BSC

Calculation/Analysis Change Notice

Complete only applicable items.

3. Document Identifier:	4. Rev.:	5. CACN:
800-P0C-MGR0-00100-000	00E	001

6. Title:

Underground Layout Configuration

7. Reason for Change:

This CACN has been created to amend the subsurface layout Geologic Framework Model reference information. A Data Tracking Number (DTN) that was used as a primary reference in this calculation has been superseded. This CACN adds a reference to the current Geologic Framework Model DTN.

The *VULCAN GFM3.1 Representation* reference (DTN: MO0003MWDVUL03.002) was qualified and verified at the time this calculation was issued. However, this reference has been superseded and the appropriate data for BSC engineering to reference is the *Geologic Framework Model 2000* (DTN: MO0012MWDGFM02.002), as noted in the current *IED Geotechnical and Thermal Parameters* (DI: 800-IED-MGR0-00401-000). The *Geologic Framework Model 2000* data files were converted to a file format suitable for BSC engineering use as the *GFM2000 Representation in the VULCAN Software System* (DTN: MO0309MWDVCNGR.001), which is owned by BSC engineering and was utilized in the creation of this CACN.

8. Supersedes Change Notice:	☐ Yes	If, Yes, CACN No.: _____	☒ No

9. Change Impact:

Inputs Changed:	☒ Yes	☐ No	Results Impacted:	☐ Yes	☒ No
Assumptions Changed:	☐ Yes	☒ No	Design Impacted:	☐ Yes	☒ No

10. Description of Change:

Insert text at the end of Section 4.2:

The model evaluation in Section 5.1.3.3 was preformed using the qualified software VULCAN 3D 6.0 (STN: 10044-6.0-00). The evaluation and determination of operational standoffs using the VULCAN 3D 6.0 software were executed on a qualified Dell Optiplex 745 (Computer Workstation M&O: YMP005052) running the Windows XP operating system. The use of VULCAN 3D 6.0 was fully within the range of the validation performed for VULCAN 3D 6.0 (DOE 2007). Therefore, VULCAN 3D 6.0 is appropriate for the evaluation as performed in this calculation.

Alter text in the last paragraph of Section 5.1.3 as follows:

A new version of the geologic model for Yucca Mountain, *GFM2000* (DTN: MO0012MWDGFM02.002), has been developed. A non-verified version has been compared with the current work and there appears to be no impact to the layout, but when the new VULCAN representation becomes available, an impact review will be required.

Insert text at the end of Section 5.1.3:

5.1.3.1 The Underground Layout Configuration

The layout is based on the *VULCAN GFM3.1 Representation*. The layout configuration was evaluated against a non-verified version of the *Geologic Framework Model 2000* (GFM2000) and found to have no impact on the layout. The *VULCAN GFM3.1 Representation* has since been superseded by the *GFM2000 Representation in the VULCAN Software System*, a 3-D model consisting of VULCAN files created by BSC engineering using the qualified version of the *Geologic Framework Model 2000*.

5.1.3.2 The Geologic Framework Model 2000

The GFM2000 document (BSC 2004) provides discussion on data changes from GFM3.1 to GFM2000. All of the GFM2000 input data were qualified prior to the model's final development. Model changes included the following:

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- refines fault locations and displacements represented in the model, specifically adding a fault in the model's far northeast corner and truncating the Ghost Dance-Abandoned Wash faults at depth, making the model more consistent with observations from geologic mapping (BSC 2004, Section 6.3.4)

- incorporates qualified borehole data omitted from GFM3.1, utilizing all available borehole data from the modeled area (BSC 2004, Section 6.3.4)

- enhancements to the geologic modeling software provide a more accurate model (BSC 2004, Section 6.3.4).

As stated in the GFM2000 document, while most changes increase the model's accuracy, the changes to the model's faults are either outside the layout area or far below the repository level, so no impact is anticipated for users of the GFM2000 DTN in the emplacement vicinity (BSC 2004, Section 6.3.4).

5.1.3.3 Model Evaluation Results

The layout configuration defined in this calculation is constrained to the location of the emplacement area, and this location is limited by geologic, hydrologic, overburden, and fault offsets (see Section 7.1). A review of the subsurface layout configuration against the qualified GFM2000 model indicates no effect on the layout with respect to the geologic, hydrologic, overburden, and fault offsets. However, for future detailed design on the underground layout configuration, it should be noted that the 60 m Calico Hills nonwelded hydrogeologic unit (CHn) minimum standoff distance (Section 7.1.6) is not met in the Panel 2 Exhaust Main near emplacement drifts 2-17 to 2-23. Consequently, these seven emplacement drifts do not have much leeway for their elevation to be reduced and to still comply with all the hydrologic offsets.

The *Underground Layout Configuration for LA* (BSC 2007) incorporated excavation gradient requirements for the Transport and Emplacement Vehicle, which did not exist when this calculation was published. These design changes lowered all Panel 1, Panel 2, and Panel 3W emplacement drift elevations by 1.345 m from the elevations dictated by this calculation (BSC 2007, Section 6.5.2). To verify the lowered emplacement drifts in Panel 2 met the 60 m CHn minimum standoff distance (Section 7.1.6), this calculation's designed emplacement drifts were lowered 1.345 m and checked against the *GFM2000 Representation in the VULCAN Software System* (DTN: MO0309MWDVCNGR.001). Emplacement drifts 2-17 to 2-23 did not meet the 60 m CHn minimum offset (Section 7.1.6), so operational standoffs are needed for these seven drifts. The lengths of each emplacement drift that failed to meet the hydrologic offset were measured using VULCAN and appropriate operational standoff distances were chosen (Table C1). These operational standoffs change the available emplacement drift length, reducing it by 64 m.

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Table C1: Emplacement Drift Operational Standoffs

Emplacement Drift	Operational Standoff [1] (meters)
2-17	5
2-18	10
2-19	10
2-20	11
2-21	11
2-22	11
2-23	6

Note 1: The assigned operational standoff has been round up to the nearest whole meter. The dimensions in Table C1 are provisional until a detailed evaluation is performed during the revision of the ULCLA calculation.

Insert text at the end of Section 8.8:

The available emplacement drift length of 63,944 m identified in Attachment I was revised to 65,273 m in the *Underground Layout Configuration for LA* (Section 7.5.1) layout reconfigurations. The model evaluation in Section 5.1.3.3 dictated an additional 64 m in operational standoffs in emplacement drifts 2-17 to 2-23. This results in a new available emplacement length of 65,209 m.

Add the following references to Section 10:

BSC 2007. *Underground Layout Configuration for LA*. 800-KMC-SS00-00200-000-00B. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070727.0004; ENG.20071214.0002; ENG.20080304.0021.

BSC 2004. *Geologic Framework Model (GFM2000)*. MDL-NBS-GS-000002 REV 02. Las Vegas, Nevada: Bechtel SAIC Company. ACC: DOC.20040827.0008. [DIRS 170029]

DOE (U. S. Department of Energy) 2007. *Software Validation Report for: VULCAN 3D Version 6.0 Software*. 10044-SVR-6.0-00-WINXP. Las Vegas, Nevada: U. S. Department of Energy, Office of Repository Development. ACC: MOL.20071213.0336. [DIRS 185218]

MO0309MWDVCNGR.001. *Data Files for GFM2000 Representation in the VULCAN Software System*. Submittal date: 09/25/2003. [DIRS 166600]

VULCAN 3D V6.0. 2007. Windows XP. 10044-6.0-00. [DIRS 185217]

11. REVIEWS AND APPROVAL

Printed Name	Signature	Date
11a. Originator: Kathleen M. Wooton	Kathleen Wooton	10 Mar 2008
11b. Checker: John F. Beesley	John F Beesley	10 Mar 2008
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11d. DEM: Robert J. Boutin	Robert J. Boutin	3/10/08
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