YMP	**Model Error Resolution Document** *Complete only applicable items.*	QA: QA Page 1 of 8

INITIATION

1. Originator:	2. Date:	3. ERD No.
Jim Houseworth/Ming Zhu	4/10/08	MDL-NBS-HS-000006 ERD 02

4. Document Identifier:	5. Document Title:
MDL-NBS-HS-000006 REV 03 AD 01	UZ Flow Models and Submodels

6. Description of and Justification for Change (Identify applicable CRs and TBVs):

I Background Information Summary

CR 11959: This ERD is prepared to correct a value in Table 6.6-1 and Figure 6.2-1 of MDL-NBS-HS-000006 REV 03 AD 01 [DIRS 184614].

The erroneous value in Table 6.6-1 is the percentage of flux through the repository footprint within the matrix at the TCw/PTn interface for the post-10,000-year case and the "q4" uncertainty scenario, designated as pkd_q4. This error was also in the supporting DTN: LB0705FLOWCOMP.001_REV00 [DIRS 181299]. Based on the DIRS impact analysis, the supporting DTN is not cited by any other report.

The correction to Figure 6.2-1 is editorial. The figure contains a symbol for the water table along the perched water bodies that lie above the water table.

The following documents that cite MDL-NBS-HS-000006 REV 03 [DIRS 175177] and MDL-NBS-HS-000006 REV 03 AD 01 [DIRS 184614] were checked for impacts as a result of these corrections.

- ANL-WIS-MD-000024 Rev. 01, *Postclosure Nuclear Safety Design Bases*
- ANL-WIS-MD-000027 Rev. 00, *Features, Events, and Processes for the Total System Performance Assessment: Analyses*
- MDL-WIS-PA-000005 Rev. 00 AD 01, *Total System Performance Assessment Model/Analysis for the License Application*
- TDR-NBS-HS-000020 Rev. 00, *Data Qualification Report for Simulation of Net Infiltration for Present Day and Potential Future Climates Preliminary Output*
- TDR-PCS-SE-000001 Rev. 05 AD 01, *Performance Confirmation Plan*

(see attached)

CONCURRENCE

	Printed Name	Signature	Date
7. Checker	Charles Haukwa		04/10/2008
8. QCS/QA Reviewer	Charles Beach	Charles D. Beach	4-10-08
APPROVAL			
9. Originator	Jim Houseworth Ming Zhu	James Houseworth Ming Zhu	4/10/2008 4/10/08
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(Continued from Block 6)

- ANL-EBS-GS-000002 Rev. 01 AD 01, *Geochemistry Model Validation Report: External Accumulation Model*
- ANL-EBS-MD-000049 Rev. 03 AD 01, *Multiscale Thermohydrologic Model*
- ANL-NBS-HS-000058 Rev. 00, *Calibrated Unsaturated Zone Properties*
- ANL-WIS-PA-000001 Rev. 03, *EBS Radionuclide Transport Abstraction*
- ANL-EBS-MD-000049 Rev. 03, AD 01 *Multiscale Thermohydrologic Model*
- ANL-NBS-HS-000058 Rev. 00, *Calibrated Unsaturated Zone Properties*
- MDL-MGR-HS-000001 Rev. 00, *Irrigation Recycling Model*
- MDL-NBS-HS-000001 Rev. 05 *Drift-Scale THC Seepage Model*
- MDL-NBS-HS-000008 Rev. 02 ACN 02 AD 01, *Radionuclide Transport Models Under Ambient Conditions*
- MDL-NBS-HS-000008 Rev. 02 AD 01, *Radionuclide Transport Models Under Ambient Conditions*
- MDL-NBS-HS-000011 Rev. 03, *Saturated Zone Site-Scale Flow Model*
- MDL-NBS-HS-000019 Rev. 01 AD 01, *Abstraction of Drift Seepage*
- MDL-NBS-HS-000020 Rev. 02 AD 01, *Particle Tracking Model and Abstraction of Transport Processes*
- MDL-NBS-HS-000021 Rev. 03 AD 01, *Saturated Zone Flow and Transport Model Abstraction*
- MDL-NBS-HS-000023 Rev. 01 AD 01, *Simulation of Net Infiltration for Present-Day and Potential Future Climates*
- DOE/RW-0573, *Yucca Mountain Repository SAR.* (In Process)

II Inputs and/or Software

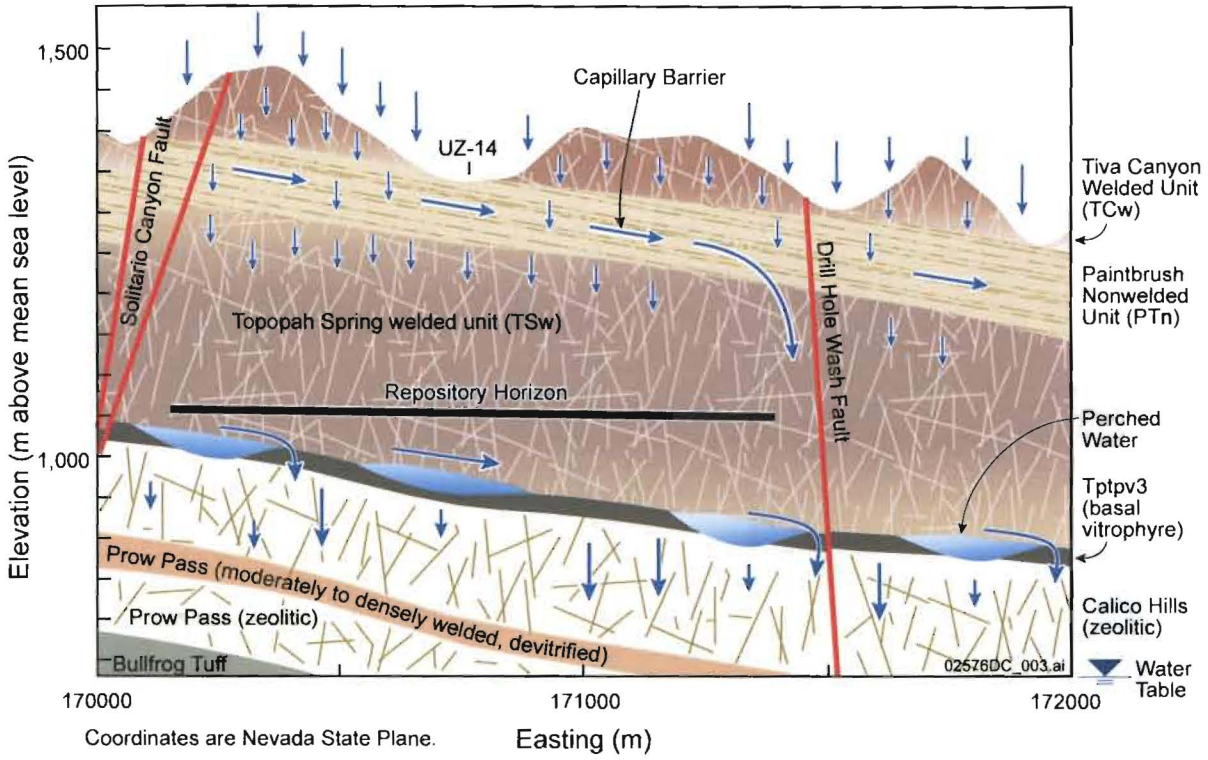
The only direct input to this error resolution analysis is DTN: LB0702UZP10KFF.002 [DIRS 179324]. This DTN is qualified as shown in the TDMS and linked in the DIRS to the parent report. This error has been corrected in DTN: LB0705FLOWCOMP.001_REV01.

No software controlled under IM-PRO-003, *Software Management*, is used in this analysis.

III Analysis and Results

The re-analysis determined that the percentage of flow in the matrix at the PTn/TCw interface within the repository footprint for the pkd_q4 climate/uncertainty scenario is 0.05% instead of 1.42%. This correction is in Table 6.6-1 below.

The corrected Figure 6.2-1, where the water table symbol has been removed from the perched water area below the repository, is given below:



Source: For illustration purposes only.

Figure 6.2-1. Schematic Showing the Conceptualized Flow Processes and Effects of Capillary Barriers, Major Faults, and Perched Water Zones within a Typical Cross Section of the Unsaturated Zone Flow Model Domain in the East-West Direction

Additional errors were identified during the revision of DTN: LB0705FLOWCOMP.001_REV00. The mass flow rate reported in the DTN for flow through the repository footprint at the repository horizon for present-day climate and the 90th percentile uncertainty scenario (designated in the DTN as pd_90) was found to be incorrect. The value reported in the DTN was 71.2886 kg/s. This value has been corrected to 6.305006 kg/s in DTN: LB0705FLOWCOMP.001_REV01.

The climate/uncertainty labels in Tables 6.6-1, 6.6-2, and 6.6-3 were also found to be incorrect for present-day and glacial-transition climates. That is, pd_10 should be labeled gt_10, pd_30 should be labeled gt_30, etc., and conversely gt_10 should be labeled pd_10, gt_30 should be labeled pd_30, etc. The labels for monsoon and post-10,000 year climates are correct. Rather than exchange the climate uncertainty labels for present-day 10th through 90th uncertainty cases

with glacial-transition 10th through 90th uncertainty cases, the labels are kept in the same order and the information in the corresponding rows are swapped. This keeps the climate periods presented in Tables 6.6-1, 6.6-2, and 6.6-3 in the natural progression over time going from top to bottom in each table. The corrected tables are shown below.

Table 6.6-1. Comparison of the Water Flux through Matrix, Fractures of Non-fault Zones, and Faults as a Percentage of the Total Flux over the Entire Model Domain and within the Repository Footprint at the TCw/PTn Interface for the 16 Flow Fields

Simulation Designation	Flux at TCw/PTn Interface over Entire UZ Flow Model Domain (%)			Flux at TCw/PTn Interface within Repository Footprint (%)		
	Fracture	Matrix	Fault	Fracture	Matrix	Fault
pd_10	98.30	0.10	1.59	98.69	0.10	1.21
pd_30	98.11	0.11	1.78	98.59	0.10	1.32
pd_50	98.08	0.07	1.84	98.59	0.07	1.34
pd_90	97.99	0.09	1.91	98.50	0.08	1.41
mo_10	98.06	0.06	1.87	98.60	0.06	1.35
mo_30	98.13	0.07	1.80	98.61	0.06	1.33
mo_50	98.33	0.06	1.61	98.72	0.05	1.22
mo_90	98.03	0.04	1.93	98.55	0.03	1.42
gt_10	98.66	0.04	1.31	99.01	0.04	0.95
gt_30	98.33	0.05	1.62	98.76	0.04	1.20
gt_50	98.54	0.03	1.43	98.81	0.03	1.16
gt_90	98.34	0.05	1.61	98.64	0.04	1.32
pkd_q1	98.10	0.03	1.87	98.61	0.02	1.37
pkd_q2	98.54	0.03	1.43	98.82	0.03	1.16
pkd_q3	98.38	0.03	1.59	98.68	0.02	1.30
pkd_q4	98.02	0.06	1.93	98.53	0.05	1.42

Output DTNs: LB06123DPDUZFF.001; LB07013DMOUZFF.001; LB07013DGTUZFF.001; LB0702UZP10KFF.002; LB0705FLOWCOMP.001_REV01, file: flux_statistics_updated.xls.

PTn=Paintbrush nonwelded hydrogeologic unit; TCw=Tiva Canyon welded hydrogeologic unit.

NOTE: The sum of flux percentages of fracture, matrix, and fault may differ slightly from 100% due to truncation errors.

Table 6.6-2. Comparison of the Water Flux through Matrix, Fractures of Non-fault Zones, and Faults as a Percentage of the Total Flux over the Entire Model Domain and within the Repository Footprint at the Repository Level for the 16 Flow Fields

Simulation Designation	Flux at Repository Horizon over Entire UZ Flow Model Domain (%)			Flux at Repository Horizon within Repository Footprint (%)		
	Fracture	Matrix	Fault	Fracture	Matrix	Fault
pd_10	64.63	17.49	17.88	86.90	12.31	0.79
pd_30	71.33	10.27	18.40	93.50	5.05	1.45
pd_50	71.29	9.12	19.59	94.14	4.43	1.42
pd_90	78.97	7.43	13.60	96.95	2.06	0.99
mo_10	71.64	13.26	15.10	91.14	8.00	0.86
mo_30	73.34	9.35	17.31	94.54	4.04	1.42
mo_50	68.18	8.13	23.70	95.11	3.55	1.34
mo_90	79.63	6.33	14.04	97.89	1.03	1.08
gt_10	58.42	9.71	31.87	94.20	5.16	0.65
gt_30	67.14	7.90	24.95	95.96	2.73	1.31
gt_50	64.74	7.51	27.75	96.68	2.03	1.28
gt_90	74.04	6.69	19.27	97.76	1.24	1.00
pkd_q1	79.14	9.02	11.84	95.79	3.32	0.89
pkd_q2	65.34	7.24	27.42	96.88	1.84	1.29
pkd_q3	72.36	6.93	20.71	97.09	1.49	1.42
pkd_q4	79.40	6.71	13.89	97.58	1.37	1.05

Output DTNs: LB06123DPDUZFF.001; LB07013DMOUZFF.001; LB07013DGTUZFF.001; LB0702UZP10KFF.002; LB0705FLOWCOMP.001_REV01, file: flux_statistics_updated.xls.

NOTE: The sum of flux percentages of fracture, matrix, and fault may differ slightly from 100% due to truncation errors.

Table 6.6-3. Comparison of the Water Flux through Matrix, Fractures of Non-fault Zones, and Faults as a Percentage of the Total Flux over the Entire Model Domain and within the Repository Footprint at the Water Table for the 16 Flow Fields

Simulation Designation	Flux at Water Table over Entire UZ Flow Model Domain (%)			Flux at Water Table within Repository Footprint (%)		
	Fracture	Matrix	Fault	Fracture	Matrix	Fault
pd_10	30.35	25.98	43.68	51.55	32.52	15.93
pd_30	34.57	15.44	49.99	52.30	16.85	30.85
pd_50	28.42	17.01	54.56	49.21	17.60	33.19
pd_90	31.31	10.58	58.11	57.61	7.71	34.68
mo_10	29.13	21.71	49.16	52.90	26.63	20.47
mo_30	31.25	14.83	53.91	51.38	15.93	32.69
mo_50	25.99	15.39	58.62	48.80	17.10	34.10
mo_90	29.17	8.17	62.66	58.42	5.94	35.64
gt_10	20.24	14.40	65.36	54.21	23.53	22.26
gt_30	25.56	12.78	61.66	50.58	16.50	32.92
gt_50	22.35	12.72	64.92	47.26	15.70	37.04
gt_90	28.72	7.09	64.19	57.97	5.95	36.08
pkd_q1	26.18	18.84	54.98	56.95	19.96	23.09
pkd_q2	22.84	11.93	65.23	50.42	16.87	32.70
pkd_q3	23.50	14.01	62.50	47.89	15.10	37.01
pkd_q4	29.88	8.95	61.17	58.55	6.26	35.18

Output DTNs: LB06123DPDUZFF.001; LB07013DMOUZFF.001; LB07013DGTUZFF.001; LB0702UZP10KFF.002; LB0705FLOWCOMP.001_REV01, file: flux_statistics_updated.xls.

NOTE: The sum of flux percentages of fracture, matrix, and fault may differ slightly from 100% due to truncation errors.

In Section 6.6.2.4 of MDL-NBS-HS-000006 REV 03 AD 01, the normalization of percolation flux distributions within the repository footprint is discussed. The flux used to normalize the percolation flux distribution for each climate state is referenced to Tables 6.1-2 and 6.1-3. The normalization flux values for the 10th percentile present-day, monsoon, glacial-transition climate states and the post-10,000 year period are identified as 3.03 mm/yr, 6.74 mm/yr, 11.03 mm/yr, and 16.89 mm/yr, respectively. However, in the supporting DTN (DTN: LB0705FLOWCOMP.001_REV00), the normalization flux values are found to be 3.69 mm/yr, 7.14 mm/yr, 10.8 mm/yr, and 19.6 mm/yr for the 10th percentile present-day, monsoon, glacial-transition climate states and the post-10,000 year period, respectively. These values differ from those in Tables 6.1-2 and 6.1-3 because they were computed as the simple average of the percolation flux rates over all columns within the repository footprint in the UZ flow model. That is, the fluxes from all repository footprint columns (in mm/yr) were summed and divided by the total number of repository footprint columns. The average flux values reported in Tables 6.1-2 and 6.1-3 were computed from the total mass flux rate over all model columns divided by the total area of all the model columns and the density of water. The revised paragraph is shown below:

"Percolation fluxes at the repository horizon and within the repository footprint can be further analyzed using a frequency distribution plot. This plot displays the averaged percentage of the repository area subject to a particular percolation rate. Note that the normalized flux rates are determined by normalizing the percolation flux values with respect to the column averaged percolation flux within the repository footprint for each scenario. For example, "1" stands for the normalized flux rate corresponds to average percolation flux within the repository footprint of 3.69, 7.14, 10.08, and 19.60 mm/yr (DTN: LB0705FLOWCOMP.001_REV01), respectively, for each of the four 10th percentile infiltration scenarios. The information, as shown in Figures 6.6-9, 6.6-10, 6.6-11, and 6.6-12 (see Appendix E for calculation details), is important to drift-scale modeling studies of flow and transport at drifts and flow-redistributing phenomena through the TSw. Figures 6.6-9 to 6.6-12 show the frequency distribution of normalized percolation flux within the repository horizon for the four 10th percentile infiltration rates of the four climates."

Figures 6.6-9 through 6.6-13, presented in Section 6.6.2.4 of the parent report should all cite DTN: LB0705FLOWCOMP.001_REV01 as a source DTN in addition to the sources already cited. The specific source information for each figure is shown in the table below.

Figure	Additional Source for Identified Figure
6.6-9	DTN: LB0705FLOWCOMP.001_REV01, file: *pd_10_rep.xls*
6.6-10	DTN: LB0705FLOWCOMP.001_REV01, file: *mo_10_rep.xls*
6.6-11	DTN: LB0705FLOWCOMP.001_REV01, file: *gt_10_rep.xls*
6.6-12	DTN: LB0705FLOWCOMP.001_REV01, file: *pkd_q1_rep.xls*
6.6-13	DTN: LB0705FLOWCOMP.001_REV01, file: *cumu_flux_2007.xls*

IV Impact Evaluation

IV.1 Error in the Percentage of Flow in the Matrix at the PTn/TCw Interface, within the Repository Footprint for the pkd_q4 Climate/Uncertainty Scenario, Table 6.6-1 of MDL-NBS-HS-000006 REV 03 AD 01

The only impact of this error is on DOE/RW-0573. Draft Table 2.3.2-7 of DOE/RW-0573, Section 2.3.2 is affected because this contains the values as given in Table 6.6-1 from MDL-NBS-HS-000006 REV 03 AD 01. The change will be implemented in DOE/RW-0573. No other report has cited this value, nor has the data from the DTN been used by any other technical product. This has no impact on the conclusions of MDL-NBS-HS-000006 REV 03 AD 01.

IV.2 Error in Figure 6.2-1 of MDL-NBS-HS-000006 REV 03 AD 01

The only impact of this error is on DOE/RW-0573. Draft Figure 2.3.2-5 of DOE/RW-0573, Section 2.3.2 is affected because this is the same figure as shown in Figure 6.2-1 of

MDL-NBS-HS-000006 REV 03 AD 01. The change will be implemented in DOE/RW-0573. No other reports are affected by this change. This has no impact on the conclusions of MDL-NBS-HS-000006 REV 03 AD 01.

IV.3 Error in Mass Flow Rate for the pd_90 Climate/Uncertainty Case in MDL-NBS-HS-000006 REV 03 AD 01

This error exists only in DTN: LB0705FLOWCOMP.001_REV00. These mass flow rates were not reported in MDL-NBS-HS-000006 REV 03 AD 01 or MDL-NBS-HS-000006 REV 03. Furthermore, the DTN has not been cited as input by any other technical product. Therefore, this change has no impact. This has no impact on the conclusions of MDL-NBS-HS-000006 REV 03 AD 01.

IV.4 Error in Climate/Uncertainty Case Labels in Tables 6.6-1, 6.6-2, and 6.6-3 of MDL-NBS-HS-000006 REV 03 AD 01

The only impact of this error is on DOE/RW-0573. Draft Table 2.3.2-7 of DOE/RW-0573, Section 2.3.2 is affected because this contains the values as given in Tables 6.6-1, 6.6-2, and 6.6-3 of MDL-NBS-HS-000006 REV 03 AD 01. The change will be implemented in DOE/RW-0573. No other reports have specifically cited present-day or glacial-transition cases from these tables. This error exists within the file "FlowComponents.doc" in the supporting DTN (DTN: LB0705FLOWCOMP.001). This file has been removed from the revised DTN (DTN: LB0705FLOWCOMP.001_REV01). No technical product has cited data from this DTN. This has no impact on the conclusions of MDL-NBS-HS-000006 REV 03 AD 01.

IV.5 Error in Normalization Flux Values for Percolation Flux Distributions in the Repository Footprint in Section 6.6.2.4 of MDL-NBS-HS-000006 REV 03 AD 01

This error does not impact any reports or DTNs. This has no impact on the conclusions of MDL-NBS-HS-000006 REV 03 AD 01.

IV.6 Additional Source Information for Figures 6.6-9 through 6.6-13 of MDL-NBS-HS-000006 REV 03 AD 01

This error does not impact any technical products or DTNs. This has no impact on the conclusions of MDL-NBS-HS-000006 REV 03 AD 01.