (FERC or the Commission) request[1]. Historically, sediment accumulation has occurred at three of the Project recreation sites: Broad Creek, Conowingo Creek, and Peach Bottom Marina. High-sediment watershed loadings due to agricultural land use contribute heavily to sedimentation at the three recreation sites. Sediment accumulation at recreation facilities limits boat launch egress and ingress. Figure 1-1 shows the location of these sites relative to Conowingo Dam.

On March 19, 2021, FERC issued a new license for the Conowingo Project. In License Article 420 of the new license, FERC requires that Exelon Generation Company, LLC (Exelon) file a revised Sediment Management Plan (Plan) with the following revisions:

> a) A provision to conduct dredging with the frequency and depth needed to maintain the navigation channel at the Conowingo Creek, Peters Creek (Peach Bottom Marina), and Broad Creek boat ramps, where sediment has been accumulating, in order to improve and maintain recreational boating access. The provision should address how the dredged material will be disposed.
>
> b) A provision that beginning in 2022, the licensee must conduct a bathymetric survey of Conowingo Pond at 5-year intervals to monitor sediment transport and depositional patterns within the pond. The licensee must file the results of each bathymetric survey with the Commission by March 31 of the following year. The results of each bathymetric survey must include an analysis of any change in sediment deposition or scour in the pond from the previous survey(s), including the 2011 survey, so that any changes in sediment depositional or scour patterns in the pond over time since the 2011 survey can be monitored.
>
> c) Measures (e.g., metrics for magnitude or frequency of sediment loading following high flows and storm events) that would trigger action to maintain boating access between the 5-year monitoring intervals.

The Sediment Management Plan is also cross referenced in the Recreation Plan, which has been submitted for FERC approval.

As a result, Exelon has updated the 2012 Plan to incorporate the requirements of License Article 420 as well as to include information on the 2019 and 2020 Peach Bottom Marina Dredging project and findings of additional investigations and data collected since the draft version of the Plan was filed in 2012.

Monitoring

The revised Sediment Management Plan outlines specific monitoring measures that will be implemented to identify sediment transport and depositional patterns at the Project, and impaired boating use at recreation facilities. Bathymetric surveys of Conowingo Pond, including the boating recreation facilities, will be performed at five-year intervals. The results of each bathymetric survey will include an analysis of any change in sediment deposition or scour in Conowingo Pond from the previous survey(s) so that any changes

[1] In its Year Two Determination on Requests for Modifications to the Project Study Plan on May 21, 2012, the FERC required Exelon, to develop a Sediment Management Plan for inclusion in its Final License Application. On August 31, 2012 Exelon filed a draft of the Plan with FERC which was included as Appendix C in the FLA.

in sediment depositional or scour patterns in the Pond can be monitored. Exelon will monitor water depth at the three recreational boating facilities with bathymetric monitoring every five years and biannual water depth monitoring at the three recreation boating facilities.

A bathymetric survey of Conowingo Pond and the three recreation sites was most recently performed in August 2020 to prepare dredging feasibility assessments for these sites.

In addition, Exelon proposes to conduct post-construction bathymetric surveys at the recreation facilities after each dredging event for up to three years following construction upon approval from FERC. Post-construction monitoring surveys will be conducted twice a year, once between May 1st and Memorial Day (after spring runoff and before the recreational boating season) and between Labor Day and October 1st. These post-construction surveys will be used to determine sedimentation rates at the recreation sites and assess dredging benchmarks and frequency. Exelon will conduct post-construction bathymetric surveys in 2022 and 2023 at Peters Creek[2]. Given the land use similarities within the watersheds, observations from the post-construction bathymetric surveys at Peters Creek will be used to inform approaches to future dredging activities at Conowingo Creek.

Benchmarks and Evaluation of Actions

Per Article 406, the licensee must operate the Project with a normal range of operation for Conowingo Pond between elevations 101.2 NGVD29 and 110.2 NGVD29, with a minimum elevation of 107.2 feet NGVD 29 on weekends between Memorial Day and Labor Day, to meet recreational needs. Based on the monitoring described above, when water depth or bathymetric data indicate that navigation channel bed elevations exceed elevation 103.2 NGVD[3] at the recreation boating sites, Exelon will evaluate what actions to implement to alleviate impaired boating use at the recreational facilities. Potential actions include dredging of the problem areas as well as alternative recreation use at the sites, which may require less dredging or no dredging. In its evaluation, Exelon will consider several factors, including but not limited to recreation usage of the site and associated draft needs, dredging alternatives (e.g., maintenance dredging), estimated cost versus benefit, sediment disposal and beneficial/innovative reuse options, and environmental factors such as the presence of protected species and habitat (e.g., northern map turtle[4]).

Based on the benchmark of channel elevations exceeding elevation 103.2 ft NGVD, a bathymetric survey conducted in August 2020 indicates action needs to be taken at Broad Creek. The channel bed elevations generally varied from 104-105 NGVD at Broad Creek. Approximately 3,100 CY needs to be excavated from Broad Creek to maintain adequate draft in the channel for boating. Exelon proposes to dredge Broad Creek by 2027 pending receipt of all necessary local, state, and federal approvals. The overall implementation schedule for sediment management activities is provided in Table E-1.

[2] Exelon conducted post-construction bathymetric surveys at Peters Creek in March 2020 and August 2020.

[3] State Organization for Boating Access (SOBA) recommends the water at the toe of launching ramps and boat channels be a minimum of three feet deep for motorized boating (SOBA 2006). Conowingo Pond is maintained at elevation 107.2 feet NGVD during the recreation season (Memorial Day through Labor Day). Therefore, when the elevations within the channels at Peters Creek, Broad Creek, or Conowingo Creek exceed 104.2 feet, motorized boating could be impaired at the recreation pond level. Therefore, when channel elevations are at elevation 103.2 NGVD or above based on monitoring, Exelon will consider actions to alleviate potential impaired boating use, including dredging of the problem areas as well as alternative recreation use at the sites which may require less dredging or no dredging.

[4] Following approval of the Conowingo Hydroelectric Project Northern Map Turtle Protection Plan, Exelon will conduct ten years of northern map turtle population monitoring as stipulated in Article 424 of the new FERC license.

The bathymetric survey conducted in August 2020 indicates action may also be required at Conowingo Creek to restore adequate water depth for motorized boating. However, due to ongoing concerns with sedimentation influx of the recently dredged Peach Bottom Marina (in 2019/2020), Exelon is proposing to delay starting the Conowingo Creek restoration design and permitting process until post-construction bathymetric information can be obtained at Peach Bottom Marina. A report of findings and dredging recommendations or alternatives will be completed by August 31, 2024.

The implementation schedule shown in Table E-1 takes into account the various phases of a dredging project from pre-design data collection to site restoration/closeout. Additional site-specific data that could be needed includes additional sediment testing, dredging feasibility analyses, investigation of sediment disposal and beneficial/innovative options, additional data on sensitive resources such as northern map turtles and consultation with resource agencies on mitigative measures, recreation usage data, and post-construction monitoring at Peach Bottom Marina. Exelon will initiate consultation with the USACE, PADEP, and MDE with regards to maintenance dredging at the three recent sites based on the post construction bathymetric mapping and begin development of permit applications.

Table E-1 Implementation Schedule

Task	Begin	End	Frequency
Bathymetric Surveys of Conowingo Pond & Recreation Sites	2022	2070	Every 5 years
Bathymetric Survey Report[5]	2023	2071	Every 5 years
Water Depth Monitoring	2022	2070	May and Sept. every year
Peach Bottom Marina			
Initial Peach Bottom Marina Dredging	2015	2020	
Subsequent Peach Bottom Marina Dredging[6]	TBD	TBD	
Broad Creek			
Initial Broad Creek Dredging	2022	2027	
BC - Pre-Design Data Collection	2022	2022	
BC - Design	2022	2023	
BC – Permitting	2024	2026	
BC – Construction	2026	2027	
BC – Site Restoration/Permit Closeout	2027	2027	

[5] Report to be filed every five years by March 31 of the year following five-year bathymetric surveys.

[6] Exelon's determination of dredging frequency at this site will be based on post-construction bathymetric monitoring, a site-specific recreation use assessment at Peach Bottom Marina, and receipt of map turtle survey and other Rare, Threatened, Endangered species data. Exelon is initiating preparation and submittal of maintenance dredging permits and consultations for Peach Bottom Marina based upon the recent dredging of the marina.

Task	Begin	End	Frequency
Subsequent Broad Creek Dredging[7]	TBD	TBD	
Conowingo Creek			
Initial Conowingo Creek Dredging[8]	2024	2029	
CC – Pre-Design Data Collection	2024	2024	
CC - Design	2024	2025	
CC – Permitting	2026	2028	
CC – Construction	2028	2029	
CC – Site Restoration/Permit Closeout	2029	2029	
Subsequent Conowingo Creek Dredging[9]	TBD	TBD	
Post Construction Bathymetric Surveys			
Peach Bottom Marina[10]	2022	2023	May and Sept. for 2 years following construction
Broad Creek	2028	2030	May and Sept. for 3 years following construction
Conowingo Creek	2030	2032	May and Sept. for 3 years following construction

2019/2020 Peach Bottom Marina Dredging Project

Between August 2019 and June 2020, Exelon dredged approximately 9,500 cubic yards (CY) of sediment from Peters Creek at Peach Bottom Marina to restore boating access at the site. The dredging area included dredging on the Susquehanna River side of the Norfolk Southern Railroad train trestle to provide access from the marina to the Susquehanna River.[11] Construction involved both conventional hydraulic and mechanical dredging because of varying sediment grain sizes and difficult maneuverability near the boat launch caused by the narrow channel and water levels. In order to create a dewatering area, the steep marina parking lot was temporarily demolished and regraded. The temporary grading of the marina parking lot required the excavation and temporary relocation of approximately 12,000 cubic yards of earth. After dewatering was complete, the parking lot was regraded and repaved. The sediment was transported from

[7] Exelon's determination of dredging frequency at this site will be based on post-construction bathymetric monitoring, a site-specific recreation use assessment at Broad Creek, and receipt of map turtle survey and other Rare, Threatened, Endangered species data.

[8] Given the impact on dredging design, Exelon will start the dredging design process at Conowingo Creek after the post-construction bathymetric monitoring at Peach Bottom Marina.

[9] Exelon's determination of dredging frequency at this site will be based on post-construction bathymetric monitoring, a site-specific recreation use assessment at Conowingo Creek, and receipt of map turtle survey and other Rare, Threatened, Endangered species data.

[10] Post construction surveys at Peach Bottom Marina were conducted in March and August 2020.

[11] Dredging equipment had to be mobilized twice with cranes to dredge on both sides of the trestle.

the dewatering site to land that Exelon owned in Fulton Township, Pennsylvania. The overall cost of the project was approximately $5.5 M (~$579/CY). The time for design, permitting, procurement of a contractor, and construction was five years and included time of year restrictions for in-water work due to the Chesapeake Logperch and working outside of the recreation season (after Labor Day).

Sediment Loadings

A comparison of the post-construction survey of the Peach Bottom Marina dredging area performed in March 2020 with the August 2020 bathymetric survey indicates that the channel has filled in between 1-2 feet in certain locations within the dredged channel since the March 2020 post-construction survey. Most of the channel appears to be navigable.

The aggradation of the channel in a short duration is evidence of high watershed sediment loading in Peters Creek, which is primarily caused by agricultural land use (86% of the sediment loading is from cropland). Modification of land use practices is outside of Exelon's control and the corresponding sediment loading to Peach Bottom Marina will likely continue to be high in the future. The annual sediment loading for Conowingo Creek, whose land use is also characterized by a high percentage of agricultural land, is 2.5 times that of Peters Creek. The annual sediment loading for Broad Creek is 32% more than Peters Creek, but the watershed is four times larger. Based on estimated annual sediment loadings, frequent aggradation at the recreational boating sites is expected over the life of the license.

Sediment Sampling

Exelon has collected several sediment samples at each of the three recreation boating sites since the draft Plan was filed in 2012. Sediment samples at Broad Creek, Conowingo Creek, and Peters Creek were obtained in 2012. The grain-size at Broad Creek varied between 74% fines (silts/clays) in 2012 to approximately 41% fines in 2020, while the samples revealed the sediment composition at Conowingo Creek remained consistent at approximately 72% fines. The grain size at Peters Creek varied between 60% and 58% fines for the 2012 and 2015 data sets, respectively.

Analytical test results were compared to current clean fill management policies in Maryland and Pennsylvania as shown in Tables E-2 and E-3. The results indicate that dredged spoil disposal options may potentially be limited by analytical test results, which exceed Maryland and Pennsylvania state thresholds for exceedances of arsenic (MD/PA), thallium (MD), nickel (MD), and ammonia (PA) concentrations[12].

Table E-2: 2020 Sediment Sampling – Maryland Analyte Exceedances

		Analyte		
Screening Criteria		**Arsenic (mg/kg)**	**Thallium (mg/kg)**	**Nickel (mg/kg)**
EPA Screening Level I (Residential)[13]		0.68	0.078	82
EPA Screening Level II (Non-residential)[11]		3.0	1.2	1100
Sample Location	**Sample ID**			
Conowingo Creek	CC - 1	7.1	0.15	130
	CC - 2	7.1	0.12	100

[12] Analytical sampling results from 2015 for sediment at Peters Creek prior to dredging exceeded the Pennsylvania state threshold for cobalt.

[13] Screening levels in this Table are based on a Hazard Quotient of 0.1.

		Analyte		
Broad Creek	BC - 1	4.3	0.12	56
	BC -2	16	0.15	370

The EPA regional screening levels vary based on what is referred to as the hazard quotient (HQ), the ratio of exposure concentration to a reference concentration where there are observable health effects. The regional screening levels (RSLs) vary between either using an HQ of 0.1 or 1.0. For the purposes of the table above, an HQ of 0.1 was selected for the initial screening based on recommendations in the Maryland Innovative Reuse and Beneficial Use of Dredged Material Guidance Document (MDE 2019). Use of a HQ of 0.1 results in a lower screening value by a factor of 10 then a HQ of 1.0. For sediment samples with one or only a few analytes that exceed these conservative screening levels, the regulating agency for sediment disposal/reuse (MDE) may adjust the HQ screening levels to 1.0. This would increase the residential arsenic screening level to 6.8, thallium screening level to 0.78, and nickel screening level to 820. In this case CC-1, CC-2, and BC-2 would only exceed residential use screening levels for arsenic and none of the samples would exceed residential use screening levels for thallium or nickel.

Exelon will consult with MDE about whether background levels of arsenic, thallium, and nickel are similar to those from Conowingo Creek and Broad Creek and whether their disposal or re-use would be restricted to non-residential/industrial uses.

In addition, Exelon will explore the possibility of disposing sediment from Conowingo Creek and Broad Creek on its Fulton Hill property in Pennsylvania. Based on the analytical tests, one of the Conowingo Creek samples exceeded the clean fill standard for ammonia and one of the Broad Creek samples exceeded the clean fill standard for arsenic. Therefore, sediment from Conowingo Creek and Broad Creek could not be disposed of at the Fulton Hill site without further discussion with PADEP about whether it was possible if testing of background levels indicated similar levels of ammonia and arsenic.

Table E-3. 2020 Sediment Sampling – Pennsylvania Analyte Exceedances

		Analyte	
Screening Criteria		Ammonia (mg/kg)	Arsenic (mg/kg)
Clean Fill Limit		360	12
Sample Location	**Sample ID**		
Conowingo Creek	CC - 1	460.0	7.1
	CC - 2	130.0	7.1
Broad Creek	BC - 1	89.0	4.3
	BC -2	100.0	16.0

Dredging Technology Review

Since the August 2012 draft Sediment Management Plan was filed, Exelon has conducted literature reviews of conventional and innovative dredging technologies and reviewed their applicability to sediment management at the Conowingo recreation sites. Conventional hydraulic dredging, which was performed at Peach Bottom Marina, appears to be the most complicated and requires the most space for staging and dewatering of sediment and is not conducive to sites with a lot of debris or coarse gravel/sediment (upstream of Peach Bottom Marina boat launch). Utilizing conventional hydraulic dredging is likely the least suitable sediment removal method for these sites given the limited open/flat space adjacent to the coves.

The mechanical dredging approach used to dredge upstream of the boat launch at Peach Bottom Marina was less complicated than the initial hydraulic dredging approach. Mechanical dredges are capable of

removing coarse sediment and debris. There are more pieces of equipment in the water compared to hydraulic dredging and there is more material handling required, but the upland footprint of the work area required for dredging is minimal and there is much less water management involved. The mechanical dredging approach used at Peters Creek could likely be replicated at the Broad Creek and Conowingo Creek sites. However, similar to conventional hydraulic dredges, any conventional mechanical dredges at Peters Creek or Conowingo Creek in the future would potentially need to be mobilized twice, with cranes, if sediment removal was required on both sides of the Norfolk Southern Railroad train trestle at each cove.

Steep upland slopes, the presence of railroad trestles at two sites, and limited space for dewatering increase the difficulty of using traditional dredging and dewatering methods. These constraints also increase the level of effort needed for site analysis, design and permitting. In addition, the effects on the environment can be high due to the need for upland tree clearing and earthwork regrading (e.g., for leveling a dewatering pad). Collectively these impacts increase cost and prolong project schedule. As such, Exelon's strategies will incorporate alternative dredging technologies and innovative beneficial reuse of the dredged sediment as a means of reducing schedule duration, cost, environmental, and recreational impacts associated with the dredging projects. To this end, Exelon investigated innovative dredging technologies, such as the Dino6 dredge by Geoform International Inc. and Sand Wand and Sediment Collector technologies by Streamside Systems, Inc. Based on the size of the equipment and potential dewatering systems required, a Dino6 dredge may be a potential sediment removal method to consider for annual or maintenance dredging at the recreation sites. Exelon will continue to explore alternative dredging and material handling technologies as the engineering design and environmental permit requirements are prepared for each site.

Dredged Material Disposal Alternatives

Several end uses for dredged material were evaluated since the draft Plan was filed in August 2012, including landfill disposal, beneficial or innovative reuse, and disposal on Exelon property (i.e., at Fulton Hill where the Peach Bottom Marina dredged material was placed). Landfill disposal is expensive because of transport costs and tipping fees. A preliminary investigation of beneficial reuse included using excavated dredge material for wetland enhancement, shoreline stabilization or habitat improvement projects was conducted, and additional work will occur as part of the design and permitting work to determine if a suitable location is present in the Conowingo Project. Offsite and on-site innovative reuses were evaluated and some may have potential, such as sieving the material into different gradation sizes for Conowingo Project reuse. Coarse dredged material greater than ½" could potentially be used for aggregate in construction, such as road repair or other minor projects surrounding Conowingo Pond at the Project. The August 2020 analytical testing results indicate the fine dredged material could potentially be reused on-site at the Conowingo Project but it would require further consultation with MDE.

Off-site innovative uses include but are not limited to manufacturing structural fill, traffic barriers, bricks, permeable pavers, or soil for growing sod. Beneficial reuse alternatives will be explored more fully as the engineering design and environmental permit requirements are prepared for each site.

Environmental Considerations

An important consideration in the determination of whether dredging is suitable for the recreation boat sites is potential impacts to sensitive environmental resources, such as special status species and their habitats. Depending on the particular impact involved, such as northern map turtle in Broad Creek and Conowingo Creek, Project impacts may be mitigated by decreasing or avoiding dredging or by considering a change to the recreation opportunities at the site (e.g., changing use from motorized boating to canoes and kayaks) to

reduce impacts. Consultations with resource agencies such as MDNR and Towson University will occur as part of design and permitting of the dredging projects.

Another way to mitigate potential impacts to protected plant and animal species is to avoid specific activities during certain times of the year. However, following time-of-year restrictions for dredging activities for all of the potential identified sensitive species may preclude dredging at any time of the year. Therefore, alternative mitigation measures will need to be developed in coordination with the resource agencies in order to allow dredging. Of particular note are northern map turtle basking areas at Broad Creek and Conowingo Creek. The northern map turtle is listed as threatened in Maryland and a species of conservation concern in Pennsylvania. Any changes to the type of recreational boating or amenity at these sites in the future will be coordinated with the Recreation Plan under Article 426. Public outreach and consultation with Resource Agencies will occur with any changes submitted to FERC for approval.

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LIST OF ABBREVIATIONS

BMP	best management practice
BUILD	Beneficial Use: Identifying Locations for Dredge
CDF	confined disposal facility
Conowingo Project	Conowingo Hydroelectric Project
CY	cubic yards
DMMP	dredged material management program
EPA	Environmental Protection Agency
Exelon	Exelon Generation Company, LLC
FERC or the Commission	Federal Energy Regulatory Commission
FLA	Final License Application
GIS	geographic information system
GPM	gallons per minute
HQ	hazard quotient
kW	kilowatt
MDE	Maryland Department of the Environment
MDNR	Maryland Department of Natural Resources
MDOT MPA	Maryland Department of Transportation Maryland Port Authority
MDS	Mobile Dewatering System
mg/kg	milligram per kilogram
NGVD	National Geodetic Vertical Datum
NOAA	National Oceanographic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NWI	National Wetlands Inventory
PADEP	Pennsylvania Department of Environmental Protection
PCBs	polychlorinated biphenyls
PFBC	Pennsylvania Fish and Boat Commission
Plan or SMP	Sediment Management Plan
ROE	right of entry
RSLs	regional screening levels
RUSLE	Revised Universal Soil Loss Equation
SOBA	State Organization for Boating Access
TCLP-RCRA	Toxicity Characteristic Leaching Procedure – Resource Recovery and Conservation Act
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

1 INTRODUCTION

Exelon Generation Company, LLC (Exelon) operates the Conowingo Hydroelectric Conowingo Project (Project), located on the Susquehanna River in Maryland. The Project is operated under a Federal Energy Regulatory Commission License (Project No. 405), with the most recent license issued March 19, 2021. The Project boundary encompasses approximately 9,923 acres, including Conowingo Pond (Pond), the dam, the powerhouse, the tailrace, and the project's 15 recreation sites.

Historically, sediment accumulation has occurred at three of the Project recreation boating sites: Broad Creek, Conowingo Creek, and Peach Bottom Marina. Shallow water depths due to sediment accumulation limit boat launch egress and ingress. Figure 1-1 shows the location of the recreation boating sites relative to Conowingo Dam. Exelon is required to operate and maintain Project recreation facilities according to the revised Recreation Management Plan as specified in Article 426 of the new license.

In 2012, Exelon filed a draft Sediment Management Plan (2012 Plan) with the Conowingo Final License Application (FLA). The 2012 Plan was developed to determine methods for identifying and addressing sediment accumulation issues at the Conowingo Dam powerhouse intake structure in addition to the three Project recreation facilities listed above. Components of the 2012 Plan included an inspection program to monitor sediment accumulation at the powerhouse intakes and evidence of abrasion for the turbines; bathymetric surveys of Conowingo Pond every five years; site-specific dredging evaluations at the recreation facilities, and the development of benchmarks for action. Sediment management at the Conowingo powerhouse intakes described in the 2012 Plan is considered maintenance so the associated monitoring, inspection, and any remedial actions are incorporated in the Conowingo FERC Operation and Maintenance Program.

In the FERC License dated March 19, 2021, Article 420, entitled *Sediment Management Plan,* requires Exelon to update the 2012 Plan filed with the 2012 FLA within six months of license issuance. The revisions to the 2012 Plan specified in Article 420 include the following:

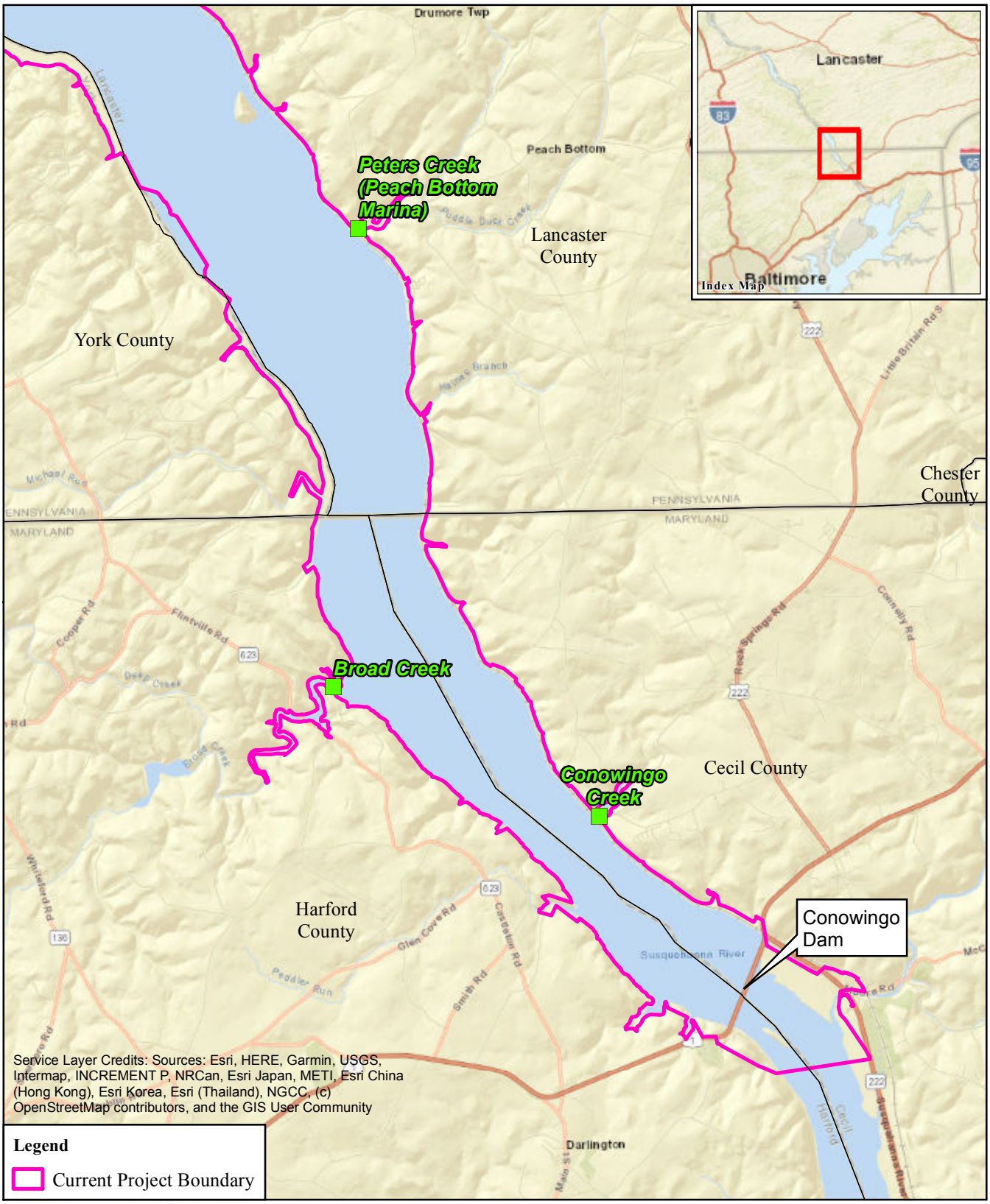
a) *A provision to conduct dredging with the frequency and depth needed to maintain the navigation channel at the Conowingo Creek, Peters Creek (Peach Bottom Marina), and Broad Creek boat ramps, where sediment has been accumulating, in order to improve and maintain recreational boating access. The provision should address how the dredged material will be disposed.*

b) *A provision that beginning in 2022, the licensee must conduct a bathymetric survey of Conowingo Pond at 5-year intervals to monitor sediment transport and depositional patterns within the pond. The licensee must file the results of each bathymetric survey with the Commission by March 31 of the following year. The results of each bathymetric survey must include an analysis of any change in sediment deposition or scour in the pond from the previous survey(s), including the 2011 survey, so that any changes in sediment depositional or scour patterns in the pond over time since the 2011 survey can be monitored.*

c) *Measures (e.g., metrics for magnitude or frequency of sediment loading following high flows and storm events) that would trigger action to maintain boating access between the 5-year monitoring intervals.*

The Sediment Management Plan (Plan) is also cross-referenced in the Recreation Management Plan.

The purpose of the Sediment Management Plan is to outline how Exelon intends to manage sedimentation at Exelon's boat launch facilities at Broad Creek, Conowingo Creek, and Peters Creek (i.e., Peach Bottom Marina).



EXELON GENERATION COMPANY, LLC

CONOWINGO HYDROELECTRIC PROJECT
PROJECT NO. 405

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Figure 1-1:
Location Map

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2 DREDGING CONSIDERATIONS

While developing the revised Plan, Exelon collected additional bathymetric and sediment data; calculated sediment loadings; and investigated sediment dredging methods and sediment disposal options, sensitive species and habitat considerations, and permitting requirements. Summaries of these efforts are summarized below.

2.1 Bathymetry

Conowingo Pond Bathymetric Data Collection

Bathymetric surveys of Conowingo Pond were conducted during the years 2011[14], 2013[15], 2014[16], 2015[17], 2016[18] and 2020. Occasionally, the lower portions of some tributaries and coves were entered, but the data collected in those locations was minimal given the large extent of the Conowingo Pond surveys. Figure 2.1-1 shows a map of the riverbed elevation within Conowingo Pond based on the 2020 survey.

Peters Creek Construction Surveys (August 2019 – March 2020)

In the fall of 2019 prior to dredging Peach Bottom Marina, a pre-construction bathymetric survey was conducted to check the predicted dredging volume. The survey/dredging area covered the Peters Creek channel starting approximately 300 ft upstream of the marina boat ramp and extended approximately 700 ft into the Susquehanna River beyond the train trestle. A post-construction survey of the dredging area was performed in March 2020.

August 2020 Survey

A bathymetric survey was conducted for Conowingo Pond, Broad Creek, Conowingo Creek, and Peters Creek (Peach Bottom Marina) during the week of August 10, 2020. Bathymetric data was collected using an Acoustic Doppler Current Profiler linked to a Real-Time Kinematic Global Positioning System unit. Figure 2.1-1 through Figure 2.1-4 show the results of the August 2020 bathymetric survey. Figure 2.1-2 shows bathymetric mapping for Broad Creek at two different scales- zoomed in at 1"=100' for details of observation and sediment sampling locations and zoomed out at 1"=250' to see the entire areal extent of bathymetric mapping.

[14] Gomez and Sullivan Engineers, P.C. 2012. Conowingo Pond Bathymetry Survey Analysis. Internal memo prepared for Exelon Generation Company, LLC. Henniker, NH: Author.

[15] Gomez and Sullivan Engineers, D.P.C. 2014. Conowingo Pond 2013 Bathymetry Survey Analysis. Internal memo prepared for Exelon Generation Company, LLC. Henniker, NH: Author.

[16] Gomez and Sullivan Engineers, D.P.C. 2015. Conowingo Pond 2014 Bathymetry Survey Analysis. Internal memo prepared for Exelon Generation Company, LLC. Henniker, NH: Author.

[17] Gomez and Sullivan Engineers, D.P.C. 2017. Lower Susquehanna River Integrated Sediment and Nutrient Monitoring Program, Lower Susquehanna River Reservoir System Bathymetric Data Collection, Internal Final Report prepared for Exelon Generation Company, LLC. Henniker, NH: Author.

[18] Lower Susquehanna River Integrated Sediment and Nutrient Monitoring Program, Lower Susquehanna River Reservoir System Bathymetric Data Collection, Internal Final Report prepared for Exelon Generation Company, LLC. Henniker, NH: Author.

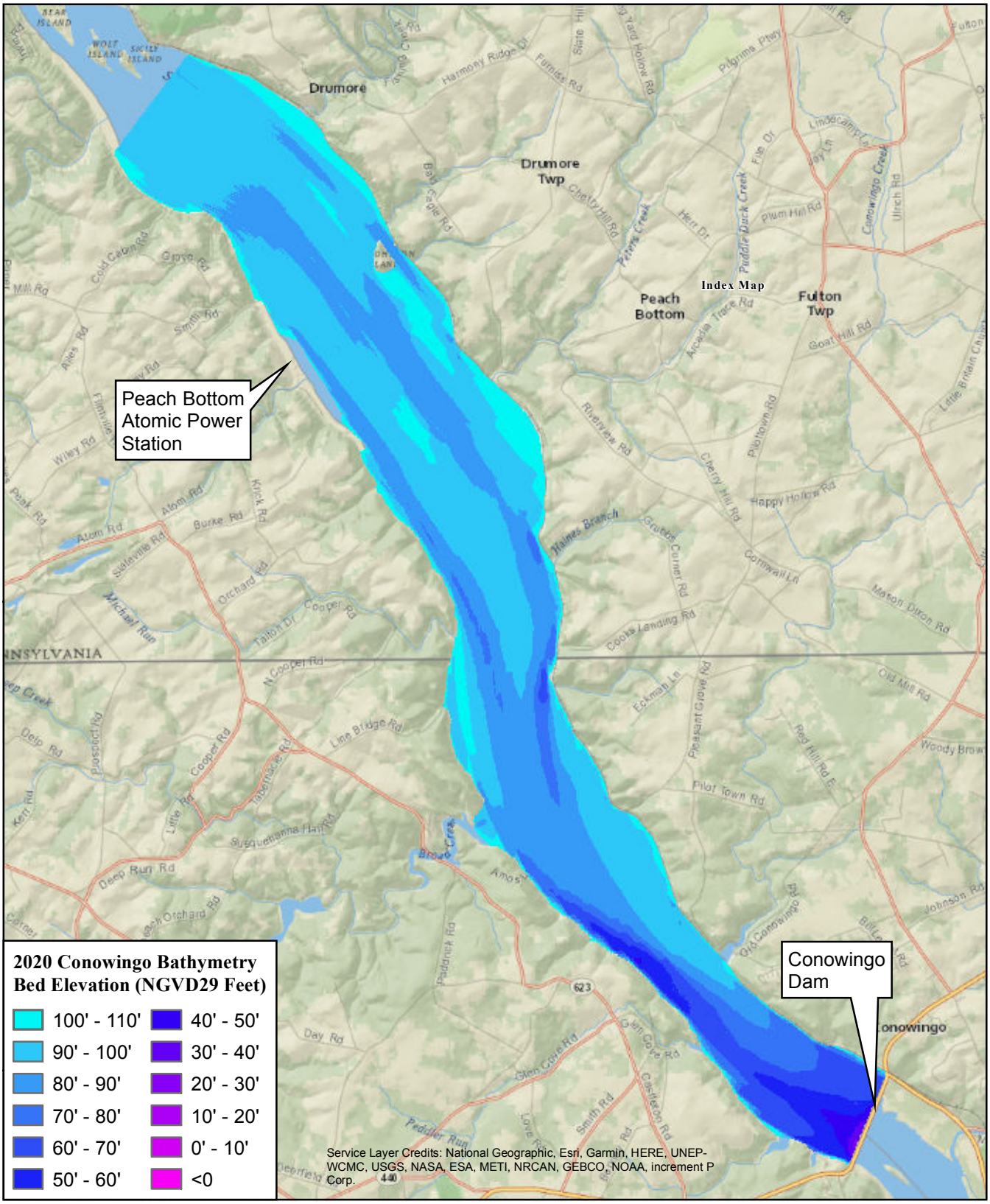

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Figure 2.1-1:
2020 Conowingo Pond Bed Elevation

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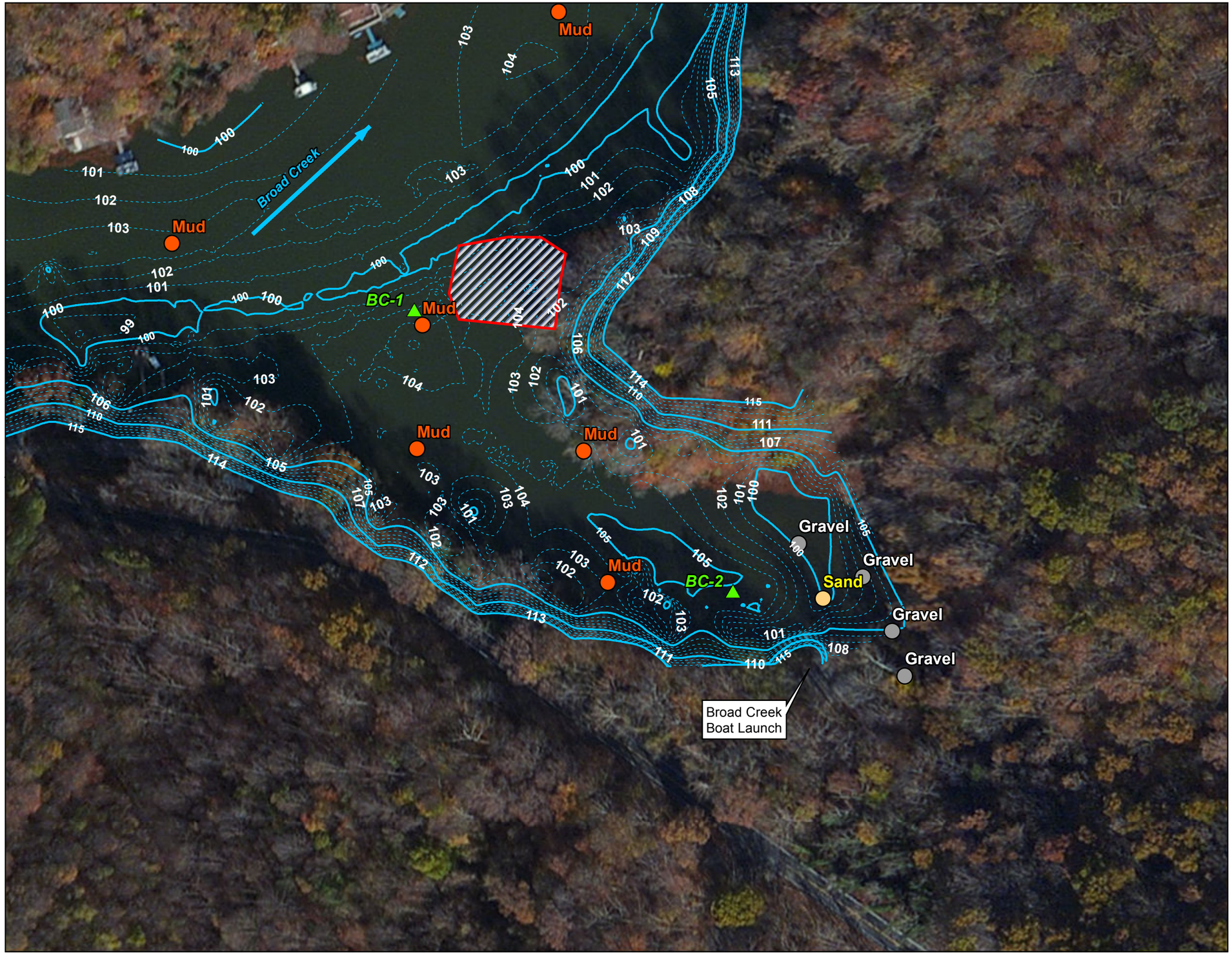

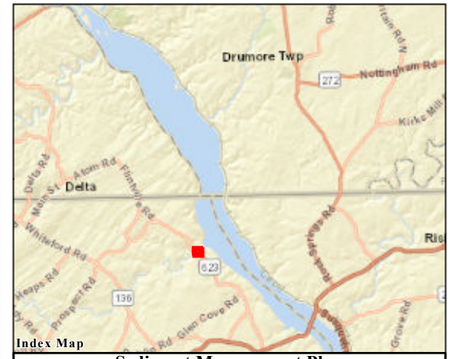

Sediment Management Plan

Figure 2.1-2:
2020 Broad Creek
Bathymetric and Sediment Survey
1 of 2

Legend

- Sampling Location
- 1 Foot Contour
- Major Contour (5 ft)
- Gravel Bar

Substrate

- Gravel
- Mud
- Sand

N

Vertical Datum: North American Vertical Datum of 1988 (NAVD 88)
Conversion: NAVD88 + 0.85 feet = NGVD29

Horizontal Datum: North American Datum of 1983 (NAD 83)
State Plane Maryland FIPS 1900 Feet Projection

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

1 inch = 100 feet

0 50 100 200 Feet

EXELON GENERATION COMPANY, LLC
CONOWINGO HYDROELECTRIC PROJECT
PROJECT NO. 405

Exelon

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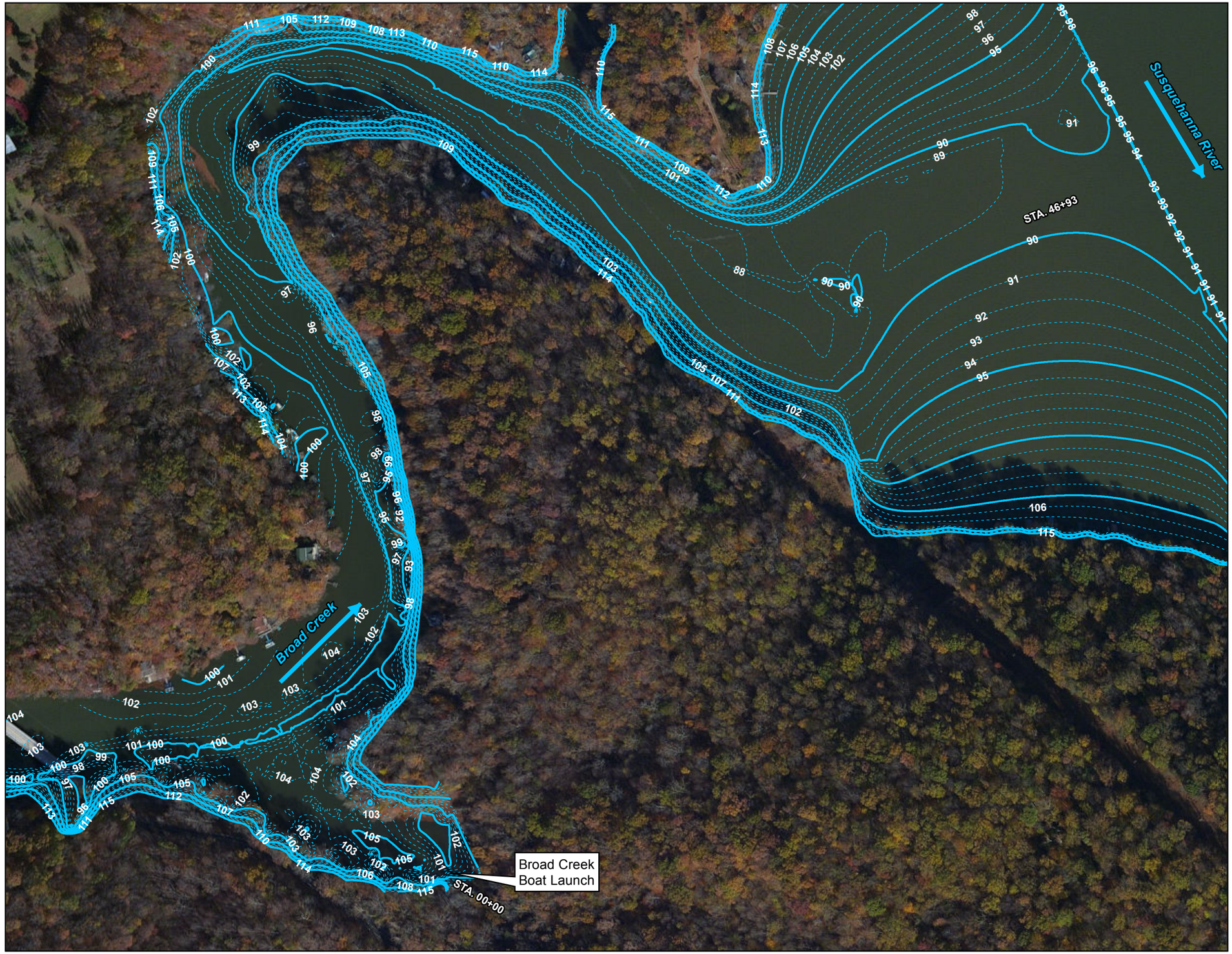

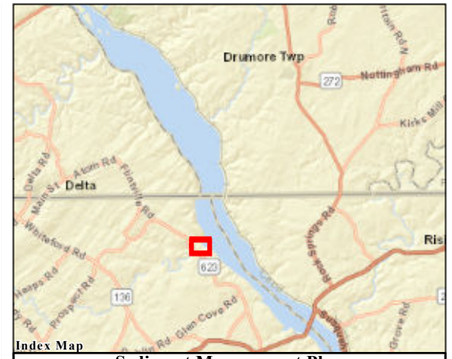

Sediment Management Plan

Figure 2.1-2:
2020 Broad Creek
Bathymetric Survey
2 of 2

Legend

- Major Contour (5 ft)
- 1 Foot Contour

N

Vertical Datum: North American Vertical Datum of 1988 (NAVD 88)
Conversion: NAVD88 + 0.85 feet = NGVD29

Horizontal Datum: North American Datum of 1983 (NAD 83)
State Plane Maryland FIPS 1900 Feet Projection

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

1 inch = 250 feet

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PROJECT NO. 405

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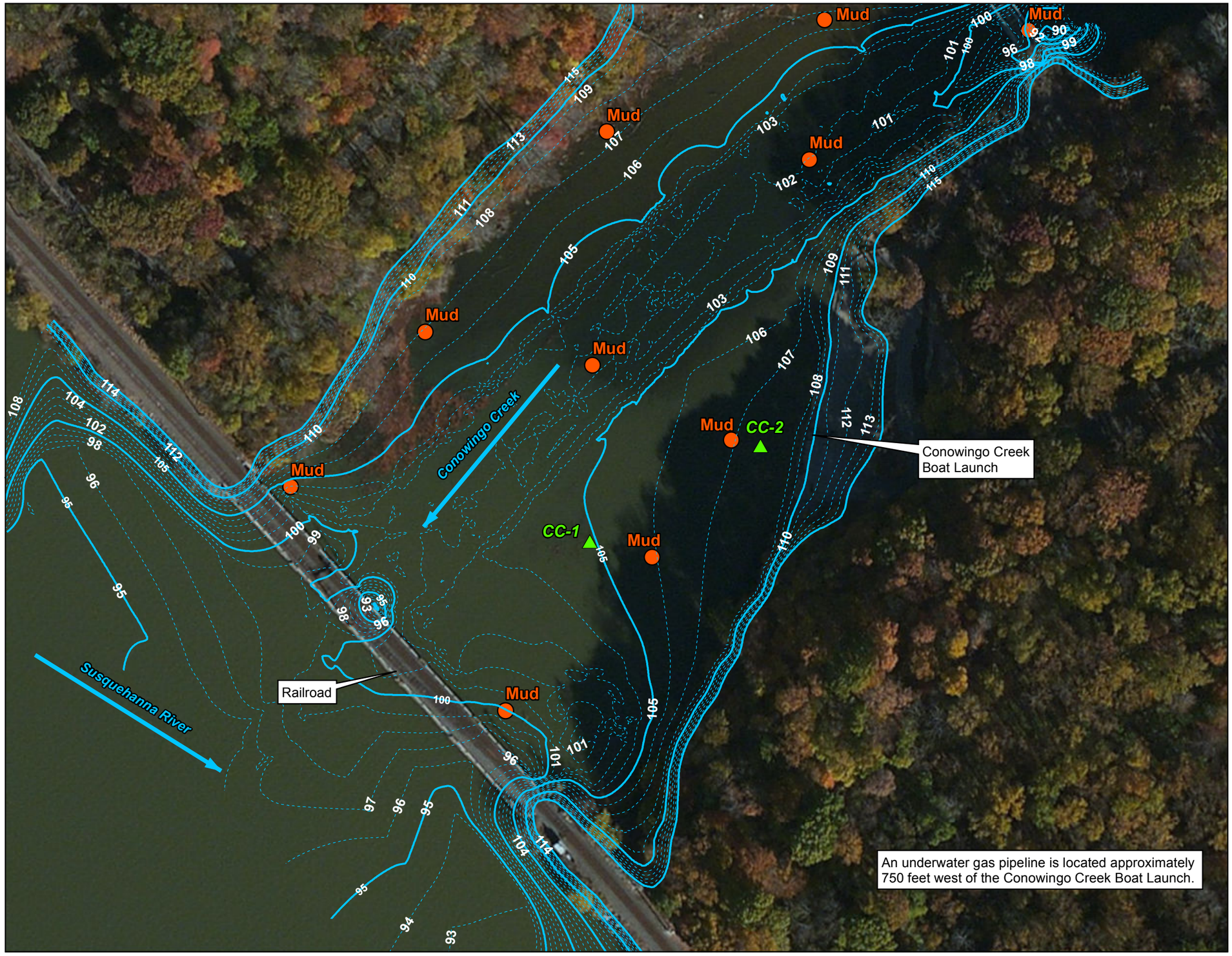

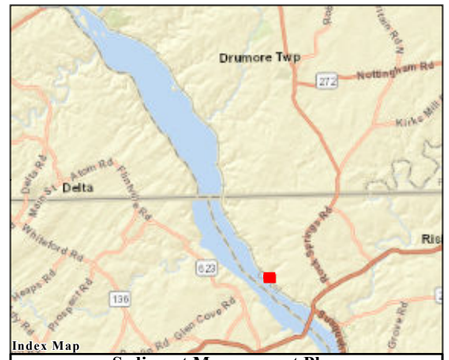

Sediment Management Plan

Figure 2.1-3:
2020 Conowingo Creek
Bathymetric and Sediment Survey

Legend

- Sampling Locations
- Major Contour (5 ft)
- 1 Foot Contour

Substrate

- Gravel
- Mud
- Sand

N

Vertical Datum: North American Vertical Datum of 1988 (NAVD 88)
Conversion: NAVD88 + 0.85 feet = NGVD29

Horizontal Datum: North American Datum of 1983 (NAD 83)
State Plane Maryland FIPS 1900 Feet Projection

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

1 inch = 100 feet

0 50 100 200 Feet

EXELON GENERATION COMPANY, LLC
CONOWINGO HYDROELECTRIC PROJECT
PROJECT NO. 405

Exelon

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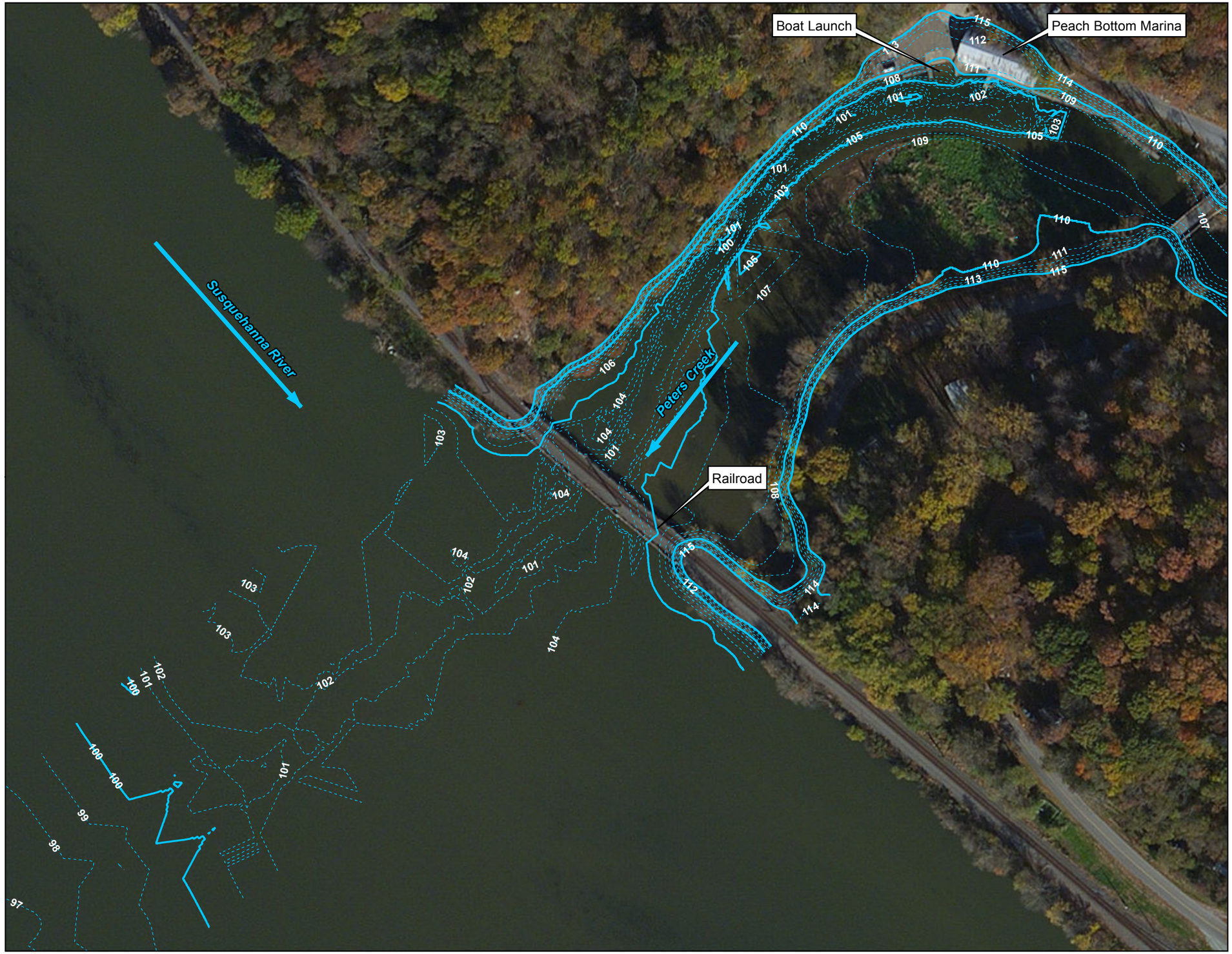

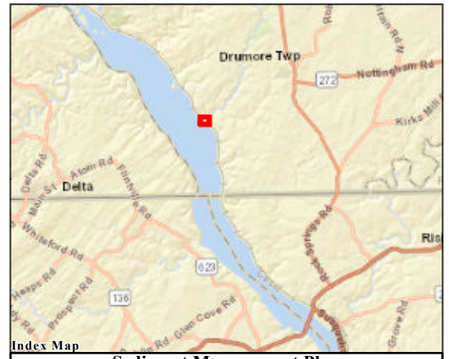

Sediment Management Plan

Figure 2.1-4:
2020 Peters Creek
Bathymetric and Sediment Survey

Legend

Major Contour (5 ft)

1 Foot Contour

N

Vertical Datum: North American Vertical Datum of 1988 (NAVD 88)
Conversion: NAVD88 + 0.85 feet = NGVD29

Horizontal Datum: North American Datum of 1983 (NAD 83)
State Plane Pennsylvania South FIPS 1900 Feet Projection

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

1 inch = 125 feet

0 62.5 125 250 Feet

EXELON GENERATION COMPANY, LLC
CONOWINGO HYDROELECTRIC PROJECT
PROJECT NO. 405

Exelon

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2.2 Sediment Sampling

Various sediment sampling efforts have been performed within Broad Creek, Conowingo Creek and Peters Creek since the draft Sediment Management Plan was submitted with the FLA in 2012. The sediment sampling efforts summarized below indicate that dredged spoil disposal options may potentially be limited by analytical test results which exceed Pennsylvania and Maryland state thresholds for exceedances of cobalt (PA), arsenic (MD and PA), thallium (MD), nickel (MD), and ammonia (PA) concentrations.

S.T. Hudson Engineers, Inc. 2013 Sediment Sampling Report

In December 2012, S.T. Hudson Engineers collected six core samples within Conowingo Creek, Peters Creek, and Broad Creek. Sediment sample analysis included particle size distribution (grain-size), and analytical testing for the following: semi-volatile organics, metals, polychlorinated biphenyls (PCBs), pesticides, dioxins, gross Alpha and Beta, Radium 226-228 Gamma Spec, and full toxicity characteristic leaching procedure – Resource Recovery and Conservation Act (TCLP-RCRA) testing. Broad Creek and Conowingo Creek are in Maryland, and Peters Creek is in Pennsylvania.

The only analyte identified that prevented the sediment at Broad Creek, Conowingo Creek, and Peters Creek from meeting Pennsylvania Department of Environmental Protection (PADEP) and Maryland Department of the Environment (MDE) clean fill criteria was elevated concentrations of cobalt. Cobalt concentrations at these three sites ranged from 17.1 – 30 mg/kg. The PADEP Clean Fill Policy (Document No. 258-2182-773) dated August 7, 2010, listed the residential limit for cobalt as 8.1 mg/kg and the non-residential limit for cobalt in Clean Fill as 22 mg/kg. On January 16, 2021, PADEP replaced the 2010 Clean Fill Policy with an updated version (Document No. 258-2182-773). In accordance with the 2021 policy, Table 4 from Appendix A of 25 Pa. Code, Chapter 250, indicates the clean fill concentration limit for cobalt was increased to 59 mg/kg (PADEP 2021). Therefore, cobalt levels demonstrated from the 2012 samples no longer exceed Pennsylvania clean fill limits.

In Maryland, the determination for clean fill is based upon United States Environmental Protection Agency (EPA) standards. Based on the May 2021 EPA standards, the cobalt levels at Broad Creek and Conowingo Creek exceed the standard for Category I/Resident Soils (2.3 mg/kg) and fall under the Category II/Industrial Soils standard (35 mg/kg)[19]. Category II soils may be used at all non-residential and non-recreational sites without restriction (MDE 2017)[20].

Grain-size analyses revealed the sediment was primarily brown-clayey silt at Broad Creek, consisting of 74% fines (passing #200 sieve), 25% sand, and 1% gravel. Sediment at Conowingo Creek was classified as brown silt with 72% fines, 26% sand, and 2% gravel. Sediment at Peters Creek was classified as brown silt and clay with an average of 60% fines, 30% sand, and 10% gravel.

Peach Bottom Marina Dredging Sediment Sampling (2015)

In 2015, sediment samples were collected for every 1,000 CY of sediment to be dredged during the Peach Bottom Marina dredging project. For every 1,000 CY of sediment within the proposed dredge area, four sediment cores were taken. A volatile organics analysis "grab sample" was collected from one of the cores

[19] The EPA regional screening levels vary based on what is referred to as the hazard quotient (HQ), the ratio of exposure concentration to a reference concentration where there are observable health effects. The RSLs vary between either using an HQ of 0.1 or 1.0. For the purposes of this evaluation an HQ of 0.1 was selected for the initial screening based on recommendations in the 2019 innovative reuse and beneficial use guidance from MDE.

[20] Additional guidance on the reuse of various dredged materials/soils can be found here: https://mde.state.md.us/programs/Marylander/Documents/Dredging/Facts_about_Fill-Ver_1320on021617.pdf

and the remaining sediment (from all four cores) was combined into a single "composite sample" for semi-volatile, herbicide, pesticide, PCB and metals analysis. Results were compared to chemical thresholds provided in the PADEP Clean Fill Policy, which revealed that cobalt was the only analyte that exceeded the residential limit (8.1 mg/kg). Cobalt levels from the sediment sampling were determined to be between 16.2 and 26.3 mg/kg. A subsequent background analysis of cobalt in the drainage basin upstream of Peters Creek and in upland soils in December 2016 determined that the cobalt levels were consistent with area background levels and PADEP allowed unrestricted placement of the dredge spoils at the designated dredge spoil disposal area. Geotechnical tests including grain size analyses were also performed in 2015.

The grain size analyses indicated that the sediment in Peters Creek was classified as primarily brown silt and brown silty sand with some gravel. The sediment had an average of 58% fines, 31% sand, and 11% gravel.

Broad Creek and Conowingo Creek Sediment Sampling (2020)

In September 2020, a total of four sediment samples from Broad Creek (BC-1 and BC-2) and Conowingo Creek (CC-1 and CC-2) were collected (two for each site) for grain size analysis and analytical testing.[21] The sediment sampling locations are shown on Figure 2.1-2 and Figure 2.1-3. Analytical testing methods were selected based on the Maryland Innovative Reuse and Beneficial Use of Dredged Material Guidance Document (MDE 2019) and guidance from the laboratory. The chemical groups evaluated included metals, volatile organic compounds, semi-volatile organic compounds, PCBs, dioxins and furans, herbicides, pesticides, and nutrients. The State of Maryland utilizes EPA regional screening levels (RSLs) as described in the 2019 Reuse and Beneficial Use of Dredged Material Guidance Document published by MDE. The sampling results indicated that the samples exceeded EPA category I standard for residential use for thallium (0.078 mg/kg) and nickel (82 mg/kg) and the EPA Category II standard for non-residential restricted use soil and fill for Arsenic (3 mg/kg). Thallium levels varied between 0.12 and 0.15 mg/kg, nickel levels varied between 100 and 370 mg/kg and arsenic levels varied between 4.3 and 16 mg/kg. A comparison of the 2020 sediment samples to Maryland state standards is provided in Table 2.2-1.

Table 2.2-1: 2020 Sediment Sampling – Maryland Analyte Exceedances

		Analyte		
Screening Criteria		**Arsenic (mg/kg)**	**Thallium (mg/kg)**	**Nickel (mg/kg)**
EPA Screening Level I (Residential)[22]		0.68	0.078	82
EPA Screening Level II (Non-residential)[21]		3.0	1.2	1100
Sample Location	**Sample ID**			
Conowingo Creek	CC - 1	7.1	0.15	130
	CC - 2	7.1	0.12	100
Broad Creek	BC - 1	4.3	0.12	56
	BC -2	16	0.15	370

The EPA regional screening levels vary based on what is referred to as the hazard quotient (HQ), the ratio of exposure concentration to a reference concentration where there are observable health effects. The RSLs vary between either using an HQ of 0.1 or 1.0. For the purposes of the table above, an HQ of 0.1 was

[21] Additional sampling will be conducted as part of the design and permitting of Broad Creek and Conowingo Creek and options for sediment disposal will be re-evaluated.
[22] Screening levels in this Table are based on a Hazard Quotient of 0.1.

selected for the initial screening based on recommendations from the Innovative Reuse and Beneficial Use of Dredged Material Guidance Document (MDE, 2019). Use of a HQ of 0.1 results in a lower screening value by a factor of 10 then a HQ of 1.0. For sediment samples with one or only a few analytes that exceed the more conservative screening levels based on a HQ of 0.1, the regulating agency for sediment disposal/reuse (MDE) may adjust the HQ screening levels to 1.0. This would increase the residential arsenic screening level to 6.8, thallium screening level to 0.78, and nickel screening level to 820. In this case, CC-1, CC-2, and BC-2 would only exceed residential use screening levels for arsenic and none of the samples would exceed residential use screening levels for thallium or nickel.

Exelon will consult with MDE about whether background levels of arsenic, thallium, and nickel are similar to those from Conowingo Creek and Broad Creek and whether their disposal or re-use would be restricted to non-residential/industrial uses.

In addition, Exelon will explore the possibility of disposing sediment from Conowingo Creek and Broad Creek on its Fulton Hill property in Pennsylvania. Based on the analytical tests, one of the Conowingo Creek samples exceeded the clean fill standard for ammonia and one of the Broad Creek samples exceeded the clean fill standard for arsenic as shown in Table 2.2-2.Therefore, sediment from Conowingo Creek and Broad Creek could not be disposed of at the Fulton Hill site without further testing of background levels of ammonia and arsenic and consultation with PADEP.

Table 2.2-2. 2020 Sediment Sampling – Pennsylvania Analyte Exceedances

		Analyte	
Screening Criteria		Ammonia (mg/kg)	Arsenic (mg/kg)
Clean Fill Limit		360	12
Sample Location	**Sample ID**		
Conowingo Creek	CC - 1	460.0	7.1
	CC - 2	130.0	7.1
Broad Creek	BC - 1	89.0	4.3
	BC -2	100.0	16.0

Grain size analyses indicated the sediment at Broad Creek consisted of 41% fines, 48% sand, and 11% gravel on average while sediment at Conowingo Creek consisted of 72% fines, 27% sand, and 1% gravel.

2.3 Sediment Loading

The annual sediment loading rate can be used as a planning tool to estimate the volume of sediment that settles at a site on an annual basis, which can inform how often potential dredging may need to occur and to inform potential sediment management decisions. Annual sediment loading rates were estimated at Broad Creek, Conowingo Creek, and Peters Creek using a variety of methods as described below.

2.3.1 Modeling

Annual sediment loading rates for Broad Creek, Conowingo Creek, and Peters Creek (Peach Bottom Marina) were estimated using the Model My Watershed program, provided by the Stroud Water Research Center, in order to quantify the amount of sedimentation at these sites. Model My Watershed is a geographic information system (GIS) based watershed modeling tool that uses hydrology, land cover, soils, topography, weather, pollutant discharges, and other critical environmental data to model sediment and nutrient transport within a watershed. The model simulates runoff and sediment and nutrient loadings for source areas within a watershed using the SCS Curve Number approach and the Revised Universal Soil Loss Equation (RUSLE) equation. RUSLE was developed by the United States Department of Agriculture for

agricultural and forested watersheds to predict long term average soil losses due to overland flow. Land use within the watersheds at the three sites is predominantly cultivated crops, deciduous forest, and pasture/hay so use of the RUSLE equation to estimate annual sediment loading is appropriate for these watersheds.

The modeling approach assumed that the source of sediment at these coves is primarily from the tributary watershed versus the mainstem Susquehanna River. This assumption is consistent with observations from the Lower Susquehanna River Integrated Sediment and Nutrient Monitoring Program[23] and coarser sediment observed in Peters Creek versus the Susquehanna River during the dredging of Peters Creek in 2019 and 2020.

The predicted sediment loadings from the Model My Watershed computer program were compared with data collected in the field for a larger Conowingo Pond tributary, Muddy Creek. Muddy Creek has a drainage area of 138 mi^2 in comparison to the drainage areas for the watersheds of the recreation sites which range in size from 10 mi^2 for Peters Creek to 40 mi^2 for Broad Creek.

USGS obtained suspended sediment samples at Station 01577500 Muddy Creek at Castle Fin, PA from 2012 to 2019. Samples were obtained roughly two to three times per month during this period. The Model My Watershed program discussed above was used to model sediment loading rates in Muddy Creek. The results from this model were compared to the field measured data obtained from the USGS. Table 2.3.1-1 shows the results of the Model My Watershed program are the same order of magnitude as the observed data from Muddy Creek.

Table 2.3.1-1: Sediment Loading Muddy Creek Observations vs Modeling Results

Modeling Program	Sediment Load Results (kg/year)	% Difference
USGS Gage Muddy Creek	44,587,370	
Model My Watershed	36,909,350	-17%

Results of the modeling analysis for Broad Creek, Conowingo Creek, and Peters Creek as well as watershed characteristics such as size and slope are included in Table 2.3.1-2. Results indicate that sediment loadings for existing conditions at the three sites are high and are influenced highly by land use. This is especially true for Conowingo Creek and Peters Creek which are heavily used for agricultural purposes. Converting annual loadings from kilograms to cubic yards required estimating the sediment density based on the specific gravity and percent solids measured for each sediment sample and assuming that the sediment is fully saturated.

[23] Gomez and Sullivan Engineers, D.P.C. 2017. Lower Susquehanna River Integrated Sediment and Nutrient Monitoring Program, Lower Susquehanna River Reservoir System Bathymetric Data Collection, Internal Final Report prepared for Exelon Generation Company, LLC. Henniker, NH: Author.

Table 2.3.1-2: Sediment Loading Modeling Results

Site	Drainage Area (mi^2)	Mean Basin Slope (%)	Sediment Loading Rate (kg/yr)	Loading Rate Per Square Mile ($kg/mi^2/yr$)	Percent Sediment Load from Croplands	Saturated Density (per cubic foot)	Volume of Sediment Deposited (CY/yr)[24]
Broad Creek	40	8.9	5,060,501	126,513	55%	138.0	2,993
Conowingo Creek	39	5.6	9,515,014	243,975	72%	138.8	5,596
Peters Creek	10	8.8	2,897,656	278,621	86%	157.9	2,253

As stated earlier, modeling of annual sediment loadings can be used as a planning tool to inform decisions, but it has limitations on exact quantitative predictions of sediment loadings for the three sites. First, modeling predicts average annual sediment loadings which may vary drastically from year-to-year sediment loadings. For instance, an unusually large rainfall event one year may generate a sediment load equivalent to the average annual loadings of many years. Second, models are based on data that can change over time. For example, the primary driver of watershed sediment loadings is land use practices which can change over time. It is expected that Best Management Practices (BMPs) required by watershed implementation plans to reduce sediment and nutrient loadings to the Chesapeake Bay[25] will also reduce soil losses for the watersheds that drain to the three recreation sites. Also, modeling at the recreation sites assumes that the source of sediment is limited to the tributary watershed and that there is no mixing with sediment carried by the Susquehanna River. In actuality, sediment transport at the three sites may be more complicated because the Susquehanna River backwaters into the coves at the three recreation sites. Lastly, the computations of sediment deposited each year are based on the average saturated sediment density values, which were calculated based on a small amount of data. The sediment density was based on just two samples at each creek which may or may not be representative of conditions throughout the navigable area in each creek.

To inform its decisions, Exelon will continue to monitor sediment model enhancements and updates as well as progress to reduce upland sediment loads with the implementation of BMPs.

[24] Values of sediment deposited at the three sites assume that all sediment delivered by the stream settles at the three sites. These values also assume that all of the sediment load at these sites comes from the respective watersheds, and not the Susquehanna River.

[25] On December 29, 2010, EPA established the Chesapeake Bay Total Maximum Daily Load (TMDL), a historic and comprehensive "pollution diet" for nitrogen, phosphorus, and sediment. In order to achieve reductions in nutrient and sediment loadings to the Bay, watershed implementation plans have been developed by the six states and District of Columbia that are part of the Chesapeake Bay watershed.

2.3.2 Peters Creek (Peach Bottom Marina) Sedimentation Rate

Approximately 9,500 CY of sediment was dredged from Peach Bottom Marina between 2019 and 2020. Bathymetric data of Peach Bottom Marina were collected prior to dredging in August 2019, after dredging had been completed in March 2020, and five months later in August 2020. The data from each of these bathymetric surveys were plotted at various locations in the creek to show the increase in deposited sediment that had occurred in the nine months after dredging of the marina was completed. The data were also used to estimate the approximate volume of accumulated sediment in the marina over the nine-month period. The cross-sectional area of sediment accumulation at each transect was calculated and the distance between each transect was used with the average end area method to estimate the volume of sediment that was deposited. The cross-sections showing the results of the pre-construction, post-construction, and the most recent survey (August 2020 – 5 months after dredging completion) are provided in Appendix A.

Most cross-sections show that the dredged volume has filled in by more than two feet in places within a nine-month period, with some cross-sections being about half full. The volume of deposited sediment since the dredging project was completed was estimated to be approximately 3,300 CY in nine months, which is equivalent to a sediment loading of approximately 4,358 CY/year. This is approximately two times higher than the volumetric accumulation calculated based on the Model My Watershed results (2,253 CY/year). It should be noted that the modeling results are based on 30 years of modeled data, while the bathymetry results are only from one year of data so the field conditions may not be comparable to the average annual sediment loading conditions.

2.3.3 Peters Creek TMDL Analysis (PADEP)

The Model My Watershed results were compared to the sediment loading rates for Peters Creek that were modeled by PADEP for the September 2020 Peters Creek Watershed TMDL (PADEP, 2020). PADEP also used Model My Watershed to establish existing loading conditions for Peters Creek. The PADEP TMDL report states that under existing conditions, the sediment loading rate for Peters Creek would be equivalent to approximately 1,264 CY/year[26]. This is approximately 78% lower than Exelon's Model My Watershed results and approximately 244% lower than the sedimentation rate determined from the results of the bathymetric analysis. The large discrepancy in Exelon's modeling results and PADEP's modeling results is most likely due to differing drainage area sizes used in each respective model. The drainage area used in the PADEP study (5.3 mi^2) appeared to exclude Puddle Duck Creek and other tributary drainage areas between the Peach Bottom Marina boat launch and the confluence of Peters Creek and Puddle Duck Creek in contrast to a drainage area size of 10 mi^2 used for this plan. Even so, the PADEP sediment loading rate for Peters Creek indicates that the Creek on average would need to be dredged every 7.5 years to maintain sufficient draft for boating if a similar channel was dredged as compared to the 2019 and 2020 project. However, this dredging project was very invasive and resulted in significant disruption to the existing parking lot and restoration. Exelon is reviewing conventional and innovative dredging and materials handling methods in order to limit the footprint of disturbance for future dredging activities. In the meantime, additional bathymetry is being proposed to review post construction channel depth in 2022 and 2023.

[26] Based on a saturated sediment density of 157.9 pounds per cubic foot for sediment in Peters Creek. The sediment density was calculated using sampling data collected in 2020.

2.4 Peters Creek (Peach Bottom Marina) Dredging

In August 2015, Exelon began the design and permitting process with the goal of dredging Peters Creek at Peach Bottom Marina to restore recreational boating access. In June 2017, state permits were obtained for the dredging project. Exelon began the procurement process in the first quarter of 2018, but the Peach Bottom Marina Dredging project start date was delayed due to the lack of responses on the bid process and the cost. In the first quarter of 2019, Exelon worked with permitting agencies to improve the design and issue amended permits in an effort to procure additional bids. By August 2019, a contractor was selected and construction began in August 2019 and finished in June 2020. Exelon dredged approximately 9,500 CY of sediment from the channel. The dredging area included dredging on the Susquehanna River side of the Norfolk Southern Railroad train trestle to restore boating access between the marina and the Susquehanna River, as well as within Peters Creek. Sediment downstream of the marina boat launch was removed using an 8-inch hydraulic dredge in 2019, while the more granular sediment and gravel upstream of the boat launch was removed with a mechanical dredge in 2020.

During the hydraulic dredging, a complicated dewatering system including booster pumps, pipes, de-sanding equipment and geotubes was staged temporarily at the parking lot across from the marina as shown in the pictures in Appendix B. The parking lot was demolished, and significant earthwork was required to accommodate the dewatering system for the hydraulic dredging. The parking lot area was ultimately restored to its original condition after all of the sediment had been relocated to a pasture owned by Exelon approximately one mile north of the marina along Slate Hill Road (Fulton Hill). Sediment removed through mechanical means was also transported to Fulton Hill. The stockpiled sediment at Fulton Hill was ultimately spread across the property and graded into the pasture.

By June 2020, the marina parking lot was regraded and restored. The temporary grading of the marina parking lot required the excavation and temporary relocation of approximately 12,000 cubic yards of earth in addition to the transportation of 9,500 CY of dredged sediment to the pasture disposal site. The overall cost of the project was approximately $5.5M (~$579/CY).

2.5 Dredging Technology Review

Since the 2012 draft Sediment Management Plan was filed, Exelon has reviewed alternative equipment and methods for dredging and managing sediment at the Project's boating recreation sites. The benefits and disadvantages for various methods are summarized based on a literature review and experience from past construction projects, including but not limited to the Peach Bottom Marina dredging project in 2019 and 2020.

2.5.1 Conventional Technology – Hydraulic Dredges

2.5.1.1 General Description

Hydraulic dredging was used to remove sediment downstream of the boat ramp at Peach Bottom Marina between October and December 2019. Many hydraulic dredges similar to the one at Peach Bottom shown in Appendix B, have cutterhead attachments, which cut channel-bed sediment and pump it through the intake pipe along with water forming a dredge slurry. The typical range for cutterhead sizes is 6 to 12-inches in diameter; the dredge at Peach Bottom had an 8-in cutterhead attachment.

As the cutterhead is moved along the channel bed, it takes in sediment and water in a slurry form. The intake pipe can be moved mechanically or by hand along the bottom of the channel depending on the contractor's equipment. These types of dredges are usually limited to dredging fines, some sands and small

gravel. For large volumes of coarse gravel or in areas where debris can collect, hydraulic dredging is not recommended.

Many hydraulic cutterhead dredges can only dredge a narrow swath in front of them. Any time a cutterhead dredge has to cut outside that limited space in front of it, the dredge needs to be re-positioned; therefore, in coves with irregular or non-linear boundaries (i.e., around docks or bulkheads), such as those at the Project recreation boating sites, it can be an inefficient means of dredging. Conventional hydraulic dredges also typically require at least 3-4 feet of draft to rotate due to the depth of the dredge pontoons. It is difficult to maintain enough draft in the coves when Conowingo Pond is at a lower pond elevation. The hydraulic dredge used at Peach Bottom Marina was approximately 43-ft long and had an operating width of 18.5-ft. Cranes were required to mobilize the dredge.

The intake pipe from the dredge conveys the slurry to shore and eventually to a Confined Disposal Facility (CDF), mechanical de-sanding equipment, belt filter presses, and/or geotubes for dewatering. Additional booster pumps along the pipeline may be required to prevent dredged material from getting stuck in the dredge line depending on the location of the dewatering site.

2.5.1.2 Dewatering

In many cases, 80% of the volume pumped through a hydraulic dredge intake (dredge) pipe is water and 20% is sediment. Dewatering methods for hydraulic dredging can vary and involve a wide variety of equipment and products. One alternative is the dredge line can discharge to a temporary (or permanent) CDF basin. CDF basins are either upland or in-water cells where dredge slurry is pumped. The dredged sediment is allowed to settle over time in the ponds before the supernatant is decanted/pumped out of the basin and returned to the original water body. To aid in enhancing the settling process, polymers can be injected into the pipelines or at the basins to help coagulate the fine dredged material.

Polymers may also be used in conjunction with geotubes to dewater finer material. Geotubes are large geotextile bags made with a fine mesh. The mesh is sized to retain fines and let water pass through it. However, there is a variety of substrate sizes at each of the Conowingo Pond coves not just fine material. Additional screening equipment in the dewatering system can be used in series with geotubes to remove larger aggregate that dewaters quickly from taking up space in the geotubes as was done for the recent dredging at Peach Bottom Marina.

Construction of dewatering facilities can require large areas of earth disturbance for the CDF and geotube laydown areas as well as the water collection.

Hydraulic dredging projects can also be prone to delays due to pumping difficulties and if a component anywhere along the dredge or supernatant return line breaks down, dredging production likely has to stop. For the Peach Bottom Marina dredging project, typical issues or delays during the hydraulic dredging, included debris/tires getting stuck on the dredge cutterhead, the booster pump going offline, replacing screens or parts on the de-sanding equipment, fixing the generator powering the polymer injector/de-sanding equipment, or fixing the supernatant collection and discharge system. Similar problems should be anticipated at the other Conowingo recreation boating sites.

2.5.1.3 Application to Conowingo Sediment Management

Peach Bottom Marina and the other two recreation boating sites are similar in that the coves are surrounded by steep topography and there is limited area readily available adjacent to the sites for contractor equipment staging and sediment dewatering. While the marina parking lot was temporarily used for dewatering at

Peters Creek, it was expensive to remove the existing pavement, perform enough grading to fit geotubes at the site, build a water collection system, and restore the site. In addition, neither Broad Creek, nor Conowingo Creek have substantial parking lots or similar areas to use on a temporary basis. At both of these sites, there are public roads nearby which limit the size of potential staging/laydown areas for construction.

2.5.2 Conventional Technology – Mechanical Dredges

2.5.2.1 General Description

Mechanical dredging requires mounting an excavator or excavator cab on a barge to excavate sediment from the channel bed and load it onto a barge or scow. The barges/scows transport the material to shore where it is offloaded with an excavator into a truck or directly into a dewatering area prior to offsite disposal/reuse.

Mechanical dredges are generally more maneuverable in small spaces and better adapted to water bodies with shallow and fluctuating water levels such as the three recreation boating sites.

Mechanical dredging requires more material handling during dredging operations, but the overall process is simplified compared to hydraulic dredging due to the lower volume of water being managed during construction.

2.5.2.2 Dewatering

During mechanical dredging operations, approximate ratios of 80% sediment to 20% water can be expected, which is the reverse of the ratio expected from hydraulic dredging. As a result, mechanical dredging requires less equipment and materials and consequentially less space for dewatering than hydraulic dredging.

Mechanically dredged sediment stockpiled at a temporary or permanent location can be either actively or passively dewatered. It may be possible to passively dewater sediment on a barge. For dredged material with a significant volume of fines, the contractor may need to mix in a dewatering additive such as lime kiln dust or an approved equal into the stockpile to dewater the material efficiently. If the material is primarily a mixture of sand and gravel, the material will likely dry out quickly without an additive.

Mechanical dredging typically involves fewer delays during construction than hydraulic dredging due to its more simplified approach. There were no delays or shutdowns during mechanical dredging portion of the Peach Bottom Marina dredging project.

2.5.2.3 Application to Conowingo Sediment Management

Mechanical dredging at Peach Bottom Marina was more efficient than hydraulic dredging. The equipment did require a crane to mobilize, and assembly of the dredge was required. In the future, if mechanical dredging is required on both sides of the Norfolk Southern Railroad trestles at Peach Bottom Marina and Conowingo Creek, the equipment would likely need to be mobilized twice as conventional mechanical dredges wouldn't be able to pass under the existing train trestles.

Mechanical dredges would be able to remove larger gravels as well as debris, if needed. However, mechanical dredging would be a concern for environmental reasons. Generally, mechanical dredging causes more turbidity than hydraulic dredging and staff at MDE have indicated that impacts from hydraulic dredging are considered temporary while those from mechanical dredging are considered permanent.

For an initial dredging of Broad Creek and Conowingo Creek, it is expected that mechanical dredging would be more efficient and cost-effective than conventional hydraulic dredging given the limited area

adjacent to the creeks for staging/dewatering and the additional capability to remove woody debris, if any is present.

2.5.3 Innovative Technology

Due to the small footprint of the recreation sites, it is anticipated that substantial grading and the removal of a number of trees may be required to apply conventional dredging, dewatering, and materials handling methods making dredging the recreation sites costly and time consuming due to the long periods required for design, permitting, and construction. Therefore, in addition to conventional dredging technologies, Exelon will continue to explore innovative dredging and material handling technologies as the engineering design and environmental permit requirements are evaluated for each site. Based on preliminary research, the Dino6 Dredge by Geoform International, Inc., and Sand Wand/Sediment Collectors by Streamside Systems, Inc. are examples of an innovative technology under consideration and is discussed below.

2.5.3.1 Innovative Technology - Dino6 Dredge by Geoform International, Inc.

The Dino6 is a small 21.5-ft long, 6.5-ft wide hydraulic dredge on pontoons, which can be mobilized with a pickup truck and launched similar to a motorboat (see Appendix B). The horizontal steel bar cutterhead, controlled with a hoist is lowered to the channel bed where it agitates the sediment, which is then sucked into a 6-in pipe with a submersible pump at a rate of up to 1,500 gallons per minute (GPM). The dredge can typically pump the dredged slurry to within 400 ft of the dredge, beyond that a booster pump may be required to transport the slurry to the dewatering area (Geoform International, Inc. 2020).

Various dewatering technologies are compatible with the Dino6 dredge based on correspondence with contractors, including metal roll-off containers with Mobile Dewatering System (MDS) geotubes from Tencate Geosynthetics (Tencate). The MDS units are made of geotextile fabric which trap fines but allow water to pass through them but each unit is only approximately 22-ft long with a storage capacity of approximately 25 CY each so they can fit inside a metal roll-off box. Because of the limited storage capacity in each bag, it is recommended by the manufacturer that several MDS units be set up at once. Once an MDS unit has been filled with sediment, the roll-off box with the MDS unit inside can be picked up with a truck and transported to a different location. The MDS unit with sediment inside can be dumped out of the roll-off box to complete the dewatering process while the roll-off container is transported back to the dredging site and a new MDS unit is installed inside it and dredging can continue.

Alternatively, Dino6 dredges have also been used in series with mechanical dewatering systems available through manufacturers/contractors such as Tri-Flo International, Inc. (Tri-Flo). Tri-Flo has a trailer with dewatering equipment including screens and hydrocyclones, which have been used at projects with Dino6 dredges in the past. The 8-ft wide x 30-ft long trailer is typically mobilized with a tractor trailer truck and requires a 100 – 200-kilowatt (kW) generator to operate. The hydraulic line from the dredge is connected directly to the trailer, where it is fed through a series of hydrocyclones which are used to sort and dewater the slurry. The sediment dewatered by the trailer is typically dry enough to pass paint filter drying tests without modification and is ready for transportation to its final destination. Prior to returning the water from the slurry to the water source, it is recommended that a clarifier(s) is installed in series with the trailer to capture any remaining fines which may remain.

Dino6 - Application to Conowingo Sediment Management

Based on the mobility and size of the Dino6 dredge, it may be worth considering for annual maintenance dredging of Broad Creek, Conowingo Creek, and Peters Creek. If a mechanical dewatering alternative would not be compatible due to the size of the equipment and space required, roll-off MDS units described

above may be a suitable alternative if the determined end-use for the removed sediment is disposal at an upland location. Once filled, the MDS units could be staged at an off-site location, such as Exelon's debris management site at Hopkins Cove or a site similar to Fulton Hill that Exelon owns.

2.5.3.2 Sand Wand / Sediment Collector by Streamside Systems, Inc.

Streamside Systems, Inc. (Streamside) offers innovative sediment removal solutions including their Sand Wand and Sediment Collector technologies. The Sand Wand is a manually operated device, which uses a water jet and suction to remove sediment from a stream bed. Once the sediment is removed it is discharged to a sediment basin/trap, geotextile filter bag or tank for offsite removal. This technology appears to be most suited for specific areas where selective removal of sediment is desired.

By contrast, Streamside also offers bedload sediment collectors, which are metal devices that stretch across stream channels which intercept and collect coarse-grained sediment as it passes over the device, while fine sediment is not collected and remains in suspension, migrating downstream. Similar to the Sand Wand, the sediment collected by the bedload sediment collectors is pumped to a sediment basin/trap, tank, or other dewatering device prior to offsite disposal. Exelon conducted a pilot in 2019 just upstream of the Peach Bottom Marina using a small sediment collector. A decision was made not to move forward with this technology at this location due to the sediment handling and truck traffic in the area utilized primarily for Exelon ground leases (cottage leases).

2.6 Dredged Material Disposal Alternatives

FERC License Article 420 states that the revised Plan should have a provision on how dredged material will be disposed. Several end uses for dredged material were evaluated since the draft Plan was filed in August 2012, including landfill disposal, beneficial or innovative reuse, and disposal at Fulton Hill where the Peach Bottom Marina dredged material was placed or other Exelon property. Options for sediment disposal particularly reuse are continually evolving and will continue to change over the life of the license. Because of this dynamic and the suitability of alternatives is site-specific, Exelon will determine the best sediment disposal alternative for each recreation boating site if it is dredged.

The benefits and disadvantages for different sediment disposal alternatives are summarized below.

2.6.1 Landfill Disposal

Modern Landfill in York, PA, and the Republic Materials Landfill in Conestoga, PA are approximately 40 miles from Peach Bottom Marina and even further from the two recreation boating sites in Maryland. The only landfill in Harford County, where Broad Creek is located, is the Harford County Waste Disposal Center, which only accepts residential waste. In Cecil County where Conowingo Creek is located, the primary solid waste disposal facility is the Central Landfill Facility just outside North East, MD, approximately 21 miles from Conowingo Creek and 27 miles from Broad Creek.

Normally the dredged material would be accepted as daily cover material at approximately $34/ton. A sales representative from Modern Landfill suggested that the cost of disposal would be at least $42/ton for clean regular landfill material. The Cecil County Department of Public Works Fee schedule suggests that the cost for contaminated soil disposal is $237/ton. These costs are just the tipping fees and do not include the transportation cost to the landfills, which could be substantial based on their distance from the recreation sites.

2.6.2 Beneficial and Innovative Reuse

Exelon has conducted a desktop review of alternative disposal options for dredged material based on the Innovative Reuse and Beneficial Use of Dredged Material Guidance Document published in 2019 by MDE and from previous dredging projects.

2.6.2.1 Beneficial Reuse

Beneficial reuse of dredged material, as defined by the 2019 guidance from MDE, includes the restoration of underwater grasses, restoration of islands, stabilization of eroding shorelines, the creation or restoration of wetlands, and the creation, restoration, or enhancement of fish or shellfish habitats.

As a part of their maintenance dredging program for the Port of Baltimore, Chesapeake Bay, and Delaware Canal, the Maryland Department of Transportation Maryland Port Authority (MDOT MPA) manages several dredged material management program (DMMP) sites. There are several active placement sites, which beneficially reuse dredged material for wetland or lost island restoration projects (MDOT MPA 2020). The two closest sites to the Conowingo Project are Pearce Creek and Masonville, which are both approximately 50 miles from Conowingo Dam. Currently, MDOT MPA sites are only accepting material from what are considered maintenance dredging projects. Additional discussions between MDOT MPA and Exelon would be required to confirm whether the cove dredging around Conowingo Pond could be considered "maintenance" (MDOT MPA 2019).

Additionally, the 2019 guidance from MDE recommends that if sediment is used for beach nourishment or marsh creation, it should not exceed 10% silts and clays. If the dredged material exceeds this threshold, the perimeter of the beach or marsh should be protected with breakwaters or similar structures to limit migration of the sediment (MDE 2019). Based on the current grain size analyses, sediment at each potential dredging site exceeds 40% fines and would require a breakwater or stabilized/hardened shoreline for any new beach nourishment or marsh creation project to prevent it from migrating. At this time, no potential marsh restoration projects have been identified within the Project Boundary.

To identify other beneficial reuse opportunities for dredged material, the State of Maryland along with other agencies developed the Beneficial Use: Identifying Locations for Dredging (BUILD) program described below.

BUILD Program

In October 2019, the Maryland Department of Natural Resources (MDNR), National Oceanographic and Atmospheric Administration (NOAA), and Chesapeake & Coastal Service developed the online BUILD tool. The purpose of the tool is to help with aligning potential dredging projects with potential restoration or other wetland/waterway projects which could use dredged material.

The online GIS mapping tool includes several data layers which include spatial, timeline/temporal, and qualitative (sediment characteristic) data. The data layers include but are not limited to:

- Upcoming dredging projects
- Dredging project buffers
- Potential restoration buffers
- Lost islands

- Dredged material placement sites
- Previous dredging projects
- MDE Wetlands/Waterways permits issued related to dredging/restoration projects.

The manual suggests that, to make beneficial reuse financially feasible, the distance between dredging and restoration projects should be less than four miles (Specht 2019). At this time, no potential restoration or reuse locations shown in the BUILD tool are within four miles of any of the recreation sites.

2.6.2.2 Innovative Reuse

Innovative reuse of dredged material includes the recycling of dredged material for the manufacturing of commercial, agricultural, industrial, or other products. Typical innovative uses include but are not limited to daily cover at landfills, fill materials for brownfield site reclamation, roadway sub-base/bed material, parking lot foundations, or embankments. Bench scale chemical and physical testing is required after the material is dredged to determine the engineering properties of the soil and whether an amendment is required.

2.6.2.3 On-site Innovative Reuse

One alternative for the innovative reuse of dredged material would be for Exelon to rent or purchase a portable aggregate/topsoil screener. Dried dredged material is dumped on top of the screen with a bobcat or excavator and the screen vibrates using a small diesel engine. The vibrating screen offers a wide variety of grid sizes which could be used to develop different gradations and the equipment can be relocated to another site with a pickup truck.

The vibration of the screens separates the gravel and coarse sand from fine material. Dredged material greater than ½" could potentially be used for aggregate in construction projects, such as road repair or other minor projects surrounding Conowingo Pond. Based on grain size analysis completed to date, such a device would be most effective at sorting out and obtaining gravel/stone for reuse from Broad Creek. This could substantially decrease the overall cost of dredging. The aggregate would likely need to be washed prior to use at another site. The August 2020 analytical testing results indicate the fine dredged material could potentially be reused on-site at the Conowingo Project, but it would require further consultation with MDE. In addition, Exelon will continue to look for other opportunities to reuse dredged sediment in wetland creation/restoration, shoreline stabilization, or habitat improvement projects.

2.6.2.4 Offsite Innovative Reuse

When soil additives are added to dredged material, it is referred to as "processed" dredged material. Typical additives include lime or fly ash, which can aid in dewatering the material and modify/stabilize dredged material. One company that accepts "processed" dredged material for recycling is CleanEarth. The company has a receiving facility in Hagerstown, MD (approximately 120 miles from Conowingo Dam). The company produces stabilized materials for pavement subbase or structural fill for construction from non-hazardous dredged material.

Additionally, in January 2021, Governor Larry Hogan and the Maryland Board of Public Works approved contracts to study other innovative uses for sediment dredged from Baltimore Harbor (AJOT 2021). The innovative reuses included:

- Structural fill and concrete applications (Harford Industrial Minerals Inc. of Joppa, MD)

- General use/production of retainer walls and low-compression strength blocks (Susquehanna Concrete Products of Magnolia, MD)
- Traffic barriers/shoreline protection structures (Northgate Environmental Management Inc. of Frederick, MD)
- Re-engineered soil for growing sod (FasTrak Express, Inc. of Rising Sun)
- Manufacturing ceramic brick and permeable pavers (Belden-Eco Products LLC).

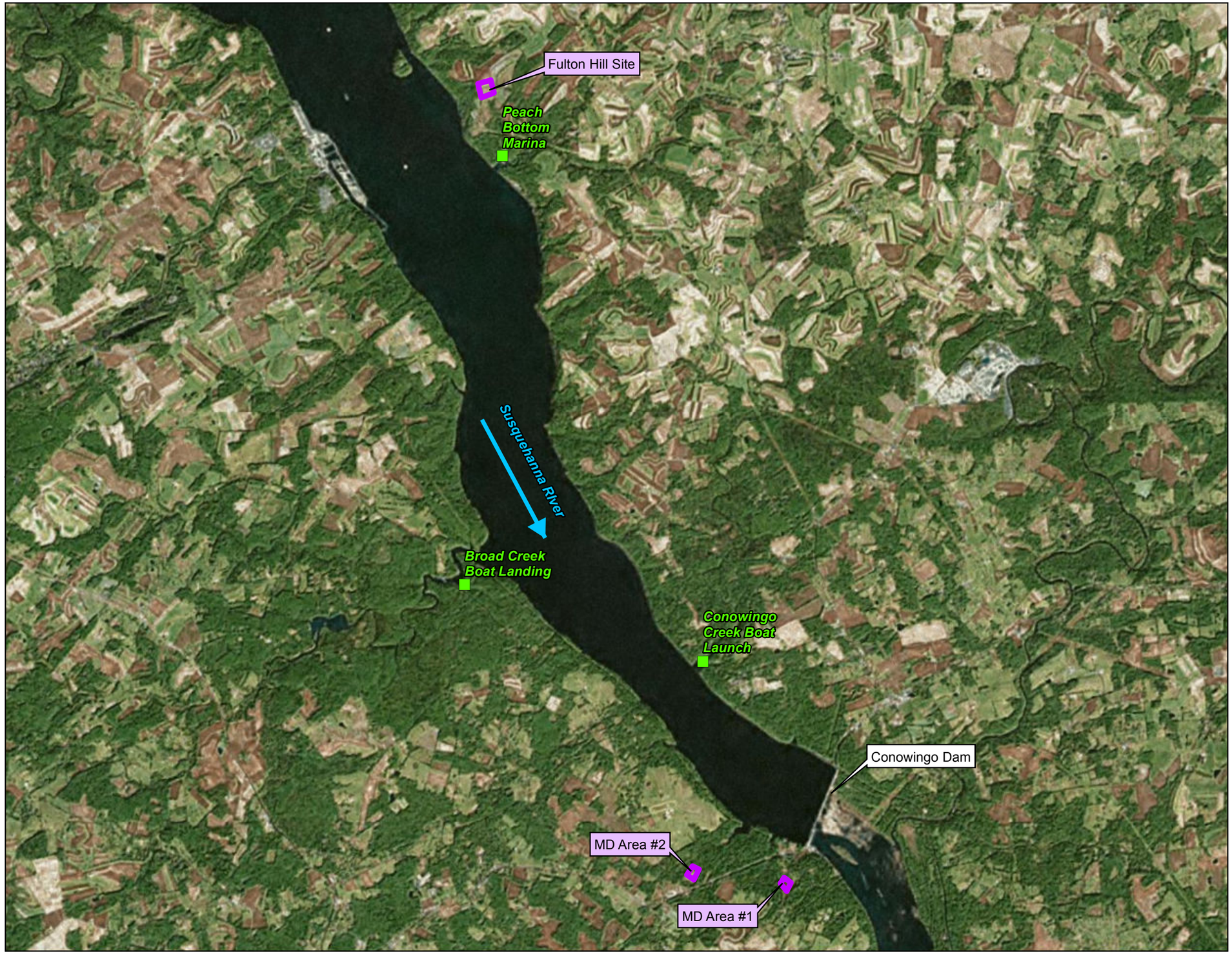
2.6.2.5 Fulton Hill or Other Exelon Property owned property

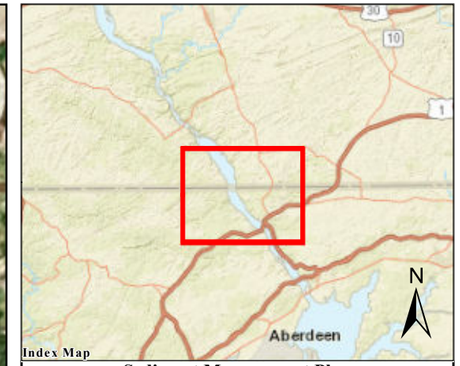
A third innovative reuse disposal alternative for consideration is spreading the material across the Fulton Hill site shown on Figures 2.6.2.5-1 and Figure 2.6.2.5-2 where sediment from the Peach Bottom Marina dredging project was spread. The site is leased by Exelon to a local farmer. Since two of the recreation sites are in Maryland, the soil samples would need to meet Maryland and Pennsylvania standards for material handling and disposal for this alternative to work. As mentioned in Section 2.2, the 2020 samples taken at Broad Creek and Conowingo Creek exceeded Pennsylvania clean fill concentration limit standards for ammonia and arsenic respectively. To determine the potential for placing the dredged material from Broad Creek and Conowingo at Fulton Hill, Exelon will need to consult with PADEP to see if the Fulton Hill site could be considered for disposal if background sediment sampling from the Fulton Hill site indicated similar "background" concentrations for ammonia and arsenic.[27]

While there would be no tipping fee to pay a landfill for disposal at the Fulton Hill site, there would be construction costs for the installation/maintenance of erosion controls, grading/spreading the material across the site, and re-seeding/restoring the site. The dredged material would be spread in an approximately 4-6" layer across the area used during the Peach Bottom dredging. Topsoil may also need to be imported to continue farming, depending on the fertility of imported dredged material and existing soil at Fulton Hill.

Two additional potential locations for stockpiling/spreading the dredged/sorted material in Maryland on Exelon owned property were identified using land ownership maps and aerial imagery and are shown on Figures 2.6.2.5-1 and Figure 2.6.2.5-3. One location is approximately half a mile south from the Conowingo Visitor Center along Shuresville Rd and the other is located on the north side of Route 1, approximately 1 mile from the Conowingo Visitor Center. These two locations are approximately five and six acres in area, respectively, and approximately seven miles from Broad Creek and five miles from Conowingo Creek.

[27] Sediment sampling was conducted in December 2016 for the recent Peach Bottom Marina dredging project to determine background concentrations of cobalt within the Peters Creek watershed.





Sediment Management Plan

Figure 2.6.2.5-1:
Potential Stockpiling Locations

Legend

- Marina Location
- Potential Stockpiling Site

Vertical Datum: North American Vertical Datum of 1988 (NAVD 88)Horizontal Datum: North American Datum of 1983 (NAD 83)State Plane Maryland FIPS 1900 Feet Projection

N

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User

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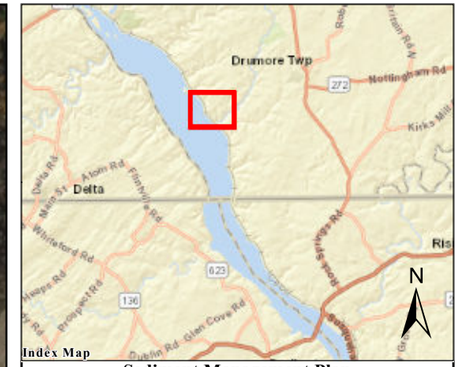

Sediment Management Plan

Figure 2.6.2.5-2:
Fulton Hill – Peach Bottom Marina Disposal Location

Legend

- Marina Location
- Potential Stockpiling Site

Vertical Datum: North American Vertical Datum of 1988 (NAVD 88)Horizontal Datum: North American Datum of 1983 (NAD 83)State Plane Maryland FIPS 1900 Feet Projection

N

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User

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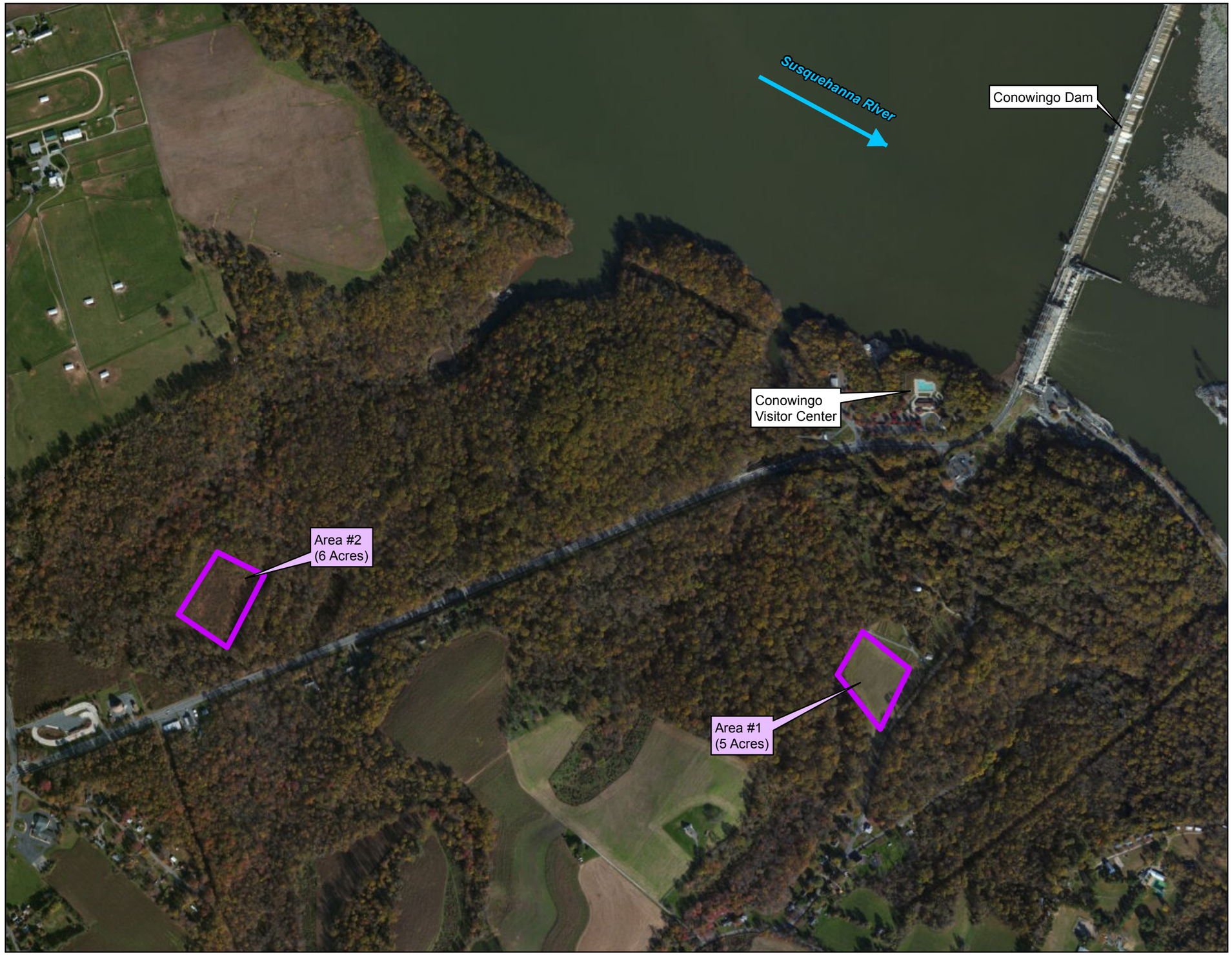

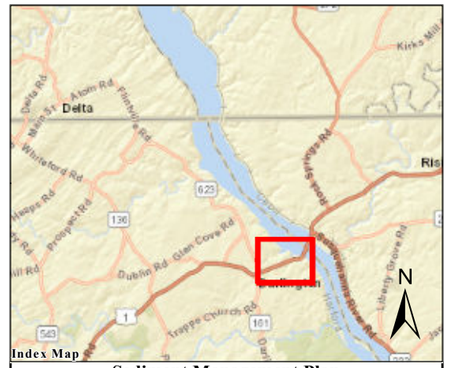

Sediment Management Plan

Figure 2.6.2.5-3:
Potential Stockpiling/Disposal Locations
Exelon Owned Property - Maryland

Legend

Potential Stockpiling Site

Vertical Datum: North American Vertical Datum of 1988 (NAVD 88)Horizontal Datum: North American Datum of 1983 (NAD 83)State Plane Maryland FIPS 1900 Feet Projection

N

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User

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2.7 Environmental Considerations and Permitting

Dredging at the three boating sites has the potential to impact sensitive resources, including protected species and lands. An important consideration in the determination of whether dredging is suitable for the recreation boating sites is potential impacts to sensitive environmental resources, such as special status species and their habitats. Depending on the particular impact involved, such as northern map turtle in Conowingo Creek, project impacts may be mitigated by decreasing or avoiding dredging or by considering a change to the recreation opportunities at the site (e.g., changing use from motorized boating to canoes and kayaks). Other environmental factors that will be considered in the evaluation of potential sediment management actions include beneficial reuse, such as using the excavated dredge material for wetland enhancement, shoreline stabilization or habitat improvement projects.

If dredging is the selected action for a boating site, permitting will be required so Section 2.7.3 is provided to outline the potential required permits and regulatory approvals that may be required at the federal, state, and local level. In addition, any future dredging activities will comply with the Conowingo Shoreline Management Plan (Article 428) to protect water quality.

2.7.1 Sensitive Environmental Resources

The following discusses the special status species that are most likely to be present at the recreation boating sites.

2.7.1.1 Northern Map Turtles

Of importance, is the presence of northern map turtles. The northern map turtle is listed as threatened in Maryland and a species of conservation concern in Pennsylvania. Capture, sighting, nesting, and basking data provided to Exelon by Towson University from a survey completed from April through November 2008 in the Susquehanna River within the State of Maryland show their presence at the recreation boating sites in Maryland. Since the movement of northern map turtles is not restricted by state boundaries, they could be present at Peters Creek too. As basking is essential for these turtles, consideration will be given to minimizing impacts to their basking habitat. Article 424 of the new FERC license requires Exelon to develop a Northern Map Turtle Protection Plan by March 2022, with a provision for population monitoring surveys, studies to determine the amount and location of needed basking habitat, as well as nest management and mitigation measures and monitoring of these measures' use and success. Implementation of the Northern Map Turtle Protection Plan will begin after FERC approval. Future dredging evaluations will consider the findings of these surveys in minimizing the impacts to these species and opportunities for enhancing their nesting and basking habitat. Consultations with resource agencies such as MDNR and Towson University will occur as part of design and permitting of the dredging projects.

2.7.1.2 Bog Turtle

Bog turtles live in herbaceous sedge meadow wetlands and need to be considered whenever potential bog turtle habitat is present. The Conowingo Creek and Peach Bottom Marina[28] are each in the vicinity of wetlands, according to the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI). The Project FERC License Article 423 requires a Bog Turtle Protection Plan to be filed with FERC by March 18, 2022. The Bog Turtle Protection Plan will include measures to protect bog turtles and their habitat throughout the Project boundary. Once finalized, all activities including dredging will need to

[28] A Phase 1 Survey was conducted prior to mechanical dredging Peters Creek on January 24, 2020. The survey determined that bog turtle habitat was not present in the project vicinity.

comply with this plan. In addition, if dredging is to occur at the recreation boating sites, it is likely that an assessment for bog turtle habitat (a Phase 1 Survey) will be required. Bog turtles are listed as a threatened species by the USFWS and the State of Maryland and considered endangered in the State of Pennsylvania.

2.7.1.3 Bald Eagle

Exelon maintains a database of Bald Eagle nests and roost locations in the vicinity of the Muddy Run Pumped Storage and Conowingo Hydroelectric Project boundaries. According to this database last updated by a 2018 survey, there are many Bald Eagle nests and roosts in the area surrounding Conowingo Reservoir, (The next survey is scheduled for 2023 and incidental nest sightings will be added to Exelon's database.) Activities at the recreation boating sites, including dredging, will need to follow Exelon's FERC-approved Bald Eagle Management Plan (License Article 421) that includes activity buffers near nests and roosts and time-of-year restrictions as well as adhering to the USFWS National Bald Eagle Management Guidelines (2007). Bald Eagles are protected under the Bald and Golden Eagle Protection Act enacted in 1940 (FWS 2018).

2.7.1.4 Indiana and Northern Long-eared Bat

Per Article 425, the following measures are required to protect Indiana and northern long-eared bat habitat and will be considered when evaluating an upland site for dewatering and/or handling of dredged materials:

> *…the licensee must avoid cutting trees equal to or greater than 3 inches in diameter at breast height on project lands from June 1 through July 31, unless a tree poses an immediate threat to human life or property. Tree removal is defined herein as cutting down, harvesting, destroying, trimming, or manipulating in any other way the trees, saplings, snags, or any other form of woody vegetation greater than 3 inches in diameter likely to be used by Indiana and northern long-eared bats.*

2.7.1.5 Chesapeake Logperch

The Chesapeake logperch is a small resident fish found only within the Susquehanna River watershed. For the Peach Bottom Marina Dredging project, the Pennsylvania Fish and Boat Commission (PFBC) requested no in-stream activity be conducted from March 15th to August 1st in order to avoid adverse impacts during the spawning season for this species. The PFBC also required that all work should be done during low-flow periods, and strict erosion and sedimentation control measures should be employed.

Since the movement of fish is not restricted by state boundaries, Chesapeake Logperch may be present in the vicinity of the Broad Creek and Conowingo Creek recreation boating sites that are in Maryland. If this species is identified during consultation with MDNR, similar time-of-year restrictions and conditions will likely be required to avoid adverse impacts during the spawning season. Chesapeake Logperch is under review as a species of concern at the Federal level and considered threatened in both Maryland and Pennsylvania.

2.7.1.6 Waterfowl Concentration and Staging Areas

Data downloaded from the Maryland GIS Data Catalog (MD iMAP, 2019) show the 458-acre Historic Waterfowl Concentration and Staging Area within the Conowingo Hydroelectric Project boundary, overlapping with the Broad Creek recreation site. Such areas are generally protected from disturbance during the winter months with a time-of-year restriction on projects of a certain scope. The new Conowingo License Article 422 includes a requirement for Exelon to prepare and enact a Waterfowl Nesting Protection Plan due to potential impacts of Project-related water level fluctuations on waterfowl nesting habitat. Any

activities that take place including at the recreation boating sites will need to align with the requirements in this plan.

2.7.1.7 Wetlands

For all of the recreation boating sites, a qualified environmental scientist will need to confirm if wetlands are present and if they will be impacted by project activities. Currently, MDNR GIS data available from the Maryland GIS Data Catalog shows that none of the Maryland project sites overlap with MDNR wetlands. NWI wetlands are present at the mouth of Conowingo Creek identified as PFO1Ah, which means that it is Palustrine, forested, broad-leaf deciduous, temporarily flooded, and impounded.

NWI data do not show a wetland at the Peach Bottom Marina; however, there is an emergent wetland in the vicinity of the marina, which Exelon delineated in 2015 and was avoided during the 2019 to 2020 dredging. The wetland is currently outside of the dredging limit but may expand with continued sediment deposition from Peters Creek. If additional dredging is considered for this site, a new wetland delineation will be required and potentially mitigation if dredging impacts the wetland.

2.7.2 Time-of-year Restrictions

Avoiding specific activities during certain times of the year can reduce potential project impacts on protected plant and animal species. Based on the current status of protected species known to be present in the area, the time-of-year restrictions for potential dredging activities are summarized in Table 2.7.2-1 below. Following these restrictions may allow Exelon to complete dredging activities without negatively impacting sensitive species; however, following all of them during dredging is impossible as they cover the complete calendar year. Alternative mitigation measures will need to be developed in coordination with the resource agencies in order to allow dredging.

Table 2.7.2-1. Dredging and Construction Time-of-year Restrictions to be Considered

Time-of-year	Restriction	Reason	Info Source	Projects
February 14-June 15	No dredging	Avoid impacting spawning anadromous and resident fish	MDNR request to MES for the Pilot Dredging Conowingo Project PFBC request to Exelon for the Peach Bottom Marina dredging project	Broad Creek Conowingo Creek Peach Bottom Marina
March 1-June 15	No dredging in areas where important finfish species have been documented to spawn	Avoid impacting spawning finfish	Federal Coastal Zone Management Act and Maryland Enforceable Coastal Policies	Broad Creek Conowingo Creek
April 1-May 31	No dredging	Avoid impacting Exelon's anadromous fish passage studies (2021)	Susquehanna River Anadromous Fish Restoration Cooperative request to MES for the Pilot Dredging Conowingo Project	Broad Creek Conowingo Creek Peach Bottom Marina
March 15-August 1	No dredging	Avoid potential impacts to protected fish species (i.e. Chesapeake logperch)	PFBC request to Exelon for the Peach Bottom Marina dredging project PFBC personal communication regarding Chesapeake logperch.	Peach Bottom Marina
April 15-October 15	No dredging within 500 yards of submerged aquatic vegetation	Avoiding damaging submerged aquatic vegetation during the growing season	Federal Coastal Zone Management Act and Maryland Enforceable Coastal Policies	Broad Creek Conowingo Creek
Late May-early September (Memorial Day-Labor Day)	Dredging should not take place during the recreation season, if possible.	Dredging may impact recreational uses.	Article 427	Broad Creek Conowingo Creek Peach Bottom Marina
June 1-July 31	No trees greater than 3 inches in diameter can be cut down.	Protect Indiana and northern long-eared bat habitat	Article 425	Broad Creek Conowingo Creek Peach Bottom Marina

Time-of-year	Restriction	Reason	Info Source	Projects
June 1-September 30	No dredging within 500 yards of shellfish areas (**mechanical and hydraulic dredging**)	Avoid damaging shellfish areas	Federal Coastal Zone Management Act and Maryland Enforceable Coastal Policies	Broad Creek Conowingo Creek
October 15-April 1	No dredging	Avoid disturbing hibernating northern map turtles	MDNR request to MES for the Pilot Dredging Conowingo Project	Broad Creek Conowingo Creek
September 1 – late fall[29]	No dredging	Avoid impacting studies of downstream passage of silver eels	Exelon coordination with USFWS for the USFWS' basin-wide study of downstream eel passage	Broad Creek Conowingo Creek Peach Bottom Marina
November 1-August 31[30]	No activities that may disturb nesting Bald Eagles within appropriate buffer zones	Avoid impacting nesting Bald Eagles	USFWS Bald Eagle Management Guidelines and Exelon Bald Eagle Management Plan	Broad Creek Conowingo Creek Peach Bottom Marina
December 16-March 14	No dredging within 500 yards of shellfish areas (**mechanical dredging**)	Avoid damaging shellfish areas	Federal Coastal Zone Management Act and Maryland Enforceable Coastal Policies	Broad Creek Conowingo Creek
Winter (specific timeline to be determined)	Unknown	Avoid impacting waterfowl	MDNR letter regarding the Pilot Dredging Conowingo Project	Broad Creek Conowingo Creek
Winter[31]	No activities that may disturb roosting Bald Eagles within appropriate buffer zones.	Avoid impacting roosting Bald Eagles	USFWS Bald Eagle Management Guidelines and Exelon Bald Eagle Management Plan	Broad Creek Conowingo Creek Peach Bottom Marina

[29] This restriction may only apply from 2021 through 2023 during years when the downstream eel passage study is taking place. The annual study end date is based on when Susquehanna River water temperatures fall below 3C, rather than a set date.

[30] This timeline is approximate. The presence or absence of birds engaged in breeding, nesting, rearing, or fledging activity at a nest will dictate if a buffer must be applied for protection.

[31] This timeline is approximate. The presence or absence of birds engaged in roosting activity at a nest will dictate if a buffer must be applied for protection.

2.7.3 Permits and Regulatory Approvals

Table 2.7.3-1 summarizes potential permits and regulatory approvals at the federal, state, and local levels that could be required for dredging at the recreation boating sites. Major permits or ones that have longer permitting process times are highlighted below. Any future dredging activities at the recreational boating sites will be coordinated with the Recreation Management Plan (Article 426) and the Shoreline Management Plan (Article 428).

2.7.3.1 U.S. Army Corps of Engineers Clean Water Act Section 404 and River and Harbors Act Section 10 Permits

The Susquehanna River is a navigable water of the United States and work in the river and its tributaries (Broad Creek, Conowingo Creek, and Peters Creek at Peach Bottom Marina) fall under the jurisdiction of the U.S. Army Corps of Engineers (USACE). Per Section 404 of the Clean Water Act, filling, grading, mechanized land clearing, ditching, other excavation activity, and piling installation in waters of the US require a Section 404 Permit from the USACE prior to the commencement of construction. Additionally, Section 10 of the Rivers and Harbors Act of 1899 requires that dredging conducted below the Ordinary High-Water elevation of navigable waters of the United States be permitted by the USACE.

The USACE can authorize dredging work a number of ways: individual permit, letter of permission, general permit, or nationwide permit. Maintenance dredging for boating sites in Maryland can be authorized by the USACE with either an individual permit, or a letter of permission[32]. To receive either of these authorizations, Exelon will need to submit a Joint Permit Application to USACE and MDE. Staff from the USACE Baltimore District have expressed willingness to authorize maintenance dredging with a letter of permission for the existing boating sites in Maryland up to a permit period of ten years.

Since dredging of Peach Bottom Marina was previously authorized for the 2019/2020 dredging project and is located in Pennsylvania where the USACE can issue permits using Nationwide Permits, the USACE could authorize maintenance dredging using a Nationwide Permit, individual permit or letter of permission. Nationwide Permit 35 (NWP 35) – Maintenance Dredging of Existing Basins seems appropriate. It covers:

> *The removal of accumulated sediment for maintenance of existing marina basins, access channels to marinas or boat slips, and boat slips to previously authorized depths or controlling depths for ingress/egress, whichever is less. All dredged material must be deposited and retained in an area that has no waters of the United States unless otherwise specifically approved by the district engineer under separate authorization. Proper sediment controls must be used for the disposal site (NWP Final Notice, 82 FR 4).*

If NWP 35 is used, authorized dredging will be limited to the dimensions of previously authorized dredging.

2.7.3.2 Maryland Permits and Regulatory Approvals

Broad Creek and Conowingo Creek are located in Maryland and will require permit and regulatory approvals from Maryland agencies and municipalities.

[32] Nationwide Permit 35 for maintenance dredging has been suspended in Maryland. The authorized activities under the Maryland State Programmatic General Permit-5 (MDSPGP-5) are not applicable to dredging projects at existing Maryland boating sites.

MDE Alteration of any Floodplain, Waterway, Tidal or Nontidal Wetland Permit

A Floodplain, Waterway, Tidal, or Nontidal Wetland permit is required in Maryland for any person who proposes to construct, reconstruct, repair, or alter a dam, reservoir, or waterway obstruction, or change in any manner the course, current, or cross section of a stream or body of water within the State.

MDE Water Appropriation or Use

This permit is required for any activity that withdraws water from the State's surface and/or underground waters, including temporary dewatering during construction (e.g., cofferdams) unless the duration of the dewatering including any intermittent periods of non-pumping is expected to last for less than thirty calendar days and the appropriation does not exceed an average of 10,000 gallons per day.

MDE NPDES Permit for Construction Activities

The National Pollutant Discharge Elimination System (NPDES) has issued a General Permit to the State of Maryland for stormwater from construction activities, which have a land disturbance of one acre or greater. Portions on dredging projects such as dewatering and staging areas, access roads, and upland sediment disposal may trigger the need for this permit.

2.7.3.3 Maryland Local Permits

Broad Creek located in Harford County will require several permits and approvals from Harford County. Likewise, Conowingo Creek located in Cecil County will require similar permits from Cecil County. These permits are triggered by ground disturbance or grading required for dewatering and staging areas, construction of access roads, sediment disposal or innovative reuse (e.g., streambank stabilization) as well as activities within the floodplain.

Erosion and Sediment Control Plan

A person may not clear or grade land without first obtaining an approved erosion and sediment control plan if the clearing or grading activities disturb more than 5,000 square feet of land area or more than 100 CY of earth.

Grading Permit

A grading permit is required prior to the start of any clearing or grading activity that may introduce sediment to any watercourse in the county or state, move more than 100 CY of earth, disturb more than 5,000 square feet of land, or create undue erosion and sediment damage to lands adjacent to the project site.

Floodplain Authorization/In-Water Conowingo Projects Permit

In Harford County, it is unlawful for any person to begin any development or construction (including filling, grading, or alteration of a watercourse) which is wholly within, partially within, or in contact with a flood hazard area until a permit is obtained from Harford County.

In Cecil County, the In-Water Projects Building Permit is required for installation of docks, piers, revetments, riprap, bulkheads or boat slips which is submitted to the Division of Permits and Inspections. Further consultation with Cecil County is required to determine the applicability of this permit for potential dredging in Conowingo Creek.

Zoning Certificate

Further consultation with both Harford and Cecil counties is required to determine the applicability of both the zoning certificate and potential building permits required for dredging and disposal/beneficial reuse. In general, building permits are only required for new construction of structures that will be occupied by a person for extended periods of time and therefore might be needed for a dredging construction project. However, a zoning certificate may be required to document any dredging activities by the Planning and Zoning departments.

Site Plan Approval

Site Plan Approval is required when applying for a zoning certificate to determine conformance with the county zoning codes and to document the location of existing and proposed improvements or uses. If it is determined that a zoning certificate is not needed for the dredging projects, submittal of a site plan approval waiver may be required. Site plans are submitted for review by the Planning and Zoning departments in Harford and Cecil County.

Stormwater Permit

For any proposed development or land disturbance exceeding 5,000 square feet of disturbance, a person shall prepare and submit a stormwater management plan. In Harford County, the stormwater management plan is submitted for review to the Department of Public Works and in Cecil County, it is submitted for review to the Division of Development Plans Review.

Forest Conservation Plan

A person who is applying for site plan approval, a grading permit, or a sediment management plan for a tract of land greater than 40,000 square feet must submit a forest conservation plan to the Planning and Zoning departments in Harford and Cecil County.

2.7.3.4 Pennsylvania Permits and Local Regulatory Approvals for Peach Bottom

The Peach Bottom Marina site is located in Lancaster County, Pennsylvania. Dredging at this site will require permit and regulatory approvals from the USACE, Pennsylvania agencies and Fulton Township. It is assumed that the same permits that were required for the 2019/2020 dredging would be required again. Table 2.7.3-1 summarizes permits and regulatory approvals that may be required.

Table 2.7.3-1 Potential Required Permits and Regulatory Approvals

Permit or Approval	Agency or Municipality	Broad Creek	Conowingo Creek	Peach Bottom Marina
Clean Water Act Section 404	USACE Baltimore District	X	X	X
River and Harbors Act Section 10	USACE Baltimore District	X	X	X
Water Withdrawal or Consumptive Use[33]	SRBC			
Alteration of Floodplain, Waterway, Tidal or Nontidal Wetland Permit	MDE	X	X	
Water Appropriation and Use	MDE	X	X	
Chapter 110 Permit for Water Withdrawal or Consumptive Use[28]	PADEP			
Chapter 105 Permit for Water Obstruction and Encroachment	PADEP			X
Chapter 102 Erosion and Sediment Control Plan	PADEP			X
Temporary Discharge Letter Approval	PADEP			X
Clean Water Act Section 401 Water Quality Certificate	MDE	X	X	
	PADEP			X
Coastal Zone Management Coastal Zone Consistency	MDE	X	X	
Endangered Species Act	USFWS Pennsylvania Field Office			X
	USFWS Chesapeake Bay Field Office	X	X	
Bald Eagle and Golden Eagle Protection Act	USFWS Pennsylvania Field Office			X
	USFWS Chesapeake Bay Field Office	X	X	
State Rare, Threatened, and Endangered Species	MDNR	X	X	
	PFBC			X

[33] While it is not anticipated that water withdrawals will be required for mechanically dredging the coves, contractor construction methods can vary.

Permit or Approval	Agency or Municipality	Broad Creek	Conowingo Creek	Peach Bottom Marina
	PGC			X
	PDCNR			X
Fisheries, DNR Lands, and Additional Natural Resources Review	MDNR	X	X	
	PDCNR			X
National Historic Preservation Act	MHT	X	X	
	PHMC			X
Permit to Install Floating Structures and Private Aids to Navigation	PFBC			X
Erosion and Sediment Control Plan County Review	Harford County Public Works	X		
	Cecil County Soil Conservation Dist.		X	
	Lancaster County Conservation Dist.			X
Grading Permit	Harford County Public Works	X		
	Cecil County Devl. Plans Review		X	
Floodplain Authorization	Harford County Planning and Zoning	X		
Building Permit – In-Water Projects (Floodplain)	Cecil County Permits and Inspections		X	
Zoning Certificate	Harford County Planning and Zoning	X		
	Cecil County Planning and Zoning		X	
	Fulton Township Zoning			X
Site Plan Approval	Harford County Planning and Zoning	X		

Permit or Approval	Agency or Municipality	Broad Creek	Conowingo Creek	Peach Bottom Marina
	Cecil County Planning and Zoning		X	
	Fulton Township Zoning			X
Stormwater Permit	Harford County Public Works	X		
	Cecil County Devl. Plans Review		X	
	Fulton Township Zoning			X
Forest Conservation Plan	Harford County Planning and Zoning	X		
	Cecil County Planning and Zoning		X	

3 MONITORING

3.1 Recreational Facilities

Sediment transport and deposition will be monitored in Conowingo Pond, at the Broad Creek, Conowingo Creek, and Peters Creek (Peach Bottom Marina) recreational facilities using bathymetric surveys and periodic water depth measurements.

3.1.1 Bathymetric Surveys

A bathymetric survey of Conowingo Pond and the three recreation sites was most recently performed in August 2020; however, Exelon proposes to conduct the 2022 bathymetric survey specified in License Article 420 in 2022 and continue the bathymetric surveys at 5-year intervals after that to monitor sediment transport and depositional patterns within the pond. The bathymetric surveys will include the Broad Creek, Conowingo Creek, and Peters Creek (Peach Bottom Marina) recreational facilities. The proposed extent of the bathymetric surveys is shown in Figure 3.1.1-1 through Figure 3.1.1-4.

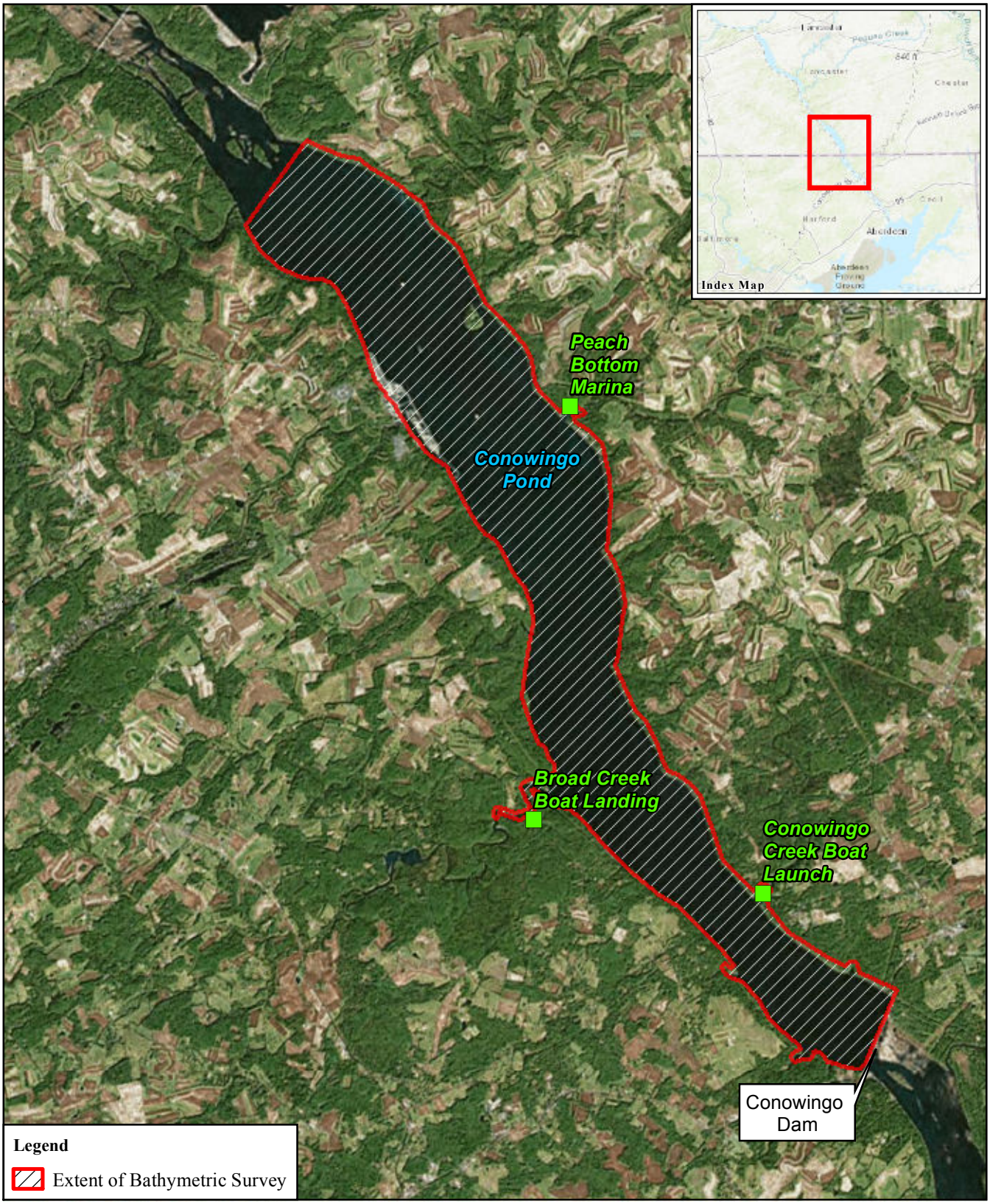
The results of each bathymetric survey will include an analysis of any change in sediment deposition or scour in Conowingo Pond from the most recent previous survey(s), so that any changes in sediment depositional or scour patterns in the Pond over time can be monitored and provided to FERC.

3.1.2 Post-Construction Bathymetric Surveys

Exelon proposes to conduct post-construction bathymetric surveys at the recreation facilities after each dredging event for up to three years following construction. Post-construction monitoring surveys will be conducted twice a year, once between May 1st and Memorial Day (after spring runoff and before the recreational boating season) and between Labor Day and October 1st. These post-construction surveys will be used to determine sedimentation rates at the recreation sites and assess dredging benchmarks and frequency.

3.1.3 Water Depth Monitoring

Water depths at the Broad Creek, Conowingo Creek, and Peters Creek (Peach Bottom Marina) recreational facilities will be monitored twice every year – between May 1st and Memorial Day (after spring runoff and before the recreational boating season) and between Labor Day and October 1st, unless there are reports of significant aggradation caused by a storm. In these cases, Exelon will determine whether additional water depth measurements are warranted and proceed accordingly. In such cases, Exelon will evaluate whether water depth measurements should be done sooner. Water depths will be measured at two critical points in each cove (Figure 3.1.1-2 through Figure 3.1.1-4), one near the boat launch and one further downstream in each creek. Monitoring points may be subject to relocation based on field observations or sedimentation patterns observed from future monitoring efforts.



EXELON GENERATION COMPANY, LLC

CONOWINGO HYDROELECTRIC PROJECT
PROJECT NO. 405

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Miles

Figure 3.1.1-1:
Conowingo Pond
Sediment Management Plan
Extent of Bathymetric Survey

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Sediment Management Plan

Figure 3.1.1-2:
Broad Creek
Sediment Mangent Plan
Monitoring Locations

Legend

- Water Depth Monitoring Locations
- Boat Launch/Landing
- Extent of Bathymetric Survey

N

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User

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PROJECT NO. 405

Exelon

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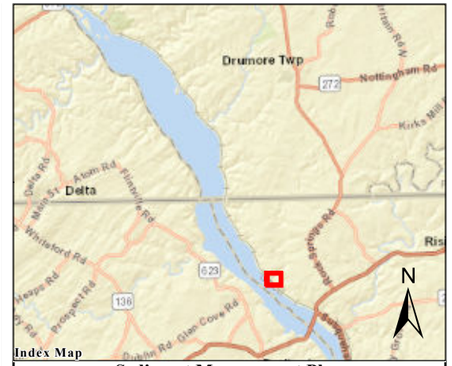

Sediment Management Plan

Figure 3.1.1-3:
Conowingo Creek
Sediment Management Plan
Monitoring Locations

Legend

- Water Depth Monitoring Locations
- Boat Launch/Landing
- Extent of Bathymetric Survey

N

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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User

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PROJECT NO. 405

Exelon

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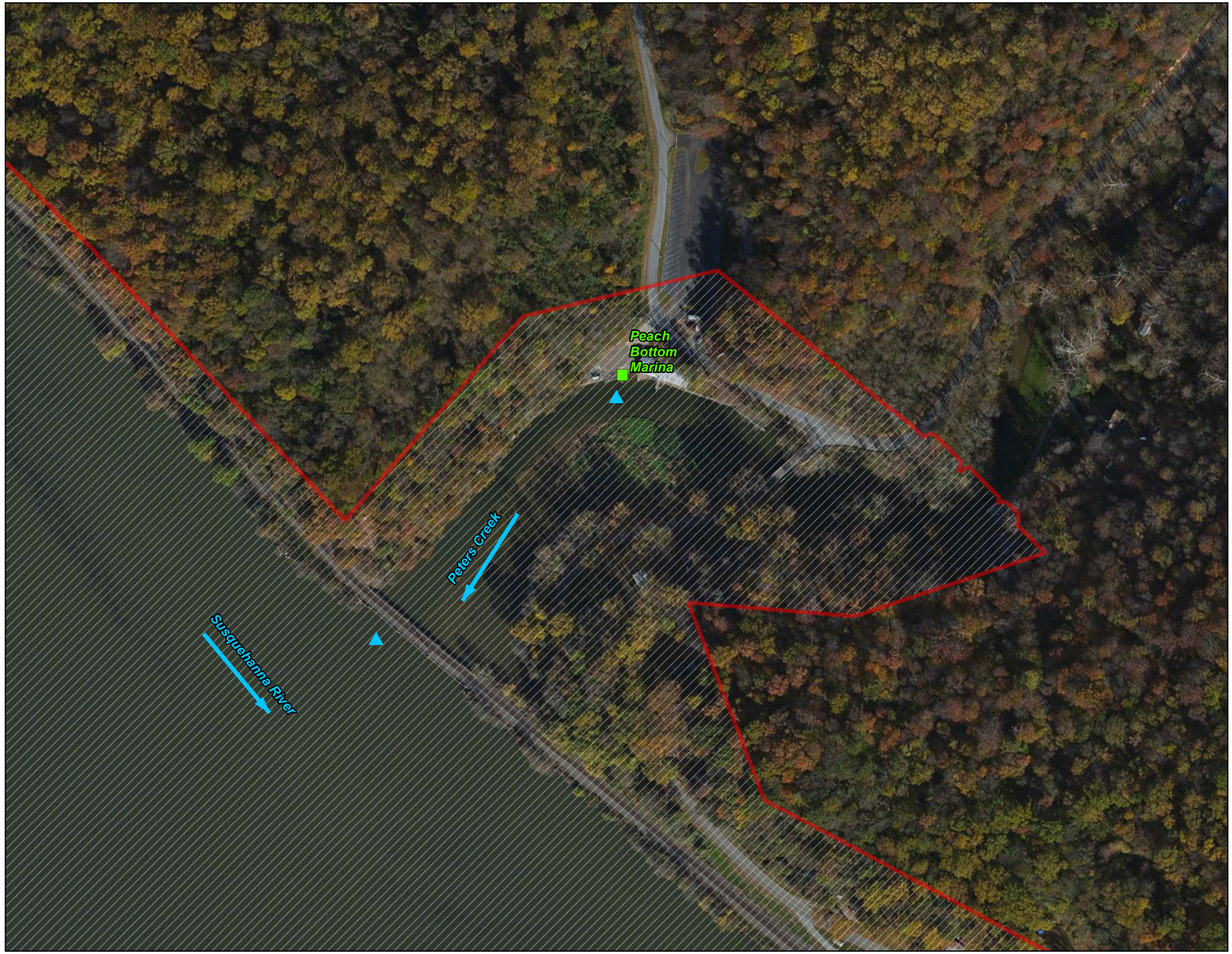

Index Map

Sediment Management Plan

Figure 3.1.1-4:
Peters Creek (Peach Bottom Marina)
Sediment Mangement Plan
Monitoring Locations

Legend

- Water Depth Monitoring Locations
- Boat Launch/Landing
- Extent of Bathymetric Survey

N

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User

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PROJECT NO. 405

Exelon

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4 IDENTIFY BENCHMARKS FOR ACTION(S)

Additional site-specific evaluations are needed before determining whether a recreation boating facility needs to be dredged. Important data to trigger these site-specific evaluations is whether the water draft depth available at each site allows for recreational boating. Exelon will monitor water depth with bathymetric monitoring every five years and biannual water depth monitoring at the three recreation boating facilities.

State Organization for Boating Access (SOBA) recommends the water at the toe of launching ramps and boat channels be a minimum of three feet deep for motorized boating (SOBA 2006). Per Article 406 of the License, Conowingo Pond is maintained at elevation 107.2 feet NGVD during the recreation season (Memorial Day through Labor Day)[34]. Therefore, when the elevations within the channels at Peters Creek, Broad Creek, or Conowingo Creek exceed 104.2 feet, motorized boating could be impaired at the recreation pond level. When channel elevations are at elevation 103.2 NGVD or above based on monitoring, Exelon will consider actions to alleviate potential impaired boating use including dredging of the problem areas as well as alternative recreation use at the sites which may require less dredging or no dredging.

SOBA also recommends channel widths to be able to "accommodate two design vessels passing safely at no-wake speed" (SOBA, 2006). The design vessels at these sites are pontoon boats with widths typically varying between approximately 8 and 12 feet. At 12 feet, two vessels passing with 10 feet between them would require a minimum channel bottom width of 34 feet. For kayaks or carry-in vessels, the channel width may be less. This criteria will be considered during Exelon's future evaluations of potential actions to alleviate impaired boating use at the sites.

[34] Per Article 406, the Licensee must operate the Project with a normal range of operation for Conowingo Pond between elevations 101.2 NGVD29 and 110.2 NGVD29, with a minimum elevation of 107.2 feet NGVD 29 on weekendsbetween Memorial Day and Labor Day, to meet recreational needs.

5 EVALUATE AND SELECT ACTION(S)

When water depth or bathymetric data indicate that elevations exceed 103.2 NGVD, Exelon will begin evaluating what actions to implement. Actions to alleviate potential impaired boating use include dredging of the problem areas as well as alternative recreation use at the sites which may require less dredging or no dredging.

To evaluate what potential action is most suitable at a site, Exelon will use site recreation use data (including surveys starting in 2030 and conducted every 10 years according to License Article 426), bathymetric and water depth monitoring data collected regularly as described in Section 4, and additional site-specific information. Additional site-specific data that could be needed are the following:

- Sediment grain size analysis and analytical testing;
- Site-specific feasibility analyses of the appropriate dredging methodology to be used, the areal extent and depth of dredging needed to support recreational boating usage, sediment disposal options, and constructability (e.g., additional constraints to be considered are railroad bridge clearances at the mouths of Peters Creek and Conowingo Creek and sediment accretion on the pond side of the Peters Creek channel). Feasibility analyses will consider lessons learned from the Peters Creek dredging activities in 2019/2020;
- Cost estimates for sediment management alternatives at each site that include construction documents, construction inspections, and continued bathymetric monitoring;
- Agency consultation with regards to impacts to sensitive resources and possible data collection related to sensitive resources;
- Disposal costs and options will be contingent on the findings of the laboratory analyses of sediment quality. Exelon will consult with the regulatory agencies, as appropriate, to determine if there are opportunities to improve habitat related to sediment removal or relocation. Exelon will work with regulatory agencies to identify appropriate disposal and beneficial/innovative reuse options that are agreeable to all parties; and
- Assessment of permitting and regulatory requirements and timeframes.

Exelon will evaluate the potential actions identified to alleviate impaired boating use at a site and determine the appropriate action considering several factors, including but not limited to recreation usage of the site and associated draft needs, dredging alternatives (e.g., maintenance dredging versus full fledge dredging project), estimated cost versus benefit, sediment disposal and beneficial/innovative reuse options, and environmental factors such as the presence of protected species and habitat (e.g., northern map turtle[35]).

Based on the benchmark of channel elevations exceeding elevation 103.2 ft NGVD, a bathymetric survey conducted in August 2020 indicates action needs to be taken at Broad Creek. The channel bed elevations generally varied from 104-105 NGVD at Broad Creek. Exelon has preliminarily identified these areas as shown in Appendix C. Approximately 3,100 CY needs to be excavated from Broad Creek to maintain adequate draft in the channel for boating. Exelon proposes to dredge these areas identified within Broad

[35] Following FERC approval of the Conowingo Hydroelectric Project Northern Map Turtle Protection Plan, Exelon will conduct ten years of northern map turtle population monitoring as stipulated in Article 424 in the new FERC license.

Creek by 2027 based on the proposed schedule in Table 5-1 below. Post-construction bathymetric monitoring at Broad Creek will be conducted for three years.

Table 5-1 Broad Creek Dredging Schedule[36]

Phase	Dates
Pre-Design Data Collection	2022-2023
Design	2022-2023
Permitting	2024-2026
Construction	2026-2027
Site Restoration/Permit Closeout	2027

Between 2019 and 2020, the main channel at Peters Creek was dredged down to elevation 101.2 NGVD. The August 2020 bathymetric survey indicates the elevation of the dredged channel downstream of the Peach Bottom Marina boat ramp has increased from 101.2 to 102.7 NGVD in some locations. The dredged channel upstream of the boat ramp in the creek appears to have increased to 103.8 NGVD in some locations. Most of channel appears to still be navigable based on the surveyed cross sections provided in Appendix A. Exelon proposes to perform post-construction bathymetric surveys at Peters Creek twice a year as described in Section 3.2 in 2022 and 2023 to evaluate sedimentation rates. In addition to the post-construction bathymetric surveys, Exelon is initiating consultation with the resource agencies about a maintenance dredging permit for Peach Bottom Marina. Table 2.7.3-1 summarizes permits and regulatory approvals that may be required.

Given the land use similarities within the watersheds, observations from the post-construction bathymetric surveys at Peters Creek will be used to inform approaches to future dredging activities at Conowingo Creek. Based on the benchmark of channel elevations exceeding elevation 103.2 ft NGVD, a bathymetric survey conducted in August 2020 indicates action needs to be taken at Conowingo Creek. The channel bed elevations generally varied from 103-104 NGVD at Conowingo Creek. Exelon has preliminarily identified these areas as shown in Appendix C. Approximately 2,600 CY needs to be excavated from Conowingo Creek to maintain adequate draft in the channel for boating.

Exelon is proposing to delay starting the Conowingo Creek restoration design and permitting process until post-construction bathymetric information can be obtained at Peach Bottom Marina. These data will inform the design. A report of findings and dredging recommendations or alternatives will be completed by August 31, 2024. Exelon proposes to dredge the areas identified within Conowingo Creek by 2029 based on the proposed schedule in Table 5-2 below. Post-construction bathymetric monitoring at Conowingo Creek will be conducted for three years.

[36] This schedule is based on the schedule for dredging Peach Bottom Marina between 2015 and 2020.

Table 5-2 Conowingo Creek Dredging Schedule[37]

Phase	Dates
Pre-Design Data Collection	2024-2025
Design	2024-2025
Permitting	2026-2028
Construction	2028-2029
Site Restoration/Permit Closeout	2029

[37] This schedule is based on the schedule for dredging Peach Bottom Marina between 2015 and 2020.

6 IMPLEMENTATION SCHEDULE

The measures proposed herein will be implemented based on the schedule in Table 6-1 below upon FERC approval of this SMP. The implementation schedule takes into account the various phases of a dredging project from pre-design data collection to site restoration/closeout. Additional site-specific data that could be needed includes additional sediment testing, dredging feasibility analyses, investigation of sediment disposal and beneficial/innovative options, additional data on sensitive resources such as map turtles and consultation with resource agencies on mitigative measures, recreation usage data, and post-construction monitoring at Peach Bottom Marina. Exelon will initiate consultation with the USACE, PADEP, and MDE with regards to maintenance dredging at the three recent sites based on the post construction bathymetric mapping and begin development of permit applications.

Table 6-1 Implementation Schedule

Task	Begin	End	Frequency
Bathymetric Surveys of Conowingo Pond & Recreation Sites	2022	2070	Every 5 years
Bathymetric Survey Report[38]	2023	2071	Every 5 years
Water Depth Monitoring	2022	2070	May and Sept. every year
Peach Bottom Marina			
Initial Peach Bottom Marina Dredging	2015	2020	
Subsequent Peach Bottom Marina Dredging[39]	TBD	TBD	
Broad Creek			
Initial Broad Creek Dredging	2022	2027	
BC - Pre-Design Data Collection	2022	2022	
BC - Design	2022	2023	
BC – Permitting	2024	2026	
BC – Construction	2026	2027	
BC – Site Restoration/Permit Closeout	2027	2027	
Subsequent Broad Creek Dredging[40]	TBD	TBD	

[38] Report to be filed every five years by March 31 of the year following five-year bathymetric surveys.

[39] Exelon's determination of dredging frequency at this site will be based on post-construction bathymetric monitoring, a site-specific recreation use assessment at Peach Bottom Marina, and receipt of map turtle survey and other Rare, Threatened, Endangered species data. Exelon is initiating preparation and submittal of maintenance dredging permits and consultations for Peach Bottom Marina based upon the recent dredging of the marina.

[40] Exelon's determination of dredging frequency at this site will be based on post-construction bathymetric monitoring, a site-specific recreation use assessment at Broad Creek, and receipt of map turtle survey and other Rare, Threatened, Endangered species data.

Task	Begin	End	Frequency
Conowingo Creek			
Initial Conowingo Creek Dredging[41]	2024	2029	
CC – Pre-Design Data Collection	2024	2024	
CC - Design	2024	2025	
CC – Permitting	2026	2028	
CC – Construction	2028	2029	
CC – Site Restoration/Permit Closeout	2029	2029	
Subsequent Conowingo Creek Dredging[42]	TBD	TBD	
Post Construction Bathymetric Surveys			
Peach Bottom Marina[43]	2022	2023	May and Sept. for 2 years following construction
Broad Creek	2028	2030	May and Sept. for 3 years following construction
Conowingo Creek	2030	2032	May and Sept. for 3 years following construction

[41] Given the impact on dredging design, Exelon will start the dredging design process at Conowingo Creek after the post-construction bathymetric monitoring at Peach Bottom Marina.

[42] Exelon's determination of dredging frequency at this site will be based on post-construction bathymetric monitoring, a site-specific recreation use assessment at Conowingo Creek, and receipt of map turtle survey and other Rare, Threatened, Endangered species data.

[43] Post construction surveys at Peach Bottom Marina were conducted in March and August 2020.

7 REPORTING

Exelon will file the results of the bathymetric survey of Conowingo Pond and the recreational facilities with FERC by March 31 of the year following the bathymetric survey. The report will include an analysis of any change in sediment deposition or scour in the pond from the previous surveys, including the most recent bathymetric survey of Conowingo Pond so that any changes in sediment depositional or scour patterns in the pond over time since the 2011 survey can be monitored. The five-year report will include the biannual water depth monitoring data described in Section 3.2.2 and a summary of any data collection, post-construction dredging bathymetric surveys, engineering and environmental analyses, permitting, procurement, or implementation of dredging activity that has occurred at these sites will also be included in the report.

8 MODIFICATIONS TO PLAN

In accordance with License Article 420, once approved, the Plan will not be amended without prior approval from FERC.

9 LITERATURE CITED

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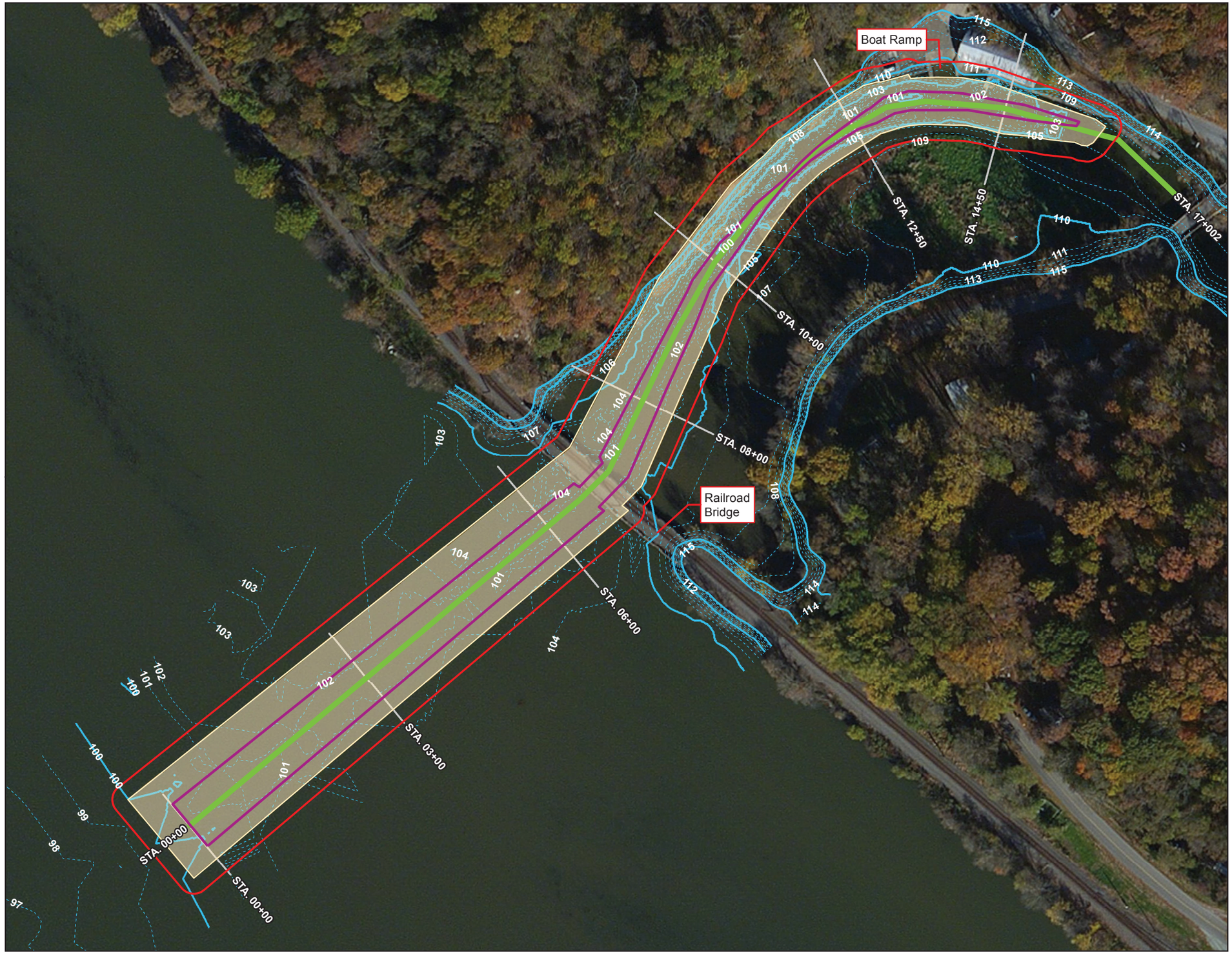
APPENDIX A. PETERS CREEK CROSS SECTIONS



Peach Bottom Marina
Dredging Area
and 2020 Bathymetric Data

Legend

- Dredging Area
- Work Area Limit
- Dredge Toe-El. 100.4
- Dredge Cross Section
- Dredge Profile
- Major Contour (5 ft)
- 1 Foot Contour

N

Vertical Datum: North American Vertical Datum of 1988 (NAVD 88)
Horizontal Datum: North American Datum of 1983 (NAD 83)
State Plane Maryland FIPS 1900 Feet Projection

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

1 inch = 125 feet

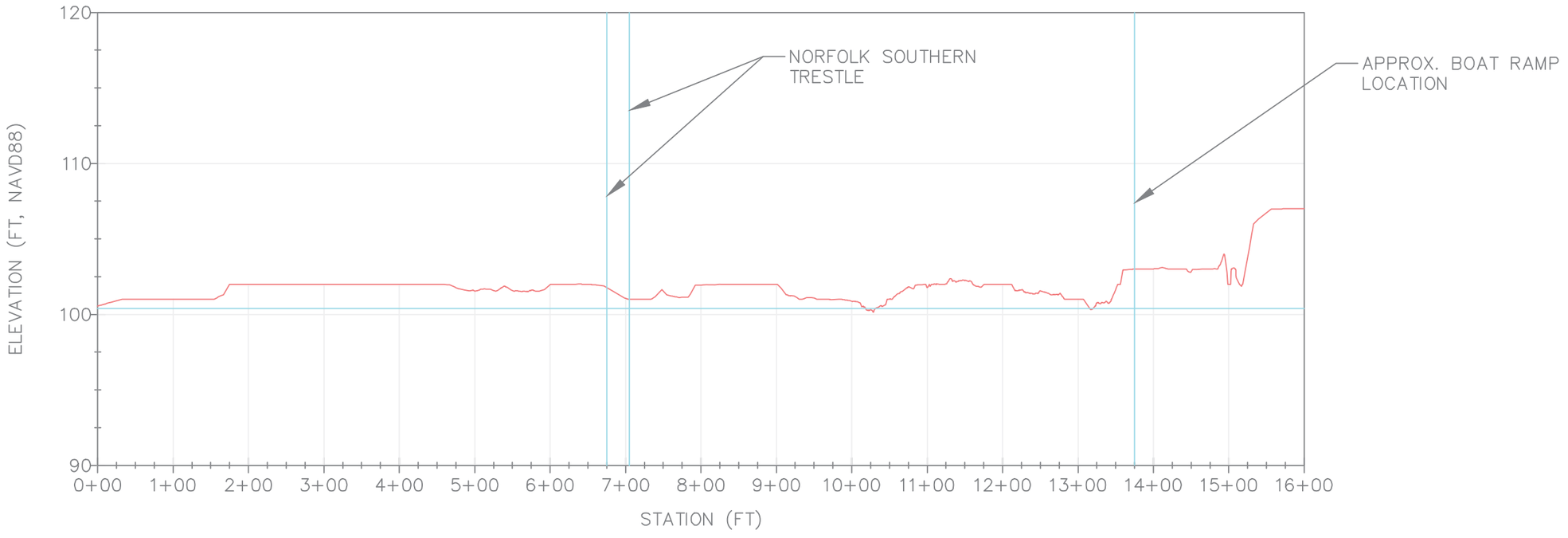
0 62.5 125 250 Feet

EXELON GENERATION COMPANY, LLC
CONOWINGO HYDROELECTRIC PROJECT
PROJECT NO. 405

Exelon

Path: X:\GISMaps\project_maps\bathymetry\pb_dredge_2020_bathymetry_profile.mxd

PETERS CREEK THALWEG PROFILE
(AUGUST 2020)



NOTES:
1) VERTICAL DATUM: NAVD88
2) ELEVATION DATA BASED ON A BATHYMETRIC SURVEY PERFORMED BY GOMEZ AND SULLIVAN BETWEEN AUGUST 11–14, 2020..

PRELIMINARY NOT FOR CONSTRUCTION

ISSUE	DATE	DESCRIPTION	BY	APP
0				

DRAWN BY:
CHECKED BY:
APPROVED BY:
PROJECT NO. 2201 DATE: 3/23/21

Exelon

GOMEZ AND SULLIVAN ENGINEERS
Williamsville, NY● Utica, NY● Albany, NY● Henniker, NH
www.gomezandsullivan.com

CONOWINGO SEDIMENT MANAGEMENT STUDY

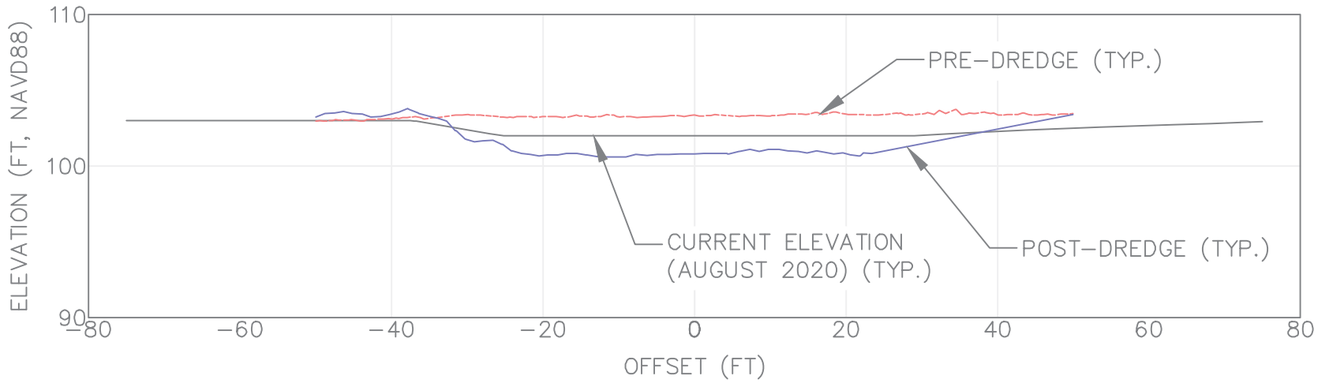
PETERS CREEK THALWEG PROFILE

Exelon Generation Company, LLC
Conowingo Hydro Station
Muddy Run Pumped Storage Plant
4948 Conowingo Road
Darlington, MD 21034

Gomez and Sullivan Engineers, D.P.C.
41 Liberty Hill Road
PO Box 2179
Henniker, NH 03242

SCALE:
DRAWING:

STA. 3+00



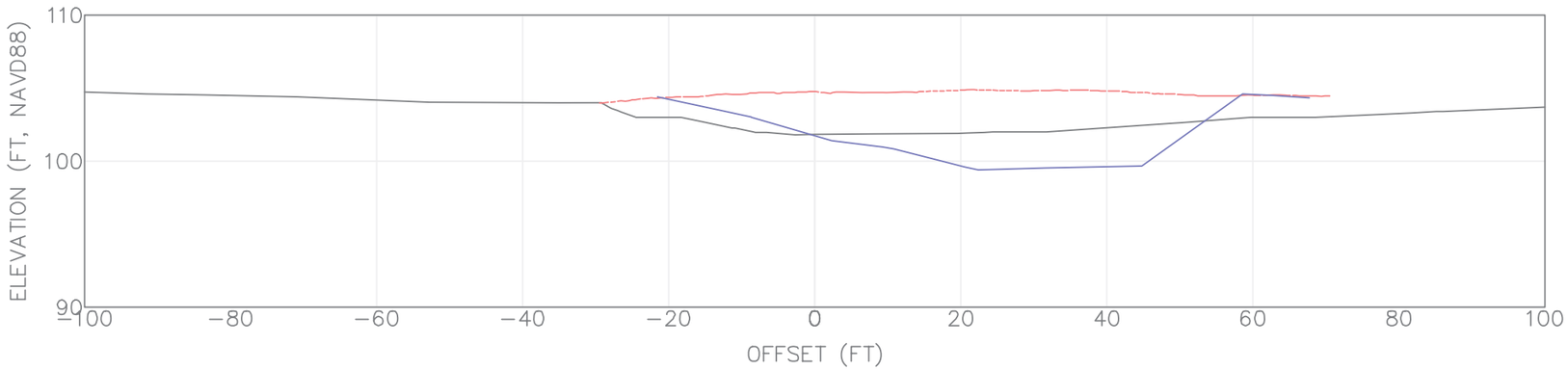
LEGEND

PRE−DREDGE SURVEY
AUGUST 2019

POST−DREDGE SURVEY
AUGUST 2019 (STA. 0+00 − 12+00)
MARCH 2020 (STA. 12+00 − 15+75)

AUGUST 2020 SURVEY

STA. 6+00



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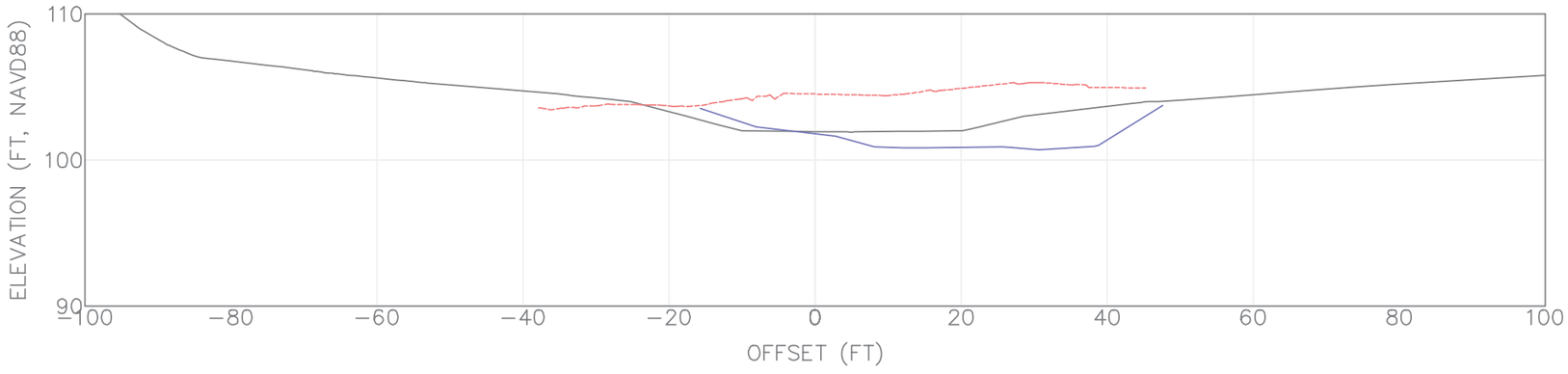


NOTES:
1) ALL SECTIONS ARE LOOKING UPSTREAM.
2) VERTICAL DATUM: NAVD88

PRELIMINARY
NOT FOR
CONSTRUCTION

ISSUE	DATE	DESCRIPTION	BY	APP
0				

DRAWN BY:
CHECKED BY:
APPROVED BY:
PROJECT NO. 2201 DATE: 3/23/21

Exelon

GOMEZ AND SULLIVAN ENGINEERS
Williamsville, NY▪ Utica, NY▪ Albany, NY▪ Henniker, NH
www.gomezandsullivan.com

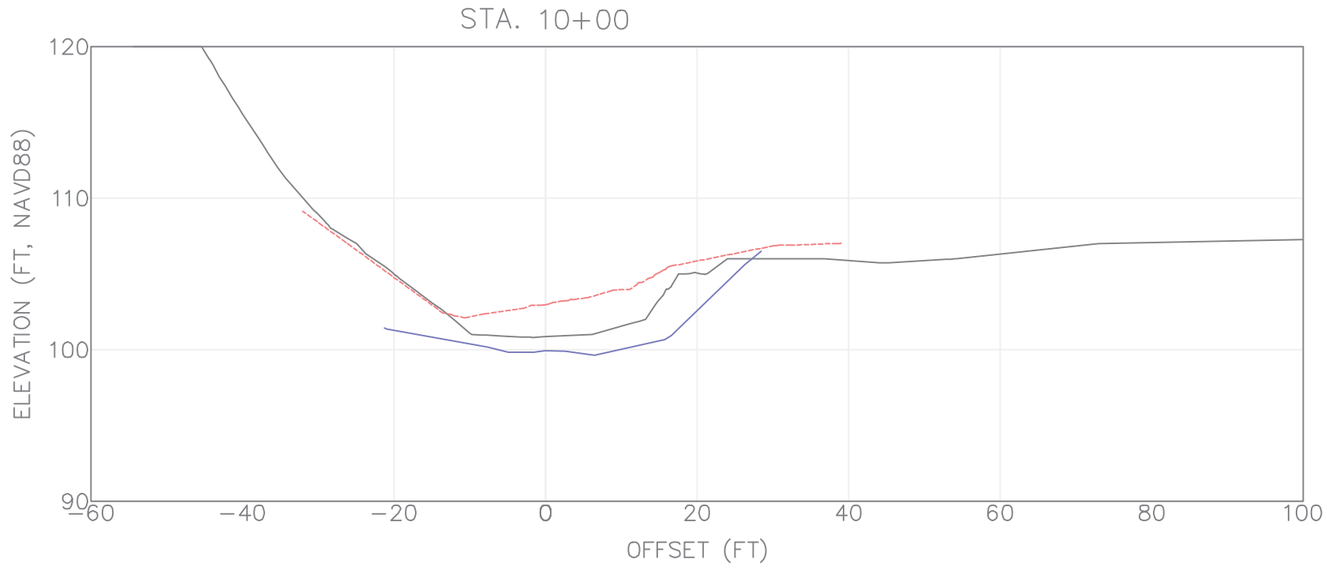
CONOWINGO SEDIMENT MANAGEMENT STUDY

PETERS CREEK
CROSS SECTIONS
SHEET 1 OF 3

Exelon Generation Company, LLC
Conowingo Hydro Station
Muddy Run Pumped Storage Plant
4948 Conowingo Road
Darlington, MD 21034

Gomez and Sullivan Engineers, D.P.C.
41 Liberty Hill Road
PO Box 2179
Henniker, NH 03242

SCALE:
DRAWING:

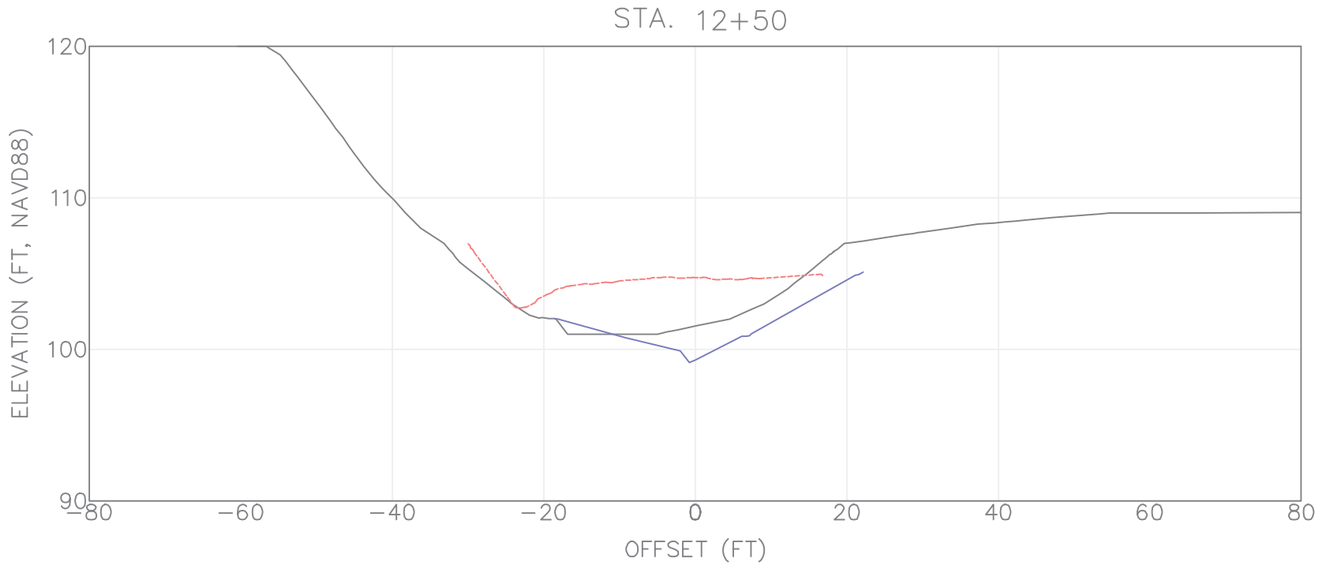


LEGEND

PRE−DREDGE SURVEY
AUGUST 2019

POST−DREDGE SURVEY
AUGUST 2019 (STA. 0+00 − 12+00)
MARCH 2020 (STA. 12+00 − 15+75)

AUGUST 2020 SURVEY



NOTES:
1) ALL SECTIONS ARE LOOKING UPSTREAM.
2) VERTICAL DATUM: NAVD88

PRELIMINARY
NOT FOR
CONSTRUCTION

ISSUE	DATE	DESCRIPTION	BY	APP
0				

DRAWN BY:
CHECKED BY:
APPROVED BY:
PROJECT NO. 2201 DATE: 3/23/21

Exelon

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CONOWINGO SEDIMENT MANAGEMENT STUDY

PETERS CREEK CROSS SECTIONS SHEET 2 OF 3

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4948 Conowingo Road
Darlington, MD 21034

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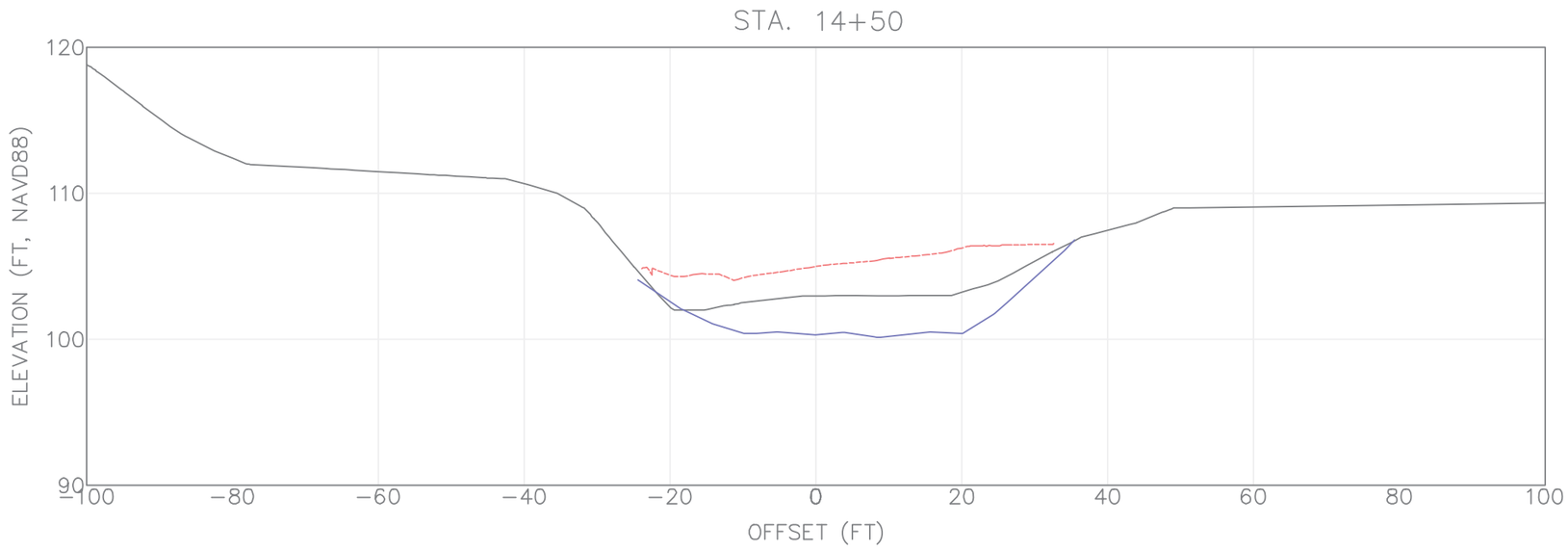
41 Liberty Hill Road
PO Box 2179
Henniker, NH 03242

SCALE:

DRAWING:



LEGEND

PRE−DREDGE SURVEY
AUGUST 2019

POST−DREDGE SURVEY
AUGUST 2019 (STA. 0+00 − 12+00)
MARCH 2020 (STA. 12+00 − 15+75)

AUGUST 2020 SURVEY

NOTES:
1) ALL SECTIONS ARE LOOKING UPSTREAM.
2) VERTICAL DATUM: NAVD88

PRELIMINARY
NOT FOR
CONSTRUCTION

ISSUE	DATE	DESCRIPTION	BY	APP
0				

DRAWN BY:
CHECKED BY:
APPROVED BY:
PROJECT NO. 2201 DATE: 3/23/21

Exelon

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CONOWINGO SEDIMENT MANAGEMENT STUDY

PETERS CREEK CROSS SECTIONS SHEET 3 OF 3

Exelon Generation Company, LLC
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PO Box 2179
Henniker, NH 03242

SCALE:

DRAWING:

APPENDIX B. PICTURES OF DREDGING AND DEWATERING EQUIPMENT

Hydraulic Dredge Example

Source: GSE, November 2019 - Peach Bottom Marina, PA.

Source: GSE, November 2019 - Peach Bottom Marina, PA.

Mechanical Dredge Example

Source: GSE, March 2020 - Peach Bottom Marina, PA.

Source: GSE, March 2020 - Peach Bottom Marina, PA.

Dino6 Dredge – Geoform International, Inc.

Source: GSE, July 2021 – Geoform International, Inc.
(https://geoforminternational.com/products/dino6/)

Source: GSE, July 2021 – Geoform International, Inc.
(https://geoforminternational.com/products/dino6/)

Dewatering - Geotubes

Source: GSE, October 2020 - Peach Bottom Marina, PA.

Source: GSE, October 2020 - Peach Bottom Marina, PA.

Mechanical Dewatering – De-sander Trailer Unit

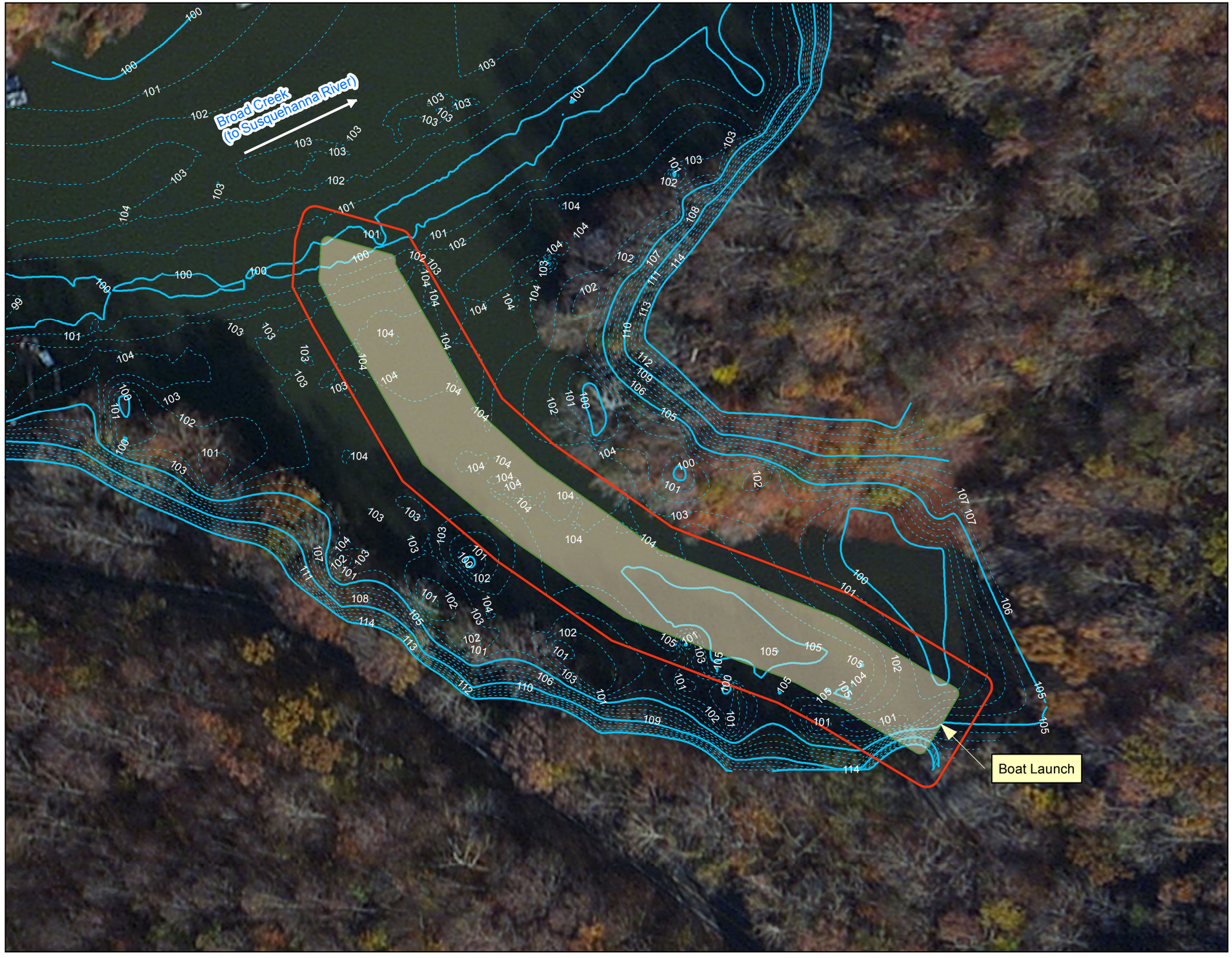
Source: GSE, October 2020 - Peach Bottom Marina, PA.

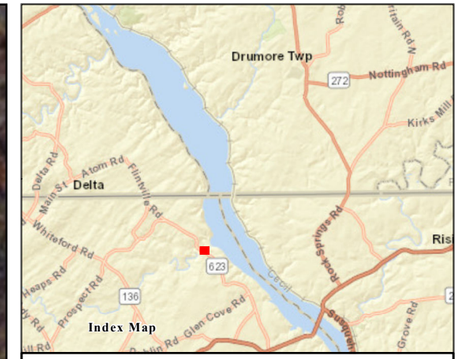
Source: GSE, October 2020 - Peach Bottom Marina, PA.

Mechanical Dewatering System (MDS) Unit in Roll-Off Container – by Tencate Inc.

Source: Tencate Inc., October 2007 - https://bishopwater.ca/wp/wp-content/uploads/2017/01/20160428122648_nb_geotube_municipal.pdf.

APPENDIX C. POTENTIAL DREDGE FOOTPRINTS AT BROAD CREEK AND CONOWINGO CREEK RECREATION SITES





Broad Creek Boat Launch
Conceptual Dredge Footprint Map

Legend

- Conceptual Dredging Footprint
- Conceptual Work Area Limit
- Major Contour (5 ft)
- 1 Foot Contour

N

Map is conceptual and not to be used for permitting or construction.

Contours were developed based on bathymetric survey data collected in August 2020.

Vertical Datum: North American Vertical Datum of 1988 (NAVD 88)
Horizontal Datum: North American Datum of 1983 (NAD 83)
State Plane Maryland FIPS 1900 Feet Projection

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

1 inch = 75 feet

0 37.5 75 150 Feet

EXELON GENERATION COMPANY, LLC
CONOWINGO HYDROELECTRIC PROJECT
PROJECT NO. 405

Exelon

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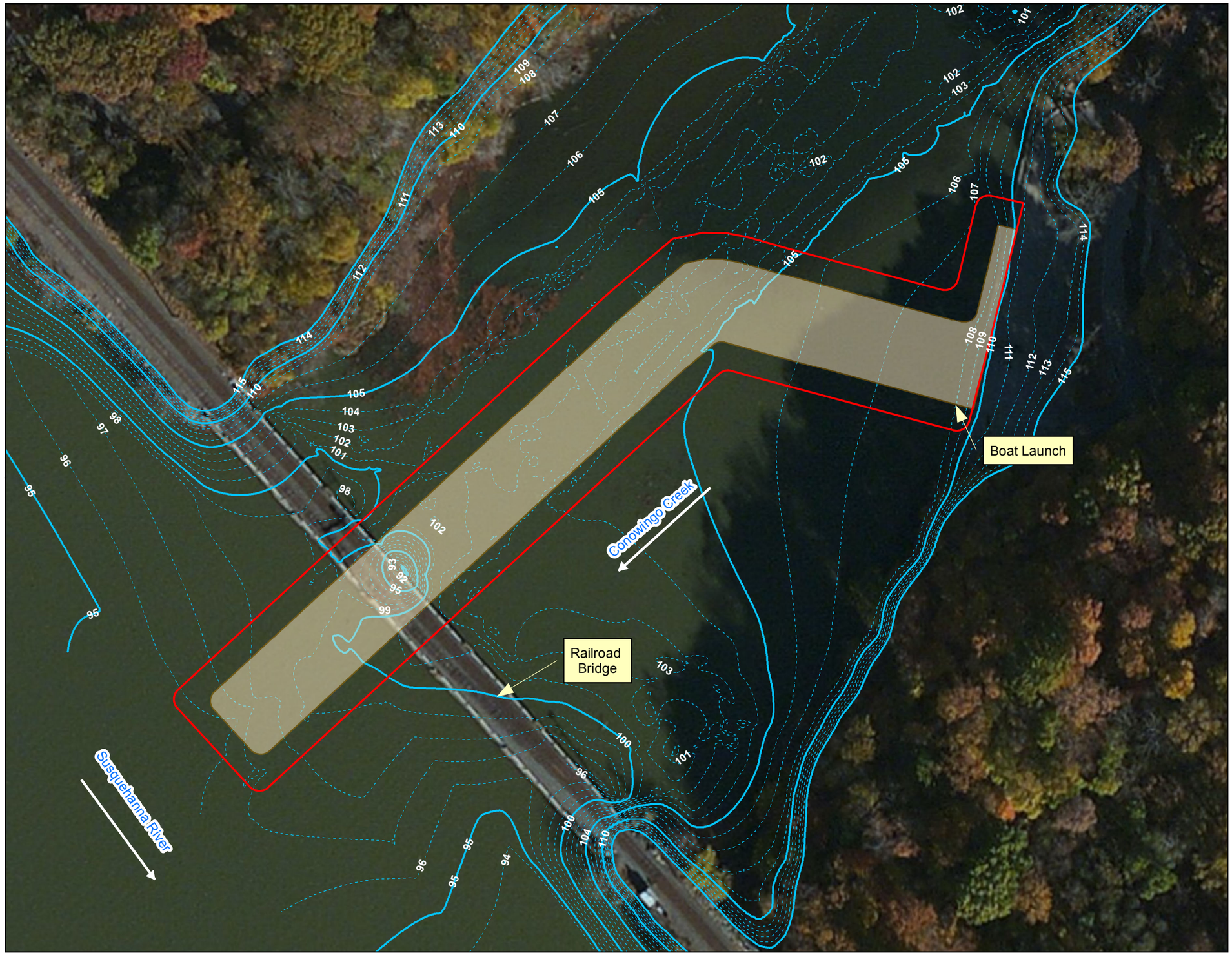

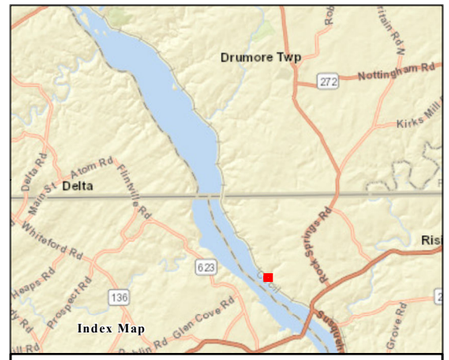

Conowingo Creek Boat Launch Conceptual Dredge Footprint Map

Legend

- Conceptual Dredging Footprint
- Conceptual Work Area Limit
- Major Contour (5 ft)
- 1 Foot Contour

N

Map is conceptual and not to be used for permitting or construction.

Contours were developed based on bathymetric survey data collected in August 2020.

Vertical Datum: North American Vertical Datum of 1988 (NAVD 88)
Horizontal Datum: North American Datum of 1983 (NAD 83)
State Plane Maryland FIPS 1900 Feet Projection

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
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1 inch = 75 feet

0 37.5 75 150 Feet

EXELON GENERATION COMPANY, LLC
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PROJECT NO. 405

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