Luminant

Rafael Flores
Senior Vice President &
Chief Nuclear Officer
rafael.flores@luminant.com

Luminant Power
P O Box 1002
6322 North FM 56
Glen Rose, TX 76043

T 254.897.5590
F 254.897.6652
C 817.559.0403

CP-200901564
Log # TXNB-09067

Ref. # 10 CFR 52

November 13, 2009

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555
ATTN: David B. Matthews, Director
Division of New Reactor Licensing

SUBJECT: COMANCHE PEAK NUCLEAR POWER PLANT, UNITS 3 AND 4
DOCKET NUMBERS 52-034 AND 52-035
RESPONSES TO REQUESTS FOR ADDITIONAL INFORMATION NO. 2990, 2999, 3230, 3663, 3664, 3665, 3666, 3667, 3668, 3669, 3670, 3671, AND 3672

Dear Sir:

Luminant Generation Company LLC (Luminant) herein submits responses to Requests for Additional Information No. 2990, 2999, 3230, 3663, 3664, 3665, 3666, 3667, 3668, 3669, 3670, 3671, and 3672 for the Combined License Application for Comanche Peak Nuclear Power Plant Units 3 and 4. The affected Final Safety Analysis Report pages are included with the responses.

Should you have any questions regarding these responses, please contact Don Woodlan (254-897-6887, Donald.Woodlan@luminant.com) or me.

There are no commitments in this letter.

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

Executed on November 13, 2009.

Sincerely,

Luminant Generation Company LLC

Donald R. Woodlan for

Rafael Flores

D090
NRO

Attachments

1. Response to Request for Additional Information No. 2990 (CP RAI #106)
2. Response to Request for Additional Information No. 2999 (CP RAI #115)
3. Response to Request for Additional Information No. 3230 (CP RAI #110)
4. Response to Request for Additional Information No. 3663 (CP RAI #101)
5. Response to Request for Additional Information No. 3664 (CP RAI #102)
6. Response to Request for Additional Information No. 3665 (CP RAI #105)
7. Response to Request for Additional Information No. 3666 (CP RAI #111)
8. Response to Request for Additional Information No. 3667 (CP RAI #112)
9. Response to Request for Additional Information No. 3668 (CP RAI #107)
10. Response to Request for Additional Information No. 3669 (CP RAI #104)
11. Response to Request for Additional Information No. 3670 (CP RAI #103)
12. Response to Request for Additional Information No. 3671 (CP RAI #113)
13. Response to Request for Additional Information No. 3672 (CP RAI #114)
14. Electronic Attachment (on CD)

cc: Stephen Monarque w/all Attachments
Electronic Distribution w/Attachments 1-13

mike.blevins@luminant.com
Rafael.Flores@luminant.com
mlucas3@luminant.com
jeff.simmons@energyfutureholdings.com
Bill.Moore@luminant.com
Brock.Degeyter@energyfutureholdings.com
rbird1@luminant.com
Matthew.Weeks@luminant.com
Allan.Koenig@luminant.com
Timothy.Clouser@luminant.com
Ronald.Carver@luminant.com
David.Volkening@luminant.com
Bruce.Turner@luminant.com
Eric.Evans@luminant.com
Robert.Reible@luminant.com
donald.woodlan@luminant.com
John.Conly@luminant.com
JCaldwell@luminant.com
David.Beshear@txu.com
Ashley.Monts@luminant.com
Fred.Madden@luminant.com
Dennis.Buschbaum@luminant.com
Carolyn.Cosentino@luminant.com

Luminant Records Management –
Portfolio of .pdf files

masahiko_kaneda@mnes-us.com
masanori_onozuka@mnes-us.com
ck_paulson@mnes-us.com
joseph_tapia@mnes-us.com
russell_bywater@mnes-us.com
diane_yeager@mnes-us.com
kazuya_hayashi@mnes-us.com
mutsumi_ishida@mnes-us.com
nan_sirirat@mnes-us.com
rjb@nei.org
kak@nei.org
michael.takacs@nrc.gov
cp34update@certrec.com
michael.johnson@nrc.gov
David.Matthews@nrc.gov
Balwant.Singal@nrc.gov
Hossein.Hamzehee@nrc.gov
Stephen.Monarque@nrc.gov
jeff.ciocco@nrc.gov
michael.willingham@nrc.gov
john.kramer@nrc.gov
Brian.Tindell@nrc.gov
Elmo.Collins@nrc.gov
Loren.Plisco@nrc.com
Laura.Goldin@nrc.gov
James.Biggins@nrc.gov
Susan.Vrahoretis@nrc.gov
sfrantz@morganlewis.com
tmatthews@morganlewis.com

Attachment 1

Response to Request for Additional Information No. 2990 (CP RAI #106)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 2990 (CP RAI #106)

SRP SECTION: 03.08.01 - Concrete Containment

QUESTIONS for Structural Engineering Branch 1 (AP1000/EPR Projects) (SEB1)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 03.08.01-1

This Request for Additional Information (RAI) is necessary for the staff to determine if the application meets the requirements of 10 CFR sections 50.34(f) and 50.55a, and General Design Criteria (GDC) 1, 2, 4, 16, and 50.

STD combined license (COL) 3.8(2) in Comanche Peak Nuclear Power Plant (CPNPP) COL FSAR, Subsection 3.8.1.5.1.2, "Prestressing System" (Page 3.8-1), states that "Prestress friction losses of the tendons due to wobble and curvature coefficients used in the analysis will be reconciled with the site-specific tendon system corrosion protection coatings present at the time of prestressing."

The applicant is requested to provide the following information:

(a) Describe the procedure for reconciling the friction losses with site-specific tendon corrosion protection coatings.
(b) Define the limits on the acceptance criteria to be used to perform these reconciliations.
(c) Describe the recovery actions that may be necessary if reconciliation leads to unacceptable results for actual friction losses.
(d) Describe the procedures for reconciliation of all physical properties of the material and the as-built properties.

ANSWER:

STD COL 3.8(2) was deleted in DCD Revision 2 per MHI Document UAP-HF-08259 (dated November 7, 2008) and was deleted from the FSAR per Revision 0 of the Update Tracking Report (UTR) submitted on April 2, 2009 with Luminant letter TXNB-09005 (ML092450340). The intention of the STD COL 3.8(2) was for the Applicant to commit to as-built reconciliation, however it was deleted since the reconciliation process is discussed in the DCD, which is incorporated by reference (IBR) in the COLA FSAR.

(a) As noted in DCD Subsection 3.8.1.5.1.2, the losses considered in the tendons are based on the items defined in ASME Code, Section III, Subarticle CC-3542. The procedure for reconciling the friction losses with site-specific tendon corrosion protection coatings will be addressed in the ASME Design Report and Construction Specification for the Prestressed Concrete Containment Vessel (PCCV). Consistent with guidance in Regulatory Guide 1.35.1, coefficients for determining friction losses are to be determined before the start of installation and are verified during construction and modified (if necessary) during construction to bring the losses into conformance. Any adjustments made during construction are recorded for the purposes of reconciliation with design documents.

(b) The structural acceptance criteria of the prestressing system is in accordance with ASME Code, Section III, Subarticles CC-3423, CC-3431.1, and CC-3542 as discussed in DCD Subsection 3.8.1.5.1.2, and is IBR in the COLA FSAR. The acceptance criteria will also be addressed collectively with the reconciliation of the friction losses with site-specific tendon corrosion protection coatings in the ASME Design Report and Construction Specification for the Prestressed Concrete Containment Vessel (PCCV).

(c) As stated in DCD Subsection 3.8.1.4.6, a Design Report of the PCCV is provided separately from the DCD. ASME Code, Section XI, Subarticle IWL-3300 requires an Engineering Evaluation Report that specifies the extent and method of required repair/replacement activities if acceptance standards are not met, including for as-built physical properties of the material if applicable. In accordance with Subarticle NCA-3350 of ASME Code, Section III, the Design Report has sufficient detail to show that the applicable stress limitations are satisfied when components are subjected to the design loading conditions. Therefore, any necessary recovery actions will be addressed collectively in the Design Report, Construction Specification, and any required Engineering Evaluation Report.

(d) The ASME Section III, Division 2 Data Report will certify that the PCCV prestressing system materials comply with the requirements of Article CC-2000, and fabrication and construction comply with Article CC-4000. The PCCV tendon system will also conform to the requirements of ASME Section XI Division 1 Subsection IWL as stated in DCD Subsection 3.8.1.7. ASME Code, Section XI, Subarticle IWL-3120 considers the post-tensioning system to be acceptable if it meets the requirements of the Construction Specification at the time of installation.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 2990 (CP RAI #106)

SRP SECTION: 03.08.01 - Concrete Containment

QUESTIONS for Structural Engineering Branch 1 (AP1000/EPR Projects) (SEB1)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 03.08.01-2

This Request for Additional Information (RAI) is necessary for the staff to determine if the application meets the requirements of 10 CFR sections 50.34(f) and 50.55a, and General Design Criteria (GDC) 1, 2, 4, 16, and 50.

STD COL 3.8(2) in CPNPP COL FSAR, Subsection 3.8.1.5.1.2, "Prestressing System" (Page 3.8-1), discusses friction losses in the prestressing tendons. The NRC staff notes that the horizontal (hoop) prestressing tendons in the pre-stressed concrete containment vessel (PCCV) curve round the entire PCCV and are about 475 ft in length. In addition, the vertical inverted U-shaped prestressing steel tendons for the PCCV extend vertically from the tendon gallery (in the basemat) up the PCCV cylinder and over the dome and down the PCCV cylinder to the opposite tendon gallery, a distance for some of the tendons of about 500 ft.

The applicant is requested to describe the prestressing techniques and procedures to be used in construction of the PCCV. The description should include a discussion of measures to be taken in post-tensioning the prestressing tendons, including the method to be used for determining the friction losses in the tendons. .

ANSWER:

STD COL 3.8(2) was deleted in DCD Revision 2 per MHI Document UAP-HF-08259 (dated November 7, 2008) and was deleted from the FSAR per Revision 0 of the Update Tracking Report submitted on April 2, 2009 with Luminant letter TXNB-09005 (ML092450340).

The PCCV is designed with a strand prestressing system as described in Subsection 3.8.1.6 of the DCD. The prestressing techniques, procedures, and resulting friction losses will depend in part on the details and characteristics of the actual system procured and the individual contractor used for the construction of the PCCV. The prestressing techniques and procedures will conform to the ASME-required Construction Specification for the PCCV, will conform to the provisions of ASME CC-4450, and will include provisions for installation tolerances, alignment of tensioning equipment, prestressing sequence and control of loading and elongation. Any deviations from the Construction Specification which result in deviations from design values will be required to be reconciled by the ASME Design Report for the PCCV.

The analytical methods used for determining friction losses in the tendons will conform to the provisions of ASME Section III Subarticle CC-3542 and RG 1.35.1 as stated in the DCD Subsections 3.8.1.4.1.1, 3.8.1.5.1.2, and 3.8.1.5.2.2. Any reconciliation required between friction losses determined during actual stressing operations versus the predicted design loads used in the design will be addressed in the PCCV Design Report. The exact methods for determining friction losses in the tendons will also be addressed in the PCCV Design Report.

ITAAC Item 3 of Table 2.2-4 of the US-APWR Tier 1 DCD requires that an analysis be performed to verify that the as-built PCCV structural design-basis loads are reconciled and that the ASME Design Report addresses this.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 2990 (CP RAI #106)

SRP SECTION: 03.08.01 - Concrete Containment

QUESTIONS for Structural Engineering Branch 1 (AP1000/EPR Projects) (SEB1)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 03.08.01-3

This Request for Additional Information (RAI) is necessary for the staff to determine if the application meets the requirements of 10 CFR sections 50.34(f) and 50.55a, and General Design Criteria (GDC) 1, 2, 4, 16, and 50.

STD COL 3.8(4) in CPNPP COL FSAR, Subsection 3.8.1.6, "Material, Quality Control, and Special Construction Techniques" (Page 3.8-2), states, in part, "All the concrete mix ingredients conform to applicable codes and standards."

The applicant is requested to identify the specific codes and standards that apply.

ANSWER:

STD COL 3.8(4) was deleted in DCD Revision 2 per MHI Document UAP-HF-08259 (dated November 7, 2008) and was deleted from the FSAR per Update Tracking Report Revision 0 (Technical Correction Version) Section 3.8.1.6, Page 3.8-2, submitted on April 2, 2009 with Luminant letter TXNB-09005 (ML092450340). The intention of the STD COL 3.8(4) was for the Applicant to commit to as-built reconciliation; however it was deleted since the reconciliation process is discussed in the DCD, which is incorporated by reference (IBR) in the COLA FSAR.

Applicable concrete codes and standards are discussed in DCD Subsection 3.8.1.6. The concrete constituents and concrete mix design comply with the requirements of Article CC-2200 of the ASME Code, Section III, Rules for Construction of Nuclear Facility Components, Division 2, Concrete Containments.

Cement used in the concrete conforms to the requirements of ASTM C 150, Specification for Portland Cement, Type I, Type II, Type IV, Type V, or ASTM C 595, Specification for Blended Hydraulic Cements, Type IP, Type IP (MS), or Type (MH).

Aggregates used in the concrete conform to the requirements in ASTM C 33, Specification for Concrete Aggregates.

Mixing water used in the concrete conforms to the requirements in Paragraph CC-2223 of the ASME Code, Section III, Division 2.

Air-entraining admixtures conform to the requirements of ASTM C260, Air-Entraining Admixtures for Concrete. Mineral admixtures conform to the requirements of ASTM C 618, Fly Ash and Raw or Calcined Natural Pozzolans for use in Portland Cement Concrete. Chemical admixtures conform to the requirements of ASTM C 494, Chemical Admixtures for Concrete.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 2990 (CP RAI #106)

SRP SECTION: 03.08.01 - Concrete Containment

QUESTIONS for Structural Engineering Branch 1 (AP1000/EPR Projects) (SEB1)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 03.08.01-4

STD COL 3.8(5) in CPNPP COL FSAR, Subsection 3.8.1.6 (Page 3.8-2), states, in part, that "The PCCV design analysis will be revised, prior to start of the PCCV superstructure construction, if the final test results affect the conclusions of the PCCV calculations."

The applicant is requested to:

(a) Define concisely the term "superstructure construction."

(b) What are the criteria to be used to determine if the test results affect the conclusions of the PCCV calculations? Provide the acceptance basis and limits on acceptability of the test results.

ANSWER:

STD COL 3.8(5) was deleted in DCD Revision 2 per MHI Document UAP-HF-08259 (dated November 7, 2008) and was deleted from the FSAR per Update Tracking Report Revision 0 (Technical Correction Version) Section 3.8.1.6, Page 3.8-2, submitted on April 2, 2009 with Luminant letter TXNB-09005 (ML092450340). The intention of the STD COL 3.8(5) was for the Applicant to commit to verify site-specific concrete mix; however it was deleted since commitments to ASME Code requirements are discussed in the DCD, which is incorporated by reference (IBR) in the COLA FSAR.

(a) While the definition of "superstructure" and "construction" is consistent with common building industry terminology, the context of "superstructure construction" in the discussion of PCCV design analysis refers to all portions of the PCCV influenced by variation in creep and shrinkage due to prestressing, and all portions conforming to the requirements of the ASME Code, Section III, Rules for Construction of Nuclear Facility Components, Division 2, Concrete Containment. DCD Figure 3.8.5-4 shows the boundary of the portions of the PCCV and its basemat that are governed by the ASME Code.

(b) In accordance with ASME Code Subparagraph CC-2231.4, if it is determined through interim test data that the design basis creep value will be exceeded, a design change may be required. The criteria used to determine if the final test results affect the conclusions will be defined in the PCCV Design Report. In general, if the creep and shrinkage coefficients selected are conservative, no revision of the PCCV Design Report would be necessary.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 2990 (CP RAI #106)

SRP SECTION: 03.08.01 - Concrete Containment

QUESTIONS for Structural Engineering Branch 1 (AP1000/EPR Projects) (SEB1)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 03.08.01-5

This Request for Additional Information (RAI) is necessary for the staff to determine if the application meets the requirements of 10 CFR sections 50.34(f) and 50.55a, and General Design Criteria (GDC) 1, 2, 4, 16, and 50.

STD COL 3.8(7) in CPNPP COL FSAR, Subsection 3.8.1.6 (Page 3.8-2), states, in part, that "Site-specific aggressivity of the ground water/soil at the CPNPP site is not applicable, as discussed in Chapter 2."

In the U.S. Advanced Pressurized Water Reactor (US-APWR) Design Control Document (DCD), Subsection 3.8.1.6, the 8th paragraph (Page 3.8-24) states, in part, "As required by SRP 3.8.1 (Reference 3.8-7), for plants with nonaggressive ground water/soil (i.e., pH is greater than 5.5, chlorides are less than 500 ppm, and sulfates are less than 1,500 ppm), an acceptable program for normally inaccessible, below-grade concrete walls and basemats is to (1) examine the exposed portions of below-grade concrete for signs of degradation, when excavated for any reason; and (2) conduct periodic site monitoring of ground water chemistry, to confirm that the ground water remains nonaggressive."

The NRC staff is unable to find a description of any program in the CPNPP COL FSAR that meets the requirements stated in the above quote from the US-APWR for the examination of below-grade concrete and the monitoring of changes in the soil aggressivity. The applicant is requested to confirm that such a program will be established and implemented for the CPNPP.

ANSWER:

A program that conforms to the requirements of SRP 3.8.1 Subsection II.7.C as described in DCD Subsection 3.8.1.6 will be established and implemented for CPNPP Units 3 and 4. FSAR Section 3.8.4.7 provides a description of the Inservice Inspection program which will be implemented. FSAR STD COL 3.8(7), Subsection 3.8.1.6, has been revised to incorporate this response. FSAR Subsection 3.8.4.7 has been revised to clarify accordingly.

Impact on R-COLA

See attached mark-up of FSAR Draft Revision 1, pages 3.8-1 and 3.8-10.

Impact on S-COLA

None.

Impact on DCD

None.

3.8 DESIGN OF CATEGORY I STRUCTURES

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

3.8.1.6 Material, Quality Control, and Special Construction Techniques

---

STD COL 3.8(3) Replace the second sentence of the first paragraph in DCD Subsection 3.8.1.6 with the following.

Any material changes to the site-specific materials for construction of the PCCV will meet the requirements specified in ASME Code, Section III (Reference 3.8-2), Article CC-2000, and supplementary requirements of RG 1.136 (Reference 3.8-3), as well as SRP 3.8.1 (Reference 3.8-7).

CP COL 3.8(7) Replace the first sentence of the thirteenth paragraph in DCD Subsection 3.8.1.6 with the following.

Site-specific ~~aggressivity of the~~ ground water/soil at the CPNPP site is not aggressive ~~applicable~~, as discussed in Subsection 2.5.4. As part of inservice inspection programs discussed in Subsection 3.8.4.7, exposed portions of below-grade concrete of seismic category I structures, including the PCCV, will be examined for signs of degradation when below-grade concrete walls and basemats are excavated for any reason, and periodic site monitoring of ground water chemistry will be performed to confirm that the ground water/soil remains nonaggressive. RCOL2_03.08.01-5 CTS-00602

CP COL 3.8(10) Replace the second and third sentences of the twenty-third paragraph in DCD Subsection 3.8.1.6 with the following.

The prestressing system is designed as a strand system.

3.8.1.7 Testing and Inservice Inspection Requirements

STD COL 3.8(14) Replace the third paragraph in DCD Subsection 3.8.1.7 with the following.

A preservice inspection (PSI) program for the PCCV will be completed at least 12 months prior to initial fuel load. The PSI requirements will conform to the provisions of ASME Section XI Division 1 Articles IWA-2000, IWE-2000, and MAP-03-023 RCOL2_03.08.01-6

A site-specific program for monitoring and maintenance of seismic category I structures is performed in accordance with the requirements of NUMARC 93-01 (Reference 3.8-28) and 10 CFR 50.65 (Reference 3.8-29) as detailed in RG 1.160 (Reference 3.8-30). Monitoring of seismic Category I structures includes base settlements and differential displacements. MAP-03-012 MAP-03-012

Prior to completion of construction, site-specific programs are developed in accordance with RG 1.127 (Reference 3.8-47) for ISI of seismic category I water control structures, including the UHSRS and any associated safety and performance instrumentation.

The site-specific programs address in particular ISI of critical areas to assure plant safety through appropriate levels of monitoring and maintenance. Any special design provisions (such as providing sufficient physical access or providing alternative means for identification of conditions in inaccessible areas that can lead to degradation) to accommodate ISI are also required to be addressed in the ISI program.

Because the CPNPP site exhibits nonaggressive ground water/soil (i.e., pH greater than 5.5, chlorides less than 500 ppm, and sulfates less than 1,500 ppm), the program for ISI of inaccessible, below-grade concrete walls and foundations of seismic category I structures~~the UHSRS~~ is less stringent than would be applied for sites with aggressive ground water/soil. The program is required to include requirements for (1) examination of the exposed portions of the below-grade concrete, when excavated for any reason, for signs of degradation; and (2) conducting periodic site monitoring of ground water chemistry, to confirm that the ground water remains nonaggressive. RCOL2_03.08.01-5

3.8.5.1 Description of the Foundations

CP COL 3.8(23) Replace the second sentence of the second paragraph in DCD Subsection 3.8.5.1 with the following.

The 4 ft. depth exceeds the maximum depth of frost penetration at CPNPP.

3.8.5.1.3 Site-Specific Structures

CP COL 3.8(24) Replace the paragraph in DCD Subsection 3.8.5.1.3 with the following new subsections.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 2990 (CP RAI #106)

SRP SECTION: 03.08.01 - Concrete Containment

QUESTIONS for Structural Engineering Branch 1 (AP1000/EPR Projects) (SEB1)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 03.08.01-6

This Request for Additional Information (RAI) is necessary for the staff to determine if the application meets the requirements of 10 CFR sections 50.34(f) and 50.55a, and General Design Criteria (GDC) 1, 2, 4, 16, and 50.

In STD COL 3.8(14), CPNPP COL FSAR, Section 3.8.1.7, preservice inspection (PSI) is not explicitly described. Is it defined as the initial inservice inspection (ISI) for the PCCV?

The applicant is requested to explain what the PSI is and to provide a detailed description of the proposed PSI.

ANSWER:

Detailed preservice inspection (PSI) procedures will be explicitly described in the site-specific Preservice Inspection program. As required by FSAR Subsection 3.8.1.7, the PSI program of the PCCV will be completed 12 months prior to initial fuel load. The PSI requirements will conform to the provisions of ASME Section XI Division 1 Articles IWA-2000, IWE-2000, and IWL-2000.

The PSI program includes the preservice examination of the concrete containment and its liner. The PSI will establish the baseline for the subsequent ISI activities. The containment liner and the penetration liners will be inspected to the requirements of Subparagraph IWE-2200 of ASME Section XI, while the containment concrete and post-tensioning system will be visually inspected to the requirements of Section IWL-2220. Preservice examination activities of the liner will be completed after the containment pressure test required by the construction code but prior to plant startup, as required by IWE-2200(a) and IWE-2200(b). Preservice examination of the concrete containment and post-tensioned tendons will be completed after the Structural Integrity Test but prior to plant startup as required by IWL-2210 and IWL-2220.1(b).

Concrete surface areas will be examined visually in accordance with Subparagraph IWL 2510 of ASME Section XI, to identify areas of concrete deterioration and distress, such as described in ACI 201.1 and

ACI 349.3R. As required by IWL-2220.2, pertinent PSI information for the unbonded tendons will be documented in the preservice examination records. As required by IWL-2310(e), the owner will define the specific requirements for visual examination of the tendon anchorage hardware, wires, or strands. These will depend on the yet to be completed detailed design of the post-tensioning system.

As required by IWL-2320, Registered Professional Engineers experienced in evaluating the condition of structural concrete will serve as the Responsible Engineers for the inspections of the concrete containment and post-tensioning systems under the PSI and ISI programs.

Examinations identified in Table IWE-2500-1 will be performed on the pressure-retaining components of the metallic shell, penetration liners, and their integral attachments of the Class CC concrete containment vessel as part of the PSI. Visual examinations will conform to the requirements of IWE-2300.

Examination personnel will meet the qualification requirements of IWE-2330. As required by IWE-2320, the Responsible Individual for the liner and penetration examinations under the PSI and ISI programs will be knowledgeable in the requirements for design, inservice inspection, and testing of Class MC and metallic liners of Class CC components.

The same individual may serve as the Responsible Individual and the Responsible Engineer, provided that individual meets the respective requirements of both IWE-2320 and IWL-2320.

FSAR Subsection 3.8.1.7 has been revised to incorporate this response.

Impact on R-COLA

See attached mark-up of FSAR Draft Revision 1 page 3.8-1 and 3.8-2.

Impact on S-COLA

None.

Impact on DCD

None.

3.8 DESIGN OF CATEGORY I STRUCTURES

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

3.8.1.6 Material, Quality Control, and Special Construction Techniques

---

STD COL 3.8(3) Replace the second sentence of the first paragraph in DCD Subsection 3.8.1.6 with the following.

Any material changes to the site-specific materials for construction of the PCCV will meet the requirements specified in ASME Code, Section III (Reference 3.8-2), Article CC-2000, and supplementary requirements of RG 1.136 (Reference 3.8-3), as well as SRP 3.8.1 (Reference 3.8-7).

CP COL 3.8(7) Replace the first sentence of the thirteenth paragraph in DCD Subsection 3.8.1.6 with the following.

Site-specific ~~aggressivity of the~~ ground water/soil at the CPNPP site is not aggressive ~~applicable~~, as discussed in Subsection 2.5.4. As part of inservice inspection programs discussed in Subsection 3.8.4.7, exposed portions of below-grade concrete of seismic category I structures, including the PCCV, will be examined for signs of degradation when below-grade concrete walls and basemats are excavated for any reason, and periodic site monitoring of ground water chemistry will be performed to confirm that the ground water/soil remains nonaggressive. RCOL2_03.08.01-5 CTS-00602

CP COL 3.8(10) Replace the second and third sentences of the twenty-third paragraph in DCD Subsection 3.8.1.6 with the following.

The prestressing system is designed as a strand system.

3.8.1.7 Testing and Inservice Inspection Requirements

STD COL 3.8(14) Replace the third paragraph in DCD Subsection 3.8.1.7 with the following.

A preservice inspection (PSI) program for the PCCV will be completed at least 12 months prior to initial fuel load. The PSI requirements will conform to the provisions of ASME Section XI Division 1 Articles IWA-2000, IWE-2000, and MAP-03-023 RCOL2_03.08.01-6

IWL-2000, and the PSI establishes the baseline for the subsequent ISI activities. ISI are performed during the initial and subsequent 10 year intervals as identified in Subsections IWE and IWL Article 2000, Examination Program B. The PCCV PSI and ISI programs include preservice examination, testing and ISI requirements, and also address personnel qualification requirements and responsibilities. The PCCV ISI program also provides detailed inspection plans and surveillance schedules consistent with those of the integrated leak rate test (ILRT) program, which is discussed further below and in Subsection 6.2.6. ASME Code Section XI requirements incorporated by reference in 10 CFR 50.55a on the date 12 months prior to issuance of the operating license, and optional ASME code cases endorsed by the NRC via RG 1.147, establish the requirements for the initial 120-month ISI program interval. ISI conducted during successive 120 month intervals complies with the requirements incorporated by reference (in 10 CFR 50.55a) 12 months before the start of the 120-month inspection interval, subject to the modifications and limitations listed in paragraph (b) of that section, or the optional ASME Code cases endorsed by the NRC via RG 1.147. RCOL2_03.08.01-6

The PCCV ISI program surveillance requirements for periodic surveillance and inspection of the overall structure, as well as the liner and prestressing tendon systems, are in accordance with ASME Code Section XI (Reference 3.8-4) Subsections IWA, IWE, and IWL. Further, inservice inspection requirements for the tendons also follow the applicable guidelines of RG 1.35 (Reference 3.8-5) and 1.35.1 (Reference 3.8-6). The ISI of the PCCV includes the pertinent items in all examination categories identified in Tables IWE-2500-1 and IWL-2500-1 of ASME (Reference 3.8-4), summarized as follows:

- PCCV pressure retaining boundary, including all accessible interior and exterior surfaces of the liner, penetration liners, and class MC components, parts, and appurtenances.
- Containment structural and pressure retaining boundary welds and pressure-retaining bolted connections.
- Integral structural attachments and welds connecting the attachments to the liner.
- Wetted surfaces of submerged areas [such as the refueling water storage pit (RWSP)].
- Moisture barriers (where applicable).
- Areas at tendon end anchors, wherever accessible, to inspect for concrete cracking, corrosion protection material leakage, and/or tendon cap deformation.
- Examination of, sampling, and testing corrosion protection material.
- Examination of wires or strand and anchorage hardware for cracks, wear, and corrosion.
- Determination of tendon forces by measuring lift-off forces.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 2990 (CP RAI #106)

SRP SECTION: 03.08.01 - Concrete Containment

QUESTIONS for Structural Engineering Branch 1 (AP1000/EPR Projects) (SEB1)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 03.08.01-7

This Request for Additional Information (RAI) is necessary for the staff to determine if the application meets the requirements of 10 CFR sections 50.34(f) and 50.55a, and General Design Criteria (GDC) 1, 2, 4, 16, and 50.

In STD COL 3.8(14) in CPNPP COL FSAR, Subsection 3.8.1.7, "Testing and Inservice Inspection Requirements," the 6th bullet (Page 3.8-4) states that "Areas at tendon end anchors, wherever accessible, to inspect for concrete cracking, corrosion protection material leakage, and/or tendon cap deformation."

The applicant is requested to provide the following information:

(a) What constitutes "inaccessibility" of an end anchor?
(b) What are the acceptance criteria to be used for determining that an end anchor is in an acceptable condition?
(c) What fraction of the total number of end anchors is not accessible?
(d) What is the rationale and procedures to be used to assure that inaccessible tendon end anchors not inspected are intact and are in satisfactory condition?
(e) What procedures will be used to correct any unacceptable conditions in the end anchors?

ANSWER:

The prestressing system consists of unbonded post-tensioned tendons of two types: horizontal hoop tendons and inverted U tendons. The horizontal tendons wrap around the cylinder and the lower part of the dome and are anchored at two vertical buttresses that are accessed for servicing through vertical chases provided in the R/B at each buttress.

The inverted U tendons run vertically up the cylinder, over the dome, and down to a tendon gallery on the opposite side. They are anchored at each end in a tendon gallery located entirely within the basemat. The gallery is accessed through a horizontal hallway that connects it to the exterior plant yard.

(a) What constitutes "inaccessibility" of an end anchor?

Per ASME Section XI, Subparagraph IWL-2521.1, inaccessibility may be due to safety or radiological hazards or because of structural obstructions. As required by Regulatory Guide (RG) 1.35, paragraph C.1.4, the post-tensioned system will be designed such that the end anchors are accessible for inspection; however, under operating conditions certain tendons may be deemed "inaccessible" for a particular scheduled ISI inspection due to industrial safety or As Low As Reasonably Achievable (ALARA) program concerns.

(b) What are the acceptance criteria to be used for determining that an end anchor is in an acceptable condition?

The PSI and ISI programs will address the acceptance criteria in detail. Specific inspection and acceptance criteria will be developed when the tendon materials and configurations and plant configuration are finalized. The acceptance criteria will conform to the standards contained in IWL-2220 (PSI) and IWL-3220 (ISI) and in RG 1.35.

(c) What fraction of the total number of end anchors is not accessible?

As required by RG 1.35, paragraph C.1.4, there are currently no end anchors that are designed as inaccessible; however, under operating conditions certain tendons may be deemed "inaccessible" for a particular scheduled ISI inspection due to industrial safety or ALARA program concerns.

(d) What is the rationale and procedures to be used to assure that inaccessible tendon end anchors not inspected are intact and are in satisfactory condition?

Under the ISI program, components of the post-tensioning system will be examined to specific criteria and procedures developed by the owner. Post-tensioning system inspection will satisfy IWL-2522 through IWL-2525 and RG 1.35, paragraphs C.4, C.5, and C.6. Any tendons deemed inaccessible for a particular ISI inspection, will be exempted from that inspection. However, per IWL-2521.1(b) and RG 1.35, paragraph C.2.5, substitute tendons will be added to the population of tendons to be inspected. Each substitute tendon will be located as close as possible to the exempted tendon.

Each exempted tendon will be examined to criteria and procedures that conform to IWL-2524 and IWL-2525, and RG 1.35, paragraphs C.3 and C.6, to the extent that the end anchorages of the exempt tendon are accessible either during operation or an outage. IWL-2524 requires a visual inspection of the tendon anchorage and a determination of free water in the anchorage end cap. IWL-2525 provides requirements for the examination of the corrosion protection medium and free water. RG 1.35, paragraph C.3 provides visual inspection criteria, while RG 1.35, paragraph C.6, provides criteria for the analysis of the corrosion protection medium (filler grease).

(e) What procedures will be used to correct any unacceptable conditions in the end anchors?

Detailed ISI procedures, including acceptance criteria and general repair/replacement criteria, will be explicitly described in the site-specific ISI program, which will be completed prior to commercial operation per Table 13.4-201 of the COLA FSAR. Acceptance criteria for the unbonded tendons will conform to the requirements of IWL-3220 and RG 1.35, paragraph C.7. Any tendon anchorage component failing the acceptance criteria will be repaired or replaced according to a plan developed under the direction of the Responsible Engineer, as required by IWL-4210. Specific repair or replacement procedures will depend on items such as the nature of the defect, the actual geometry of the anchorage, its location, and plant conditions at the time of the repair or replacement activity.

As required by IWL-4240(a), welding will be limited to the bearing plates. Other parts of the post-tensioning system will be protected from damage due to the welding process. The Repair or Replacement Plan will include, as a minimum the items indentified in IWL-4240(b).

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 2990 (CP RAI #106)

SRP SECTION: 03.08.01 - Concrete Containment

QUESTIONS for Structural Engineering Branch 1 (AP1000/EPR Projects) (SEB1)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 03.08.01-8

This Request for Additional Information (RAI) is necessary for the staff to determine if the application meets the requirements of 10 CFR sections 50.34(f) and 50.55a, and General Design Criteria (GDC) 1, 2, 4, 16, and 50.

In STD COL 3.8(14) in CPNPP COL FSAR, Subsection 3.8.1.7, "Testing and Inservice Inspection Requirements," the 10th bullet (on Page 3.8-4) states "Detensioning tendons and the removal of a wire or strand for inspection for corrosion and testing to measure strength and elongation."

The applicant is requested to provide the following information:

(a) What are the acceptance criteria to be used for determining that the extent of corrosion of a wire or strand is acceptable?

(b) What are the acceptance criteria for determining that the strength and elongation of a wire or strand are acceptable?

ANSWER:

ISI procedures will be explicitly described in the site-specific ISI program. The ISI requirements will conform to the provisions of ASME Section XI Division 1 Articles IWA-2000, IWE-2000, and IWL-2000 and RG 1.35, paragraphs C.1 through C.8.

The ISI program will require that at least one tendon of each type be completely detensioned and a wire or strand be removed from each of these tendons (IWL-2523.1, RG 1.35 C.4.1). Each removed wire or strand is then examined over its entire length for corrosion and mechanical damage (IWL-2523.2(a), RG 1.35 C.5.1). Tension tests will also be performed on each of the removed wires or strands (IWL-2523.2(b), RG 1.35 C.5.2). Specific inspection and acceptance criteria including corrosion, tensile strength, and elongation, will be developed when the tendon materials and configurations and plant configuration are finalized. The acceptance criteria will conform to the standards contained in IWL-3220 and in RG 1.35, paragraph C.7. Unacceptable conditions that fall outside the bounds of RG 1.35, paragraph C.7, will be reported to the NRC as required by RG 1.35, paragraph C.8.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 2990 (CP RAI #106)

SRP SECTION: 03.08.01 - Concrete Containment

QUESTIONS for Structural Engineering Branch 1 (AP1000/EPR Projects) (SEB1)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 03.08.01-9

This Request for Additional Information (RAI) is necessary for the staff to determine if the application meets the requirements of 10 CFR sections 50.34(f) and 50.55a, and General Design Criteria (GDC) 1, 2, 4, 16, and 50.

In STD COL 3.8(14), CPNPP COL FSAR, Subsection 3.8.1.7, "Testing and Inservice Inspection Requirements," the last bullet (Page 3.8-4) states "General visual inspection of all accessible concrete surface areas to assess the general structural condition of the containment."

The applicant is requested to provide the following:

(a) What are the acceptance criteria that will be used to conclude that the concrete surfaces are in an acceptable condition?

(b) What corrective actions would be taken in the event that the concrete surfaces were not in an acceptable condition?

ANSWER:

ISI procedures will be explicitly described in the site-specific ISI program. The ISI requirements will conform to the provisions of ASME Section XI Division 1 Sections IWA-2000, IWE-2000, and IWL-2000 and RG 1.35, paragraphs C.1 through C.8.

(a) What are the acceptance criteria that will be used to conclude that the concrete surfaces are in an acceptable condition?

As required by IWL-2510 and RG 1.35, paragraph C.3, the ISI program will require the inservice inspection of the concrete surfaces for evidence of conditions indicative of damage or degradation, such as described in ACI 201.1 and ACI 349.3R. In accordance with IWL-3111, the condition of the surface will be acceptable if the Responsible Engineer determines that there is no evidence of damage or degradation sufficient to warrant further evaluation or performance of repair /replacement activities. Per IWL-3221.3(d), at the tendon anchorage areas cracks in the concrete adjacent to the bearing plates must not exceed 0.01 in. However, the site-specific program may impose specific acceptance criteria that are more stringent than what is required by the IWL.

(b) What corrective actions would be taken in the event that the concrete surfaces were not in an acceptable condition?

The ISI program will include a Repair/Replacement Program in accordance with IWA-4150. The Program will define the managerial and administrative control for completion of repair /replacement activities. Any required repair or replacement activity will be performed in accordance with a Repair or Replacement Plan that is prepared in accordance with this program. Corrective actions required to address an unacceptable concrete condition will depend on the specific nature of the condition and would be performed under a specific repair/replacement plan. The plan would satisfy the pertinent requirements of IWL-4220. Repaired/replacement areas shall be re-examined in accordance with, and meet the acceptance standards of, the ISI program.

<u>Impact on R-COLA</u>

None.

<u>Impact on S-COLA</u>

None.

<u>Impact on DCD</u>

None.

Attachment 2

Response to Request for Additional Information No. 2999 (CP RAI #115)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 2999 (CP RAI #115)

SRP SECTION: 03.08.05 - Foundations

QUESTIONS for Structural Engineering Branch 1 (AP1000/EPR Projects) (SEB1)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 03.08.05-1

NUREG-0800, Standard Review Plan, Chapter 3.8.5, 'Foundations,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

In Comanche Peak Nuclear Power Plant (CPNPP) combined license (COL) 3.8(24) in CPNPP COL FSAR, Subsection 3.8.5.1.3.1, "ESWPT" under "Site-Specific Structures" (page 3.8-12), the second paragraph states "The bottom of the basemat is at elevation 791.08 ft., and is founded on structural concrete fill placed directly on limestone. The basemat has a shear key which extends into the fill concrete in the portion of ESWPT adjacent to the UHSRS as shown in Figure 3.8-202. The fill concrete at this portion also has a shear key which extends into the limestone as shown in Figure 3.8-202." Also, in the following Subsection of the COL FSAR under "UHSRS", a similar statement is made for the foundation under the ultimate heat sink related structures (UHSRS).

The applicant is requested to provide the following information:

(a) Is any steel reinforcement used in the concrete fill?

(b) Are the free edges of the concrete fill formed by the original soil or by forming and backfilling?

(c) What is the structural behavior of the concrete fill under lateral seismic loads, and, if shear keys are used, how are the loads that are transferred at the shear keys resisted by the concrete and transferred to the limestone base rock?

ANSWER:

(a) The fill concrete is generally designed as unreinforced concrete, except at the locations such as underneath the ESWPT adjacent to the UHSRS where the fill concrete extends into the limestone with a shear key and is locally reinforced, as shown in FSAR Figure 3.8-202. There may also be miscellaneous reinforcing installed in the fill concrete during construction, particularly at joints, to aid in forming and placement. See also the response to (b) below.

(b) The current plan is to form the edges of the fill concrete and then backfill. However, the option to "neat-line" the in-situ material for the purposes of forming may also be used in certain locations, and will be the preferred way to install shear keys that extend into limestone.

(c) The SASSI models used for soil-structure interaction analysis include the fill concrete and are used to determine the seismic demands. The ANSYS model includes conservative application of the seismic loads from SASSI and all other relevant loading conditions for design of shear keys. All lateral seismic loads transfer into the fill concrete via friction or a shear key, and also into the limestone layer beneath the fill concrete either through friction or a shear key. The shear keys, including discussion of load transfer, are described in FSAR Subsection 3.8.4.4.3. Where shear keys are used, the load from the shear key is transferred through bearing into the fill concrete or competent limestone. Shear key reinforcing is designed to provide the required strength to resist the applied shears and moments on the shear key.

FSAR Subsection 3.8.5.1.3.1 has been revised to incorporate this response.

Impact on R-COLA

See attached mark-up of FSAR Draft Revision 1 pages 3.8-11.

Impact on S-COLA

None.

Impact on DCD

None.

3.8.5.1.3.1 ESWPT

The ESPWT is an underground structure supported by a monolithic reinforced concrete basemat. The basemat is a 2 ft. thick concrete slab with top and bottom reinforcement in each direction arranged in a rectangular grid.

The bottom of the basemat is at elevation 791.08 ft., and is founded on structural concrete fill placed directly on limestone. The basemat has a shear key which extends into the fill concrete in the portion of ESWPT adjacent to the UHSRS as shown in Figure 3.8-202. The fill concrete at this portion also has a shear key which extends into the limestone as shown in Figure 3.8-202. Except at this portion where the fill concrete is locally reinforced, the fill concrete is generally designed as unreinforced concrete. RCOL2_03.08.05-1

3.8.5.1.3.2 UHSRS

The UHS basins, ESWS pump house, and the cooling towers are free-standing structures supported on a reinforced concrete basemat. Each basin, including its pump house and cooling towers, rests on a 4 ft. thick mat with top and bottom reinforcement in each direction arranged in a rectangular grid.

The bottom of the UHS basemat is at elevation 787 ft., except the pump house sump mat is at elevation 775 ft. The pump house basemat is founded directly on limestone, whereas the rest of the UHS mat is founded on structural concrete fill placed directly on limestone.

3.8.5.1.3.3 PSFSVs

PSFSVs are underground structures supported by a monolithic reinforced concrete basemat. The basemat is a 6'-6" thick concrete slab with top and bottom reinforcement in each direction arranged in a rectangular grid.

The bottom of the basemat is at elevation 782 ft., and is founded directly on limestone. Shear keys are provided which extend into the limestone as shown in Figures 3.8-213 and 3.8-214.

3.8.5.4.4 Analyses of Settlement

CP COL 3.8(26) Replace the last sentence of the first paragraph in DCD Subsection 3.8.5.4.4 with the following.

As discussed in Section 2.5.4.10.2, maximum and differential CPNPP settlements of all the major seismic category I buildings and structures at the CPNPP Units 3

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 2999 (CP RAI #115)

SRP SECTION: 03.08.05 - Foundations

QUESTIONS for Structural Engineering Branch 1 (AP1000/EPR Projects) (SEB1)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 03.08.05-2

NUREG-0800, Standard Review Plan, Chapter 3.8.5, 'Foundations,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

In CP COL 3.8(26) in CPNPP COL FSAR, Subsection 3.8.5.4.4, "Analyses of Settlement" (Page 3.8-13), states that "As discussed in Section 2.5.4.10.2, maximum and differential CPNPP settlements of all the major seismic category I buildings and structures at the CPNPP Units 3 and 4 site, including R/B [reactor buildings], PS/Bs [power source buildings], ESWPT [essential service water pipe tunnel], UHSRS, and PSFSVs [power source fuel storage vault] are less than ½ inch, including long-term settlements."

Also, CPNPP COL FSAR, Subsection 2.5.4.10.2, states that "These estimated settlements are consistent with estimated settlements for foundations of CPNPP Units 1 and 2."

In order to assess the accuracy of the estimated settlement for Units 3 and 4, the accuracy of the estimated settlement of Units 1 and 2 is needed. Therefore, the applicant is requested to provide information for the soil-bearing pressure for CPNPP Units 1 and 2 and the measured (i.e., actually recorded) differential settlement and total settlement for Units 1 and 2. Discuss how the actual settlement was bounded by the estimate for Units 1 and 2 and why you believe the estimate for Units 3 and 4 will bound the actual settlement for the new units.

ANSWER:

The calculated settlements for Units 1 and 2 seismic category I buildings are discussed in CPSES FSAR Subsection 2.5.4.10.2 and presented in Table 2.5.4-7. Units 1 and 2 are also founded on the Glen Rose Formation. An insignificant amount of elastic rebound of the subgrade (0.02 in) was measured after removal of about 40 ft of overburden. The maximum predicted settlement for Units 1 and 2 Reactor Containments with a static bearing pressure of about 12.2 ksf is documented in the FSAR as 0.26 in at the center and 0.16 in at the edge, which is consistent with the settlements estimated for Units 3 and 4. The settlements for Units 1 and 2 were evaluated to be elastic in nature and were calculated using the theory of elasticity for uniformly loaded area on an elastic half space. Consolidation or time-dependent settlement were not anticipated or considered in the settlement calculations because the combined thickness of the interbedded claystone/shale materials was minor in proportion to the thickness of the limestone materials. Measurements obtained from the Units 1 and 2 settlement monitoring program indicate about 0.125 in total settlement since the baseline measurements established in 1997, and approximately less than 0.25 in since the completion of major construction activities in 1989. These settlements are considered to be insignificant.

The plant-specific parameters, such as bearing pressures, are used in the settlement analyses for Units 3 and 4. The settlement estimates for Units 3 and 4 were made using an approach that is similar to the procedure described above for Units 1 and 2, but it also computed settlements using an alternate layered method that considers the properties of individual subgrade layers. The calculations for Units 3 and 4 also considered a lower bound deformation modulus model in order to encompass the potential variability of rock mass properties across the site and to estimate a conservative upper bound on settlement. Similar to Units 1 and 2, long-term consolidation or time-dependent settlements for Units 3 and 4 are considered to be insignificant. Elastic rebound of the subgrade for Units 3 and 4 is also taken into consideration, and the anticipated rebound has been determined to be minor, with a maximum value for the R/B of approximately 0.08 in.

In summary, settlement measurements for Units 1 and 2 indicate insignificant settlement amounts since construction of those units. Units 3 and 4 settlement estimates were made using the same general approach that was used for Units 1 and 2, except that a lower bound deformation modulus model was also used to make the estimates more conservative. The response to Question 02.05.04-17 of RAI No. 2929 (CP RAI #22) attached to Luminant letter TXNB-09059 (date October 28, 2009) (ML093080096) provided further discussion of estimated settlements for Units 3 and 4. Therefore it is believed that the plant-specific settlement estimate for Units 3 and 4 will appropriately bound the actual settlement for the new units.

<u>Impact on R-COLA</u>

None.

<u>Impact on S-COLA</u>

None.

<u>Impact on DCD</u>

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 2999 (CP RAI #115)

SRP SECTION: 03.08.05 - Foundations

QUESTIONS for Structural Engineering Branch 1 (AP1000/EPR Projects) (SEB1)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 03.08.05-3

NUREG-0800, Standard Review Plan, Chapter 3.8.5, 'Foundations,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

In CP COL 3.8(25) in CPNPP COL FSAR, Subsection 3.8.5.5, "Structural Acceptance Criteria" (Page 3.8-13), provide a table in the CPNPP COL FSAR that lists the factor of safety for overturning, sliding, and flotation.

ANSWER:

A table showing the factors of safety for overturning, sliding, and flotation for site-specific buildings and structures (PFSVs, UHSRS, ESWPT) has been added to the FSAR. A reference to the table and a text description of the table has been added in FSAR Subsection 3.8.5.5.

Impact on R-COLA

See attached mark-up of FSAR Draft Revision 1 page 3.8-12 and Table 3.8-203.

Impact on S-COLA

None.

Impact on DCD

None.

and 4 site, including R/B, PS/Bs, ESWPT, UHSRS, and PSFSVs are less than ½ inch, including long-term settlements.

3.8.5.5 Structural Acceptance Criteria

CP COL 3.8(25) Replace the second sentence of the first paragraph in DCD Subsection 3.8.5.5 with the following.

All ~~major~~ seismic category I buildings and structures at the CPNPP Units 3 and 4 site, including R/B, PS/Bs, ESWPT, UHSRS, and PSFSVs, are founded either directly on a limestone layer or structural concrete fill which is placed directly on the limestone. The ultimate bearing capacity of the limestone is 146,000 psf. Table 3.8-202 shows the actual bearing pressure during static and seismic load cases with minimum factor of safety. The allowable static bearing capacity is calculated as 1/3 of the ultimate bearing capacity. The allowable dynamic bearing capacity is calculated as 1/2 of the ultimate bearing capacity. Table 2.8-203 shows the load combinations and factors of safety against overturning, sliding and flotation for site-specific buildings and structures. RCOL2_03.08.05-4 RCOL2_03.08.05-5 RCOL2_03.08.05-3

3.8.6 Combined License Information

Replace the content of DCD Subsection 3.8.6 with the following.

3.8(1) *Deleted from the DCD.* MAP-03-003

3.8(2) *Deleted from the DCD.* MAP-03-004

CP COL 3.8(3) ***3.8(3)*** *Material changes for PCCV*

This COL item is addressed in Subsection 3.8.1.6.

3.8(4) *Deleted from the DCD.* MAP-03-005

3.8(5) *Deleted from the DCD.* MAP-03-006

3.8(6) *Deleted from the DCD.* MAP-03-007

CP COL 3.8(7) ***3.8(7)*** *Aggressivity of ground water/soil*

This COL item is addressed in Subsection 3.8.1.6.

3.8(8) *Deleted from the DCD.* MAP-03-008

Table 3.8-203 RCOL2_03.08.05-3

Load Combinations and Factor of Safety for Buildings and Structures

Building/Structure	Load Combination (per SRP 3.8.5)	Overturning (FS_{ot})	Sliding (FS_{sl})	Flotation (FS_{fl})
PFSVs	D + H + W	5.51	1.85[2]	N/A
	D + H + E_s	3.29	1.28[2]	N/A
	D + H + W_t	5.51	1.85[2]	N/A
	D + F_b	N/A	N/A	1.71
UHSRS	D + H + W	>6	1.77	N/A
	D + H + E_s	>3	1.10	N/A
	D + H + W_t	>>1.1[4]	>>1.1[4]	N/A
	D + F_b	N/A	N/A	1.13[1]
ESWPT	D + H + W	3.56[5]	1.61[3][5]	N/A
	D + H + E_s	1.57[5]	1.18[3][5]	N/A
	D + H + W_t	3.56[5]	1.61[3][5]	N/A
	D + F_b	N/A	N/A	2.0

Notes

1. The value shown is based on the assumption that a UHS basin is completely emptied of water (such as for maintenance) concurrent with a local intense precipitation event that causes saturation of the adjacent backfill up to elevation 821 ft. This is conservative because, as stated in Subsection 2.4.2.3, the UHSRS are adjacent to downward slopes leading into the Squaw Creek Reservoir which allow drainage to pass freely without accumulating.
2. Shear keys are used to prevent sliding and the FS is based on the shear key capacities.
3. Adjacent to the UHSRS, a shear key is used at both the tunnel base slab-to-concrete fill interface and the concrete fill-to-limestone interface, and the FS is based on shear key capacity.
4. Global stability is governed by wind and seismic load combinations for the UHSRS and is not explicitly calculated for the tornado load combination. In terms of total base shear force, the seismic demand is more than 10 times the tornado demand.
5. The factors of safety shown are for the ESWPT segment adjacent to the UHSRS, which governs the design with respect to these safety factors due to the mass and exposure of the UHS air intake missile shields that are integrally attached to the tunnel at this location.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 2999 (CP RAI #115)

SRP SECTION: 03.08.05 - Foundations

QUESTIONS for Structural Engineering Branch 1 (AP1000/EPR Projects) (SEB1)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 03.08.05-4

NUREG-0800, Standard Review Plan, Chapter 3.8.5, 'Foundations,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

In CP COL 3.8(25) in CPNPP COL FSAR, Subsection 3.8.5.5, "Structural Acceptance Criteria" (Page 3.8-13), the second paragraph states "All major seismic category I buildings and structures at the CPNPP Units 3 and 4 site, including R/B, PS/Bs, ESWPT, UHSRS, and PSFSVs, are founded either directly on a limestone layer or structural concrete fill which is placed directly on the limestone."

The applicant is requested to address the question, Are there any "minor" seismic Category I buildings or structures for the CPNPP? If yes, identify these structures and describe the foundations for these structures.

ANSWER:

There are no "minor" seismic Category I buildings or structures for the CPNPP Units 3 and 4. FSAR Subsection 3.8.5.5 has been revised to reflect this response.

Impact on R-COLA

See attached mark-up of FSAR Draft Revision 1 page 3.8-12.

Impact on S-COLA

None.

Impact on DCD

None.

and 4 site, including R/B, PS/Bs, ESWPT, UHSRS, and PSFSVs are less than ½ inch, including long-term settlements.

3.8.5.5 Structural Acceptance Criteria

CP COL 3.8(25) Replace the second sentence of the first paragraph in DCD Subsection 3.8.5.5 with the following.

All ~~major~~ seismic category I buildings and structures at the CPNPP Units 3 and 4 site, including R/B, PS/Bs, ESWPT, UHSRS, and PSFSVs, are founded either directly on a limestone layer or structural concrete fill which is placed directly on the limestone. The ultimate bearing capacity of the limestone is 146,000 psf. Table 3.8-202 shows the actual bearing pressure during static and seismic load cases with minimum factor of safety. The allowable static bearing capacity is calculated as 1/3 of the ultimate bearing capacity. The allowable dynamic bearing capacity is calculated as 1/2 of the ultimate bearing capacity. Table 2.8-203 shows the load combinations and factors of safety against overturning, sliding and flotation for site-specific buildings and structures. RCOL2_03.08.05-4 RCOL2_03.08.05-5 RCOL2_03.08.05-3

3.8.6 Combined License Information

Replace the content of DCD Subsection 3.8.6 with the following.

3.8(1) *Deleted from the DCD.* MAP-03-003

3.8(2) *Deleted from the DCD.* MAP-03-004

CP COL 3.8(3) ***3.8(3)*** *Material changes for PCCV*

This COL item is addressed in Subsection 3.8.1.6.

3.8(4) *Deleted from the DCD.* MAP-03-005

3.8(5) *Deleted from the DCD.* MAP-03-006

3.8(6) *Deleted from the DCD.* MAP-03-007

CP COL 3.8(7) ***3.8(7)*** *Aggressivity of ground water/soil*

This COL item is addressed in Subsection 3.8.1.6.

3.8(8) *Deleted from the DCD.* MAP-03-008

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 2999 (CP RAI #115)

SRP SECTION: 03.08.05 - Foundations

QUESTIONS for Structural Engineering Branch 1 (AP1000/EPR Projects) (SEB1)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 03.08.05-5

NUREG-0800, Standard Review Plan, Chapter 3.8.5, 'Foundations,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

In CP COL 3.8(25) in CPNPP COL FSAR, Subsection 3.8.5.5, "Structural Acceptance Criteria" (Page 3.8-13) states that "The ultimate bearing capacity of the limestone is 146,000 psf. Table 3.8-202 shows the actual bearing pressure during static and seismic load cases with minimum factor of safety."

The applicant is requested to provide the following information:

(a) Are the bearing pressures presented in CPNPP COL Table 3.8-202, the second and third columns, calculated from factored loads or service loads?

(b) The ultimate bearing capacity of the limestone of 146 ksf is listed in the fourth column of the table. What is the allowable bearing capacity?

(c) The available factor of safety listed in CPNPP COL FSAR Table 3.8-202 should be calculated based on the allowable bearing capacity and soil bearing pressures of the service loads.

ANSWER:

(a) The bearing pressures in Table 3.8-202 are calculated from service loads (unfactored loads).

(b) The allowable static bearing capacity is calculated as 1/3 of the ultimate bearing capacity. The allowable dynamic bearing capacity is calculated as 1/2 of the ultimate bearing capacity. The value for allowable dynamic bearing capacity is based on DCD Subsection 3.7.1.3, which is incorporated by reference in the FSAR, and states in part:

> A minimum factor of safety of 2 is suggested for the ultimate bearing capacity versus the allowable dynamic bearing capacity; however, a different value may be justified based on site-specific geotechnical conditions.

(c) The available factor of safety values presented in Table 3.8-202 are based on the ultimate bearing capacity in order to remain consistent with FSAR Subsections 2.5.4.10.1 and 2.5.4.11. However, two columns have been added to Table 3.8-202 to present the allowable bearing capacity and the ratio of allowable bearing capacity to bearing pressure (available factor of safety values based on the allowable bearing capacity).

FSAR Subsection 3.8.5.5 and Table 3.8-202 have been revised to reflect this response.

Impact on R-COLA

See attached mark-up of FSAR Draft Revision1 page 3.8-12 and Table 3.8-202.

Impact on S-COLA

None.

Impact on DCD

None.

and 4 site, including R/B, PS/Bs, ESWPT, UHSRS, and PSFSVs are less than ½ inch, including long-term settlements.

3.8.5.5 Structural Acceptance Criteria

CP COL 3.8(25) Replace the second sentence of the first paragraph in DCD Subsection 3.8.5.5 with the following.

All ~~major~~ seismic category I buildings and structures at the CPNPP Units 3 and 4 site, including R/B, PS/Bs, ESWPT, UHSRS, and PSFSVs, are founded either directly on a limestone layer or structural concrete fill which is placed directly on the limestone. The ultimate bearing capacity of the limestone is 146,000 psf. Table 3.8-202 shows the actual bearing pressure during static and seismic load cases with minimum factor of safety. The allowable static bearing capacity is calculated as 1/3 of the ultimate bearing capacity. The allowable dynamic bearing capacity is calculated as 1/2 of the ultimate bearing capacity. Table 2.8-203 shows the load combinations and factors of safety against overturning, sliding and flotation for site-specific buildings and structures. RCOL2_03.08.05-4 RCOL2_03.08.05-5 RCOL2_03.08.05-3

3.8.6 Combined License Information

Replace the content of DCD Subsection 3.8.6 with the following.

3.8(1) *Deleted from the DCD.* MAP-03-003

3.8(2) *Deleted from the DCD.* MAP-03-004

CP COL 3.8(3) ***3.8(3)*** *Material changes for PCCV*

This COL item is addressed in Subsection 3.8.1.6.

3.8(4) *Deleted from the DCD.* MAP-03-005

3.8(5) *Deleted from the DCD.* MAP-03-006

3.8(6) *Deleted from the DCD.* MAP-03-007

CP COL 3.8(7) ***3.8(7)*** *Aggressivity of ground water/soil*

This COL item is addressed in Subsection 3.8.1.6.

3.8(8) *Deleted from the DCD.* MAP-03-008

CP COL 3.7(7)

Table 3.8-202
Summary of Bearing Pressures and Factor of Safety

RCOL2_03.08.05-5
CTS-00603

Building	Bearing Pressures (lb/ft^2)		Ultimate Bearing Capacity (lb/ft^2)	Available Factor of Safety (Based on Ultimate Bearing Capacity)		Allowable Bearing Capacity (lb/ft^2)		Ratio of Allowable Bearing Capacity to Bearing Pressure	
	Static Case	Seismic Case$^{(1),(2)}$		Static Case	Seismic Case	Static Case	Seismic Case	Static Case	Seismic Case
R/B	11,300	18,900	146,000	~~12,900~~ 12.9	~~7,700~~7.7	48,700	73,000	4.3	3.9
T/B	5,900	7,400	146,000	~~24,700~~ 24.7	~~19,700~~19.7	48,700	73,000	8.3	9.9
A/B	6,600	10,800	146,000	~~22,100~~ 22.1	~~13,500~~13.5	48,700	73,000	7.4	6.8
PS/Bs	4,300	7,400	146,000	~~34,000~~34	~~19,700~~19.7	48,700	73,000	11.3	9.9
PSFSVs	2,900$^{(3)}$	5,100$^{(3)}$	146,000	~~50,300~~ 50.3	~~28,600~~28.6	48,700	73,000	16.8	14.3
UHSRS	4,500$^{(4)}$	16,200$^{(4)}$	146,000	~~32,400~~ 32.4	~~9,000~~9	48,700	73,000	10.8	4.5
ESWPT	3,600$^{(5)}$	12,400$^{(5)}$	146,000	~~40,600~~ 40.6	~~11,800~~11.8	48,700	73,000	13.5	5.9

CTS-00603

CTS-00603

Notes:
1) All seismic case bearing pressures are based on the site-specific FIRS with 0.1 g PGA as described in Subsection 3.7.1.
2) Seismic case bearing pressures shown above include static bearing pressures.
3) The pressure shown includes bearing pressure due to full fuel oil tanks.
4) The pressure shown includes bearing pressure due to full reservoirs.
5) The maximum bearing pressures occur underneath the portion of the ESWPT supporting the air intake missile shields adjacent to the UHSRS.

Attachment 3

Response to Request for Additional Information No. 3230 (CP RAI #110)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3230 (CP RAI #110)

SRP SECTION: 09.04.05 - Engineered Safety Feature Ventilation System

QUESTIONS for Containment and Ventilation Branch 1 (AP1000/EPR Projects) (SPCV)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 09.04.05-1

This Request for Additional Information (RAI) is necessary for the staff to determine if the application meets the requirements of 10 CFR 52.80(a), and General Design Criteria (GDC) 2, 4, 5, 17, and 60.

In combined license application (COLA), FSAR subsections 9.4.5.2.2, 9.4.5.2.3, 9.4.5.2.4, 9.4.5.2.5 and FSAR Table 9.4-201, Luminant assigns a heating coil capacity values to the heaters of the air handling units for the following systems:

- Class 1E Electrical Room HVAC System;
- Safeguard Component Area HVAC System;
- Emergency Feedwater Pump Area HVAC System; and
- Safety Related Component Area HVAC System

Class 1E power supplies provides the NRC staff assurance of the ability of the engineered safety features (ESF) air handling unit heaters to provide this safety function during and subsequent to postulated accidents, including loss of offsite power.

During its review, per the guidance of NUREG-800 Standard Review Plan (SRP) 9.4.5, the NRC staff found that Luminant did not include in the FSAR a reference section (9.4.8 in the DCD) or references that would provide the bases and calculations used in the sizing of the heaters for these ESF systems' air handling units. As such, Luminant is requested to either establish a clear performance criteria for the heaters and a means (ITAAC and/or startup testing) of verifying that heaters have been sided adequately; or provide the following information to justify the value selected:

- What is the basis for the sizing of the heaters?
- What is the design basis area temperature that the heaters are designed to maintain? The design basis should be clearly stated in the FSAR.

Additionally, in order to facilitate confirmatory calculations, please provide the inputs to the design calculations used in the derivation of the heating coil capacity value for the heater of the four main control room air handling units.

ANSWER:

The basis for the sizing of the heaters is calculation of the heating requirement.

The heating requirement is determined by the differential air temperature between the entering air temperature to the air handling unit (AHU) and the leaving air temperature from the AHU. The heating requirement is calculated by the following equation.

$$q = 60 \times \rho \times Cp \times Q \times (tl - te) \times 1.15$$

where,

q :	Heating requirement (BTU/h)
ρ :	Density (0.075 lb/ft^3)
Cp:	Specific heat (0.24 BTU/lb-F)
Q :	Total airflow rate across the heating coil (CFM)
tl :	Supply air temperature (deg F)
te :	Return air temperature (deg F)
1.15:	Margin

The heating requirement of each AHU is determined by the design conditions presented in Table 1 (attached).

As noted above, the capacity of the heating coils is dependent on the differential air temperature between the supply and return air. The return air temperature of each AHU is affected by site-specific conditions because the return air to each AHU is mixed with outside air and depends on the heat loss from each room affected by outside conditions. The above design basis and design considerations are based on DCD Subsection 9.4.5 and Table 9.4-1. Therefore, additional design basis information is not required in the COLA FSAR.

Refer to the response to RAI No. 3219 (CP RAI #63) Question 09.04.01-1 submitted on October 30, 2009 (ML093090163) with respect to the design input value to calculate the heating coil capacity value for the four MCR AHUs.

<u>Impact on R-COLA</u>

None.

<u>Impact on S-COLA</u>

None.

<u>Impact on DCD</u>

None.

<u>Attachment</u>

Table 1, "Design Conditions"

Table 1. Design Conditions

		Class 1E Electrical Room AHU A,B train	Class 1E Electrical Room AHU C,D train	Safeguard Component Area AHU	Emergency Feedwater Pump (M/D) AHU	Emergency Feedwater Pump (T/D) AHU	Penetration Area AHU	Annulus Emergency Filtration Unit Area AHU	Charging Pump Area AHU	Component Cooling Water Pump Area AHU	Essential Chiller Unit Area AHU	Spent Fuel Pit pump Area AHU
Input Value	Q (CFM)	40,000	52,000	5,000	2,100	1,300	5,000	1,000	1,000	1,000	1,000	1,500
	tl (deg F)	63.0	63.0	72.0	56.5	65.0	74.0	100.0	75.0	70.0	70.0	70.0
	te (deg F)	60.7	60.2	59.6	54.3	56.3	59.0	75.0	62.0	64.0	59.0	62.0
Output Value	q (BTU/h)	114,264	180,835	77,004	5,738	14,047	93.150	31,050	16,146	7,452	13,662	14,904
	q (kW)	33.5	53.0	22.6	1.7	4.2	27.3	9.1	4.7	2.2	4.0	4.4
	Used Value q (kW)	37	55	24	2	4.5	29	10	6	3	4.5	5

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3230 (CP RAI #110)

SRP SECTION: 09.04.05 - Engineered Safety Feature Ventilation System

QUESTIONS for Containment and Ventilation Branch 1 (AP1000/EPR Projects) (SPCV)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 09.04.05-2

This Request for Additional Information (RAI) is necessary for the staff to determine if the application meets the requirements of 10 CFR 52.80(a), and General Design Criteria (GDC) 2, 4, 5, 17, and 60.

In COLA FSAR subsections 9.4.5.2.2, 9.4.5.2.3, 9.4.5.2.4 and 9.4.5.2.5 and FSAR Table 9.4-201, Luminant assigned heating coil capacity values to the forty-two air handling units of the following four ESF Ventilation Systems:

- Class 1E Electrical Room HVAC System;
- Safeguard Component Area HVAC System;
- Emergency Feedwater Pump Area HVAC System; and
- Safety Related Component Area HVAC System

This technical information is being provided to satisfy the requirements of US-APWR COL Information Item US-APWR COL 9.4(4) which reads;

"*The COL Applicant is to determine the capacity of cooling and heating coils that are affected by site specific condition.*"

Item 2.C of SRP 9.4.5 section I, "Areas of Review", reads:

"Safety-related portions of the ESFVS are also reviewed with respect to the following:

C. The ability of the safety features equipment in the areas being serviced by the ventilation system to function under the worst anticipated degraded ESFVS system performance;"

The NRC staff notes that an excerpt from item 1 of SRP 9.4.5 section III, "Review Procedures", reads:

"...The system performance requirements are reviewed to determine that they limit allowable component operational degradation (e.g., loss of function, damper leakage) and describe the procedures that will be followed to detect and correct these conditions. ..."

Item 2.C of SRP 9.4.5 section III, “Review Procedures”, pertains to the subject in-service inspection and functional testing of system components important to safety.

The NRC staff found that neither COL Application FSAR 9.4 nor US-APWR DCD subsection 9.4.5.4 “Inspection and Testing Requirements” contain any type of testing or inspections of the ESF air handling unit (AHU) heaters for demonstrating/ maintaining operability of the heaters. The only information that seems to relate in DCD subsection 9.4.5.4 is the first sentence of the fifth paragraph which reads “*Air handling units are factory tested in accordance with Air Movement and Control Association standards.*”

The NRC staff notes that each AHU heater is safety-related and performs a significant safety-related function.

The NRC staff also notes that SRP 14.3.7 section II, "SRP Acceptance Criteria", item 1 reads

“...Tier I should be reviewed for consistency with the initial test program described in DCD Tier 2 Chapter 14.2..".

The COL applicant did not provide in the application an ITAAC update to include the ESF Ventilation System (ESFVS) air handling unit heaters in Tier 1 DCD subsection 2.7.5.2 “Engineered Safety Features Ventilation System”. Similarly, the COL applicant did not provide in the application an update of the following preoperational tests to reflect the addition of these AHU heaters to the US-APWR plant:

- 14.2.12.1.96 Safeguard Component Area HVAC System Preoperational Test
- 14.2.12.1.97 Emergency Feedwater Pump Area HVAC System Preoperational Test
- 14.2.12.1.98 Class 1E Electrical Room HVAC System Preoperational Test
- 14.2.12.1.106 Safety-Related Component Area HVAC System Preoperational Test

The staff requests that a justification be provided as to why the heater capacity need not be verified through site-specific ITAAC or startup testing. Alternatively, appropriate ITAAC and startup testing should be submitted.

ANSWER:

Testing of the ESF ventilation system (ESFVS) air handling unit (AHU) heaters is adequately addressed by a revision to the US-APWR DCD in response to an RAI.

As revised in response to DCD RAI 184, Question 14.03.07-26, submitted on April 9, 2009 (ML091040177), ITAAC Item 4, parts b, d, e and f in DCD Tier 1 Table 2.7.5.2-3 require tests and analyses to verify the as-built ESFVS is capable of maintaining the respective area within design limits for temperature during all plant operating conditions, including normal plant operations, abnormal and accident conditions. ITAAC Item 4, parts b, d, e and f apply to performance of the as-built ESFVS, including heater performance as necessary to maintain temperature within design limits.

<u>Impact on R-COLA</u>

None.

Impact on S-COLA

None.

Impact on DCD

None.

Attachment 4

Response to Request for Additional Information No. 3663 (CP RAI #101)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3663 (CP RAI #101)

SRP SECTION: 02.04.01 - Hydrologic Description

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/1/2009

QUESTION NO.: 02.04.01-1

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.1, 'Hydrologic Description,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

Provide a description of the process followed to determine how the proposed plant interfaces with the hydrosphere, including determinations of the hydrologic causal mechanisms that may require special plant design basis, current and future surface water uses by Comanche Peak, Units 3 and 4 and other users, conceptual models used to establish bounding hydrologic conditions, and conceptual models used to quantify uncertainty in hydrological processes and conditions at the site.

ANSWER:

Based on a conference call with the NRC conducted October 16, 2009, Luminant understands that "process" does not mean plan or approach but refers to related technical considerations.

FSAR Section 2.4 provides technical considerations related to how the proposed CPNPP Units 3 and 4 will interface with the hydrosphere. As part of the ongoing review process, Luminant recently enhanced Subsections 2.4.2 through 2.4.7, Subsections 2.4.10 through 2.4.13, and Subsection 2.5.4.3 of the FSAR. These enhancements were provided in FSAR Update Tracking Report Revision 4, submitted via Luminant letter TXNB-09039, dated September 2, 2009 (ML092520125). Enhancements included the hydrologic causal mechanisms design basis, the conceptual models used to establish bounding hydrologic causal conditions, and a discussion of the hydrological processes and conditions at the site.

<u>Impact on R-COLA</u>

None.

<u>Impact on S-COLA</u>

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3663 (CP RAI #101)

SRP SECTION: 02.04.01 - Hydrologic Description

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/1/2009

QUESTION NO.: 02.04.01-2

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.1, Hydrologic Description,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

Provide all maps, figures, textual references, stream gauging, groundwater level, and other spatially referenced hydrologic and hydro geologic data with consistent datum and projections.

ANSWER:

The NRC indicated an interest in the source and availability of the spatially referenced data used for hydrologic and hydrogeologic data referenced in the FSAR during the Hydrology Safety Site Visit in July 2009. This was identified as Information Needs HYDSV-01 and HYDSV-02.

The GIS files (spatially referenced data) necessary to address HYDSV-01 and HYDSV-02 were provided on CDs via Luminant letter TXNB-09037 dated August 31, 2009 (ML092470198). The information contained on the CDs indicates the following:

(1) the Grading and Drainage Plan locations have a datum relative to the North American Datum of 1983 (NAD83) and North American Vertical Datum of 1988 (NAVD88)

(2) the USGS quadrangles have a datum relative to the North American Datum of 1927 (NAD27), and National Geodetic Vertical Datum of 1929 (NGVD29)

(3) most analyses utilized both Sanborn data and USGS data (NAD 83/NAVD 88 datum and the NAD 27/NGVD 29 datum).

FSAR Subsection 2.4.2.1, FSAR Table 2.4.2-204 (USGS gage 08091700) and Figures 2.4.2-201, 2.4.2-202, 2.4.3-202, 2.4.3-209, 2.4.4-201 and 2.4.4-202 were updated in FSAR Update Tracking Report Revision 4, submitted via Luminant letter TXNB-09039, dated September 2, 2009 (ML092520125).

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3663 (CP RAI #101)

SRP SECTION: 02.04.01 - Hydrologic Description

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/1/2009

QUESTION NO.: 02.04.01-3

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.1, Hydrologic Description,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

Provide a consistent plant grade level for referencing structures systems and components important to safety and analyzing the design basis flood.

ANSWER:

The consistency of plant grade elevation and structures, systems and components elevation values given in FSAR Subsection 2.4.1 (~823 ft) and Subsection 2.4.5 (~822 ft) was addressed during the Hydrology Safety Site Visit in July 2009 at the Comanche Peak Nuclear Power Plant. This was addressed as Information Need HYDSV-03.

In response to HYDSV-03, FSAR Subsection 2.4.1.1 was revised to provide a consistent methodology. This subsection now shows the plant "floor" elevation instead of plant "grade" elevation. The correct value for the plant floor elevation is 823 ft above msl. FSAR Subsection 2.4.5 was revised to indicate that the value of 822 ft msl is the plant grade level elevation for safety-related facilities. These changes are reflected in FSAR Update Tracking Report Revision 4, submitted via Luminant letter TXNB-09039, dated September 2, 2009 (ML092520125).

<u>Impact on R-COLA</u>

None.

<u>Impact on S-COLA</u>

None.

<u>Impact on DCD</u>

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3663 (CP RAI #101)

SRP SECTION: 02.04.01 - Hydrologic Description

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/1/2009

QUESTION NO.: 02.04.01-4

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.1, Hydrologic Description,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

Provide a description and rationale of the metrics used to determine the significance to the safety analyses of hydrologic units (stream segments and reservoirs) within the Brazos River Basin.

ANSWER:

The basis for determining that the area between Possum Kingdom Lake and Lake Whitney, including Lake Granbury (see Figure 2.4.4-201) is the most significant portion of the Brazos River basin was discussed during the Hydrology Safety Site Visit in July 2009 at the Comanche Peak Nuclear Power Plant. This was identified as Information Need HYDSV-04.

In response to HYDSV-04, FSAR Subsection 2.4.1.2 was revised to clarify which portions of the Brazos River Basin were chosen for the safety analyses and why. These changes are reflected in FSAR Update Tracking Report Revision 4, submitted via Luminant letter TXNB-09039, dated September 2, 2009 (ML092520125).

As referenced in the Comanche Peak Steam Electric Station FSAR (Reference 2.4-214), near the CPNPP site, the Brazos River Channel is located in incised meanders formed by the river. These meanders may be the result of uplift of the area and sea level fluctuations after a mature meandering drainage pattern is attained. The meanders are eroded through and are flanked by rock slopes confining the river within a relatively narrow channel. Immediately adjacent to the channel within the meanders is a narrow flood plain. Although accretion and erosion occur within the channel, as is typical of a meandering river, the well-defined meanders indicate that the channel location is closely confined. The geometry of the banks is governed closely by their location with respect to the meander pattern. The bank on the outside of a bend generally is steep; whereas, the bank on the inside of the bend usually has a gentler slope.

There are currently three reservoirs located on the main stem of the Brazos River: Possum Kingdom Lake, Lake Granbury, and Lake Whitney. Each of these reservoirs is within 150 river miles of the

CPNPP site, and most of the main stem Brazos River reservoir storage is concentrated along this reach. Because the site is located off-channel on a tributary of the Brazos River, the most conservative approach for the critical dam failure event would be for this reach of the Brazos River to flood by way of domino-type dam failure of upstream dams, and for flood waters to back-up from the Brazos River and Paluxy River confluence onto the site by way of the Squaw Creek catchment. For the dam failure analysis, the peak flow of the probable maximum flood (PMF) coincident with assumed hydrologic domino type dam failure of three upstream dams were analyzed at the Brazos River and the Paluxy River confluence. Morris Sheppard Dam and De Cordova Bend Dam are located within the portion of the Brazos River Basin identified as most significant for the dam failure analysis; however, for conservatism, the failure of Hubbard Creek Dam, which impounds Hubbard Creek Reservoir, was also used in the dam failure analysis. Hubbard Creek Dam is located approximately 357 miles upstream of Morris Sheppard Dam and was chosen for the dam failure analysis based on its distance from Morris Sheppard Dam and greater storage capacity when compared to other upstream reservoirs in the region. Domino type failures are included coincident with PMF flows and transposed downstream without any attenuation. Thus, the closely confined basin geometry of this reach and the concentration of major reservoirs were used as the basis for determining this portion of the basin as the most significant for the dam failure analysis.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3663 (CP RAI #101)

SRP SECTION: 02.04.01 - Hydrologic Description

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/1/2009

QUESTION NO.: 02.04.01-5

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.1, Hydrologic Description,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

Provide a description of all existing and proposed reservoirs within the Brazos River Basin and discuss their significance in terms of the design basis flood analysis.

ANSWER:

The description of the existing and proposed reservoirs considered in the design basis flood analysis, both upstream and downstream of the site (as required in SRP 2.4.1), was discussed during the Hydrology Safety Site Visit in July 2009. This was identified as Information Need HYDSV-05.

In response to HYDSV-05, FSAR Subsection 2.4.1.2 was revised to clarify which reservoirs were considered in the dam failure analysis. These changes are reflected in FSAR Update Tracking Report Revision 4, submitted via Luminant letter TXNB-09039, dated September 2, 2009 (ML092520125).

For the dam failure analysis, the peak flow of the probable maximum flood (PMF) coincident with assumed hydrologic domino type dam failure of Hubbard Creek Dam, Morris Sheppard Dam, and De Cordova Bend Dam at the Brazos River and the Paluxy River confluence were analyzed as shown on Figure 2.4.4-201. These reservoirs were chosen for the dam failure analysis based on storage capacity and distance from the Brazos River and the Paluxy River confluence. Hubbard Creek Dam is located approximately 357 miles upstream of the Brazos River and Paluxy River confluence and was included in the dam failure analysis based on its distance from Morris Sheppard Dam and greater storage capacity (324,983 ac-ft), when compared to other upstream reservoirs in the region.

According to the 2006 Brazos Region G Water Plan (Reference 2.4-208), most of the sites in the state that are readily amenable to reservoir development have already been utilized. Many other sites that are amenable to reservoir development have not been thoroughly developed as potential water supplies, even though they have been studied for many years. These projects have been mentioned in previous state water plans, but have not been developed due to permitting problems, environmental impacts, water quality, or cost considerations. Over the last 10 to 20 years, the development of major reservoirs has slowed considerably due to stringent permitting requirements and increased environmental awareness. For these reasons, any major reservoir should be considered only as a long-term solution for the development of the project. If the project is taken to fruition, it would most likely take more than 10 years.

Seven potential upstream reservoir sites were evaluated in the 2006 Brazos Region G Water Plan. All but one of these reservoir sites, the proposed South Bend Site, were found to contain less storage than Possum Kingdom Lake and Hubbard Creek Reservoir, and were excluded from the dam failure analysis.

The proposed South Bend Site, located approximately 251 miles upstream of the Brazos River and Paluxy River confluence, would store up to 771,604 ac-ft. This reservoir was not recommended as a water management strategy in the 2006 Region G Water Plan, which indicates implementation of the South Bend Reservoir would encounter difficult permitting constraints and would likely require significant treatment due to water quality concerns. Although the proposed South Bend Reservoir would be closer to the Brazos River and Paluxy River confluence, and would impound a greater volume of water than the Hubbard Creek Reservoir and Possum Kingdom Lake, the site has not been recommended as a water management strategy for Region G and was not included in the dam failure analysis.

Potential reservoir sites identified in the 2006 Llano Estacado ("Region O") Water Plan (Reference 2.4-269) contain less storage than the Hubbard Creek Reservoir and Possum Kingdom Lake and are at locations greater than 500 miles upstream from the Brazos River and Paluxy River confluence.

Based on information from the 2006 Brazos Region G (Reference 2.4-208) and 2006 Region H (Reference 2.4-270) water plans, there are no proposed main stem reservoirs downstream of Lake Whitney. For the dam failure analysis, failure of downstream structures would reduce the effects of upstream dam failure and were not considered in the dam failure analysis. Similarly, failures of downstream off-channel structures were not considered.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

Attachment 5

Response to Request for Additional Information No. 3664 (CP RAI #102)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3664 (CP RAI #102)

SRP SECTION: 02.04.02 - Floods

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/1/2009

QUESTION NO.: 02.04.02-1

NUREG-0800, Standard Review Plan, Chapter 2.4.2, 'Floods,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

In order to determine the safety of structures, systems, and components (SSCs) with respect to floods, Luminant is requested to state explicitly in the COL FSAR the water surface elevation and associated flow rate for the design basis flood (DBF) at the site, and describe all assumptions used in determining the DBF from the flooding scenarios detailed in FSAR Sections 2.4.3 through 2.4.9. Provide a rationale and describe the process used to determine that the stated DBF is bounding conservative, with respect to all permutations of stream, local precipitation, dam failure scenarios, tsunami, surge, seiche, and wind/wave coincidence.

ANSWER:

FSAR Subsection 2.4.2.2 identifies the types of events evaluated to determine the worst potential flood and the corresponding water surface elevation. The design basis flood (DBF) elevation of 807.87 ft msl is explicitly identified in FSAR Subsection 2.4.2.2 and results from a maximum flood level at CPNPP Units 3 and 4 due to a Probable Maximum Precipitation (PMP) on the Squaw Creek watershed and coincident wind waves. No initial losses were assumed for the DBF, indicating saturated antecedent moisture conditions at the onset of the storm. This assumption is more conservative than the guidance provided in ANSI/ANS-2.8-1992. The PMF for the Squaw Creek watershed is assumed to occur coincidentally with the peak of the domino-type dam failure effect experienced at the Brazos River and Paluxy River confluence throughout the duration of the PMF. The assumption that multiple PMF scenarios occur coincidentally is conservative. The Squaw Creek watershed peak PMF inflow was determined to be 221,000 cfs. The routed peak discharge from the SCR is 148,000 cfs. The assumptions, flow rate for the DBF and the process used to determine the DBF are discussed in detail in FSAR Subsection 2.4.3. The resulting inflow and outflow hydrographs are shown in FSAR Figure 2.4.3-207. FSAR Subsection 2.4.3.6 has been revised to indicate the updated Probable Maximum Flood (PMF) and coincident wind wave estimates.

The critical dam failure event was the assumed domino-type failure of Hubbard Creek Dam, Morris Sheppard Dam and DeCordova Dam. The potential backwater effect of the dam failure event coincident with the PMF was analyzed. The Brazos River watershed, the location of the three dams and the location of CPNPP Units 3 and 4 are given in FSAR Figure 2.4.4-201. The total transposed flow for the critical dam failure event is 6.7 million cfs with a resulting maximum water surface elevation of 774.99 ft msl. at the Brazos River and Paluxy River confluence.

FSAR Subsection 2.4.4 was revised to identify the resulting maximum water surface elevation at the confluence of Brazos River and Paluxy River and to provide a discussion about potential reservoir sites. Additional details for the proposed (future) dams and the critical dam failure event are provided in the response to Question 02.04.04-1 of RAI No. 3666 (CP RAI #111) in Attachment 7 to this letter.

FSAR Subsection 2.4.2.2 identifies that specific analyses of Brazos River flood levels resulting from ocean front surges, seiches, and tsunamis are not required because of the inland location and elevation characteristics of the CPNPP site. Additional details are provided in FSAR Subsections 2.4.5 and 2.4.6. Snowmelt and ice effect considerations are unnecessary because of the temperate zone location of the CPNPP site. Additional details are provided in FSAR Subsections 2.4.3 and 2.4.7. Analyses of flood waves from landslides into reservoirs were not required because of the absence of major elevation relief. In addition, elevation characteristics of the vicinity water features, combined with limited slide volumes, prohibit significant landslide induced flood waves. Additional details are provided in FSAR Subsection 2.4.9.

FSAR Subsection 2.4.6 was revised to include a discussion about the hill-slope failure/landslide-generated tsunami like waves within the Squaw Creek Reservoir.

Slope stability within the immediate area of the CPNPP Units 3 and 4 is discussed in FSAR Subsection 2.5.5. The slope stability analysis indicates stable permanent slopes, and therefore hill-slope failure-induced waves are not plausible in the Squaw Creek Reservoir.

As discussed in FSAR Subsection 2.5.3, there are no capable seismic faults and there is no potential for non-tectonic fault rupture within the 25 mi radius of the CPNPP Units 3 and 4. Therefore, hill-slope failure due to seismic activity is not plausible at the CPNPP Units 3 and 4

FSAR Subsection 2.4.2.2 has been revised to identify the flood design considerations and the corresponding water surface elevations and explicitly identify the design basis flood.

The FSAR subsection revisions cited above were reflected in FSAR Update Tracking Report Revision 4, submitted previously via Luminant letter TXNB-09039, dated September 2, 2009 (ML092520125).

<u>Impact on R-COLA</u>

None.

<u>Impact on S-COLA</u>

None.

<u>Impact on DCD</u>

None.

Attachment 6

Response to Request for Additional Information No. 3665 (CP RAI #105)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3665 (CP RAI #105)

SRP SECTION: 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/1/2009

QUESTION NO.: 02.04.03-1

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.3, 'Probable Maximum Flood (PMF) on Streams and Rivers,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

Provide a description of the process used to determine that the probable maximum flood (PMF) analysis for streams and rivers is the most conservative of all plausible conceptual models. This description needs to consider the parameter selections and assumptions made in watershed probable maximum precipitation (PMP) estimation, watershed runoff modeling, channel routing and runoff accumulation modeling, and local site drainage and runoff modeling.

ANSWER:

The changes cited below were reflected in FSAR Update Tracking Report Revision 4, submitted via Luminant letter TXNB-09039, and dated September 2, 2009 (ML092520125).

FSAR Subsection 2.4.3 has been revised to include a discussion about the rationale for using Snyder's method and the basin characteristics used within the Snyder's method as part of Information Need HYDSV-06 identified during the July 2009 Hydrology Safety Site Visit. FSAR Subsections 2.4.2.3 and 2.4.3 have also been revised to indicate updated PMP, PMF and wind wave estimates due to a change in the runoff model. FSAR Tables 2.4.2-208, Table 2.4.3-202, Table 2.4.3-207 and Table 2.0-1R have been updated to account for changes due to PMF elevation.

The conceptual models to determine the design basis flooding and local site drainage comply with the guidance of Regulatory Guides 1.206 and 1.59 and are described in FSAR Subsections 2.4.2 and 2.4.3. The method for determining river and stream flooding is consistent with the current guidance provided in ANSI/ANS-2.8-1992.

The design basis flood results from the probable maximum precipitation (PMP) for the Squaw Creek watershed coincident with the maximum calculated wind water activity for the Squaw Creek Reservoir. The design basis flood elevation is 807.87 ft msl which is more than 14 ft. below the 822 ft. msl grade for safety related structures. Squaw Creek and Paluxy River watersheds were evaluated for flooding under numerous scenarios. In all cases, flooding due to PMF on Squaw Creek Reservoir with coincident wind wave activity was the limiting case for CPNPP Units 3 and 4.

The PMP for the Squaw Creek and Paluxy River watersheds is determined using Hydrometeorological Reports (HMR) No. 51 and No. 52. The HMR No. 52 recommended temporal distribution of the PMP. The PMP is maximized by examining various storm centers, storm sizes, and orientation. Antecedent storm conditions are chosen to maximize resulting runoff.

For the Squaw Creek watershed, the critical storm center was found to be near the watershed centroid, identified as point SC X in FSAR Figure 2.4.3-202. A storm center at SC2 results in the maximum PMP for the Squaw Creek watershed. The storm center SC X results in a higher runoff and hence SC X is considered to be the critical storm center for the Squaw Creek watershed. The critical 72-hr storm PMP rainfall total is 38.46 in. for the Squaw Creek watershed. The critical temporal distribution was determined by runoff analysis to be an end peaking arrangement for the Squaw Creek watershed.

For the Paluxy River watershed, the critical storm center was found to be near the watershed centroid, identified as point PR Y on FSAR Figure 2.4.3-202. The critical 72-hr storm PMP rainfall total is 35.08 in. for the Paluxy River watershed. The critical temporal distribution was determined by runoff analysis to be a center peaking arrangement for the Paluxy River watershed.

The PMP rainfall amounts are converted to runoff using the U.S. Army Corps of Engineers (USACE) HEC-HMS model. Squaw Creek and Paluxy River watersheds were divided into 4 sub-basins for estimating rainfall-runoff and corresponding water surface elevations. Utilizing the Snyder's unit hydrograph methodology and Muskingum Cunge routing, runoff is maximized by using wet antecedent conditions, no precipitation losses, and examination of multiple time distributions for the PMP. The PMF elevation due to PMP rainfall at storm center at SC X results in a water surface elevation of 709.9 ft msl at the Squaw Creek Reservoir.

The empirical relationship developed by Snyder is found to be reliable through widespread usage and is used within the HEC-HMS model for Squaw Creek and Paluxy River watersheds. Snyder's unit hydrograph method was used for the CPNPP Units 1 and 2 unit hydrograph development and is considered applicable under PMF conditions. Since, the Snyder's method provided reasonable estimates for peak direct runoff rate at the CPNPP Units 1 and 2 location, it was considered to be applicable to determine the peak direct runoff rate for CPNPP Units 3 and 4. Snyder's method uses peaking coefficient (C_p) and lag coefficient (C_t) to determine runoff and lag time. These coefficients depend on drainage basin characteristics. To represent a conservative approach, the basin characteristics resulting in higher runoff at the CPNPP Units 3 and 4 were used in the runoff model.

As discussed in FSAR Subsection 2.4.3.2, no initial losses were used indicating saturated antecedent conditions at the onset of the antecedent storm. This assumption is more conservative than that indicated in ANSI/ANS 2.8-1992. As discussed in FSAR Subsection 2.4.3.3, the assumptions of 40 percent antecedent rainfall and no initial losses were used to account for nonlinear basin response. The initial and constant loss method was used within the HEC-HMS analysis. A uniform loss rate of 0.10 inch/hour for the entire watershed as determined by the CPNPP Units 1 and 2 SSI Dam Design Calculation was used to calculate runoff using the HEC-HMS model. Assuming no initial loss and lower uniform loss rate will result in a higher runoff and represents a conservative approach. Any site drainage system features, such as culverts and inlets, are assumed non-functional.

The USACE HEC-RAS, version 3.1.3, modeling software was used to translate the flood hydrographs obtained from the HEC-HMS model to water surface elevation. The standard step, unsteady-flow analysis for the Squaw Creek and the Paluxy River watersheds resulted in a water surface elevation of 775.21 ft msl on the downstream side of the Squaw Creek Reservoir. Cross sections were estimated using the Squaw Creek Dam TXU 04627 Breach Analysis, prepared by Freese and Nichols and USGS quadrangles. Cross section interpolations were performed as necessary to provide a stabilized HEC-RAS model.

The hydrographs obtained from the sub-basins were used as the upstream boundary and the lateral inflow within the HEC-RAS model. A constant stage hydrograph, due to the peak dam failure flow described in FSAR Subsection 2.4.4, was used as the boundary condition at the downstream end of the Paluxy River. This is a bounding condition including the conservative assumptions that multiple PMF scenarios occur coincidentally and that the peak domino-type dam failure effects are maintained at the confluence throughout the duration of the PMF. A computation interval of 5 minutes was used in the HEC-RAS model.

The analysis of local intense precipitation utilizes the Rational Method to determine runoff. CPNPP Units 3 and 4 site was divided into 11 sub-basins for analyzing the effects of local intense precipitation. The peak runoff flows due to the PMP are based on the time of concentration. The time of concentration is calculated using the Soil Conservation Services (SCS) segmental approach as described in Technical Release (TR)-55. The time of concentration (T_c) is the sum of the time for the runoff to flow from the upper part of the sub-basin to the point of concentration. A combination of sheet flow, shallow flow and channel flow conditions for the sub-basins was considered in determining the total T_c. A trapezoidal cross section was considered in determining the channel flow conditions.

The Rational Method was selected because the area being analyzed was a small developed area. Precipitation and intensity are maximized using point precipitation from HMR No. 51 and No. 52. Any site drainage system features, such as culverts and inlets, are assumed non-functional. Runoff is maximized by assuming no precipitation or runoff losses.

Water surface elevations are determined using the weir equation for the peak runoff rate from the sub-basins with a tail water elevation at 790.9 ft msl from a PMF at the Squaw Creek Reservoir. A sensitivity analysis is also performed by increasing and decreasing the Manning's roughness coefficient.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3665 (CP RAI #105)

SRP SECTION: 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/1/2009

QUESTION NO.: 02.04.03-2

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.3, 'Probable Maximum Flood (PMF) on Streams and Rivers,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

Provide a rationale for assumptions made in the modeling of watersheds for computation of the PMF on rivers and streams affecting the site. Provide electronic versions of input files and documentation of all computer models used in the estimation of the PMF.

ANSWER:

The conceptual models to determine the design basis flooding comply with the guidance of Regulatory Guides 1.206 and 1.59. Determining river and stream flooding is consistent with the current guidance provided in ANSI/ANS-2.8-1992.

A discussion of the conceptual model and rationale for assumptions used in computation of the PMF on rivers and streams affecting CPNPP Units 3 and 4 is provided in the response to Question 02.04.03-1 above.

Calculation TXUT-001-FSAR-2.4.3-CALC-012 has been revised to incorporate changes to the Snyder's lag and peaking coefficients, that were identified in response to Information Need HYDSV-06 during the July 2009 Hydrology Safety Site Visit. Revision 1 of this calculation is provided (on CD) as an attachment.

FSAR Subsections 2.4.2 and 2.4.3 have been revised to be consistent with Revision 1 of calculation CALC-012. Calculation "MITS004 – Probable Maximum Flood Calculation for Comanche Peak Nuclear Power Plant Units 3 and 4 (HEC-HMS & HEC-RAS)", Revision 1 and the input and output (I/O) files (FlowMaster) were submitted as part of Information Need HYDSV-07, via Luminant letter TXNB-09037 dated September 2, 2009.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

Attachment

Calculation TXUT-001-FSAR-2.4.3-CALC-012, Revision 1 (on CD)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3665 (CP RAI #105)

SRP SECTION: 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/1/2009

QUESTION NO.: 02.04.03-3

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.3, 'Probable Maximum Flood (PMF) on Streams and Rivers,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

Provide a rationale for assumptions made in the modeling of instream flooding and drainage for computation of the PMF on rivers and streams affecting the site. Provide documentation and electronic versions of input files for all computer models used to compute the river and stream flooding.

ANSWER:

A discussion of the conceptual model, rationale and assumptions made in the modeling of instream flooding and drainage for computation of the PMF on rivers and streams affecting the CPNPP Units 3 and 4 is provided in the response to Question No. 02.04.03-1 of this RAI.

Calculation "MITS004 – Probable Maximum Flood Calculation for Comanche Peak Nuclear Power Plant Units 3 and 4 (HEC-HMS & HEC-RAS)", Revision 1 and the input and output (I/O) files (FlowMaster) were submitted previously as part of July 2009 Hydrology Safety Site Visit Information Need HYDSV-07 via Luminant letter TXNB-09037, dated September 2, 2009.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3665 (CP RAI #105)

SRP SECTION: 02.04.03 - Probable Maximum Flood (PMF) on Streams and Rivers

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/1/2009

QUESTION NO.: 02.04.03-4

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.3, 'Probable Maximum Flood (PMF) on Streams and Rivers,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

Provide a clarifying discussion of the physical effects included in the computed wave heights, wave setup, and wave runup heights reported in combined license application FSAR Section 2.4.3.6. Explain how these computed heights and the assumptions made in the computations are consistent with heights reported and assumptions made in FSAR Section 2.4.5 for wind generated waves.

ANSWER:

U.S. Army Corps of Engineers (USACE) guidance EM 1110-2-1100, Table II-2-2, indicates that frontal squall lines generating extreme wave conditions in inland waters can have characteristic heights up to 5 m (16.4 ft). USACE EM 1110-2-1100, Table II-2-2, also indicates that the wind systems affecting inland waters are fetch-limited and are based on wind speeds of up to 45 mph.

An adjusted wind speed of 49.91 mph was utilized for coincident wind generated wave activity as discussed in FSAR Subsection 2.4.3. The maximum runup, including wave setup, is estimated to be 16.9 ft. The maximum wind setup is estimated to be 0.07 ft. Therefore, the total water surface elevation increase due to high speed wind wave activity is estimated to be 16.97 ft.

The estimated elevation of 16.97 ft. is higher than the elevation of 16.4 ft. obtained from USACE guidance, and is used as the resulting wind wave activity elevation. As discussed in FSAR Subsection 2.4.3, the resulting water surface elevation due to probable maximum flood (PMF) is 790.90 ft. msl. and the resulting PMF elevation coincident with wind wave activity is 807.87 ft. msl.

FSAR Subsection 2.4.5 was revised to identify the resulting PMF elevation coincident with wind wave activity as part of Information Need item HYDSV-11 identified during the July 2009 Hydrology Safety Site Visit. FSAR Subsection 2.4.3.6 was also revised to indicate updated PMF and coincident wind wave estimates, and FSAR Subsection 2.4.2.2 was revised to identify the flood design considerations and the resulting water surface elevations with explicit identification of the design basis flood in response to Information Need HYDSV-14. Coincident wind wave was not included for the PMF water surface elevation for ice effects listed in FSAR Subsection 2.4.7; however, this Subsection has been revised to include the coincident wind wave activity per the response to RAI No. 3669 (CP RAI #104), Question 02.04.07-2 in Attachment 10 of this letter.

The changes to the cited FSAR Subsections above were reflected in FSAR Update Tracking Report Revision 4, submitted via Luminant letter TXNB-09039 dated September 2, 2009 (ML092520125).

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

Attachment 7

Response to Request for Additional Information No. 3666 (CP RAI #111)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3666 (CP RAI #111)

SRP SECTION: 02.04.04 - Potential Dam Failures

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 02.04.04-1

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.4, 'Potential Dam Failures,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

Provide a description of the process used to determine that the multiple dam failure analysis and resulting flood elevations are based on the most conservative of all plausible conceptual models, including consideration of multiple scenarios of domino failures of existing and proposed dam development within the Brazos River Basin and coincident wind and wave activity on each failed dam.

ANSWER:

The NRC expressed interest in this information during the July 2009 Hydrology Safety Site Visit and it was identified as Information Needs HYDSV-04 and HYDSV-09. The cited subsection changes below were reflected in FSAR Update Tracking Report Revision 4 submitted via Luminant letter TXNB-09039 dated September 2, 2009 (ML092520125).

Near the CPNPP site, the Brazos River Channel is located in incised meanders formed by the river. These meanders may be the result of uplift of the area and sea level fluctuations after a mature meandering drainage pattern is attained. The meanders eroded through and are flanked by rock slopes confining the river within a relatively narrow channel. Immediately adjacent to the channel within the meanders is a narrow flood plain. Although accretion and erosion occur within the channel, as is typical of a meandering river, the well-defined meanders indicate that the channel location is closely confined. The geometry of the banks is governed closely by their location with respect to the meander pattern. The bank on the outside of a bend generally is steep; whereas, the bank on the inside of the bend usually has a gentler slope as stated in the Comanche Peak Steam Electric Station FSAR (FSAR Reference 2.4-214).

There are currently three reservoirs located on the main stem of the Brazos River: Possum Kingdom Lake, Lake Granbury, and Lake Whitney. The Brazos River watershed, locations for the Possum Kingdom Lake, Lake Granbury and Lake Whitney are identified in FSAR Figure 2.4.4-201. Each of these reservoirs is within 150 river miles of the CPNPP site, and most of the main stem Brazos River reservoir storage is concentrated along this reach. Because the site is located off-channel on a tributary of the Brazos River, the most conservative approach for the critical dam failure event would be for this reach of the Brazos River to flood by way of domino-type dam failure of upstream dams, and for flood waters to back-up from the Brazos River and Paluxy River confluence onto the site by way of the Squaw Creek catchment. For the dam failure analysis, the peak flow of the probable maximum flood (PMF) coincident with assumed hydrologic domino type dam failure of three upstream dams were analyzed at the Brazos River and the Paluxy River confluence. Morris Sheppard and De Cordova Bend are main stream Brazos River dams located upstream of the confluence of Squaw Creek with Paluxy River and Brazos River. They are located within the portion of the Brazos River Basin identified as most significant for the dam failure analysis; however, for conservatism, the failure of Hubbard Creek Dam, which impounds Hubbard Creek Reservoir, was also used in the dam failure analysis. Hubbard Creek Dam is located approximately 357 miles upstream of Morris Sheppard Dam and was chosen for the dam failure analysis based on its distance from Morris Sheppard Dam and greater storage capacity when compared to other upstream reservoirs in the region. Domino type failures are included coincident with PMF flows and transposed downstream without any attenuation. Thus, the closely confined basin geometry of this reach and the concentration of major reservoirs were used as the basis for determining this portion of the basin as the most significant for the dam failure analysis.

Similarly, Lake Palo Pinto is located on a tributary of the Brazos River between Morris Sheppard and DeCordova dams. Lake Palo Pinto contains a significantly smaller volume of water than Hubbard Creek Reservoir. Lake Stamford and White River Reservoir are more distant and located on different tributaries.

According to the 2006 Brazos Region G Water Plan (FSAR reference 2.4-208), most of the sites in the state that are readily amenable to reservoir development have already been utilized. Many other sites that are amenable to reservoir development from a technical, or water supply, point of view have not been developed even though they have been studied for many years. Seven (7) potential upstream reservoir sites were evaluated in the 2006 Brazos Region G Water Plan. All but one of these potential reservoir sites, the proposed South Bend Site, were found to contain less storage than the Hubbard Creek Reservoir and were excluded from the dam failure analysis. The proposed South Bend Site, located approximately 251 miles upstream of the Brazos River and Paluxy River confluence, would store up to 771,604 ac-ft. The South Bend Reservoir was not recommended as a water management strategy in the 2006 Region G Water Plan, which indicates implementation of the South Bend Reservoir would encounter difficult permitting constraints and would likely require significant treatment due to water quality concerns. Although the proposed South Bend Reservoir would be closer to the Brazos River and Paluxy River confluence and would impound a greater volume of water than the Hubbard Creek Reservoir, the South Bend Reservoir has not been recommended as a water management strategy for Region G and therefore was not included in the dam failure analysis. The proposed reservoirs in the downstream watershed are significantly smaller in volume. Based on the storage volume and location of proposed downstream reservoirs, failure of downstream dams would reduce the effects of upstream dam failure. Hence failure of downstream dams was not considered in the dam failure analysis and the rationale for selecting the Hubbard Creek Dam, Morris Sheppard Dam and DeCordova Dam as the critical dam failure event is valid.

NUREG-0800 and Regulatory Guide 1.206 both specifically examine dam failure under hydrologic conditions. If failures are likely and under seismic conditions, ANSI/ANS-2.8-1992 defines the seismic dam failure combinations as the safe shutdown earthquake coincident with the peak of the 25-year flood, or the operating basis earthquake coincident with the peak of the one-half probable maximum flood (PMF) or 500-year flood, whichever is less.

Dam failures are assumed to occur coincident with the peak of the PMF. Failure during the PMF exceeds the regulatory guidance for hydrologic events coincident with seismic failure. Additional conservatism in the analysis includes the dam failure coincident with PMF flow as transposed downstream without attenuation to the confluence of Paluxy River and Brazos River.

The total dam failure flow is the sum of the spillway flow, the breach flow, the remainder of the overtopping flow not affected by the breach width combined with the coincident PMF flow for the respective dams. The dam failure flows represent the dam storage for the respective dams. The coincident wind wave activity on each failed upstream dam will be limited to an instantaneous wave height and will not increase the dam failure flows. Hence, coincident wind wave activity on each of the failed upstream dam was considered not applicable for the dam failures.

The resulting maximum water surface elevation at the confluence of Brazos River and Paluxy River cross section is 774.99 ft msl for the total transposed flow of 6.7 million cfs. CPNPP Units 3 and 4 safety-related facilities are located at elevation 822 ft msl, providing almost 47 ft of freeboard. Additionally, the resulting water surface elevation is below the Squaw Creek Dam crest elevation of 796 ft. Therefore, coincident wind wave activity results would be equivalent to the wind wave activity for SCR. In the unlikely event of achieving the water surface elevation described above, possible headcutting on the downstream slope of Squaw Creek Dam could result in failure of the Squaw Creek Dam. However, failure would lower the water surface elevation of SCR. In the event of Squaw Creek Dam failure the fetch length determined by the wind wave activity in FSAR Subsection 2.4.3.6 would not be increased.

FSAR Subsection 2.4.1.2 was revised to clarify which portions of the Brazos River were chosen for the safety analyses and why. FSAR Subsection 2.4.4 was revised to include a discussion about the volume of water, distance from Brazos River and Paluxy River confluence and the development potential of proposed reservoir sites that were considered for the dam failure analyses.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3666 (CP RAI #111)

SRP SECTION: 02.04.04 - Potential Dam Failures

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 02.04.04-2

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.4, 'Potential Dam Failures,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

Provide documentation and electronic versions of input files to all computer models used to compute the water surface elevations for dam break flooding analysis.

ANSWER:

Calculation TXUT-001-FSAR-2.4.4-CALC-015, "Brazos River Dam Failures Analysis for Comanche Peak Nuclear Power Plant Units 3 and 4" Revision 0 and the input and output (I/O) files (FlowMaster) were placed in the reading room in response to Information Need HYDSV-08 identified during the July 2009 Hydrology Safety Site Visit.

The FlowMaster I/O files were submitted to the NRC via Luminant letter TXNB-09037 dated August 31, 2009 (ML092470198).

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3666 (CP RAI #111)

SRP SECTION: 02.04.04 - Potential Dam Failures

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 02.04.04-3

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.4, 'Potential Dam Failures,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

Provide a rationale for and discuss how the existing dams in the Brazos River Basin (referenced in FSAR Section 2.4.1) were analyzed to determine the appropriateness of limiting dam failure analysis to Morris Shepherd and De Cordova Dams. Explain how the impact of failure of proposed (future) dams was considered in the dam failure analysis.

ANSWER:

The critical dam failure event was the assumed domino-type failure of Hubbard Creek Dam, Morris Sheppard Dam and DeCordova Dam coincident with the probable maximum flood (PMF). Discussion of the proposed (future) dams and the critical dam failure event for the existing dams is provided in the response to Question 02.04.04-1 above.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3666 (CP RAI #111)

SRP SECTION: 02.04.04 - Potential Dam Failures

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 02.04.04-4

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.4, 'Potential Dam Failures,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

Provide a rationale for assuming normal water surface elevations for reservoirs included in the domino-type dam failure scenario. Explain why the analysis should not include maximum reservoir elevations as reported in operating histories or in reservoir operating guides maintained by operating authorities.

ANSWER:

Dam failure was assumed to occur coincident with the PMF. Reservoirs are assumed to be at normal water surface elevation for antecedent conditions at the onset of the PMF. The PMF for the corresponding watershed without any attenuation was added to the dam failure flow for each reservoir. The PMF exceeds the spillway capacity and the standard broad crested weir overflow equation was used to determine the peak water surface elevation. The excess flow spills over the dam crest and overtopping was modeled through the standard broad crested weir flow equation defined by the HEC-RAS reference manual. The process used to determine the height of the overtopping flows is discussed in detail in FSAR Subsection 2.4.4.1. No tailwater was assumed in order to maximize the water height component of the dam failure equation, given by USACE EM 1110-2-142. The peak water surface elevation for the corresponding dam failure is equal to the height of the dam plus the height of the overtopping flows, which will exceed the maximum reservoir elevation and hence, was considered to be conservative.

FSAR Subsection 2.4.4.1 was revised to indicate that reservoirs are assumed to be at normal water surface elevation for antecedent conditions at the onset of the PMF.

<u>Impact on R-COLA</u>

See attached marked-up FSAR Draft Revision 1 pages 2.4-27.

Impact on S-COLA

None.

Impact on DCD

None.

Structural analysis of each structure has not been performed as part of this analysis. The potential backwater effects of dam failures on the Brazos River are examined assuming hydrologic failure of dams coincident with the PMF. The PMF is a more extreme event than the safe shutdown earthquake coincident with the peak of the 25-year flood, and the operating basis earthquake coincident with the peak of the one-half PMF or the 500-year flood. Seismic dam failure coincident with lesser flooding would result in lower flood elevations and has not been examined, except as noted below.

The considered upstream structures are described below. Reservoirs are assumed to be at normal water surface elevations with no turbine discharges for antecedent conditions at the onset of the PMF. The gates at Morris Sheppard Dam and DeCordova Bend Dam are assumed to be closed. Failure of downstream structures would reduce the effects of dam failure and are not considered to fail. RCOL2_02.04.04-4

Hubbard Creek Dam is an earthfill structure 109 ft high, 12,580 ft long, with a 2000 ft long uncontrolled spillway. The spillway has a discharge capacity of 480,387 cfs. The impounded reservoir, Hubbard Creek Reservoir, has an estimated storage capacity of 317,750 ac-ft at normal water surface elevation. (Reference 2.4-222)

Morris Sheppard Dam is a concrete buttress structure 154 ft high, 2740 ft long, with a 729 ft long gated spillway. The spillway has a discharge capacity of 515,000 cfs. The impounded reservoir, Possum Kingdom Lake, has an estimated storage capacity of 556,220 ac-ft at normal water surface elevation. (Reference 2.4-222)

DeCordova Bend Dam is a concrete gravity structure 79 ft high, 2200 ft long, with a 656 ft long gated spillway. The spillway has a discharge capacity of 635,000 cfs. The impounded reservoir, Lake Granbury, has an estimated storage capacity of 136,823 ac-ft at normal water surface elevation. (Reference 2.4-222)

The coincident PMF flows are determined using the approach detailed in Appendix B of the NRC Regulatory Guide 1.59 (RG 1.59). Overtopping depth at each structure is determined using the standard broad crested weir flow equation.

$$Q = C \cdot L \cdot H^{1.5}$$

where

Q = flow (cfs)
C = weir flow coefficient (C = 2.6)
L = weir length (ft)
H = weir energy head (ft)

Attachment 8

Response to Request for Additional Information No. 3667 (CP RAI #112)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3667 (CP RAI #112)

SRP SECTION: 02.04.05 - Probable Maximum Surge and Seiche Flooding

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 02.04.05-1

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.5, 'Probable Maximum Surge and Seiche Flooding,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

Provide a description of and rationale for the process used to determine the conceptual models for probable maximum hurricane, probable maximum wind storm, seiche and resonance, wave runup, and sediment erosion and deposition to ensure that the most conservative of plausible conceptual models has been identified.

ANSWER:

The conceptual models developed for determining flood waves from probable maximum hurricane, probable maximum wind storm, seiche and resonance, and wave runup comply with the guidance of Regulatory Guides 1.206 and 1.59 and are described in FSAR Subsection 2.4.5. Determination of hurricane, wind storm, seiche and resonance flooding, and wave runup is consistent with the current guidance provided in ANSI/ANS-2.8-1992.

CPNPP Units 3 and 4 are located approximately 275 miles inland from the Gulf of Mexico. Therefore a surge due to a probable maximum hurricane would not cause flooding at the CPNPP Units 3 and 4 site. Maximum winds are used to evaluate wind wave effects, including wave runup, for the Squaw Creek Reservoir. Resulting flood waves reach an elevation of 807.87 ft msl, which is less than the CPNPP Units 3 and 4 plant grade elevation of 822 ft msl.

A qualitative assessment for seismically-induced seiche based on U.S. Army Corps of Engineers (USACE), Seismic Design for Buildings, TI 809-04, December 31, 1998, Page F-16 is provided in FSAR Subsection 2.4.5. As discussed in FSAR Subsection 2.5.3, there are no capable faults, and there is no potential for non-tectonic fault rupture within the 25 mi radius of the CPNPP Units 3 and 4.

Therefore, landslide-induced waves are not plausible for the Squaw Creek Reservoir. Slope stability within the immediate area of the CPNPP Units 3 and 4 is discussed in FSAR Subsection 2.5.5. FSAR

Subsection 2.4.5 addresses the meteorologically/atmospheric-induced seiche/resonance based on USACE "Coastal Engineering Manual" EM 1110-2-1100, Part 2.

No water is required directly from the Brazos River to support safety-related functions. Therefore, there are no safety-related facilities that would be affected by sediment deposition and erosion.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3667 (CP RAI #112)

SRP SECTION: 02.04.05 - Probable Maximum Surge and Seiche Flooding

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 02.04.05-2

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.5, 'Probable Maximum Surge and Seiche Flooding,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

In order to determine consistency of analyses for wind generated waves, provide a discussion on the consistency of computation of wind-generated waves in combined license (COL) FSAR Section 2.4.5 compared with that provided in COL FSAR Section 2.4.3.6. Discuss any differences in the assumptions made, parameters used, and resulting estimations of wave height. Also clarify the physical effects that are accounted for in each reported wave height.

ANSWER:

The wind generated waves estimated in FSAR Subsection 2.4.5 are based on the U.S. Army Corps of Engineers (USACE) guidance EM 1110-2-1100. USACE EM 1110-2-1100, Table II-2-2, indicates that frontal squall lines generating extreme wave conditions in inland waters can have characteristic heights up to 5 m (16.4 ft). USACE EM 1110-2-1100, Table II-2-2, also indicates that the wind systems affecting inland waters are fetch limited and are based on wind speeds of up to 45 mph.

An adjusted wind speed of 49.91 mph was utilized in estimating coincident wind generated wave activity as discussed in FSAR Subsection 2.4.3. The maximum runup, including wave setup, is estimated to be 16.9 ft. The maximum wind setup is estimated to be 0.07 ft. Therefore, the total water surface elevation increase due to high speed wind wave activity is estimated to be 16.97 ft. The estimated elevation of 16.97 ft. is higher than the elevation of 16.4 ft. obtained from USACE guidance, and is used as the resulting wind wave activity elevation.

As discussed in FSAR Subsection 2.4.3, the resulting water surface elevation due to probable maximum flood (PMF) is 790.90 ft msl. Therefore, the resulting PMF elevation coincident with wind wave activity is 807.87 ft. msl. Resulting flood waves reach elevation of 807.87 ft msl which is less than the CPNPP Units 3 and 4 plant grade elevation of 822 ft msl.

FSAR Subsection 2.4.5 has been revised to identify the resulting maximum runup, including wave setup, and the maximum wind setup and runup as part of Information Need items HYDSV-11 identified during the July 2009 Hydrology Safety Site Visit. This revision makes the flood elevation reported in FSAR Subsection 2.4.5 consistent with the flood elevation reported in FSAR Subsection 2.4.3.6 (807.87 ft msl). The cited subsection change was reflected in FSAR Update Tracking Report Revision 4 submitted via Luminant letter TXNB-09039 dated September 2, 2009 (ML092520125).

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3667 (CP RAI #112)

SRP SECTION: 02.04.05 - Probable Maximum Surge and Seiche Flooding

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 02.04.05-3

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.5, 'Probable Maximum Surge and Seiche Flooding,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

Provide discussion to clarify the assumptions made and the risk thresholds used to eliminate from consideration the seiche hazard to the site. Provide a quantitative characterization of the term "rare" as used in reference to USACE geologic hazard evaluations of seiche wave risk.

ANSWER:

A qualitative assessment for seismically-induced seiche based on U.S. Army Corps of Engineers (USACE), Seismic Design for Buildings, TI 809-04, December 31, 1998, Page F-16 is provided in FSAR Subsection 2.4.5. The USACE guidance TI 809-04 indicates that "...it appears to be rare for a seiche wave to exceed about 2 meter (7 feet) in height.". The normal pool elevation for Squaw Creek Reservoir is 775 ft msl and the water surface elevation due to probable maximum flood is 790.9 ft msl. The CPNPP Units 3 and 4 are more than 7 ft above the normal pool and probable maximum flood elevations.

As discussed in FSAR Subsection 2.5.3, there are no capable faults, and there is no potential for non-tectonic fault rupture within the 25 mi radius of the CPNPP Units 3 and 4.

Therefore, landslide-induced waves are not plausible for the Squaw Creek Reservoir. Slope stability within the immediate area of the CPNPP Units 3 and 4 is discussed in FSAR Subsection 2.5.5. Subsection 2.4.5 addresses the meteorologically/atmospheric-induced seiche/resonance based on USACE, "Coastal Engineering Manual" EM 1110-2-1100, Part 2.

The FSAR Subsection 2.4.5 was revised to include discussion about seismically induced seiche as part of Information Needs Items HYDSV-10, HYDSV-12, and HYDSV-13 identified during the July 2009 Hydrology Safety Site Visit. The cited subsection change was reflected in FSAR Update Tracking Report Revision 4 submitted via Luminant letter TXNB-09039 dated September 2, 2009 (ML092520125).

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3667 (CP RAI #112)

SRP SECTION: 02.04.05 - Probable Maximum Surge and Seiche Flooding

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 02.04.05-4

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.5, 'Probable Maximum Surge and Seiche Flooding,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

Provide an assessment of meteorologically and seismically-induced seiches in Squaw Creek Reservoir.

ANSWER:

FSAR Subsection 2.4.5 includes a discussion about the hill-slope failure/landslide-generated tsunami like waves within the Squaw Creek Reservoir.

Slope stability within the immediate area of the CPNPP Units 3 and 4 is discussed in FSAR Subsection 2.5.5. The slope stability analysis indicates stable permanent slopes and therefore hill-slope failure-induced waves are not plausible for the Squaw Creek Reservoir.

As discussed in FSAR Subsection 2.5.3, there are no capable faults, and there is no potential for non-tectonic fault rupture within the 25 mi radius of the CPNPP Units 3 and 4. Therefore, hill-slope failure due to seismic activity is not plausible for the CPNPP Units 3 and 4.

FSAR Subsection 2.4.5 was revised to include discussion about seismically induced seiche as part of Information Needs item HYDSV-10 identified during the July 2009 Hydrology Safety Site Visit. The cited subsection change was reflected in FSAR Update Tracking Report Revision 4 submitted via Luminant letter TXNB-09039 dated September 2, 2009 (ML092520125).

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

Attachment 9

Response to Request for Additional Information No. 3668 (CP RAI #107)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3668 (CP RAI #107)

SRP SECTION: 02.04.06 - Probable Maximum Tsunami Flooding

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 02.04.06-1

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.6, 'Probable Maximum Tsunami Hazards,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

Provide a description of the process followed to determine the conceptual models for probable maximum tsunami, tsunami propagation, wave runup, inundation, and drawdown, hydrostatic and hydrodynamic forces, debris and water-borne projectiles, and sediment erosion and deposition to ensure that the most conservative of plausible conceptual models has been identified.

ANSWER:

The conceptual models developed for determining the probable maximum tsunami and tsunami-type flood waves comply fully with the guidance of Regulatory Guides 1.206 and 1.59 and are described in FSAR Subsection 2.4.6. Changes to FSAR Subsection 2.4.6 were provided in FSAR Update Tracking Report Revision 4, submitted via Luminant letter TXNB-09039, and dated September 2, 2009 (ML092520125).

As shown in U.S. Army Corps of Engineers (USACE) guidance TI 809-04, the Gulf Coast is located in Zone 1, which corresponds to a wave height of 5 ft. Tsunami risk map maximum wave heights and historical maximum recorded tsunami wave heights for the Gulf Coast are compared to the available freeboard of the CPNPP Units 3 and 4 above the Brazos River. Resulting flood waves are less than the design basis flood of 807.87 ft msl. Therefore, there is no potential for inundation, hydrostatic and hydrodynamic forces, debris, or water-borne projectiles affecting safety-related facilities.

As discussed in FSAR Subsection 2.5.3, there are no capable tectonic sources in the vicinity of the CPNPP Units 3 and 4. Therefore, there is negligible potential for tectonic fault rupture at the CPNPP Units 3 and 4 site or in the vicinity. Because there is negligible potential for tectonic fault rupture, seismic induced or landslide generated waves are not plausible for the water bodies adjacent to the CPNPP Units 3 and 4

No water is required from the Brazos River and Squaw Creek Reservoir to support safety-related functions at the CPNPP Units 3 and 4. Therefore, there are no safety-related facilities that would be affected by sediment deposition, erosion, or drawdown.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3668 (CP RAI #107)

SRP SECTION: 02.04.06 - Probable Maximum Tsunami Flooding

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 02.04.06-2

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.6, 'Probable Maximum Tsunami Hazards,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

Provide an assessment of the magnitude, risk, and risk thresholds for hill-slope failure-generated surges in Squaw Creek Reservoir and describe the process used to ensure that the tsunami flooding risk analysis for Squaw Creek Reservoir including hill-slope failure generated tsunami is bounding and conservative.

ANSWER:

FSAR Subsection 2.4.6 indicates that the slope stability within the immediate area of the CPNPP Units 3 and 4 is discussed in FSAR Subsection 2.5.5. The slope stability analysis indicates stable permanent slopes and therefore hill-slope failure-induced waves are not plausible for Squaw Creek Reservoir. FSAR Subsection 2.4.6 has been revised to include a discussion about the possibility of hill-slope failure/landslide-generated tsunami like waves within the Squaw Creek Reservoir.

As discussed in FSAR Subsection 2.5.3, there are no capable faults, and there is no potential for non-tectonic fault rupture within the 25 mi radius of the CPNPP Units 3 and 4. Therefore, hill-slope failure due to seismic activity is not plausible for the CPNPP Units 3 and 4.

The NRC professed an interest in this information during the July 2009 Hydrology Safety Site Visit and was identified as Information Needs items HYDSV-12, and HYDSV-13. The cited subsection changes were reflected in FSAR Update Tracking Report Revision 4 submitted via Luminant letter TXNB-09039 dated September 2, 2009 (ML092520125).

<u>Impact on R-COLA</u>

None.

Impact on S-COLA

None.

Impact on DCD

None.

Attachment 10

Response to Request for Additional Information No. 3669 (CP RAI #104)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3669 (CP RAI #104)

SRP SECTION: 02.04.07 - Ice Effects

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/1/2009

QUESTION NO.: 02.04.07-1

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.7, 'Ice Effects,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

Provide a discussion of the processes used to determine that the analyses of ice-effects on flood elevations, ice-induced forces, and ice-related impairment of the ultimate heat sink equipment are conservatively bounding.

ANSWER:

The NRC expressed an interest in this information during the July 2009 Hydrology Safety Site Visit. This was identified as Information Need HYDSV-15. This cited subsection changes described below were submitted in FSAR Update Tracking Report, Revision 4 submitted via Luminant letter TXNB-09039, dated September 2, 2009 (ML092520125).

The conceptual models to determine ice effects, ice-induced forces and ice-related impairment adhere to the requirements of NRC Regulatory Guide 1.206. Determination of ice effects, ice-induced forces and ice-related impairment is consistent with the current state of the practice guidance provided in ANSI/ANS-2.8-1992. The Accumulated Freezing Degree Days (AFDD) and corresponding ice thickness at the CPNPP Units 3 and 4 site were estimated based on U.S. Army Corps of Engineers (USACE) guidance's EM 1110-2-1612, TR-04-19, and TN-04-3.

According to the USACE, ice jams occur in 36 states, primarily in the northern tier of the United States. Texas is not included in this coverage. USACE Cold Regions Research and Engineering Laboratory, historical ice jam database indicate no ice jams for Squaw Creek Reservoir. According to the USACE, frazil ice forms in supercooled turbulent water in rivers and lakes. As discussed in FSAR Subsection 2.4.7, meteorological and gage data indicate air and water temperatures stay above freezing. Anchor ice is defined as frazil ice attached to the river bottom, irrespective of the nature of its formation. The potential for freezing (i.e., frazil or anchor ice) and subsequent ice jams on the Squaw Creek and Brazos River is remote. Additionally, sustained periods of subfreezing water temperatures are not characteristic of the region.

The climate and operation of Squaw Creek Reservoir prevent any significant icing. There are no safety-related facilities that could be affected by ice induced low flow.

The essential service water system (ESWS) four wet mechanical draft cooling towers are protected from freezing as described in FSAR Subsection 9.2.1.3. The freeze protection for the ESWS Pump House Ventilation System is discussed in FSAR Subsection 9.4.5.2.6. FSAR Subsection 2.4.7 has been updated to include this information as part of Information Need HYDSV-15.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3669 (CP RAI #104)

SRP SECTION: 02.04.07 - Ice Effects

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/1/2009

QUESTION NO.: 02.04.07-2

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.7, 'Ice Effects,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

In order to maintain consistency in referencing water surface elevations for probable maximum flood (PMF) events, reconcile the PMF elevation of 788.9 feet referenced in FSAR Section 2.4.3.6 with the PMF elevation of 809.28 feet referenced in FSAR Section 2.4.7. Provide discussion of the physical effects and assumptions from which these different values result and why the use of one or the other is appropriate.

ANSWER:

FSAR Subsection 2.4.3.6 identifies the revised probable maximum flood (PMF) and coincident wind wave estimates. The PMF and maximum coincident wind wave activity was revised as part of Information Needs items HYDSV-06 and HYDSV-07 identified during the July 2009 Hydrology Safety Site Visit. The revised PMF and maximum coincident wind wave activity results in a flood elevation of 807.87 ft. msl.

The revised FSAR PMF analyses cited above were reflected in FSAR Update Tracking Report Revision 4 submitted via Luminant letter TXNB-09039 dated September 2, 2009 (ML092520125).

Coincident wind wave was not included for the PMF water surface elevation for ice effects that were previously identified in FSAR Subsection 2.4.7. Accordingly, FSAR Subsection 2.4.7 has been revised to include the coincident wind wave activity to be consistent with FSAR Subsection 2.4.3.6.

The updated FSAR Subsection 2.4.7 is reflected in FSAR Update Tracking Report, Revision 4 submitted via Luminant letter TXNB-09039, dated September 2, 2009 (ML092520125). However, during FSAR review for this RAI it was noted that Subsection 2.4.7 has incorrect reference numbers in the last paragraph. The Reference Numbers 2.4-269 and 2.4-270 should be 2.4-271 and 2.4-272, respectively. Accordingly, FSAR Subsection 2.4.7 has been updated to identify the correct references.

Impact on R-COLA

See attached marked-up FSAR Draft Revision 1 pages 2.4-35 and 2.4-36.

Impact on S-COLA

None.

Impact on DCD

None.

2.4.7 Ice Effects

CP COL 2.4(1) Replace the content of DCD Subsection 2.4.7 with the following.

According to the EPA STOrage and RETrieval (STORET) database, two gaging stations located on the SCR and its tributaries recorded water temperatures for different periods between 1973 and 1985. The lowest recorded water temperatures range from 41.9°F to 50°F. The lowest recordings, 41.9°F, occurred on February 10, 1982 at station 11555, Squaw Creek and State Highway 144 (SH 144), Northeast of Glen Rose. (Reference 2.4-245)

Gaging station 11856 is located on Brazos River and gaging station 11976 is located on Paluxy River. The gaging station 11856 on Brazos River at U.S. Highway 67 (US 67) recorded water temperatures from 1968 to 1998. The lowest recorded water temperature at this station was 39.02°F. (Reference 2.4-245) The gaging station 11976 on Paluxy River in City Park recorded water temperatures from 1973 to 1996. The lowest recorded water temperature at this station was 39.2°F. (Reference 2.4-245) This data suggests that Squaw Creek water temperatures generally remain above the freezing point. The recordings are summarized in Table 2.4.7-201.

According to the USACE, ice jams occur in 36 states, primarily in the northern tier of the United States. (Reference 2.4-246) (Figure 2.4.7-201) Texas is not included in this coverage. USACE Cold Regions Research and Engineering Laboratory historical ice jam database (Reference 2.4-247) indicates no ice jams for Squaw Creek. However, the USACE ice jam database reports that Brazos River was obstructed by rough ice at Rainbow near Glen Rose, Texas, on January 22-23 and January 25-28, 1940, with flood stage of 20 ft. (Reference 2.4-247)

CPNPP Units 3 and 4 safety-related facilities are located at elevation 822 ft msl. The SCR spillway elevation is 775 ft msl (Reference 2.4-214). The maximum water surface elevation during a probable maximum flood event and coincident wind waves is at ~~790.9~~807.87 ft msl, which is more than ~~30~~14 ft below the CPNPP Units 3 and 4 safety-related facilities. The possibility of inundating CPNPP Units 3 and 4 safety-related facilities due to an ice jam is remote. RCOL2_02.04.07-2 HYDSV-14

Meteorological records from the Southern Regional Climate Center (SRCC) were examined for areas in the vicinity of CPNPP Units 3 and 4. Records indicate that December and January have the coldest temperatures. For the available period of record from 1971 to 2000, the climate station at Dallas/Fort Worth has a recorded monthly average minimum temperature of 34°F, occurring in January. (Reference 2.4-248)

According to the USACE, frazil ice forms in supercooled turbulent water in rivers and lakes. (Reference 2.4-246) Anchor ice is defined as frazil ice attached to the river bottom, irrespective of the nature of its formation. The potential for freezing (i.e., frazil or anchor ice) and subsequent ice jams on the Squaw Creek and Brazos River is remote. Additionally, sustained periods of subfreezing water temperatures are not characteristic of the region. The climate and operation of SCR prevent any significant icing on the Squaw Creek. There are no safety related facilities that could be affected by ice induced low flow.

According to U.S. Army Corps of Engineers methods (Reference 2.4-~~269~~271), the maximum potential ice thickness is a function of accumulated freezing-degree days (AFDD). The average maximum AFDD for CPNPP Units 3 and 4 is approximately 100 days (Reference 2.4-~~270~~272). The resulting maximum potential ice thickness is 7 in. There are no safety-related facilities that could be affected by ice-induced low flow at CPNPP Units 3 and 4. The freezing protection for the essential (sometimes called emergency) service water system (ESWS) four wet mechanical cooling towers is described in Subsection 9.2.1.3. The freezing protection for the ESW Pump House Ventilation System is described in Subsection 9.4.5.2.6. HYDSV-15 RCOL2_02.04.07-2

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3669 (CP RAI #104)

SRP SECTION: 02.04.07 - Ice Effects

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/1/2009

QUESTION NO.: 02.04.07-3

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.7, 'Ice Effects,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

Provide a discussion of the effects of the accumulated freezing days in January and December and ice-induced reduction for the capacity of water storage in the safety-related essential (sometimes called "emergency") service water system (ESWS) for both of the proposed four wet mechanical draft cooling towers per unit. Provide hydro meteorological data and documentation to justify the assumptions used to derive the conclusions about ice-related risk of impairment.

ANSWER:

The Accumulated Freezing Degree Days (AFDD) and corresponding ice thickness at the CPNPP site were estimated based on U.S. Army Corps of Engineers (USACE) guidance. The average maximum AFDD for the CPNPP Units 3 and 4 is approximately 100 days. The resulting maximum potential ice thickness is 7 inches.

The four ESWS wet mechanical draft cooling towers are protected from freezing as described in FSAR Subsection 9.2.1.3. The freeze protection for the ESW Pump House Ventilation System is discussed in FSAR Subsection 9.4.5.2.6.

FSAR Subsection 2.4.7 has been updated to include the AFDD based on USACE guidance. The revised FSAR Subsection 2.4.7 also includes a reference to FSAR Subsections 9.2.1.3 and 9.4.5.2.6 to address freeze protection for the ESWS and pump house ventilation system. FSAR Subsection 2.4.16 has been revised to include the two additional references.

The NRC expressed an interest in this information during the July 2009 Hydrology Safety Site Visit. The information was identified as Information Needs HYDSV-15 and HYDSV-16. In response to HYDSV-16, the cited subsections were changed and are reflected in FSAR Update Tracking Report Revision 4 submitted via Luminant letter TXNB-09039 dated September 2, 2009 (ML092520125).

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

Attachment 11

Response to Request for Additional Information No. 3670 (CP RAI #103)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3670 (CP RAI #103)

SRP SECTION: 02.04.10 – Flooding Protection Requirements

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/1/2009

QUESTION NO.: 02.04.10-1

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.10, 'Flooding Protection Requirements,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

In order to satisfy the requirements for determination of a design basis flood with respect to the plant grade elevation, provide a discussion of flooding events that is consistent with combined license application FSAR Section 2.4.2 and explicitly identify the design basis flood in the determination of the absence of need for flood protection measures at the plant. Provide description consistent with that discussed in FSAR Section 2.4.1.

ANSWER:

Changes to FSAR Subsection 2.4.2 were provided in FSAR Update Tracking Report Revision 4, submitted via Luminant letter TXNB-09039, dated September 2, 2009 (ML092520125) that identify the design basis flood, the plant grade elevation, and whether flood protection measures are necessary.

Revised FSAR Subsection 2.4.2 identifies the flood design considerations and the resulting water surface elevations and explicitly identifies the design basis flood. The flood elevation at the CPNPP Units 3 and 4 is lower than the elevation of 822 ft. msl. for safety-related structures at CPNPP Units 3 and 4. Therefore, flood protection measures and emergency procedures to address flood protection are not required.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

Attachment 12

Response to Request for Additional Information No. 3671 (CP RAI #113)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3671 (CP RAI #113)

SRP SECTION: 02.04.11 – Low Water Considerations

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 02.04.11-1

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.11, 'Low Water Considerations,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

Provide a description of the process followed to determine the conceptual models for low water from drought and from other phenomena. The description needs to include the effects of low water on safety-related water supplies under possible water use limits to ensure that the site characteristics related to low-water events are based on the most conservative of plausible conceptual models.

ANSWER:

The conceptual model for establishment of low flow conditions includes calculating a long-term 7Q10 flow for the Brazos River. The USGS streamflow gages used for the low flow calculations are, Brazos River near Glen Rose (gage number 08091000) and Brazos River near Glen Rose (gage number 08090800). These gages were chosen due to proximity to the proposed CPNPP Units 3 and 4. Daily average flows for these gages were compiled using a combination of actual data over the period of available data from the gages. Low-flow frequency analysis was performed in accordance with USGS Bulletin 17B using the Log-Pearson Type III distribution method.

Makeup water to the cooling water system flow is supplied by the intake as described in FSAR Subsection 2.4.1.2.3.2. The intake structure includes necessary intake screens, pumps, etc. to convey the lake water to various cooling tower basins. Lake Granbury is also a makeup source to the raw water pretreatment system used to ensure water is suitable for use in various systems at CPNPP Units 3 and 4. Intake screen locations consider the Lake Granbury minimum level. There are no safety-related plant requirements provided by Lake Granbury.

The mechanism of makeup water flow control for both ESWS and CWS Cooling Tower are based on the basin water level. The flow controls for ESWS Cooling Tower and CWS are described in FSAR Subsection 9.2.5 and Subsection 10.4.5, respectively. No water is required from the Brazos River, Squaw Creek Reservoir and Lake Granbury to support safety-related functions. Therefore, low water has no effect on safety-related facilities.

FSAR Subsection 2.4.11.5 has been updated to refer to FSAR Subsection 9.2.5 and Subsection 10.4.5. The information was identified as Information Needs item HYDSV-11 identified during the July 2009 Hydrology Safety Site Visit. The cited subsection change was reflected in FSAR Update Tracking Report Revision 4, submitted via Luminant letter TXNB-09039 dated September 2, 2009 (ML092520125).

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3671 (CP RAI #113)

SRP SECTION: 02.04.11 – Low Water Considerations

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 02.04.11-2

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.11, 'Low Water Considerations,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

Provide clarification for the flow rates required for makeup water individually and in aggregate for the essential service water system (ESWS) cooling towers, ensuring that the information provided is consistent with flow rates and water balances for the cooling water systems described in the Environmental Report. Explain whether the supply of makeup water to the ESWS cooling towers is continuous, intermittent, or periodic.

ANSWER:

During normal operation, Lake Granbury provides 31,200 gpm makeup to the circulating water system (CWS), and 274 gpm as makeup for the ESWS, for a total of 31,474 gpm per unit, plus 1100 gpm to the raw water storage tanks, or a total of 65,400 gpm for both units.

The above information is consistent with Environmental Report (ER) Subsection 3.4.1.3 in ER Update Tracking Report Revision 4, submitted via Luminant letter TXNB-09026 dated July 27, 2009.

The makeup flow to ESWS Cooling Towers is provided periodically based on the basin level. The flows are normally controlled with basin water levels by on/off operation of ESWS Cooling Tower basin makeup control valves, as explained in FSAR Subsection 9.2.5.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

Attachment 13

Response to Request for Additional Information No. 3672 (CP RAI #114)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3672 (CP RAI #114)

SRP SECTION: 02.04.12 – Groundwater

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 02.04.12-1

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.12, 'Groundwater,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

Provide a description of the process followed to determine the conceptual models subsequently used to establish subsurface site characteristics related to groundwater to ensure that the most conservative of plausible conceptual models have been identified.

ANSWER:

During the Hydrology Safety Site Visit, the NRC expressed interest in the process followed to determine the conceptual models subsequently used to establish subsurface site characteristics related to groundwater to ensure that the most conservative of plausible conceptual models have been identified. The conceptual site model discussion was identified in Information Needs HYDSV-17, HYDSV-18, HYDSV-19, HYDSV-21, HYDSV-23, HYDSV-24, HYDSV-29 and HYDSV-30. In response to these Information Needs the FSAR Subsections identified below were changed and are reflected in FSAR Update Tracking Report Revision 4, submitted via Luminant letter TXNB-09039, dated September 2, 2009 (ML092520125).

Horizontal Pathway Chosen

The plausible horizontal pathways are identified on new post-construction cross-section Figures 2.4.12-212 through 2.4.12-214. FSAR Subsections 2.4.12.3.1, 2.4.13.4 and 2.4.13.5 have been revised to clarify the conservativeness of the groundwater horizontal release pathways chosen.

Porosity Used in Liquid Effluent Release Analysis

FSAR Subsection 2.4.12.2.5.1 has been revised to describe the conservatism in the travel times chosen for the liquid effluent release analysis. The revised FSAR Subsection 2.4.12.2.5.1 provides a discussion of porosity values; the most conservative porosity value for the velocity and travel time analysis; and the basis for selecting the most conservative value. Revised FSAR Subsection 2.4.12.3.1

clarifies what porosity was conservatively used for the pathways identified. This also resolves ER RAI HYD-05 (2.3.1-5).

Affect of Precipitation Based Upon Post-Construction Configuration

Precipitation data was obtained for the period of interest from November 2006 through May 2008 and added to the CPNPP Units 3 and 4 groundwater elevation hydrographs. Due to an error in the CPNPP station's rainfall data, precipitation data from Opossum Hollow located approximately 3.4-mi southwest of CPNPP Units 3 and 4 was used. Water levels in the shallow A-zone wells (regolith/fill material) were the only wells that exhibited any type of seasonal response that loosely correlated with actual precipitation and was not recognized in all of the A-zone wells.

The vast majority of the regolith/fill material in the area of CPNPP Units 3 and 4 will be removed, minimizing the capacity for shallow groundwater retention. Any post construction precipitation at the site will form surface water runoff, and will be addressed by the site's grading and drainage plan. Post-construction infiltration of precipitation is expected to be limited to areas of engineered structural fill and will not be representative of permanent groundwater conditions. The design parameters of the engineered structural fill are expected to conform to the specific static and dynamic property requirements of the DCD. Consequently, since post-construction site conditions will minimize the capacity for shallow groundwater retention, hydroclimatic changes would have minimal effect.

FSAR Subsection 2.4.13.2 has been revised to include a discussion of rainfall infiltration based upon post-construction configuration and effect of rainfall infiltration on the source term transport analyses.

Information pertaining to revised hydrographs has been incorporated into FSAR Subsections 2.4.12.2.4 and FSAR Subsection 2.4.13.2 has been revised to include a discussion of rainfall infiltration based upon post-construction configuration and effect of rainfall infiltration on the source term transport analyses. This also resolves ER RAI HYD-06 (2.3.1-6, 10 CFR 51.70(b)).

Revised FSAR Subsections 2.4.13.2 and 2.4.13.3 clarify how construction activities affect precipitation infiltration, surface runoff, groundwater levels and flow paths. This also resolves ER RAI HYD-03 (2.3.1-3).

Post-Construction Configuration and Affect on Plausible Pathway Chosen

Revised FSAR Subsections 2.4.12.3.1, 2.4.13.2, 2.4.13.3, 2.4.13.4 and 2.4.13.5, Figure 2.4.12-212, and Cross Section Figures 2.4.12-213 and 2.4.12-214 clarify and show the impacts of construction-related alterations to the site for the plausible pathways identified. This also resolves ER RAI HYD-04 (2.3.1-4).

Vertical Pathway Elimination

Revised FSAR Subsection 2.4.13.4 clarifies how the vertical groundwater pathway was eliminated.

Conservatism of Horizontal Release Pathways Chosen

Revised FSAR Subsections 2.4.12.3.1, 2.4.13.2, 2.4.13.3, 2.4.13.4 and 2.4.13.5 clarify how the horizontal release pathways were chosen and why they are considerably conservative.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3672 (CP RAI #114)

SRP SECTION: 02.04.12 – Groundwater

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 02.04.12-2

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.12, 'Groundwater,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

The CPNPP Units 1 and 2 FSAR states that alterations related to construction increased groundwater levels onsite. In order to understand the effect of construction of Units 3 and 4 on the hydrologic characteristics of the subsurface, plausible groundwater pathways, and site groundwater levels, Luminant is requested to provide a detailed description of the location and extent of planned construction activities including: excavation of regolith/undifferentiated fill and bedrock, the placement of engineered fill and the addition of engineered features (such as drainage ditches, parking lots, roads, etc.). Additionally, please evaluate and discuss the impact of these changes on site hydrologic processes such as infiltration, surface runoff, groundwater levels, hydraulic gradients and flow paths.

ANSWER:

During the Hydrology Safety Site Visit, the NRC expressed interest in planned construction activities including: the planned removal of regolith/undifferentiated fill and bedrock, the planned placement of engineered fill, the addition of engineered features (such as drainage ditches, parking lots, roads, etc.) and the impact these will have on hydrologic processes such as infiltration, surface runoff, groundwater levels, hydraulic gradients and flow paths. This was identified as Information Needs HYDSV-19, HYDSV-20 and HYDSV-21, and HYDSV-23. In response to these Information Needs the FSAR Subsections identified below were changed and are reflected in FSAR Update Tracking Report Revision 4, submitted via Luminant letter TXNB-09039 dated September 2, 2009 (ML092520125).

FSAR Subsections 2.4.13.2 and 2.4.13.3 were revised to clarify how construction activities affect precipitation infiltration, surface runoff, groundwater levels and flow paths. This revision also resolved ER RAI HYD-03 (2.3.1-3).

Information pertaining to revised hydrographs was incorporated into FSAR Subsections 2.4.12.2.4 and 2.4.13.3. This resolved ER RAI HYD-06 (2.3.1-6). FSAR Subsection 2.4.13.2 was revised to include a discussion of rainfall infiltration based upon post-construction configuration and effect of rainfall infiltration on the source term transport analyses.

FSAR Subsections 2.4.12.3.1, 2.4.13.2, 2.4.13.3, 2.4.13.4 and 2.4.13.5, Figure 2.4.12-212, Cross Section Figures 2.4.12-213 and 2.4.12-214 were revised to clarify and show the impacts of construction-related alterations to the site for the plausible pathways identified. This revision also resolved ER RAI HYD-04 (2.3.1-4).

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3672 (CP RAI #114)

SRP SECTION: 02.04.12 – Groundwater

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 02.04.12-3

In accordance with 10 CFR 52.79(a) provide illustrations of cross-sections through the centerline of each proposed reactor area which present the post-construction site configuration, hydro geological units beneath the site (including the Twin Mountains Formation and bedrock transition zone found in the Glen Rose), monitoring wells and borings used as control points and probable directions of groundwater movement. Also provide maps displaying post-construction site features and conceptualize post-construction groundwater conditions.

ANSWER:

During the Hydrology Safety Site Visit, the NRC expressed interest in the post-construction groundwater system and this item was identified as Information Needs HYDSV-21. In response to HYDSV-21, the following changes were made and are reflected in FSAR Update Tracking Report Revision 4, submitted via Luminant letter TXNB-09039, dated September 2, 2009 (ML092520125).

The vast majority of the regolith/fill material in the area of CPNPP Units 3 and 4 will be removed, minimizing the capacity for shallow groundwater retention. Any post construction precipitation at the site will form surface water runoff and will be addressed by the site's grading and drainage plan. Post-construction infiltration of precipitation is expected to be limited to areas of engineered structural fill and will not be representative of permanent groundwater conditions. The design parameters of the engineered structural fill will conform to the specific static and dynamic property requirements of the DCD. Consequently, hydroclimatic changes would have minimal effect because post-construction site conditions will minimize the capacity for shallow groundwater retention.

FSAR Subsection 2.4.13.2 was revised to include a discussion of rainfall infiltration based upon post-construction configuration and effect of rainfall infiltration on the source term transport analyses.

FSAR Subsections 2.4.12.3.1, 2.4.13.2, 2.4.13.3, 2.4.13.4 and 2.4.13.5, Figure 2.4.12-212, and Cross Section Figures 2.4.12-213 and 2.4.12-214 were revised to clarify and show the impacts of construction-related alterations to the site for the plausible pathways identified and were used in development of the conceptual site model.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3672 (CP RAI #114)

SRP SECTION: 02.04.12 – Groundwater

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 02.04.12-4

NUREG-0800, Standard Review Plan (SRP), Chapter 2.4.12, 'Groundwater,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

In order to understand impacts of seasonality and climatic fluctuations on aquifers beneath and in the vicinity of the site, Luminant is requested to provide the following information:

a. Explain or discuss any trends or fluctuations in data from onsite monitoring wells, which will be displayed on the revised hydrographs submitted as part of Luminant's response to Environmental RAI HYD-06.

b. Correlate data from onsite monitoring wells to monitoring data from area wells with longer records, and provide a discussion of any apparent seasonal and climatic trends and aquifer response to historic precipitation conditions.

c. Identify current precipitation conditions at the site (i.e., wet, normal or drought conditions) and evaluate and discuss the effect that long-term wet and dry periods will have on the post-construction groundwater conditions and compliance with the design criteria maximum groundwater level.

ANSWER:

a. During the Hydrology Safety Site Visit, the NRC expressed interest in the hydrographs constructed showing groundwater levels in wells screened onsite and in the data, at a scale adequate to display variations or trends, collected through May 2008. Correlating the onsite monitoring well data to area wells, seasonal and climatic trends with aquifer response based on historic precipitation data, and precipitation on groundwater level and fluctuations were identified as Information Needs HYDSV-20, HYDSV-21 and HYDSV-22.

In October 2006, a groundwater investigation was initiated as part of the subsurface study to evaluate hydrogeologic conditions at CPNPP Units 3 and 4. As part of this groundwater investigation, 47 monitoring wells were installed at 20 locations within the shallow regolith and Glen Rose Formation onsite. Due to the variable nature of groundwater reported at the CPNPP site, the well clusters were installed across the footprint of CPNPP Units 3 and 4 from west to east of the reactor areas to define the groundwater bearing capabilities and properties of the zones likely to be affected, and to identify the hydraulic connectivity between the zones, if any. Monitoring wells were designated as follows, where X denotes the well or cluster number for the three zones:

A-zone wells: Regolith or undifferentiated fill monitoring wells (MW-12XXa) were installed if greater than 10 ft of soil was encountered above hollow-stem auger refusal.

B-zone wells: Shallow bedrock monitoring wells (MW-12XXb) were generally completed in the upper 40 to 65 ft of bedrock in an apparent zone of alternating stratigraphy; i.e., claystone, mudstone, limestone, and shale sequences.

C-zone wells: Bedrock monitoring wells (MW-12XXc) were generally completed in deeper bedrock zones consisting of alternating stratigraphy and competent bedrock.

Following well development, water levels were measured from November 2006 to May 2008 to characterize seasonal trends in groundwater levels. The hydrographs (Figure 2.4.12-209) have been revised to show precipitation data. The groundwater elevation data is presented by well/cluster location and includes approximate screen elevations for each well in the cluster. In addition, the hydrographs depict rainfall totals for the period of interest. Rainfall data presented was collected from the Opossum Hollow rain gauge located approximately 3.4-mi southwest of the CPNPP Unit 3 and 4 site. Overall, the hydrographs show that water levels in the deeper Glen Rose Formation (C-zone) do not fluctuate and remain at a constant level near the base of the well or depict a steadily increasing water level, indicating that this water is not actual groundwater. Hydrographs from the shallow bedrock wells (B-zone) show a slow and steady increase of water levels over time with little to no fluctuations, also suggesting water levels are related to infiltration from the overlying soils and not actual groundwater. Hydrographs from the regolith/fill material wells (A-zone) indicate some slight fluctuations that may be tied to seasonal rainfall. In some of the A-zone wells there appears to be a slight increase in water levels that may correspond to the spring seasons but there is no significant correlation in the A-zone wells across the site in response to rainfall.

The water levels in the regolith/fill material and the upper zone of the Glen Rose Formation (A-zone and B-zone, respectively) were attributed to surface run-off and were not a true measure of permanent groundwater in the formation.

Water Levels and Potentiometric Elevations in the Regolith (A – Zone)

Groundwater steadily increased from December 2006 to July 2007. Water levels remained constant or decreased slightly from August 2007 to February 2008.

Water Levels and Potentiometric Elevations in the Shallow Bedrock (B – Zone)

Nine of the 16 wells completed in this zone contained no, or negligible, amounts of water for up to eight months before exhibiting measurable water (greater than 1 ft). The majority of these wells exhibited a slow to steady recharge with no indication of reliable equilibrium conditions over the monitoring period.

Six monitoring wells screened in shallow bedrock exhibited no, or slight, changes in water level over the monitoring period. One of these wells (MW-1211b) was installed on the northeast portion of CPNPP Units 3 and 4 in the undifferentiated fill material. During installation, an effort was made to install this well in bedrock; however, due to the thickness and nature of the undifferentiated fill material, the boring was terminated at the bedrock surface (approximately 75 ft below ground surface [bgs]). Water level measurements for this well were consistent with those of regolith monitoring well MW-1211a and the normal pool elevation of SCR over the monitoring period.

One monitoring well screened in the shallow bedrock exhibited variable water levels with no indication of reliable equilibrium conditions when compared to other wells with similar screened zones. Monitoring well MW-1217b, located near the center point of CPNPP Unit 3 exhibited an approximate 15 ft increase in water level from December 2006 to March 2007 followed by a decline of 5 ft through May 2007. From May 2007 to January 2008, this well exhibited a water level increase of approximately 7 ft, and from January 2008 to May 2008, exhibited a water level decrease of approximately 7ft.

Water Levels and Potentiometric Elevations in the Bedrock Monitoring Wells (C- Zone)

Of the 13 groundwater monitoring wells screened in bedrock, eight contained no, or negligible, amounts of water over the monitoring period and six exhibited a slow to steady recharge with no indication of reliable equilibrium conditions.

The requested information was incorporated into FSAR Subsections 2.4.12.2.4 and 2.4.13.3 and also resolved ER RAI HYD-06 (2.3.1-6).

b. During the Safety Site Visit, the NRC expressed interest in how groundwater levels and flow directions determined from onsite wells compare to those determined from regional wells in the vicinity of the site. This was identified as Information Need HYDSV-22 and was closed during the site visit.

As discussed in at the July 2009 Hydrology Safety Site Visit, investigation wells completed for CPNPP Units 3 and 4 were completed in the regolith/undifferentiated fill material only. There is no relationship between the on-site water levels in the Glen Rose Formation wells and the off-site wells. The first aquifer beneath the site is in the Twin Mountains Formation that lies below the Glen Rose Formation.

Beneath the site the Glen Rose Formation is not considered an aquifer. Groundwater gauged within the Glen Rose Formation at CPNPP is considered perched or negligible. Groundwater wells completed in the Glen Rose Formation off-site are recharged by the overlying Paluxy formation which is also absent beneath the CPNPP site. The Paluxy formation is a recharge zone to the Glen Rose, when present; hence, there is no recharge below the CPNPP to the Glen Rose Formation, only surface water infiltration. There is no evidence of hydrologic connection between the Glen Rose and the Twin Mountains Formation.

c. During the Safety Site Visit, the NRC expressed interest in the precipitation conditions at the site (i.e., wet, normal or drought conditions) during the reported monitoring of groundwater levels and the effect that a change in hydroclimatic conditions will have on the post-construction groundwater system. The information was identified as Information Needs HYDSV-21.

Precipitation data was obtained for the period of interest from November 2006 through May 2008 and added to the Units 3 and 4 groundwater elevation hydrographs. Due to an error in the CPNPP station's rainfall data, precipitation data from Opossum Hollow located approximately 3.4-mi southwest of CPNPP Units 3 and 4 was used. Water levels in the shallow A-zone wells (regolith/fill material) were the only wells that exhibited any type of seasonal response that loosely correlated with actual precipitation and was not recognized in all of the A-zone wells.

The vast majority of the regolith/fill material in the area of CPNPP Units 3 and 4 will be removed, minimizing the capacity for shallow groundwater retention. Any post construction precipitation at the site will form surface water runoff, and will be addressed by the site's grading and drainage plan. Post-construction infiltration of precipitation is expected to be limited to areas of engineered structural fill and will not be representative of permanent groundwater conditions. The design parameters of the engineered structural fill are expected to conform to the specific static and dynamic property requirements of the DCD. Consequently, since post-construction site conditions will minimize the capacity for shallow groundwater retention, hydroclimatic changes would have minimal effect.

FSAR Subsection 2.4.13.2 has been revised to include a discussion of rainfall infiltration based upon post-construction configuration and effect of rainfall infiltration on the source term transport analyses.

These changes are reflected in FSAR Update Tracking Report Revision 4, submitted via Luminant letter TXNB-09039, dated September 2, 2009 (ML092520125).

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3672 (CP RAI #114)

SRP SECTION: 02.04.12 – Groundwater

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 02.04.12-5

The four groundwater flow paths and related travel time scenarios presented in FSAR Section 2.4.12.3 are based on current site conditions. To demonstrate compliance with 10 CFR 100.20(c), which requires consideration of site characteristics which may affect flow and transport, please evaluate the applicability of these flowpaths in a post-construction setting and provide a revised description of the most conservative, plausible post-construction flowpaths, if needed.

ANSWER:

During the Hydrology Site Safety Visit, the NRC expressed interest in the four groundwater flow path and travel time scenarios and the effect of construction-related alterations to the site on the path and travel time. This information was identified as Information Need HYDSV-23. In response to HYDSV-23 the following changes were made and are reflected in FSAR Update Tracking Report Revision 4, submitted via Luminant letter TXNB-09039, dated September 2, 2009 (ML092520125).

FSAR Subsections 2.4.12.3.1, 2.4.13.2, 2.4.13.3, 2.4.13.4 and 2.4.13.5, and Figure 2.4.12-212 were revised, and Figures 2.4.12-213 and 2.4.12-214 were added, to clarify and show the impacts of construction-related alterations to the site for the conservative plausible pathways and release points identified. Figures 2.4.12-213 and 2.4.12-214 provide cross-sectional depictions of the post-construction release flow pathways. This information also resolved ER RAI HYD-04 (2.3.1-4).

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3672 (CP RAI #114)

SRP SECTION: 02.04.12 – Groundwater

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 02.04.12-6

To satisfy 10 CFR 100.20(c) as it relates to evaluating site characteristics important to hydrology, explain how the parameters selected for travel time calculations conservatively represent parameters which may be expected along post-construction flowpaths. Specifically:

a. Present the range of effective porosities in hydrologic units along potential flowpaths including engineered fill, and describe why lower measured values presented in Chapter 2.5 of the FSAR were not used.

b. Discuss how averaging of literature values for the effective porosity of the regolith and bedrock (from Reference 2.4-261 of the FSAR), and the use of total porosity in the undifferentiated fill demonstrate conservatism, and

c. Explain the rationale behind the use of hydraulic conductivity values which are less than the highest values determined through onsite aquifer testing.

ANSWER:

a. During the Hydrology Safety Site Visit, the NRC expressed interest in the range of effective porosities in the regolith/undifferentiated fill and underlying bedrock and on how porosity values used in the travel time calculations demonstrate conservatism. This was identified as Information Need HYDSV-24.

In response to HYDSV-24, FSAR Subsection 2.4.12.2.5.1 was revised to discuss how the porosities used in calculating the travel times were the most conservative. Revised Subsection 2.4.12.3.1 clarifies what porosity was conservatively used for the pathways identified. This information also resolved ER RAI HYD-05 (2.3.1-5).

b. During a discussion at the July 2009 Hydrology Safety Site Visit, NRC staff expressed interest in how averaging of literature values for the effective porosity of the regolith and bedrock (from Reference 2.4-261 of the FSAR), and the use of total porosity in the undifferentiated fill demonstrate conservatism. This was identified as Information Need HYDSV-18.

FSAR Subsection 2.4.12.2.5.1 was revised to describe the conservative approach of using the average porosity for the limestone at the Units 3 and 4 site of 11.9 percent as opposed to the average total porosity for the shallow bedrock of 25.6 percent as measured at the CPNPP Units 3 and 4 site.

c. During the Hydrology Safety Site Visit, the NRC expressed interest in all site-specific hydraulic conductivity values from slug tests, packer tests, pumping tests, and any other relevant hydraulic testing conducted and on how the values selected for the travel time calculation demonstrate conservatism. This was identified as Information Need HYDSV-18.

In response to HYDSV-18, FSAR Subsection 2.4.12.3.1 was revised to describe the conservatism in the travel times chosen for the liquid effluent release analysis. Revised FSAR Subsection 2.4.12.2.5.1 further demonstrates why the porosities chosen were conservative.

These changes are reflected in FSAR Update Tracking Report Revision 4, submitted via Luminant letter TXNB-09039, dated September 2, 2009 (ML092520125).

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak Units 3 and 4

Luminant Generation Company LLC

Docket No. 52-034 and 52-035

RAI NO.: 3672 (CP RAI #114)

SRP SECTION: 02.04.12 – Groundwater

QUESTIONS for Hydrologic Engineering Branch (RHEB)

DATE OF RAI ISSUE: 10/2/2009

QUESTION NO.: 02.04.12-7

Section 2.4.12.2.5 of the Update Tracking Report, Rev. 0, dated April 2, 2009, 'Technical Correction Version' of the FSAR dated March 31, 2009 states that the undifferentiated fill, regolith and the shallow Glen Rose Formation which generally coincide with monitoring well zones "a" and "b", will be removed during construction in the power block area. Despite this excavation, it appears that groundwater bearing portions of these formations with water levels, inferred to be above the design maximum groundwater level (on Figures 2.4.12-210 of the FSAR), will be left in place after construction. In accordance with 10 CFR 100.21(d) demonstrate that the maximum operational groundwater level will comply with the design maximum groundwater level.

ANSWER:

During the Safety Site Visit, the NRC expressed interest in the hydrographs constructed showing groundwater levels in wells screened onsite and on the data collected through May 2008 taken at a scale adequate to display variations or trends. The precipitation conditions at the site (i.e., wet, normal or drought conditions) during the reported monitoring of groundwater levels and the effect that a change in hydroclimatic conditions will have on the post-construction groundwater system. This was identified as Information Needs HYDSV-20 and HYDSV-21.

See the response to Question 02.04.12-4 above for a complete discussion on the hydrograph showing groundwater level fluctuations. The information has been incorporated into FSAR Subsections 2.4.12.2.4 and 2.4.13.3. This also resolves ER RAI HYD-06 (2.3.1-6). FSAR Subsection 2.4.13.2 was revised to include a discussion of rainfall infiltration based upon post-construction configuration and the effect of rainfall infiltration on the source term transport analyses.

Precipitation data was obtained for the period of interest from November 2006 through May 2008 and added to the Units 3 and 4 groundwater elevation hydrographs. Due to an error in the CPNPP station's rainfall data, precipitation data from Opossum Hollow located approximately 3.4-mi southwest of CPNPP Units 3 and 4 was used. Water levels in the shallow A-zone wells (regolith/fill material) were the only wells that exhibited any type of seasonal response that loosely correlated with actual precipitation and was not recognized in all of the A-zone wells.

The vast majority of the regolith/fill material in the area of CPNPP Units 3 and 4 will be removed, minimizing the capacity for shallow groundwater retention. Any post construction precipitation at the site will form surface water runoff, and will be addressed by the site's grading and drainage plan. Post-construction infiltration of precipitation is expected to be limited to areas of engineered structural fill and will not be representative of permanent groundwater conditions. The design parameters of the engineered structural fill will conform to the specific static and dynamic property requirements of the DCD. Consequently, since post-construction site conditions will minimize the capacity for shallow groundwater retention, hydroclimatic changes would have minimal effect.

FSAR Subsection 2.4.13.2 was revised to include a discussion of rainfall infiltration based upon post-construction configuration and effect of rainfall infiltration on the source term transport analyses.

These changes are reflected in FSAR Update Tracking Report Revision 4, submitted via Luminant letter TXNB-09039 dated September 2, 2009 (ML092520125).

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

Attachment 14

Electronic Attachment (on CD)

Calculation TXUT-001-FSAR-2.4.3-CALC-012, Revision 1