Conowingo/Muddy Run Project FERC Relicensing
Proposed Study Plan Meeting
Meeting Minutes
September 22-23, 2009, 10:00 PM – 4:00 PM
Darlington Volunteer Fire Department

Project Team Attendees:
Colleen Hicks, Exelon (colleen.hicks@exeloncorp.com)
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Marjorie Zeff, URS (marjorie_zeff@urscorp.com)
Deborah Poppel, URS (deborah.poppel@urscorp.com)

Stakeholders Attendees:
Andy Shiels, Pennsylvania Fish and Boat Commission (PaFBC) (ashiels@state.pa.us)
Mike Hendricks, PFBC (mihendrick@state.pa.us)
Jim Richenderfer, Susquehanna River Basin Commission (SRBC) (jrichenderfer@srbc.net)
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Gary Petrewski, PPL (gpetrewski@pplweb.com)
Mike Helfich, Riverkeeper (lowsusriver@hotmail.com)
Introductions and Agenda Review

Colleen Hicks (Exelon) opened the meeting and welcomed everyone. Parties introduced themselves and gave their position and affiliation. Tom Sullivan (Gomez and Sullivan) described the meeting structure and reviewed the meeting agenda. Each study was to be opened to questions due to time constraints and the large number of studies to be discussed. Tom Sullivan also provided an overview of the next series of steps in the ILP process.

Jim Spontak (PaDEP) speaking on behalf of the resource agencies requested that the deadline for filing comments on Exelon’s revised study plan be pushed back from 6 January 2010 and that the resource agencies and Exelon jointly file a revised process plan with FERC. He requested that the remaining PAD references, raw, and intermediate data be provided to resource agencies by 9 October 2009.

Session 1: Fish Passage – Conowingo

3.2 Downstream Fish Passage Effectiveness Study

MDNR requested that the periodicity of juvenile out migration be included in the Revised Study Plan backed up by a literature review. It was indicated that river herring were not specifically mentioned and that fall-back and re-entrainment was not addressed.

NAI indicated that size was a more important factor than the specific species in determining mortality rates. Also, the fall-back and re-entrainment could be estimated through literature reviews and site-specific information previously collected.

NAI will include site-specific information as part of the literature review, and the identify out-migration period in the Revised Study Plan based on literature review.
Referencing page 3-9, task 1, information concerning the turbine specifications was requested. NAI indicated that turbine specifications will be provided and that the vented and non-vented turbines have similar design characteristics.

The following turbine design specifications will be included in the Revised Study Plan and provided to the agencies by 16 October 2009:

- Turbine type;
- Turbine speed;
- Number of buckets;
- Spacing between wicket gates; and
- Vented versus non-vented.

Referencing the table on page 3-11, the total fish numbers need to be double checked for accuracy. Additionally, the source of the test fish for the balloon tag study would need to be determined as hatchery fish were not available.

USFWS raised a concern if other, non-mechanical sources of mortality were being considered in the study and how was spillage mortality being addressed. NAI indicated that 90% of mortality was mechanically related and that the balloon tag study documented the disposition of each fish in order to answer this question.

Riverkeeper raised a question about the availability of American eels and if there are surrogates for the study and if spillage frequency could be included in the analysis. Also, in relation to the eel study, can a literature review be comparable to conditions at Conowingo. A final question was asked if length would be a factor in the entrainment/impingement analysis as only width was mentioned.

NAI indicated that eels were not available for the balloon tag study and there are no surrogates that can be used in their place. Spillage frequency would be included in the analysis of the study. NAI indicated that length was a factor for entrainment but not impingement.

MDNR indicated that eels may be available from commercial fishers in the area and could provide NAI with contact information.

3.3 Biological and Engineering Studies of American Eel at the Conowingo Project

PaFBC referred to page 3-18 and mentioned that it was imperative that conceptual designs and engineering were used to develop optimal locations for eel passage and to prevent fallback. It was noted that only the biological information is being addressed and that this should be treated as more than a feasibility study. It was also recommended that the east side of Conowingo Dam be surveyed for eels as well as the west side. Riverkeeper also suggested that an extensive, long-term eel study be conducted in Conowingo Pond with emphasis on downstream movement.

NAI indicated that the eel sampling locations were proposed for the spillway pool, located on the eastern side of the dam; however other sampling area have not yet finalized.

3.4 American Shad Passage Study
The stakeholders indicated that they have no comments at this time.

3.5 Upstream Fish Passage Effectiveness Study

MDNR raised questions about the definitions of passage efficiency and when fish enter the project area. It was suggested that the actual project area is somewhere below the dam and not when the fish enter the lift area. NAI clarified that the fish are considered in the project area at the lower end of Rowland Island.

MDNR also indicated that project operations needed to be altered to fully assess fish behavior. Additionally, MDNR has not yet agreed to provide personnel, tagging equipment, or service for any study.

Referencing page 3-35, page 1, a concern was raised about any potential tagging effects from individual fish tagged by 3 methods (radio, PIT, floy) and will this be investigated. NAI did not believe that there will be any tagging effect or that tagging effects are cumulative, but fish do not necessarily need to have 3 tags.

USFWS wants to look at fish behavior in the tailrace to determine how easily they find the fish lift at different operating scenarios. NAI indicated that the antenna array and study design will cover this concern. The specifics related to the antenna array and coverage will be included in the revised study plan.

PaDEP was concerned how gizzard shad passage affected American shad passage. Specifically, how do the following affect American shad passage:

- Exclusion of gizzard shad from the fish lift; or
- Passing gizzard shad early

Additionally, PaDEP was concerned as to how all of these studies would affect shad passage that will be occurring simultaneously and wanted velocities to be studied to see if there is any correlation between specific velocity and fish passage and/or attraction to the lift.

3.6 Conowingo East Fish Lift Attraction Flows

PaFBC indicated that project operations need to be manipulated in order to determine optimal conditions for American Shad passage. Referring to page 3-45, the agencies wanted to know the criteria for determining the need for a 2nd field season (2011) and have it indicated in the revised study plan.

3.9 Biological and Engineering Studies of the East and West Fish Lifts

PaDEP, referencing page 3-61, stated that more specifics are necessary in the revised study plan to better described Exelon’s proposal for analyzing the feasibility of expanding the spawning tanks at the West Fish Lift.

Session 2: Fish and Aquatics - Muddy Run

3.3 Entrainment and Impingement at the Muddy Run Project

USFWS requested that the historic reports that characterize entrainment be provided. USFWS indicated that there is no information on eel entrainment and these studies concerning eels need to be site-specific.
USFWS also asked how non-mechanical mortality, long term and cumulative effects will be assessed and the expected accuracy.

NAI indicated that all information will be supplied and that the balloon tag study will document all mechanical and non-mechanical effects on the eels and that fish are held for 48 hours to determine delayed mortality rates.

FERC asked if any of these methods would ensure reduced mortality at the Muddy Run facility. GSE indicated that there is very little that can be done to reduce the mortality of a pumped storage project.

### 3.4 Impacts of Muddy Run Project on Conowingo Pond Fishes

PaFBC and PaDEP remarked that no field work was proposed for this particular study and that it is exclusively a literature search. It was requested that more recent information is needed, including water quality data, for characterization of the fisheries (e.g. species composition, condition factor, age composition, etc.) in both Muddy Run Reservoir and the Conowingo Pool. NAI indicated that intensive sampling was performed in the late 1990s and that all of the information was there to calculate condition factor.

### 3.5 Nearfield Effects of the Muddy Run Project on Migratory Fishes

USFWS, referencing page 3-28, stated that pre-spawned and post-spawned shad will react differently to the water current queue of Muddy Run as well as any fish migrating in the near field region. It was suggested that sampling in the Muddy Run canal during the pumping phase would be useful information to collect. Hydro-acoustics and Didson were suggested as ways to sample.

### 3.6 Muddy Run Project Effects on Migratory Fishes: Interactions with the PBAPS Thermal Plume

USFWS suggested that a temperature distribution map be generated indicating the aerial extent of the plume as temperature can influence migration and spawning timing. PaDEP asked how far the plume migrated to the east when both PBAPS is generating and Muddy Run is pumping. Riverkeeper wanted Susquehanna River flows correlated with this situation to determine flow/plume interaction.

### 3.10 Creel Survey of Muddy Run Recreation Lake

PaFBC indicated that boating and birding use of the recreation lake and power reservoir has not been proposed and suggested that angling in the power reservoir be investigated. It was also suggested that user groups be consulted when developing the recreation management plan. GSE indicated that these concerns will be discussed in the session that includes recreation activities.

### 4.2 Full Discharge Net Entrainment Field Study

This issue was included in the discussion of study 3.3- Entrainment and Impingement at the Muddy Run Project.

### 4.3 Study of Entrainment of Upstream Migrating American Eels

This issue was included in the discussion of study 3.3- Entrainment and Impingement at the Muddy Run Project.
4.4 Telemetry Study of Adult American Eel to Determine the Potential for Entrainment and Availability of a Safe Zone of Passage past the Project Area in the Susquehanna River

PaDEP suggested that literature be reviewed of barriers and/or attractants relative to eels and should be included for both Conowingo and Muddy Run. Riverkeeper suggested that this is a unique situation that cannot be covered by a literature review and that a field based study needs to be performed.

GSE indicated that the reason a field study was not proposed is that American eel abundance in Conowingo Pond or in upriver areas now and in the near future is extremely low. A review of the substantial eel behavior information obtained from other river systems would be sufficient to achieve the study goals.

Session 2: Fish and Aquatics – Conowingo

3.10 Maryland Darter Surveys

USFWS requests 4 seasons of sampling instead of 3 and does not agree that Maryland darter cannot be sampled in the winter. According to USFWS, new techniques (e.g., trawling) are more effective in sampling for Maryland darter, compared to conventional techniques. Also, Maryland darter should be sampled for 2 years instead of 1 as has been proposed by Exelon. NAI suggested that the second year will not likely be successful if the first one is not.

3.13 Study to Assess Tributary Access in Conowingo Pond

PaFBC was concerned about overhead obstructions (e.g., railroad bridges) in relation to tributary access and indicated that recreational boating activities were being ignored. Comprehensive, GIS based bathymetric maps at different flow and generation conditions were warranted to address this issue. NAI indicated that bathymetry has been done on a limited basis and that recreational access to the tributaries is limited.

3.18 Characterization of Downstream Aquatic Communities

PaFBC indicated that the study plan does not adequately respond to the resource agency requests for a reference reach comparison. This study aspect will be of great importance to the agencies.

GSE reiterated its belief that there are no suitable reference reaches available for comparison to the lower Susquehanna River below Conowingo Dam. Also, a reference reach comparison would not inform any Protection, Mitigation, and Enhancement (PME) measures.

3.19 Freshwater Mussel Characterization Study below Conowingo Dam

PaFBC indicated that the study is inadequate to quantify the mussel communities and that a reference reach needs to be used for comparison. Habitat mapping and a quantitative analysis of relative abundance is necessary to accurately assess the population. An agreement should be reached with MDNR to be able to collect specimens for inventory and future reference purposes. The Riverkeeper indicated the size information should be collected on all collected mussel specimens, rather than just the smallest and largest specimens.

3.24 Zebra Mussel Monitoring Study
MDNR suggested an outreach program to educate the public of the hazards of invasive species such as the zebra mussel.

3.25 Creel Survey of Conowingo Pond and the Susquehanna River below Conowingo Dam

USFWS suggested that the study plan used by PaFBC/Penn State during their survey of an upper portion of Susquehanna River be consulted and emulated to produce consistent results. PaFBC also suggested that recreational birders be surveyed to determine use of facilities. The Riverkeeper asked that to the extent possible, specific information be collected on the location of where fish are being caught in Conowingo Pond.

Session 3: Water Quality – Muddy Run

3.1 Muddy Run Water Quality Study

USFWS stated that water quality is a function of water quantity in addition to other parameters that are surveyed and that flow needs to be considered a water quality issue.

Session 3: Water Quality – Conowingo

3.1 Seasonal and Diurnal Water Quality in Conowingo Pond and below Conowingo Dam

SRBC indicated that dissolved oxygen should be measured in the discharge boils and that water quality measurements should be compared to station 643 to ensure that it is functioning properly. The dissolved oxygen measurements should be continuous to capture any periods where it may be low (early or late). Measurements at the minimum flow unit could form a bridge between the water passing through the turbines and station 643. MDNR suggested a separate unit at the station 643 location to confirm its accuracy. MDNR also indicated that the period could be potentially shortened to a few weeks rather than several months, since the intent of the study to simply confirm the accuracy of station 643.

NAI indicated that it is not feasible to have 10+ dissolved oxygen sensors in the discharge area when the majority of them will not be providing meaningful information at any given point in time.

3.14 Debris Management Study

The agencies did not have any comments on this issue at this time.

3.15 Sediment Introduction and Transport (Sediment and Nutrient Loading)

MDNR indicated that the study plan did not provide enough detail and was very vague. The agencies want studies to assess:

- Storage volume;
- Sediment accumulation rate; and
- Benchmarks for future mitigation.

The first 2 issues should be covered in a literature review in relation to a sediment monitoring plan. It was also stated that sedimentation behind the dam should be addressed now, no matter who is involved before an emergency or catastrophic event occurs. MDNR also wanted to know what plan is in place when sediment capacity is reached. GSE indicated that the first and second bullets above will be
addressed, but that the third bullet will not as it is not the sole responsibility of Exelon and is a basin-wide issue.

Riverkeeper asked whether the specific amount of sediment and phosphorous has been addressed and have the economic impacts of a large quantity of sediment released to the bay been considered (e.g. Hurricane Agnes). Riverkeeper also suggested that access to dredging needs to be provided. Exelon indicated that no economic analysis is currently planned.

USFWS indicated that recreational access to the shoreline at Garrett Island Refuge downstream (relating to sediment starvation) of the project is an issue that needs to be considered. USFWS indicated that analysis of this issue would require field survey.

It was agreed that clarifications and more detail will be provided in the Revised Study Plan.

3.20 Salinity and Salt Wedge Encroachment

SRBC referencing page 3-127 task 2, statistical analysis would be appropriate and may answer the question as to the degree of this issue. SRBC also wanted confirmation that the time-step used in the statistical analysis (task 2) would be no greater than an hourly time-step. Additionally, PaFBC suggested that graphs and figures be used to illustrate conditions instead of raw data and spreadsheets.

4.1 Continuous water temperature monitoring (15 minute intervals) at various locations within the Conowingo Hydroelectric Project Impoundment and Tailrace, and Susquehanna River and upper Chesapeake Bay (Susquehanna Flats) downstream of the Conowingo Dam

USFWS indicated that the historical information required to determine whether the Conowingo Project influences water temperature needs to be provided to resource agencies. USFWS noted that if operational conditions have changed since deregulation, then the historical data may not be relevant. PaFBC indicated that if the restoration goals for American shad and river herring are eventually met, then water quality conditions in the lower Susquehanna River would need to be sufficient to support the increased population.

4.2 Water Quality Modeling in the Upper Chesapeake Bay and links to the Chesapeake Bay Program’s Water Quality Standards and Water Quality Needs of other Individual Species and Aquatic Communities for which Data are Available

This issue was discussed with study 3.1 Muddy Run Water Quality Study.

4.3 Develop sediment transport model and perform field work to study the physical and biological effects of alterations in sediment dynamics in the reservoir and downstream, including (a) sediment deposition in Conowingo pool and effects on habitat of resident and migratory fish; (b) sediment starvation and armoring downstream of the dam and effects of scouring flows; (c) characteristics of flow events (i.e., magnitude, frequency, duration) capable of scouring the Conowingo pool and releasing pulses of stored sediment downstream; (d) the biological impacts in the Susquehanna River and Chesapeake Bay of sediment release from Conowingo pool

This issue was discussed in relation to study 3.15 Sediment Introduction and Transport (Sediment and Nutrient Loading).
4.4 Conduct an Economic/Environmental costs analysis of the "no action" option for addressing sediment build-up in the Conowingo Pool

This issue was discussed in relation to study 3.15 Sediment Introduction and Transport (Sediment and Nutrient Loading).

Session 4: Water Use – Muddy Run

3.2 Hydrologic Study of Muddy Run Water Withdrawal and Return Characteristics

The agencies did not have any comments at this time.

4.1 Model Flow in the Muddy Run Project Discharge Tailrace, and Susquehanna River Using Computational Fluid Dynamics Model Techniques

USFWS indicated that the proposed method is not adequate to address the issue. USFWS indicated that a 3-D model is needed to adequately analyze velocity characteristics. GSE indicated that the first step is to determine if there are velocity issues using readily available information (e.g. PPL CFD model). If velocity issues are identified, then more robust techniques can be used (3-D modeling). Acoustic Doppler Current Profiling (ADCP) along with radio telemetry data will answer the basic question and then it will be determined if more robust tools are needed.

Session 4: Water Use – Conowingo

3.7 Fish Passage Impediments Study below Conowingo Dam

MDNR indicated that all possible problem areas need to be identified and questioned whether the HEC-RAS model will provide enough detail to answer the questions. MDNR requested that the Revised Study Plan include more detail on the existing HEC-RAS model (e.g., cross section spacing, cell spacing, etc.). USFWS asked whether fish can move from the west to the east fish lift during full generation in the spring and can this be addressed. GSE stated that the HEC-RAS model will be useful in identifying whether there is a velocity barrier below the dam. The radio telemetry portion of the proposed study will address fish movements within the tailrace and fish lift entrance areas.

Also, a specific concern was raised about access to Octoraro Creek. Exelon agreed to address this issue in the Revised Study Plan.

3.8 Downstream Flow Ramping and Fish Stranding Study

PaFBC indicated that the spill pool should be surveyed in November as that is when American shad and river herring are out-migrating and preferably in the morning after a night of generation. USFWS asked how predation was going to be addressed by the stranding study and whether dissolved oxygen and temperature will be measured in the exposed pools. It was suggested that the security cameras at the dam should be utilized to address predation.

3.11 Hydrologic Study of the Lower Susquehanna River

SRBC referencing task 4-3, wants to know specifics about how the model will be used and if sub-hourly time segments (~15 minutes) can be used. It was also mentioned that bathymetry is very important to this issue and questioned whether surveys need to extend farther downstream than Rowland Island.
3.16 Instream Flow Habitat Assessment below Conowingo Dam

USFWS suggested that 2-D modeling may be more appropriate for the instream flow study versus 1-D modeling. USFWS noted that there was a similar study completed for the Delaware River that may provide useful information on techniques and methodologies.

3.21 Impact of Plant Operations on Migratory Fish Reproduction

PaDEP suggested that the plan did not include field sampling of ichthyoplankton and previous studies were not adequate in estimating fish reproduction.

3.22 Shortnose and Atlantic Sturgeon Life History Studies

NMFS noted that they had requested a field sampling study for the sturgeon species and a literature review was proposed by Exelon. NMFS reiterated their request for field sampling including site-specific habitat and fish surveys. NMFS noted that previous radio telemetry work has been completed for sturgeon relative to their occurrence in the Delaware River basin. It may be possible to utilize the fish previously tagged by USFWS. Exelon would need to set-up a receiving array in the lower Susquehanna River to monitor any movement into the area by these previously tagged fish. This would likely satisfy the NMFS to identify species occurrence. PaFBC indicated that a literature review for shortnose sturgeon passage be included as part of the revised study plan.

4.5 Model flows in the Conowingo Project Tailrace, Spillway, and Downstream Susquehanna River using Two-Dimensional and Three-Dimensional Computational Fluid Dynamics (CFD) Model Techniques

This issue was discussed when addressing study 3.16 Instream Flow Habitat Assessment below Conowingo Dam.

4.6 Assessment of Habitat Availability and Persistence in the Zone affected by Subdaily Flow Fluctuations downstream of Conowingo Dam

This issue was discussed when addressing study 3.16 Instream Flow Habitat Assessment below Conowingo Dam.

4.7 Influence of Subdaily Flow Fluctuations on Diadromous Fish Movement; Larval Fish Survival and Growth; Abundance and Composition of Macroinvertebrates Downstream of the Dam; and Fish Community Composition

This issue was discussed when addressing studies 3.18 Characterization of Downstream Aquatic Communities and 3.19 Freshwater Mussel Characterization Study below Conowingo Dam

Session 5: Terrestrial and Wetland Resources – Muddy Run

3.7 Transmission Line Avian Interaction Study

The agencies did not have any comments at this time.
3.8 Study to Identify Critical Habitat Use Areas for Bald Eagle

USFWS indicated that “Critical” should be changed to “Essential” as there is not bald eagle critical habitat in the area. Also, there is no baseline information on eagle mortality and the opportunity should be taken to utilize the radio tags currently in the field as part of the U.S. Amry study to provide further information on eagle use of the area. The use of forested shoreline in light of future project land use should be considered as part of the shoreline management plan. Compliance with the Bald and Golden Eagle Act is required. It was suggested that the USFWS, Army and Exelon sit down to discuss a possible cost share for future eagle studies.

3.9 Study to Identify Potential Habitat and Presence/Absence of Bog Turtle and Rough Green Snake

PaFBC indicated that the proposal is acceptable as long as all habitat is evaluated on all project lands.

Session 5: Terrestrial and Wetland Resources – Conowingo

3.12 Water Level Management (Littoral Zone and Water Level Fluctuation)

SRBC recommended that the study analyze the drawdown range from 104.5 to 109.5 ft.

3.17 Downstream EAV/SAV Study (Water Level Vegetative Cover Study)

MDNR wanted clarification that the historical EAV/SAV data described in task 1 includes both pre or post-deregulation periods.

3.23 Study to Identify Critical Habitat Use Areas for Bald Eagle

This issue was discussed with study 3.8 Study to Identify Critical Habitat Use Areas for Bald Eagle at Muddy Run.

Session 6: Recreation, Shoreline Management, Historic, and Archaeological Resources – Muddy Run

3.11 Recreational Inventory and Needs Assessment

PaDEP questioned if hunting would be assessed and if the feasibility of bird viewing sites could be analyzed at Muddy Run.

3.12 Shoreline Management

The agencies did not have any comments at this time.

3.13 Visual and Noise Assessment of the Muddy Run Project

The agencies did not have any comments at this time.

3.14 Archaeological and Historic Cultural Resource Review and Assessment

The agencies did not have any comments at this time.
Session 6: Recreation, Shoreline Management, Historic, and Archaeological Resources – Conowingo

3.26 Recreational Inventory and Needs Assessment

Mason Dixon Trail indicated that the issue of trail access and the need for a parking lot near Muddy Creek needed to be resolved. Currently, Exelon is completing a survey of the property to try to identify Exelon property. Mason-Dixon Trail also stated that there is a need for an improved trail and put-in location below the Conowingo Dam. The previous facility was closed after 9/11.

PaDEP indicated that the parking lot at Octoraro Creek fishing facility may not be adequate to handle the spring fishing season. MDNR suggested investigating birding in the tailraces area and also installing stairs between the fishing pier and the boat launch.

3.27 Shoreline Management

USFWS wanted confirmation that wetlands will be identified along the shoreline and if fish nursery and eagle perching/nesting sites would be identified. It was also suggested that possible impediments to tributary entrances be identified as part of the land use constraint mapping proposed in the study plan.

3.28 Archaeological and Historic Cultural Resource Review and Assessment

The agencies did not have any comments at this time.

4.8 Evaluate the Possibility of Re-opening the Catwalk to Recreational Fishing

FERC indicated that a new vulnerability assessment would need to be completed before 31 December 2010. Several stakeholders stated that the recreation study should include whether there is a demand for use of the catwalk. FERC stated that the docket pertaining to the catwalk closure should be included as part of the recreation inventory assessment.