SUPPLEMENTAL 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.: 4314 (CP RAI #147)

SRP SECTION: 02.04.12 – GROUNDWATER

QUESTIONS FOR HYDROLOGIC ENGINEERING BRANCH (RHEB)

DATE OF RAI ISSUE: 2/26/2010

QUESTION NO.: 02.04.12-08 S02

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.

By letter dated October 2, 2009, the NRC staff issued RAI ID 3672 (RAI No. 114) Question Number 14266 (02.04.12-1), in which the NRC staff asked, "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."

The applicant responded in document CP-200901564-Log No TXNB-09067-(ML093230704) executed on November 13, 2009. The NRC staff has reviewed the response and has determined that additional information is needed in order to complete its review.

The staff determined that an adequate description of the processes used to develop conservative conceptual models used subsequently in the accidental release evaluations was not sufficiently provided in the RAI response. The information provided in the response has numerous assumptions and lacked adequate conceptual description, data, and analyses to characterize the site alterations and how these alterations affect the hydrologic processes at the site. For example, it is assumed that there will not be any shallow groundwater at the site after construction is completed because the A and B zones will be entirely removed and the surface water drainage system will be designed to prevent subsurface infiltration.

Also, the NRC staff disagrees with a statement, which was made intermittently throughout the RAI responses and the combined license application, Revision 1 Part 2 FSAR, that groundwater within the Glen Rose Formation is "not real groundwater". This statement is unsupported since on the basis of data presented, the NRC staff asserts that the Glen Rose Formation is indeed a groundwater bearing perched aquifer.

In order to make its safety determination based on adequate characterization of the site, the NRC staff requests that the applicant provide the information below. The responses should follow

guidance related to the analysis of groundwater related hazards through compliance with this and the accompanying RAIs.

1. Provide adequate conceptual and site specific information on how the surface water and groundwater flow system is expected to change after Comanche Peak Nuclear Power Plant, Units 3 and 4 are constructed.

2. Provide an adequate site conceptual model supported by data, analyses and construction design information to support the conclusions presented.

This is supplemental RAI 2.4.12-00-S.

SUPPLEMENTAL INFORMATION:

Luminant supplemented the response to this question on August 29, 2011 (ML11242A146) stating:

> This supplemental information is provided to address NRC Hydrologic Open Item 2.4.12-1 from the audit conducted June 7-9, 2011. This supplemental information expands the original response to Question 2.4.12-8 as a result of discussions during the audit.
>
> FSAR Subsections 2.4.12.2.4, 2.4.12.2.5.2, 2.4.12.3, and 2.4.12.5 were revised to provide a clearer picture of the post-construction site conceptual groundwater model and alternate groundwater pathways.

Since that date, Luminant has constructed and analyzed numerical groundwater models for the CPNPP site, including a projection of post-construction groundwater elevations and groundwater pathways to Squaw Creek Reservoir and the Twin Mountains Formation aquifer. The groundwater models and pathway analysis are presented and discussed in the supplemental responses to Questions 02.04.12-09, 02.04.12-11, 02.04.12-12, and 02.04.12-17 below. The previous responses to this question remain valid to the extent that they are not superseded by the supplemental information attached to this letter.

Impact on R-COLA

None.

Impact on S-COLA

None; this supplemental response is site-specific.

Impact on DCD

None.

SUPPLEMENTAL 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.: 4314 (CP RAI #147)

SRP SECTION: 02.04.12 – GROUNDWATER

QUESTIONS FOR HYDROLOGIC ENGINEERING BRANCH (RHEB)

DATE OF RAI ISSUE: 2/26/2010

QUESTION NO.: 02.04.12-09 S04

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

By letter dated October 2, 2009, the NRC staff issued RAI ID 3672 (RAI No. 114) Question Number 14267 (02.04.12-2), in which the NRC staff asked "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."

The applicant responded in document CP-200901564-Log No TXNB-09067-(ML093230704) executed on November 13, 2009. The NRC staff has reviewed the response and has determined that additional information is needed in order to complete its review.

The staff acknowledges that the additional information provided in the response partially satisfies the information need with regard to the post-construction site conditions. However, the information provided did not incorporate adequate 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, subsurface drains, parking lots, roads, etc.)

The NRC staff provides the following examples that demonstrate some of the inadequacies in the description and level of details provided within the response.

1. The applicant stated that there will not be any shallow groundwater at the site after

construction is completed because the A and B zones will be removed and the surface water drainage system will be designed to prevent subsurface infiltration and preclude buildup near plant foundations. However, these statements are not sufficient to illustrate that the system will function as designed and to establish a maximum operational groundwater level and ensure compliance with the US-APWR design parameter groundwater level. In fact, Section 2.4.13 of the FSAR for Units 1 and 2 states that construction activities actually created areas where water levels were elevated due the placement of permeable fill materials. The data and evaluations presented are not adequate and of sufficient detail to show that this will not occur at the Units 3 and 4 site. For example, Figures 2.4.12-213 and 2.4.12-214 show new fill around many of the new structures but it is not clear how and if this new fill will be drained and what post-construction groundwater and surface water conditions (flow and levels) will be like.

2. The water level hydrographs from B-zone monitoring wells MW1201b (middle of Unit 4) and MW1207b (just north of Unit 3) have water level elevations of over 830 ft. The screened interval for these wells extends to elevations of 808 ft and 803 ft, respectively, which is well below the 822 ft site grade. This suggests that at least some portion of the water bearing B-zone could remain after the site grading is completed. The applicant has stated that it will all be removed.

In order to make its safety determination based on adequate characterization of the site that depicts the post-construction scenario adequately, the NRC staff requests that the applicant provide the following information.

1) A qualitative description of the construction related impacts that could affect site hydrology including maps at a legible scale, sufficiently detailed engineering design information on drainage systems and a description of conservative measurements or estimates of hydrologic parameters. This information should be of sufficient detail to support an analysis of the impact of site modifications on site hydrologic processes such as infiltration, surface runoff, groundwater levels, hydraulic gradients and flow paths.

2) A conservative quantitative analysis that demonstrates that the estimated maximum operational groundwater level complies with the US-APWR Design Certification Document.

This is supplemental RAI 2.4.12-01-S.

SUPPLEMENTAL INFORMATION:

Luminant provided an initial response (02.04.12-09) to this question on August 26, 2010 (ML102440679).

In response to discussions with the staff during the NRC Hydrology Audit conducted June 7-9, 2011, Luminant supplemented the response (02.04.12-09 S01) to this question on July 14, 2011 (ML11199A011) to assess and confirm the site was not susceptible to seismically induced increases in groundwater levels.

Also in response to discussions with the staff during the NRC Hydrology Audit conducted June 7-9, 2011, Luminant supplemented the response (02.04.12-09 S02) to this question on August 29, 2011 (ML11242A146) due to changes in the site grading and drainage plan and additional discussions with the staff. This supplemental response superseded portions of the original August 26, 2010 response and added additional evaluations of theorized drainage and groundwater pathways from the engineered fill, as well as provided additional details on areas of above ground engineered fill placements.

Luminant supplemented the response (02.04.12-09 S03; not numbered on the response) to this question on November 28, 2011 (ML11334A029) providing the white paper, "Estimation of Conservative Bounding Fill and Infiltration Cap Properties and Determination of Above Grade Fill Extents," dated November 2011. This white paper was included as an attachment to the supplemental response (ML11335A056).

Based on subsequent discussion with the staff, the white paper has been revised, converted to a project report, and is included as Enclosure 1.

In addition, since the August 29, 2011 and November 28, 2011 letters, the applicant has constructed and analyzed numerical MODFLOW-based groundwater models to assess the post-construction maximum groundwater elevation and groundwater pathways, presented in Calculation TXUT-001-FSAR-2.4.12-CALC038, Revision 4 (Enclosure 2) and Calculation TXUT-001-FSAR-2.4.12-CALC039, Revision 40 (Enclosure 3).

The discussion contained within this response supersedes the responses to Question 02.04.12-9 provided in both the original response (02.04.12-09, August 26, 2010, ML102440629), the second supplemental response (02.04.12-09 S02, August 29, 2011, ML11242A146), and the third supplemental response (02.04.12-09 S03, November 28, 2011, ML11334A029 and ML11335A056)

Maximum Groundwater Elevation Analysis

This assessment examined the maximum groundwater elevation under an extreme climatic event, which is statistically highly unlikely to occur. For this calculation, the Probable Maximum Precipitation Event was used to represent the extreme climatic event, with infiltration to the subsurface based on the amount of precipitation received during that event. The effects of recharge from the theoretical maximum precipitation event in this model resulted in groundwater elevations of approximately 795 ft msl in areas outside of the essential service water pipe tunnels (ESWPTs), adjacent to the essential service water pipe chase (ESWPC), and surrounding the Turbine Building Complex (T/B Complex), power source fuel storage vaults (PSFSV), and the ultimate heat sink related structures (UHSRS). The engineered fill on the interior portion of the ESWPTs adjacent to the Reactor Building Complex is assumed to be a closed basin with a minimum overtopping elevation of 804 ft msl. The ESWPTs will isolate the interior area from the outer subsurface, providing a barrier to subsurface groundwater flow. Therefore, the groundwater level in the fill within the ESWPTs is assumed to reach a maximum of 804 ft msl before overflowing to the exterior fill (maximum groundwater elevation at 795 ft msl). Both elevations are below the DCD criterion elevation of 821 ft msl within the power block area.

Groundwater Pathway Analysis

Groundwater movement in the horizontal and vertical directions from the boric acid tanks (BATs), located in the CPNPP Units 3 and 4 auxiliary buildings was assessed in the calculation to identify the limiting horizontal groundwater pathway and travel time to Squaw Creek Reservoir (SCR), as well as the vertical travel time from the base of the excavations (BAT elevation) to the Twin Mountains Formation aquifer. Based on the site geotechnical evaluation (Section 2.5), the vertical pathway from each unit is essentially identical (hydrogeologic properties and distance to underlying formations); therefore, the evaluation of vertical migration beneath each unit is considered to be identical.

Multiple pathways for the horizontal movement of groundwater particles were identified in the model. The two shortest pathways were identified as having nearly the same travel distance; however, the key pathway of interest has the fastest travel time at Unit 3 and only a slightly greater pathway distance than the next shorter pathway. This pathway extends west from the BATs, moving through engineered fill on the west and then north side of the unit, between the ultimate heat sink (UHS) basins, and then exiting to SCR northeast of the unit. The pathway is calculated to be 1,194 feet in length with a particle travel time of 62 days. It should be noted that due to the

assumed high groundwater level in the fill used for pathway modeling (821 ft msl at the BAT locations), the closed basin effect of the ESWPTs does not occur and the pathway travels unimpeded through the subsurface materials from the BAT to SCR.

The vertical pathway is calculated to be 186 feet long with a travel time of 8,115 days. The pathway begins at the base of the excavation adjacent to the BATs and extends through the bedrock of the Glen Rose Formation to the top of the underlying Twin Mountains Formation.

A revised discussion of the horizontal and vertical pathways assessed is provided in FSAR Subsection 2.4.12.3.1.

Enclosures (on CD)

1. Project Report TXUT-001-PR-020, Revision 0, "Estimation of Conservative Bounding Fill and Infiltration Cap Properties and Determination of Above Grade Fill Extents," dated March 15, 2013.

2. Calculation TXUT-001-FSAR-2.4.12-CALC038, Revision 2, “Evaluation of Maximum Post-Construction Groundwater Level”

3. Calculation TXUT-001-FSAR-2.4.12-CALC039, Revision 2, “Calculation of Horizontal and Vertical Pathways”

Impact on R-COLA

See attached marked-up FSAR Revision 3 pages 2-lxii, 2-lxvi, 2-lxviii, 2.0-10, 2.4-83, 2.4-84, 2.4-85, 2.4-86, 2.4-87, 2.4-88, 2.4-89, 2.4-90, 2.4-91, 2.4-92, 2.4-93, 2.4-94, 2.4-95, 2.4-96. 2.4-97, 2.4-98, 2.4-99, 2.4-246, 2.4-247, 2.4-248, 2.4-249, 2.4-263, 2.4-264, Figures 2.4.12-212, 2.4.12-213, 2.4.12-214, 2.4.12-215, 2.4.12-216 and new Figures 2.4.12-217, 2.4.12-218, 2.4.12-219, and 2.4.12-220.

See attached marked-up ER Revision 3 pages 2.3-38, 2.3-39, 2.3-40, 2.3-41, 2.3-42, 2.3-43, 2.3-44, 2.3-45, 2.3-146, 2.3-147 and 7.2-4.

Impact on S-COLA

None; this supplemental response is site-specific.

Impact on DCD

None.

SUPPLEMENTAL 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.: 4314 (CP RAI #147)

SRP SECTION: 02.04.12 – GROUNDWATER

QUESTIONS FOR HYDROLOGIC ENGINEERING BRANCH (RHEB)

DATE OF RAI ISSUE: 2/26/2010

QUESTION NO.: 02.04.12-10 S01

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.

By letter dated October 2, 2009, the NRC staff issued RAI ID 3672 (RAI No. 114), Question Number 14268 (02.04.12-3), in which the NRC staff asked "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, hydrogeological 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."

The applicant responded in document CP-200901564-Log No TXNB-09067-(ML093230704) executed on November 13, 2009. The NRC staff has reviewed the response and has determined that additional information is needed in order to complete its review.

The staff acknowledges that cross-sections were included in the applicant's response as Figures 2.4.12- 213 and 2.4.12-214 and Figures 2.5.4-209 through 211. While these cross-sections contain useful and related information they do not satisfy the intent of the original RAI, which was to illustrate the post construction conceptual site configuration by incorporating description of conceptual hydrologic conditions (such as groundwater levels, flow directions, etc.) and site hydrogeology with associated well or boring control points through the Twin Mountains Formation on one set of cross-sections.

Information provided in the cross-sections does not clearly show the anticipated surface and groundwater conditions. The flowpaths presented in these cross-sections are simple straight lines with little documentation or maps to support the selection of these specific pathways as the most probable result of post-construction conditions. The interaction between surface water and

groundwater is important and there are insufficient details on expected interactions post-construction.

In order to make its safety determination based on adequate characterization of the site, the NRC staff requests that the applicant provide cross-sections through the centerline of each proposed reactor area which present on the same figure the post-construction site configuration, hydrogeological 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.

This is supplemental RAI 2.4.12-02-S.

SUPPLEMENTAL INFORMATION:

Luminant responded on August 26, 2010 (ML102440679) and the question was considered resolved and closed as a result of the submitted information.

Since that date, Luminant has revised the site layout, grading and drainage and excavation. Therefore, the maps and cross sections provided previously have been updated to include the most recent site data.

Reference

Grading and Drainage Plan, Drawing CVL-12-11-101, Rev I.

Enclosures (on CD)

Figure 1-1 Cross Section Location Map

Figure 1-2 Cross-Section A-A'

Figure 1-3 Cross-Section B-B'

Figure 1-4 Cross-Section C-C'

Impact on R-COLA

None.

Impact on S-COLA

None; this supplemental response is site-specific.

Impact on DCD

None.

SUPPLEMENTAL 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.: 4314 (CP RAI #147)

SRP SECTION: 02.04.12 – GROUNDWATER

QUESTIONS FOR HYDROLOGIC ENGINEERING BRANCH (RHEB)

DATE OF RAI ISSUE: 2/26/2010

QUESTION NO.: 02.04.12-11 S01

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.

By letter dated October 2, 2009, the NRC staff issued RAI ID 3672 (RAI No. 114), Question Number 14269 (02.04.12-4), in which the NRC staff asked "In order to understand impacts of seasonality and climatic fluctuations on aquifers beneath and in the vicinity of the site, the Applicant 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 the Applicant'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; and (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."

The applicant responded in document CP-200901564-Log No TXNB-09067-(ML093230704) executed on November 13, 2009. The NRC staff has reviewed the response and has determined that additional information is needed in order to complete its review.

The staff determined that the applicant's response does not adequately address parts (b) and (c) of the RAI. As presented in the RAI response to part (b), it was determined during the site audit that due to the location of Squaw Creek Reservoir to the north, east and south-east of the site, data from offsite wells within the Glen Rose Formation would not likely be helpful in confirming flow directions in the vicinity of the site. However, an evaluation of groundwater level trends in any nearby offsite wells which may exist is still needed to better understand the response of the aquifer to long-term hydro-climatic stresses such as changes in precipitation and evapotranspiration.

In response to part (c) the applicant asserted that long term climatic changes would have minimal effect due to the limited number of wells exhibiting seasonal and long-term fluctuations and the

planned removal of a large portion of the Glen Rose Formation. The staff agrees that aquifer response to precipitation may not be seen in all wells in the Glen Rose Formation. However, fluctuations of several feet are observed in several wells. The staff also understands that a large portion of the Glen Rose Formation near the site will be removed. However, the extent of this removal is not clear to the staff and it appears that after removal, water-bearing portions of the Glen Rose Formation may be left intact in the vicinity of the site.

In order to make its safety determination based on adequate characterization of the site and description of the hydrologic causal mechanisms that govern groundwater flow processes at the site, the NRC staff requests that the applicant provide the following information.

1) Discussion on long-term groundwater trends based on data from nearby wells with longer periods of monitoring

2) Description of how current precipitation conditions relate to normal or extreme precipitation conditions (wet, normal, and dry).

3) Description of impacts of groundwater level fluctuations due to changes in precipitation conditions on the maximum operational groundwater level determined in response to RAI 2.4.12-01-S.

This is supplemental RAI 2.4.12-03-S-a.

SUPPLEMENTAL INFORMATION:

Luminant responded on August 26, 2010 (ML102440679) stating:

1) Longer periods of data do not exist from regional Glen Rose Formation wells. Wells with longer periods of monitoring are in a distinctly different groundwater regime (overlain by the Paluxy) and are not correlatable for comparison to groundwater conditions at the CPNPP site. Groundwater levels are prevented from exceeding DCD limits by the grading plan and post-construction site modifications.

2) During the monitoring period (2006-2008), the area was considered to be near normal to wet according to the NOAA Historic Palmer Drought Indices. The area has remained near normal precipitation with the occasional, normal summer moderate drought conditions. Table 1 summarizes the NOAA data.

3) The only wells that show any effect due to precipitation are the groundwater A-zone wells, which will be entirely removed within the plant area. In addition, the maximum groundwater accumulation within the underlying formations will be controlled by the post-construction grading plan (see response to Question 02.04.12-9 above).

No additional Glen Rose Formation wells were found with longer periods of monitoring; however, additional groundwater gauging was conducted for the onsite monitoring wells between August 2012 and December 2012. The results of the 2012 monitoring events are included in the supplemental response to Question 02.04.12-12 below.

Since that date, Luminant has constructed and analyzed numerical groundwater models for the CPNPP site, including a projection of post-construction groundwater elevations and groundwater pathways to Squaw Creek Reservoir and the Twin Mountains Formation aquifer, and a post-construction evaluation of precipitation effects on maximum groundwater elevations.

The groundwater model and pathway analysis is presented and discussed in response to Question 02.04.12-09 above.

Impact on R-COLA

None.

Impact on S-COLA

None; this supplemental response is site-specific.

Impact on DCD

None.

SUPPLEMENTAL 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.: 4314 (CP RAI #147)

SRP SECTION: 02.04.12 – GROUNDWATER

QUESTIONS FOR HYDROLOGIC ENGINEERING BRANCH (RHEB)

DATE OF RAI ISSUE: 2/26/2010

QUESTION NO.: 02.04.12-12 S01

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.

By letter dated October 2, 2009, the NRC staff issued RAI ID 3672 (RAI No. 114), Question Number 14269 (02.04.12-4), in which the NRC staff asked "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; and (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."

The applicant responded in document CP-200901564-Log No TXNB-09067-(ML093230704) executed on November 13, 2009. The NRC staff has reviewed the response and has determined that additional information is needed in order to complete its review.

The NRC staff determined that the hydrographs with rainfall data provided by the applicant‘s response do not provide adequate information to determine whether the data demonstrates equilibrium conditions since water levels in some wells are still increasing.

In order to make its safety determinations based on the most current and reliable information, the staff requests that the applicant provide updated hydrographs with more recent data.

This is supplemental RAI 2.4.12-03-S-b.

SUPPLEMENTAL INFORMATION:

Luminant responded on August 26, 2010 (ML102440679) stating:

> Eighteen months of groundwater gauging data for the on-site monitoring wells has been provided. No further data collection was performed for the on-site groundwater monitoring wells.
>
> Historical on-site water levels are discussed in FSAR Subsection 2.4.12.2.3, which emphasizes the general lack of reliable groundwater found during construction activities at CPNPP Units 1 and 2. None of the onsite monitoring wells with the exception of some soil (groundwater A-zone) wells, shows a correlation with rainfall data collected from the Opossum Hollow rain gage. Additional and more recent data would not provide any useful information as it has already been shown that the wells do not respond to climatic changes.
>
> Currently, the only wells that show any effect due to precipitation are the groundwater A-zone wells. These wells will be entirely removed and maximum groundwater accumulation within the underlying formations will be controlled by the post-construction grading plan.

Since that date, Luminant has conducted an additional five months of groundwater gauging activities at the CPNPP site, which is discussed in the enclosed Project Report TXUT-001-PR-019. Updated hydrographs are Figures 2 through 21 in this report. This supplement provides updated FSAR text, tables and figures.

Enclosure

Project Report TXUT-001-PR-019, Revision 0, “Groundwater Monitoring Well Gauging and Squaw Creek Reservoir Elevation Assessment Report for the COL Application” (on CD)

Impact on R-COLA

See attached marked-up FSAR Revision 3 pages 2-lxvii, 2.4-73, 2.4-74, 2.4-75, 2.4-76, 2.4-77, 2.4-78, 2.4-79, 2.4-80, 2.4-95, 2.4-250, 2.4-251, 2.4-252, 2.4-253, 2.4-254, 2.4-255, 2.4-256, 2.4-257, 2.4-258,2.4-266, Figures 2.4.12-208, 2.4.12-209, and 2.4.12-210.

See attached marked-up ER Revision 3 pages 2.3-32, 2.3-33, 2.3-34, 2.3-35, 2.3-36, 2.3-37, 2.3-38, 2.3-137, 2.3-138, 2.3-139, 2.3-140, 2.3-141, 2.3-142, 2.3-143, 2.3-144, 2.3-145, 6.3-3, 6.3-4, and 6.6-4, and Figure 2.3-27.

Impact on S-COLA

None; this supplemental response is site-specific.

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.: 4314 (CP RAI #147)

SRP SECTION: 02.04.12 – GROUNDWATER

QUESTIONS FOR HYDROLOGIC ENGINEERING BRANCH (RHEB)

DATE OF RAI ISSUE: 2/26/2010

QUESTION NO.: 02.04.12-13 S01

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.

By letter dated October 2, 2009, the NRC staff issued RAI ID 3672 (RAI No. 114), Question Number 14270 (02.04.12-5), in which the NRC staff asked "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."

The applicant responded in document CP-200901564-Log No TXNB-09067-(ML093230704) executed on November 13, 2009. The NRC staff has reviewed the response and has determined that additional information is needed in order to complete its review.

The staff noted that groundwater levels in wells MW-1200b and MW-1202B are labeled as anomalous on Figures 2.4.12-210 sheets 6 through 8. However, Table 2.4.12-209 shows that the water levels measured in the wells were relatively consistent throughout the period of monitoring. The information lacks adequate description of why the values from these wells are considered anomalous and not included as part of the potentiometric contouring on Figures 2.4.12-210. If included, the data could indicate that water levels within B-zone are lower to the west of the Unit 4 reactor site and that groundwater may flow from Unit 4 to the west.

The NRC staff also noted that the four flowpaths currently presented in the FSAR represent the shortest straight line from the proposed Units to SCR. As a result, the resultant flowpaths may not be realistically representative of the post-construction environment.

In order to make its safety determination based on information that adequately demonstrates conservatism and consideration of the post-construction conditions at the site, the staff requests

that flowpaths be based upon post-construction site conditions, as determined in the analyses performed in response to RAI 2.4.12-01. In addition, if the anomalous nature of the water level measurements from wells MW-1200b and MW-1202b cannot be adequately explained, the staff requests that the applicant evaluate the potential of flowpaths to the west away from Unit 4.

This is supplemental RAI 2.4.12-04-S.

SUPPLEMENTAL INFORMATION:

Luminant responded on August 26, 2010 (ML102440679) stating:

> During evaluation of groundwater flow pathways following construction of CPNPP Units 3 and 4, it was determined that engineered fill placement surrounding the reactor building, auxiliary building, essential service water pipe tunnels, and ultimate heat sink basins was in connection with areas of existing fill to the east of Unit 3 and north of Unit 4. Therefore, groundwater flow pathways were evaluated using the engineered fill instead of the low hydraulic conductivity Glen Rose Limestone. Because the properties of the engineered fill to be used during construction are unknown, it has been conservatively assumed that any groundwater reaching the engineered fill would be transported instantly to the nearest engineered fill/existing fill interface, where it would then flow through the existing fill to SCR. See Figure 1-1 provided with the response to Question 02.04.12-9 above.
>
> Hydrographs of groundwater B-zone wells MW-1200b and MW-1202b show a slow, steady rise in level following installation. These wells are clearly not in equilibrium with the surrounding groundwater and cannot be used to make groundwater gradient judgment.

The question was considered resolved and closed as a result of the submitted information.

Since that date, Luminant has constructed and analyzed numerical groundwater models for the CPNPP site, including a projection of post-construction groundwater elevations and groundwater pathways to Squaw Creek Reservoir and the Twin Mountains Formation aquifer. Luminant has also conducted an additional five months of groundwater gauging activities at the CPNPP site. B-zone monitoring wells MW-1200b and MW-1202b now show indications of equilibrium conditions (fluctuating or falling water levels) and have been included in the assessment of site groundwater conditions.

The groundwater models and pathway analysis are presented and discussed in the supplemental responses to Questions 02.04.12-09, 02.04.12-11, 02.04.12-12, and 02.04.12-17 with the additional groundwater gauging data and analysis presented and discussed in the response to Question 02.04.12-12.

Impact on R-COLA

None.

Impact on S-COLA

None; this supplemental response is site-specific.

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.: 4314 (CP RAI #147)

SRP SECTION: 02.04.12 – GROUNDWATER

QUESTIONS FOR HYDROLOGIC ENGINEERING BRANCH (RHEB)

DATE OF RAI ISSUE: 2/26/2010

QUESTION NO.: 02.04.12-14 S01

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.

By letter dated October 2, 2009, the NRC staff issued RAI ID 3672 (RAI No. 114), Question Number 14271 (02.04.12-6), in which the NRC staff asked “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.”

The applicant responded in document CP-200901564-Log No TXNB-09067- (ML093230704) executed on November 13, 2009. The NRC staff has reviewed the response and has determined that additional information is needed in order to complete its review.

The NRC staff acknowledges that in response to parts (a) and (b) of the RAI question, the applicant has revised the calculations and used a porosity of 11.9% for the C-zone limestone. However, in Section 2.5 of the FSAR it is estimated that the limestone beds at the site have an average “total” porosity of 11.9%. Effective porosity would be substantially lower than 11.9% especially since average moisture content of the limestone reported in Section 2.5 was only 5%. Therefore, Staff finds that the Applicant’s assumption of an effective porosity of 11.9% to be not conservative for the C-zone limestone.

In order to make its safety determination based on consideration of conservative estimates for parameters that govern the hydrologic processes at the site, the staff requests that the applicant

use more conservative assumptions for effective porosity for the lateral and vertical migration scenarios or provide additional justification for the conservatism of existing assumptions.

This is supplemental RAI 2.4.12-05-S-a.

SUPPLEMENTAL INFORMATION:

Luminant responded on August 26, 2010 (ML102440679) and the question was considered resolved and closed as a result of the submitted information.

Since that date, Luminant has constructed and analyzed numerical groundwater models for the CPNPP site, including a projection of post-construction groundwater elevations and groundwater pathways to Squaw Creek Reservoir and the Twin Mountains Formation aquifer. These models justify the parameters used in the model construction and analysis, including effective porosities.

The groundwater model and pathway analysis is presented and discussed in the response to Question 02.04.12-09 above.

Impact on R-COLA

None.

Impact on S-COLA

None; this supplemental response is site-specific.

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.: 4314 (CP RAI #147)

SRP SECTION: 02.04.12 – GROUNDWATER

QUESTIONS FOR HYDROLOGIC ENGINEERING BRANCH (RHEB)

DATE OF RAI ISSUE: 2/26/2010

QUESTION NO.: 02.04.12-15 S01

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.

By letter dated October 2, 2009, the NRC staff issued RAI ID 3672 (RAI No. 114), Question Number 14271 (02.04.12-6), in which the NRC staff asked "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."

The applicant responded in document CP-200901564-Log No TXNB-09067-(ML093230704) executed on November 13, 2009. The NRC staff has reviewed the response and has determined that additional information is needed in order to complete its review.

The NRC staff noted that the applicant's response to part (c) of the RAI reports that the hydraulic conductivity used for the horizontal flowpath was 1.37×10^{-5} cm/sec which is representative for the C-zone. If there is B-zone remaining after excavation is completed, a more conservative hydraulic conductivity value is warranted to be used for the remaining zone.

In order to make its safety determination based on consideration of current and correct information, the staff requests that the applicant confirm the existence of any remaining B-zone after excavation and discuss the selection of conservative post-construction porosities and hydraulic conductivities for the C-zone and B-zone.

This is supplemental RAI 2.4.12-05-S-b.

SUPPLEMENTAL INFORMATION:

Luminant responded on August 26, 2010 (ML102440679) stating:

1. FSAR Subsection 2.4.12.3.1 states that the highest hydraulic conductivity measured at the site (1.37×10^{-5} cm/s) was used for the pathway analysis. This hydraulic conductivity was measured from MW-1217b, a groundwater B-zone well completed in. engineering layer "A", and was the highest measure hydraulic conductivity measured within the Glen Rose Limestone.
2. The discussion of hydraulic conductivity values in the FSAR and the RAI response do not state that the hydraulic conductivity is from the engineering layer "C" zone of the Glen Rose. It is measured in the upper Glen Rose (groundwater B-zone) with higher hydraulic conductivities than the engineering layer "C" zone. As stated in the FSAR and used in the postulated accident analysis, the hydraulic conductivity is the highest measured on site, and will be conservative for the postulated release flow path through the engineering layer "C" zone.
3. Based on the response to Question 2.4.12-13 above, the hydraulic conductivity of the Glen Rose Limestone will no longer be used in the pathway analysis, as it is assumed that groundwater will preferentially flow through the engineered fill and existing fill prior to release in SCR. Pathway analysis calculations have been revised to use the hydraulic conductivity of the existing fill.

The question was considered resolved and closed as a result of the submitted information.

Since that date, Luminant has constructed and analyzed numerical groundwater models for the CPNPP site, including a projection of post-construction groundwater elevations and groundwater pathways to Squaw Creek Reservoir and the Twin Mountains Formation aquifer. These models justify the parameters used in the model construction and analysis, including effective porosities.

The groundwater model and pathway analysis is presented and discussed in the response to Question 02.04.12-09 above.

Impact on R-COLA

None.

Impact on S-COLA

None; this supplemental response is site-specific.

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.: 4314 (CP RAI #147)

SRP SECTION: 02.04.12 – GROUNDWATER

QUESTIONS FOR HYDROLOGIC ENGINEERING BRANCH (RHEB)

DATE OF RAI ISSUE: 2/26/2010

QUESTION NO.: 02.04.12-16 S01

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.

By letter dated October 2, 2009, the NRC staff issued RAI ID 3672 (RAI No. 114), Question Number 14271 which asked “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.”

The applicant responded in document CP-200901564-Log No TXNB-09067-ML093230704 executed on November 13, 2009. The NRC staff has reviewed the response and has determined that additional information is needed in order to complete its review.
During the review of groundwater velocity and travel time calculations presented in Table 2.4.211, the staff found several items that made it impossible to reproduce the velocities and travel times results for each pathway using the parameters and assumptions presented in the FSAR. The items identified are explained as follows:

a) Using the Applicant's assumptions provided in Table 2.4.12-211, the staff performed a confirmatory analyses for travel time and velocity. The staff was not able to recreate velocities and travel times reported by the Applicant in Table 2.4.12-211.

b) In Table 2.4.12-211, the water levels reported from wells MW-1217a (Scenario 1, Pathway 3a) and MW-1215a (Scenario 2, Pathway 4a) are incorrect. The values are actually the same as the values reported for wells MW-1217b and MW-1215b, respectively.

c) Table 2.4.12-211 and Section 2.4.12.3.1 (page 2.4-57) report that a hydraulic conductivity value of 1.37x10-5 cm/sec was used in the travel time calculations. However, in Section 2.4.12.3 (page 2.4-56) the upper value for hydraulic conductivity within the shallow bedrock is reported as $1.037x10^{-5}$ cm/sec.

In order to make its safety determination based on current, correct, and conservative estimates of parameters that govern the hydrologic processes at the site, the staff requests the following information.

1) Pursuant to issue (a), document all parameter values used in the calculations (including the path length for each scenario), and, if necessary revise the FSAR to include corrected results.
2) Pursuant to issue (b), correct either the well names or the starting head values for the calculation and revise the calculation as appropriate.
3) Pursuant to issue (c) determine which of these values is correct and revise the calculation as appropriate.

This is supplemental RAI 2.4.12-05-S-c.

SUPPLEMENTAL INFORMATION:

Luminant responded on August 26, 2010 (ML102440679) stating:

> Typographical errors were discovered In FSAR Table 2.4.12-211 and Subsection 2.4.12.3. The table has been revised to show parameters and calculations for the anticipated fill transport of groundwater based on the re-evaluation of flow pathways described in the response to Question 02.04.12-13 above. FSAR Subsection 2.4.12.3 has been revised to discuss the current pathway analysis as described in the responses to Questions 02.04.12-9, -13, -14, and -15 above.

The question was considered resolved and closed as a result of the submitted information.

Since that date, Luminant has constructed and analyzed numerical groundwater models for the CPNPP site, including a projection of post-construction groundwater elevations and groundwater pathways to Squaw Creek Reservoir and the Twin Mountains Formation aquifer.

The groundwater model and pathway analysis is presented and discussed in the response to Question 02.04.12-09 above and includes updated FSAR tables, text, and figures as appropriate.

Impact on R-COLA

None.

Impact on S-COLA

None; this supplemental response is site-specific.

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.: 4314 (CP RAI #147)

SRP SECTION: 02.04.12 – GROUNDWATER

QUESTIONS FOR HYDROLOGIC ENGINEERING BRANCH (RHEB)

DATE OF RAI ISSUE: 2/26/2010

QUESTION NO.: 02.04.12-17 S01

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.

By letter dated October 2, 2009, the NRC staff issued RAI ID 3672 (RAI No. 114), Question Number 14272 (02.04.12-7), in which the NRC staff asked "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."

The applicant responded in document CP-200901564-Log No TXNB-09067-ML093230704 executed on November 13, 2009. The NRC staff has reviewed the response and has determined that additional information is needed in order to complete its review.

The staff disagrees with the applicant's assertion that there will be no groundwater at the site during the post-construction phase. Data from Units 1 and 2 show that construction activities can create areas where water levels are elevated due the placement of permeable fill materials. Figures 2.4.12-213 and 2.4.12-214 show new fill around many of the new structures, but it is not clear how and if this new fill will be drained and what the details will be for post-construction groundwater and surface water conditions (flow and levels). Seasonal trends in groundwater elevation related to seasonal rainfall recharge are obvious with as much as 10 ft of variation between wet and dry seasons in the A-zone and 5 ft in the B-zone (which will not be entirely excavated during construction).

In order to make its safety determination based on site configuration that reflects the engineered fill materials and changes to the onsite hydrologic processes, the NRC staff requests that the applicant

provide a conservative analysis of maximum operational groundwater level that takes into account the removal of portions of Zone-B and takes into account the fact that the area surrounding the excavated and backfilled area of the site still has the potential for lateral inflow. The analyses should include an evaluation of any surface and subsurface drainage systems that will be implemented to maintain groundwater levels below the Design Control Document design criteria..

This is supplemental RAI 2.4.12-06-S.

SUPPLEMENTAL INFORMATION:

Luminant responded on August 26, 2010 (ML102440679) stating:

> This question is answered in the responses to Questions 02.04.12-9 and 02.04.12-13 above. Re-evaluation of groundwater flow in engineered fill material and limiting conditions provided by the trench drain system will maintain groundwater levels below the DCD design criteria.

Since that date, Luminant has constructed and analyzed a numeric groundwater model for the CPNPP site, including a projection of post-construction groundwater elevations and groundwater pathways to Squaw Creek Reservoir and the Twin Mountains Formation aquifer. The post-construction evaluation of precipitation effects on maximum groundwater elevations does not rely on the perimeter trench drain elevations when analyzing post-construction groundwater elevations.

The groundwater model and pathway analysis is presented and discussed in the response to Question 02.04.12-09 above.

Impact on R-COLA

None; this supplemental response is site-specific.

Impact on S-COLA

None.

Impact on DCD

None.