Enclosures 1, 2, and 3 Contain ~~Proprietary Information Submitted Under 10 CFR 2.390, Withhold~~ from Public Disclosure
Enclosure 5 Contains ~~Security Related Information 10 CFR 2.390, Withhold from Public Disclosure~~

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TXX-14048

10 CFR 2.390
10 CFR 50.54(f)

April 4, 2014

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

SUBJECT: Comanche Peak Nuclear Power Plant (CPNPP) Docket Nos. 50-445 And 50-446 Submittal of Requested Information Regarding Fukushima Lessons Learned – Flooding Hazard Reanalysis Report (TAC NOS. MF1099 and MF1100)

References:
1. NRC Letter, Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident; dated March 12, 2012, Accession No. ML12073A348.
2. Luminant Generation Company LLC's Letter TXX-13053, Response to March 12, 2012, Request for Information Enclosure 2, Recommendation 2.1, Flooding Hazard Reevaluation Report, of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident, dated March 12, 2013, Accession No. ML13074A058
3. NRC Letter, Request for Additional Information Regarding Fukushima Lessons Learned – Flooding Hazard Reanalysis Report, dated March 7, 2014, Accession No. ML14059A188

Dear Sir or Madam:

On March 12, 2012, the U. S. Nuclear Regulatory Commission (NRC) staff issued Reference 1 requesting information pursuant to 10 CFR 50.54(f). By Reference 2, Luminant Generation Company LLC (Luminant Power) submitted Comanche Peak Nuclear Power Plant's (CPNPP) Flooding Hazard Reevaluation Report in response to Enclosure 2, Required Response 2 of the 50.54(f) letter (Reference 1).

Reference 3 transmitted an NRC request for additional information regarding the Flooding Hazard Reevaluation Report (FHRR) in Reference 2.

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Luminant Power's response to the Reference 3 RAI for Comanche Peak Nuclear Power Plant (CPNPP) Units 1 & 2 is provided in the Attachment to this letter.

There are three enclosures (data disks) provided by Westinghouse to support the RAI responses

- Enclosure 1 - CD labeled "Paul C. RIZZO Associates, Inc. Original Submittal of Calculations F-01 through F-22. Comanche Peak Flood Hazard Reevaluation. Project No. 12-4891." (Proprietary)
- Enclosure 2 - CD labeled "Paul C. RIZZO Associates, Inc. Supporting Electronic Files for RAI Responses. Comanche Peak Flood Hazard Reevaluation. Project No. 12-4891." (Proprietary)
- Enclosure 3 - CD labeled "Paul C. RIZZO Associates, Inc. Supporting Calculations for RAI Responses F-23 through F-25. Comanche Peak Flood Hazard Reevaluation. Project No. 12-4891." (Proprietary)

Also Enclosure 4 is the Westinghouse Application for Withholding Proprietary Information from Public Disclosure CAW-14-3937, accompanying Affidavit, Proprietary Information Notice, and Copyright Notice.

The subject document was prepared and classified as Westinghouse Proprietary Class 2. Westinghouse requests that the document be considered proprietary in its entirety. As such, a non-proprietary version will not be issued.

As Enclosures 1, 2 and 3 contain information proprietary to Westinghouse Electric Company LLC, it is supported by an Affidavit signed by Westinghouse, the owner of the information. The Affidavit sets forth the basis on which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b)(4) of Section 2.390 of the Commission's regulations.

Accordingly, it is respectfully requested that the information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10 CFR Section 2.390 of the Commission's regulations.

Correspondence with respect to the copyright or proprietary aspects of the item listed above or the supporting Westinghouse Affidavit should reference CAW-14-3937 and should be addressed to James A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company, 1000 Westinghouse Drive, Building 3 Suite 310, Cranberry Township, Pennsylvania 16066.

During review of the FHRR calculations in support of the RAI responses, an error in the calculations was discovered which resulted in Squaw Creek Reservoir (SCR) water surface elevation being approximately one foot higher than previously reported by the FHRR. This issue has been entered into CPNPP's corrective action program (Condition Report CR-2014-003467). Luminant Power will submit a supplement to the Flooding Hazard Reevaluation Report (Reference 2) by July 31, 2014 to address this calculation error. The attachment to this letter provides additional details regarding calculations performed to address this calculation error as part of the RAI response, and refinements to be considered in the updated FHRR supplement to be submitted by July 31, 2014.

During communications between the NRC (Balwant Singal, et.al.) and Luminant Power (Carl Corbin, et.al.) on February 24, 2014, Luminant Power agreed to provide files related to site layout and topography. These files are provided on Enclosure 5 and contain Sensitive Unclassified Non-Safeguards Information (SUNSI). Luminant Power requests that Enclosure 5 be withheld from public disclosure according to the provisions of 10 CFR 2.390(d)(1).

This letter contains one new regulatory commitment.

Commitment Number	Commitment Description	Due Date
4816329	Luminant Power will submit a supplement to the Flooding Hazard Reevaluation Report to address a calculation error.	July 31, 2014

If there are any questions regarding this plan, please contact Mr. Carl B. Corbin at (254) 897-0121 carl.corbin@luminant.com.

I state under penalty of perjury that the foregoing is true and correct.

Executed on April 4, 2014.

Sincerely,

Luminant Generation Company LLC

Rafael Flores

By: Fred W. Madden

Fred W. Madden
Director, External Affairs

Attachment	Comanche Peak Nuclear Power Plant (CPNPP) Response to Request for Additional Information Regarding Flooding Hazard Reevaluation Report (Non-Proprietary)
Enclosure 1	CD labeled "Paul C. RIZZO Associates, Inc. Original Submittal of Calculations F-01 through F-22. Comanche Peak Flood Hazard Reevaluation. Project No. 12-4891." (Proprietary – Withhold under 10 CFR 2.390)
Enclosure 2	CD labeled "Paul C. RIZZO Associates, Inc. Supporting Electronic Files for RAI Responses. Comanche Peak Flood Hazard Reevaluation. Project No. 12-4891." (Proprietary– Withhold under 10 CFR 2.390)
Enclosure 3	CD labeled "Paul C. RIZZO Associates, Inc. Supporting Calculations for RAI Responses F-23 through F-25. Comanche Peak Flood Hazard Reevaluation. Project No. 12-4891." (Proprietary– Withhold under 10 CFR 2.390)
Enclosure 4	Westinghouse Application for Withholding Proprietary Information from Public Disclosure CAW-14-3937, accompanying Affidavit, Proprietary Information Notice, and Copyright Notice (Non Proprietary)
Enclosure 5	CD labeled "Security Related Information Withhold under 10 CFR 2.390, Comanche Peak Nuclear Power Plant (CPNPP) site layout and topography" (SUNSI)

c - E. J. Leeds, Director, Office of Nuclear Reactor Regulation *
Marc L. Dapas, Region IV *
Jessica A. Kratchman, NRR/JLD/PMB *
Balwant K. Singal, NRR A
Resident Inspectors, Comanche Peak *

* Without Enclosures 1, 2, 3, and 5

Comanche Peak Nuclear Power Plant (CPNPP) Response to Request for Additional Information Regarding Flooding Hazard Reevaluation Report

<u>Discussion of calculation error discovered during preparation of responses to RAIs</u>

During review of the Flooding Hazard Reevaluation Report (FHRR) calculations in support of the Request for Additional Information (RAI) responses, it was found that the regression equation used to determine the 100-year flow rate for Squaw Creek, the benchmark by which calibration of the HEC-HMS inputs was done, was incorrectly read from the source document. The equation in the source document specifies the drainage area, 'A' is to be taken to a power of -0.0467, however the applicable Probable Maximum Flood (PMF) analysis calculation used 'A' to the power of -0.0407. The observed error was determined to have an impact on four of the PMF analysis calculations used as the basis for the original FHRR submittal, (i.e., referred to as F-10, F-12, F-19 and F-22).

To address the error, a new sensitivity calculation, F-24 was developed and is included on the provided DVD/CDs as RAI response supporting calculations. Calibration of the HEC-HMS model was performed to the corrected value resulting in PMF flow rates within Squaw Creek, water surface elevations with Squaw Creek Reservoir (SCR) and the SSI and revised wind setup and wave runup. By running the HEC-RAS models as unsteady-state HEC-RAS simulations, the original results from PMF analysis calculations F-12 and F-19 bounded revised results from new calculation F-24. Water surface elevations for the SCR determined in original calculation F-22 were approximately one foot under revised elevations generated in new sensitivity calculation F-24.

The error in the calibration of the HEC-HMS model to the regression equation resulted in an increased water surface elevation. There are several parameters that CPNPP will consider for refinement. Based on the head at the SCR dam during the flood, the weir coefficient of 2.63 used in the analyses can be refined. The geometry of the emergency spillway used right-angle side walls of the spillway and did not consider the as-built shallow sloping of the side walls that allow traffic to drive over the spillway, which is an added refinement. The combined effects flood was computed using an antecedent 40% probable maximum precipitation (PMP) storm prior to the full PMP. This is consistent with the Units 3&4 FSAR. ANS 2.8 provides the option to use the lesser of the 40% PMP and the 500-year precipitation.

Luminant Power will submit a supplement to the Flooding Hazard Reevaluation Report to address calculation error by July 31, 2014. The updated FHRR supplement will also consider the refinements noted above.

The NRC RAIs and Luminant Power's responses are provided below. The list of references is provided at the end of this attachment.

RAI 1: Local Intense Precipitation and Associated Site Drainage (Choice of Methods and Technical Rationale)

The CPNPP, Units 1 & 2 Flood Hazard Reevaluation Report (FHRR) local intense precipitation section includes discussions on methods used to perform the analysis. In the discussions, the licensee uses a 5-minute (min) 1-square mile ($mi^{2)}$ (2.59-square kilometer (km^2)) probable maximum precipitation (PMP) value of 6.25 inches (15.9 centimeter (cm)) and a 15-min 1-mi^2 (2.59 km^2) PMP value of 9.78 inches (24.8 cm). In the Final Safety Analysis Report (FSAR) for CPNPP, Units 3 and 4 combined license application (Luminant, 2012), the 5-min 1-mi^2 (2.59 km^2) PMP is reported as 6.3 inches (16.0 cm), and the 15-min 1-mi^2 (2.59 km^2) PMP is reported as 9.8 inches (24.9 cm). The NRC staff has analyzed both sets of PMP values and determined that use of the Units 3 and 4 FSAR (Luminant, 2012) would produce higher peak discharge, according to the Rational Runoff Transformation Method (RRTM) and when used in U.S. Army Corps of Engineers (USACE) Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS) for simulating Scenario 4. The effects of rounding could also result in higher water levels when using other runoff estimation methods and when analyzing other flooding hazards, such as stream and river flooding and dam failure flooding.

Also, review of the FHRR indicates that for intervals not included in HMR 52[1], evenly-split distribution of rainfall was provided (i.e. the 20-min cumulative rainfall total was estimated as the 15-min total plus one-third of the difference between the 30-min and 15-min totals).

a. With respect to uncertainty in estimating PMP values and proper assessment of flooding hazards using current methods, the NRC staff requests a justification and description of the technical rationale for the Units 1 and 2 FHRR that resulting in a lower flood hazard compared to the values presented in the Combined Operating License Application (COLA) for Units 3 and 4 of the same site.
b. In order to determine the appropriate method to be used for the analysis related to the rainfall distribution, the NRC staff requests justification for the interpolation method used to determine PMP values at 5-mine intervals for durations not reported in HMR 52 (i.e. 10-min, 20-min, 25-min, etc.). More specifically, staff requests justification for not using other interpolation methods, such as non-linear interpolation, which could potentially have provided higher magnitudes of precipitation.

Response to RAI 1, Part a:

Revision 3 of the Units 3&4 Final Safety Analysis Report (FSAR) (Reference 1) indicates that the peak rainfall intensity for the local intense precipitation (LIP) is 6.2 inches/5-minutes. Luminant issued a letter on May 13, 2013 to the NRC (Reference 2) that provided supplemental information to address RAIs for the Combined Operating License Application (COLA) for Comanche Peak Nuclear Power Plant (CPNPP) Units 3&4. As stated in this letter:

> ***NRC Concern #3:*** *NRC staff identified 6.25 in. for 5 min intensity (75 in/hr). However, HEC-RAS input for PMP was 6.2 in. for 5 min intensity. Why wasn't the more conservative 6.25 in. for 5 min value used? Clarification of source and design input is needed.*
>
> ***Resolution-*** *The PMP value of 6.2 in. was derived in Calculation TXUT-001-FSAR-2.4.2-CALC-019 (CALC-019), Revision 0 using Hydrometerological Report 51 (HMR-51) and HMR-52. This appears to be a rounding issue and CALC-019 has been revised to utilize the conservatively rounded value of 6.3 inches for 5 min intensity. The revised PMP values are documented in CALC-019, Revision 2. The PMP value of 6.3 in. is used in CALC-036 Revision 3 and CALC-037 Revision 3.*

The analyses associated with the development of Units 1&2 FHRR reported a peak rainfall intensity of 6.25 inches for 5-minutes, which is consistent with the value identified by the NRC in the correspondence referenced above.

Response to RAI 1, Part b:

The probable maximum precipitation (PMP) hyetograph for the LIP analysis was developed from the 5-, 15-, 30-, 60-, and 360-minute duration PMP rainfall depths obtained from the appropriate short duration precipitation figures in Hydrometeorological Report (HMR) 52 (Reference 3). HMR-52 does not indicate how to interpolate between estimated PMP depths for specified storm durations.

For the FHRR, rainfall depths for the 5-minute intervals between specified storm durations (i.e., between 5 minutes and 15 minutes, or 15 minutes and 30 minutes, etc.) were estimated by dividing the additional rainfall depth between the included intervals. This preserved the total depth of the PMP per HMR-52 methodology. This is consistent with the method used to determine the LIP rainfall distribution provided in Appendix B of NRC NUREG/CR-7046 (Reference 4, Figure B-5).

RAI 2: Local Intense Precipitation and Associated Site Drainage (Model Documentation and Input/Output Files)

Staff requests electronic input/output files and other relevant digital data files for the following:

1) HEC-HMS model for surface flow modeling of the Local Intense Precipitation (LIP) probable maximum flood (PMF)
2) Hydrologic Engineering Center River Analysis System (HEC-RAS) and HEC-Geo-RAS model for LIP PMF routing and peak water elevations
3) Digital Elevation Model (DEM) or other x-y-z data files used for surface modeling

Response to RAI 2:

The requested model files are provided on Enclosure 2 (data disk) in the directory *Requested_Files\RAI_2_LIP.* The file, *FileList.docx,* lists the files within the directory RAI_2_LIP. The files are also listed below:

A.	Directory *georas*	Geo-RAS shapefiles and DEM
B.	Directory HMS	HEC-HMS model files
C.	*SC1_HECRAS_rational*	Scenario 1 HEC-RAS model files
D.	*SC2_HECRAS_SCS6*	Scenario 2 HEC-RAS model files
E.	*SC3_HCRAS_SCS6_oVBS*	Scenario 3 HEC-RAS model files
F.	*SC4_HECRAS_SCS6_oVBS_trans-culv1*	Scenario 4 HEC-RAS model files

RAI 3: Local Intense Precipitation and Associated Site Drainage (Choice of Methods and Technical Rationale)

The NRC staff analyzed different temporal rainfall distributions and determined that a centered distribution produces higher peak discharge values compared to a descending distribution for a 6-hour (hr) LIP event. Compared to a descending distribution, the staff's analysis determined that a centered rainfall distribution using the Soil Conservation Service (SCS) Unit Hydrograph (UH) Method without rainfall losses results in 6.2 percent to 6.8 percent higher peak discharge values. An illustration of temporal PMP and discharge values for both distributions is shown on Figure 1 for Storage Area 21677. According to the staff's analysis, for the SCS UH Method including rainfall losses, peak discharge values using a centered distribution, range from 9.3 percent to 23.4 percent, higher than those from a descending distribution. An illustration of temporal PMP and discharge values for both distributions is shown on

Figure 2 for Storage Area 21677. While a centered distribution appears to bound a descending distribution, other arrangements (such as a two-thirds distribution) may produce even higher water levels. Based on the review, the NRC staff requests for the following information:

A. Technical rationale for assuming a descending distribution for LIP analysis.

B. Documentation of any sensitivity analysis performed in analyzing the PMP, drainage discharge, and water levels associated with local intense precipitation flooding.

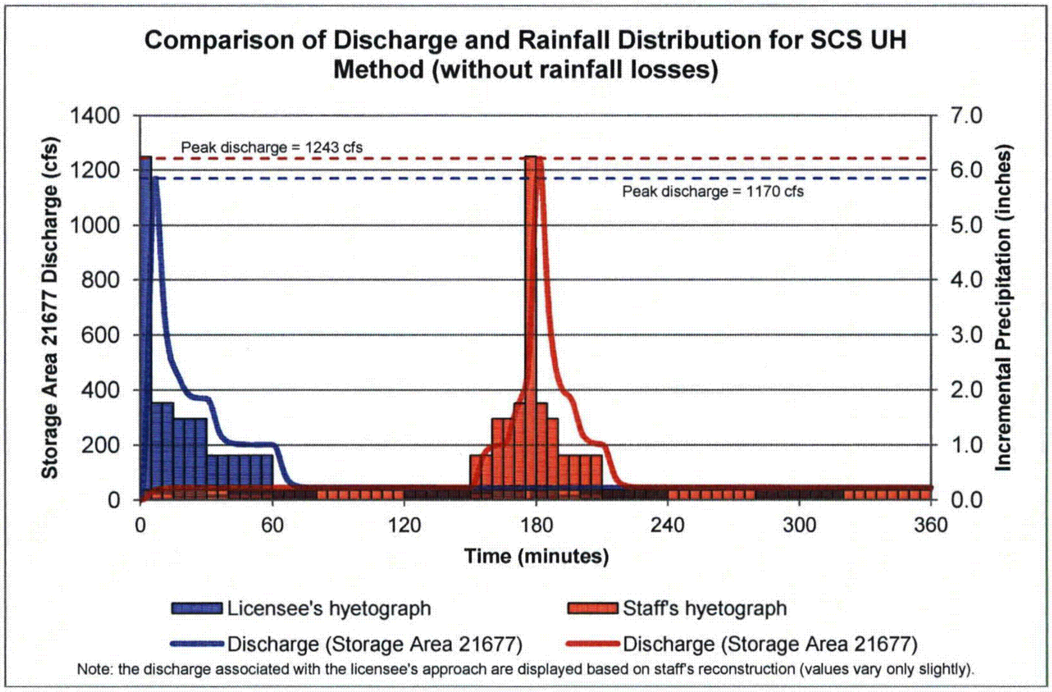

Figure 1: Comparison of temporal rainfall distributions and discharge using the SCS UH Method, without rainfall losses (see note at bottom of Figure 1)

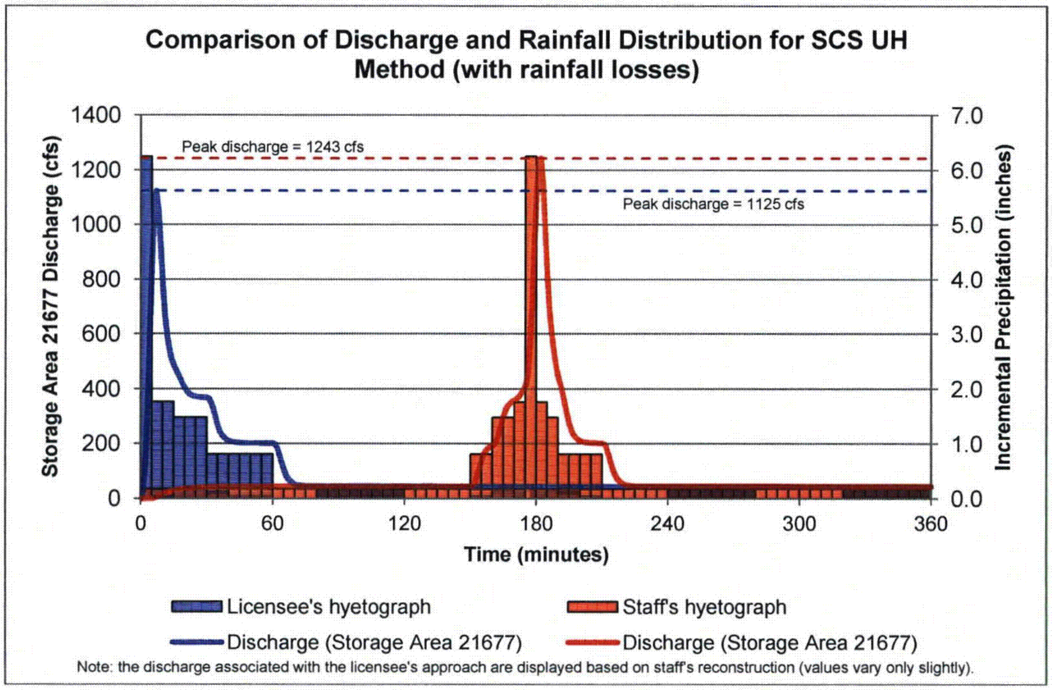

Figure 2: Comparison of temporal rainfall distributions and discharge using the SCS UH Method, including rainfall losses (see note at bottom of Figure 2)

Response to RAI 3, Part a

A descending rainfall distribution, with the highest rainfall intensities early in the event, was used in Calculation F-03 (Reference 5) in support of the FHRR in accordance with the method used in Appendix B of NRC NUREG/CR-7046 (Reference 4, Figure B-5).

Response to RAI 3, Part b

Sensitivity analyses (beyond the implementation of the Hierarchical Hazard Assessment [HHA] methodology) were not conducted using different rainfall distributions for the LIP analysis.

RAI 4: Local Intense Precipitation and Associated Site Drainage (Choice of Methods and Technical Rationale)

For Scenario 4 presented in the FHRR, the associated calculation package F-03 (Rizzo, 2013c[2]) mentions that culverts on the northwest and southwest sides of the vehicle barrier system (VBS) were assumed not to be blocked. This important modeling assumption is not mentioned in the FHRR. In order to determine the correct application of methods, the NRC staff requests that the licensee provide the technical rationale and assumptions implemented in the modeling of these culverts in a consistent manner.

Response to RAI 4

The HEC-RAS LIP model was initially developed for the F-03 calculation under the assumption that all culverts on site were blocked. All water levels in the F-03 calculation were referenced to the North American Vertical Datum of 1988 (NAVD88). The National Geodic Vertical Datum of 1929 (NGVD29) is considered to be 0.12 feet below the NAVD88 (See response to RAI 5). Select elevations were converted to NGVD29 in the calculation for comparison to the current licensing basis. RAI responses are presented in both datums herein.

This resulted in maximum LIP flood stages for Scenario 3 of 811.00 feet (ft) NGVD29 (811.12 ft NAVD88) and 810.12 ft NGVD29 (810.24 ft NAVD88) in Subbasins 21685 and 21728, respectively, resulting in a flood stage at Subbasin 21692 in the powerblock of 810.74 ft NGVD29 (810.86 ft NAVD88), which is in excess of the entryway elevation into safety related buildings of 810.50 ft NGVD29 (See the results of Scenario 3 in Table 7-1 in the F-03 calculation).

Following HHA methodology, a more refined model was developed to determine the peak LIP flood stage that would be obtained if the following two culverts remained in service during the LIP event:

- A 48-inch culvert within Subbasin 21685 at the northwest corner of the vehicle barrier system (VBS) perimeter.
- A 54-inch culvert within Subbasin 21728 at the southwest corner of the VBS perimeter.

Considering the large diameter of the culverts and the fact that the site area immediately surrounding the power block does not support the production of large debris that can fully block these culverts, this was considered to be a realistic condition and consistent with NRC guidelines documented in Reference 4.

The more refined model resulted in maximum LIP flood stages of 802.29 ft NGVD29 and 809.30 ft NGVD29 in Subbasins 21685 and 21728, respectively, resulting in a peak LIP flood stage in the power block of 810.34 ft NGVD29 for Storage Area 21699, which is lower than the entry elevation into safety related buildings of 810.50 ft NGVD29 (See results of Scenario 4 in Table 7-1 in the F-03 calculation).

RAI 5: Local Intense Precipitation and Associated Site Drainage (Choice of Methods and Technical Rationale)

The FHRR for CPNPP, Units 1 and 2 does not have a documented reference for datums in the FHRR; instead, the licensee cross-references the FSAR for CPNPP, Units 1 and 2 (referred to as Reference 2 throughout the FHRR) for various elevations. During the review, the NRC staff also noted some inconsistencies in the use of datums within some of the calculation packages thus raising with regard to the accuracy and quality control used in ensuring that the data and predicted water levels were properly maintained. As an example, Table 7-1 of calculation package F-03 (Rizzo, 2013c) appears to report peak water elevations in NAVD88, whereas the majority of the calculation package and FHRR describe elevations using NGVD29. With respect to the data presented in the FHRR and to address errors associated with reporting of elevation data, the NRC staff requests a clear verification of the data used in the FHRR for elevations. The NRC staff also requests a description of the method used for extracting elevation data from topography maps, entering values into hydrologic models, and reporting peak water levels and plant grades in the FHRR in a consistent manner.

Response to RAI 5

There are no errors associated with the reporting of the elevation data in Calculation F-03 or the FHRR. Elevations are reported in both the National Geodetic Vertical Datum of 1929 (NGVD29) and the North American Vertical Datum of 1988 (NAVD88) as appropriate.

A Digital Elevation Model (DEM) was developed for modeling site topography for the F-03 calculation (Reference 5) using site-specific topographic data provided in NAVD88. The DEM was then used to delineate subbasins for modeling runoff in HEC-HMS and for digitally extracting the profiles of the broad-crested weirs used to model flow between Storage Areas (SA) in the HEC-RAS model. The maximum LIP water surface elevations determined in HEC-RAS in NAVD88 were referred back to NGVD29 for comparison with site grade elevations provided in the Units 1&2 FSAR, utilizing the appropriate datum conversion.

Footnote 1 on page 3 of Calculation F-03 notes the datum elevation conversion for NGVD29 to NAVD88 is 0.12 ft at the plant site using the National Geodetic Survey VERTCON tool. Table 7-1 of Calculation F-03 lists simulated elevations within model catchments using a vertical datum of feet NAVD88 and indicates the conversion from NAVD88 to NGVD29 at select locations in note 5 of the table. Table 7-2 of Calculation F-03 reports flood elevations at specific buildings within the powerblock in both

NAVD88 and NGVD29. Table 3-2 of the FHRR lists peak pond water elevations in MSL, which is equivalent to NGVD29 elevations in Calculation F-03 Table 7-2.

RAI 6: Local Intense Precipitation and Associated Site Drainage (Choice of Methods and Technical Rationale)

The licensee has selected Scenario 4, which is the least conservative of the scenarios considered in the FHRR. The NRC staff also noted that the site characteristics, more specifically the weir coefficients used in the analysis, require further explanation. In order to address questions related to estimation of water levels using appropriate and current methods, the NRC staff requests the technical rationale for selection of:

a) Water levels resulting from Scenario 4 and the assumptions included in the HEC-RAS model for Scenario 4, the least conservative of the scenarios presented in the FHRR.
b) Site characteristics which justify the use of weir coefficients of 3.0, which calculation package F-03 (Rizzo, 2013c) states is a high value for the conditions simulated, in modeling storage area connections for Scenario 4.

Response RAI 6, Part a

The selection of Scenario 4 in Calculation F-03 (Reference 5) as the representative simulation for the FHRR is based on the implementation of the Hierarchical Hazard Assessment (HHA) approach, which entails the progressive refinement of scenarios, as discussed in NRC NUREG/CR-7046. Table 2-1 of the calculation summarizes how the runoff inputs to the HEC-RAS model for each scenario were refined from the previous scenario.

Scenario 1 used the Rational Method to estimate peak flow. Scenarios 2 and 3 used constant inflows for each subbasin set equal to the peak discharges, determined in HEC-HMS utilizing the Soil Conservation Service (SCS) Unit Hydrographs (UH) without rainfall losses, which leads to conservative estimates of peak discharge. Increasing refinement per the HHA methodology, the time varying runoff hydrograph (now accounting for rainfall losses using the SCS Curve Number) was used as input to each subbasin for Scenario 4, providing a more realistic simulation of the LIP event.

Scenario 4 also added a refinement to account for flow through the two large diameter culverts. The justification for this refinement is given in the response to RAI 4.

Response RAI 6, Part b

The last refinement in Scenario 4 was an increase in the discharge coefficient for the weirs used to simulate the hydraulic connection between SA in the HEC-RAS model from 2.63 to 3.0. This results in a reduction in the head required for a given discharge, as can be seen by solving the standard weir equation (Reference 6, Eq. 6-14) for the head:

$$H = \left(\frac{Q}{C*L}\right)^{2/3} \qquad \text{Equation 6-1}$$

where,
Q is the discharge, in cfs,
C is the discharge coefficient,
L is the length of the weir in feet, and
H is the head on the weir, in feet.

The weirs used for simulating the hydraulic connection between SAs fall within two general categories: **well-defined, broad-crested weirs**, which are raised above grade level, such as along roads, sidewalks, and vehicle barrier structures; and **at-grade controls**, which are defined by boundaries between paved areas and are graded to direct sheet flow towards outfall structures. Reasonable ranges for both types of weirs represented in the HEC-RAS model are discussed below.

Well-defined, broad-crested weirs:

For well-defined, broad-crested weirs, the value of C in Eq. 6-1 is a function of geometric properties of the weir and the head over the crest. Depending on the weir configuration, the HEC-RAS Hydraulic Reference Manual (Reference 6, Table 8-1) reports values of the coefficient between 2.6 and 3.1 for broad-crested weirs.

The weir coefficient increases as head increases, reported to vary from 2.48 to 3.32 for heads varying from 0.2 to 5.5 ft, depending on the breadth of the crest. For instance, for a head of 1.0 ft over the weir crest, the coefficient ranges from 3.32 for a six-inch breadth, e.g., the top of a Jersey barrier, to 2.63 for a weir with a 10-foot breadth, e.g., the top of a VBS, (Reference 7, Table 5-3).

For a given head, the weir coefficient increases with the inclination of the surfaces approaching the crest on the upward and downward slopes (Reference 7, Tables 5-5 and 5-6, respectively). The higher values associated with sloped approaches are appropriate for roads and sidewalks characterized by mild slopes in the direction of flow.

Since HEC-RAS requires the input of a single coefficient for the weirs, a representative head is used to select the weir coefficient. For the modeling application under consideration, heads on the weirs vary from an average value of about 0.65 ft to a maximum value of over 2.0 ft during the simulation. Considering that most flow between SAs will occur during the higher head conditions, it is appropriate to use a time-averaged value of the head within 10 to 20 percent of the maximum head because the majority of the flow between SAs will be during the period for which these higher heads are acting.

At-grade control Weirs:

For long broad-crested weirs with no appreciable end contractions and with slopes greater than or equal to the head loss due to friction, as occurs at the at-grade drainage divides of large paved areas graded to direct flow towards outfall structures, flow within the weir is at critical depth, with discharge given as (Reference 7, Eq. 5-53):

$$Q = 3.087*L*H^{3/2} \qquad \text{Equation 6-2}$$

For the simulation of runoff on site, most of the weir sections used to model the hydraulic connection between SAs are at-grade weirs with mild slopes, for which Equation 6-2 is applicable and; therefore, a value of C = 3.0 in Equation 6-1 is appropriate and slightly conservative. A lower value of the weir coefficient may be appropriate for the 10-foot wide VBS units, but at the downstream (south) end of the site, the VBS weirs were not overtopped.

Considering the head range modeled, and the geometry of the hydraulic connections between the SAs used to characterize site topography, the use of a weir coefficient of 3.0 in the HEC-RAS model provided reasonable estimates of flow and stage for LIP flooding.

RAI 7: Local Intense Precipitation and Associated Site Drainage (Choice of Methods and Technical Rationale)

In calculation package F-01 (Rizzo, 2013a), the licensee states "the HMR52 program was used to obtain the 72-hour PMP storm analysis for comparison purpose only." The NRC staff requests documentation of the analysis used in the estimation of the 72-hour (hr) PMP for LIP and clarification on how HMR 52 program results for the 72-hr LIP storm were used and what comparisons were made.

Response to RAI 7:

The 72-hour, 10-square mile PMP is provided for comparison with the 6-hour, 10-square mile PMP in Calculation F-01 (Reference 8). The 6-hour, 10-square mile event resulted in a higher 5-minute intensity for 1-square mile (6.25 inches in 5-minutes) and total 6-hour/10-square mile depth (30.03 inches) compared to the output from the HMR-52 program (1.81 inches in 5 minutes for 10 square miles and 29.73 inches in 6 hours for 10 square miles). No comparison was made with any other calculation. The 72-hour PMP listed in the HMR-52 program output is for a 10-square mile area and does not contain a 5-minute interval with rainfall intensity for a 1-square mile PMP. Higher peak stages are expected using the LIP with rainfall intensities for the 1-square mile PMP (see response to RAI 9).

Calculation F-01 provides documentation for the calculation of the PMP, including input and output files for the HMR-52 runs. The following files and directories from the F-01 calculation are included for reference in Enclosure 2 (data disk) within RAI_7.zip:

- F1 Site SpecificPMP.pdf (F-01 Calculation Report)
- Directory "shapefiles" (with GIS shape files)
- Directory "References"
- Directory "CD," HMR-52 Input and Output files and EXCEL calculations

RAI 8: Local Intense Precipitation and Associated Site Drainage (Choice of Methods and Technical Rationale)

The FHRR in Section 3.2.1.4 states that the water levels on the Squaw Creek Reservoir (SCR) and the Safe Shutdown Impoundment (SSI) due to LIP are lower than the water levels in the SCR due to regional river flooding, as documented in the licensee's calculation packages. Considering the significance of wind wave runup in estimation of flood levels and the low physical margin available between the peak LIP-induced flood level under Scenario 4 and entry elevations of safety-related systems, structures, and components (SSC), the NRC staff requests:

a) Clarification to determine whether wind wave runup was considered in the analysis of on-site flooding within the protected area (PA).
b) Information and analysis related to water depth, fetch length, wave height potential, and flooding potential for on-site flooding with wind effects.

Response to RAI 8, Part a:

Wind waves and runup are considered for the Squaw Creek Reservoir (SCR) and the safe shutdown impoundment (SSI). However, runup from wind waves is not a credible flooding hazard within the protected area (PA) during an LIP event. Ponding depths on the powerblock area do not support the growth of wind waves because:

- Ponding depths are relatively shallow (approximately few inches in the most refined scenarios).
- Runoff flow directions are generally directed away from safety-related System, Structures and Components (SSCs) as the result of site grading, preventing waves from reaching safety-related SSCs.
- Intervening safety related buildings and various site facility support buildings within the PA, the VBS and tall chain-link security fencing

serve to block and/or dissipate the wind energy sufficiently to not create credible wave action due to site ponding depths.

- The various buildings and structures (including the VBS) shorten potential fetch lengths.

Response to RAI 8, Part b:

Water levels of the SSI and SCR are lower in the LIP analysis than for the river analysis. For the LIP, rainfall is modeled as falling on a one-square mile area centered on the powerblock and does not include the total catchment of the SSI and SCR. As a result, the reservoir water surface elevations, wave heights, and runup for the LIP analysis are bounded by the reservoir water surface elevations, wave heights, and runup of the river flooding analysis.

RAI 9: Local Intense Precipitation and Associated Site Drainage (Choice of Methods and Technical Rationale)

As noted in the FHRR Section 4.3.2, an equipment ramp on the west face of the non-safety-related Turbine Building (TB) of Unit 2, which is at elevation of 809.3 feet (ft) (246.67 meters (m)) NGVD29, could communicate the reevaluated effects of local intense precipitation flood water to the safety related Electrical Control Building at elevation 778 ft. The FHRR indicates that "the total volume of runoff that can accumulate in the lower Unit 2 TB sump and condenser pit elevations (i.e., elevation 759 ft and lower) for the 6-hour duration of the Local Intense Precipitation event was determined to be less than the available capacity of these areas." Although not explicitly stated, the NRC staff assumes this conclusion is based on quantitative analysis of LIP Scenario 4.

The NRC staff requests that the licensee provide quantitative analyses of LIP flood-water inundation into the Unit 2 TB sump and condenser pit resulting from:

A. 6-hr duration LIP flooding Scenarios 1, 2, 3, and 4, as well as any new LIP flooding evaluations involving different PMP distributions.
B. The 72-hr duration LIP event.

In addition, the quantitative analyses should also state the level of flooding, if any, that occurs within the Electrical and Control Building due to water conveyance from the Unit 2 TB.

Response RAI 9, Part a:

In response to RAI 9, the results of modeling LIP flooding in the powerblock area and inflow to the Turbine Building (TB) down the equipment ramp into the west side of the

TB are presented for the two LIP events requested, based on rainfall-runoff modeling in HEC-RAS.

The equipment ramp entrance to the TB is between Column Lines 9-T and 10-T, as shown in site design drawings. The ramp descends from an elevation of 809.5 ft NGVD29 at its tangent with the service road down to an elevation of 803.0 ft NGVD29, flush with the top slab of the mezzanine deck.

A stage-volume relationship for the interior of the TB is developed from site design drawings, as summarized in Table 9-1 (all tables for RAI 9 are provided at the end of this response) (Calculation F-23, Reference 9). Note that the top of the Unit 2 TB sump and condenser pit area is represented by the 778 ft elevation or an available volume capacity of 4.61 ac-ft before any potential impact to the 778 ft safety related ECB floor elevation can be realized or deemed credible. The stage-volume relationship is based on the assumption that 10 percent of the basement floor area is obstructed, that all inflow from the ramp onto the mezzanine level falls to the basement level, and that the inflow has a clear flow path into the Unit 2 condenser sump. These last two assumptions are supported by the fact that there is a large open grating area on the mezzanine level, directly over the Unit 2 condenser sump.

Simulations of LIP runoff into the TB are based on the following assumptions:

- The normally closed metal roll-up door at the bottom of the ramp fails in a completely open position. This is conservative since any partial failure would decrease the flow rate into the building.
- The sump pumps (one 50- and one 300-GPM for each unit) are not operating. This is conservative since the operation of these sumps is included in routine operator surveillances.
- The drainage trench at the bottom of the ramp, outside the roll-up door is blocked. When operating with complete functionality, this drain would reduce the volume of inflow into the TB.
- Flow down the equipment ramp and over the retaining walls on each side of the ramp is represented, based on site design drawings, as a 172-foot long composite weir flow (a 12-foot ramp section with crest elevation 809.5 + 2 x 80-foot long retaining wall sections with crest elevations of 810.5) with a length-weighted weir coefficient of 2.84 (Reference 7; Table 5-3).

The HEC-RAS models (i.e., Scenarios 2 through 4) of Calculation F-03 (Reference 5) are modified to represent the storage within the TB (Calculation F-23, Reference 9). To Address RAI 9a, the steady-state flows used in calculation F-03 are replaced with time varying flows developed using HEC-HMS. Only transient simulations are used to address RAI 9a . As the Rational Method (i.e., Scenario 1) only leads to a steady-state peak flow, it is not included in this evaluation (Reference 9).

The 6-hour PMP, shown on Figure 3-2 of the FHRR, is used in HEC-HMS simulations described in Calculation F-02 (Reference 10). The resulting peak runoff values for Scenarios 2 through 4 are listed in Table 9-2.

Table 9-3 lists the resulting stages for LIP flooding Scenarios 2, 3, and 4. For the 6-hour PMP, water levels do not fill the condenser sump of TB-2, with freeboards of between 9 and 14 ft with respect to the top of the basement floor slab (elevation 778.0 ft NGVD29) and do not reach safety-related SSCs.

Response RAI 9, Part b:

To respond to part b of RAI 9, the 72-hour PMP presented in Calculation F-01 (Reference 8) for a 10-square mile area is used to simulate the LIP event, as shown on Figure 3-2 of the FHRR. This PMP is used in HEC-HMS simulations for Scenarios 2 through 4 (Reference 9).

The resulting peak runoff values for these simulations are listed in Table 9-4. The simulated runoff from these HEC-HMS simulations are used in subsequent HEC-RAS simulations for Scenarios 2 through 4, described in Calculation F-03 (Reference 5). Table 9-5 lists the peak stage simulated for these scenarios. For the 72-hour PMP, water levels do not fill the condenser sump of TB-2, with a freeboard of 8 to 12 ft with respect to the top of the basement floor slab (elevation 778.0 ft NGVD29) and does not reach safety-related SSCs.

TABLE 9-1
STAGE VOLUME RELATIONSHIP
FOR THE TURBINE BUILDING

WATER LEVEL (ft NGVD29)	WATER LEVEL (ft NAVD88)	VOLUME (ACRE - ft)
755.25	755.37	0.00
758.33	758.45	0.27
758.75	758.87	0.32
759.00	759.12	0.36
778.00	778.12	4.61
778.20	778.32	10.30
803.00	803.12	60.82

Source: *Turbine Bldg Stage Volume Curve2.xlsx*
(Enclosure 3 (data disk) F-23 Rev 0)

TABLE 9-2
HEC-HMS SIMULATED PEAK RUNOFF FROM CATCHMENTS USING THE 6-HOUR PMP

HYDROLOGIC ELEMENT	DRAINAGE AREA (sq-mile)	SCENARIO 2 & 3 PEAK RUNOFF (cfs)	SCENARIO 4 PEAK RUNOFF (cfs)
21652	0.0040	144.1	140.1
21656	0.0035	126.1	122.6
21658	0.0042	152.7	130.7
21660	0.0087	315.7	306.9
21662	0.0100	363.5	337.3
21664	0.0005	17.0	16.5
21671	0.0125	454.1	431.7
21673	0.0011	39.0	37.9
21677	0.0322	1,169.0	1,124.0
21680	0.0025	92.2	89.6
21682	0.0034	124.3	120.8
21683	0.0025	92.4	89.8
21685	0.0010	36.6	35.6
21686	0.0032	116.5	113.2
21690	0.0009	33.3	32.3
21691	0.0008	29.9	29.0
21692	0.0043	157.7	153.3
21695	0.0008	28.1	27.3
21696	0.0015	55.3	53.7
21699	0.0047	169.9	165.1
21703	0.0027	97.8	95.0
21706	0.0010	36.6	35.6
21709	0.0011	40.7	39.6
21712	0.0014	49.6	48.2
21714	0.0006	22.7	22.1
21717	0.0005	17.6	17.1
21719	0.0005	17.7	17.2
21720	0.0036	131.7	128.0
21721	0.0022	79.5	77.2
21724	0.0005	17.6	17.1
21728	0.0063	230.0	223.5

Source: *1hour_1sqmilePMP_9.xlsx*
(Enclosure 3 (data disk) F-23 Rev 0)

TABLE 9-3
HEC-RAS SIMULATED PEAK STAGES WITHIN TURBINE BUILDING
6-HOUR PMP

SIMULATION	PEAK STAGE (ft NAVD88)	PEAK STAGE (ft NGVD29)	PEAK FLOW INTO TB (cfs)	VOLUME FLOW INTO TB (ACRE-ft)
6hr PMP SC2, Transient	768.77	768.65	31.16	2.52
6hr PMP SC3, Transient	768.77	768.65	31.16	2.52
6hr PMP SC4, Transient	764.39	764.27	22.46	1.54

Source: *Turbine Bldg Stage Volume Curve2.xlsx*
(Enclosure 3 (data disk) F-23 Rev 0)

TABLE 9-4
HEC-HMS SIMULATED PEAK RUNOFF FROM CATCHMENTS USING THE 72-HOUR PMP

HYDROLOGIC ELEMENT	DRAINAGE AREA (sq-mile)	SCENARIO 2 & 3 PEAK RUNOFF (cfs)	SCENARIO 4 PEAK RUNOFF (cfs)
21652	0.0040	55.6	55.6
21656	0.0035	48.6	48.6
21658	0.0042	58.9	58.7
21660	0.0087	121.7	121.7
21662	0.0100	140.2	140.1
21664	0.0005	6.6	6.6
21671	0.0125	175.1	175.1
21673	0.0011	15.0	15.0
21677	0.0322	450.8	450.7
21680	0.0025	35.6	35.6
21682	0.0034	47.9	47.9
21683	0.0025	35.6	35.6
21685	0.0010	14.1	14.1
21686	0.0032	44.9	44.9
21690	0.0009	12.8	12.8
21691	0.0008	11.5	11.5
21692	0.0043	60.8	60.8
21695	0.0008	10.8	10.8
21696	0.0015	21.3	21.3
21699	0.0047	65.5	65.5
21703	0.0027	37.7	37.7
21706	0.0010	14.1	14.1
21709	0.0011	15.7	15.7
21712	0.0014	19.1	19.1
21714	0.0006	8.8	8.8
21717	0.0005	6.8	6.8
21719	0.0005	6.8	6.8
21720	0.0036	50.8	50.8
21721	0.0022	30.6	30.6
21724	0.0005	6.8	6.8
21728	0.0063	88.7	88.7

Source: *1hour_1sqmilePMP_9.xlsx*
(Enclosure 3 (data disk) F-23 Rev 0)

TABLE 9-5
HEC-RAS SIMULATED PEAK STAGES WITHIN TURBINE BUILDING
72-HOUR PMP

SIMULATION	PK STAGE (ft NAVD88)	PK STAGE (ft NGVD29)	PEAK FLOW INTO TB (cfs)	VOLUME FLOW INTO TB (ACRE-ft)
72hr PMP SC2, Transient	770.31	770.19	30.16	2.86
72hr PMP SC3, Transient	770.31	770.19	30.16	2.86
72hr PMP SC4, Transient	765.72	765.60	21.83	1.84

Turbine Bldg Stage Volume Curve2.xlsx
(Enclosure 3 (data disk) F-23 Rev 0)

RAI 10: Stream and River Flooding (Model Documentation and Input/Output Files)

The NRC staff requests electronic input/output and other relevant digital data files for the following:

1) HMR 52 programs for PMP analysis of the Squaw Creek and Paluxy River watersheds
2) HEC-HMS model for surface flow modeling of PMF
3) HEC-RAS and HEC-Geo-RAS model for PMF routing and peak water elevations Digital Elevation Model (DEM) or other x-y-z data files used for surface modeling
4) Land use map used for Curve Number estimation as included in Appendix B
5) Soil type map used for Curve Number estimation as included in Appendix B

Response to RAI 10

The electronic input/output and other relevant digital data files are included in the Enclosure 2 (data disk) within RAI_10.zip:

- RAI 10-1_HMR52
- RAI 10-2_HEC-HMS
- RAI 10-3_HEC-RAS
- RAI 10-4_Landuse
- RAI 10-5_Soils

RAI 11: Stream and River Flooding (Model Documentation, Choice of Methods, and Technical Rationale)

a. As reported in calculation packages F-10 (Rizzo, 2013j) and F-11 (Rizzo, 2013k), HEC-HMS model calibration for the Squaw Creek and Paluxy River watersheds used a meteorological model of SCS Storm, Type II. Since CPNPP is located very near the area of Storm Type III, the NRC staff requests a description of any consideration given to a Type III distribution and a justification as to why a Type III distribution was not selected.

b. The NRC staff requests the technical rationale related to site characteristics for selecting the Manning's roughness coefficients *n* used in the HEC-HMS models for runoff estimation. In particular, the staff requests additional information on any sensitivity analysis used to calibrate the model to other precipitation and flow conditions that would have resulted in higher magnitudes. If no additional conditions were used for calibration, the staff requests justification as to why one observation was sufficient to determine the model calibration was satisfactory.

c. The NRC staff notes that the calibrated model includes a basin coefficient which may be conservative (typical range of 1.8 to 2.2 with lower values more conservative) and a peaking coefficient which may not be conservative (typical range of 0.4 to 0.8 with higher values more conservative). In order to determine the consistent use of appropriate parameters, the staff requests the technical rationale related to site characteristics for selecting Snyder unit hydrograph transformation coefficients as used in the licensee's hydrologic modeling. The staff also requests additional information on any sensitivity analysis used to calibrate the model to other precipitation and flow conditions.

d. Section 2.5.2 of the FHRR states, "Additionally, for both the Squaw Creek and Paluxy River watersheds, consideration was given to a potential 50-year projected scenario with an assumed 5 percent increase in impervious area for each sub-basin." With respect to the Hierarchical Hazard Assessment (HHA) approach discussed in Section 3.2.2.2.1 of the FHRR, the staff requests the following:

   i. Technical rationale for using a 5 percent increase in impervious cover for future projections, exclusively for Scenario 5 of the Paluxy River watershed runoff analysis.

   ii. Justification for why this 5 percent assumption was not added to the least conservative scenario (Scenario 4) which the licensee selected.

   iii. Justification for not applying this 5 percent assumption to any scenarios for the Squaw Creek watershed PMF considered by the licensee.

Response to RAI 11, Part a

The SCS Storm, Type II, was used for the rainfall runoff modeling carried out in support of the flood hazard reevaluation for the CPNPP. A Type III storm distribution was not used because the watersheds contributing to flow at the site are located in Hood, Somervell and Erath Counties. These north central Texas counties are located entirely within the region identified for SCS Type II Storms, as clearly shown on Figure B-2 of the TR-55 manual (Reference 11, Appendix B).

Response to RAI 11, Part b

The selection of roughness coefficients for use in modeling PMF flows for the flood hazard reevaluation study was based on an evaluation of the available data.

For Squaw Creek upstream and downstream of the reservoir, the roughness parameters were initially chosen for the overbank areas of the floodplain in terms of land use determined from aerial photography. A Manning's roughness coefficient of 0.035 was selected for the roughness of the main channel, which is a value representative of streams at full stage with some vegetation (Reference 6, Table 3-1).

Starting with these values, the parameters were refined by calibration to the peak flow for a 100-year flood event, as estimated with the regression equation provided by the Texas Department of Transportation (Reference 12, p. 4.35), as discussed in Calculation F-10, "PMF Estimation for Squaw Creek" (Reference 13).

Calibration to a single return period was considered sufficient for the purposes of modeling flow in the streams upstream and downstream of the SCR, because the modeling of the PMF flood stage of importance is dominated by storage and outflow effects rather than flow in the upstream and downstream channels.

Similarly for the Paluxy River, the roughness parameters were initially chosen for the overbank areas of the floodplain in terms of land use determined from aerial photography. A Manning's roughness coefficient of 0.045 was selected for the roughness of the main channel, as representative of a natural channel that is clean and winding, with some pools, shoals, weeds and stones (Reference 6, Table 3-1).

Starting with these values, the parameters were refined by calibration using rainfall and runoff data made available at USGS Gage 08091500, as discussed in Calculation F-11, "PMF Estimation for Paluxy River" (Reference 14). The roughness coefficients and Snyder unit hydrograph parameters were calibrated until the response of the Paluxy River watershed matched the maximum gage flow caught for USGS gage 08091500, within approximately 10 percent.

Response to RAI 11, Part c

The technical rationale for using calibration to select the Snyder unit hydrograph coefficients is provided in the HEC-HMS Technical Reference (Reference 15), which notes that the C_t and C_p values are best found via calibration, as they are not physically-based parameters.

Typical values of C_t range from 1.8 to 2.2. The value of C_p typically ranges from 0.4 to 0.8 with larger values of C_p associated with smaller values of C_t. For both the Squaw Creek and the Paluxy River, calibration was started with values in the middle of the typical range (C_t = 2.0, C_p = 0.6) and the models were then calibrated until the calibrated model was within 10-percent of the 100-year flood for Squaw Creek and within 20-percent of the selected observed discharge for the Paluxy River.

In order to estimate the Manning's roughness coefficients for the overbank areas, a compound Manning's roughness coefficient was determined based on land use and cover data following the HEC-RAS Hydraulic Reference (Reference 6). Because of this physically-meaningful basis of assigning the Manning's values for the overbank areas, they were not varied in the calibration process. The Manning's roughness values for the channel sections were varied as part of calibration, starting with values of 0.1 and 0.04 for Squaw Creek and the Paluxy River, respectively, based on the stream morphology as judged from aerial topography.

As described in Part b, the Manning's roughness coefficient and Snyder unit hydrograph parameters were calibrated to the best available data for both Squaw Creek and Paluxy River. A large number of calibration runs were carried out to get a good match with the best available data and to determine how sensitive the calibration was to each parameter. The Snyder unit hydrograph coefficients (C_t and C_p) were varied first and then the Manning's roughness parameter was adjusted next to obtain a match to the peak discharge within 5 to 10-percent.

Response to RAI 11, Part d

The 5 percent increase in the impervious cover was considered for both the Paluxy River and Squaw Creek.

Cases 5 and 14 of Calculation F-10, "PMF Estimation for Squaw Creek" (Reference 13) applied the 5 percent increase in the impervious cover to Squaw Creek. Scenario 5 of Calculation F-11, "PMF Estimation for Paluxy River" (Reference 14) applied the 5 percent increase in the impervious cover within the Paluxy River watershed.

The stage due to the 5 percent increase in the impervious cover over existing conditions is considered in Scenario PF 5 of Calculation F-12, "Water Level Estimation Due to

PMF" (Reference 16) based on Case 14 of Calculation F-10 and Scenario 5 of Calculation F-11.

An increase of 5 percent in the impervious cover is a conservative assumption meant to forecast the impacts of future development within the watershed. An increase of 5 percent is not anticipated in the site watershed for the remaining lifetime of the plant. This conservative assumption is not required for the reevaluation since the purpose of the reevaluation is to represent current site conditions. However, it was included as a sensitivity check on the impact of future increases in impervious cover. The selection of 5 percent increase in the impervious cover was based on the rural nature of the contributing watersheds. However, this change did not have a significant impact on the maximum water levels. The difference in maximum water surface elevations between scenarios PF 4 and PF 5 was reported as 0.01 ft.

RAI 12: Stream and River Flooding (Choice of Methods and Technical Rationale)

a) Calculation F-12 (Rizzo, 2013l) describes the selection of 0.1 and 0.3 for contraction and expansion coefficients, respectively, for normal flowing cross sections. The NRC staff requests the technical rational for the selection of values for contraction and expansion coefficients. Additionally, the staff requests description of whether any changes in contraction or expansion coefficients were used for any cross-sections aside from those adjacent to bridges.

b) The NRC staff requests technical rationale for the selection of Manning's roughness coefficient *n* values and any sensitivity analysis performed in selecting these values for the channels and overbanks in HEC-RAS for the stream and river flooding analysis.

c) Compared to the FSAR for Units 3 and 4 (Luminant, 2012), the values for Manning's roughness coefficient included in the Units 1 and 2 FHRR are less conservative. The licensee has selected Scenario 4 which is the least conservative scenario and as such should describe how this justifies appropriate reevaluation of flood hazards at the site using current and appropriate methods. The NRC staff requests the description of, and technical rationale for, the assumptions included in the HEC-RAS model for Scenario 4.

Response to RAI 12, Part a

For the HEC-RAS modeling of Squaw Creek and the Paluxy River executed in support of the FHRR process, typical values of the contraction and expansion coefficients used in modeling head loss between channel sections were selected, following standard industry practice as discussed in the HEC-RAS Hydraulic Reference (Reference 6).

For reaches between cross sections where the change in effective cross section area is gradual and small (i.e., absence of hydraulic structures), and the flow is subcritical, coefficients of contraction and expansion were set to 0.1 and 0.3, respectively. This is consistent with industry standards as recommended by the HEC-RAS Hydraulic Reference (Reference 6). For the FHRR of Units 1&2, these coefficients are applicable for model reaches where hydraulic structures do not impact the flow of water.

For reaches with abrupt changes in effective cross section area, such as at bridges, contraction and expansion coefficients of 0.3 and 0.5 were used as discussed in the HEC-RAS Hydraulic Reference (Reference 6).

Response to RAI 12, Part b

As described in Section 2.2.2 of Calculation F-12, "Water Level Estimation Due to PMF" (Reference 16), a flood routing roughness coefficient of 0.15 was used for the left and right overbanks of both Squaw Creek and Paluxy River. This conservative value was used to be consistent with the value for the overbanks described in Revision 3 of the Units 3&4 FSAR (Reference 1).

For selecting the roughness coefficient to be used within the channel, aerial photography of each river was examined to determine, on average, whether Squaw Creek and Paluxy River can best be defined as clean, straight, etc. or weedy, deep, with any deep pools. Based on these evaluations, average Manning's n values for each river were selected from the typical values given in the HEC-RAS Hydraulic Reference (Reference 6). Sensitivity analyses were then performed to fine tune the Manning's n values within the channel for each flooding source, based on historical gage data. Those sensitivity analyses are discussed in Section 2.3 of Calculation F-12, "Water Level Estimation Due to PMF" (Reference 16).

Response to RAI 12, Part c

As described in the response to RAI 12, Part B, the Manning's *n* values for the left and right overbanks of both Squaw Creek and Paluxy River are consistent with Revision 3 of the Units 3&4 FSAR (Reference 1). The response to part b also notes that the Manning's *n* values within the channel were calibrated based on historical gage data. They are less conservative than the values reported in the FSAR for CPNPP, Units 3&4 (Reference 1), but are based on historical data for the Paluxy River and established regression equations for Squaw Creek, as discussed in the response to part b of RAI 11. Furthermore, Calculation F-12 says, "Note that FSARs for Units 3&4 uses 0.15 for the channel and overbanks. This is not representative of the reaches since the land use in the channel and overbanks are not the same. Hence, this calculation presents more representative values for Manning's *n* roughness coefficients, which is based on model calibration."

The use of Manning's *n* values within the channel is considered representative and applicable for the analyses. Assumptions concerning the other loss mechanisms for the HEC-RAS model for Scenario PF 4 are discussed in the responses to RAIs 11b, 12a, and 12b.

RAI 13: Stream and River Flooding (Choice of Methods and Technical Rationale)

The FHRR (Table 2.2) describes the service water intake structure (SWIS) operating deck elevation of 796 ft (242.62 m) NGVD29 as a safety-related SSC elevation with a peak flooding elevation for this structure (under scenario PF 4) of 795.03 ft (Table 3-3). However, in calculation package F-13 (Rizzo, 2013m) the licensee states that "overtopping of the operating deck of the SWIS at 796 ft for PF 1 will not flood the safety-related structures at the SWIS since the vertical face of the SWIS pump room continues to an elevation of 830 ft MSL [mean sea level]." To address this apparent inconsistency, the NRC staff requests:

A. Clarification of what the minimum safety-related elevation of the SWIS is and how flood water levels exceeding the 796 ft (242.62 m) NGVD29 elevation of the SWIS operating deck would impact this safety-related SSC.

B. A description of how flooding as a result of scenarios that are more conservative than Scenario 4 would impact flooding of the SWIS. The NRC staff notes that peak surface water elevations for PMF Scenario PF 1 and SSI PMF Scenarios 1 and 2 exceed the 796 ft NGVD29 elevation of the SWIS operating deck.

Response to RAI 13, Part a

The minimum safety-related elevation of the Service Water Intake Structure (SWIS) is 796 ft NGVD29. There is no inconsistency between the FHRR and the text in

Calculation F-13 with respect to this issue. The statement in the FHRR is correct. The Service Water pumps are located at elevation 796 ft NGVD29 inside the SWIS. The text in Calculation F-13 (Reference 17) is also correct. The subject of the calculation is the impact of wind waves. The static water levels reported in Calculation F-12 for all scenarios were less than elevation 795 ft NGVD29.

Only in one scenario did the still water elevation plus runup due to wind waves on the SSI exceed elevation 796 ft NGVD29. That value was 797.58 ft NGVD29 for Scenario PF 1. However, this value is calculated for runup on the vertical face of the outboard wall of the SWIS. As shown in the design drawings, there is a deck above the trash racks on the exterior of the structure at elevation 796 ft NGVD29 providing separation from the outboard wall of the structure that is adjacent to the pump room, which will change the breaking characteristics of the wind waves for Scenario PF 1 to reduce the wave runup elevation. The transient wave action will not impact the still water elevation inside the pumphouse, as discussed in more detail below. Note that the pump intake area is below the 796 ft NGVD29 operating deck floor slab. Therefore, the wave runup for Scenario PF 1 does not affect the function of the Service Water pumps.

Furthermore, Scenario PF 1 is not a reasonable case to represent the flood conditions in the SCR due to the excessive conservatism in the simplifying assumptions used in the development of the scenario. Note that the SSI dam separates the SCR from the SWIS structure and that it is the wave runup from the SSI body of water, not the SCR that impacts the vertical wall of the SWIS for PF 1. As such, and consistent with the HHA method, Scenario PF 1 was refined further in the subsequent scenarios and is not considered representative for the site.

Response to RAI 13, Part b

To provide the requested description of how wave-augmenting water surfaces in excess of elevation 796 ft NGVD29 would impact water levels inside the SWIS, the highly conservative scenario of PF 1 is considered below.

Table 7-5 of the F-13 calculation lists the peak elevations on the vertical face of the SWIS pump room for each of the modeled scenarios. For the PF 1 Scenario, which is the most conservative per the HHA methodology, the static water level near the SWIS was calculated to be 794.80 ft NGVD29. The peak water surface elevation, including runup, was calculated as 797.58 ft NGVD29, with a significant wave height of 0.85 ft and a wave period of 1.27 seconds.

The deep water wave length (L) is approximately equal to (Reference 18, Equation II-1-11):

$$L \approx \frac{gT^2}{2\pi}\sqrt{\tanh\left(\frac{4\pi^2 d}{T^2 g}\right)} \qquad \text{Equation 1}$$

where,
g is the gravitation constant (32.2 ft/sec/sec)
T is the wave period (sec), and
d is the water depth (ft).

The depth of water at the approach to the SWIS for the PF 1 Scenario is estimated as the still water level minus the SWIS top of base slab elevation = 794.8 - 755 = 39.8 ft, giving a wave length of about 8.27 ft.

As shown in the Coastal Engineering Manual (Reference 18, Figure II-1-4), surface wave effects decrease with depth and, as a rule of thumb, are assumed to be insignificant at depths greater than L/2 ft below the still water level - about 4.3 ft in this case.

Site design drawings show that the top of the vertical wall opening into the pump bay of the SWIS has an elevation of 769.0 ft NGVD29, which is 25.8 ft below the PF 1 still water elevation, significantly lower than the 4.3-foot depth representing the practical limit of wave action. This indicates that exterior changes in water level outside the SWIS due to wave action will not impact still water levels within the pumphouse, and below the 796 ft NGVD29 operating deck floor slab.

In summary, although the runup on the exterior of the pumphouse deck above the trash racks is greater than 796 ft NGVD29, the exterior wall of the pumphouse prevents this wave action from affecting water levels inside the pumphouse and below the 796 ft NGVD29 operating deck. The water levels inside the pumphouse are isolated from the wave effects because the opening to the pumphouse is at an elevation of 769 ft NGVD29, well below the depth of sensible wave action.

RAI 14: Combined Effects Flooding (Choice of Methods and Technical Rationale)

The NRC staff requests a description of any sensitivity analysis that was performed on the temporal distributions of the full PMP and 40 percent PMP used for antecedent conditions in the combined effects analysis. In particular, the staff requests additional information on whether rainfall distributions with higher proportions of rainfall toward the end of the antecedent event were considered.

Response to RAI 14

A sensitivity analysis was not conducted for the temporal distributions of the full PMP and 40 percent PMP used for antecedent conditions in the combined effects analysis. This is also consistent with guidelines provided in the American Nuclear Society (ANS) 2.8 about combined event flooding.

RAI 15: Combined Effects Flooding (Choice of Methods and Technical Rationale)

With consideration of the HHA (as presented in Section 3.2.8 of the FHRR), the NRC staff requests justification for selecting and reporting water levels resulting from Scenario PF 4 (which is a less conservative scenario and includes rainfall losses and no assumption for a future increase in impervious cover) in the FHRR for combined effects flooding. The staff also requests technical rationale for the use of contraction and expansion coefficients, Manning's roughness coefficient *n* values, and Snyder transformation coefficients as used in HEC-HMS and HEC-RAS for Scenario PF 4.

Response to RAI 15

Scenario PF 4 represents existing conditions and includes rainfall losses and runoff transformation, and routing through channels, which is a realistic representation for the purpose of the analysis. Scenario PF 5 in Calculation F-19 (Reference 19) is the same as Scenario PF 4, but also accounts for the 5 percent increase in impervious cover over 50 years. As shown in Table 7-1 of Calculation F-19, there is no difference in water surface elevation in the SCR between Scenarios PF 4 and PF 5. Therefore, it is appropriate to select PF 4.

Justifications and rationales for the selection of the contraction and expansion coefficients, Manning's roughness values, and Snyder hydrograph parameters used in the HEC-HMS and HEC-RAS models used for the development of Scenario PF 4 are provided in the responses to RAI 11 and 12.

RAI 16: Combined Effects Flooding and Local Intense Precipitation (Choice of Methods and Technical Rationale)

As noted in the "Severe Weather Abnormal Procedure Simulation" section of the FHRR, backflooding to the Electrical & Control Building can occur within the Circulating Water System (CWS) when the discharge valve pathways are open for maintenance and the flood level reaches 778 ft. The response procedure simulation estimates that a total of 3 hours is required to reinstall equipment and preclude backflooding. It is further noted that for the combined event PMF (i.e., scenario PF 4) it will take 3.2 hours for the SCR water level to rise from elevation 777 ft (when response procedure begins) to 778 ft. The NRC staff notes that although SCR peak flood elevations are lower for LIP flooding than for combined effects flooding, the rate of reservoir pool elevation rise is likely to differ between the different flooding mechanisms. In order to quantitatively assess flooding hazard to the CWS from the flooding of the SCR, the staff requests quantitative analyses of the time in which the SCR rises from 777 ft to 778 ft and the extent of CWS flooding, if any, as resulting from:

a. Combined effects flooding Scenarios PF 1, PF 2, PF 3, and PF 4, as well as any new combined effects flooding evaluations involving different PMP distributions.

b. LIP flooding Scenarios 1, 2, 3, and 4, as well as any new LIP flooding evaluations involving different PMP distributions.

Response to RAI 16, Part a

Only steady-state HEC-RAS simulations of PF 1, PF 2, PF 3 and PF 4 were made for the simulation of combined event for Calculation F-19 (Reference 19). As such, the results from these simulations cannot be used to estimate the time required for the water level of the SCR to increase from 777 ft to 778 ft NGVD29.

Calculation F-22 (Reference 20) provides a transient simulation of conditions of the combined events, which can be used to estimate the time for water levels to rise. The supporting HEC-HMS simulation for Calculation F-22 includes rainfall losses and runoff transformation, but does not include a 5-percent increase in impervious areas to represent future conditions. The F-22 simulation represents conditions of Scenario PF 4.

The HEC-RAS simulation indicates that the time for the water level in SCR to rise from 777 ft to 778 ft NGVD29 during the combined events (i.e., a 40 percent PMP followed by the full PMP) is 3.1 hours, based on an updated evaluation in Calculation F-24 (Reference 21).

Response to RAI 16, Part b

For the 6-hour, one-square mile LIP analysis, rainfall occurs over the plant site, not over the entire Squaw Creek watershed. The runoff volume (about 200 acre-feet) does not significantly change water levels within SCR. As a result, flood elevations within SCR do not reach an elevation of 778 ft NGVD29 in the LIP simulations.

RAI 17: Failure of Dams and Onsite Water Control/Storage Structures (Model Documentation and Input/Output Files)

The NRC staff requests electronic input/output files and relevant digital data files for the following:

1) HEC-HMS models for surface flow modeling of PMF
2) HEC-RAS and HEC-Geo-RAS model for PMF routing and peak water elevations
3) Digital Elevation Model (DEM) or other x-y-z data files used for surface modeling

Response to RAI 17

The requested model files are provided on Enclosure 2 (Data Disk) in the directory *Requested_Files\ RAI_17_Dam_Failure*. The file *FileList.docx* lists the files within the directory *RAI_17_Dam_Failure*. The files are also listed below:

A.	*DEM_lrg F-14.zip*		DEM
B.	*Rai_17 F14.zip*		
	a.	*Brazos_SS*	HEC-RAS model files for Brazos River
	b.	*RevSC1*	HEC-RAS model files for Squaw Creek
	c.	*EqualizationChannelGeometry.xlsx*	Contains description of SSI spillway

RAI 18: Failure of Dams and Onsite Water Control/Storage Structures (Choice of Methods and Technical Rationale)

The NRC staff's review of calculation package F-14 (Rizzo, 2013n) identified some inconsistencies as to whether Fort Phantom Hill Dam and Hubbard Creek Dam were included in the analysis. Hence, the staff requests clarification on which dams were breached in the controlling dam failure scenario and the criteria used to select the dams included in the controlling dam failure analysis.

Response to RAI 18

Breach scenarios were not developed as part of the FHRR. The results of the breach scenarios documented in Revision 3 of the Units 3&4 FSAR were utilized as input to the analyses associated with the FHRR. Failure of the Fort Phantom Hill Dam and Hubbard Creek Dam were included in the analysis, which determined that the flow rate through the Brazos River due to dam failure is equal to 6,730,000 cubic feet per second (cfs) based on the information presented in Revision 3 of the Units 3&4 FSAR. That flow rate was then input into a steady-state HEC-RAS model for the Brazos River near CPNPP in order to determine the extent of flooding along the Brazos River. Based on the steady-state model results, the stage at the confluence of Squaw Creek and Brazos River is equal to 760.45 ft NGVD29. The stage level at the confluence was used as the downstream boundary condition of a steady-state HEC-RAS model that accounted for the Squaw Creek, Squaw Creek Dam and the SSI reservoir.

RAI 19: Failure of Dams and Onsite Water Control/Storage Structures (Choice of Methods and Technical Rationale)

The licensee assumes downstream boundary conditions based on the results of the FSAR for Units 3 and 4, with total breach flow along the Brazos River of 6,730,000 cubic feet per second (cfs) (191,000 cubic meters per second (cms)) and a water level of 760.45 ft (231.79 m) NGVD29 at the foot of Squaw Creek Dam. A more recent revision of the FSAR for Units 3 and 4 includes a total breach flow of 8,380,000 cfs (237,000 cms) and water level of 768.03 ft (234.10 m) NGVD29 below Squaw Creek Dam. The NRC staff requests clarification on how these changes to the Units 3 and 4 FSAR are being addressed and what impact this change may have on the dam failure analysis.

Response to RAI 19:

The unsteady-state HEC-RAS model for Squaw Creek was run using the revised boundary of a stage of 768.03 ft NGVD29 at the confluence of Squaw Creek and Brazos River for a flow of 8,380,000 cfs per the most recent revision of the FSAR (Reference 22).

The results of the new simulation indicate that the revised, higher water level is 768.15 ft NGVD29, which is still below the crest of the service spillway for the Squaw Creek Reservoir Dam (Calculation F-25, Reference 23). Therefore, the water surface elevations on the SCR do not change since there are no backwater effects downstream of the dam.

RAI 20: Hazard Input to the Integrated Assessment: Flood Event Duration Parameters

The March 12, 2012, 50.54(f) letter, Enclosure 2, requests the licensee to perform an integrated assessment of the plant's response to the reevaluated hazard if the reevaluated flood hazard is not bounded by the current design basis. Flood scenario parameters from the flood hazard reevaluation serve as the input to the integrated assessment. To support efficient and effective evaluations under the integrated assessment, the NRC staff will review flood scenario parameters as part of the flood hazard reevaluation and document results of the review as part of the staff assessment of the flood hazard reevaluation.

The licensee has provided reevaluated flood hazards at the site including local intense precipitation flooding, probable maximum flooding on contributing watershed, flooding in streams and rivers, and flooding from breach of dams. The local intense precipitation flooding is reported to exceed the current licensing basis and subsequently the licensee has committed to perform integrated assessment.

The licensee is requested to provide the applicable flood event duration parameters (see definition and Figure 6 of the Interim Staff Guidance (ISG) JLD-ISG-2012-05, "Performing of an Integrated Assessment," dated November 30, 2012 (ADAMS Accession No. ML 12311A214) associated with mechanisms that trigger an integrated assessment using the results of the flood hazard reevaluation. This includes (as applicable) the warning time the site will have to prepare for the event (e.g., the time between notification of an impending flood event and arrival of floodwaters on site) and the period of time the site is inundated for the mechanisms that are not bounded by the current design basis. Please provide the basis or source of information for the flood event duration, which may include a description of relevant forecasting methods (e.g., products from local, regional, or national weather forecasting centers) and/or timing information derived from the hazard analysis.

Response to RAI 20:

Figure 20-1 is provided below in response to RAI 20. A figure is not provided for river flooding (and combined effects) because the plant site grade of 810 ft NGVD29 and applicable safety related SSCs are not inundated by the river flooding event. Figure 20-1 shows the length of time water surface elevations remains above elevation 810 ft NGVD29 for the storage area which leads to the highest water surface elevations around the site.

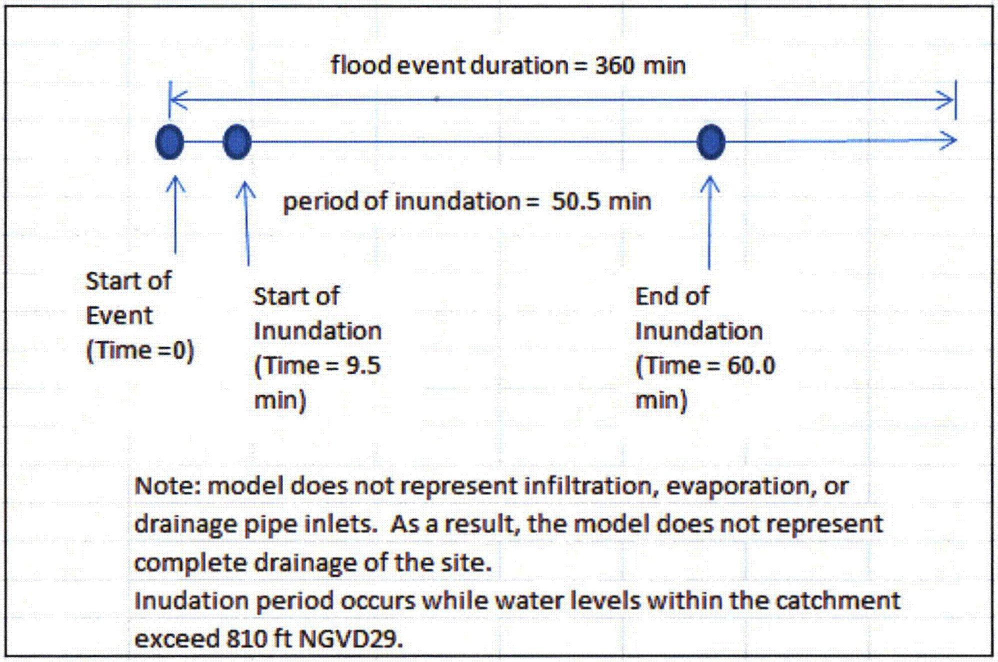

FIGURE 20-1
FLOOD DURATION OF STORAGE AREA 21669 FOR 6-HOUR PMP, SC4 OF LIP

RAI 21: Input to Integrated Assessment: Flood Height and Associated Effects

The March 12, 2012, 50.54(f) letter, Enclosure 2, requests the licensee to perform an integrated assessment of the plant's response to the reevaluated hazard if the reevaluated flood hazard is not bounded by the current design basis. Flood scenario parameters from the flood hazard reevaluation serve as the input to the integrated assessment. To support efficient and effective evaluations under the integrated assessment, the NRC staff will review flood scenario parameters as part of the flood hazard reevaluation and document results of the review as part of the staff assessment of the flood hazard reevaluation.

The licensee has provided reevaluated flood hazards at the site including local intense precipitation flooding, probable maximum flooding on contributing watershed, flooding in streams and rivers, and flooding from breach of dams. The local intense precipitation flooding is reported to exceed the current licensing basis and subsequently the licensee has committed to perform integrated assessment.

The March 12, 2012, 50.54(f) letter, Enclosure 2, requests the licensee to perform an integrated assessment of the plant's response to the reevaluated hazard if the reevaluated flood hazard is not bounded by the current design basis. The licensee is requested to provide the flood height and associated effects (as defined in Section 9 of

JLD-ISG-2012-05) that are not described in the flood hazard reevaluation report for mechanisms that trigger an Integrated Assessment. This includes the following quantified information for each flooding mechanism (as applicable):

- Hydrodynamic loading, including debris,
- Effects caused by sediment deposition and erosion (e.g., flow velocities, scour),
- Concurrent site conditions, including adverse weather, and
- Groundwater ingress

Response to RAI 21:

Page 45 of the FHRR discusses the screening of loads on the SWIS due to the PMF. Pages 44 through 46 discuss the screening out of debris effects on SSCs due to the PMF.

The effects of sediment deposition in the SSI are discussed on page 46 of the FHRR. The 2007 bathymetric survey (FHRR Reference 6) for the SCR was used in the development of the elevation-storage information for the reservoir, accounting for sedimentation levels at the time of the survey.

The controlling hazards are all precipitation hazards. Therefore, rainfall is considered concurrent with the hazard. Table 3-5 of the FHRR lists the maximum 2-year wind speed that would be concurrent with the flood hazards, 37.84 mph. Consistent with the site location, lightning and hail may be expected to occur during hazards.

Groundwater effects on the SWIS are discussed on page 45 of the FHRR. Groundwater effects on other seismic category 1 buildings are discussed pages 47 through 48 of the FHRR.

An integrated assessment will be performed (see response to RAI 22). The integrated assessment will address the effects of each bulleted item.

RAI 22: Input to the Integrated Assessment: Triggers for the integrated assessment The FHRR describes integrated assessment related actions as follows:

Since the current design basis for external flooding does not bound the reevaluated hazards, an integrated assessment will be performed.

The NRC staff requests the licensee to identify which flooding hazard mechanisms will be included in the integrated assessment.

Response to RAI 22:

The integrated assessment will include LIP and flooding from rivers and streams, considering the fact that the combined effects analysis is included in the flooding from rivers and streams evaluation.

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13. RIZZO, 2013d, Paul C. Rizzo Associates, Inc. (RIZZO), "PMF Estimation for Squaw Creek," Revision 1, RIZZO Calculation 12-4891 F-10, February 11, 2013.

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Enclosure 4 to TXX-14048

Westinghouse

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CAW-14-3937

April 2, 2014

APPLICATION FOR WITHHOLDING PROPRIETARY
INFORMATION FROM PUBLIC DISCLOSURE

Subject: CD labeled "Paul C. RIZZO Associates, Inc. Supporting Calculations for RAI Responses F-23 through F-25. Comanche Peak Flood Hazard Reevaluation. Project No. 12-4891."

CD labeled "Paul C. RIZZO Associates, Inc. Supporting Electronic Files for RAI Responses. Comanche Peak Flood Hazard Reevaluation. Project No. 12-4891."

CD labeled "Paul C. RIZZO Associates, Inc. Original Submittal of Calculations F-01 through F-22. Comanche Peak Flood Hazard Reevaluation. Project No. 12-4891."

The proprietary information for which withholding is being requested in the above-CDs is further identified in Affidavit CAW-14-3937 signed by the owner of the proprietary information, Westinghouse Electric Company LLC. The Affidavit, which accompanies this letter, sets forth the basis on which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b)(4) of 10 CFR Section 2.390 of the Commission's regulations.

The subject CDs were prepared and classified as Westinghouse Proprietary Class 2. Westinghouse requests that the CDs be considered proprietary in its entirety. As such, non-proprietary versions will not be issued.

Accordingly, this letter authorizes the utilization of the accompanying Affidavit by Luminant Generation Company LLC.

Correspondence with respect to the proprietary aspects of the application for withholding or the Westinghouse Affidavit should reference CAW-14-3937, and should be addressed to James A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company, 1000 Westinghouse Drive, Building 3 Suite 310, Cranberry Township, Pennsylvania 16066.

Very truly yours,

James A. Gresham, Manager
Regulatory Compliance

Enclosures

CAW-14-3937

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

ss

COUNTY OF BUTLER:

Before me, the undersigned authority, personally appeared James A. Gresham, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Westinghouse Electric Company LLC (Westinghouse), and that the averments of fact set forth in this Affidavit are true and correct to the best of his knowledge, information, and belief:

J A Gresham

James A. Gresham, Manager
Regulatory Compliance

Sworn to and subscribed before me
this 2nd day of April 2014

Anne M. Stegman

Notary Public

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Anne M. Stegman, Notary Public
Unity Twp., Westmoreland County
My Commission Expires Aug. 7, 2016
MEMBER, PENNSYLVANIA ASSOCIATION OF NOTARIES

(1) I am Manager, Regulatory Compliance, in Engineering, Equipment and Major Projects, Westinghouse Electric Company LLC (Westinghouse), and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing and rule making proceedings, and am authorized to apply for its withholding on behalf of Westinghouse.

(2) I am making this Affidavit in conformance with the provisions of 10 CFR Section 2.390 of the Commission's regulations and in conjunction with the Westinghouse Application for Withholding Proprietary Information from Public Disclosure accompanying this Affidavit.

(3) I have personal knowledge of the criteria and procedures utilized by Westinghouse in designating information as a trade secret, privileged or as confidential commercial or financial information.

(4) Pursuant to the provisions of paragraph (b)(4) of Section 2.390 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.

(i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse.

(ii) The information is of a type customarily held in confidence by Westinghouse and not customarily disclosed to the public. Westinghouse has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence. The application of that system and the substance of that system constitute Westinghouse policy and provide the rational basis required.

Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

(a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of

Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.

(b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage, e.g., by optimization or improved marketability.

(c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.

(d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.

(e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.

(f) It contains patentable ideas, for which patent protection may be desirable.

(iii) There are sound policy reasons behind the Westinghouse system which include the following:

(a) The use of such information by Westinghouse gives Westinghouse a competitive advantage over its competitors. It is, therefore, withheld from disclosure to protect the Westinghouse competitive position.

(b) It is information that is marketable in many ways. The extent to which such information is available to competitors diminishes the Westinghouse ability to sell products and services involving the use of the information.

(c) Use by our competitor would put Westinghouse at a competitive disadvantage by reducing his expenditure of resources at our expense.

(d) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If competitors acquire components of proprietary information, any one component may be the key to the entire puzzle, thereby depriving Westinghouse of a competitive advantage.

(e) Unrestricted disclosure would jeopardize the position of prominence of Westinghouse in the world market, and thereby give a market advantage to the competition of those countries.

(f) The Westinghouse capacity to invest corporate assets in research and development depends upon the success in obtaining and maintaining a competitive advantage.

(iv) The information is being transmitted to the Commission in confidence and, under the provisions of 10 CFR Section 2.390, it is to be received in confidence by the Commission.

(v) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.

(vi) The proprietary information sought to be withheld in this submittal is that which is contained in:
CD labeled "Paul C. RIZZO Associates, Inc. Supporting Calculations for RAI Responses F-23 through F-25. Comanche Peak Flood Hazard Reevaluation. Project No. 12-4891" (Proprietary)

CD labeled "Paul C. RIZZO Associates, Inc. Supporting Electronic Files for RAI Responses. Comanche Peak Flood Hazard Reevaluation. Project No. 12-4891" (Proprietary)

CD labeled "Paul C. RIZZO Associates, Inc. Original Submittal of Calculations F-01 through F-22. Comanche Peak Flood Hazard Reevaluation. Project No. 12-4891" (Proprietary), for submittal to the Commission, being transmitted by Luminant Generation Company LLC letter and Application for Withholding Proprietary Information from Public Disclosure, to the Document Control Desk. The proprietary information as submitted by Westinghouse is that associated with the NRC's Request for Additional Information Regarding Fukushima Lessons Learned – Flooding Hazard Reanalysis Report (TAC Nos. MF1099 and MF1100) for Comanche Peak Nuclear Power Plant, Units 1 and 2 (ML14059A188), and may be used only for that purpose.

(a) This information is part of that which will enable Westinghouse to:

(i) Respond to the NRC's request for additional information.

(b) Further this information has substantial commercial value as follows:

(i) Westinghouse plans to sell the use of similar information to its customers for the purpose of external flood hazard analysis.

(ii) Westinghouse can sell support and defense of external flood hazard analysis.

(iii) The information requested to be withheld reveals the distinguishing aspects of a methodology which was developed by Westinghouse.

Public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of Westinghouse because it would enhance the ability of competitors to provide similar external flood hazard analysis, technical evaluation justifications and licensing defense services for commercial power reactors without commensurate expenses. Also, public disclosure of the information would enable others to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

The development of the technology described in part by the information is the result of applying the results of many years of experience in an intensive Westinghouse effort and the expenditure of a considerable sum of money.

In order for competitors of Westinghouse to duplicate this information, similar technical programs would have to be performed and a significant manpower effort, having the requisite talent and experience, would have to be expended.

Further the deponent sayeth not.

PROPRIETARY INFORMATION NOTICE

Transmitted herewith is the proprietary version of CDs furnished to the NRC in connection with requests for Additional Information Regarding Fukushima Lessons Learned – Flooding Hazard Reanalysis Report (TAC Nos. MF1099 and MF1100) for Comanche Peak Nuclear Power Plant, Units 1 and 2 (ML14059A188), and may be used only for that purpose. The CDs are to be considered proprietary in their entirety.