Susquehanna River Basin Commission

a water management agency serving the Susquehanna River Watershed

February 22, 2012

Mrs. Amy Elliott
U.S. Army Corps of Engineers
State College Field Office
1631 South Atherton Street, Suite 101
State College, PA 16801

Re: Public Notice in Reply to Application Number NAB-2008-01401-P13;
Pennsylvania Power and Light (PPL);
Bell Bend Nuclear Power Plant (BBNPP);
U.S. Army Corps of Engineers, Baltimore District

Dear Mrs. Elliott:

The Susquehanna River Basin Commission (SRBC) appreciates the opportunity to offer comments in response to the referenced Public Notice on the proposal by PPL to construct Bell Bend Nuclear Power Plant (BBNPP), a new nuclear power facility located in Salem Township, Luzerne County, Pennsylvania. SRBC staff is currently reviewing several aspects of the project with the intent of presenting recommendations to our commissioners at a future meeting of the SRBC.

The SRBC is a federal-interstate compact commission, created in 1971 by the passage of concurrent legislation by the General Assemblies of the three basin states, Pennsylvania, New York, and Maryland, and by the United States Congress. Under the terms of the Susquehanna River Basin Compact (Compact), SRBC is vested with very broad authority in the areas of water resources planning, management, conservation, development, utilization, and allocation within the jurisdictional area of the Susquehanna River Basin. SRBC regulates the withdrawal and consumptive use of water pursuant to Article 3, Section 3.10, of the Compact, P.L. 91-575, 84 Stat. 1509 et seq., and SRBC Regulations 18 CFR Parts 801, 806, 807, and 808. SRBC authorizes withdrawals and consumptive water uses in accordance with its Comprehensive Plan for the Water Resources of the Susquehanna River Basin (SRBC Comprehensive Plan), adopted on December 4, 2008, and as amended from time to time.

SRBC received applications for BBNPP dated May 13, 2009, requesting a surface water withdrawal from the North Branch Susquehanna River of up to 44 million gallons of water per day (MGD) and the consumptive use of water of up to 31 MGD. A groundwater withdrawal application also received at that time was subsequently retracted due to a lack of detailed information available. The SRBC commenced review of the applications in accordance with its regulations and SRBC Policy No. 2003-1, *Guidelines for using and determining passby flows*

and conservation releases for surface water and groundwater withdrawal approvals. On January 14, 2011, PPL amended the applications, changing the surface water withdrawal amount from 44 MGD to 42 MGD and the consumptive use from 31 MGD to 28 MGD. On January 10, 2012, SRBC received an application for a groundwater withdrawal of 1.0 MGD (30-day average) for dewatering necessary for construction activities primarily related to the essential service water emergency make-up system pond.

Due to the magnitude of the project and its proposed water withdrawal and consumptive use requested in the applications, the project review by SRBC staff has been extensive. PPL has provided a large volume of supplementary documents in response to SRBC staff's comments. This includes the Joint Permit Application (JPA), submitted to the SRBC on June 28, 2011, as a supplement to the application. PPL is continuing to submit additional information about the project and results of various studies. Several studies related to aquatic resources are scheduled to begin this summer. Based upon the outcome of staff's technical evaluations, SRBC staff will make a recommendation to the commissioners regarding approval, conditional approval, or denial of the project.

SRBC staff's technical review is ongoing, and some issues, as described below, are not resolved at this time. Because the review is incomplete, other issues may arise. The following sections of this letter include general comments regarding the BBNPP project followed by more detailed comments.

GENERAL COMMENTS REGARDING THE PROJECT

Consumptive Water Use. Consumptive use is defined by SRBC as the loss of water withdrawn from the basin through a process by which the water is not returned to the waters of the basin undiminished in quantity, including but not limited to evaporation, transpiration by vegetation, incorporation in products during their manufacture, injection into a subsurface formation and diversion out of basin. In accordance with SRBC regulations, PPL must propose (and the SRBC commissioners must approve) mitigation for its requested consumptive water use of 28 MGD. SRBC staff finds appropriate mitigation for consumptive use by a new facility of this magnitude and at this location must be in the form of compensatory water or discontinuance of use during designated low flow periods rather than payment of the mitigation fee.

PPL is proposing an innovative approach of pooling its various water storage "assets" to meet its consumptive use mitigation requirements at several existing projects within the basin and at the proposed BBNPP facility. This approach, as presented to the Commissioners in the form of a general concept and not a specific plan on June 23, 2011, may potentially allow for the more effective utilization of PPL's water storage assets in the Susquehanna River basin.

No formal action has been taken to date by SRBC regarding PPL's pooled asset concept, nor has PPL made a formal submission of its request. To develop this concept into an acceptable submission for review and possible approval by SRBC, PPL must establish a suite of storage options and operational alternatives, and designate which generation facilities and other PPL projects are to be included in the plan. At a minimum, the plan must identify how PPL proposes

to modify the existing approved mitigation methods at each of the facilities addressed by the plan, include applications for any new and increased withdrawals from water supply assets that might initially be added to the asset pool, and include information demonstrating that proposed releases are feasible and adequate to meet PPL's mitigation obligations. SRBC staff's role will be to evaluate the merits of any future pooled asset plan to ensure it meets the consumptive use mitigation goals and requirements as described in the SRBC's Comprehensive Plan and regulations. Location and quantity of available storage, as well as acceptable water quality, and timing of operations will be critical factors in staff's review of the plan.

Some of the details required in the plan include a list of specific water supply assets located upstream of BBNPP that are being considered as part of the Pooled Assets proposal, including the proposed amount of mitigation and expected licensing/permitting or contractual actions for each asset. In addition to sources of storage being identified, all necessary agreements among the different legal entities, both within the PPL corporate structure and any other project sponsors, must be resolved prior to approval of an "asset" into the plan. As a separate action from the BBNPP applications, SRBC staff will make a recommendation to the commissioners regarding acceptance, modification or rejection of the consumptive use mitigation plan.

SRBC regulations also require that major projects explore options to limit the quantity or avoid consumptive use of water. PPL has submitted studies that investigate using dry cooling techniques as an alternative to natural draft cooling towers. Utilizing dry cooling technology at BBNPP would significantly reduce the consumptive use; however, this technology has not been utilized for nuclear power plants to date and most likely the cost would be prohibitive. Nonetheless, SRBC staff has outstanding comments pertaining to this issue that have not been resolved at this time.

Water Withdrawal. In accordance with the standard contained in SRBC regulations, the surface water withdrawal and the groundwater withdrawal may not cause significant adverse impacts to the water resources of the basin. In its evaluation, SRBC staff may consider effects on stream flows and other users, water quality degradation that may be injurious to any existing or potential water use; effects on fish, wildlife, or other living resources or their habitat; and effects on low flows of perennial or intermittent streams. SRBC staff also considers the reasonable foreseeable water needs of a project.

SRBC staff evaluates each proposed withdrawal to determine the need for a protective passby flow condition, which restricts the ability to take water during low flow conditions. SRBC staff undertakes that evaluation using criteria that are applicable to all surface water withdrawals and groundwater withdrawals influencing surface water. This protocol, adopted in 2003, enables SRBC to evaluate the impact of the withdrawal and involves looking both upstream and downstream to assess cumulative impact, taking into account all other withdrawals and discharges and their impacts on the resource, particularly during low flow periods.

Early in the review process, PPL chose to pursue alternative analyses (using Instream Flow Incremental Methodology [IFIM]) in hopes of supporting its contention that the routine

passby requirement (20% average daily flow [ADF]) is not needed to protect aquatic resources and downstream water uses. A panel of experts representing PPL, SRBC, and water resource agencies of SRBC's member jurisdictions including the Pennsylvania Fish and Boat Commission (PFBC), U.S. Fish and Wildlife Service (USFWS), U.S. Geological Survey (USGS) and the Pennsylvania Department of Environmental Protection (PADEP) was convened and reviewed the design of aquatic studies and an IFIM study developed by PPL to assess the potential adverse impacts of BBNPP water withdrawals on the Susquehanna River.

Because a passby flow is the "trigger" for projects to cease their withdrawal during low flows, upstream storage is typically necessary for projects pursuing non-interruptible withdrawals to allow continued operations during all flow conditions. Should SRBC determine that the requested surface water withdrawal cannot be approved without a passby condition, PPL would need to provide for water storage upstream of BBNPP to assure that all sections of the Susquehanna River are protected during periods of low flow.

As a side note, SRBC is currently evaluating Policy No. 2003-1 to incorporate contemporary science. The recent study, ***Ecosystem Flow Recommendations for the Susquehanna River*** by The Nature Conservancy, serves as the scientific framework for a new policy proposal that will provide for limiting alteration to natural flow regimes and the ecological processes they support. SRBC staff has developed the policy proposal collaboratively with water resource agencies of our member jurisdictions, and anticipates its release to the public in the near term. BBNPP will be subject to any standards adopted by the SRBC prior to its action on the pending applications.

PPL has completed and submitted to SRBC in the JPA the IFIM study using a 1-D flow model. PPL has not submitted the results of the 2-D analysis they previously completed and findings from other aquatic studies that will be conducted during summer 2012. Therefore, SRBC staff's review of the IFIM study, in coordination with agencies of its member jurisdictions, is ongoing.

The groundwater withdrawal application for dewatering major excavations during construction of BBNPP is currently undergoing review. The review process typically requires 12 months to complete. One of SRBC staff's concerns is that appropriate measures are taken to protect wetlands in the vicinity of the excavations. With the withdrawal application, PPL also has submitted an aquifer testing waiver request. This waiver request is also under review.

DETAILED COMMENTS

In its ongoing review, SRBC has provided a number of comments on the applications to PPL. Detailed comments related to the technical review are documented in correspondence between PPL and the SRBC, copies of which are distributed to other interested agencies including the U.S. Army Corps of Engineers (USACE). The voluminous JPA submittal required SRBC staff to conduct its review in increments; the two most recent comment letters are attached. These comments and other forthcoming comments need to be addressed by PPL before staff finalizes any recommendations for SRBC action on the applications.

SRBC provided review comments pertaining to JPA Binder 3, Appendix B, Section 7, Subsections 1, 2, and 7 in a letter dated October 18, 2011 (Attachment 1). To summarize, SRBC staff found that the conclusion in Subsection 1, that the negative impact on aquatic life caused by BBNPP water withdrawals would be "generally small and infrequent," is premature. All the comments in Attachment 1 regarding the 1-D IFIM study must be resolved before conclusions about the 1-D modeling can be made. Additionally, other studies need to be completed, reviewed and approved before final conclusions can be made. The expert panel, convened to review the study plan, agreed that an IFIM study using a 2-D flow model should be used to study the riffle and island portions of the study area. At this time, the results of this effort have not been submitted for review. The separate mussel study that was recommended by the expert panel was not performed in 2011 due to adverse river conditions and is presently scheduled to be completed in 2012.

SRBC staff will conduct a comprehensive review of all aquatic studies to reach conclusions regarding the impact of BBNPP water withdrawals on aquatic life. Further, PPL has not analyzed impacts at less than the Q7-10 flow (843 cubic feet per second [cfs]) in any of the aquatic studies; therefore, Q7-10 is the minimum flow at which SRBC would impose a passby.

SRBC provided review comments pertaining to JPA Binder 3, Appendix B, Section 7, Subsections 3, 4, 5, and 6 in a second letter issued on December 21, 2011 (Attachment 2). Comments pertaining to Subsection 4, Assessment of Cooling Tower Blowdown Impacts, are being referred to PADEP and will be addressed during the NPDES permitting process. The SRBC awaits PPL's response to comments pertaining to Dissolved Oxygen Effects in Section 4.6.

Comments pertaining to Subsection 5, Water Quality Assessment of Backwater Areas Used by Juvenile Smallmouth Bass, must be resolved by PPL and accepted by SRBC staff as part of the comprehensive review of all aquatic studies. PPL is in agreement that further temperature and dissolved oxygen studies are required to resolve some of the comments. A plan for the additional studies needs to be developed, and the field work will need to be performed this summer and early fall.

Comments pertaining to Subsection 6, Assessment of Potential Impacts on Downstream Users, have not been resolved to date. Additional analysis of the potential impacts is required, and may involve PADEP staff to evaluate the effect of reduced flows caused by BBNPP on the ability of downstream users to meet requirements of their National Pollutant Discharge Elimination System (NPDES) permits.

In addition to providing written comments, SRBC staff has regularly participated in conference calls and periodic meetings with PPL, and it is staff's understanding that PPL is actively working to resolve the comments and concerns raised in the letters. SRBC staff understands that it is PPL's intention to finalize the scope of all remaining aquatic studies this spring so that field work can be accomplished during favorable flow conditions this summer.

PPL anticipates that data and reports will be submitted to SRBC in the September 2012 timeframe.

Considering the schedule that PPL will submit information required by SRBC's review process and the time necessary to coordinate with other agencies of our member jurisdictions, it is unlikely that the SRBC could act on the PPL applications during 2012. However, staff recommendations should be complete before year-end, which would allow for SRBC commissioner action at its first 2013 quarterly meeting (March 2013).

SRBC appreciates the opportunity to comment on the Public Notice for the BBNPP project. If you have any questions regarding the above, please feel free to contact Paula Ballaron at (717) 238-0423, extension 222.

Sincerely yours,

James L. Richenderfer, Ph.D., P.G.
Director, Technical Programs

Attachments: (1) SRBC Comment Letter to PPL dated 10/18/2011
(2) SRBC Comment Letter to PPL dated 12/21/2011

cc: Michael Canova; USNRC
John Fringer; USNRC
Susan Weaver; PADEP
Heidi Biggs; PADEP
Tom Starosta; PADEP
Eugene Trowbridge; PADEP
Mark Hartle; PFBC
Tom Shervinskie; PFBC
Jennifer Kagel; USFWS
Jamie Davis; USEPA
Michael Caverly; PPL
Gary Petrewski; PPL

ATTACHMENT 1

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Susquehanna River Basin Commission

a water management agency serving the Susquehanna River Watershed

October 18, 2011

Mr. Terry L. Harpster
VP-Bell Bend Project-Development
PPL Bell Bend, LLC
38 Bomboy Lane, Suite 2
Berwick, PA 18603

Re: PPL Bell Bend Nuclear Power Plant;
Project Response Status and Filing of
Joint Permit Application – BNP-2011-126;
Salem Township, Luzerne County, Pennsylvania

Dear Mr. Harpster:

Susquehanna River Basin Commission (Commission) staff has reviewed the "Project Response Status and Filing of Joint Permit Application" for the Bell Bend Nuclear Power Plant (BBNPP) submitted in the referenced correspondence. Our comments below pertain to the Joint Permit Application (JPA) Binder 3, Appendix B, Section 7, Subsections 1, 2, and 7. We will respond to the remaining subsections under separate cover. Additionally, responses to other sections of Enclosure 1 to BNP-2011-126, Response Summary and JPA Cross-Reference, will be under separate cover.

1. In Section 1, the first question in the Summary is "What is the relationship between aquatic habitat and river flows . . . ?" The response was "PHABSIM analysis of aquatic habitat for eight fish species indicates that negative impacts on habitat due to the requested BBNPP water use are generally small and infrequent, and would not contribute to habitat-related population limitations." The Physical Habitat Simulation (PHABSIM) analysis is incomplete, as it does not focus on the area of the river where impacts to aquatic life are most likely to occur, specifically the island and riffle area between transects G2 and R1. The Commission requires additional PHABSIM analysis of this stretch of the river, similar to the analysis submitted in an e-mail from Gary Petrewski, dated May 19, 2011.

   Additionally, to more accurately assess the relationship between aquatic habitat and river flows, the study should focus on low flows in the range of Q7-10 and 20 percent average daily flow (ADF). Unlike most Instream Flow Incremental Methodology (IFIM) studies that typically analyze a broader range of flow regimes based on hydroelectric power operations, the purpose of the BBNPP study is to address impacts on aquatic life at low flows to determine an appropriate passby requirement,

and it may provide information useful in establishing a requirement for mitigation makeup water for the consumptive water use at BBNPP.

Lastly, the Commission notes that several aquatic studies have not been completed, and studies that have been completed have not been reviewed and accepted by the Commission, which renders the statement, "negative impacts on habitat due to the requested BBNPP water use are small and infrequent . . .", premature and cannot be fully evaluated at this time. Comments on the studies that have been submitted must be resolved and other agreed upon studies, including the 2D flow analysis and Mussel Survey, need to be completed, reviewed, and accepted before valid conclusions about the impacts on aquatic life can be drawn.

2. In Section 1, the summary related to the impact of reduced river flow and stage on smallmouth bass indicates, "Once water temperatures consistently exceed 84-85°F, juveniles migrate from the shoreline backwater habitat into deeper river water." This statement is not supported by the study presented in Section 5. The study does not adequately evaluate if the juvenile bass are migrating at a smaller size due to water temperature, and if their natural preference would be to remain in these areas longer to achieve a larger size and thereby reduce predation pressure.

3. In Section 2, second paragraph, the conclusion that there is no negative impact on 7 of 23 species and life stage combinations may not be supported pending final review of the study. For example, historical flows in that section of the river have been considerably lower than the low flow of 800 cubic feet per second (cfs) in the study, and therefore, the conclusion cannot be made without some qualification. Absent an analysis on flows less than 800 cfs, the Commission could not support a passby flow requirement at less than this amount.

   On pages 12 and 13, a paragraph should be added to discuss the margin of error for this IFIM study. There are areas of statistical analysis within the study where errors may be introduced, particularly extrapolation of flows at BBNPP from the Wilkes-Barre stream gage and in the extrapolation of various flows at each transect from one set of flow measurements. Other parameters in the study may also generate a margin of error. A better understanding of the study results will be provided by generating an overall margin of error for the study.

4. Figure 2-1 depicting the "Generalized IFIM sequence" does not show steps for consultation with stakeholders to determine goals of the study, and does not include a step for stakeholders to reach a consensus regarding study conclusions. Due to time constraints and the way the IFIM study was conducted, some of the consultative steps were skipped and had to be retrofitted. In any case, the steps are essential to producing a viable IFIM study and should be included on Figure 2-1.

5. In Section 2.4, for the two transects that were added "during an agency visit," further explanation is needed to demonstrate what data were collected at what flow and how those data were extrapolated to other flows.

6. In Section 2.5, the daily discharge data from 1899 to 2010 cover too large a time frame and dampen impact from development in the watershed. We recommend a period from 1960 to 2008 to develop the time series of daily river flow. Additionally, to adequately analyze low flows, scenarios should be developed using time series of daily river flow experience from 1999 to 2002.

   In addition, known upstream consumptive use should be used in the flow scenarios. For example, the Susquehanna Steam Electric Station (SSES) consumptive use is permitted at 48.000 million gallons per day (mgd). Another flow scenario should be developed subtracting the maximum daily BBNPP consumptive use and all the upstream consumptive use to the Wilkes-Barre gage, including the maximum SSES consumptive use less mitigation releases from Cowanesque Reservoir, from the adjusted flow at the Wilkes-Barre gage.

   In footnote 3 on page 21, what is the rationale for stating that these figures are conservative?

7. In Section 2.6, in addition to the data provided, a graphic of the Weighted Usable Area (WUA) results over time would add another level of analysis to help visualize the change in WUA during the course of the year and where problem areas could occur. This graphic should include current conditions and then the various scenarios.

   In the second paragraph, we agree that the slope of the curve is critical and the focus of the study is to analyze flows in consideration of a passby flow requirement. Accordingly, the x-axis on Figure 2-6 should display lower flows in the Q7-10 to 20 percent ADF range. This will provide better visualization of WUA at the lower flows. In addition, timing and duration of low flows are also critical and, as requested above, WUA plotted against time for each species and life stage would provide data for more specific analysis.

   On page 24, first full paragraph, the Commission regards the relationship between WUA and higher flows to be irrelevant for the purpose of analyzing the need for a passby flow requirement and/or mitigation of the BBNPP consumptive use of water. Although the PHABSIM model shows reduced WUA at higher flows, other factors such as water temperature and dissolved oxygen levels are less critical to aquatic life at high flows. The high flows may temporarily displace some species as they seek more suitable habitat; however, any mortality due to temporary loss of habitat is natural and cannot be attributed to consumptive use of water by BBNPP. At low flows, the consumptive use of water by BBNPP does negatively impact WUA, as well as water temperature and dissolved oxygen, which is the rationale for the study

to focus on low river flows. The above statement also applies to the second to last paragraph of page 29.

In addition, the fifth sentence of the first full paragraph on page 24, the statement that, ". . . any flow reduction due to BBNPP consumptive use can never have a negative effect on the available suitable habitat" cannot be supported because flows less than 800 cfs were not evaluated. Absent analysis focused on flows less than 800 cfs, the Commission will follow established policy and require a passby flow at the Q7-10 river flow or higher.

8. In Section 2.7, the riffle areas within the study area are the areas of most concern, and an analysis of WUA for those areas is essential to fully evaluate any potential effects due to consumptive use at BBNPP. The PHABSIM analysis is incomplete and does not include an analysis on the area of the river where impacts to aquatic life are most likely to occur: the island and riffle area between transects G2 and R1. Further analysis is required that provides the proper focus on this reach of the river. The agreed upon 2D analysis may provide a better understanding of the dynamics of the river in this area.

   In the first paragraph of Section 2.7 on page 25, linear extrapolation to estimate daily WUA for flow values less than 800 cfs is inappropriate because at flows that low, the relationship between WUA and flow is curvilinear. A best-fit curvilinear formula should be used to extrapolate WUA values at flows less than 800 cfs.

   The depiction of WUA versus flow was normalized (nWUA); however, the Commission requires the raw numbers for each species and life stage to assess potential bottlenecks and overall scale of changes in an area for each species.

   In the second paragraph on page 28, the Commission acknowledges that the negative impact to WUA occurs primarily at low flows that may not occur frequently, and this is the relationship portrayed in the WUA versus percent time graphs. For some species and life stages like juvenile smallmouth bass, the low flows are coincident with higher temperatures and low dissolved oxygen. These conditions have been observed to cause mortality of juvenile smallmouth bass. In this case, the percent of time is not relevant; however, the length of time and magnitude of the negative impact on WUA is critical to the survival of the juvenile smallmouth bass. As requested above, a graph of WUA versus time would provide data for a more in-depth analysis.

   In the last paragraph on page 28, the Commission does not agree with the stated conclusion that there is no substantial difference in habitat availability when flows are reduced by BBNPP consumptive water use. Based on comments above, the analysis must be focused on low flows, appropriate sections of the river, and time of the year before reaching this conclusion.

On page 29, first full paragraph, a more robust assessment of WUA should be conducted in conjunction with seasonality constraints. The timing of the low flows makes a difference and analysis should be focused on each species and life cycle that coincides with low flow events.

9. In Section 2.8, conclusions resulting from the PHABSIM study are premature pending resolution of the above comments. The focus of the study should be on low flows, particularly in the riffle area of the river. Additionally, conclusions from the PHABSIM analysis should be integrated with the results of other studies on this section of the river. For example, analyses from Sections 4.0 and 5.0 should be incorporated to more fully assess potential changes in water temperature and dissolved oxygen levels and effects on fish species, especially those dependent on shallow water areas during the summer. Finally, two studies were not included in the JPA submission, the 2D analysis of the riffle area of the river and the Mussel Survey. The results of these studies also need to be integrated into conclusions of the impact of BBNPP on aquatic life.

   The above comment also applies to Section 7.0.

If you have any questions regarding the above, please contact Paula Ballaron at (717) 238-0423, extension 222.

Sincerely yours,

James L. Richenderfer, Ph.D., P.G.
Director, Technical Programs

cc: Gary Petrewski; PPL
Michael Canova; USNRC
Stacey Imboden; USNRC
Amy Elliott; USACE, Baltimore District
Susan Weaver; PADEP
Eugene Trowbridge; PADEP
Mark Hartle; PFBC
Tom Shervinskie; PFBC
Jennifer Kagel; USFWS
Larry Miller; USFWS
Jamie Davis; USEPA

ATTACHMENT 2

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Susquehanna River Basin Commission

a water management agency serving the Susquehanna River Watershed

December 21, 2011

Mr. Michael J. Caverly
VP-Financial Nuclear Development
PPL Bell Bend, LLC
Two North Ninth Street
Allentown, PA 18101

Re: Bell Bend Nuclear Power Plant; BNP-2011-126;
Project Response Status and Filing of Joint Permit Application;
Salem Township, Luzerne County, Pennsylvania

Dear Mr. Caverly:

Susquehanna River Basin Commission (Commission) staff has reviewed the "Project Response Status and Filing of Joint Permit Application" for the Bell Bend Nuclear Power Plant (BBNPP) submitted in the referenced correspondence. Our comments below pertain to the Joint Permit Application (JPA) Binder 3, Appendix B, Section 7, Subsections 3, 4, 5, and 6. Additionally, responses to other sections of Enclosure 1 to BNP-2011-126, Response Summary and JPA Cross-Reference, will be under separate cover.

1. In Section 3, the response provided in BNP-2011-071 was sufficient to satisfy the Commission regarding dilution of acid mine drainage from Nescopeck Creek.

2. In Section 4.3, first paragraph, there is a statement that the CORMIX model has no calibration parameters. The Commission is concerned that the CORMIX model does not accurately model the heated effluent from the Susquehanna Steam Electric Station (SSES) diffuser. As noted in Table 4-2, there is significant discrepancy between the observed distance to the 0.5°F isotherm and the distance to the 0.5°F isotherm computed by the CORMIX model. This comment was previously transmitted in a letter dated September 23, 2011. A sensitivity analysis should be performed to assess the potential plume dimensions using a range of input parameters and environmental conditions (depth, velocity). This section should include a description of how the difference in modeled/observed results were applied to the scenario simulations in Section 4.5 (Thermal Plume Size and Configuration Estimates).

   In the third paragraph, the plume edges were defined by one standard deviation from the centerline. The Commission questions this assumption based on the configuration of the diffuser, which is 120 feet long with 72 ports. Additionally, the data set used for the standard deviation calculation should be described.

The Commission will correlate our response to BNP-2011-202, dated October 31, 2011, regarding the CORMIX model, pending resolution of the above comment.

3. In Section 4.4, the Commission considers summer low flow conditions to be the most critical because they represent flows in the range where a passby flow is most likely to be required. In Table 4-3, we question the water temperatures in the summer low flow scenario. Based on the sonde temperature recordings in Section 5.0, the 62.3°F water temperature for the Susquehanna River and the 62.4°F temperature for the SSES blowdown are inappropriately low. The summer low flow scenario should be based on worst case, most likely in the July to August time frame, and the temperatures should be peak temperatures which are over 90°F as indicated by the sonde measurements in Section 5.0. Additionally, we question the blowdown flow rate and blowdown temperature attributed to BBNPP as measured on September 23, 2004. For BBNPP, the calculated peak values should be used. The SSES blowdown flow rate for the summer low flow scenario should not be the December mean, as listed in Table 4-3. The peak summer blowdown should be used. It appears as though the information in the table is reversed for SSES blowdown temperature. The inputs to the model should be verified for correctness and the model input/output should be provided. The Commission requires Tables 4-3 and 4-4 be revised based on resolution of the above comments.

4. In Section 4.5, Figures 4-10 and 4-11 should be revised to add a 0.5°F isosurface to more fully depict the thermal plume from the blowdown effluent.

5. In Section 4.6, the Commission considers summer low flow conditions to be the most critical with regard to potential impacts; therefore, the summer low flow end of the near field should be used for dissolved oxygen (DO) calculations.

6. In Section 4.7, Figure 4-13, the vertical axis is labeled Fahrenheit; however, the values appear to be Celsius.

7. In Section 5, the design of the study does not allow for full evaluation of the objectives outlined in this section and in Section 9 of the Aquatic Impact Studies Workplan transmitted by BNP-2010-103, dated April 29, 2010. The location of the sondes, the defined critical period for young-of-year (YOY) smallmouth bass (SMB), and the use of different temperature and DO concentrations in the analysis should relate directly to the purpose of the study. As noted below, the Commission requires additional study before modification of our standard passby flow guidance can be considered.

   The stated purpose of the study was to evaluate whether stressful water quality conditions occurred in 2010 in microhabitats and main channel habitats during the critical period for juvenile SMB, and to assess if consumptive water use may exacerbate these conditions in microhabitats concomitant with depth changes. Juvenile SMB spend the first 2 to 3 months in backwater microhabitats where they may be stressed by high temperatures and low DO leading to infection by the

bacterium *Flavobacterium columnare* as reported by Chaplin et al. (2009). Adult fish in main channel habitats do not appear to be affected by the bacterium, likely due to the availability of more favorable water quality during the summer (typically cooler and better oxygenated); therefore, it is not clear why main channel habitats were evaluated since YOY SMB do not use these areas during the critical period. Evaluation of additional backwater or shoreline habitats where YOY SMB have been observed would have yielded more data from these more critical habitats.

The critical period for YOY SMB is defined in the current study differently than in Chaplin et al. (2009). Based on the life history of SMB in the Susquehanna River, the critical period for YOY SMB (the first 2 to 3 months after swim-up) was estimated as May 1 through July 31 (Chaplin et al.; 2009), while the current study evaluated the critical period as July 1 through September 30. The rationale for the use of this time period is not provided, and it is likely YOY SMB move from the microhabitats in August.

Reference to temperature and DO concentrations that may be stressful to YOY SMB are given as greater than 84°F and less than 5.0 milligrams per liter (mg/L) in Section 5.1, although temperatures greater than 87°F and DO less than 4.0 mg/L are evaluated throughout the rest of the study. Regardless of Pennsylvania Department of Environmental Protection (PADEP) water quality criteria, temperature and DO concentrations that are critical to YOY SMB survival should be evaluated to understand the potential for stressed and diseased fish.

8. In Section 5.1, last sentence, it is important to note that at low flows in the Q7-10 range, many areas of the river become characterized as backwater or shallow shoreline because of the damming effect of emerging rock strata, reduced flow, and reduced water depths. The Commission requires a more rigorous review of the study area to determine the size and location of these backwater areas during low flow conditions. This determination will help assess the magnitude of the potential impact to YOY SMB caused by reduced flow due to BBNPP consumption.

9. In Section 5.2, Table 5-1, details should be provided to indicate if these temperatures are daily averages or an instantaneous maximum limit.

10. In Section 5.3, the statement that BBNPP consumptive water use is "approximately 1% of the average flow" is not relevant. At the Q7-10 flow of 843 cubic feet per second (cfs), the BBNPP consumptive use of 43 cfs constitutes approximately 5.1% of the river flow individually, and much greater when considered cumulatively with other known consumptive uses upstream.

    In Section 5.3, first paragraph, the primary objective is stated in the last sentence; however, it would be more appropriate to include in Section 5.1. It should not be limited to backwater areas, but also include shoreline areas where flows and depths are lower and use by YOY SMB has been documented.

On page 67, the analytical approach presented, increased duration of potential exposure, is not comprehensive. Data from more than 2 years must be analyzed to draw valid conclusions regarding the increased duration of potential exposure. Periods of low flow, such as the early 2000's and mid-1960's, should also be analyzed to assess the impact. Additionally, analysis is required for the time period from July 1 through September 30, evaluating the increased magnitude of the impact, defined as temperature over 87°F and DO less than 4 mg/L, on YOY SMB caused by increased temperature and decreased DO resulting from BBNPP consumptive use. Additionally, a similar analysis should be performed using 84°F and 5 mg/L DO as limiting criteria to be consistent with Section 5.1 and the Chaplin et al. (2009) study. The sonde data presented in Sections 5.5.1 and 5.5.2 would indicate there are days that the additional 0.5°F will result in the maximum temperature for the day exceeding 87°F. Similarly, there are additional days that the DO is less than 4 mg/L because of the BBNPP consumptive use. Both effects will potentially increase stress on juvenile SMB. Finally, the period being analyzed should be expanded to include May and June to determine if there are impacts to SMB fry.

11. In Section 5.4, the two sondes located at the Environmental Lab are out of the study area and produce data that are not relevant to the purpose of the study. Similarly, the two sondes located at the Berwick Test Track Ramp are out of the study area and produce data that are not relevant to the study. Additionally, the data are not relevant because the flows in that area of the river do not meet the criteria of "backwater" defined in Section 5.1.

    In Section 5.4, second paragraph, using paired sondes in this study with one of the pair in deeper water does not address the objective of this study. Placing additional sondes in backwater or shoreline habitats would provide more relevant data. A location closer to the area of interest where YOY SMB have been observed in the past should be used, allowing for a more complete assessment of these microhabitats within this shallow water area of the river.

    In Section 5.4, fifth paragraph on page 70, the need for determining the relationship between the upstream and downstream locations has not been provided in the objectives and, therefore, the rationale for the upstream location and downstream location is not justified. To fully evaluate potential impacts of consumptive use on YOY SMB habitat, microhabitats primarily within the riffle portion of the study area where YOY SMB have been documented should be evaluated.

    On page 72, the Pennsylvania State Water Quality Criteria provides useful parameters for analysis; however, the purpose of the study is broader than meeting these criteria. The objective of the study, as defined in Section 5.1, is to analyze the impact of the consumptive use of water by BBNPP on juvenile SMB and SMB fry and, therefore, other parameters should be analyzed, such as those defined in the Chaplin et al. (2009) study.

On page 73, the analysis on Figure 5-6 indicates that water temperatures in 2010 were warmer than the historical average. The text should explain the data collection method and location(s) of the temperature recordings. To draw valid comparisons with the 1974 to 2009 time frame, the collection method and location should be consistent. Chaplin et al. (2009) indicates that a difference of 0.8°C in water temperature was noted in 2008 compared to the historical record (1974 to 1979), consistent with warming trends in other parts of the world. Based on this, the data from 2010 also should be compared to the more recent record (2006 to 2009). It should be noted that, if this indicates a warming trend, the impact of the BBNPP consumptive use on SMB in the future will be exacerbated because of the increased stress caused by natural conditions.

12. In Section 5.5, Table 5-5, the most extreme temperature and DO recordings were at Sonde #1 at Goose Island. Additional data should be obtained from similar areas in the study area to determine the extent and magnitude of the temperatures and DO levels.

In Section 5.5.1, first paragraph, because temperatures greater than 84°F were indicated as being stressful to YOY SMB in Section 5.1, this analysis should include the frequency of temperatures exceeding 84°F as well.

In Section 5.5.1, in the next to last sentence, what is the basis for the statement that the reduced 0.5-inch water level results in an approximate <0.5°F water temperature change?

In Section 5.5.1, in the last sentence, the statement, "These potential changes are small in comparison to natural diurnal T and DO changes." may be valid; however, the changes in temperature and DO caused by BBNPP consumptive water use will most likely cause the peak temperature in the diurnal cycle to be higher and the lowest DO level in the diurnal cycle to be lower, causing additional potential stress to YOY SMB. The incremental increase in extreme temperatures and incremental decrease in DO levels should be noted.

The temperature and DO data should be analyzed to determine any relationship with flow data. These data could then be used to assess the effect of a 43 cfs withdrawal on temperature and DO, especially in juvenile SMB habitat.

In Section 5.5.1, Figure 5-7, the figure on the bottom panel of page 76 needs to be resized to be consistent with the other graphs in this section.

In Section 5.5.2, because DO concentrations less than 5.0 mg/L were indicated as being stressful to YOY SMB in Section 5.1, this analysis should include the frequency of hourly observations below this concentration as well.

In Section 5.5.2, it should be noted that the lowest DO levels were recorded at Sonde #1 at Goose Island. As noted above, additional data are required to determine the extent and magnitude of the low DO levels.

In Section 5.5.2, Figure 5-10, the July period for Sondes #5 and #6 includes the number of observations above each bar. The other graphs in this section should be consistent with the format used for Sondes #5 and #6.

In Section 5.5.4, second paragraph, it is noted that YOY SMB vacated areas when temperatures exceeded 87°F occasionally in July, but more often in August. These observations support the critical period for evaluating YOY, which is identified by Chaplin et al. (2009) as May 1 through July 31. Additionally, the observations from the SMB chronology indicate YOY SMB were observed with fungus at water temperatures of 84°F and higher, indicating the need to evaluate this temperature range.

13. In Section 5.6, first paragraph, it appears that in areas where water temperature was approaching 90°F and SMB were not observed in early July, these fish may have moved out prematurely because the observations from the appendix indicate other backwater and shoreline areas that were slightly cooler still held YOY SMB. This warrants further consideration of the statement that fry had migrated to deeper river water since they had reached juvenile size.

    In Section 5.6, fourth paragraph, it is indicated that deviations in water temperature and DO from the Pennsylvania State Water Quality Criteria were of short duration and limited to shallow inshore locations. These shallow inshore locations are the critical habitats for YOY SMB that are of concern in this area. The fact that diseased and dying fish were observed indicates these were likely stressful conditions. This is understated in these conclusions.

    In Section 5.6, the statement in the fifth paragraph that "the incremental effect of the 43 cfs BBNPP consumptive water use, which showed no significant change or increase in the stressors." cannot be supported by the data collected and the analysis performed in this study. Chaplin et al. (2009) demonstrated that SMB in the Susquehanna River have been declining most likely due to the stressors noted in this study: increased temperatures and decreased DO. Additional study is required to determine the magnitude and extent of the effects of BBNPP consumptive water use on SMB. Backwater and shallow shoreline areas within the study area should be identified and sondes located appropriately to gather the required data. Four of the six sondes in this study, two at the Environmental Lab and two at the Berwick Test Track Ramp, were not located in the study area and, therefore, it is inappropriate to utilize these data to draw conclusions. Data are required from other backwater areas within the study area, such as the backwater areas in the Rocky Island vicinity.

14. In Section 6.1, the analysis of the impact of BBNPP consumptive water use on downstream users was based on Q7-10 flows. Because flows less than Q7-10 were

not analyzed, the Commission cannot accept a passby flow requirement less than Q7-10.

In Table 6-1, two downstream water users are listed, Cherokee Pharmaceuticals withdrawing 34.392 million gallons per day (mgd) and Danville Municipal Authority withdrawing 2.000 mgd on average, indicating the potential BBNPP consumptive use to impact their operations. These evaluations must be completed before conclusions can be drawn regarding the impact of BBNPP consumptive use on downstream users.

In Table 6-2, for four of the seven downstream dischargers listed in the table, the impact of BBNPP consumptive water use is indeterminate. The analyses on these downstream dischargers must be complete before conclusions can be drawn regarding the impact of BBNPP consumptive water use on their operations. In some cases, as noted, the analysis should include input from PADEP.

The Commission recognizes that PPL Bell Bend, LLC (PPL) does not control actions or inaction of the downstream users with regard to requests that they perform an impact analysis; however, the Commission does require a level of effort analysis by PPL to address the potential impacts of the consumptive use of water by BBNPP on the downstream users. Reporting on responses from the downstream users requires some analysis by PPL to assure that the responses are adequate. In Table 6-2, apparently some of the downstream operations that discharge water into the river have conferred with PADEP to assist with their internal analysis. This may be an option for PPL when analyzing these impacts.

If you have any questions regarding the above, please feel free to contact Paula Ballaron at (717) 238-0423, extension 222.

Sincerely yours,

James L. Richenderfer, Ph.D., P.G.
Director, Technical Programs

cc: Gary Petrewski; PPL
Michael Canova; USNRC
Patricia Vokoun; USNRC
Amy Elliott; USACE, Baltimore District
Susan Weaver; PADEP
Eugene Trowbridge; PADEP
Mark Hartle; PFBC
Tom Shervinskie; PFBC
Jennifer Kagel; USFWS
Larry Miller; USFWS
Jamie Davis; USEPA

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