TVA

Tennessee Valley Authority, 1101 Market Street, Chattanooga, Tennessee 37402

June 13, 2013

10 CFR 50.4
10 CFR 50.90

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Watts Bar Nuclear Plant Unit 1
Facility Operating License No. NPF-90
NRC Docket No. 50-390

Subject: **Response to NRC Request for Additional Information Related to License Amendment Request to Updated Final Safety Analysis Report Changes Associated with Hydrologic Analysis (TAC No. ME9130)**

References:

1. Letter from TVA to NRC, "Application to Revise Watts Bar Nuclear Plant Unit 1 Updated Final Safety Analysis Report Regarding Changes to Hydrologic Analysis (WBN-UFSAR-12-01)" dated July 19, 2012 (ADAMS Accession No. ML12236A167).

2. Letter from TVA to NRC, "Supplement to Application to Revise Watts Bar Nuclear Plant Unit 1 Updated Final Safety Analysis Report Regarding Changes to Hydrologic Analysis (WBN-UFSAR-12-01)," dated March 1, 2013 (ADAMS Accession No. ML13067A393).

3. Letter from NRC to TVA, "Watts Bar Nuclear Station, Unit 1 - Request for Additional Information Related to License Amendment Request to Updated Final Safety Analysis Report Changes Associated with Hydrologic Analysis from Balance-of-Plant Branch (TAC No. ME9130)," dated May 14, 2013 (ADAMS Accession No. ML13127A168).

By letter dated July 19, 2012 (Reference 1), and supplemented by letter dated March 1, 2013 (Reference 2), the Tennessee Valley Authority (TVA) submitted a License Amendment Request (LAR) to the Facility Operating License No. NPF-90 for the Watts Bar Nuclear Plant (WBN), Unit 1. The LAR proposed to revise the WBN, Unit 1, Updated Final Safety Analysis Report (UFSAR) to reflect the results from new hydrologic analysis. The proposed changes are consistent with the latest approved hydrology calculations.

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By letter dated May 14, 2013 (Reference 3), the Nuclear Regulatory Commission (NRC) forwarded a request for additional information (RAI) originating from the NRC Balance-of-Plant Branch (SBPB). The response to the RAI is due 30 days from its date of issuance, or June 13, 2013.

Enclosure 1 to this letter provides TVA's responses to this RAI. There are no changes required to the LAR as submitted in the Reference 1 letter and supplemented in the Reference 2 letter as a result of this additional information. Consistent with the standards set forth in 10 CFR 50.92(c), TVA has determined that the additional information as provided in this letter does not affect the no significant hazards considerations associated with the proposed amendment previously provided in Reference 1. TVA has further determined that the proposed amendment still qualifies for a categorical exclusion from environmental review pursuant to the provisions of 10 CFR 51.22(c)(9). Additionally, in accordance with 10 CFR 50.91(b)(1), TVA is sending a copy of this letter, the enclosures, and the attachments to the Tennessee Department of Environment and Conservation.

There are no new regulatory commitments included in this submittal. Please address any questions regarding this submittal to Ed Schrull at (423) 751-3850.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 13th day of June 2013.

Respectfully,

J.W. Shea
Vice President, Nuclear Licensing

Enclosure:

1. Response to NRC Balance-of-Plant Branch (SBPB) Request for Additional Information (RAI)

cc (Enclosure):

NRC Regional Administrator - Region II
NRC Senior Resident Inspector – Watts Bar Nuclear Plant, Unit 1
Director, Division of Radiological Health, Tennessee State Department of Environment and Conservation

ENCLOSURE 1

TENNESSEE VALLEY AUTHORITY
WATTS BAR NUCLEAR PLANT UNIT 1

RESPONSE TO NRC BALANCE-OF-PLANT BRANCH (SBPB) REQUEST FOR ADDITIONAL INFORMATION (RAI)

By letter dated July 19, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML 122360173), the Tennessee Valley Authority (TVA), submitted a license amendment request to revise the Watts Bar Nuclear Plant (WBN), Unit 1 Updated Final Safety Analysis Report (UFSAR) to reflect the results from new hydrologic analysis. These proposed changes are consistent with the latest approved hydrology calculations. The proposed changes in the updated hydrologic analysis include updated input information, and updates to methodology that include the use of the U.S. Army Corps of Engineers Hydrologic Modeling System and River Analysis System software. By a letter dated March 1, 2013 (ADAMS Accession No. ML 13067A393), TVA supplemented the submittal with additional information. In order to complete its review of the above documents, the U.S. Nuclear Regulatory Commission staff requests the following additional information originating from our Balance-of-Plant Branch (SBPB):

1.0 SBPB RAI Question 1

Section 2.4, "Hydrological Engineering" under 2.1 "Proposed Changes" states that adding information regarding coincident wind wave activity results in up to an additional 2.5 feet (ft) for determining the Design Basis Flood (DBF) elevations. *Flood Design Considerations,* under Section 2.1 states, in part, that this change proposes to update coincident wind wave activity that results in up to an additional 2.5 ft for determining the DBF elevations.

However, the existing WBN Unit 1 UFSAR marked-up text provided to show the proposed changes states, under Sections 2.4, "Hydrologic Engineering" and 2.4.2.2, "Flood Design Consideration," that coincident wind wave activity results in wind waves of up to 2.2 ft (crest to trough).

Please clarify what is the actual coincident wind wave activity for determining the DBF elevations.

1.1 TVA Response - SBPB RAI Question 1

Section 2.1, "Proposed Changes" states that up to an additional 2.5 ft is used for determining the design basis flood (DBF) elevations. This additional allowance is the calculated wave runup and wind setup value added to the probable maximum flood (PMF) elevation to determine the DBF level on the approaching slopes or walls of the various critical structures, and is different than the calculated wave heights (e.g., 2.2 ft (crest to trough)) that would be experienced on the corresponding approaching slopes or walls. In this case, the highest calculated wave runup and wind setup value on the site is for the Intake Pumping Structure consisting of 2.4 ft and 0.1 ft, respectively (for a total of 2.5 ft added to the PMF level). This DBF level is calculated based upon a maximum wave height of 2.2 ft (crest to trough) that would be experienced for the Intake Pumping Station at PMF level and maximum assumed winds. The maximum wave heights, significant wave heights, and wave periods are used as input to the calculation of wave runup, as further described for each critical structure below.

Therefore, the reference to "wind waves of up to 2.2 ft (crest to trough)" is different than the reference to "coincident wind wave activity that results in up to an additional 2.5 ft for determining the DBF elevations."

As described in WBN Unit 1 UFSAR Subsection 2.4.3.6, determination of DBF elevations requires consideration of a calculated coincident wind wave activity based upon a 21 mph overland wind, which results in a maximum wave height of 2.2 ft (crest to trough). The maximum wave height (Hmax) value is the average of the highest one percent of waves in the representative wave spectrum. Based upon the maximum wave height approaching the slopes or walls of the critical structures, and the location of the critical structures including surrounding topography, a wave runup is calculated. The DBF levels include the summation of the resulting PMF, the calculated wave runup, and the calculated wind setup. The DBF levels vary and are calculated for impact on various critical structures.

As described in WBN Unit 1 UFSAR Subsection 2.4.3.6, for the Intake Pumping Structure, the maximum wave height would be 2.2 ft and the significant wave height would be 1.3 ft, with a corresponding wave period of 2.3 seconds. For the critical west face, the maximum wave height would be 1.9 ft high, and the significant wave height would be 1.1 ft high. The corresponding wave period is 2.1 seconds. As described in WBN Unit 1 UFSAR Subsection 2.4.2.2, the updated DBF elevation for the Intake Pumping Structure (south and east faces) is elevation 741.7 ft. The DBF elevation includes an additional 2.5 ft above the PMF level, which includes the calculated wave runup of 2.4 ft plus the calculated wind setup of 0.1 ft.

As described in WBN Unit 1 UFSAR Subsection 2.4.3.6, the coincident wind wave activity for the Diesel Generator Building, the maximum wave height would be 1.7 ft high, crest to trough, and the significant wave height would be 1.0 ft high, crest to trough. The corresponding wave period is 2.0 seconds. Runup at the Diesel Generator Building is maintained on the slopes approaching the structure and is below all access points to the building. As described in WBN Unit 1 UFSAR Subsection 2.4.2.2, the updated DBF elevation for the Diesel Generator Building is 741.6 ft, which is 0.4 ft below the Diesel Generator Building operating floor elevation of 742.0 ft. The DBF elevation includes an additional 2.4 ft above the PMF level, which includes the calculated wave runup of 2.3 ft plus the calculated wind setup of 0.1 ft.

As described in WBN Unit 1 UFSAR Subsection 2.4.3.6, the maximum wave height approaching the Auxiliary, Control, and Shield Buildings would be 1.5 ft high, and the significant wave height would be 0.9 ft high. The corresponding wave period is 1.9 seconds. The wave runup on the walls of the Auxiliary, Control, and Shield Buildings is 1.7 ft and reaches elevation 741.0 ft, including wind setup. However, this is the external flood level used as a basis for determining the structural capability of the Auxiliary, Control, and Shield Buildings. The Auxiliary and Control Buildings will flood with the water level at elevation 729.0 ft. As stated in WBN Unit 1 UFSAR Subsection 2.4.14.1, the DBF surge level inside the Auxiliary Building is elevation 739.7 ft, or 0.5 ft above PMF.

2.0 SBPB RAI Question 2

Section 2.4.14, "Flooding Protection Requirements" under Section 3.0, "Technical Evaluation" states in part that the Essential Raw Cooling Water strainers and support equipment are located on elevation 722.0 ft of the Intake Pumping Station (IPS), connected to elevation 741.0 ft via stairwells and doors W001 and W002 at elevation 741.0 ft. These doors both have 0.5 ft concrete berms at the opening to elevation 741.0 ft and as a result of the proposed change, a compensatory measure of staged sandbags to be constructed into a berm at any time prior to or during the event of a Stage I flood warning has been implemented. These sandbags will be constructed into a berm at least 12 inches in height to prevent water intrusion to elevation 722.0 ft.

Please provide additional information to provide assurance that this compensatory measure will prevent water intrusion to elevation 722.0 ft.

a) Is this compensatory measure already in place?

b) If constructed during the event of a Stage I flood warning, where will the sandbags be pre-staged?

c) How long will it take to construct this berm of at least 12 inches in height?

d) Will this operation interfere with any other activities during the Stage I flood warning preparations?

e) Will this action be specified in a controlled procedure?

2.1 TVA Response - SBPB RAI Question 2

a) The compensatory measure is staged for implementation under existing Maintenance Instruction 0-MI-17.004 "Movement of Equipment, Flood Mode Preparation," as discussed in Item b) below.

b) The compensatory measure utilizing sandbags at the Intake Pumping Structure is staged for implementation upon a Stage I Flood Warning. The sandbags are physically staged inside two metal gang boxes on the Raw Cooling Water pump deck exterior of the Intake Pumping Station structure on elevation 728 ft.

c) During Stage I and Stage II Flood Warning preparations, three-man maintenance teams are assigned to dedicated activities. Five such teams are reasonably assumed to be available during a flooding event. One of these three-man teams would be directed to install the sandbags. The sandbag structure being built is not complex. It must be a minimum of 1 ft high and approximately 6 ft in length. The sandbags are approximately 40 pounds and installation will require approximately 1-1/2 hour including travel time. The manpower complement and completion of task to construct the sandbag berm were included in the NTTF 2.3 Flood Walkdown activity performed at WBN as described in Item d) below.

d) The activity of the compensatory measure utilizing sandbags at the Intake Pumping Structure will not interfere with other activities.

e) The action to install the sandbags is controlled in 0-MI-17.004 Section 6.6. This procedure is implemented at the direction of the Shift Manager under Abnormal Operating Instruction AOI-7.01, "Maximum Probable Flood," during flood preparation.

3.0 SBPB RAI Question 3

Section 2.4.14, "Flooding Protection Requirements" under Section 3.0, "Technical Evaluation" states, in part, that temporary compensatory measures are in place to ensure adequate flood protection and permanent plant modifications are planned to restore or gain additional margin between the revised DBF elevations and limiting safety-related Systems, Structures, and Components (SSCs) in the Auxiliary Building. Specifically, a limiting safety-related component required to be available during a plant flood affected by the increase in DBF elevations is the Thermal Barrier Booster (TBB) Pump Motors.

a) The temporary flood protection barrier for the TBB pump motors will provide approximately 0.8 ft of margin above the DBF surge level. Please provide justification to provide assurance that this margin will be adequate for flood protection.

b) Please provided *[sic]* a diagram of temporary flood protection barriers for TBB pump motors.

c) What other limiting safety-related SSCs required to be available during a plant flood are in the Auxiliary Building? What compensatory measures are planned for these limiting safety-related SSCs, if any?

3.1 TVA Response - SBPB RAI Question 3

a) The temporary flood protection barrier for the TBB Pump motors has been replaced by a permanent flood protection barrier as of March 29, 2013, as discussed in detail in the letter from TVA to NRC, "Completion of Commitments Related to Updated Hydrologic Analysis Results for Sequoyah Nuclear Plant Units 1 and 2 and Watts Bar Nuclear Plant Unit 1 (TAC Nos. ME8805, ME8806, and ME8807)," dated April 29, 2013 (ADAMS Accession No. ML13126A101). The permanent plant modification includes a two foot margin, so the minimum elevation at the top of the barrier is designed to be approximately 741.7 ft. Survey elevations of the permanent flood protection barrier are documented and verify that the required design margin of the as-constructed permanent flood protection barrier is met.

b) The temporary flood protection barrier for the TBB Pump motors has been replaced by a permanent flood protection barrier. Drawings of the permanent flood protection barrier constructed around the WBN Unit 1 TBB Pumps, including additional details of the permanent flood protection barrier, are provided in the letter from TVA to NRC, "Completion of Commitments Related to Updated Hydrologic Analysis Results for Sequoyah Nuclear Plant Units 1 and 2 and Watts Bar Nuclear Plant Unit 1 (TAC Nos. ME8805, ME8806, and ME8807)," dated April 29, 2013 (ADAMS Accession No. ML13126A101).

c) Plant design guide WB-DC-40-29 R11 "Flood Protection Provisions" contains a listing of components located in the Auxiliary Building required to be operable during a plant flood. The other components potentially affected by the updated DBF surge level in the Auxiliary Building include the Spent Fuel Pit Cooling (SFPC) Pumps motors, the SFPC Skimmer Pump motor, and the WBN Unit 1 chilled water circulating pump motors for the Main Control Room (MCR) Chillers and the 6.9kV Shutdown Board Room (SDBR) Chillers located on Auxiliary Building floor elevation 737.0 ft, and ancillary equipment.

   A permanent flood protection barrier around the WBN Unit 1 SFPC Pumps B-B, Pump A-A, and Pump C-S motors (0-MTR-78-9-B, 0-MTR-78-12-A, and 0-MTR-78-35-S) and the SFPC Skimmer pump motor (0-MTR-78-1) was completed on March 29, 2013. Drawings of the permanent flood protection barrier constructed around the WBN Unit 1 SFPC and SFPC Skimmer Pumps, including additional details of the permanent flood protection barrier, are provided in the letter from TVA to NRC, "Completion of Commitments Related to Updated Hydrologic Analysis Results for Sequoyah Nuclear Plant Units 1 and 2 and Watts Bar Nuclear Plant Unit 1 (TAC Nos. ME8805, ME8806, and ME8807)," dated April 29, 2013 (ADAMS Accession No. ML13126A101).

   Permanent flood protection barriers have also been installed for the MCR and SDBR Chillers, and ancillary equipment, located on Auxiliary Building floor elevation 737.0 ft, to provide protection for these components up to the DBF surge elevation within the Auxiliary Building (739.7 ft). Details of the permanent flood protection barriers, and other flood are provided in the letter from TVA to NRC, "Supplement to Application to Revise Watts Bar Nuclear Plant Unit 1 Updated Final Safety Analysis Report Regarding Changes to Hydrologic Analysis (WBN-UFSAR-12-01)," dated March 1, 2013 (ADAMS Accession No. ML13067A393). In addition to these flood protection barriers, Abnormal Operating Instruction AOI-7.11 "Flood Mode Establishment of Shutdown and Electric Board Room Ventilation" provides an alternate means of cooling if normal cooling is lost during a plant flood.

4.0 SBPB RAI Question 4

Section 3.3, "Margins" states that the Spent Fuel Pit Cooling Pump (SFPCP) motors have a reduced new margin of approximately 0.7 ft between the DBF surge level and the base of the motors and that a permanent plant modification will provide additional flood protection margin with respect to the DBF level.

a) Where and at what elevation are the SFPCP motors located and what is the DBF surge level at this location?

b) What is the desired flood protection margin with respect to the DBF level?

4.1 TVA Response - SBPB RAI Question 4

a) The SFPC Pump motors are located at elevation 740.6 ft. The DBF surge level inside the Auxiliary Building is elevation 739.7 ft.

b) Two feet above the DBF surge level is the desired minimum flood protection margin for the SFPC Pump motors. The completed modification for a permanent flood protection barrier around the SFPC Pumps as discussed in the response to SBPB RAI Question 3 item c provides this minimum design margin of two feet above the DBF surge level of 739.7 ft, or 741.7 ft. Therefore, adequate flood protection margin exists to protect the SFPC Pump motors.

5.0 SBPB RAI Question 5

In Section 2.4.1 "hydrological *[sic]* Description," under "Flood Design Considerations" states that the change proposed increases the DBF including wind wave run up during the Probable Maximum Flood to elevation 741.6 ft, which is 0.4 ft below the Diesel Generator Building operating floor elevation of 742.0 ft.

Section 2.4.14, "Flooding Protection Requirements," states that to restore margin for the TBB pump motors, a temporary flood protection barrier has been designed to be installed around the TBB pump motors. This barrier encompasses the TBB pump motors providing approximately 0.8 ft of margin above the DBF surge level.

Section 3.3, "Margins," states, in part, that the SFPCP Motors have a reduced new margin of approximately 0.7 ft between the DBF surge level and the base of the motors and TVA committed to installing a permanent plant modification to provide additional flood protection margin with respect to the DBF level for the WBN, Unit 1 SFPCP Motors by March 31, 2013 (ADAMS Accession No. ML 12171A053).

a) The SFPCP motors have a margin of 0.7 ft and the licensee committed to provide additional flood protection margin. However, the diesel generator building has a margin below 0.7 ft, (specifically 0.4 ft), and the TBB pump motor has a new margin slightly above 0.7 ft, (specifically 0.8 ft), and no other actions are planned to increase the flood protection for these components. Please explain the criteria to determine how much flood protection margin is adequate for each limiting safety-related component required to be available during a plant flood event.

5.1 TVA Response - SBPB RAI Question 5

a) Currently, both the TBB Pumps and SFPC Pumps have permanent flood barriers that provide a margin of two feet above the DBF surge level. Therefore, these components are adequately protected from an external flood event.

   Previously, at the time that the Near-Term Task Force (NTTF) 2.3 flooding walkdowns were conducted at WBN, these and other limiting safety-related components were evaluated in accordance with TVA procedures and guidance from Nuclear Energy Institute (NEI) 12-07, "Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features." NEI 12-07, Section 3.13, defines the term "available physical margin" (APM) for each applicable flood protection feature as the difference between the licensing basis flood height and the flood height at which water could affect a system, structure, or component important to safety. NEI 12-07, Section 5.8 states that if the physical margin of a flood protection feature appears to be small (a plant specific judgment) and the consequences of flooding at that location appear to be significant (loss of a safety function), the condition should be entered into the corrective action program.

The DBF level at the Diesel Generator Building is 741.6 ft. The floor elevation of the Diesel Generator Building is 742.0 ft. This yields a margin of 0.4 ft. In conformance with the guidance in NEI 12-07 Section 5.8, TVA entered the low APM for the Diesel Generator Building into the corrective action program. The corrective actions to address the low APM are underway. As part of the corrective action plan development, it has been determined that a loss of safety function is possible if the APM is exceeded as the seven day fuel oil tanks would be susceptible to the effects of flooding because the path of inleakage to damage this equipment is through the penetrations located at elevation 742 ft. Therefore, additional interim protection or mitigation measures are being developed, and implementation of mitigating measures if determined necessary are being tracked to completion by the corrective action program.

6.0 SBPB RAI Question 6

Section 2.4.14, "Flooding Protection Requirements" under Section 3.0, "Technical Evaluation" states that the critical elevation of flood-sensitive equipment located on elevation 722.0 ft is approximately 18 inches above the floor elevation. However, Section 3.3, "Margins" states that the critical elevation of flood-sensitive equipment located on elevation 722.0 ft is approximately 7 ft above the floor elevation.

Please explain the nature of the discrepancy between these two elevations noted for the flood-sensitive equipment in the IPS structure.

6.1 TVA Response - SBPB RAI Question 6

The correct elevation is approximately 18 inches above the 722.0 ft floor elevation. Although most of the flood-sensitive equipment in the Intake Pumping Station Mechanical Equipment Rooms is located 7 ft or more above the 722.0 ft floor elevation, the essential raw cooing water (ERCW) traveling water screen stop/start pressure switches are located on a local panel approximately 18 inches above the 722.0 ft floor elevation as confirmed during the NTTF 2.3 flooding walkdowns that were conducted at WBN.

ENCLOSURE 1

RESPONSE TO NRC BALANCE-OF-PLANT BRANCH (SBPB) REQUEST FOR ADDITIONAL INFORMATION (RAI)

7.0 SBPB RAI Question 7

Enclosure 1 of the March 1, 2013, supplement, under "Detailed Description and Technical Evaluation" states that transient analyses were performed for the loss of Main Control Room (MCR) and Shutdown Board (SDBR) heating ventilation and air condition (HVAC) in wintertime conditions to determine the maximum temperatures achieved and temperature profiles for the MCR and SDBR, as well as for the auxiliary control room, auxiliary instrument rooms, and the battery board rooms. The MCR HVAC transient analysis was run to determine the steady-state temperature in the MCR with a 50-percent reduction in lighting load applied. The MCR temperature under these conditions was used as an input boundary condition to the SDBR transient analysis since these areas share a common boundary and MCR cooling is lost in this scenario.

Enclosure 1 of the original application dated July 19, 2012, under "Probable Maximum Precipitation" states that there are two basic storm situations that have the potential to produce a maximum flood at WBN. These two situations are a sequence of storms during the month of March.

a) Please explain why the transient analyses were performed for the loss of MCR and SDBR HVAC during wintertime as opposed to spring (sequence of March storms) or summertime (higher outside temperatures).

b) Are the maximum temperatures for the SDBRs, MCR, auxiliary control room, auxiliary instrument rooms and battery board room higher/lower or the same, during any of the other seasons of the year?

7.1 TVA Response - SBPB RAI Question 7

a) There are two basic "seasons" when considering storm scenarios: winter and summer. The winter season is considered to occur between October 1 and April 15. The summer season is considered to occur between April 16 and September 30. Most floods at WBN, however, have been produced by winter-type storms in the main flood-season months of January through early April (Reference UFSAR Subsections 2.4.1.2 and 2.4.14.9.5).

   The transient analysis referenced in Enclosure 1 of the March 1, 2013, supplement was performed and documented under the TVA corrective action program to determine the effect of the deficiency identified with possible flooding of the MCR and SDBR Chillers and ancillary equipment on operability. The supporting information for the transient analysis utilized an alternate analytical method in accordance with TVA procedures for determining PMF levels, utilizing the U.S. Army Corps of Engineers (USACE) River Analysis System (HEC-RAS) software to perform simulations for the 21,400 square mile downstream centered March storm event, the 7,980 square mile Bull Gap centered March storm event, and the 7,980 square mile Bull Gap centered June storm event. The 21,400 square mile March storm event was the controlling PMF case and the only case that would exceed the elevation of the most limiting MCR and SDBR components (MCR and SDBR chilled water circulating pump motors).

   The transient analysis also utilized Thermal Model Generator (TMG) simulations for both the MCR and the SDBR. The MCR model was revised to determine room temperatures which were then input to the SDBR model runs. Each model was executed for a 30-day duration with results checked to confirm that steady-state conditions were obtained. The base case, performed for both the MCR and SDBR heating ventilation and air conditioning (HVAC) TMG models, was based on outdoor temperatures for a PMF event beginning in April, at the end of the winter season and into the summer season. Based on data obtained for Athens, TN, for June, the maximum temperature used for the duration of the event was 88°F and the daily temperature swing used was 22°F. This temperature profile is conservative for this case because the maximum temperature is based on June average maximums while most of the event would occur during April and May.

b) Maximum temperatures during any other season of the year were not considered in the evaluation because it was an analysis to determine immediate operability for the MCR and SDBR systems, and the deficiency involving the possible flooding of the MCR and SDBR Chillers and ancillary equipment was identified in November 2012. The evaluation for operability conservatively assumed winter flood levels and conservative outdoor temperatures. Permanent modifications to the MCR and SDBR Chillers and ancillary equipment have been completed as described in the response to SBPB RAI Question 3. These modifications were completed in March 2013, restoring flood protection for the equipment for all flood scenarios during all seasons. The evaluation performed in the operability determination bounded the time period prior to these modifications being implemented. Therefore, there was no need to evaluate maximum temperatures during any other season of the year.

8.0 SBPB RAI Question 8

Enclosure 1 of the March 1, 2013, supplement under "Detailed Description and Technical Evaluation" states TVA is implementing plant modifications to provide a flood barrier around each of the MCR and SDBR chilled water circulating pumps and motors, and to protect the affected MCR and SDBR Chiller ancillary equipment from water intrusion, to provide flood protection up to the DBF level of 739.7 ft, ensuring they are able to perform as designed during and after a DBF event. These plant modifications will be installed by March 31, 2013.

Please provide diagram(s) for the planned plant modification to provide flood barrier around the MCR and SDBR chilled water circulating pumps and motors, and to protect the affected MCR and SDBR Chiller ancillary equipment from water intrusion.

8.1 TVA Response - SBPB RAI Question 8

Permanent flood protection barriers have been installed for the MCR and SDBR Chillers, and ancillary equipment, located on Auxiliary Building floor elevation 737.0 ft, to provide protection for these components up to the DBF surge elevation within the Auxiliary Building (739.7 ft). The drawings for the flood barrier around the MCR and SDBR chilled water circulating pump are provided in Attachment 1.

**RESPONSE TO NRC BALANCE-OF-PLANT BRANCH (SBPB)
REQUEST FOR ADDITIONAL INFORMATION (RAI)**

9.0 SBPB RAI Question 9

Enclosure 1 of the March 1, 2013, supplement under "Detailed Description and Technical Evaluation" states that each flood barrier around the respective chilled water circulating pump is a static structure rigidly attached to the concrete pump foundation that will resist the hydrostatic forces generated during a DBF event. ... The pumps are still accessible for maintenance.

It further states that access for maintenance on or replacement of the chilled water circulating pump motors will require removal and reinstallation of the associated flood barrier. Installation of the flood barriers will require additional Operator actions to be performed during Stage I and Stage II flood warning preparations in accordance with approved plant procedures.

a) Please clarify if the flood barrier will have to be removed in its entirety during maintenance, replacement, and installation of the submersible pump.

b) Will the flood barrier need to be removed for maintenance or replacement of the drain line manual valve?

c) What is the timeframe for removal and re-installation of the flood barrier during these activities?

9.1 TVA Response - SBPB RAI Question 9

a) No part of the flood barrier constructed around the MCR and SDBR chilled water circulating pumps would have to be removed during installation of the submersible pump. Replacement or maintenance on the chilled water circulating pump motor would require removal of the spray shield incorporated into the flood barrier design as shown in Attachment 1.

b) The flood barrier constructed around the MCR and SDBR chilled water circulating pumps would not require removal for maintenance or replacement of the drain line manual valve. The drain line valve threads onto a threaded pipe segment that is seal-welded to the flood barrier as shown in Attachment 1.

c) Removal and re-installation of the spray shield on the flood barrier can be accomplished in less than an hour. Removal involves removing a series of bolts along the top sides of the flood barrier, and installation involves refastening of the bolts. Without the spray shield on, the pump motors would be exposed to potential spray from a fire protection actuation or process fluid line break, but would still be protected from an external flood event.

ENCLOSURE 1

RESPONSE TO NRC BALANCE-OF-PLANT BRANCH (SBPB) REQUEST FOR ADDITIONAL INFORMATION (RAI)

10.0 SBPB RAI Question 10

Enclosure 1 of the March 1, 2013, supplement, under "Detailed Description and Technical Evaluation" states that to provide additional assurance that the chilled water circulating pumps and associated motors are protected against flood waters during a DBF event, a portable submersible pump will be installed inside the flood barrier during Stage I flood warning preparations in accordance with approved plant procedures.

It further states that Operations and Maintenance Departments will be impacted due to changes in Stage I and Stage II flood mode warning preparation procedures and activities requiring closure of the drain valves on the pump enclosures, installation of the portable sump pumps inside the enclosures and routing of electrical extension cords to a power source available during a DBF event. These actions have been evaluated, and determined to be capable of being performed along with existing flood mode operations in the required completion time.

a) Where will the submersible pumps and electrical extension cords be pre-staged?

b) How long and how many operators will it take to perform these actions during Stage I?

10.1 TVA Response - SBPB RAI Question 10

a) The submersible pumps and electrical extension cords are pre-staged in two separate metal gang boxes near the chilled water circulating pumps. The Train A equipment is staged at column lines A4-R on elevation 737 ft in the Auxiliary Building. The Train B equipment is staged at column lines A12-S on elevation 737 ft in the Auxiliary Building. Both metal gang boxes are labeled "0-MI-17.004 Flood Mode," the procedure that directs installation of the submersible pumps upon receipt of a Stage I Flood Warning.

b) During the reasonable simulation conducted during the NTTF 2.3 Flood Walkdown, a typical trained crew of three maintenance personnel out of an expected available crew of 15 during a flooding event was assigned to perform the activities in 0-MI-17.004. Because some additional Stage I Flood Warning activities have been added following completion of the NTTF 2.3 Flood Walkdown reasonable simulation, including the additional actions required for the MCR and SDBR Chillers, TVA has initiated actions to complete an updated validation of the current Stage I Flood Warning activities. As discussed in the letter from TVA to NRC, "Tennessee Valley Authority (TVA) - Extension Request Regarding the Flooding Hazard Reevaluation Report Required by NRC Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendation 2.1, Flooding, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," dated March 12, 2013 (ADAMS Accession No. ML13080A073), TVA is revising AOI 7.01 to facilitate more efficient transition to flood mode operation. To ensure the AOI can be appropriately implemented, which includes implementation of the activities in 0-MI-17.004, TVA committed to perform a drill to the revised WBN flood mode operation AOI-7.01 by December 31, 2013.

ENCLOSURE 1

RESPONSE TO NRC BALANCE-OF-PLANT BRANCH (SBPB) REQUEST FOR ADDITIONAL INFORMATION (RAI)

11.0 SBPB RAI Question 11

Enclosure 1 of the March 1, 2013, supplement, under "Detailed Description and Technical Evaluation" states that other plant modifications to the affected MCR and SDBR Chiller ancillary equipment will be implemented by March 31, 2013, to ensure flood protection up to the DBF level of 739.7 ft. These modifications to the MCR and SDBR Chiller ancillary equipment provide protection from water intrusion for the specified electrical components.

This supplement also states that to provide additional assurance that the MCR and SDBR Chillers ancillary equipment is protected against flood waters during a DBF event, additional measures to prevent water intrusion for these components will be completed during Stage I flood warning preparations in accordance with approved plant procedures.

Please provide description, and diagrams if available, of these additional plant modifications planned to provide protection from intrusion to the specified electrical components and additional measures to prevent water intrusion to these components.

11.1 TVA Response - SBPB RAI Question 11

The modifications to provide flood protection for various instrumentation and control components on the MCR Chillers A & B and the SDBR Chillers A & B that are under the DBF surge elevation were implemented by March 31, 2013. This protection is accomplished in two parts:

1. The vendor supplied flex conduit leading to the electrical ancillary equipment located under the DBF surge level has been replaced with water tight Boa flex. These conduits and existing rigid conduits were then plugged using an approximately 1/2 inch depth of Kaowool bulk along the length of the cable and in voids between cables, and applying Dow-Corning RTV-738 non-corrosive silicone rubber sealant on top of the Kaowool at the point where they entered the ancillary equipment. The RTV-738 was also used to seal around the outside of the conduit fittings of the flex and rigid conduits at these same points of entry. Any seams, other than the covers and vent holes, were also sealed with RTV-738. Two control boxes (one each on the MCR Chillers) had any unused holes plugged (this did not include any existing weep holes which will be sealed during the Stage I Flood Warning preparation procedure). Existing components mounted in the junction box were removed, RTV-738 applied to the mounting holes, and the components remounted, ensuring that the RTV-738 filled the mounting holes and sealed the threaded connections. A gasket was also added to the cover plate for each junction box. Existing vendor supplied electrical splices with twist on wire caps were replaced with taped splices using Scotch 70 tape with an overlay of Scotch 33+. Any existing taped splices were re-taped as previously described. Any terminations to terminal points were protected using a coating of RTV-3140 per applicable site procedures. The junction box covers and the ancillary equipment housing covers were not sealed at this time to allow preventive maintenance or troubleshooting activities to occur.

2. The second part of the design change consists of the directions on the activities to be performed during Stage I Flood Warning preparations. During these activities, all weep holes and vent holes on the ancillary equipment and junction boxes located under the DBF surge level will be sealed using Sili-Thane 803. The housing covers of the ancillary

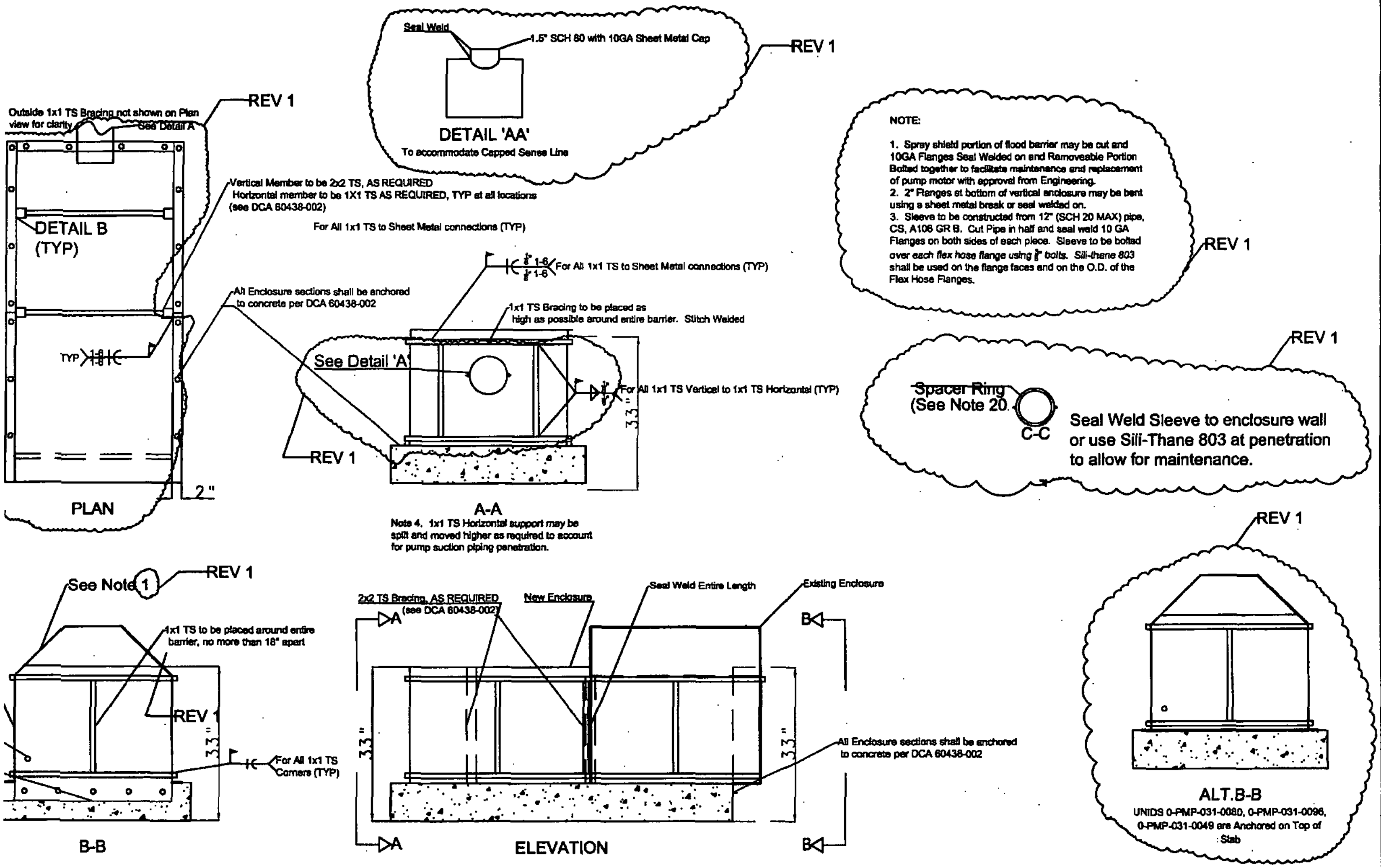
equipment will also be sealed using Sili-Thane 803. The two junction boxes (one each on the MCR chillers) will have 1/8 inch bead of Sili-Thane 803 placed around each of the mounting holes of the junction box cover in such a way that the bolt threads get coated when the bolt is reinstalled. Each bolt will then be reinstalled, ensuring that the bolt head is seated firmly in the sealant. After all bolts are sealed, an additional 1/8 inch bead of Sili-Thane 803 will be placed around the seam where the cover meets the box. As stated in Section 6.1 of 0-MI-17.004, Sili-Thane 803 has a cure time of 24 hours, and because of the restricted time frame for completion of Stage I Flood Warning preparations, the sealing must be completed within the first three hours after receiving a Stage I Flood Warning.

The tools and material for implementation activities performed during Stage I Flood Warning preparations are staged in the Auxiliary Building at column lines A4-R on elevation 737 ft, except the sealant which is stored in the Procurement Warehouse. The steps to perform these activities are controlled in 0-MI-17.004 (Appendices B through E). Each Appendix contains a diagram detailing the specific components to be protected for each of the four chiller packages.

DRAWING CHANGE AUTHORIZATION

PIC 60484
PG 46

DCN 60438
PAGE 46



REV	Prepared/Date	Checked/Date	CHANGE REFERENCE
2			
1	B.C. Cusick 03/28/13	C.W. Monroe 03/28/13	PIC 60484
0	C.W.MONROE_11/10/12	B.C.CUSICK_11/10/12	N/A

CONTRACT NO: N/A STAGE N/A

DCA PREREQUISITES: N/A

ANT CCD NO: N/A CAT. 4

DISCIPLINE CIVIL

AFFECTED BASE DRAWING NO. AND REV
48W1226-15_REV.E

DCA NO. 60438-001 UNIT: 0

DRAWING CHANGE AUTHORIZATION

WATTS BAR NUCLEAR PLANT	PIC 60484 PG 47	DCN 60438 PAGE 47

1. All enclosure/barrier material to be 10 GA A570 Grade D or greater. A570 GR45 is greater than A570 GR D.
2. Enclosure/barrier material to be coated in accordance with G-55.
3. Enclosure Dimensions (Horizontal) will vary for each motor due to interferences. The Requirement is that the Pump and Motor SHALL be barricaded in a water tight enclosure.
4. All joints between enclosure/barrier and concrete shall be bolted and sealed by Sili-thane 803 or equivalent. Barrier *SHALL be watertight at all joints and penetrations.*
5. Critical Dimensions are shown on DCA 60438-001. These Dimensions SHALL be met.
6. In order to facilitate working around penetrations, 16 GA steel may be cut and fit into place and seal welded to the main enclosure, All Openings/penetrations through barrier shall be sealed by Sili-thane 803 or equivalent. (penetrations may be sealed by using a seal weld when appropriate)
7. Enclosure shall be mounted to the concrete pedestal using ⅜" Hilti Kwik Bolt anchor bolts. A bolt shall be no greater than 2-1/8 inches from each new free edge and spaced no more than 12" center to center without engineering approval.
8. ~~All Steel to Steel interfaces shall be seal welded.~~
9. **AS REQUIRED** *2x2x1/4 TS supports to be welded to enclosure at locations to be determined by field.* Supports should be installed within 1 foot of the outside end of the new section of the enclosure and at the joint between the new and existing enclosure. These supports shall be aligned on each side so that the 1x1x1/8 TS can be placed between them, crossing the enclosure horizontally.
10. **AS REQUIRED** 1x1x1/8 TS shall be cut to fit and welded to the 2x2x1/4 TS at a location as high as possible on the walls of the enclosure. The 1x1 TS spans the enclosure horizontally to provide stiffness. This shall exist at every location where the 2x2 TS is present.
11. 1x1x1/8 TS supports to be stitchwelded around entire outside of barrier(horizontally) as high as possible and as near bottom as possible. ~~Vertical 1x1x1/8 TS supports shall be cut to fit and welded to the horizontal members, no more than every 18" OC.~~ 1"x1"x⅛" TS Supports may be coped as necessary to clear interferances.
12. Existing enclosure shall be removed, any sealant shall be removed. Sealant shall be placed before the enclosure is reinstalled. Once all anchor bolts are reinstalled, seal the edge of the concrete to steel interface.
13. For new sections of steel enclosure, sealant shall be placed before the enclosure is installed. Once anchor bolts are installed, seal the edge of the concrete to steel interface.
14. Any Surface that will be sealed using Sili-Thane 803 shall be primed using PSI-690 Primer. **REV 1**
15. All Materials to be QA Level 1 unless otherwise approved by Engineering
16. 1-1/2" Drain line to be provided on enclosure to facilitate draining enclosure in the event that Fire Suppression System is activated. Drain line to consist of 1-1/2" Normally Open Ball Valve(TIC CJC309A). Line is to be 1-1/2" threaded pipe segment seal welded to Enclosure. This Pipe is to be 1-1/2" ,CS, A106 Gr. B, SCH 80 (TIC CKR920Y) Field to determine appropriate length. Ball Valve to be threaded onto Drain Line and Sealed Water Tight. The UNID for these valves is related to the Motor which is protected. They are 0-DRV-031-80, 0-DRV-031-96, 0-DRV-031-36, and 0-DRV-031-49.
17. ~~All sealed joints using Sili-Thane 803 shall be a minimum ⅛" thick.~~
18. 16GA Material to be A570 GR 36.
19. For Welding Purposes A570 GR D, GR 45, and GR 36 are considered identical.
20. Fabricate 10 GA spacer ring for Annular Area between 12" Pipe and Flange. Sealweld Spacer Ring to 12" pipe. Use Sili-Thane 803 on joint between Spacer Ring and Pipe Flange.
21. Washers may be omitted on Anchor Bolts to achieve minimum thread engagement.
22. Apply primer and sealant along inside surface at locations of abandoned anchor bolt holes.

REV	Prepared/Date	Checked/Date	CHANGE REFERENCE
2			
1	B.C. Cusick 03/28/13	C.W. Monroe 03/28/13	**PIC 60484**
0	C.W. Monroe 11/10/12	B.C. Cusick 11/10/12	DCN 60438-A

CONTRACT NO: N/A STAGE N/A	AFFECTED BASE DRAWING NO. AND REV 48W1226-15 Rev. E
DCA PREREQUISITES: N/A	
ANT CCD NO: N/A CAT. 4	
DISCIPLINE CIVIL	DCA NO. 60438-002 R0 UNIT: 0

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